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Corrugated Iron Buildings in Britain: Cultural Significance and Conservation Challenges

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Chapter 3: The Development of Cultural Values in Britain and their Effect on the Designation of Corrugated Iron Buildings

3.0 Introduction

A crucial obstacle in the protection of corrugated iron buildings is the perception that they have no value. It is typical to discard that which is without value, and so corrugated iron buildings have, throughout their production history, been pulled down as quickly as they were put up. The reasons for this are very complex, involving Britain's history; the longevity of iron (especially corrugated iron); and the uses that corrugated iron has been put to. Apart from *plastic,* corrugated iron is a material that is disliked almost more than any other. Chapter 3 explores cultural values, the development of conservation values, and why both perceptions derived from historical events and cultural commentators affect current cultural values. This evaluation is developed to examine how the philosophical roots of conservation influence current conservation valuation and the designation of corrugated iron buildings. Chapter 3 also investigates how our national perceptions of corrugated iron have affected the conservation of these buildings.

Dorothy Bell proposes that:

> Cultural values, the core principles on which society exists, are dependent on the unwritten and often unspoken rules by which we organise our behaviour. Some cultural values are near universal (for example, abhorrence of murder), but many are not and depend heavily on learnt responses.[282]

[282] Bell, 'The Value of Ruins,' 265.

Cultural values come from our national, local and personal histories. They are what we acknowledge when we think about what to preserve for the future. These are what inform our conservation values.

The conservation values we ascribe to buildings, and hence their cultural significance, will inform us what to conserve. What is conserved will be the narrative of the histories that represent us, as observed by the Getty Conservation Institute:

> In the field of cultural heritage conservation, values are crucial to deciding what to conserve - what material goods will represent us and our past, to future generations – as well as to determining how to conserve?[283]

The cultural values and perceptions which affect the cultural significance of corrugated iron buildings depend heavily on learnt responses. The cultural significance that we ascribe to corrugated iron buildings is not fundamental to society, it has been acquired through memories and cultural values. This chapter will explore these cultural and conservation values, and explores how the criteria for the conservation of buildings, and in particular corrugated iron buildings are affected.

[283] Avrami, Mason, and de la Torre, *Values and Heritage Conservation*, 1.

3.1 The Importance of Cultural Values in Conservation

The Getty Conservation Institute observes that: 'Values give some things significance over others and thereby transform some objects and places into *heritage.*'[284] To assess the value of buildings there must be a system of valuation. The evaluations, judgements and actions in conservation depend on the categories used for assessing cultural significance. These categories of cultural significance are dependent on their authors, usually conservation commentators such as Austrian art historian Alois Riegl, or architectural authorities such as Historic England, and are written out in documents like the Burra Charter or Historic England's Conservation Principles.[285]

Other systems which determine cultural significance are organised less formally but are still pervasive. For example, personal responses to historic buildings are substantially governed by the associations that these spaces hold for the individual.[286] We might construct our own hierarchies of significance based on our regard for people who lived in a particular building, or we might develop an idiosyncratic emotional attachment to ruins based on our familiarity with Gothic horror stories, such as *Frankenstein* written by Mary Shelley and published in 1818.

Academic and popular writing on conservation philosophy is always implicitly based on the personal conservation values of the author. This is often unacknowledged. Historic England's *Conservation Principles* despite, as Pendlebury states, being 'at pains to establish the inclusiveness of heritage across 'multiple communities',[287] reverts to being a catalogue of criteria for awarding cultural significance. It encourages accountability rather than a

[284] Avrami, Mason, and de la Torre, *Values and Heritage Conservation*, 7.
[285] Department for Digital, Culture, Media and Sport (DCMS), 'Principles of Selection for Listing Buildings', 1 March 2010, updated 19 November 2018, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/757054/Revised_Principles_of_Selection_2018.pdf.
[286] Bell, 'The Value of Ruins,' 265.
[287] John Pendlebury, *Conservation in the Age of Consensus* (London: Routledge, 2009), 191.

'devolution of decision making.'[288] The conservation values that underlie the philosophy are not explicitly discussed, such as *evidential value, historical value, aesthetic value,* and potential conflicts of interest are not examined in any depth. *Principles* pays lip service to social inclusivity. The words of Thomas Jefferson in the U.S. Declaration of Independence 1776, describe the authors' tone perfectly: 'We hold these truths to be self-evident.' Historic England's Conservation Principles is a consciously definitive statement of conservation values.

Historic England's *Principles* are far from being the only document attempting to construct a hierarchy of conservation values. Historic Environment Scotland has published a broadly similar set of principles, and there are numerous international Charters - the Athens, Venice and Burra Charters - which attempt to do likewise. This accumulation of educated certainties, expressed by experts in art and architectural history, has created what can best be described as *established* or *elite values.*

At a superficial level, these *established* or *elite* values are irreproachable: they are the considered views of educated observers. However, seen from other starting points, elite values can be variable, conflicting and arbitrary. Whilst it is true that they are founded on serious scholarship, it is also true that this scholarship, is itself based on self-referential assumptions as to what is worthy of study. One of the strongest of these assumptions is that association with a named architect increases the conservation value of a building. Yet another is that the socio-economic standing of the owner is material in determining the value of a building: castles and great houses are held to have greater cultural significance than cottages or mills of the same age.[289] There are an estimated 2,000 castles in Scotland out of which 554 are listed.[290] The poster in figure 3.1 proudly displays the numbers of sites owned by English Heritage which include archaeology, statues, gardens and buildings. Out of a total number of

[288] Pendlebury, *Conservation in the Age of Consensus*, 191.
[289] The National Trust has more stately homes that any other form of building.
[290] Historic Environment Scotland listing database, search results for 'castle', accessed 20 August 2020, https://www.historicenvironment.scot/advice-and-support/Listing-scheduling-and-designations/listed-buildings/search-for-a-listed-building/.

254 buildings, 207 are castles, palaces, churches and great houses. By concentrating on a limited range of buildings, the elite values that are taken for granted by scholars of art history and architecture automatically exclude recognition of the conservation value of corrugated iron.

Figure 3.1. The number of English Heritage properties by type, displayed on a poster a Cleve Abbey. Nearly 50% are of Castles, palaces and great houses.

The focus of much scholarship is not only restricted by the subjective creation of *elite* values, but also weakened by attempting to prevent these values from changing over time. However, value systems are dynamic and respond to changes in society as a whole. As David Lowenthal states, 'Heritage is never merely conserved or protected; it is modified – both enhanced and degraded – by each new generation.'[291]

[291] David Lowenthal, 'Stewarding the Past in a Perplexing Present,' Research Report (Los Angeles: The Getty Conservation Institute, 2000), 23.

Nor do cultural significances remain constant geographically; different countries have markedly distinct hierarchies of the conservation value of buildings. For example, the cultural significance of corrugated iron in Australia could not be more different from that in Britain.

The philosophical basis on which assessment of cultural significance and conservation value is determined is particularly important to corrugated iron buildings, because the material is accorded the lowest valuation in almost all hierarchies of value. This makes it one of the most vulnerable of all building materials.

3.2 The Historical Development of Cultural Values

This section examines the evolution of the seventeenth and eighteenth century cultural values which continue to dominate current conservation philosophy.

3.2.1 The Rise of the Picturesque

Of the multiple reasons why corrugated iron currently enjoys a low perceived cultural significance, a key one, is that it has no place in any post-Reformation romantic and picturesque vision of Arcadia.

Modern conservation is influenced by previous traditions of thought.[292] In the seventeenth and eighteenth century new intellectual freedoms encouraged the growth of an antiquarian interest in the history of previous civilisations, and, as stated by Jokilheto, 'major attention [was] given to the analysis of the work of ancient historians.'[293] This new interest in humanism acquired an 'important political significance.'[294] The indirect effects of the liberalisation of the English Renaissance scholarship were wide-ranging; scholarship was not confined to the study of history but spread rapidly into scientific enquiry regarding the physical world. The period of the Enlightenment - the Age of Reason – was an age of scientific discovery, debate in coffee houses and societies and learned academies. The eighteenth-century Enlightenment attempted to develop a rational view of history underpinned by research and observation; the evidence-based research that emerged from this.[295] As the eighteenth century antiquarian Sir Richard Colt-Hoare is quoted as saying of antiquarianism: 'We speak from facts not theory.'[296] This secularism was challenged at the end of the eighteenth century, when the experience of beauty became more irrational, and the development of the romantic garden provided an opportunity for 'a re-

[292] Jokilehto, *A History of Architectural Conservation*, 15.
[293] Jokilehto, *A History of Architectural Conservation*, 15.
[294] Jokilehto, *A History of Architectural Conservation*, 16.
[295] Glendinning, *The Conservation* Movement, 31.
[296] Sir Richard Colt Hoare, *The Ancient History of Wiltshire* (London: Lackington, Hughes, Harding, Mavor, and Jones, 1819). The opening line of Colt-Hoare's publication reflects the thinking of the early nineteenth century.

mystification of the secular world of the Enlightenment.'[297] The picturesque is, as artist and author William Gilpin stated, 'that peculiar kind of beauty which is agreeable in a picture.'[298]

Figure 3.2. Studley Royal with the ruins of Fountains Abbey beyond the lake. Typical of the monastic ruins created by the Henrician reformation, the site was ideal for the creation of an Arcadian garden because it was not overlain with memories of armed conflict. Photograph by the author.

The ruined abbeys which remained after the English Reformation may well have been sufficient to stimulate Arcadian garden design, but with the addition of castles ruined in the aftermath of the Cromwellian civil war, the landscape of Britain became the perfect cradle for the development of the picturesque within the culture of the Romantic Movement. English Heritage in an *Introduction to Parks and Gardens* state that '…landscapes [are] imaginatively recreated scenery from classical Arcadia and Elysium, and temples and grottoes enhanced the illusion and mood.'[299] Such development, intimately

[297] Martin Karlsson Tebus, 'Arcadia – Model, Musum and Playground,' accessed 17 August 2020, http://www.martinkarlsson.net/arcadia.html.
[298] Jessica Fay, 'What is the Picturesque?,' The National Trust in partnership with the University of Oxford, accessed 11 August 2020, https://www.nationaltrust.org.uk/features/what-is-the-picturesque-.
[299] 'Georgians: Parks and Garden,' English Heritage, accessed 10 August 2020, https://www.english-heritage.org.uk/learn/story-of-england/georgians/landscape.

coupled with antiquarian definitions of cultural significance combined to create a set of cultural significances dominated by the picturesque.

> Kent's "Elysian Fields" and Brown's "Grecian Valley" are a classical grove and a Greek valley replete with allusions and juxtapositions of antiquity and the modern period, of past virtue and the modern political example, as expressed in many of the names of the temples.[300]

The Enlightenment fascination with the picturesque Arcadian vision recreated in gardens such as Stowe Park or Stourhead.

Figure 3.3. Stourhead gardens. Photograph by the author

Picturesque aesthetics are still at work in our appreciation of contemporary landscapes and in architecture today. Riegl acknowledges the existence of the aesthetics of buildings, but also states that it is not a sound way to assess the

[300] Iris Lauterbach, 'Landscape and Garden Design in 18th-Century Europe: Architectural Use of the Natural,' Brewminate, accessed 12 August 2020, https://brewminate.com/landscape-and-garden-design-in-18th-century-europe-architectural-use-of-the-natural.

value of a building.[301] Nevertheless even if this is not formally acknowledged, in the eyes and mind of the common man, one building can be said to be more beautiful than another. This is particularly so with corrugated iron buildings. They only fit into the picturesque fantasy when treated in a whimsical way, such as at Portmeirion in Wales or into tin tabernacles decorated in the Gothic style.

3.2.2 The Rise of Stone as a Culturally Dominant Material

Another way that corrugated iron struggles to be valued in heritage is as a building material. It was first patented in 1829, so is essentially a modern material. Almost all other building materials are valued more, such as brick, timber and stone, and of these stone is the most valued. The buildings in the care of Historic England are castles, palaces, churches and great houses and are largely made from stone.[302]

How and why did stone come to be a culturally dominant material and who made this happen? In order to answer this, it is necessary to look at the role that stone buildings played in history and how the rise of the picturesque had an influence on the use of stone in culture. The value of stone was also promoted by commentators such as eighteenth-century archaeologist Johann Winkelmann.

In Britain, the historical valorisation of stone is evidenced in buildings such as the castles and cathedrals of Britain and Europe. After the Romans left Britain in the fifth century, the archaeological record strongly suggests that timber and

[301] Alois Riegl, 'The Modern Cult of Monuments: Its Essence and Its Development', trans. Kurt W. Foster and Diane Ghiardo, in *Historical and Philosophical Issues in the Conservation of Cultural Heritage*, ed. Nicholas Stanley Price, M. Kirby Talley Jr., and Alessandra Melucco Vaccaro (Los Angeles: Getty Conservation Institute, 1996), 69–83. First published as *Moderne Denkmalkultus: sein Wesen und seine Entstehung*, (Wien: K. K. Zentral-Kommission für Kunst-und Historische Denkmale: Braumüller, 1903), 71.
[302] See figure 3.1.

thatch became the dominant vernacular building materials.[303] [304] This tradition came to an abrupt end in the eleventh century, after the Norman invasion, when, for high status buildings such as castles, palaces and religious buildings, the Normans build with stone. The defend-ability of stone structures continued to influence military architecture throughout the middle ages. Edwards castles in North Wales and the castles of the Marcher Lords on the Welsh border are built with stone to make them practically defendable and also to serve as statements of domination.[305] [306] These high-status buildings had vast sums of money spent on their creation and were the ultimate symbols of wealth and power: stone became symbolic of wealth and power.

The Reformation both in Britain and in Europe led to radical adjustments in the balance between religious and secular power. As noted by Glendinning:

> The Reformation broke up the old unity of Western Christendom, provoking a crescendo of conflicts culminating in the Thirty Years War of 1618–48. Throughout northern and western Europe, these inflicted a repeated and massive devastation on the urban and rural landscape. In reaction, the built fabric underwent a sharp collective 'valorisation,' as its set pieces became charged with cultural significance and valued as subjects both of loss and of potential restoration-sentiments previously commanded only by the ruins of antiquity.[307]

Glendinning provides convincing examples of the post-Reformation treatment of ruins by referencing the destruction and rapid restoration of the Grand Palace in Brussels and Sainte-Croix cathedral in Orleans.[308] This reflex-to-rebuild was not characteristic of the treatment of British buildings destroyed in the Henrician reformation. The ruined cities and religious buildings of the German Thirty Years War and the French religious wars were the result of

[303] H. M. Taylor and Joan Taylor, *Anglo-Saxon Architecture* (Cambridge: Cambridge University Press, 1965).
[304] Helena Hamerow, David A. Hinton and Sally Crawford, eds., *The Oxford Handbook of Anglo-Saxon Archaeology* (Oxford: Oxford University Press, 2010).
[305] Arnold Taylor, 'The Beaumaris Castle Building Account of 1295–1298,' in *Castles in Wales and the Marches: Essays in Honour of D. J. Cathcart King*, ed. John R. Kenyon and Richard Avent (Cardiff: University of Wales Press, 1987).
[306] Tom McNeill, *English Heritage Book of Castles* (London: English Heritage and B. T. Batsford, 1992).
[307] Glendinning, *The Conservation Movement*, 35.
[308] Glendinning, *The Conservation Movement*, 36.

aggressive conflict, whereas the ruins created by Henry VIII resulted from a relatively peaceful change of ownership.

As stated above, the religious houses destroyed by Henry VIII created a substantial estate of ruins. They became the perfect foundations, 'rediscovered for their picturesque and sublime values,'[309] on which to construct picturesque Arcadian gardens.[310] Fountains Abbey in Yorkshire was pulled down and left as a ruin and the removed stone was sold commercially. Eighteenth and nineteenth century designers of Arcadian landscape had dual reasons for adopting stone as the material for realising their vision. Practically, the fortuitously created resource of ruined abbeys and castles provided much of the needed resource material, and with some added 'selective demolition' [311] became a ready-made form.

Modern attitudes to building design and to building materials arose during the Renaissance and developed further in Britain during the eighteenth-century Enlightenment. Because much of the empirical antiquarian research of the Enlightenment concentrated on Greco-Roman stone architecture, a conflation arose between the stone-built remains of those civilisations and the nature of the civilisations themselves: use of stone became the proof of civilised values. The picturesque imitation temples at Studley Royal or Stourhead were conscious recreations not just of Classical buildings, but of Classical civilisation itself. Picturesque gardens employed stone to recreate temples and grottos.

> Stourhead is a lush-green southern English landscape that – in the eyes and emotions of the artistically cultivated observer and walker – has been transformed into the Roman Campagna.[312]

This conflation has persisted and still strongly influences current attitudes to the cultural significance of building materials. Studley Royal and Stourhead are

[309] Jokilehto, *A History of Architectural Conservation*, 41.
[310] Jokilehto, *A History of Architectural Conservation*, 41.
[311] Glendinning, *The Conservation Movement*, 48.
[312] Lauterbach, 'Landscape and Garden Design.'

both good examples, but on their own do not indicate the scale of resource and intellectual commitment that eighteenth and nineteenth century Britain devoted to the creation of picturesque Arcadian estates.

For the admirer of this vision, modern materials in general, and corrugated iron in particular, did not and will not form an appropriate addition to their landscape. The eighteenth-century Enlightenment also elevated stone into its pre-eminent position as a building material. It might seem a safe assumption that stone, and in particular, marble, had an overwhelmingly superior cultural status and this is certainly implicit in the writing of Vitruvius.[313] However, the physical evidence presented by surviving ruins may be deceptive.

Johann Winckelmann was an eighteenth century German archaeologist and art historian whose writings directed popular taste toward classical art. Winkelmann's regard for stone sculpture as the ultimate expression of Greco-Roman architectural achievement[314] was an early manifestation of a continuing reverence for stone as a material, to the extent that disciples of Winkelmann, '…may have scraped paint off the ancient surface to display the bare stone.'[315] We know that the bleached marble sculpture so admired by Winkelmann[316] was originally almost always painted; the marble itself may have had limited cultural significance to the ancient world.

[313] Vitruvius, *The Ten Books on Architecture* (New York: Dover Publications, 1960).
[314] Jokilehto, *A History of Architectural Conservation*, 60–61.
[315] Jokilehto, *A History of Architectural Conservation*, 65
[316] Jokilehto, *A History of Architectural Conservation*, 65.

Figure 3.4. The Colosseum, Rome. The architecture visible in this image is composed of a random mixture of stone, brick and concrete, highlighting the indifference of Roman builders to stone: they simply used the cheapest and most adaptable material in any given circumstance. In reality the classical buildings were often not made from stone, but a mixture of brick, concrete and stone. Even the much-revered Palladio in the fifteenth century did not build from solid stone. His valorisation of classical architecture in the Italian town of Vicenza is largely built from brick and covered by imitation stone. Photograph by the author.

The cultural significance placed on stone has persisted is one of the principal determinants of current conservation values, as reflected by the nature of buildings accorded statutory designation. This prejudice in favour of stone as the pre-eminently culturally significant material makes recognition of the value of newer materials, such as corrugated iron, very difficult.

Because of the way we valorise stone, the designation system in Britain prioritises stone buildings above those made from other materials. Building styles that struggle for recognition such as industrial buildings, are more likely to be valued if they are made from stone, not concrete, and certainly not corrugated iron.

3.3 The History of Designation in Britain

The first Ancient Monuments Protection Act was passed in 1882, which provided the first list of monuments and was the beginning of a state based authority to protect Britain's heritage.[317] The first Inspector was General Pitt-Rivers who was employed to persuade owners of vulnerable ancient monuments, such as Stonehenge, to allow the state to take them into Guardianship. This would provide care by the Office of Works department whilst still remaining in private ownership. At the end of the nineteenth century most land landowners felt that castles, abbeys and particularly houses, should be cared for by their owners; it was not the responsibility of the State. This first list consisted of fifty scheduled monuments – all prehistoric or Roman and all were uninhabited structures.

Before 1908 the scheduling of ancient monuments offered almost no protection of any kind. At this time the Royal Commission of Ancient Monuments was created for Scotland, England and Wales, with the aim of investigating, and publishing a list of monuments that might be scheduled. It was a very slow process.[318]

There was, at the same time, a growing public awareness of the importance of place and total environments. The National Trust was founded in 1895 and in 1926 the Council for the Protection of Rural England (CPRE) was formed. Much of this interest was brought about by the increase in urban sprawl and use of the motor car to visit the countryside and stately homes. Morrison and Minnis comment in *Carscapes* that:

[317]Michael Hunter, ed., *Preserving the Past: The Rise of Heritage in Modern Britain* (Stroud: Alan Sutton, 1996), 9.
[318] Hunter, *Preserving the Past*, 42.

> Much of what people came to view as their heritage was defined by what they were now able to see through the agency of the motor car. But at the same time the act of carrying out this exploration had the effect of damaging the very things that attracted the motorist in the first place: beautiful untouched villages and remote open countryside. [319]

It became increasingly imperative to protect the heritage that was being damaged by modernity. By the time the Ancient Monuments act of 1931 was passed there were 3,000 ancient monuments scheduled and 250 taken into Guardianship. This act aimed to protect the settings of monuments, but still all agreements for protection were by the good will of the owner.

1932 Town and Country Planning act was the first piece of legislation to consider interventionist planning.[320] It was the first act to incorporate structures – country houses and timber framed buildings. It also gave authority to Local Authorities to enable them schedule buildings, which prevented demolition without permission. At the same time the idea of a national survey of Britain's heritage and assessment of buildings under threat was raised as a possibility which it was thought, would only take a 'year or two.'[321]

The 1944 act laid the foundations of the inclusion of historic buildings into the Town and Country Planning Act of 1947. A huge stimulus to the realisation of the need to protect historic buildings was brought about by the Blitz, which destroyed large numbers of buildings; this combined with the fact that under 30 buildings had been protected in the previous 12 years, mostly because of fears of compensation. There was a growing urgency to assess and inform planners which buildings to preserve - a list which would be a tool to work with; eventually three different post war lists were amalgamated.

[319] Kathryn A. Morrison and John Minnis, *Carscapes: The Motor Car, Architecture and Landscape in England* (London: Yale University Press, 2012), 277.
[320] Andrew Saint, 'How Listing Happened,' in *Preserving the Past: The Rise of Heritage in Modern Britain*, ed. Michael Hunter (Stroud: Alan Sutton, 1996), 117.
[321] Saint, 'How Listing Happened,' 114.

The first list was derived from the Ministry of War salvage scheme, appointing 300 architects to assess what was worth keeping after the bombing to incorporate into planning. These buildings were to include 'good' buildings up to 1850 and 'exceptional' buildings after. The second list was the National Buildings Record (NBR) which was set up by John Summerson in 1941, which eventually in 1963, became the NMR - National Monument record - and later in 2012, English Heritage Archive. The third list was the Monuments and Fine Arts organisation- set up by the military to make lists of the monuments captured during the war. Importantly they were able to raise the awareness of a need for a national inventory of historic buildings. All these were amalgamated and became 'an essential part of the data upon which the national plan for reconstruction is to be based.'[322]

By 1946 the principles of the list had been agreed. 'The compilation of lists was for experts […] there should be room over the years for revision and addition but not, without very good reason, for subtraction.'[323] In England the buildings were to be graded under three categories – 1, 2 and 3, and a set of instructions for listing was offered to advisors titled *Instructions to Investigators* for the Listing of Buildings of Special Architectural or Historic Interest'. This official paper was written by architect Richard Garton with architectural historian John Summerson.[324]The *Instructions* discusses the administrative uses of the lists and advises that, because it was not certain of the uses that the lists might have in the future, it was important to take a broad a view of what to include as possible.

Importantly the *Instructions* are explicit in expecting that a very broad approach should be taken in the types of building listed:

> The Act speaks of special architectural and historic interest and any building to be listed may have both, but must have one or the other kind of interest. Of course in a great measure they coexist. Most of the buildings which interest the architect also interest the historian

[322] Vanessa Brand, 'Buildings at Risk: A Sample Survey' (English Heritage, 1992).
[323] Saint, 'How Listing Happened,' 128.
[324] Details of the instructions can be read in John Earl, *Building Conservation Philosophy*, 3rd ed. (Shaftesbury: Donhead, 2003), 195.

> and conversely, but the two kinds of interest combine in very different proportions and ways, between the extreme cases where one or the other only is in question. Under each head, the historical and the architectural, several distinct approaches or criteria can be recognised which it would certainly not be easy but is probably not necessary to reduce to common terms. So long as a building has special interest from any of the following points from any points of view it can be properly be listed or at least submitted for listing, since the lists put in by investigators will undergo a certain degree of censorship at Headquarters.[325]

However, it also notes that as the lists were needed urgently, there would not be time to examine the interiors of the buildings.

In practice the 'historic interest' has come to take second place to 'architectural interest'. This is because it is easier to assess and defend buildings in terms of architectural qualities. If the former had be followed more closely it might be easier to protect buildings such as those made from corrugated iron and develop a more defined narrative of the nature of historicism in building.

The *Instructions* also state that:

> It must be understood that Architectural History for our purpose includes not only the history of architectural design but equally the history of structural, including engineering, technique, and that for our purpose a steel bridge is as much a building as a cathedral. Certain *industrial buildings* are landmarks (whether we call them architectural or historical makes no matter) of *the mechanical and industrial revolution*, and thus ought certainly to be listed, though it may be that the investigators will wish to seek specialist advice in the matter.[326]

Corrugated iron buildings fit well into the above description of 'the history of structural, including engineering, technique.'

[325] Earl, *Building Conservation Philosophy*, 197.
[326] Earl, *Building Conservation Philosophy*, 198.

The listing of buildings was seen as a finite exercise, with the Ministry expecting completion within three years. However, it took till 1970 till the first survey was completed. Listing became '…a little industry, in itself, with its own cultural frame of reference, art-historical criteria and programme. …Listing was, as it remains, umbilically connected to the planning process.'[327]

Over the next fifty years the criteria for listing expanded. During the 1960s post-war development destroyed many buildings and by the 1970s a re-survey of urban areas took place, with many more buildings being listed. The criteria for inclusion in this revised list were greatly extended, with both vernacular and industrial buildings receiving greater recognition. The value of some corrugated iron buildings, such as the Balmoral ballroom, was recognised at that time. In the 1980s Michael Heseltine, then Secretary of State, commissioned a resurvey of the whole of rural England on a county by county basis. The standard of survey was not consistent; Devon and Cornwall were excellent and many new buildings were added, but in Somerset, where the historic building stock is similar to that in Devon, produced only minor additions to the list.[328]

Listing by theme began in the 1990s, concentrating on isolating types of buildings and representative examples of each type, such as petrol stations, cinemas, town halls and courts of law.[329] Superficially this would seem to be a means by which the conservation value of non-traditional buildings, such as those made of corrugated iron, could be given due recognition. Tin tabernacles, for example, are an obvious example of a themed building type. However, themed listing might well prove in practice to be an abandonment of Garton and Summerson's original aim of designation: that all buildings of sufficient worth should be listed. The weakness of thematic listing is that only samples from each theme are listed. This has the potential of greatly increasing the subjectivity of designation: the more that selection replaces

[327] Saint, 'How Listing Happened,' 131.
[328] Peter Beacham, head of listing English Heritage, personal communication with author, 2013.
[329] Historic England, 'Listing Selection Guides,' accessed 12 August 2019, https://historicengland.org.uk/listing/selection-criteria/listing-selection/.

universal designation, the greater becomes the role of selective personal decision-making.

The aims and practical management of designation have continued to develop in recent years. There has been greatly increased recognition of intangible heritage in general and of the buildings which support an intangible narrative. The case study of Cultybraggan Camp in Chapter 4 highlights this change as does increased recognition of tangible assets, such as the Balmoral ballroom that illustrate intangible narratives of technical design innovation.

3.4 Conservation Values in Practice

3.4.1 Valuation and Criteria for Designation

This section examines how the choice of value and hence criteria used for assessing the cultural significance of buildings influences their valuation. The investigation is developed to explore how these valuations affect the designation and protection of corrugated iron buildings.

In practical conservation, as opposed to philosophical debate, consideration of conservation value is often limited to *age* and *rarity.* The values of *age* and *rarity* are often inextricably linked, because the attrition generated by use, neglect and general decay means that as buildings age, they inevitably become rarer. Thus, the attribute of *age value* almost always brings concomitant *rarity value*. These values are also easy to quantify, which makes them easy to use. This is hardly surprising, because these values come the closest to being a universally agreed basis for assessing the cultural significance of buildings. Though it is possible to achieve a concise definition of cultural significance, such as: 'the importance of a site as determined by the aggregate values attributed to it,'[330] such simple definitions are of limited practical utility since they do nothing to harmonise competing definitions of cultural significance. For example, research by the Getty Conservation Institute itemises considerable diversity in the criteria for assessing significance:

[330] Maria de la Torre and Randal Mason, 'Assessing the Value of Cultural Heritage,' Research Report, Introduction.

Riegl (1902)	**Lipe (1984)**	**Burra Charter (1998)**	**Frey (1997)**	**English Heritage (1997)**
Age	Economic	Aesthetic	Monetary	Cultural
Historical	Aesthetic	Historic	Option	Educational/ academic
Commemorative	Associative-symbolic	Scientific	Existence	Economic
Use	Informational	Social (including spiritual, political, national, other cultural)	Bequest	Resource
Newness	-	-	Prestige	Recreational
-	-	-	Educational	Aesthetic

Figure 3.5. Summary of heritage value typologies devised by various scholars and organizations. Source: de la Torre, *Assessing the Value of Cultural Heritage*, 9.

What is important here is that all the lists are different. This is because cultural significance is hard to define: it is different for different people and different for different places.

Alois Riegl explores the different values that can be attributed to monuments and comments that practical conservation values can also conflict one with another. This is particularly true of the values that Riegl defines as *age* and *newness*. Both values can be simultaneously relevant to a single building, thus generating practical difficulties in devising repair and conservation. Should the

building be allowed to deteriorate, and develop age value or be restored completely and regain newness value?

Historic valuations within the heritage industry have often focussed exclusively on the classical or gothic styles and combined this focus with an unconscious emphasis on cultural constructs such as the *picturesque*. These 'pictorial and antiquarian values'[331] which have dominated architectural thinking since the eighteenth century, have often eclipsed other values, such as the potential for different forms of architecture enabled by the new materials available in the nineteenth century.[332]

This focus on style has been further reinforced by an education system that has, in the past, ensured that students were given an education based on the artistic values of the classical and Gothic traditions. This focus has permeated every aspect of heritage planning and organisation, and still affects the choice of which buildings to protect. The appreciation and warning from John Harvey in 1972 remains prescient:

> The cardinal principle in the selection of what buildings to save must be discrimination. Obviously, it is neither desirable nor practically possible to keep all old buildings. The overall problem has to be kept within bounds by limitations of various kinds, the main criteria being quality, date and position. It will probably be agreed by all who accept the preservation of works of art as a valid social activity that there are some buildings which, on grounds of their exceptional artistic quality, or their historic interest, or both together, deserve to be kept in perpetuity: that is for as long as they can physically be maintained. Except for marginal cases where there is dispute as to the rank of the building, this group presents no difficulty. On the other hand, the great size of many buildings in this category does mean that their maintenance is likely to be costly, and that unless appropriate measures are taken they will get the lion's share of all funds, both public and private, made available for conservation.[333]

[331] Richards, *The Functional Tradition*, 14.
[332] Richards, *The Functional Tradition*, 16.
[333] Harvey, *Conservation of Buildings*, 35.

Historic valuation systems have also been focussed on the association of architecture with wealth and social influence. Listing and scheduling have concentrated on buildings created and owned by the rich and powerful and in the past the bulk of the conservation effort of the National Trust, for example, has been skewed in favour of great houses. About two thirds of National Trust properties are country houses.[334] Whilst it is true that many of these great houses are exemplars of great architecture, it is also true that the conservation effort put into conserving stately homes supports a historical narrative that exalts inequality and indefensible social stratification. The Balmoral Ballroom was not Balmoral Castle; Prince Albert did not choose to build a castle from corrugated iron, but a temporary ballroom.

The emergence and development of this narrative has had a profound effect on the perceived conservation valuation of corrugated iron. Until recently the value attributed to buildings was that propagated by heritage specialists and the people who funded them. These specialists, skilled in art history and educated to revere the culture of the classical world, created a system of elite values which significantly undervalued vernacular and modern buildings.

The adoption of the *elite* values has meant that, as stated by the Getty Conservation Institute in 2002, 'Too often, experts determine significance on the basis of a limited number of established criteria.'[335]

In this case *age, rarity* and *historical/architectural*. In other words, although an elite valuation system produces a consistent and coherent set of valued buildings, it is by definition a system of exclusion that is unable to recognise the diversity of claims to cultural significance. The current conservation value of corrugated iron is an excellent example of the dangers posed by an elite valuation system: even though corrugated iron buildings are often *old*, and even *rare,* and carry important associations, the inflexibility of elite valuation prevents recognition of their worth.

[334] Hugh Mellor, National Trust advisor, email message to author, 10 July 2020.
[335] de la Torre, *Assessing the Value of Cultural Heritage*, 5.

3.4.2 The Democratisation of Heritage

When Australia ICOMOS published The Burra Charter in 1979, over forty years ago, they were responding to a peculiarly Australian problem: it was becoming increasingly obvious that European models for determining cultural significance were seen by the Aboriginal population as further evidence of colonial oppression. The European concentration on the valorisation of buildings rather than of places was the core of the problem. The Burra Charter address this issue directly by demanding increased status for the power of place and also the social and cultural associations of things and places. To reset the balance between tangible and intangible heritage, Burra stress the importance of democratisation. It recognised that intangible social and cultural associations needed direct input from the people most affected. Experts on historical European architecture could not be expected to fully appreciate the cultural significance of sacred places such as Ayers Rock. The Burra Charter did more than urge the recognition of intangible heritage, it was a subtle and intelligent document which provided a convincing model for most aspects of heritage management. Because of this it has profoundly affected conservation strategies in Britain by introducing the concept of democratisation.

Britain's heritage management has been influenced by the Burra Charter's advocacy of democratisation. In the past the cultural value and hence cultural significance of a building was decided by small groups of experts and validated by those who funded their decisions. National heritage organisations not only provided funds for the conservation of historic buildings; they also funded the expert staff who administered the system. This centralisation of funding effectively excluded the general public from valuation process. Both philosophically and practically conservation value was decided by a small

group of experts whose outlook was dominated by elite and traditional values.[336]

In seeking to widen and democratise the process of conservation valuation the Burra Charter also suggests that *aesthetic, historic, scientific* and *social* values, and *use* value should be taken into account, and very importantly, that other values may be added as 'understanding of a particular place increases.'[337] This is an explicit recognition that the unchallenged adoption of elite values has failed to recognise the dynamic nature of cultural significance.

For corrugated iron buildings, the Burra Charter is a welcome document. It has forced a reappraisal of elite values and has directly promoted the re-evaluation of buildings that hitherto fell outside the scope of those values. However, in challenging established prejudices it has created new problems. Who is qualified to make judgements on *social* or *emotional* significance? Is democratisation desirable? The opening-up of conservation valuation to all members of society, rather than restricting it to those in possession of specialist expertise, may well produce unpredictable and even undesirable re-evaluations of cultural significance.

For example, the case of Dunelm House suggests a complex relationship between designation and democratisation. The designation status of Dunelm House has not taken account of expert advice from Historic England, but has been decided by the responsible government minister.[338] Since the government minister is, in theory, democratically accountable this would appear to be an example of the increased democratisation of heritage decision-making. However, a convincing alternative interpretation is that the Minister is unaccountably responding to the specialist self-interests of the

[336] Edward Relph, 'The Power of Place 1: Intrinsic Power,' *Placeness, Place, Placelessness*, accessed 13 August 2020, https://www.placeness.com/the-power-of-place-1-intrinsic-power.
[337] Australia ICOMOS, 'The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 1999, 12, https://australia.icomos.org/wp-content/uploads/BURRA_CHARTER.pdf.
[338] Richard Waite and Ella Braidwood, 'C20 Society Appeals Against Dunelm House Listing Rejection,' *Architects' Journal*, accessed 13 August 2020, https://www.architectsjournal.co.uk/news/c20-society-appeals-against-dunelm-house-listing-rejection.

University rather than consciously rejecting the advice of his own experts because it was undemocratic.

An interesting discussion of the illusory and unpredictable nature of democratisation is contained in Nicola Thompson's analysis of 'The Practice of Government in a Devolved Scotland: The Case of the Designation of the Cairngorms National Park'. Although this deals with the designation of land areas rather than buildings, most of her findings apply equally to both.[339]

The emergence of the Heritage Lottery Fund (HLF) in 1994, as one of the principal sources of conservation funding, has elevated democratisation to a core aspect of conservation management. The consequences of funding the repair and conservation of heritage by the lottery has required, by necessity, is a general democratisation of stakeholders and decision makers.

This means that the HLF has 'no limiting definition of heritage.'[340] This allows it to move beyond established or elite values and involve a certain amount of social inclusion in the decision-making process. In turn this opens up opportunities for the…'concentration on attributes that are much more personal than scientific classifications.'[341]

The Heritage Lottery Fund may not have specifically set out to introduce alternative valuation narratives, but its sensitivity to accusations of elitism has in practice introduced, by default, increased acceptance of the Burra Charter's democratisation agenda. The democratisation of conservation valuation in Britain is an ongoing process, and its long-term implications are, as yet, unclear. The Getty Conservation Institute, in its 2002 paper, 'Assessing the Value of Cultural Heritage, states:

> The values considered in this process should include those held by experts – the art historians, archaeologists, architect and others

[339] Nicola Thompson, 'The Practice of Government in a Devolved Scotland: The Case of the Designation of the Cairngorms National Park,' *Environment and Planning C: Government and Policy* 24, no. 3 (June 2006).
[340] Pendlebury, *Conservation in the Age of Consensus*, 202.
[341] Pendlebury, *Conservation in the Age of Consensus*, 202.

> – as well as other values bought forth by new stakeholders or constituents, such as social or economic value.[342]

This comment by the Getty Conservation Institute demonstrates the extent to which Burra has permeated the thinking of academic conservation, but does not mean that practical conservation valuation has fully abandoned elite values. The values embodied in Historic England's and Historic Environment Scotland's published criteria sometimes appear to be challenged by the democratisation of heritage.

Whilst it is abundantly clear that elite valuation has done little to safeguard corrugated iron buildings, democratisation without education may be equally damaging. The loss of old and rare corrugated iron village halls suggests that democratisation may not always be a positive move for corrugated iron buildings.

Democratisation also brings difficult issues of practical valuation. How are the intangible values of social, spiritual and place to be measured?

As stated by the Getty:

> The stakeholders of social values are usually members of the public who have not traditionally participated in our [conservation] work or had their opinions taken into consideration. Today, as we recognise the importance of including all stakeholders in the process, we must turn to other disciplines to bring these new groups into the discussions. [343]

This does not mean that the general public have come to exercise control over conservation projects. Rather that specialist local interest groups have acquired an enhanced role in conservation funding decisions and can now exert direct influence on the decisions of the heritage professionals in Historic England and Historic Environment Scotland. The case study of Cultybraggan Camp which will be explored in the following chapter, is an interesting example

[342] de la Torre, *Assessing the Value of Cultural Heritage*, 3.
[343] de la Torre, *Assessing the Value of Cultural Heritage*, 5.

of heritage democracy in action; the Comrie Development Trust have worked alongside Historic Environment Scotland to help secure funding and conservation support for their project.

The Burra Charter allows a much broader definition of heritage protection, including a more democratic vision of the buildings to be valued. However, analysis of Historic England's and Historic Environment Scotland's valuation criteria suggests that a complex and unpredictable modification system is being applied to the basic criteria. For example, *age* and *rarity* are not being applied to corrugated iron buildings in the same way that they are to masonry buildings. Corrugated iron buildings have to be demonstrably *older* and *rarer* in order to attract designated status. Prior to 1990, the corrugated iron buildings that are listed in England date from the nineteenth century. Only after the year 2000 are twentieth century corrugated iron buildings listed.

Alongside this, it seems highly unlikely that the downgrading of the designation of St Fillan's Chapel from grade B to C (see chapter 4) would have occurred if a similar level of repair had been undertaken on a traditional masonry building.

That unpredictable modifications to published valuation criteria are applied in practice is perhaps unsurprising. However, the published criteria are dependent on perceptions of cultural value and these are dynamic and change over time.[344] The apparent stability of the published criteria is thus founded on fluid, multiple, and often conflicting, aspects of diverse cultures and national identities.

In addition to the considerable range and diversity of cultural values that underlie basic valuation concepts like *age* and *rarity*, additional valuation criteria such as *spiritual, educational* and *aesthetic* values are very difficult to interpret consistently in practice. For example, gothic ruins may be valued for *spiritual* and *aesthetic* reasons, but modernist buildings for *newness* value.

[344] Chapter 2 examines the development of cultural values over time with particular reference to corrugated iron.

Much philosophical writing has been produced in an attempt to construct practical hierarchies of value, but severe problems of definition and interpretation remain. As an example, Alois Riegl's analysis of public perceptions of conservation value is generalised and rather patronising when he writes:

> The masses have always been pleased by everything that appeared new; in the works of man they wished to see only the creative triumphant effect of human power and not the destructive force of nature's power, which is hostile to the work of man.[345]

The contempt implicit in Riegl's use of the phrase 'the masses' suggests that he does not feel that their views can withstand academic scrutiny. In other words, the general public's hierarchies of conservation value may depend on ill-informed and unjustifiable perceptions of value. Applying fractured philosophical foundations can make the practical application of conservation value very difficult. Riegl's sentiments may now conflict with modern attitudes towards democratisation; some stakeholders who are concerned with architectural conservation may not have the cultural values, knowledge and experience in the field of building heritage, but their opinions must be taken into account. When designation decisions were based solely on expert opinion, public perceptions of cultural significance were of little significance; now the democratisation of conservation valuation will inevitably elevate the future importance of public perception.

[345] Riegl, 'The Modern Cult of Monuments,' 80.

3.5 Perceptions of Corrugated Iron

The evidence reviewed in Chapter 2 strongly suggests that public perceptions of buildings not only rest on uncertain levels of background knowledge but are also subject to arbitrary change over time. In the early nineteenth century, for example, new corrugated iron buildings were perceived as exciting evidence of technological advance, but by the end of the nineteenth century these perceptions had changed, and corrugated iron buildings had acquired a contempt born of familiarity.

Figure 3.6. Corrugated iron sculpture in New Zealand. This is an excellent example of how national attitudes towards corrugated iron and good taste in public design vary on a national basis. Photograph by John Wood.

3.5.1 National Perceptions

Perceptions of conservation value, and the designation decisions that they drive, are also moderated by the cultural differences between nations. The

values embodied in the Burra Charter, for example, originated in a specifically Australian context. The emphasis on the value of ‘place’ as well as the value of ‘things’, which is fundamental to the Burra Charter, is a direct recognition of the Aboriginal culture of Australia. Apart from the cultural differences between European colonial settlers and aboriginal peoples, Australia has become culturally separate from Europe, with the experiences of the early European colonists shaping profoundly non-European attitudes towards corrugated iron. Australian and New Zealanders celebrate the material that is perceived as an essential part of the early settler’s lives, as is evidenced by their art. Antipodeans have not forgotten that the survival of their ancestors was facilitated by the transportability and ease of erection of ‘corro’. This is reflected by the integration of corrugated iron buildings into open-air museums and its adoption into adventurous modern design. This regard, almost reverence, for corrugated iron is reflected in common culture by items such as postage stamps and giant corrugated iron models.

Figure 3.7. Corrugated iron is proudly displayed on the postage stamp. Image from Auspost. Reproduced with permission

The Australian valuation of corrugated iron is not limited to the general public, but also extends into academic writing. Pedro Guedes, Miles Lewis, Anne Warr and more recently Adam Mornement and Dirk Spennemann, who all live in Australia, have all written extensively about corrugated iron. Did they become interested in corrugated iron structures before moving to Australia? Pedro Guedes’ thesis suggests that at the time he was living in Britain the question

arose of 'how it was that such buildings [iron and corrugated iron] were not dominant in their place of origin?[346] Anne Warr[347] published her dissertation on corrugated iron at York University in 1976, prior to moving to Australia. Despite having spent time in Britain, these authors have ultimately chosen to concentrate their research effort from an Australian base. There can be little doubt that the enhanced cultural significance given to corrugated iron in Australia has been a major influence on where they have chosen to work. Although these Australia-based academic authors, have undoubtedly reinforced the public regard for corrugated iron within their immediate national context, their influence on the perceptions of corrugated iron held by the general public outside Australia has been limited. Theodore Prudon, an American, comments that public attitudes toward modernist architecture is equally true for corrugated iron:

> The perceptions of modern buildings vary from country to country, can differ by typology and will change over time.'[348] …and that 'Solutions achieved in one country may or may not be acceptable physically, philosophically or politically in another…[349]

Prudon goes on to discuss the schism which has developed between sections of educated professional opinion and the general public's attitude to conservation value:

> Many of the [modernist] period's icons are appreciated and praised by a professional audience for aesthetic or social values but have been rejected by the public at large, which has a great deal of negative perceptions about modern building design. These perceptions remain a serious obstacle to preservation efforts…[350]

[346] Guedes, 'Iron in Building,' 4.
[347] Warr, Anne, 'Corrugated Iron' (master's thesis, University of York, 1976).
[348] Prudon, *Preservation of Modern Architecture*, 26.
[349] Prudon, *Preservation of Modern Architecture*, ix.
[350] Prudon, *Preservation of Modern Architecture*, 25.

Though this observation specifically concerns perceptions of modernist architecture, it again applies equally strongly to public perceptions of corrugated iron.

3.5.2 Developing Perceptions about Corrugated Iron

The way in which we perceive the world around us, including our perceptions of feelings about buildings**,** is substantially learned. This learning process incorporates manifold sources within our culture, including formal education, television, popular literature, and stories from our grandparents. The complex and diffuse nature of these influences inevitably introduces an element of inconsistency between the perceptions of one individual and another; individual variation is mirrored at an international scale.

For example, the popular perception that thatched country cottages were an essential part of the picturesque beauty of the countryside is a nineteenth century romantic fiction construct. Prior to that time, they were the homes of poor people, - damp, crowded and insanitary but by the twentieth century they had become the all-pervasive image on a box of chocolates. However, industrial buildings do not appear on chocolate boxes – they have too many recent memories of an industrial past and have yet to develop a romantic fiction of their own.

The historic use of corrugated iron, as discussed in Chapter 2, has been very important in shaping present day perceptions of its value, many of which are highly negative. The problems brought by industrialisation were manifold: it brought unprecedented inequality, uncertainty and social difficulty as well as prosperity. It may not be fair, but it is hardly surprising that industrial products and technologies should become symbolic of the social costs of industrialisation. Corrugated iron, as a quintessentially industrial product, has suffered badly from such negative perceptions.

As well as perceptions imposed by industrialisation, corrugated iron also became associated with war. Very large numbers of conscripted troops, during the first and second world Wars, experienced life in Nissen and Quonset huts.

This inevitably produced an association between these corrugated iron buildings and all the negative aspects of warfare. How far such negative perceptions of corrugated iron persist among children born after the end of the Second World War is unclear. However, it seems likely that at least some elements of negativity must persist.

3.5.3 Recent Changes in Public Perceptions

Despite the lingering perceptions of the late nineteenth and early twentieth centuries, public perceptions of corrugated iron are dynamic and continue to evolve in both positive and negative ways. *Country Living* is an aspirational lifestyle magazine with a large circulation, 167,992 copies printed in 2016, and in the recent past it has run feature articles extolling the romantic appeal of corrugated iron.[351] The magazine is responding to what it believes is a changed public perception of the value of corrugated iron. Their favourable presentation of corrugated iron is limited to specific categories: shepherds huts and tin tabernacles appear to have an appealing element of nostalgia, whereas domestic and industrial use of corrugated iron remains unappealing.

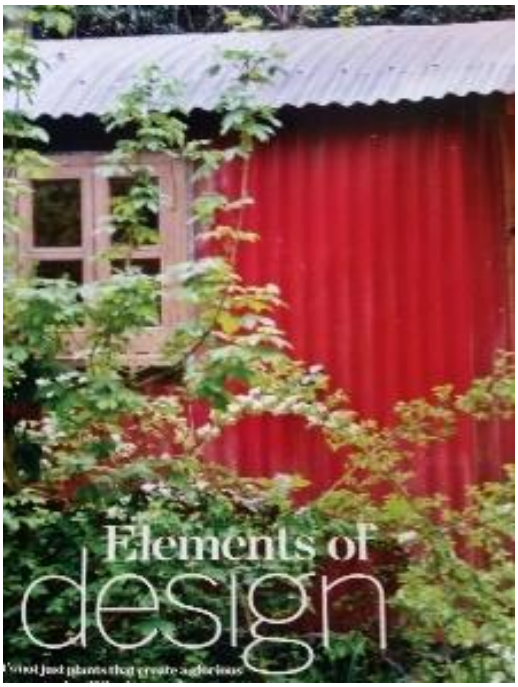

Figure 3.8. Illustration from a feature on corrugated iron in *Country Living* magazine. Image from Donaldson, 'Elements of Design,' 68.

[351] Stephanie Donaldson, 'Elements of Design,' *Country Living*, May 2013, 68.

Another current influence on the public perception of architectural design in general is the television series, Grand Designs.[352] The presenter, Kevin McCloud, has consistently chosen to highlight buildings that challenge the elite values of traditional architecture. Corrugated metal is given equal design prominence with traditional masonry.

Viewing figures, 3.3 million viewers in 2010,[353] suggest that McCloud's perception of value in buildings has intrigued the general public. As Riegl noted, the public attitude to buildings can simultaneously include the contradictory, and mutually exclusive, attributes of *age* and *newness*.[354]

3.5.4 Conclusion

This divergence of opinions matters because perceptions of the cultural significance and value of corrugated iron are crucial to its conservation. As Marta de la Torre and Randall Mason remark: 'value has always been the reason underlying heritage conservation. It is self-evident that no society makes an effort to conserve what it does not value.'[355] Prudon, commenting on the perceptions of Modernism amplifies and reinforces this:

> Understanding how the perception of a building has evolved is critically important to a comprehensive preservation approach. It helps to develop an informed basis from which to engage the public. (The alternative is to rely primarily on early architectural criticisms, initial perceptions, and ongoing associations.) Perceptions will certainly change over time; recognising this and the proximity from which we are looking at the past is fundamental to the discussion of perceived value, and thus the preservation of modern buildings.' [356]

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[352] 'Channel 4 Grand Designs revisits the Strathaven Airfield House,' 30 August 2018, YouTube video, https://youtu.be/g87kJXsrPPw.
[353] John Plunkett, 'TV Ratings: Grand Designs Lays Firm Foundations for New Series with 3.3m,' *Guardian*, 16 September 2010, accessed 24 July 2019, https://www.theguardian.com/media/2010/ sep/16/tv-ratings-grand-designs, (accessed 24th July, 2019).
[354] Riegl, 'The Modern Cult of Monuments,' 80–81.
[355] de la Torre, *Assessing the Value of Cultural Heritage*, 3.
[356] Prudon, *Preservation of Modern Architecture*, 30.

Increasing democratisation of the management of conservation may well stifle growing expert appreciation of the value of modernist, industrial and corrugated iron buildings. The continuing dominance of the picturesque in popular valuation of buildings has so far meant that corrugated iron buildings, amongst others, cannot become culturally valuable unless they achieve pseudo-picturesque status such as has developed for shepherd's huts or tin tabernacles.

Perceptions of the value of buildings are always complicated and often contradictory. It is unsurprising that the general public has an unclear approach to the material, and that public perceptions are often at variance with expert opinion.

3.6 The Application of Designation Criteria to Corrugated Iron Buildings

3.6.1 Historic England and Historic Environment Scotland's Criteria for Listing

Corrugated iron buildings are the buildings of prefabrication, industry and war. They are not the buildings for the wealthy, the famous and the powerful. As Mornement and Holloway state:

> …there are no monuments made of corrugated iron, no grand buildings or landmarks. It is a humble, unpretentious material better suited to the background than the limelight. [357]

By designating buildings we help protect them for our history. The buildings we choose to protect combines concepts gained from our cultural values and our perceptions of our culture. Criteria for designation are specifically chosen to protect a broad range of building types. How does this affect the designation of corrugated iron buildings?

The combination of cultural values and perceptions are of vital importance when setting down the values and criteria for designation. The criteria cited by Historic England's Conservation Principles[358] and Principles of Selection for Listed Buildings[359] encompass age and rarity, architectural interest and historic interest. Architectural and historical interest constitute technological interest, aesthetic merits, association and historical and social interpretation. Historic Environment Scotland's Scottish Historic Environment Policy[360] and the update Designation Policy and Selection Guidance'[361] criteria are broadly similar, stating architectural interest which constitutes design, materials and

[357] Mornement and Holloway, *Corrugated Iron*, 7.
[358] English Heritage, 'Conservation Principles: Policies and Guidance,' 28–31.
[359] DCMS, 'Principles of Selection,' 5–7.
[360] Historic Scotland, 'Scottish Historic Environment Policy'.
[361] Historic Environment Scotland, 'Designation Policy and Selection Guidance,' 5 April 2019, accessed 13 August 2019, https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=8d8bbaeb-ce5a-46c1-a558-aa2500ff7d3b

setting alongside historical interest which constitutes age and rarity, association, and social and historical interest.

These criteria seek to be comprehensive and to follow the aims set out in the *Instructions to Investigators for the Listing of Buildings of Special Architectural or Historic Interest under Section 42 of the Town and Country Planning Act 1944*, which suggests that those charged with listing should be inclusive, yet at the same time claims that there is a risk of 'uncertainty' as to 'what considerations have and have not been taken into account' in the decisions made regarding candidates for lists.[362] Given this declared balance, are the criteria inclusive enough allow corrugated iron buildings to be recognised and protected through this system of registration?

3.6.2 The Application of Criteria to Corrugated Iron Buildings

By examining each of the criteria for designation in turn it is possible to explore how corrugated iron buildings concur with these criteria.

3.6.2.1 Age and Rarity

The most commonly accepted and frequently used criteria for assessing buildings are *age* and *rarity.* But what happens when they are applied to corrugated iron buildings?

Age and *rarity* together would seem to be a completely objective and practical criteria for assessing conservation value: both are absolute numerical values that can be researched, determined and compared. However, the applied reality is more complex. Natural attrition – caused by accident, weathering or deliberate destruction – means inevitably that as buildings become older, they become rarer.

[362] John Earl, *Building Conservation Philosophy*, 3rd ed. (New York, Routledge, 2003), 195–96.

As Saint suggests in *Modern Matters*:

> It is a self-evident truth that we have more recent buildings than older ones… The sliding scale which governs the listing and scheduling process means that a tiny lump of Roman ruin will be protected, whereas most complete twentieth century buildings won't.[363]

There may be near-universal theoretical agreement that the commonplace is less significant than the rare; but how this is applied in practice is often not straightforward. In 1946, the *Instructions to Investigators* suggests that:

> From 1850 down to 1914 only outstanding works should be included and since 1914 none unless the case seems very strong….'the selection of buildings for the last 150 years should comprise without fail the principle works of the principal architects.[364]

This was written in 1946, 150 years prior to this takes it back to 1800 which mean that most Victorian architecture would not be included for listing. There appears to be no evidence for the choice of these dates. One can assume that 1850 was 100 years before the *Instructions* happened to be written.

Current recommendations are:

- before 1700, all buildings that retain a significant proportion of their original fabric are likely to be regarded of special interest;
- from 1700 to 1850, most buildings that retain a significant proportion of their original fabric are likely to be regarded of special interest, though some selection is necessary;
- from 1850 to 1945, because of the greatly increased number of buildings erected and the much larger numbers that have survived, progressively greater selection is necessary;
- careful selection is required for buildings from the period after 1945, another watershed for architecture.[365]

In the last 70 years, since the *Instructions to Investigators* was written, there has been a slight shift in emphasis. Buildings from 1850 - 1945 require 'greater

[363] Andrew Saint, 'Philosophical Principles of Modern Conservation', in *Modern Matters: Principles and Practice in Conserving Recent Architecture* (Shaftesbury: Donhead, 1996), 16.
[364] Earl, *Building Conservation Philosophy*, 200.
[365] DCMS, 'Principles of Selection,' 6.

selection.' This sliding scale lacks transparency and predictability. To be convincing it needs to be based on a defendable tariff that could be used to predictably calculate the overall value of a building when age, rarity and association are combined. No such tariff appears to have ever existed. Many tariffs are possible; an arbitrary and illustrative tariff might be based on percentages given to each value, such as 20% to age, 15% to association etc. The problem is not the tariff but the way in which is it applied.

Evidently, corrugated iron buildings dating from 1850 have significant *age value*. As with early modernist buildings, despite their misleading name, they have now comfortably passed their one-hundredth birthday. But despite this strong claim to *age value,* they struggle to gain designated status. Probably the only corrugated iron building to be listed partially for age value is the Balmoral Ballroom which was constructed in 1851. Most other corrugated iron buildings were built after 1890 when the mass production of steel became viable, so do not attract designation by *age value.* They can be valued and hence listed for other attributes, but not *age*.

The Dorset survey in the year 2000 revealed a total of 29 buildings, excluding farm buildings. 2 of these were listed; the Isolation Hospital at Corfe, listed for being a prefabricated isolation hospital built in 1900s and Devan Haye, a two storey house in Sherborne, built in 1890 and attributed in William Cooper. 11 of the total number have since been demolished.

Corrugated iron buildings can be *rare* as well as old, but their *rarity value* is also not properly recognised by the designation system, whether they are assessed on either a national or local scale. Georgian town houses are not particularly rare, and are little older than early corrugated iron buildings, but are almost universally designated. Modernist buildings have only ever been produced in limited numbers, and are thus rare by definition, but do not attract universal designation. This suggests that in practice *age* or *rarity* are sufficient to guarantee the designation of some buildings, but not others. *Age* and *rarity* alone are not sufficient grounds for designation but need to be augmented by

combination with other published conservation values.[366] An interesting example of not valuing older corrugated iron buildings is St Fillan's chapel at Killin. This was designated Category B in but was downgraded to Category C in May 2006.[367] This is surprising, as the chapel, built in 1887, is very old for a corrugated iron building.

There appears to be an undefined *age* and *rarity* threshold: If a building (or fragment) is exceptionally old, lack of associative value is of no consequence. Conversely, for a relatively modern building, very powerful associations are needed to enhance its lesser claim to *age* value. For corrugated iron buildings, as they diminish in number they will become very rare, b,ut will this be acknowledged by those in charge of designation?

3.6.2.2 Historical Interest: Association

When a building can be associated with a famous event or person, its *age* and *rarity* values are often subordinated to that celebrity.

Historic Environment Scotland attempts to rationalise the complex relationship between *age/rarity* and association by suggesting that, 'The fabric should reflect the person or event and not merely be a witness to them,'[368] thus implying that the building cannot be listed just because a famous person slept there.

Historic Environment Scotland and Historic England have both produced statements of their conservation principles which act as criteria by which to measure a building's suitability for designation. However, these criteria or principles are always open to interpretation; a specialist in Georgian architecture, for example, with developed training, skill and experience is most unlikely to radically reappraise their perceptions of value because they have

[366] Andrew Saint, 'Philosophical Principles of Modern Conservation,' 16–17.
[367] Historic Environment Scotland, 'Killin, Main Street, St Fillan's Episcopal Church, Including Gates, Gatepiers and Boundary Walls,' accessed 28 July 2019, http://portal.historicenvironment.scot/designation/LB46364.
[368] Historic Scotland, 'Scottish Historic Environment Policy,' 75.

read Historic England's Principles. What they are more likely to do is interpret the principles to reinforce their existing perceptions of value.

These published criteria for valuation can often be modified by conflicting principles: such as *memory values* and *association values* which may override any other consideration. For example, Ruskin's house at Brantwood is listed grade 2*, but this is unlikely to be on the grounds of age, rarity or architectural merit: it is valorised for its association with Ruskin.

Corrugated iron buildings rarely benefit from valorisation by association, they usually have no famous people attached to them, and are relatively undervalued because of this. The Balmoral ballroom benefits from its royal associations, and the corrugated iron in the roof of Paddington railway station is undoubtedly valorised by its association with Brunel. But in general, it is true that valuation by association is not a feature of corrugated iron buildings.

Particularly rare in Britain are corrugated iron buildings by designers whose name has any associative power. Although profiled metal has become the standard cladding material for modern industrial units, and although many of these display considerable design flair in terms of form and colour, it is rare for their valuation to be associated with named architects. Possibly the only recent British building by a celebrated designer to make use of profiled metal is Richard Murphy Architects Strathaven House, south of Glasgow, described by the architects as:

> The structure is a simple cantilevered steel frame and the proposed roof and wall cladding is mill-finished corrugated aluminium, a material which resonates with local farm cladding and indeed the cladding of the adjacent hangars.[369]

[369] 'House at Strathaven Airfield,' Richard Murphy Architects, accessed 5 May 2019, http://www.richardmurphyarchitects.com/viewItem.php?id=2426.

Figure 3.9. Strathaven Airfield House designed by Richard Murphy. Image reproduced with permission.

3.6.2.3 Historical Interest: Narrative

One of the potential benefits of the democratisation of heritage is the opportunity for the general public to promote the historical narratives they associate with individual corrugated iron buildings.

Many extant corrugated iron buildings reflect national and personal histories, allowing visitors access to important narratives of the past. The corrugated iron Nissen huts that were essential to the rapid housing of prisoners of war at Cultybraggan Camp is a good example of this (see chapter 4), suggesting how the narratives attached to the buildings can be as culturally significant as the physical spaces themselves. The buildings are the embodiment of the memories of wartime and their use for re-enactment of the historical events that took place at Cultybraggan means that the site has a cultural role beyond its practical use value.

Most of the historical narratives attached to corrugated iron buildings relate to the social memories of the people who lived and used them. The village halls in Dorset housed the memories of the people who used them for local dances; or, as at Binham near Weymouth, where the building – purchased from the army for £12 – was now used for the local lads to play pool on a Friday night. These narrative connections are important to the history of their locality and its culture – and the corrugated iron buildings exist as vehicles by which these stories can be told.

These examples show how corrugated iron features in private and local narratives, rather than being valorised in national heritage. National heritage has been criticised for its tendency to preserve grand and securely 'tangible' historical sites at the cost of marginalised, supposedly less significant memory. Celmara Pocock, David Collett, and Linda Baulch note that 'the process whereby sites are first identified and then assessed for significance inevitably favours the more obvious and apparent forms of built or physical heritage sites'; sources of history which 'lack the monumental or structural elements that underpin European heritage traditions' are typically overlooked.[370] The protection of corrugated iron buildings and their stories is forestalled by this preference for 'the monumental' in built or physical heritage. More provisional and often on a smaller scale, corrugated iron can receive less official recognition, yet it nevertheless remains a powerful source of cultural memory.

What we value heritage for, varies according to circumstance and need. As Pendlesbury states, '…heritage does play very different roles in different circumstances, and this can be expressed in terms of value.'[371] This gives the potential for a spectrum of the values of heritage. Some values are easy to allocate and assess, like *age* or *rarity*, others less so, such as *memory* and *beauty*. These local and personal cultural memories are not 'wrong,' they are just harder to quantify. For the buildings to survive there must be a long term

[370] Celmara Pocock, David Collett, and Linda Baulch, 'Assessing Stories Before Sites: Identifying the Tangible from the Intangible,' *International Journal of Heritage Studies* 21, no. 10 (2015): 964–65.
[371] Pendlebury, *Conservation in the Age of Consensus*, 203.

sense of ownership. Heritage is not just for the past and present, but for the future.

3.6.2.4 Architectural Interest: Aesthetics

Age value, as described by Riegl, refers to the visual appearance of the building rather than Historic Environment Scotland's or Historic England's definition of age value which refers to the buildings physical age. Riegl identifies that emotional appeal of the appearance of the building can be split into two conflicting responses,[372] the desire to make a building look old – to show the signs of the passage of time, marked by age and rust – or the desire for the building to look new. He states that:

> Age value is revealed in imperfection, a lack of completion, a tending to dissolve shape and colour, characteristics that are in complete contrast with those of modern, i.e., newly created, works.[373]

In this, corrugated iron is no different from any other historic material. However, as discussed above, perceptions of corrugated iron draw heavily on emotional responses relating to historical events. This results in the aesthetics of corrugated iron buildings being the most diverse of all the factors impacting decisions regarding the designation of those buildings. In a context of increasing democratisation of heritage it is also one of the most important. If the general public are to have a greater say in how conservation value is determined, their emotional response to the *look* of buildings will become increasingly important.

Rigel identifies the idea of newness as 'the most formidable opponent of age value'.[374] Interestingly he suggests that newness, 'expressed by the simple criteria of unbroken form and pure polychromy' is the 'art value of the mass majority of the less educated or the uneducated.'[375] This implies that if the 'less

[372] Riegl, 'The Modern Cult of Monuments,' 80.
[373] Riegl, 'The Modern Cult of Monuments,' 73.
[374] Riegl, 'The Modern Cult of Monuments,' 80.
[375] Riegl, 'The Modern Cult of Monuments,' 80.

educated' were assessing the heritage value of corrugated iron buildings, very little cultural significance would be given.

Riegl suggests[376] that the appeal of *newness* stems from the need of the general public to have completeness of form that allows non-specialists to appreciate a building. It is certainly easier to persuade people that corrugated iron is acceptable if it is new. Newness value, is in itself is time limited and is most notable in freshly built Modernist buildings – the general acceptance of new concrete without stains – but also apparent in the appreciation of corrugated iron. When corrugated iron was first invented in 1830 and used on the first warehouse buildings at the London Dock, it was generally appreciated by the general public – as explained by Loudon in his encyclopaedia,[377] and also by George Hebert, editor of the Register of the Arts and Sciences, who, in his article describes the new corrugated iron shed as 'Extraordinary Light and Simple Roof.'[378]

[376] Riegl, 'The Modern Cult of Monuments,' 80.
[377] Loudon, *An Encyclopaedia*, 206.
[378] 'Extraordinary Light and Simple Roof.' *Register of the Arts and Sciences*, vol. 5, N.S. (1831), 153.

Figure 3.10. Padstow lifeboat station. Photograph by Benjamin Evans.

More modern employments of corrugated iron also suggest how its 'newness' is associated with a favourable reception. The new lifeboat station at Padstow, designed by Poynton Bradbury Wynter Cole Architects uses corrugated cladding and has also won awards for engineering, by Institute of Structural Engineers, the British Construction Industry and the Cornish Building Group.[379]

Richard Murphy's Strathaven House won the RIBA Regional award in 2019, as is described as: '…a light, airy and joyful building which, as well as a family home, provides highly effective and attractive separate workspaces for both its owner.'[380] It certainly capitalises on the value of newness in the appeal of pristine corrugated iron.

[379] Poynton Bradbury Wynter Cole Architects, 'Awards,' accessed 13 August 2019, http://www.pbwc.co.uk/html/15information/awards.html.
[380] 'Briongos MacKinnon House, Strathaven,' *RIBA Journal*, Royal Institute of British Architects, 30 May 2019, accessed 2 August 2019, https://www.ribaj.com/buildings/regional-awards-2019-scotland-richard-murphy-architects-house-briongos-mackinnon-house.

These, of course are the accolades of architects, but Kevin McCloud on the Grand Designs film of Strathaven House describes the use of corrugated cladding on the buildings as: 'a humble material' and 'a noble one,'[381] making the building 'beautiful,' having 'zest' and being 'appropriate.' This enthusiasm for buildings using corrugated cladding inevitably leaves an impression on the viewers, conveying positive emotions to counteract earlier, potentially negative preconceptions of the material.

The need for corrugated iron to look pristine seems to come from a fear that is not a viable material if it appears rusty and weathered. Tied up with these opinions are prejudices and perceptions of corrugated iron as an inferior material that corrodes. However, decay is not necessarily in itself aesthetically problematic. The intentional ruins of the eighteenth century, such as Studley Royal or Stourhead are culturally acceptable. These were made from stone, and critics such as Ruskin, were appreciative of the beauty of the aesthetic of decayed stone. However, this appreciation does not extend so readily to the decay of more modern, industrial materials. In the twentieth and twenty-first century it is inevitable that much of the decay of our urban and suburban buildings will involve materials other than stone such as concrete and corrugated iron.

[381] 'Channel 4 Grand Designs revisits the Strathaven Airfield House,' 30 August 2018, YouTube video, https://youtu.be/g87kJXsrPPw.

Figure 3.11. ‘Red Barn’ by Kathy Lewis. Reproduced with permission.

Art historian, Riegl appreciated the difficulties of assessing buildings from an artistic or aesthetic viewpoint. He states that sometimes it is possible to admire more recent buildings than older ones, - so plainly we do not just assess the value of buildings by their age, there are aesthetic values to be considered. He notes that the age of a building is quantifiable and consequently is an objective value. But to assess the aesthetics of a building is a subjective problem. Values such as these are ‘less clearly formulated […] because they change incessantly from subject to subject and moment to moment.’[382]

Artists are often the first to perceive beauty where others don’t. Recently many more artists have begun to see beauty in rusty tin, and some British architects are including it their repertoire of architectural materials. Artist Kathy Lewis has painted a corrugated iron barn in stages of decay; but there is beauty in this, and the setting allows it to be firmly in the picturesque, making it visually acceptable. However, reactions to decaying corrugated iron buildings are complex. By featuring corrugated iron in art, it draws attention to more

[382] Riegl, ‘The Modern Cult of Monuments,’ 71.

marginalised areas of life, such as industry and poverty, which are frequently perceived as not part of the heritage or culture in general.

What is perhaps less acceptable is Raffaello Rosselli's Tin Shed.[383] This Australian architect, using old corrugated iron has aimed for a very different aesthetic. As stated by the architect:

> The humble tin shed is an iconic Australian structure. The project was to repurpose an existing tin shed at the rear of a residential lot, in the inner-city suburb of Redfern, Sydney. Located on a corner the existing shed was a distinctive building, a windowless, narrow double storey structure on a single storey residential street. As the only remaining shed in the area it is a unique reminder of the suburb's industrial past.[384]

In Australia the corrugated iron shed is iconic and, as discussed earlier, Murcutt's buildings even appear on a national stamp. Rosselli's buildings uses this icon, but treats the corrugated iron differently. Instead of choosing to clad a modern building in new corrugated cladding, he has decided not to replace the original tin. By doing this he has chosen to perpetuate the historical narrative of the suburb's industrial past. Rosselli's Tin Shed is using the aesthetic of rusted corrugated iron, to not just imply age value, as the building is old in Australian terms. He has restored it, and in the process has perpetuated its history by maintaining its character. The decision to do so reflects the building's aesthetic values as well as its age value.

Perhaps surprisingly the building is very popular with tourists and is part of an architecture tours of Sydney.[385] The implication suggests, as discussed earlier, that old corrugated iron is part of the cultural narrative of Australia, and this particular building part of that history.

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[383] Raffaello Rosselli, 'Tinshed,' Raffaello Rosselli Architect, accessed 1 August 2019, http://rdotr.com/work/architecture/redfern-tin-shed/.
[384] 'Tinshed / Raffaello Rosselli,' ArchDaily, 11 April 2013, accessed 13 August 2019, https://www.archdaily.com/357865/tinshed-raffaello-rosselli.
[385] 'Raffaello Rosselli's Tinshed in Sydney,' *The Architectural Review*, 3 February 2014, accessed 25 February 2019, https://www.architectural-review.com/today/raffaello-rossellis-tinshed-in-sydney/8658191.article?v=1.

Figure 3.12. ‘Tinshed,’ Australia, designed by Raffaello Rosselli. In an unusual decision, Rosselli has used the material in its broken and battered form. Apparently, when the builders finished the initial build, he felt it was not battered enough and adjusted the sheet of corrugated iron to make it look wobblier. Perhaps it should be no surprise that this exciting use of corrugated iron is being created in Australia. Image reproduced with permission.

Not as extreme as Rosselli’s Tin Shed is the visitor centre at Mottisfont Abbey (see below), which uses a material called Corten, designed to give the appearance of rusty corrugated iron without actually rusting.

Figure 3.13. A successful use of Corten and corrugated iron at Mottisfont Abbey, designed by Burd Haward architects.

Corten is steel with a thin layer of oxide on the exterior surface. This durable material is used because of its attractive appearance, and suitability for buildings in an industrial setting. In this case the Corten is used for its aesthetic value giving the illusion of age and industry.

Whatever their derivation perceptions of acceptable appearance, it can have a profound effect on the conservation of different building types. Put simply, traditional masonry buildings, whose merit is unquestionably recognised by traditional established and elite value systems, are allowed and even encouraged to develop a patina of biological colonisation and minor imperfections. This encourages the deployment of a minimum intervention repair philosophy. Modernist and corrugated iron buildings tend not to be treated in this way. An exception being the recently (2015) tin chapel at the Weald and Downland Museum which has been repaired using extensive patches to decayed areas of its cladding. Age value of historical buildings is selectively applied.

3.7 Other Values and Criteria

3.7.1 Emphasis on Permanence

Corrugated iron buildings, despite abundant evidence of their durability when adequately maintained, are often perceived as temporary. Prefabricated corrugated iron buildings are relatively easy to repair by simple replacement of damaged materials. Paul Dadson, in the conclusion of his thesis, notes:

> It is crucial, therefore, that the Department of the Environment reconsiders its general policy, so as to enable the better examples to become listed buildings. As we have seen it is not correct to regard corrugated iron as a transient temporary material.[386]

Figure 3.14. An abandoned corrugated iron chapel at Rodhuish in Somerset. Its designation and at-risk status is unknown, but if it remains unoccupied and unmaintained its life expectancy is very limited in this condition. Photograph by the author.

The perception of temporariness is often influenced by the application of corrugated iron to pre-fabrication. The corrugated iron buildings designed for export to the colonies were pre-fabricated and were indeed intended to be a moveable response to short term needs. However, 'movable' and

[386] Dadson, 'Rediscovering Corrugated Iron,' conclusion.

‘prefabricated’ do not necessarily equate ‘temporary.’ More importantly, many corrugated iron buildings were never intended to be either mobile or temporary. When Greene and Scamp chose to use corrugated iron for the roofs of the Chatham slips, they were not planning on replacing them at any stage in the future with something more ‘permanent.’ The reason for using corrugated iron was its permanent advantages of lightness, strength and relative low cost, not temporariness. Scamp and Greene were hoping for a long life for the material and put considerable design effort into assuring themselves of its durability.[387]

Corrugated iron buildings from the nineteenth century are now over 100 years old, with those from 1850s heading to 200 years old. Such life span is proof that well-maintained corrugated iron is a permanent material. The perception of corrugated iron buildings as temporary is challenging to their future survival: lack of durability is used as the perfect self-validating excuse for demolition.

Despite the abundant evidence that corrugated iron can be a durable material, some caution is needed in in assessing its permanence. The speed at which buildings disappear is governed by the nature of the threats that they face by their inherent vulnerability is also factor.

The rapid decay of some of the Nissen huts at Cultybraggan demonstrates the difficulty of promoting corrugated iron as a permanent material. Its inherent vulnerabilities are easily exaggerated by wilful neglect, but to use this sensitivity as a justification for resisting designation is a self-fulfilling argument. Because corrugated iron easy to dismantle, cannibalistic reuse at Cultybraggan is another acute threat, and is widely seen as evidence of a temporary nature of corrugated iron. But it is dangerously misleading to suggest that this is a vulnerability unique to corrugated iron. It is not the only building material that is vulnerable in this way. Timber farming has always been susceptible to deconstruction to facilitate use elsewhere.

[387] Evans, *Building the Steam Navy*, 129.

3.7.2 Functionality

The functional tradition is where the form or shape of a building is dependent of the function or job that the building has to fulfil. It is in many ways the antithesis of style driven architecture, where functionality is frequently sacrificed in the name of style.

As discussed by Richards in *The Functional Tradition*:

> Because of the misunderstandings that have grown up round the term 'functionalism' in the heat of the struggle to establish its supremacy over the philosophy that survived from the nineteenth century, when pictorial and antiquarian values predominated, and especially because of the extent to which the term has been used for polemical rather than descriptive purposes, functionalism has acquired the reputation of being a revolutionary creed, peculiar to our day.[388]

Corrugated iron was designed to be a function-based material; many were prefabricated and were designed with the functional imperatives of ease of travel and erection in mind. Decorative or style elements are almost always subordinated to functionality. For example, the corrugated iron covered boat slips at Chatham docks, have significance and value precisely because of their functionality. However, additional elements in their valuation are their association with the eminent engineers such as Scamp and Green, and also their being part of a wider group of early dockland structures.

The Japanese architect Shuhei Endo has created buildings with corrugated iron that illustrate the difficulty of defining functionality. His curvilinear corrugated iron buildings are functional: they successfully serve their defined purpose, but they also stretch the definition of functionality to its limits, and so also highlight the difficulty of trying to categorise corrugated iron.

[388] Richards, *The Functional Tradition in Early Industrial Buildings*, 14.

The Australian and Japanese use of corrugated iron as style statements combined with functionality have aroused very little equivalent architectural interest in Britain. Richard Murphy's Strathaven House uses corrugated iron to reflect the idea of corrugated iron barns and aircraft hangars. Nick Thomson exploits the functionality of corrugated iron in domestic housing design on the Isle of Skye:

> Tinhouse celebrates corrugated metal sheeting, commonly used on the agricultural buildings of the rural landscape. It does so in a thoroughly contemporary way by using mill finished corrugated aluminium as the external cladding for both roof and walls.[389]

Figure 3.15. 'Tin House': functional corrugated iron is used by Nick Thomson as a main component of a house on the Isle of Skye. However, the apparent concentration on functionality is also a style statement because the building consciously echoes the Highland tradition of prefabricated corrugated iron. Photograph by Nick Thompson.

The use of corrugated iron as part of an architectural statement is unusual in Britain, and is interesting that they both occur in Scotland. More common is the use of corrugated iron in a more industrial context.

[389] Rural Design Architects, 'Tinhouse,' accessed 9 August 2019, https://www.ruraldesign.co.uk/TINHOUSE.

3.7.3 Conclusion

Recent refocus on themed listing by Historic England may offer some fresh opportunity of designation for corrugated iron buildings, provided there are individuals who are willing to champion them. This has partially happened in the themed resurvey of the historic docklands;[390] David Evans has included a large section in his book *Building the Steam Navy*, where the corrugated iron is evaluated. Other thematic treatments of the material have been confined to surveys done by students studying for a master's thesis.

Since the start of designation in 1947 there has been a general broadening of the criteria used to attribute cultural significance.

The United Kingdom Department of National Heritage's policy guidance states:

> There is a growing appreciation not just of the architectural set pieces, but of many more structures, especially industrial, agricultural and other vernacular buildings that, although sometimes individually unassuming, collectively reflect some of the most distinctive and creative aspects of English history.[391]

Despite the broadening of assessment criteria, and the introduction of thematic listing, the starting point for designation assessments has remained unchanged. The Principles published by Historic England in 2010, and Historic Environment Scotland's policy document of 2011, are both based on the certainty that *age* and *rarity* are the fundamental criteria for assessment of conservation value.

[390] Evans, *Building the Steam* Navy, 129.
[391] Department of National Heritage, 'Planning Policy Guidance Note 15 (PPG 15): Planning and the Historic Environment,' sec. 6.2, September 1994, accessed 14 August 2019, https://webarchive.nationalarchives.gov.uk/20120906040142/http://www.communities.gov.uk/documents/planningandbuilding/pdf/142838.pdf.

If pursued energetically thematic listing is almost certain to discover numerous eligible buildings, some of which will be constructed in corrugated iron. The principal cause of uncertainty is that thematic listing to date has been driven more by the personal interests of its researchers, than by any agreed hierarchy of need. Why, for example, invest thematic listing effort in petrol station canopies and not in corrugated iron agricultural buildings?

Figure 3.16. Designated petrol filling station.

3.8 The Analysis of Listing for Designated Corrugated Iron Buildings

3.8.0 Introduction

This thesis argues that corrugated iron is not given due recognition for its cultural significance. Analysis using the criteria developed by Historic England (HE)[392] and Historic Environment Scotland (HES)[393] clearly demonstrates that corrugated iron fulfils many, if not all, of the generally accepted criteria for the award of significance. This section uses primary data from HES and HE designation records to demonstrate that the designation of buildings, in theory a perfect reflection of cultural significance, is in fact unconsciously biased against corrugated iron buildings.

To strengthen this analysis, I also examine the HES designation data to see if other building types suffer the similar unconscious negative bias. The data on Modernist buildings has been chosen for this purpose. Modernism has been chosen because the parallels between corrugated iron buildings and Modernist are similar. As stated by Pendlebury, Modernism …'can be characterised by its use of non-traditional materials, avoidance of ornament and, [ ] it avoidance of historical associations.'[394] Corrugated iron buildings have identical attributes.

All data has been derived from HES' and HE's current online listed buildings database.[395] The data for corrugated iron buildings, Modernist building and all other listed building was easily available from the HES website. Although I was able to obtain the data for corrugated iron buildings from HE, it was not possible to get the data for all listed buildings.[396]

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[392] DCMS, 'Principles of Selection'.
[393] Historic Environment Scotland, 'Listing Criteria,' accessed 3 March 2019, https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/listed-buildings/listing-process/#listing-criteria_tab.
[394] Pendlebury, *Conservation in the Age of Consensus*, 22.
[395] Historic England, 'Search the List,' *National Heritage List for England*, accessed 12 October 2018, https://historicengland.org.uk/listing/the-list/.
[396] Neil Guiden, Historic England, email messages to author, 31 January 2018 – 4 April 2019.

Firstly the HES database was analysed and the data for corrugated iron buildings compared to all designated buildings. Secondly I compared how the number of corrugated iron buildings are designated by year compared to the number of designations for Modernist buildings. Thirdly the proportion of corrugated iron buildings designated in Scotland by year was analysed and compared with the total number of buildings designated by year, and finally I have examined the number of designations for all buildings by century of construction.

3.8.1 Analysing the Data

The analysis of the HES and HE listing data suggests that the valuation and significance of corrugated iron buildings becomes recognised more frequently in the latter half of the twentieth century. The same also appears to be true for Modernist buildings. Indeed, there appears to be a close match between the rates of designation for corrugated iron and for Modernist architecture. This suggests that designation appears to be heavily biased in favour of established and elite values such as *age* and *rarity* value.

The HES Designation of all Buildings Compared to the Proportion of Listed Corrugated Iron and Modernist Buildings

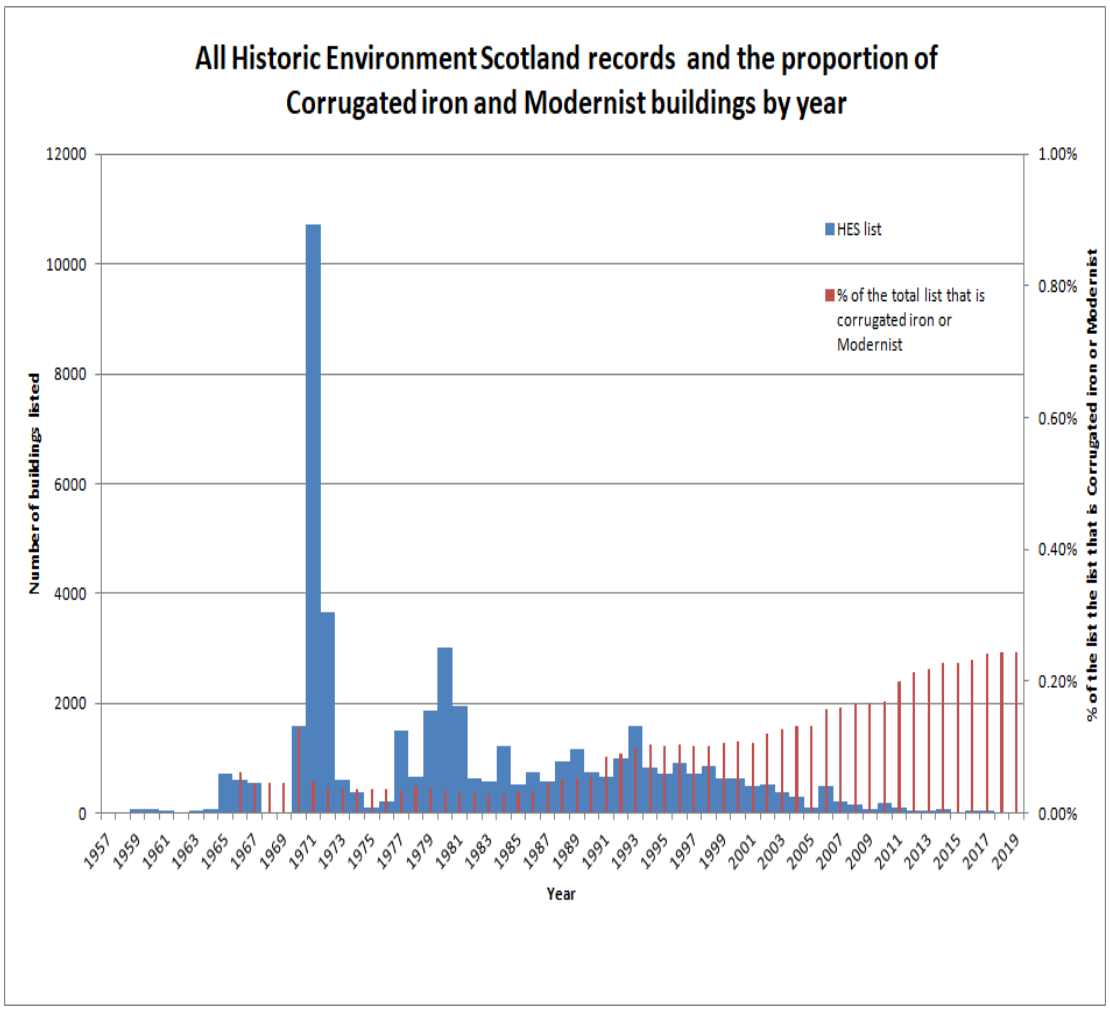

Figure 3.17. Graph showing the number of designated buildings per year. Data from Historic Environment Scotland

Figure 3.17 shows all the designated buildings. The graph reveals that the majority of designation activity took place between 1972 and 2007 with a peak in 1980 and again in 1993. Since 1993 there has been a steady decline in the number of listings. There is an anomaly in 1971 and 1972; this is because of adding a backlog of buildings listed before that date onto a new database.[397] In comparison to the total number of buildings listed, a proportionally increased number of corrugated iron and modernist buildings were listed over this period.

[397] David Shaw, Historic Environment Scotland, email message to author, 22 May 2019.

This increase occurs from 1990 to the present date. However, the corrugated iron and modernist data was still relatively very small consisting of only .25% on the total number of listed buildings.

HES Data Reflecting the Changes in the Rates of Designation for Listed Corrugated Iron and Modernist Buildings

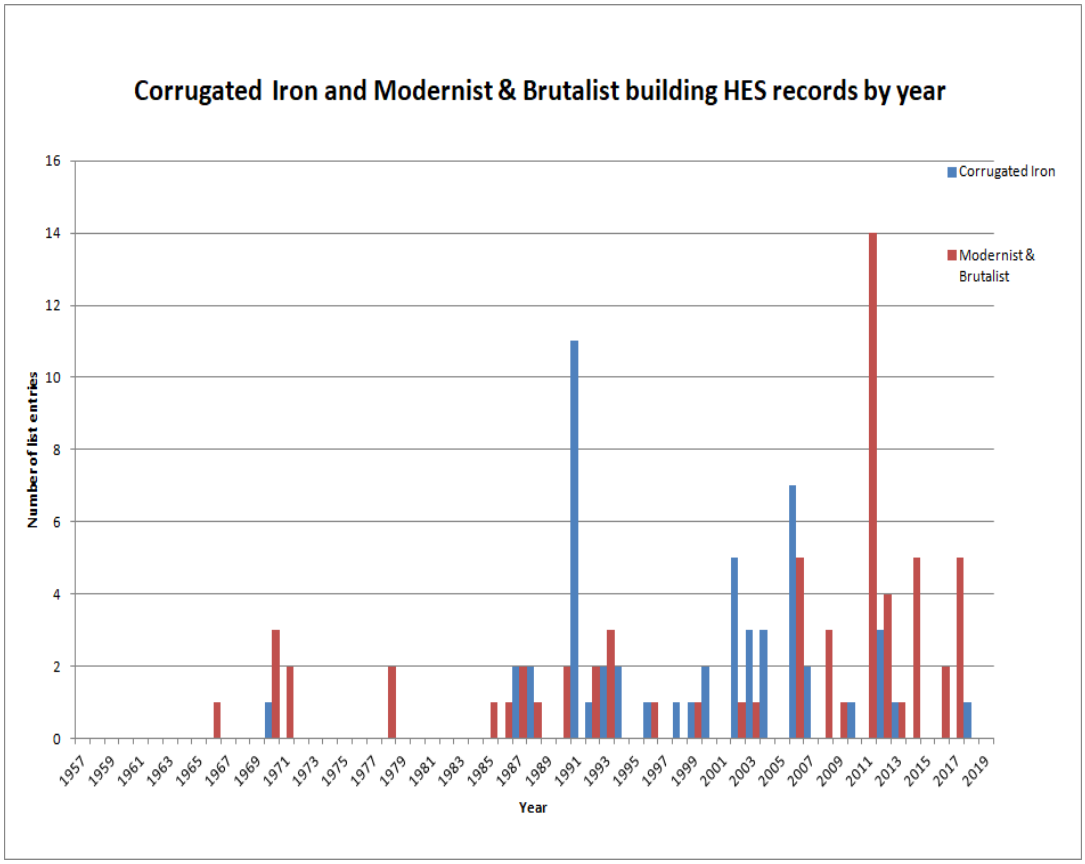

Figure 3.18. Graph showing number of Modernist and Brutalist or corrugated iron buildings designated by Historic Environment Scotland.

The second graph, figure 3.18, compares the data from HES and shows the designation of corrugated iron and Modernist buildings (including Brutalist buildings) and shows a different relationship, revealing that the bulk of designations took place from the late 1980s. Again, this graph show anomalies; the Queen Street railway shed in Glasgow was listed in 1970 and has corrugated iron as part of its structure; the early designations in the

Modernist data are mostly Arts and Crafts buildings (a popular style at that date), such as the Willow Tea rooms in Glasgow. However, the curves of both graphs show an upward trend from the 1990's onwards, suggesting that designation for these types of buildings occurred at a later date than the group of all listed buildings in Scotland. The small number of entries in figure 3.18 is also of note, showing that although there has been an increase in listing for corrugated Iron and Modernist buildings they still represent a small proportion of the total list.

Comparing the Data from HES and HE for Listed Corrugated Iron Buildings

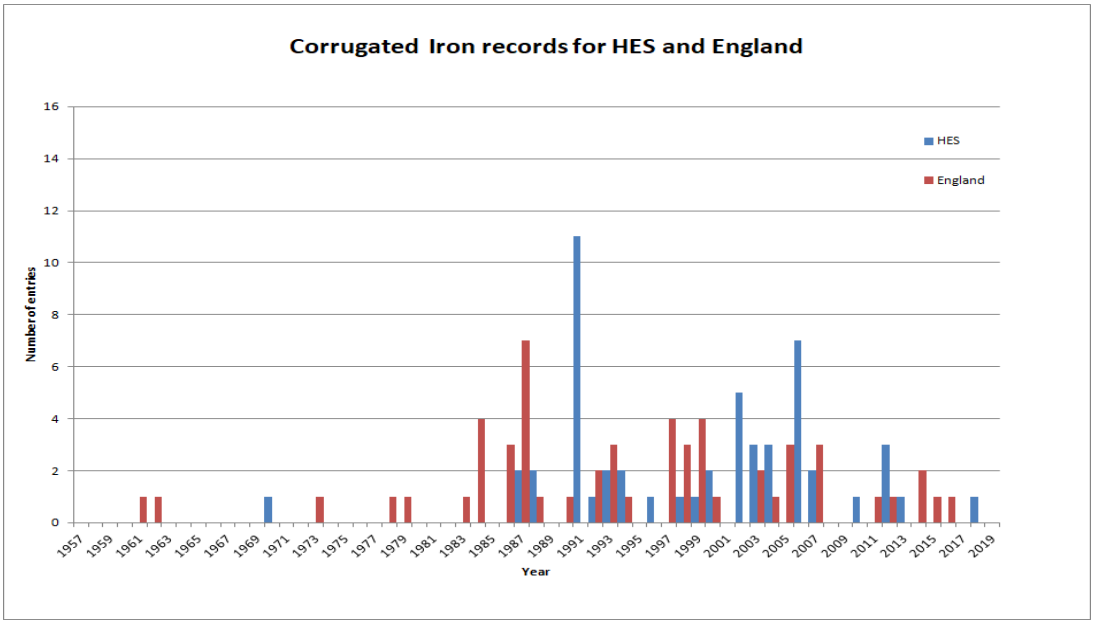

Figure 3.19. Graph showing number of corrugated iron buildings designated by Historic England and Historic Environment Scotland.

Figure 3.19 shows the rates of designation for corrugated iron buildings by year for both Historic England and Historic Environment Scotland. As seen in figure 3.19, there is a general increase in listing of corrugated iron buildings from 1989 onward. Taking into account the anomalies discussed above, figures 3.18 and 3.19 both show that the designation of corrugated iron

buildings increases towards the end of the twentieth century, and also that the curve for HE peaks earlier than that for HES. As discussed previously, the amount of data is very small; what can be established is that in both counties the designation of corrugated iron building occurred at a later date than other building types.

The first English example of designation of a predominantly corrugated iron structure appears to have occurred in 1973 when Frome railway station was designated. Although corrugated iron appears to be an essential part of the structure, the station was listed for being a 'Largely unaltered example of a small station of the period [1850] and probably the last through train shed of its type in use on the Western Region.'[398] Other corrugated iron buildings were added to the list moderately swiftly after this. In 1978, Church of the Ascension, Abbots Langley, Hertfordshire,[399] and in 1984, Church of St Saviour, Swale, Faversham, Kent.[400] Both these churches are what would typically be known as *tin tabernacles,* decorated with Gothic detailing. These two relatively early English designations appear to demonstrate a growing appreciation of corrugated iron as a culturally significant material in its own right. These churches were not designated because they were corrugated iron but because they carried pseudo-gothic details.

3.8.2 Bias in the Collection of the Data

Because of the low numbers of corrugated iron buildings being designated, there is a general shortage of data on corrugated iron buildings. However, there are some trends.

[398] Historic England, *National Heritage List for England*, s.v. 'Frome Station (Main Building),' accessed 20 July 2019, https://historicengland.org.uk/listing/the-list/list-entry/1345526.
[399] Historic England, *National Heritage List for England*, s.v. 'Church of the Ascension,' accessed 20 July 2019, https://historicengland.org.uk/listing/the-list/list-entry/1173189.
[400] *British Listed Buildings Online*, s.v. Church of St Saviour, accessed 15 July 2019, https://britishlistedbuildings.co.uk/101240313-church-of-st-saviour-faversham.

The data for corrugated iron buildings in Scotland (figure 3.18) reveals that most of the buildings listed are either military buildings with 26 listed, or religious buildings, with 10 listed churches. The remaining 16 buildings were recreational, industrial and domestic, only one of which is agricultural – a sheep stall. A similar bias can be seen from the designated corrugated iron buildings in England, which constituted 19 military buildings (including naval dockyards) and 11 churches out of a total of 54 corrugated iron buildings. Of the 25 remaining buildings only 3 are agricultural.

This is surprising as the limited survey work that this project has done in Scotland and England indicate that the most extensive historic deployment of corrugated iron has been into agriculture and that this deployment has been no less culturally significant than any other use of the material. This designation database shows a clear bias toward military and religious buildings at the expense of agricultural corrugated iron without any convincing explanation for this bias.

The bias inherent in the designation of different deployments of corrugated iron buildings might be less convincing if it were not mirrored in the datasets for Modernist and Brutalist architecture (figure 3.22). Examination of the data of Modernist buildings in Scotland shows that there are 14 are hydro-electric power stations, mostly listed in one year. Neither the list of 10 Brutalist buildings nor the list of Modernist buildings includes St Peter's College, Cardross, which was listed in 1966. Nor does it include the Glasgow School of Art by Macintosh, which, given that the Willow Tearooms and Hill House were on the Modernist database, is perhaps an anomaly.

Designated Corrugated Iron Buildings in Scotland at June 2019				
name	**date**	**cat**	**type of building**	**date of construc-tion**
Queen Street Station, Train shed, Glasgow	1970	A	railway	1978
Syre Church, Sutherland	1987	C	church	
Italian Chapel, Lambholm, Orkney	1987	A	church	1942
Montrose Airfield, buildings 46, 47, 48	1988	A	military	1913
Montrose Air Station Air-hangar	1988	B	military	1937
East Fortune, Loading Bay and Stores	1991	B	military	1916
East Fortune Hospital Stores	1991	B	military	1945
East Fortune Hospital Offices 11	1991	B	military	1945
East Fortune Nursing Admin Block 15	1991	B	military	1945
East Fortune Hospital Stores	1991	B	military	1945
East Fortune Hospital Drivers Office	1991	B	military	1945
East Fortune Hospital Recreation Stores	1991	B	military	1945
Strathy and Halladale Church	1991	B	church	c1900
Drillhall, Golspie	1991	A	military	1892
Beach Club House, West Ferry Bay, Royal Tay Yacht Club	1991	B	recreational	1887
Village Hall, Quothquhan, South Lanark	1991	C	domestic	1903
Lambertons Engineering works, Coatbridge	1992	B	industrial	19thc
St Michael's Church, Royal Edinburgh Hospital	1993	B	church	1876
Garlies Lodge and Motor House	1993	C	domestic	1910
House at Pier, West Loch, Tarbert	1994	C	domestic	early 20th c
Horsacleit, Harris	1994	B	domestic	late 19th c
Gutters Hut, North Ness, Shetlands	1996	B	industrial	c1900
Hirendean Sheep stell (stall)	1998	C	agricultural	19th c
St Fillan's Church. Killin	1999	C	church	1876
Folla Rule Village Hall	2000	B	domestic	c1904
Souters Shop, Ballogie, Aberdeenshire	2000	A	industrial	
Paravane Shed, Lyness, Orkney	2002	A	military	1917
Strathendrick Golf Club, Pavilion	2002	C	recreational	c1901
Romney Hut, Lyness, Hoy	2002	C	military	1942
Longhope lifeboat station, Hoy	2002	B	military	1912
Garrison Theatre, Lyness, Hoy	2002	C	military	1942
Lamash, Military hall	2003	C	military	1914
Pirnmill Free Church	2003	C	church	1920
Coastal Defence Battery, Shetland	2003		military	1940
Errogie Cottage	2004	C	domestic	
Errogie United Free Church	2004	C	church	1900

Drill hall, Ullapool	2004	C	military	1887
Carrick Castle Church, Loch Lomond	2006	C	church	1882
Cultybraggan Cadets Camp, huts 19, 20, 44, 45, 46	2006	A	military	1941
Cultybraggan Cadets Camp, huts 1-3, 21, 29-39, 47-57	2006	B	military	1941
Crail Airfield Aircraft Painting Hangar	2006	B	military	1939
Crail Airfield Aircraft Repair Shop	2006	A	military	1939
Crail Airfield, Torpedo Training Building	2006	A	military	1939
Oil Storage Tank, Lyness, Hoy	2006	A	military	1942
Tarbert Stores, Harris	2007	C	domestic	c1900
Port Edgar Power Station	2007	C	industrial	1917
Balmoral Ballroom	2010	A	domestic	1851
Elie, St Michael and all Angels Episcopal Church, Fife	2012	C	church	1905
Westerdunes Court Pillbox	2012		military	1940s
Coastal Defence Battery, Shetland	2012		military	1940
St Fillan's Church, Newport on Tay	2013	B	church	1886
Delaware Hall, Kyle of Lochalsh	2018	C	military	1917

Figure 3.20. Table showing designated corrugated iron buildings in Scotland (June 2019).

Designated Corrugated Iron buildings in England at June 2019				
Name	**date**	**grade**	**type**	**date of constr-uction**
Paddington Station	1961	1	station	1851-4
Boat Store, Sheerness	1962	1	naval dockyard	1856
Frome Railway Station, Somerset	1973	2	railway	1857
Church of the Ascension , Abbots Langley, Herts	1978	2	church	1880
Aircraft hangars, Farnborough, Hants	1979		military	
Church of St Saviours, Swale, Faversham, Kent	1983	2	church	1885
Boiler-shop, Chatham	1984	2*	naval dockyard	1847
No8 Machine shop	1984	2	naval dockyard	1880
Garrison Church of St Barbara, Surrey	1984	2	church	1901
Railway Carriage Skittle Alley, Devon	1984	2	railway	1987
Railway Buildings, Oswestry	1986	2	railway	1865
Waggon shed, Southend on Sea, Shoebury	1986	2	railway	1860s
Transfer Sheds, Didcot Railway	1986	2	railway	1840
Hydraulic Silo, Nothumberland	1987	2*	agricultural	1895
Aircraft Hangars, Cherwell, Wilts	1987	2	military	1941
Barn, Cannings, Wiltshire	1987	2	agricultural	
Pewsey Hill Barn, Wiltshire	1987	2	agricultural	
Grandstand Fulham Football Club	1987	2	recreational	late 19th c
Granary Storehouse ,Essex	1987		naval dockyard	
Darnall Works, Sheffield	1987	2	industrial	1913
Aircraft Hangars, Sevenoaks, Kent	1988	2	military	1910
Golders Green, Kent	1990	2	church	1914
Railway Shelter, Denham Golf Club, Bucks	1992	2	railway	1912
Bailbrook Mission Hall, Somerset	1992	2	church	1892
Waltham Gunpowder Mill	1993	S	agricultural	
Railway Works Transport Garage, Williton, Somerset	1993	2	railway	
Mundesley Hospital, Mundesley Road, Norwich	1993	2	hospital	1898
Isolation Hospital, Purbeck	1994	2	hospital	1900s
Royal Marine Drill Hall, Plymouth	1997	2	naval dockyard	1892
Evangelical church, Hackney, London	1997	2	church	1858
Fornham Free Church, Bury St Edmunds, Suffolk	1997	2	church	1901
Norton Bravant, 32, Wellhouse Road, Beech, Hampshire	1997	2	domestic	1903
St James' Episcopal Church Hall, Brent, London	1998	2	church	1863

Petter Warren Houses, Yeovil, Somerset	1998	2	domestic	1929
Petter Warren houses, Bampton, Devon	1998	2	domestic	1929
Nos 4,5,6 Slips, Chatham	1999	1	naval dockyard	1845
No7 Slip, Chatham	1999	1	naval dockyard	1852
Composite Ship Building Shed, Plymouth	1999	2	naval dockyard	1897
Bellman Hangar, Surrey	1999	2	military	1940
Cookerhouse, Acetone Factory, Holton Heath, Dorset	2000	2	industrial	1916
Millwall Ironworks Building	2003	2	industrial	1860
Flying Boat Hangars, Mountbatten, Plymouth	2003	2	naval dockyard	1917
Iron Bungalow, Immingham, Lincs	2004	2	domestic	1907
Aircraft Hangars, Durrington	2005	2*	military	1910
Four Aircraft Hangars, Swale, Kent	2005	2	military	1912
Aircraft Hangar, Filton, Bristol	2005	2	military	1917
Devan Haye, Sherborne, Dorset	2007	2	domestic	1889
Tower house, East Bawdsey, Suffolk	2007	2	domestic	1893
St Paul's, Marple, Greater Manchester	2011	2	church	late 19th c
Type 25 Pill Box, Studland, Dorset	2012	2	military	1841
Aircraft Hangar, Filton, Bristol	2014		military	
Church of All Saints, Brokeswood, Trawbridge, Wilts	2014	2	church	1904
Anti-Tank obstacle - CI, Somerset	2015	2	military	1940
St Mary the Virgin, Gloucester	2016	2	church	1914

Figure 3.21. Table showing designated corrugated iron buildings in England.

3.8.3 The Quality of the Data

The analysis of data can be significantly impeded by poor data quality and data structures, and specific examples might include data recorded using non-standard terms or misspellings, missing data, data that requires manual searches of subsidiary databases where there is no public access, a poor selection of search terms and difficulties finding related image content. A few of the potential issues noted above occurred when searching the databases of both HE and HES which made the research more challenging.

The search term ‘corrugated iron’ produced a list of all the designated buildings where the surveyor noted the presence of corrugated iron. This ranged from corrugated iron churches, where the material is an essential part of the structure, to a small lean-to on the back wall of a stately home, where the corrugated iron is both new and irrelevant to the structure of the buildings. To find the buildings that were designed because of corrugated iron, I selected buildings where corrugated iron formed an essential part of the building. Because of the rudimentary nature of many of the descriptions and the lack of illustration, further investigations were taken, by accessing the websites for the individual buildings.

The HE listing descriptions that mention corrugated iron before the 1970s only do so where it is an incidental element in an otherwise masonry or timber structure. A typical example is *Ironstone Barn*, in the South Down which is included under *corrugated iron* as it has recently been protected by some new corrugated iron sheet. It is in fact an eighteenth century timber framed building.

A number of buildings were mislabelled. One of the most important examples of a corrugated iron building in England is the Cardington Airship Hangars in Bedford. Both these vast buildings, listed at grade 2* do not appear when the database is searched because the data entry is for *corrugated steel* and not *corrugated iron*.[401] Although technically correct, corrugated steel is not a term commonly used and also not the search term used by all the other corrugated iron buildings on the list. This lack of consistency may mean that other buildings are left off the list or are filed under other search terms.

[401] Historic England, search results for ‘Cardington’, accessed 15 June, 2019, https://historicengland.org.uk/sitesearch?searchType=Site&search=Cardington&page=&filterOption=filterValue&facetValues=&pageId=38601.

Designated Modernist Buildings in Scotland at June 2019				
name	**date**	**cat**	**type of building**	**date of construction**
Gillmorehill Campus B8, Glasgow university	1970	B	education	1947
National Library of Scotland, Edinburgh	1970	A	education	1934
Willow Tea Rooms, Glasgow	1970	A	recreation	1903
Roman Catholic Church, Dunblane	1971	B	church	1935
The Hill House, Helensburgh	1971	A	domestic	1902
Ardnasaid, Edinburgh	1978	B	domestic	1931
Court House, Saddell	1978	A	domestic	1921
Invergarry Power Station	1985	B	HEP	1950
Glen Affric Hydro-electric scheme	1986	A	HEP	1950
All Saints' Episcopal Church	1987	C	church	1935
Adam House, Univ of Edinburgh	1987	B	education	1954
Rothsay Pavillion, Bute	1988	A	recreation	1938
Foursquare Tobacco Factory, Paisley	1990	B	industrial	1936
Sighthill Industrial Estate	1990	A	Industrial	1949
Ayrshire Central Hospital, Irvine	1992	B	hospital	1935
Inverurie Hospital, Inverurie	1993	B	hospital	1936
Nurses Home, Inverurie Hospital	1993	B	hospital	1936
Admin Block, Inverurie Hospital	1993	B	hospital	1936
Rothsay Academy, Bute	1996	B	education	1955
St Theresa's Catholic Church, Glasgow	1999	B	church	1956
Canongate redevelopment	2003	B	domestic	1956
Gala Fairydean football stadium	2006	A	recreation	1963

George Square Theatre, Univ of Edinburgh	2006	B	recreation	1965
Adam Ferguson Building, Univ of Edinburgh	2006	B	education	1965
William Roberson Building, Univ of Edinburgh	2006	B	education	1965
Pollock Halls of Residence, Univ of Edinburgh	2006	A	education	1956
The Loan, West Linton	2008	A	domestic	1934
Brucefield Church, Whitburn, Lothian	2008	A	church	1965
The Tower, Univ of Dundee	2008	B	education	1958
Laverock Bank Avenue, Edinburgh	2011	B	domestic	1957
Sloy Awe Hydro-electric power station	2011	C	HEP	1955
Tummel Garry Hydro-electric power station	2011	B	HEP	1955
Lussa, Hydro-electric scheme	2011	B	HEP	1956
Shin, Hydro-electric scheme	2011	C	HEP	1960
Conon valley, Hydro-electric scheme	2011	C	HEP	1955
Great Glen Hydro-electric scheme	2011	B	HEP	1955
Glen Affric Hydro-electric scheme, Intake Tower	2011	B	HEP	1963
Glen Affric Hydro-electric scheme, Mullerdoch dam	2011	B	HEP	1952
Conon Valley, Hydro-electric scheme, spillway towers	2011	C	HEP	1957
Conon Valley, Hydro-electric scheme, Orin dam	2011	B	HEP	1961
Tummel Garry Hydro-electric power station, Errochty Dam	2011	B	HEP	1956
Claremont Court, Edinburgh	2011	C	domestic	1959
Glascarnoch Dam, Conon Valley, Hydro-electric scheme	2011	B	HEP	1957
Rotten Row, Univ of Strathclyde	2012	B	education	1968
57, Laurel Street, Glasgow	2012	B	domestic	1946
Carberry Chapel, Inveresk, Lothian	2012	C	church	1965

Hospital Administration Block, Lynbank Hospital, Dunfermline	2014	B	hospital	1965
Ulva House, Isle of Ulva	2014	B	domestic	1955
David Hume Tower, Univ of Edinburgh	2016	A	education	1960
Dalhousie Land, Univ of Edinburgh	2016	C	education	1960
Santa Maria Abbey, Haddington	2017	A	church	1952
St Mungo's Church, Alloa	2017	C	church	1958
Cardinal Newman High school, Bellshill	2017	B	education	1972
Brutalist Buildings				
Cables Wynd House, Edinburgh	2017	A	domestic	1963
Linksview House, Edinburgh	2017	A	domestic	1964
Hudson Beare Lecture Theatre, Univ of Edinburgh	2009	B	education	1961
Matthew Building. Univ of Dundee	2014	B	education	1967
Anderston Kelvingrove Parish Church, Glasgow	2014	B	church	1965
1, Carlton Place, Glasgow	2013	B	government	1972
Dam Park Stadium, Ayr	2000	B	recreation	1961
St Andrews RC Church, Livingston	2014	B	church	1968
Town Centre Park, Lanarkshire	2012	C	multipurpose	1966
Summerhall, The Royal (Dick) Veterinary School, Edinburgh	2002	B	education	1909
Listed but not under Modernism or Brutalist				
St Peter's College, Cardross	1992	A	church	1966
Glasgow School of Art	1966	A	education	1997

Figure 3.22. Table showing designated Modernist buildings in Scotland.

The HES' Modernist database relied on the criteria applied by the person assigning the title 'Modernism.' Searching the term 'Modernism' revealed that other closely related styles of buildings, were not included under this title, such

as Brutalism. That Brutalist[402] architecture was not included in the Modernist category suggests that other examples of related architecture with a different name but similar attributes, such as International style, might be excluded also from the list of Modernist data. Also listed under Modernism were a large number of Arts and Crafts style buildings.

However, using the dataset as specified by HES, further investigation of Brutalist style buildings suggested that their designation data correlates strongly with that for the designation of Modernism. Interestingly, but unsurprisingly, if the data for Brutalist and Modernist buildings are used together, their designation still occurs at a later date than the set of all buildings. They are also designated in relatively small numbers when compared with the designation of all listed buildings.

3.8.4 Quantities of Data

Despite many emails to Historic England, it was not possible to find dates of listing for all the designated buildings in Historic England's database, mostly, they said, due to the scale of the list.[403] Searching the database for *buildings* revealed total number of 80,000, but it is not clear if these are individual buildings or groups of buildings. Searching the term 'corrugated iron' in the HE list returned 6,859 entries, of which only 55 buildings appear to be *principally* constructed from the material.

In contrast it was possible to access the entire HES list of designated buildings, along with their dates of listing, revealing a total of 55,790 buildings. Out of a total of 982 referenced to corrugated iron in the HES list, 930 were filtered out for the reasons stated above, leaving a total of 52 buildings listed where corrugated iron featuring is an essential component. 53 buildings are described as Modernist in style, rising to 63 if Brutalist buildings are included.

[402] Brutalism: an architectural style of the 1950s and 1960s characterised by simple, block-like forms and raw concrete construction. 'Brutalism,' Tate Britain, accessed 6 August 2020, https://www.tate.org.uk/art/art-terms/b/brutalism.
[403] Neil Guiden, Historic England, email message to author, 4th April 2019.

Adding together the numbers of corrugated iron buildings with the Modernist and Brutalist buildings suggests that the ensuing 115 buildings account for 0.1% of all listed buildings in Scotland.

However, out of the remaining corrugated iron buildings in Scotland (as surveyed by Nick Thomson in 2003), calculating the percentage that are listed is more challenging. Thomson's 2003 survey gives a total of 161 buildings, but his research is incomplete; the survey omits much of the Outer Hebrides and only includes Hoy on the Orkneys missing the mainland and other islands. Neither does it include military buildings.

Figure 3.21 lists Scottish corrugated iron buildings listed in 2019. This contains a large number of buildings that do not occur in Thomson's survey, mainly military and recently listed buildings. However, there are 16 corrugated iron buildings in figure 3.21 which also feature in Thomson's survey, which is 10% of the total number of corrugated iron buildings which existed in 2003.

At first glance it seems that corrugated iron buildings are well represented. But in the nineteenth and early twentieth century, corrugated iron buildings were ubiquitous. It is possible that nearly a quarter of all buildings used corrugated iron. The near extermination of corrugated iron buildings means that survivals are relatively rare and, perhaps, all worthy of designation.

The database for HES' listed buildings was generally well-designed and easy to access. The search for corrugated iron buildings has no known omissions, but the search for Modernism and Brutalism revealed discrepancies, as mentioned above, the problem appeared to lie with the judgement of the person adding the data and the difficulty of differentiating consistently between the styles of more modern architecture. This does not seem to have resulted in buildings being omitted from the list, but rather in some buildings being incorrectly categorised.

The Number of Listed Buildings by Century

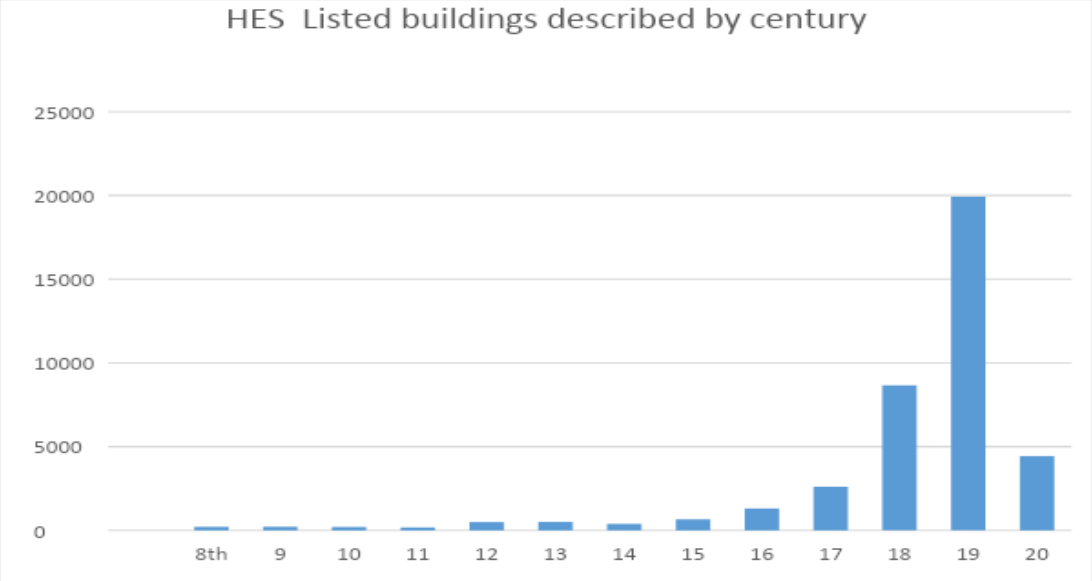

Figure 3.23. Graph showing designated buildings by century of construction in Scotland.

At first glance figure 3.23 shows that more nineteenth century buildings are designated than those from any other century. This is probably because of the greater survival rate of buildings from this period alongside a possible number of mentions of alterations and additions to older buildings that were carried out in the nineteenth century. The list does not differentiate between buildings and alterations.

Nevertheless the graph is worthy of discussion because it highlights the significant drop in the designation of twentieth-century buildings. The actual number of buildings in Scotland has increased in the twentieth century, due to urban expansion in places such as Glasgow. If the buildings were listed in proportion to the total number, the graph would be expected to increase by a similar proportion. This raises the question of what might have caused the dearth twentieth century listed building.

From 1900 till World War II there was a general rise in awareness of the demolition of great buildings such as John Soane's Bank of England, which was demolished in 1924, and prehistoric monuments such as Stonehenge and

Avebury. However this occurred as Prudon notes, in 'a context in which Art Deco and Neo-Georgian buildings were still not readily accepted or recommended for listing status in Britain.'[404] There was little concern for the loss of twentieth century buildings when so many older buildings were under threat. Not until 1946 when the *Instructions to Investigations*[405] was provided for those making the first lists, was there a suggestion that later buildings should be included. The *Instructions* stated that:

> Between 1800 and 1850 listing should be confined to buildings of definite quality and character. From 1850 down to 1914 only outstanding works should be included and since 1914 none unless the case seems very strong.[406]

Such specific instructions inevitably made it more challenging to list twentieth century buildings. Figure 3.22, the dataset of all Modernist buildings on HES listed buildings register, suggests that no Modernist buildings were listed before 1966, when the Glasgow School of art was listed.

In 1986 the *30 year rule* and *10 year rule* were initiated, which stated that:

> any building over thirty years could be considered for listing, and the 'ten-year rule' by which any building over ten years old that was threatened and of outstanding interest (listable at grade I or II*), could be considered for listing.[407]

Figure 3.22 shows that the listing of most Modernist buildings occurred after the introduction of the 30 years rule. This is confirmed by figure 3.18 which shows an upward trend of listing; there is a spike in 2011 which accounts for the listing of a large number of hydro-electric power stations.

The 30 year rule made it possible to list buildings of the twentieth century. But this legislation did not happen in isolation. Prior to the instigation of the 30 year

[404] Prudon, *Preservation of Modern Architecture*, 10.
[405] Earl, *Building Conservation Philosophy*, 196.
[406] Earl, *Building Conservation Philosophy*, 200.
[407] Historic England, 'Timeline of Conservation Catalysts and Legislation,' accessed 22 August 2020, https://historicengland.org.uk/whats-new/features/conservation-listing-timeline/.

rule there had been a growing interest in the architecture of the twentieth century, so much so that by 1979 the Twentieth Century Society was founded.[408] The aim of the society was to safeguard the buildings built after 1914. Initially the society was called the Thirties Society and took shape after a prominent exhibition at the Hayward Gallery called *The Thirties – British Art and Design Before the War.*

As Prudon notes, 'Professional and public perception combined does, however, ultimately determine whether heritage value will be assigned to a particular building.'[409] The perception of buildings is probably more important than the legislation. This applies to corrugated iron buildings. While corrugated iron buildings are not favourably perceived, there will be very little attempt to preserve them; the legislation and structure are present, but the will to use them is not. The 30 year rule is only used to protect buildings that are perceived to have heritage value.

The graph in figure 2.23 does not indicate a lack of designatable buildings, but rather a reluctance to apply designation to buildings, that are perceived to lack value.

3.8.5 Conclusion

Corrugated iron and Modernist architecture are united in this study by their common struggle for valuation and recognition by the designation system. In Scotland no corrugated iron or Modernist buildings were listed till 1970.

Analysis of the Historic Environment Scotland database in the figures 3.17, 3.18 and 3.19, shows an increase of designation activity relating to corrugated iron buildings in the late 1980s, at a time when there was a general increase in the awareness of the value of corrugated iron, such as the dissertation

[408] The Twentieth Century Society, 'History,' accessed 22 August 2020, https://c20society.org.uk/about-us/history#timeline.
[409] Prudon, *Preservation of Modern Architecture*, 26.

written by Paul Dadson in 1989.[410] The graphs, which use the dataset from Historic Environment Scotland reveal a similar late awakening of interest in Modernist buildings in general, which is particularly marked for Brutalist buildings, none of which were listed till 2009. In reality there are, of course, many more listed Brutalist buildings, the problem lies in the dataset and the misnaming of buildings styles. For example, St Peter's College designed by Gillespie, Kidd and Coia was listed Category A in 1992, and Craigsbank Parish Church, by Rowland Anderson was listed in 2002, well before 2009.

This graphical analysis of designation by designation date dramatically highlights how the late recognition of the historical value of corrugated iron and Modernist buildings is a common feature of these otherwise disparate building types.

Analysis of the graphs does not directly explain is why designation has been so slow. One obvious explanation might be that no building can be listed until it is 30 years old. This could be applied to the Modernist and Brutalist buildings. However, there are examples of corrugated iron buildings in the list that were built in the 1850's. The attribute of *age* value could be easily applied to many corrugated iron buildings making them obvious candidates for designation.

Another reason for failure to list may lie in changing cultural associations. As discussed earlier in the chapter, the received values for assessing the architectural historical are deeply embedded in institutional systems establishing cultural significance. Until the later part of the twentieth century those charged with the survey of drawing up the list were still struggling to include buildings that could not be listed for *style* value. For example it was not possible to list farm buildings unless there was a farmhouse on the site.[411] The drift in the scope of designation that is revealed by analysis of data for the last 30 years appears to have been principally driven by a recognition of industrial decline and the impact that was having on the disappearance of buildings that were once commonplace. Two outstanding examples of this are the adoption

[410] Dadson, 'Rediscovering Corrugated Iron'.
[411] Member of the Devon listing group, interview by the author, 18 July 2019.

of the Stott Park Bobbin Mill by English Heritage and the Preservation of the Victoria Colliery in the outskirts of Edinburgh. This has forced a reappraisal of historical value and the way we interpret history, causing us to start re-evaluating buildings from the more recent past.

This research has highlighted the increasing need of a well-structured database. Well-structured data allows effective interrogation to better reveal bias in the way that designation is carried out. It would allow informed decisions on future priorities for designation policies. Without a high-quality database, informed decision-making on the future of designation will remain very difficult.

Informative though it is, it would be helpful to extend the Historic Environment Scotland designation database spread sheet by adding live links to the listed building description, date when it was first listed, date it was built, and with a one line designation description. A column for the category of building would also be useful – possibly more than one style. That way it would be possible to compare and contrast buildings and make decisions about the focus of designation. Above all, incorporating any sort of visual record would bring the list itself into the twenty-first century.

Close analysis of the list has strongly reinforced what this research suspected from the outset: for many years, designation was dominated by elite values, and those responsible for it recognised only recently that cultural significance can encompass corrugated iron and modernism.

Chapter 4: Case Studies

4.0 Introduction

Figure 4.1. Locations of case studies. Image based on Ordnance Survey, 'Outline Map of the United Kingdom,' 2016, accessed 17 March 2018, https://www.ordnancesurvey.co.uk/docs/outline-maps/uk-outline-admin-maps.pdf.

This section explores four case studies using a range of building types that have implemented corrugated iron as part of their structure. The case studies are: the Balmoral ballroom, St Fillan's Church, Killin, Cultybraggan prisoner-of-war camp and St Fagans National Museum of History in Wales. These examples explore how corrugated iron buildings gain different protection and value from individual contexts and as also illustrate the versatility of corrugated iron.

Discussion of cultural significance will review how designation has been applied to individual corrugated iron buildings. The case studies all illustrate different aspects of the power of context and its relationship to understanding, perceptions, and materials, and how practical decisions on use and maintenance, are influenced by these perceptions of cultural significance and value.

All the case studies examine the buildings' current state of repair and the implications for future conservation needs. The currently perceived cultural significance of each building is also examined, and particular attention will be given to how and by whom this significance has been determined. Discussion

on how the building fits into the development of corrugated iron architecture in general will be integrated into each case study. All the case studies will review the practical conservation problems and opportunities presented by each building. Detailed attention will be given to the current condition and future maintenance of the buildings in the light of the approaches already adopted in their conservation.

4.0.1 Choice of Case Studies

The aim of the case studies has been to provide as wide as possible a range of insights into the strengths, weaknesses opportunities and threats presented by corrugated iron buildings, and the cultural significance that is applied to them.

Many corrugated iron buildings are complex hybrids of timber and metal construction, which pose additional issues that complicate the discussion of their corrugated iron elements. An excellent exemplar of these practical limitations on the choice of case study subjects is the Drill Hall at Golspie. This is a complex hybrid structure, too large to adequately survey from ground level and in desperate need of effective maintenance.

Figure 4.2. Drill Hall, Golspie, Sutherland. One of the fascinating deployments of corrugated iron that was impractical as a case study. The image was taken in October 2009 and the condition has deteriorated significantly since then. The Drill Hall is a striking example of how difficult it can be to find truly beneficial re-use for buildings that were created to fulfil highly specific uses.

The same strict interpretation of ‘corrugated iron’ has also led to the exclusion of iron architecture not directly involving corrugated iron. For example, the 1940s saw an unsuccessful experimental use of cast iron as a structural walling material for domestic housing. Although this system allowed rapid

construction, it was too expensive, and its failure serves to highlight the economic success of corrugated iron.

Figure 4.3. The wall of a house at the Black Country Museum – made from cast iron tiles. Metal buildings have never been as economical to building compared with other materials.

Also excluded from the cases studies is any example of corrugated iron being used for primarily artistic effect. The reason for this is scarcity of corrugated iron art in Britain. With the exception of Clough Williams-Ellis whimsical masterpiece of Portmeirion, this research has not been able to locate any British examples of corrugated iron used primarily as art.

Figures 4.4 and 4.5. Corrugated iron as art. Its lightweightness and rigidity have allowed its use in some distinctly non-utilitarian buildings, and it is even possible to be frivolous with it. *Left*, gazebo, Portmeirion, North Wales. Photograph by Bruce Induni. *Right*, corrugated dog, Tirau, New Zealand. Two corrugated sheep sit adjacent. Photograph by John Wood.

One of the reasons the case studies have been chosen is to reflect corrugated iron's dual role as both cladding and structure. The case study of St Fillan's Church at Killin illustrates the difficulty of disentangling the two roles. This is because, at first glance, such buildings appear to have structural timber framing. But in reality, the timber framing is too lightweight to be viable without the support and stiffening of the corrugated iron. The Nissen huts at Cultybraggan also combine the stiffness of the corrugated iron cladding with the relatively limited strength of a lightweight metal frame. Both these examples capture the spirit of Palmer's original design where he envisaged corrugated iron as being self-supporting structurally. The original tobacco shed, designed to be both stiff and light, was the inspiration for other buildings, such as the station canopy at Andover and throughout the London and South Western mainline railway. Many agricultural buildings also followed Palmer's original design principles.

Gathering data on the use and maintenance of corrugated iron has not proved straightforward, and the choice of case studies has to some extent been dictated by the support shown from contractors and owners. For example, the airship hangars at Cardington could potentially have made an exceptionally useful case study, but the lack of positive cooperation from the owners and contractors made this impossible. In contrast to this, Sonya Linskaill could not have been more helpful with the St Fillan's case study. I was able to meet her on several occasions and was provided with extensive background information and data about the repairs. Cultybraggan presented a unique set of issues. Unlike Balmoral and St Fillan's, it is managed by a group of people, the Comrie Development Trust, a group of locals who are responsible for promoting the welfare of Comrie. This adds to the potential difficulties and opportunities that would not arise otherwise.

The case studies are presented in date of construction order to demonstrate the adaptability and versatility of the material over one hundred and fifty years. Each case study includes a discussion of the contextual history of the building and the impact of the building on the development of corrugated iron in general.

The Balmoral Ballroom was an obvious choice for study as it is almost certainly the oldest surviving corrugated iron building in Britain and probably joint oldest in the world. The Church of St Fillan's at Killin was another obvious choice because of the cooperative enthusiasm of the repairing architect Sonya Linskaill who discussed the repair project in detail at several site meetings. The Cultybraggan Camp case study was chosen because the Camp has unique issues of scale of the site and the maintenance demands on such a large group of buildings. In contrast, St Fagans revealed their perception of the low cultural significance of corrugated iron by failing to hold any significant detail on the condition of the buildings before they were moved to the museum or the details of their reconstruction. The selection of case studies have also been chosen to allow discussion on the current cultural significance applied to corrugated iron buildings as well as perceived significance.

4.1 Case Study 1: The Balmoral Ballroom

4.1.0 Introduction

The Balmoral ballroom is a building of high historical significance, made from corrugated wrought iron. It is listed Category A, because of its age, rarity and important associations.

The ballroom, built in 1851, is the oldest known surviving corrugated iron building in Britain, and also one of the oldest in the world. It is one of a handful of surviving corrugated iron buildings from the 1850s, and is probably the only building of this date in Britain to retain most of its original corrugated iron. The ballroom is now over one hundred and sixty years old, and so dispels the myth that corrugated iron is a modern and short-lived material. The building was originally bought by Prince Albert to be used as a ballroom whilst the new Balmoral Castle was being built. When visiting the Great Exhibition of 1851, he saw a selection of prefabricated iron buildings made by Edward Taylor Bellhouse, and was so impressed that he ordered one for use on the Balmoral Estate. The ballroom is now functioning as a carpenter's workshop and has survived well because of the ethos of conservation that is prevalent on the Balmoral estate. The Factor, though helpful, was unaware of the status of the building, but delighted to learn more. The Balmoral ballroom is unusual amongst corrugated iron buildings because of the large quantity of significant documentation about Bellhouse and the building, a large amount of which is written by Australian academic Miles Lewis.[412]

[412] Miles Lewis, 'Australian Building: A Cultural Investigation,' accessed 22 July 2020, https://www.mileslewis.net/australian-building.

Figure 4.6. The Balmoral ballroom on the Balmoral estate.

4.1.1 The Building Design

The Balmoral Ballroom has a single-story cast-iron frame with wrought iron roof trusses and appears to have been originally supported on timber foundations. Hand pressed wrought iron corrugated panels are bolted directly to the cast iron framing. The bolts appear to be machine produced and are not likely to be the originals. Despite some replacements, patching and modifications, most of the corrugated iron survives. The windows shown in the *Illustrated London News* engraving from 1851 (see below) do not appear to match any of those currently installed in the building and the access doors also appear to have been modified. Despite these changes the structural and corrugated elements of the building are substantially authentic and original.

The design of the Balmoral ballroom sets it apart from later corrugated iron buildings. The elaborate cast iron framing has design details unique to the buildings created by Bellhouse, and the wrought iron infill panels are corrugated horizontally rather than vertically. Bellhouse ran the Eagle

Foundry in Manchester, which specialised in millwrighting and founding and developed 'a specialised system of assembling iron building components.'[413] He also exported buildings to California. The Balmoral ballroom largely ignores the structural capabilities of corrugated iron, and is, in effect, a traditional post and rail timber framed building, but with cast iron substituted for the timber posts and rails. This is typical of Bellhouse's design approach and derives from his familiarity with cast iron. The corrugated iron infill panels have only a limited structural role because of the strength inherent in the cast iron frame. This allowed Bellhouse to use his five-inch pitch corrugated iron with the corrugations running horizontally, because it had little supporting role for the eaves and roof.

Figure 4.7. Castlefields Viaduct, Manchester: an example of ET Bellhouse's familiarity with cast iron engineering. Image from 'Castlefield Viaducts (Manchester),' *Grace's Guide to British Industrial History*, accessed 13 August 2019, https://www.gracesguide.co.uk/Castlefield_Viaducts_(Manchester).

The semi-structural use of corrugated iron in prefabricated buildings takes its strength partly from the internal timber framing. The Balmoral design may have relegated corrugated iron to a non-structural role, but some of

[413] Lewis, 'Prefabrication in Australasia'.

Bellhouse's later buildings, such as the warehouse in Little George Street, Fitzroy, Australia, also have used structural corrugated iron in its gables.[414] The iron exterior and framing of the ballroom is also part of an ongoing attempt to make buildings less vulnerable to insect, rot attack and safety of possessions. Though not particularly relevant in the Scottish climate, Bellhouse's iron buildings were exported to Australia and other parts of the world and would have needed to be proof against external threats.

4.1.2 History of the Building

In 1837 Queen Victoria came to the throne of Britain. In 1848, inspired by visits to Scotland, Prince Albert bought the Balmoral estate, near Aberdeen. However, the old castle was considered too small, so construction of a new castle began in 1851, and was completed 1856. The Queen and consort stayed in the old castle, but needed extra office space and other ancillary buildings, one of which was a ballroom. Prince Albert attended the Great Exhibition in Hyde Park in 1851, at a time when work on the new Balmoral Castle had just started. Whilst there he saw examples of iron prefabricated buildings, designed by engineer E. T. Bellhouse, and was so impressed that he ordered one for use at Balmoral to act as a ballroom.

Bellhouse worked quickly, and the ballroom was soon constructed, as evidenced by the correspondence between Bellhouse and the Keeper of the Privy Purse in 1851.[415] The building specifications were sent by Bellhouse on 4th July 1851, and by mid-August the ballroom was ready to be dispatched to Balmoral. Both the speed of its production and of its delivery emphasise one of the key advantages of prefabricated buildings. However, the Factor at that time, a Dr Robinson, was concerned, asking:

[414] Lewis, 'Prefabrication in Australasia'.
[415] Thomson, 'History and Conservation,' 7.

> …would it not be desirable to postpone the erection of the iron ballroom until after Her Majesty leaves Balmoral, as no part of the material has yet arrived and the putting up of the iron must cause a deuce of noise and bother.[416]

Nonetheless it was completed by October, and ready for the Gillies Ball, and referred to by Queen Victoria in her diary on the 5 October:

> We went below the highest points, a little way through the upper part of the wood, where there is a flag staff, & from whence one overlooks Abergeldie. Here, we stopped for me to sketch. We had a shower whilst up there. We walked down the greater part of the hill & then rode through Abergeldie grounds, getting into the carriage at the gate. — Albert returned soon after us, having got nothing. — Mama & her party dined. Sir J. Graham sat next to me. The 5 Children came after dinner, & we went to the Gillies Ball in the Iron Ball Room remaining till ½ p. 11. The Children danced several times & enjoyed themselves very much.[417]

The evidence of Queen Victoria's diary reference is supplemented by a photograph of her on her horse, with John Brown in attendance. The ballroom is seen to the left of the photograph, located near the new stables.

[416] Thomson, 'A Study of Early Corrugated Iron,' 3111.
[417] Queen Victoria, 'Journal Entry: Wednesday 5th October 1853,' Queen Victoria's Journals, accessed 22 August 2020, http://www.queenvictoriasjournals.org/search/displayItemFromId.do?FormatType=fulltextimgsrc&QueryType=articles&ResultsID=2771168116512&filterSequence=0&PageNumber=2&ItemID=qvj07585&volumeType=PSBEA.

Figure 4.8. Queen Victoria on her horse with John Brown. The ballroom is to the left. The apparent age of the queen and the presence of John Brown implies that this photograph was taken in the 1890s. By this time the new castle including the ballroom had been completed and it is likely that Bellhouse's ballroom had been moved to its current setting. Image from Ivor Brown, *Balmoral: The History of a Home* (London: Collins, 1955), 113.

The building was used as the castle ballroom and also as an artist's studio by the German born painter Carl Haag till 1856, by which time the new castle had been completed.

4.1.3 Edward Taylor Bellhouse

Edward Taylor Bellhouse epitomises the early nineteenth century engineer and entrepreneur[418]. He ran the Eagle Foundry in Manchester, the family firm, and was an apprentice to William Fairbairn,[419] an engineer and early pioneer of metal buildings. As an iron founder whose commercial and technical interests lay primarily in producing cast iron and not wrought iron, he did not produce his own corrugated iron, but bought it in from third party suppliers such as Morewood and Rogers, or Tupper and Carr.[420] However, Bellhouse's design effort was considerable and he produced the unique and patented detail of the shaped flange which connected cast iron frame to the corrugated iron.

[418] Thomson, 'A Study of Early Corrugated Iron,' 3110.
[419] Herbert, *Pioneers of Prefabrication*, 41.
[420] Herbert, *Pioneers of Prefabrication,* 52.

Figure 4.9. ‘Ballroom for Balmoral’ by E. T. Bellhouse, 1851. The Balmoral ballroom was only one of a number of designs that Bellhouse produced the different markets. Image from *Illustrated London News* (22 November 1851).

Nothing in Bellhouse’s design of the Balmoral ballroom suggests that he was trying to reinvent the architectural form of buildings, rather he was maintaining existing building style but substituting iron for traditional materials. At Balmoral, Bellhouse took Palmer’s radical, new material and tamed it to reproduce a traditional form of building – a straightforward substitution of cast iron for wooden posts and corrugated iron for wooden planks. A feature of Bellhouse’s system of combining horizontally corrugated iron with specially shaped cast iron framing,[421] was that it provided an accurately shaped junction between the corrugated iron panels and the cast iron frame. To do this required accurately shaped cast iron components but produced an exceptionally weather-proof building.

This feature was extended to the structural guttering which not only tied together the vertical framing pillars, but also provided an accurate and positively shaped junction between the corrugated iron of the roof panels and the framing of the walls. It is interesting that later manufacturers never adopted the Bellhouse system. This was probably because it was expensive, and as the status of corrugated iron buildings declined, manufacturing

[421] Herbert, *Pioneers of Prefabrication,* 53.

emphasis switched from impressive architectural detailing to minimum cost production. A further feature of the cast iron framing was an integral channel shaped to receive timber battens that in turn supported the internal timber cladding.

Figure 4.10. Balmoral ballroom guttering. Photograph by the Factor of Balmoral, 2014.

The roof**,** constructed in corrugated iron sheeting with the corrugations running down the slope, is supported on wrought iron trusses and purlins. The interior is typical of many corrugated iron structures, being panelled throughout with tongue and groove softwood boarding. It is not known if felt or any other insulation was introduced between the tongue and groove boarding and the iron shell of the building. There are no records of the original foundations for the walls or the floor of the ballroom, but Miles Lewis notes in his paper on Bellhouse[422] that several of Bellhouse's designs contemporary with the Balmoral ballroom, had timber foundations to which the iron work was bolted.

[422] Lewis, 'Prefabrication in Australasia'.

4.1.4 Use, Adaptability and Functionality

Any building which is capable of successfully being both a royal ballroom and a carpenter's workshop must, by definition, be an exemplar of adaptability. Prefabricated corrugated iron buildings, such as the Balmoral ballroom, are inherently adaptable as designs. Non-functioning parts can be removed and replaced without unduly adverse effect on the structure. This is significant for corrugated iron buildings in general because one of the commonest reasons given for their demolition is that they cannot be realistically adapted to new uses.

4.1.5 Conservation Issues

The current condition of the ballroom is attributable to the generally high level of maintenance on the Balmoral estate. The condition is excellent throughout; the only significant physical issue is corrosion of localised areas of the original wrought iron based corrugated iron. It has been recently and thoroughly repainted. Because none of the original iron was galvanised, paint adhesion problems have not been a major factor.

Figure 4.11. Ballroom roof. The roof has been completely replaced in new corrugated iron, but the date of the renewal is not known. This is a realistic strategy because the redundancy inherent in roofing sheets is negligible: they have to be waterproof.

Figure 4.12. The integral cast iron guttering system. Functioning as designed, as are the replacement downpipes. The empty bolt holes in the cast iron column to the right of the image are worthy of note, as they are where the original corrugated iron has been removed to form a modified window.

Figure 4.13. Frame detail of the ballroom. The frame has no significant decay problems and has good paint adhesion.

Figure 4.14. Original wrought iron corrugated panels on the walls. In generally excellent condition with only light surface corrosion pitting. This suggests that paint film maintenance has not always been consistent.

Figure 4.15. Window detail of the ballroom. The windows are all softwood replacements, except for two longer and lower windows (one shown centrally in this image) the form of the replacements appears to follow the original design. The paint condition is variable and needs maintenance.

Figure 4.16. The most significant external details are the cast iron framing and the original corrugated wrought iron panels, but additional details include the decorative barge boards, and roof detailing with an elaborate ventilator and cast iron brattishing along the crest. It is unclear if these details have been replaced, but they are in excellent condition.

Figure 4.17. Recent repairs to the ballroom using steel. Modern, steel-based, corrugated iron has been used to repair the lower part of the central panel. This repair is probably connected to the removal of the original door and its replacement by window. It is not clear how the narrow pitch of the repair corrugated iron has been matched to the profile integral to the cast iron frame.

Figures 4.18 and 4.19. Repairs to corrosion damage using glass fibre reinforced resin. Though skilfully done, the change in surface texture caused by these repairs is noticeable. Against these disadvantages resin repair is cheap and highly weather resistant in the short and medium term. It is relatively easy to remove and retreat and allows the maximum retention of historic material. Balancing the pros and cons of conservation strategies is rarely straightforward.

The Ballroom is now in intermittent use and is unheated for extended periods. This is certain to impose an excessive condensation load on the timber lining and the inner surface of the corrugated iron. Both are highly vulnerable to damage from the moisture burden that this condensation will create. This problem is common to all buildings in intermittent use and is discussed further in the studies of Cultybraggan and St Fillan's Church.

Because the ballroom is listed at Category A, in normal circumstances all alterations and repairs would need listed building consent, and it is unlikely that such consent would be given to use glass reinforced plastic as a repair medium. However, it is not clear that the monarch is bound by the law relating to listed buildings. What is certain is that the estate management system at Balmoral was unaware of the ballroom's listed status.

4.1.6 The Cultural Significance

The cultural significance of the Balmoral ballroom cannot be doubted. It is an important building not just in Britain, but also internationally. In Britain, its associations with Victoria and Albert, its age and its rarity, and its pioneering technology all justify its Category A status.

Enhanced cultural significance is particularly justified because of the ballroom's technical qualities. The building pre-dates the mass production of mild steel, with the corrugated iron being made from wrought iron. Bessemer invented mild steel in 1856, but the technique was not perfected till the late nineteenth century. Producing corrugated sheets from wrought iron presented considerable technical difficulties: The presence of phosphorus made it unpredictably brittle, and the inclusion of slag made creating and shaping thin sheets very difficult. The Balmoral corrugated iron therefore represents a considerable achievement of practical skill as well as one of technical innovation. The disapproval shown by Ruskin and Morris of anything that was mass produced cannot be applied to the Balmoral corrugated iron; both the material and the corrugations were produced by hand by skilled artisan labour.

The Balmoral ballroom is also culturally significant because it exemplifies a key element in the zeitgeist of the Victorian age. Prince Albert appears to have shared the genuine excitement that much of British society displayed towards innovation. Miles Lewis notes, for example, that Bellhouse's Custom

House (or Piata) in Peru was erected temporarily at his works and attracted 25,000 visitors over a ten-day period.[423]

The Balmoral ballroom emphasises the extraordinary shift in status that occurred during the early phases of corrugated iron building production. It was presented at the Great Exhibition as a high-tech, high-status building and as such caught the eye of Prince Albert. He did not choose it because it was cheap, but because he was impressed by the innovation and perceived design value of Bellhouse's building. The low status subsequently given to corrugated iron was not current at the time of the ballroom's purchase: corrugated iron had not yet become the 'pestilence' so hated by Ruskin and Morris,[424] and was an exciting new material fit for a royal ballroom.

The connection of the Ballroom to Prince Albert and also the well-known Victorian painter Carl Haag,[425] highlights an aspect of the designation process that normally works against the recognition of corrugated iron. Association with famous people or events is a factor in the designation process, and influences the perceived cultural significance and conservation value of buildings.

The Balmoral ballroom's claim to Category A designation status by association is strongly reinforced by its rarity. Although corrugated iron buildings were produced in large quantities in the 1850s, by Bellhouse and others,[426] there are few known surviving examples of this age. The only other Bellhouse building is a house in Melbourne, Australia, which is now in the care of the National Trust of Australia.

[423] Lewis, 'Prefabrication in Australasia'.
[424] Walker, 'Corrugated Iron,' ix.
[425] Hisham Khatib, *Palestine and Egypt Under the Ottomans*: *Paintings, Books, Photographs, Maps and Manuscripts* (New York, Tauris Parke, 2003), 101.
[426] Herbert, *Pioneers of Prefabrication.*

Figure 4.20. The Melbourne corrugated iron building by Bellhouse, before removal to the National Trust site in Melbourne. Note the cast iron window.[427] Image from Australia National Trust.

The adoption of the Melbourne Bellhouse building by the Australian National Trust, highlights how different cultures ascribe different values to the same material. In contrast, the Balmoral Ballroom, according to the Historic Environment website, appears to have not been designated until 2010, and survives not because of recognition of its cultural significance by the Balmoral estate, but because it is a useful utilitarian space.

4.1.7 Conclusion: Challenges and Possibilities

The continued existence, but changing role, of the Balmoral ballroom demonstrates that beneficial reuse of corrugated iron buildings is challenging but possible. Its inherent adaptability has been implicitly supported by the conservation minded estate ownership of the building, but corrugated iron buildings in less fortunate circumstances have also proved remarkably adaptable and amenable to beneficial reuse.

The Dorset Survey, as explained in the introduction, found that corrugated iron buildings maintain their fitness-for-purpose despite being physically dismantled, moved to new sites and given new uses. Two excellent examples

[427] Clare Lewis and Mary Lloyd, 'Portable Buildings' (B.Arch. thesis, University of Melbourne, 1959).

are the Morden Shooting Lodge and the Corfe Castle Isolation Hospital. Despite their highly specific original design intention, both have found successful new beneficial use as domestic houses. Interviews with their owners[428] emphasised the success of this adaptation: they were felt to be excellent places to live. Building on this corroborative evidence, it appears reasonable to suggest that the Balmoral ballroom does provide a strong positive indication that corrugated iron buildings can be moved, adapted and given new beneficial use without compromising their fitness for purpose.

Figure 4.21. The Shooting Lodge, Morden, Dorset. This cottage, much loved by its occupiers, started life as a shooting lodge in a different location. The owners have demonstrated that ingenuity is one of the most important elements of adaptability by reusing the old corrugated iron from removed during roof repairs by making it into a new goat shed.

[428] Personal communications with the owners during the survey, June 2000.

Figure 4.22. The Isolation hospital, Corfe Castle. Now in the ownership of the National Trust, who have refurbished the building and use it as accommodation for seasonal letting; very popular with tourists staying in the area. It was constructed in the early twentieth century as a hospital and nurse's accommodation, to treat infectious diseases such as smallpox and diphtheria. The National Trust has successfully adapted the buildings as holiday cottages, carrying on the hospital theme by using old hospital beds as part of the décor. Photograph by the author.

Despite its adaptability, longevity and relatively low maintenance demands, the ballroom is still somewhat at risk. As stated earlier, a discussion with the Factor revealed that that he was unaware of its Category A listed status, or of its interesting history.[429] Conversations with estate staff failed to establish why its listed status had not been grasped. To the Factor it was simply a reasonably convenient and functional working space. The uninformed responses of the estate staff were a powerful corroboration that there is a widespread perception that corrugated iron is of low cultural significance: it had never occurred to estate staff that the ballroom might be an important building.

[429] However, he was enthusiastic to learn more and has been sent a copy of this part of the thesis.

If the Ballroom has not been overly safeguarded by its designation or its perceived status amongst those responsible for its maintenance, it certainly has benefitted from Bellhouse's excellent specification of materials, which used thick and well-made corrugated sheeting, and the modular structure of the ballroom which has made it easy to move. The building's adaptability has passively allowed its survival rather than any positive commitment to conservation on the part of the estate.

Because of its early date the Balmoral ballroom is probably the most important corrugated iron in building Britain. It presents the technical innovation involved in the adaption of traditional wrought iron to radically new uses. The ballroom is also an exemplar of the ingenuity and entrepreneurial spirit of Victorian industrialists. Edward Taylor Bellhouse, its creator, was not following any established design path developed by other manufacturers whose methods were quite different from the Balmoral ballroom design. The ballroom also provides a fascinating insight into Prince Albert's enthusiasm for innovation and scientific advance. The cultural significance of the building is recognised in its Scottish Category A listed status; its significance is also recognised throughout Britain and across the world, and it has been well documented in academic papers and journals.[430] Despite this recognition of the ballroom's importance by architectural experts and heritage administrators, it remains unclear that the royal estate fully understands the importance of the ballroom. The building has survived by application of the ethos of conservation-by-default, whereby the crown estates do not replace unless absolutely necessary. The ballroom makes an interesting contrast to the other case studies because its original design and construction represents a different compromise between cost and quality from that to be found at St Fillan's or Cultybraggan. It is an expensive, high specification building which also happens to be transportable and made from corrugated iron.

[430] As demonstrated in, for instance, the work of Nick Thomson; E.T. Bellhouse; Miles Lewis; *Illustrated London News*; Anne Warr.

Though the ballroom was bought to fulfil a temporary need, corrugated iron was specifically chosen by Prince Albert as being technically and socially suitable for a royal building. The ballroom is now over one hundred and sixty years old, created only twenty years after the first invention of corrugated iron, and dispels the frequently held myth that corrugated iron is a modern and short-lived material.

4.2 Case Study 2: St Fillan's Episcopal Church, Killin

4.2.0 Introduction

St Fillan's Church, Killin is one of the oldest surviving corrugated iron churches in Scotland and has been identified as 'an exceptionally important iron chapel' by Historic Environment Scotland.[431] Its interest has been greatly enhanced in recent years by a sensitive programme of conservation. Because of this it has become an exemplar of how corrugated iron buildings can be conserved. The chapel's interest has been further enhanced by the crucial role played by the architect responsible for the repairs. This highlights the importance of individual people in the practical application of conservation values.

The religious and social context surrounding the chapel's creation and continued conservation provides a further dimension of interest. Currently the building is shared between two denominations, the Roman Catholic Church and the Scottish Episcopal Church. The congregation has been very supportive of the repair programme and there is a strong sense of local emotional ownership amongst the local community.[432]

However, the value of this conservation has been challenged by the downgrading, without public explanation, of the listing Category from B to C.

The Chapel is located in the Trossachs, which have been part of an established tourist route since the nineteenth century, and this has lent significant additional status to the chapel. The village has become an integral part of the tourist experience of the picturesque Trossachs, and the chapel is a part of the picturesque whole, thus demonstrating how cultural significance is heavily context dependent.

[431] Sonya Linskaill, 'St. Fillan's Episcopal Church, Killin: Conservation of a Tin Tabernacle,' *Scottish Vernacular Buildings Working Group* 35 (2011 – 2012): 27.
[432] Sonya Linskaill, personal communication with the author.

Figure 4.23. St Fillan's Chapel, Killin, after repair in 2014.

4.2.1 The Building Design

St Fillan's Chapel is set in the village of Killin in the Trossachs National Park. The chapel echoes the traditional design of a mediaeval church, having a chancel, a nave, and a North and South transept. The original nave was three bays long but was extended in 1885 to the present four bay structure. The west porch is original, but the meeting room to the east of the altar was added in 1969 using second-hand corrugated iron taken from Tyndrum railway station.[433]

The construction details are typical of nineteenth century corrugated iron church design. It is a single-story building, with corrugated iron cladding on a lightweight timber frame and full internal boarding out. The roof is covered in corrugated iron with the corrugations running from ridge to eaves. It has soft wood structural framing supported by a masonry plinth. The interior surfaces of the frame are clad in softwood tongue and groove boarding. The building is mildly embellished by decorative barge boards and a small timber bell-cote. Timber framed windows have a vaguely Gothic inspiration typical of the influence of the Ecclesiological society on the construction of tin tabernacles.

The walls appear to be clad in galvanised mild steel sheeting, but the relatively early construction date of 1876 lends some uncertainty to the nature of the metal. Bessemer took out his patent for the mass production of mild steel in

[433] Linskaill, 'St. Fillan's Episcopal Church,' 3.

1856, but this was not perfected till the late nineteenth century, so the original cladding at St Fillan's may have been wrought iron. This potentially makes any original surviving corrugated iron cladding quite rare.

The corners of the building are formed by folding the corrugated iron sheets to provide an overlap. This crude method of forming corners contrasts markedly with the engineered corners of Bellhouse's Balmoral ballroom and are a striking reminder of how cheapness and practicality were starting to become the hallmarks of later Victorian corrugated iron building.

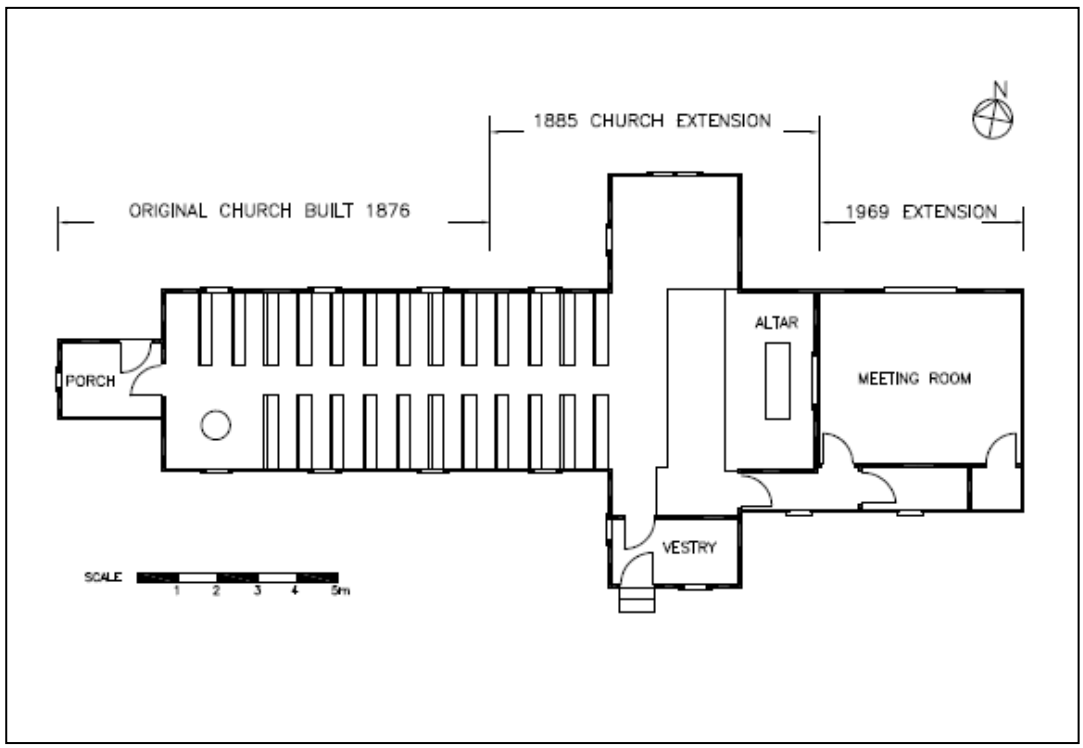

Figure 4.24. Plan of St Fillan's drawn by the architect for the conservation. Image provided by Sonya Linskaill.

St Fillan's is unusual because many of the corrugated iron sheets have been riveted together as opposed to each sheet being individually fixed to the framing. The relatively early date of construction may mean that although standardised kit production had started, it was still, to some extent, experimental.

4.2.2 History of the Building

St Fillan's is one of the earliest corrugated iron churches to be built in the Scottish Highlands. However, many more followed it, with at least seventy-five new tin tabernacles being built between 1908 and 1914.[434] Most of these were built by the United Free Church, which was only one of the multiple and fragmented Scottish churches in the second half of the nineteenth century, as discussed in Chapter 3.

The architect, Sonya Linskaill, reports in her booklet 'St. Fillan's Episcopalian Church,' that the church of St Fillan's was constructed with money from the 7th Earl of Breadalbane, which was built as a private chapel, mainly for the use of the Earl's shooting parties. Consequently, the building is known locally as the 'Grouse Chapel.' Because of this specialised use, the building was only open in the summer 'when services were held, mostly, by prominent English clergy who were on holiday in the area.' [435] The intermittent summer use ceased after the outbreak of the Second World War, and the church appears to have been unused till 1948. After the war, the building was first lent by the Earl of Breadalbane to the United Diocese of St Andrew's, Dunkeld and Dunblane, and in 1958 gifted to the Diocese Trustees, to be held in perpetuity for the congregation.

[434] Linskaill, 'St. Fillan's Episcopal Church,' 16.
[435] Linskaill, 'St. Fillan's Episcopal Church,' 16.

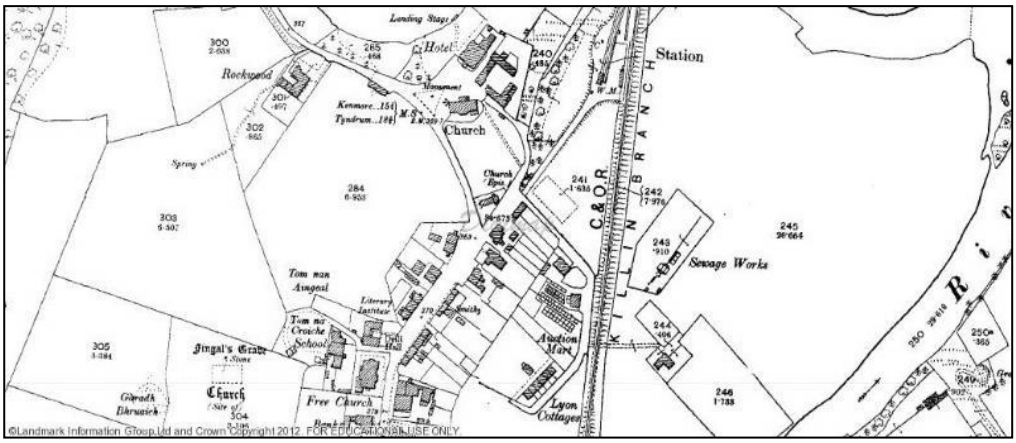

Figure 4.25. Map of Killin village showing the proximity of St Fillan's to the railway station. The church must have been first delivered to Killin junction, near the town of Callander, because the branch line to Killin was not constructed until 1886. The new station at Killin would have strongly reinforced the role of Killin as a tourist destination and made access to St Fillan's much easier for the Earl of Breadalbane's celebrity ministers. Image from Ordnance Survey County Series 1:10560, County/Tile: Stirling, 1900, Landmark Information Group, made using EDINA Historic Digimap Service, http://digimap.edina.ac.uk.

The 7th Earl of Breadalbane was anxious to develop the Killin area for tourism, so supported the building of a new railway line to the town. This brought the prefabricated chapel and other corrugated iron buildings to the town.

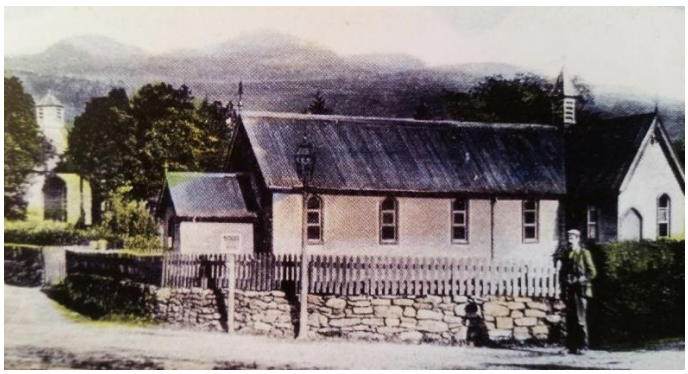

Figure 4.26. St Fillan's Church shown in a postcard. This image was probably taken in the 1920s or '30s for the tourists holidaying in the Trossachs. Its creation demonstrates that the chapel was seen as being part of picturesque tourist environment of the village as a whole. Image from Killin Heritage Society.

A significant factor in the low-cost of corrugated iron buildings was the ease of which they could be transported by railway. The coming of the railway to

Callander in 1870, not only allowed the delivery of the kit for St Fillan's Church, it also enabled tourism to come to the area; urbanisation and industrialisation created a demand for escape into the country.[436] The railway itself profoundly changed the economy of the Killin area. Easy mass tourism became possible, particularly after the branch line to Killin was completed, and the speed of this development was highly significant.

St Fillan's Chapel became a practical proposition because the iron for its corrugated sheets was less expensive than stone, and its delivery by rail to Killin junction was economically viable. The direct rail link to Killin not only allowed the delivery of St Fillan's Church as a prefabricated building, it also transported the members of the shooting parties who were the initial users of the church.

Lord Breadalbane needed to provide infrastructure for his house guests with some urgency, and a corrugated iron building allowed him to provide a new church in weeks instead of years. His Lordship's enthusiasm for corrugated iron also appears to have had a sound business basis. Sonya Linskaill suggests that there is compelling evidence that he was a shareholder in the London Church and Chapel Company, who may have produced the corrugated iron for the cladding on the church,[437] rather than Speirs and Co, who only manufactured corrugated iron after the date for the initial erection of St Fillan's in 1876. Not only was the erection of a prefabricated building much quicker than a traditional stone one, it would have been much cheaper. A comparison of catalogue price lists with records of contemporary church building suggest that corrugated iron may have been less than a tenth of the cost of an equivalent stone building.[438]

[436] Jo Cox and John R. L. Thorp, *Devon Thatch: An Illustrated History of Thatching and Thatched Buildings in Devon* (Tiverton: Devon Books, 2001),135, 136.
[437] Sonya Linskaill, personal communication, 2014.
[438] Cooper, *Gardeners' and Poultry Keepers' Guide*.

Figure 4.27. Map showing railway connection to Killin from Callander in 1886. The extension of the railway beyond Killin up to the shore of the lake highlights the Killin area status as a tourist destination. Tourists would have used the railway to connect with boat trips and fishing on the lake. Similar arrangements existed (on a larger and more successful scale) at Loch Lomond and Loch Katrine. It seems likely that the whole Killin branch had a primary commercial purpose of facilitating tourism. Image from Ordnance Survey County Series 1:10560, County/Tile: Stirling, 1900, Landmark Information Group, made using EDINA Historic Digimap Service, http://digimap.edina.ac.uk.

4.2.3 Use, Adaptability and Functionality

The history of St Fillan's demonstrates its adaptability and functionality. It was created as a private chapel for grouse hunting parties,[439] who were more likely to have been characterised by their fondness for a whiskey laced Sunday lunch than for their religious devotion but has been successfully reused for worship by both Catholic and Protestant villagers.

The building has adapted in the last few years by responding to changes in church attendance, and the building is used for multi-denomination purposes, thereby ensuring that the church is used more than once a week. Declining church attendances are a major problem throughout Britain, and are pushing churches towards a maintenance crisis.[440]

[439] Sonya Linksaill, personal communication with the author, 2014.
[440] Bruce Induni, project manager for the SPAB Church Maintenance Cooperative Project 2012–13, personal communication with the author.

4.2.4 Conservation Issues

St Fillan's is one of a very few corrugated iron churches adopting a conservation-based approach to the repair of the building. Established repair techniques would normally involve wholesale replacement of damaged elements.

In line with the ICOMOS principles, the repairs at St Fillan's have explicitly set out to retain as much original fabric as possible. In practice this has meant that damaged corrugated iron has always been repaired if possible and old repairs have been retained. Recognition of the cultural significance and conservation value of the original corrugated iron has informed all the repair work. The only area where repair rather than replacement was deemed impractical was the roof, where there was extensive damage to the corrugated iron. Severe corrosion had taken place at the lower edge where the corrugated iron came into direct contact with the cast iron guttering and its fixings; also damaged by corrosion was the joint between the ridge piece and the roofing sheets. To minimise the visual impact of the new corrugated iron, the architect went to great lengths to source like-for-like replacement.

Figure 4.28. A general view of the church before and after repair. Note the dark staining at the lower edge of many sheets of corrugated iron. This is caused by biological growth which is benefiting from moisture trapped in the lap of the sheets. It is a sign that the corrugated iron is not seating well and is allowing moisture penetration. The general dowdiness indicates that the paint needs renewal. Photograph by Sonya Linskaill.

Figure 4.29. Corrosion protection: This image shows the failure of more recent paint on the roof. Although the underlying paint film appears to be largely intact, and there is no evidence that the galvanising has failed, this still needs attention. Most importantly, it looks horrible and is an invitation for any hostile fewer to suggest that the whole building needs demolition. Technically this failed paint is trapping water which is likely to speed up corrosion of the underlying metal. Photograph by Sonya Linskaill.

Figure 4.30. The condition of the corrugated iron in the underside of the eaves illustrates the generally poor condition of all the roofing sheets. The only area where repair rather than replacement was deemed impractical was the roof, where there was extensive damage to the corrugated iron. Severe corrosion had taken place at the lower edge where the corrugated iron came into direct contact with the cast iron guttering and its fixings; also damaged by corrosion was the joint between the ridge piece and the roofing sheets. Photograph by Sonya Linskaill.

Figure 4.31. Ridge piece (at top of roofing sheets). Dismantling showed that significant amounts of water had entered the roof because of the poor quality of this detail. There is a poorly shaped lap between the ridge piece and the roofing sheets. Photograph by Sonya Linskaill.

Figure 4.32. Before repair, the downpipes appeared to be working correctly but discharging directly into the soil adjacent to the walls. This was causing excessive moisture to be drawn into the plinth wall, the civil beam of the wooden frame and the lower edge of the corrugated iron, causing them all to decay. Conservation often fails to see beyond the immediate object, but in this case the architect has installed a functioning subsurface drainage system. The drain is now repaired and functioning correctly. An interesting conflict arose between the architect and building control over the proposed installation of a French drain. Such drainage systems are a commonplace in conservation specifications but were not acceptable to the local building control officer. Photograph by Sonya Linskaill.

Figure 4.33. Details of wooden frame. St Fillan's follows the standard nineteenth century approach to constructing corrugated iron chapels. This used a wooden frame to support (and be stiffened by) the corrugated iron cladding. In this way and air gap is automatically created between the corrugated sheets and the internal timber boarding. The gap allows ventilation which minimises the build-up of condensation on the inside face of the corrugated iron and thus produces a durable form of construction. Historically, this durability depended largely on the high quality of timber used in the framing. The durability of the wood masked a fundamental problem: corrugated iron sheeting is inherently prone to accumulate condensation on its inner surface. The quality of wood currently available to repair the original framing does not match that of the original. Photographs by Sonya Linskaill.

Linskaill summarises her conservation approach to the timber framing as follows:

> Repairing the rotten timber frame was more problematic than the repair of corrugated iron. To prevent disrupting the internal tongue and groove pitch-pine panelling, it was necessary to remove all the corrugated iron wall sheets to access the bottom timber rail which was badly affected by wet rot. The wall sheets themselves were in good condition and all were refitted in their original position.[441]

[441] Sonya Linskaill, personal communication with the author.

Figure 4.34. This image illustrates the prefabricated framing of St Fillan's. Each prefabricated section of the walls had a square frame butted against its neighbour. The image is complicated by the paler section of wood (middle left, under the upper wall plate) which appears to be a replacement.

The roof boarding towards the top of the picture reveals a rough and ready attitude on the part of those who erected the building on site. It would be interesting to research how the quality of prefabricated buildings was affected by the standard of on-site labour. Photograph by Sonya Linskaill.

Figure 4.35. Detail of the lower edge of the wall cladding, showing how condensation and leakage has decayed the lower rail of the structural framing and allowed the wall to sag. Photograph by Sonya Linskaill.

Figure 4.36. A particular vulnerability of prefabricated corrugated iron buildings is rainwater removal from the lower edge of the walls. Conservation at St Fillan's has departed from the original design and improve the drainage detail by inserting a preformed metal sill behind and under the corrugated iron. Photograph by Sonya Linskaill.

Figure 4.37. A peculiarity of St Fillan's is the quantity of fixings used to secure the edge of walling sheets. It is highly unusual to nail in the trough of every corrugation as has been done here. This oddity would seem to match the poor quality of the roof board meeting (see above) and is another indication of an inexperienced being used to erect the church. Photograph by Sonya Linskaill.

Figure 4.38. One of the nave windows during dismantling of the church. Note that the glazing is applied to a fully finished subsidiary frame and not directly to the wall framing that surrounds it.

Only the windows in the nave are originals. Those in the eastward extension appear to date from the extension of the church using second-hand materials from Tyndrum railway station, which was done in the 1960s. Photograph by Sonya Linskaill.

Repairs to St Fillan's Church

Figure 4.39. Patch repairs to localised corrosion damage caused by the electrolytic reaction between the cast-iron of the downpipe and the galvanised steel corrugated cladding. The repairs been formed in glass fibre and there is a risk of ultraviolet light attack. Care will be needed to keep them well painted in order to prevent this. Photograph by Sonya Linskaill.

Figure 4.40. Patch repairs are nailed to the original corrugated iron. These appear to have been done at some considerable time in the past. It is not clear how well they have been waterproofed all-weather matching corrugated iron for the patches was obtained. They do, however, appear to be working satisfactorily. The conservation approach to the repair at St Fillan's has not chosen to make good pre-existing repairs, but to retain them. Photograph by Sonya Linskaill.

Figure 4.41. A metal cover has been added at the bottom of the wall-sheets to throw condensation and rainwater clear of the brick plinth. The rainwater down-pipes have been modified to connect closely with newly installed drains. Just as importantly the original cast-iron ventilation grills have been cleaned and repaired to continue subfloor ventilation to the interior. Photograph by Sonya Linskaill.

Figure 4.42. Glass fibre insulation introduced into the airspace between the corrugated iron and the internal timber boarding when the eastward extension was added in the 1960s. Such insulation carries a severe risk of timber decay and cladding corrosion because it restricts the ventilation. Omitting new insulation emphasises that the repairs have sought to preserve the authenticity of the building, and by doing so to maintain its cultural significance. Photograph by Sonya Linskaill.

4.2.5 The Cultural Significance

After 130 years in a relatively hostile environment, and with a pattern of intermittent use and minimal maintenance, the corrugated wallcovering on St Fillan's Church has remained in repairable condition. The decay of the roof covering, though severe, needs to be set in context: how many roof coverings do survive for 130 years without major repair? As rough guide, thatch will need major repair after thirty years, slates and tiles will need new nails and patterns in 120 years or less, built-up felt roofs will need complete replacement in 25 to 30 years. The adoption of the conservation-based repair approach complicates the analysis as there is a conflict between the philosophical approach of maintaining authenticity and cultural significance by minimum repair, and the practical aim of achieving maximum usable life.

St Fillan's Chapel is old enough to have unquestionable cultural significance, and it is undeniably significant to the local community because it is an integral part of the historical narrative of Killin. It forms an essential part of the culturally significant tourist and natural environment resource of the Trossachs and is also culturally significant because its religious use has embodied a rarely achieved level of ecumenical harmony. Its local ownership and the effort put into its repair by the local community has further increased its local significance. However, its claim to significance through rarity is more complex. Tin tabernacles are not yet rare in Scotland, but their future is very uncertain. If developments in England are repeated in Scotland, corrugated iron churches may well become rare within a decade.

Tin tabernacles are without doubt the most publicly appreciated expression of corrugated iron architecture. Out of only 2 books whose content is entirely on corrugated iron buildings, one is solely on Tin tabernacles.[442] They are the corrugated iron buildings most likely to feature in popular magazines and they evoke widespread public appreciation. This may be due to the Gothic style windows which, together with the picturesque detailing of barge boards, finials and bell cotes, provides a perceived link with mediaeval cultural tradition.[443]

However, not all communities have given their tin tabernacles long-term cultural significance. If Scotland is taken together with England most demolitions of corrugated iron churches have occurred without significant local outcry. Good examples are Upper Basildon in Berkshire, where the tin tabernacle was demolished and replaced by a 'concrete wigwam',[444] St Phillip's Church, Buddle Lane, Exeter, where the building was demolished on the grounds of redundancy and the Chapel at South Wonston, which was gifted to the Weald and Downland Living Museum. The scale of demolition south of the border illustrates the severity of the decline in the cultural

[442] Mornement and Holloway, *Corrugated Iron*; Smith *Tin Tabernacles*. Further evidence from informal surveys conducted as part of this research, 2013–19.
[443] Suki Urquhart, interview by author, 2013; David Dawson, personal communication, 2014.
[444] Vicar of Upper Basildon, interview by author, 2013.

significance of corrugated iron buildings since the end of the nineteenth century.

St Fillan's in Killin, with its established tourist economy, provides a benign context for the church. Not all corrugated iron churches are in such a comfortable position, as changes in patterns of worship, and the general decline in church attendance have rendered many corrugated iron churches redundant. Whilst the examples of Fort Augustus and the corrugated iron buildings at the Highland Folk Museum offer some grounds for optimism, beneficial reuse is often hard to find and facilitate.

Figure 4.43. The Mill Shop at Fort Augustus, 2013, illustrating that beneficial re-use is possible if the ambitions and location are favourable. Photograph by the author.

The cultural significance of many corrugated iron churches suffers because they are perceived to be temporary structures. This perception is reinforced by a widely held presumption that corrugated iron is an unsuitable material for religious buildings and that only traditional masonry is appropriate. These

perceptions and presumptions are deeply embedded in attitudes towards buildings, as discussed in Chapter 3, and St Fillan's cannot be guaranteed immunity from them. If St Fillan's is now valued by the community, this was not always the case. In 1959 St Fillan's was under threat of demolition. Sonya Linskaill quotes unpublished church records from 1959, stating that the building was considered:

> of no architectural value' [and] in the not too distant future it can be replaced with a building of more worthy character in keeping with the other buildings in the vicinity.[445]

How far this opinion was representative is unclear, because in 1969 a corrugated iron extension was added using second-hand materials salvaged from Lower Tyndrum railway station. Presumably this was driven by thrift, at least as much as by recognition of the cultural significance of corrugated iron, but it also suggests a lack of hostility towards the material.

By 2009, when the recent major refurbishment of the building commenced, perceptions of cultural significance had changed.[446] Public bodies overtly recognised the conservation value of the church by grant aiding its repair. The extent of this recognition is illustrated by the range of grant givers involved in the St Fillan's restoration. These included:

- The Heritage Lottery Fund
- Loch Lomond and the Trossachs National Park Authority
- Historic Scotland
- The congregation
- The Listed Places of worship grant scheme
- The Dalrymple Donaldson Fund
- The Scottish Churches Architectural heritage Trust
- The Garfield Weston Foundation
- The Scottish Episcopal Church

[445] Linskaill, 'St. Fillan's Episcopal Church,' 26.
[446] Sonya Linskaill, personal communication, 2013.

This impressive list of institutional funders, who must be assumed to have a sophisticated view of cultural significance, also included contributions from the Church itself and from individual donors.

The increased recognition of the cultural significance of St Fillan's may be due in part to the persuasive talents of the repairing architect – Sonya Linskaill – but her persuasion could only have been so effective in an intellectual climate predisposed to accept the conservation value of corrugated iron. No clearer indication of this changed cultural climate could be given than the words of the Most Reverend David Chillingworth, the Bishop of St Andrews, Dunkeld and Dunblane, Primus of the Scottish Episcopalian Church, who said:

> A tin tabernacle is not a temple. Part of the charm and the beauty of this building is its very modesty - and indeed its temporary nature. It makes no claims to eternity or solidity. People sometimes talk of great cathedrals of England as 'sermons in stone'. They mean the very permanence of the buildings – the soaring Gothic arches - are themselves testimony to the wonder and majesty of God. So, this modest building in a beautiful place – a cathedral of nature more like – makes no claims for itself other than just as a place of worship.[447]

Evidence from local use, tourism interest and the willingness of grant giving bodies to provide funding all suggest that the perceived cultural significance of St Fillan's is increasing. But at the same time its listing status[448] has been downgraded from B to C. The reasons for this downgrading are as obscure as they are interesting. Private conversations with Historic Scotland listing staff failed to determine why St Fillan's had been listed in the first place or why its status had been decreased. This mystery illustrates the unpredictable status

[447] Sonya Linskaill, 'An Account of the Heritage Restoration of St Fillan's Church Killin,' booklet produced with funding from the Killin Conservation Area Regeneration Scheme, 2012, accessed 13 August 2019, http://strathearnchurches.org.uk/images/documents/St-Fillans---Killin-Tin-Tabernacle-Restoration-Booklet.pdf.

[448] Historic Environment Scotland, 'Killin, Main Street, St Fillan's Episcopal Church, Including Gates, Gatepiers and Boundary Walls,' accessed 28 July 2019, http://portal.historicenvironment.scot/designation/LB46364.

of corrugated iron within the designation system, and perhaps the arbitrary workings of the designation system itself.

Tourist perceptions of the picturesque and the persuasiveness of Sonya Linskaill, combined with the ecumenical significance of St Fillan's, have overcome the perceptions of low cultural significance that often attaches to corrugated iron buildings. A contributory factor to this success will have been the unusually high regard in which corrugated iron buildings are generally held in the Scottish Highlands; corrugated iron played a significant role the release of Highland people from the squalor of the black house.[449] Further, it provided them with affordable churches, schools, meeting rooms and storage for agricultural produce. It is no surprise that Highland people have the warmest regard for a material which greatly improved the quality of their ancestors' lives. The power of this affection has been emphasised by interview evidence from Robert (Bob) Powell, director of the Highland Folk Museum, and corroborated by the public popularity of the museum.[450]

Figure 4.44. The school at the Highland Folk Museum, 2012. Photograph by the author.

[449] Director of the Highland Folk Museum August, interview with the author, 2012.
[450] Visitor numbers have grown year-on-year and reached 66,000 in 2015. See 'THANK YOU FOR VISITING!!,' Highland Folk Museum, High Life Highland, 2015, accessed 13 August 2019, https://www.highlifehighland.com/highlandfolkmuseum/thank-you-for-visiting/ and 'Visitor numbers soar at Highland Folk Museum,' The Highland Council, 30 July 2010, accessed 9 August 2019, https://www.highland.gov.uk/news/article/3954/visitor_numbers_soar_at_highland_folk_museum.

4.2.6 Conclusion: Challenges and Possibilities

The repairs undertaken by Sonya Linskaill demonstrate that the building is adaptable. For example, the provision of improved heating and modern toilets was completely achievable without significant alteration to the fabric of the building. Corrugated iron buildings such as St Fillan's are adaptable to new uses and even new locations without necessarily eroding their use value or cultural significance.

St Fillan's presents a fascinating case study of the management of corrugated iron buildings and provides a benchmark for application of conservation repair techniques.

No other corrugated iron building in current use in Scotland has received the same level of philosophical and technical expertise as St Fillan's. Exceptional care and effort have been taken to design and install effective patches to the corrugated iron and to retain existing historic patching.

An almost universally accepted principle within conservation is minimum repair.[451] However, its application to traditional masonry buildings is much simpler than to corrugated iron. Stone buildings generally have massive levels of redundancy in their structure, and it is rarely necessary to completely replace a walling stone because its surface has been eroded. This is not the case with corrugated iron. Small scratches will lead to rapid corrosion, and even the smallest hole is likely to cause swift deterioration of the timber framing.

It is likely that the difficulty in practically applying an advanced philosophical approach will be a significant factor in preventing conservation values being applied to other corrugated iron churches. Applying pragmatically mixed philosophical approaches demands great self-confidence on the part of the specifier. It is easier and intellectually safer to simply replace everything rather than assessing each section of decay individually. Real powers of persuasion will be needed to convince clients and builders of the value of a conservation

[451] Australia ICOMOS, 'The Burra Charter'.

approach at least until the cultural significance of historic corrugated iron is acknowledged across conservation.

St Fillan's is a place of worship for two denominations – the Scottish Episcopal Church and the Roman Catholic Church.[452] Religious tolerance has been notably absent historically in the Highlands. Perhaps the most extreme example was the construction by the parishioners of Loch Sunart of a floating corrugated iron church; this was necessary because the local laird refused permission for the construction of a new church on his land, as discussed in Chapter 2. The ongoing dispute over the recent re-siting of the Aberfeldy church to Dull, illustrates that the insertion of a Catholic building into a Presbyterian community can still reawaken historic religious debate. Against this background of religious disharmony, St Fillan's has become a positive statement of co-operation between the Scottish Episcopal Church and the Roman Catholic Church in Scotland.

The repair of St Fillan's raises wider questions for conservation in Scotland. The approach adopted proves that some owners, architects and funders accord corrugated iron significant conservation value. But this raises an awkward question: if St Fillan's has sufficient cultural significance and conservation value to be worthy of expensive and complex repairs, why is this elevated status not given to all corrugated iron churches? Historic stone-built churches are universally deemed worthy of conservation repair but a conservation approach to repairing corrugated iron is very unusual: it does not follow that other tin churches will benefit from its success at St Fillan's.

[452] Linskaill, 'St. Fillan's Episcopal Church,' 21–34.

4.3 Case Study 3: Cultybraggan Prisoner-of-War Camp Number 21

Figure 4.45. Cultybraggan POW Camp. This image gives some indication of the scale of the Camp. Photograph by the author.

4.3.0 Introduction

The Cultybraggan prisoner of war (POW) camp is a collection of Nissen huts located near the small town of Comrie in Stirlingshire. It has been chosen as a case study because it is a nationally and internationally significant group of corrugated iron buildings. It is also an important example of both tangible and intangible heritage and highlights the potential conflicts that can arise between physical conservation and the presentation of a narrative. At present the site is managed by the Comrie Development Trust (CDT), which is an association of local people who have a variety of ambitions for the site. This diversity of focus causes significant management issues.

The cultural significance of the Camp has been recognised by the award of Category A designation status to 5 of the Nissen huts and Category B to twenty four huts and includes the setting of the whole site.[453] One of the main reasons

[453] Listing descriptions for Category A and Category B buildings: Historic Environment Scotland, 'Comrie, Cultybraggan Former Cade Camp, Huts 19 and 20 (Guard's Block) and 44, 45, 45,' accessed 12 August 2019, http://portal.historicenvironment.scot/designation/LB50471 and Historic Environment Scotland, 'Comrie, Cultybraggan Former Cadet Camp, Huts 1-3, 21,

for listing the Camp is given in the Statement of Significance which says the Camp 'allows the site to retain a highly interpretable form.'[454] The Camp has a strong local significance because of the wartime impact it had on the community of Comrie. By no means all the prisoners were confined to the Camp, and enduring personal relationships developed between prisoners and Comrie residents. Cultybraggan also embodies many powerful wartime human narratives. The most infamous relates to the housing of dangerous Nazi prisoners who murdered Wolfgang Rosterg, a fellow prisoner whom they regarded as a traitor.[455]

The case studies of the Balmoral ballroom and St Fillan's Church both illustrate aspects of the use, conservation and cultural significance of corrugated iron that involve individuals and specialists making the decisions for a single building. The case study value of Cultybraggan is quite different: Cultybraggan has approximately eighty corrugated iron buildings in various stages of decay, most of which are Nissen huts. The decisions on use of the site and repairs to the buildings are taken democratically via the Comrie Development Trust and so there is no single person responsible for devising and implementing maintenance decisions.

Figure 4.46. Creating a community orchard at Cultybraggan on the site of the assault course. Using the Camp for allotments and an orchard has been hugely successful. Photograph by the author.

29-39, 47-57 (All Nos Inclusive),' accessed 12 August 2019, http://portal.historicenvironment.scot/designation/LB50472.

[454] Virginia Crocker, 'Cultybraggan Training Camp (Former WW2 POW Camp), near Comrie, Perthshire,' Statement of Significance, 2015, 4.

[455] Crocker, 'Cultybraggan Training Camp,' 3.

4.3.1 The Buildings and their Context

The Comrie trust has a wide variety of groups including environmentalists, heritage specialists, businesses renting workshop space and groups who enjoy re-enactment. Each has their own vested interest in the Camp as a whole, and special interest in individual huts. Repair of the Nissen huts is often at odds with the ambitions of the non-conservation-oriented interest groups.[456]

The Cultybraggan buildings present the most brutally utilitarian face of corrugated iron, are set in relatively harsh climatic conditions, and so offer extreme conservation challenges. They are also an exemplar of a more general conservation problem: how do you conserve buildings that are considerably beyond their original design lives? This case study addresses the difficulty of choosing between a whole-site conservation strategies and restricting conservation to a sample of key buildings.

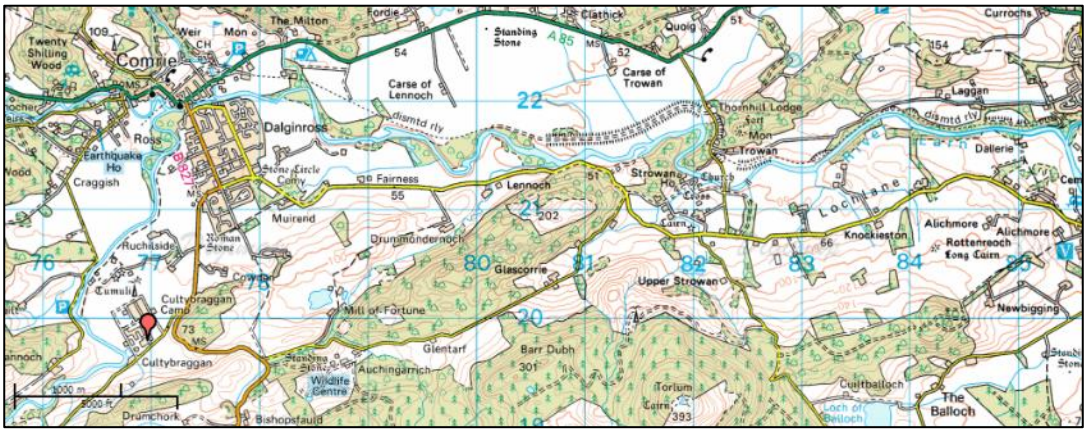

Figure 4.47. Map showing Cultybraggan POW Camp just south of the town of Comrie. Camp 242 is the grid form streets, just south of the town of Comrie. Source: Digimap.

Cultybraggan Camp is near the town of Comrie on the southern fringe of Highland Scotland. It was created in 1941 as part of a national network of prisoner of war camps. Little trace of most of these now remains and Cultybraggan is now a rare survival of wartime specialist architecture.

[456] Members of the Comrie Trust, personal communications with the author, 2014–15.

4.3.2 History of the Buildings

In 1942 the allied offensive in North Africa initiated a prisoner of war problem, which after 1944 became acute. Allied advances in Europe after D-Day produced very large numbers of German prisoners, and an estimated 400,000 men[457] were in internment camps by 1945. Some of these prisoners were regarded as dangerous enough to pose a significant security threat.

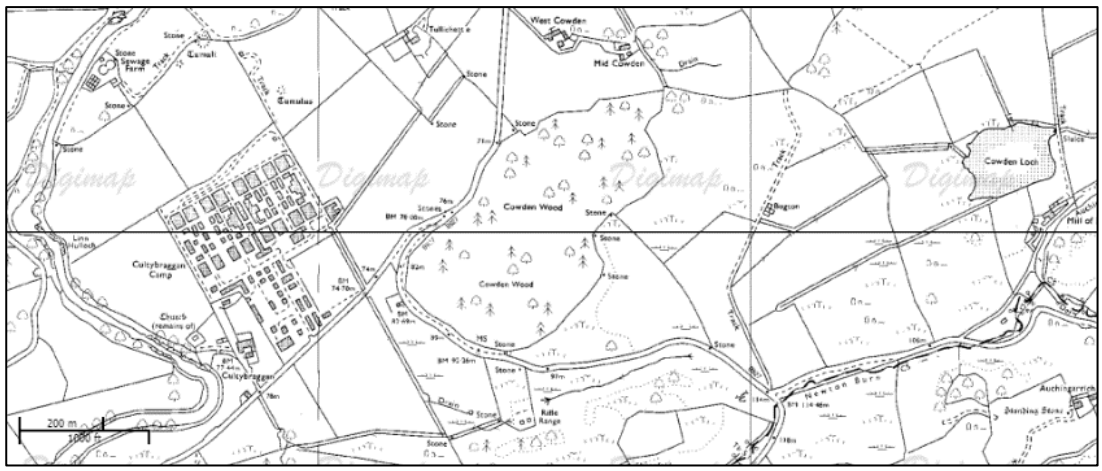

Figure 4.48. Map showing Cultybraggan, 1970. Source: Digimap.

The site at Cultybraggan was remote, yet capable of supply by railway and was flat enough to allow easy construction. In 1941 Cultybraggan Camp was purpose built to house Italian POWs, but by 1944, it was used for German POWs. It was one of approximately 600 camps built in Britain and had a capacity of between 4000 – 4500 men. At one time it was a high security prison, and the Camp was also known a Nazi 2; the other maximum-security prison was at Watten, near Wick.

[457] J. Anthony Hellen, 'Temporary Settlements and Transient Populations, The Legacy of Britain's Prisoner of War Camps: 1940-1948,' *Archive Fur Wissenschaftliche Geographie* 53, no. 4 (1999): 191–219.

From 1949 until 2004 Cultybraggan was used as a summer camp for the Territorial Army (TA), and in the late 1980s a Royal Observer Corps nuclear bunker was built on the site. After the whole site was abandoned by the army it was purchased in 2006, by the Comrie Development Trust (CDT).[458]

The site originally had four prisoner compounds, built in the four quadrants of the site. Two of the quadrants have been cleared of huts, the space being used for other activities, such as the community orchard. The other 2 quadrants contain the eighty remaining Nissen huts of varying configurations, as well as other related buildings.

The military use of corrugated iron is discussed in chapter 2, but the Nissen huts at Cultybraggan are adaptations of the original and need some additional explanation.

Major Peter Nissen designed his hut in response to the military imperatives of the First World War. It had to be easily transportable and quickly erected by unskilled labour. It was simply a replacement for the canvas tent and was never designed to be permanent. When the original designers of Cultybraggan Camp chose Nissen huts, it is doubtful that they thought the Camp would last beyond the duration of the war. Many of the conservation challenges now facing the huts at Cultybraggan stem from the original design concept of a temporary camp.

From a present-day conservation perspective, it is easy to overlook the astonishing durability of Major Nissen's design. The huts at Cultybraggan were not constructed to last for seventy-five years, they were designed to be mass produced and quickly erected by unskilled labour, and in both these ambitions they have exceeded any reasonable expectation. Over one hundred thousand had been produced by the end of the Second World War as Mallory and Ottar note:

[458] 'Comrie Development Trust is owned and managed by local people living within the boundary defined by the area of responsibility of our Community Council. The Board consists of up to 12 positions elected by, and from, the membership with up to three co-opted positions to attract particular skills on to our board.' ('About Us,' Comrie Development Trust, accessed 22 February 2016, http://comriedevelopmenttrust.org.uk/about-us).

> The Nissen hut thus represented the first real mass production of complete buildings as opposed to the mass production of components, an important stage in the history of both civil and military architecture… The simplicity of the individual components, the consequent ease of production, no nailing and hand fitting over several small components as in the earlier types, and the quantity actually produced put the Nissen in comparison with car production today.[459]

The cultural significance of Major Nissen's hut as a pioneering use of mass production methods cannot be disputed, but the technical innovation and clever use of materials is overshadowed by association with war, deprivation and prisoner status. Where Nissen huts have been used for civilian housing, this has always been seen as marginally acceptable temporary accommodation, as expressed by an Australian, 'They're freezing cold in winter and they're stinking hot in summer…There's no breeze through them and they're always inundated with ants.'[460]

4.3.3 Use, Adaptability, and Functionality

The Comrie Development Trust took ownership of the site in 2006 and since then have put in major infrastructure improvements such as electricity, drainage, water supplies and phone lines to facilitate the development of the site. Their aims, as stated on their website are: 'to develop the site as a model of sustainable development for rural communities across Scotland.'[461] To achieve this they propose to:

[459] Mallory and Ottar, *Architecture of Aggression*, 81.
[460] Kathy Marks, 'Australians Do Battle over the Prefab Huts of Pommy Town,' 31 March 2009, accessed 3 May 2018, https://www.independent.co.uk/news/world/australasia/australians-do-battle-over-the-prefab-huts-of-pommy-town-1658051.html.
[461] 'Cultybraggan Camp Development,' accessed 2 May 2018, http://comriedevelopmenttrust.org.uk/about-us/cultybraggan.

> create a community orchard, allotments and sports facilities; to establish a Comrie Heritage Centre which that will manage the refurbishment of the buildings together with interpretation and re-enactment opportunities; to initiate an economic area, which will create opportunities for long term, secure local business opportunities and to manage the environment with a focus on renewable energy and sustainability.

This coalition of many varied interest groups that form the CDT, has taken on complete responsibility for the use, management and repair of 30 historic listed buildings on the site, which are Nissen huts. The size and complexity of the building conservation problems has no current parallel within Scotland. Careful management ensured funding and initially a development loan of £150,000 was received from the Triodos bank. Over the last few years funding has been given by bodies such as Historic Environment Scotland and the Scottish government for the repair of the buildings and upkeep of the site. The initial loan and other funding was spent on the main infrastructure of the site, so the financing of repairs and refurbishment to the buildings has had to be generated in alternative ways. To do this the CDT are attempting find beneficial reuse for as many of the huts as possible, with those that were set aside to house the most dangerous Nazi prisoners. The hope is that the narrative of the murder of Wolfgang Rosterg and the historical frisson of staying in a prisoner of war camp will make the huts attractive as holiday lets.

4.3.4 Conservation Issues

Figure 4.49. Corrugated iron Nissen hut at Cultybraggan. The Camp preserves an extraordinary example of corrugated iron architecture's survival; but this survival does not mean that it can be easily conserved. Although huts like this appear to be in reasonable condition, hidden defects in the framing, heating system combine with the need for external maintenance to make conservation a daunting task. Photograph by the author.

Figure 4.50. The poor condition of many of the huts, partly due to the quality of the materials used. The steel and the galvanising are likely to have been compromised because of wartime shortages, and because the buildings were only seen as temporary. Photograph by the author.

Figure 4.51. The climate at Cultybraggan is particularly hostile, with high rainfall, extreme cold, and strong winds. Wind, especially, will have damaged the huts by driving moisture between the lap joints of each corrugated sheet. The internal corrosion visible here had started before the corrugated iron cladding and lining had been cannibalised to repair other huts. Photograph by the author.

Figure 4.52. Every aspect of the site provides difficult maintenance challenges. This damage has been caused by an accidental impact from a ride on lawnmower. Such incidents are probably inevitable when the Comrie Development Trust Has to rely on volunteer labour for grounds maintenance. The damage reveals that the underlying corrugated iron is in surprisingly good condition, but unless repairs are carried out swiftly water ingress will do rapid damage. Photograph by the author.

Figure 4.53. A further vulnerability of the basic design is the termination of the corrugated iron at the end walls. This has yet to be satisfactorily addressed. Water penetrating along and through the end wall is trapped between the masonry and the corrugated iron causing rapid decay of the metal. Photograph by the author.

Figure 4.54. Though not the case here, fixings generally are a source of water ingress. Thermal expansion of the corrugated iron is a real problem, and fixings have to be flexible enough to accommodate this without coming loose. This is a major challenge and the fixings frequently fail in the long term. Photograph by the author.

Figure 4.55. The three-year gap between the end of military use and the takeover by the Comrie Development Trust, was a damaging break in repainting and general maintenance and has caused major paint failures. These failures are starting to permit corrosion of the corrugated iron. Photograph by the author.

Figure 4.56. Cannibalisation has revealed the frame of this hut emphasising that the corrugated iron is more or less self-supporting, and the main function of the frame is to tie the sheets together rather than holding them up. The render here has failed primarily because thermal expansion of the corrugated iron relative to the masonry has stressed it to breaking point. Photograph by the author.

Figure 4.57. Crude and unsystematic attempts have been made to modify the corrugated iron to seal against the end wall of most of the huts. The centre of the image reveals crude hacksaw cut to help shape the iron. This and the aggressive hammering used to bend the iron around the masonry will have fractured the galvanising and thus greatly accelerated corrosion. Photograph by the author.

Figure 4.58. One major problem, found on many of the huts, is the reinforcement of the lower edges of the corrugated iron with bricks and concrete. This has been poorly executed and is trapping water between the concrete and the metal which will accelerate corrosion of the corrugated iron. Photograph by the author.

Figure 4.59. Because Cultybraggan was a prisoner-of-war camp and functionality was its main design motivation, there is no decorative detail. However, some intriguing details of camp life do survive such as this phone booth. Photograph by the author.

Figure 4.60. Patch repairs are attractive from a conservation point of view because they involve the minimum loss of original material. Here, however, they depend on the cannibalising of other huts to obtain the patch material and the use of potentially corrosive metal fittings to secure the patch. Adding a sealant to make the patch waterproof is essential, but there is no reason to do it as unattractively as this. Photograph by the author.

Three of the Comrie Development Trust interest groups are making use of the Nissen huts. These are the Heritage Group, the Environmental Group and the business start-up group. The differing needs and ambitions of each group mean that three different repair approaches to the huts are being adopted.

Figure 4.61. Repairs to the corrugated iron. The paler sections are where new sheets have been introduced to repair corrosion damage, and not as was suggested by Heritage Group volunteers, markings to prevent attack by Allied aircraft. The date of the repairs is not known, but probably the 1960s. Image from Comrie Development Trust.

Figure 4.62. The lack of insulation in Nissen's design makes condensation on the inner faces of the hut unavoidable, thus damaging the fabric of the hut itself and making any productive use problematic. The picture illustrates the incompatibility between the conditions that were acceptable to the military during the Second World War, and modern demands for a satisfactory accommodation. Image from Australian War Memorial, accessed 23 August 2020, https://www.awm.gov.au/collection/C1276130.

Figure 4.63. Military attempt (probably from the 1980s) to introduce insulation between the corrugated iron skins. Note the excellent condition of the corrugated iron exposed by removal of the closing sheet. This is clearly a modern replacement that calls into question the authenticity of much of the site.

Figure 4.64. The refurbishment of two Nissen huts that will be used as part of the museum, housing the Heritage group's collection and the visitor's centre. The original corrugated iron lining has been retained and it will be interesting to see if condensation problems interfere with the museum displays. Image from Comrie Development Trust.

4.3.5 The Cultural Significance

This survival of Cultybraggan Camp is due largely to it having remained in military occupation as The Territorial Army till 2006. Until the camp was abandoned by the Territorial Army, maintenance of the buildings was adequate on a day-to-day level, with a significant replacement of corrugated iron, extensive repainting and general maintenance of the site. Since then general site-wide maintenance appears to have been sporadic and minimal, and the buildings are showing systemic signs of decay.

The problem of condensation driven corrosion of the corrugated iron shells of the Nissen huts has no easy conservation solution. Complete dismantling, rust removal and a high-quality paint system, are all necessary parts of conserving the existing corrugated iron and metal frame, a process which requires expensive materials and demands skilled labour. It is almost certain that complete replacement of the corrugated iron at Cultybraggan would be a cheaper alternative, but this raises an acute problem of material authenticity.

This is a core question for conservation. Is designation in place to preserve a run-down Territorial Army training camp or the immaculate corrugated iron of a newly built prisoner-of-war camp? This problem goes far wider than Cultybraggan.

The repair strategy for most of the huts depends on generating alternative beneficial use by local businesses. Huts will be offered to commercial tenants rent-free on condition that the tenants maintain the fabric. This strategy has already attracted tenants, but its overall success has been mixed and getting all tenants to comply with requirements appears to be an ongoing challenge. There would also appear to be an incompatibility between commercial activity on the site and the preservation of its intangible ambience as a prisoner-of-war camp. This is important for the whole site, but particularly acute for the part of the project aiming to created holiday lets. In 2018 funding was received from the Heritage Lottery Fund, Historic Environment Scotland and a Sustainable Development Fund, for the refurbishment of eleven Nissen huts to create themed accommodation that will attract visitors seeking to relive the atmosphere of the Second World War.

The cultural significance of Cultybraggan, like that of the Balmoral Ballroom and St Fillan's Church is a complex blend of materiality and narrative. We need to remember what it was for as well as what it is made of.

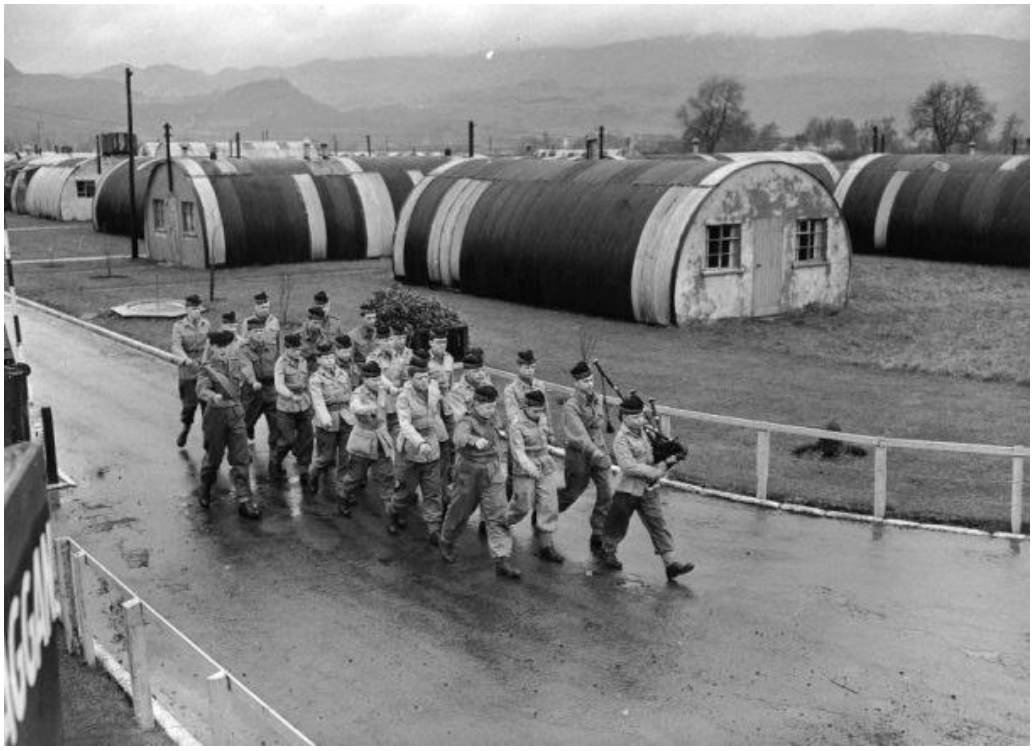

Figure 4.65. Cultybraggan Camp in use by the Territorial Army in the 1960s. Image from Blair Urquhart of the Comrie Development Trust.

4.3.6 Conclusion: Challenges and Possibilities

One of key elements of the conservation value of Cultybraggan does not lie in the survival of one, or even several of the huts, but in the exceptionally rare survival of the camp as whole. Individual Nissen huts are still relatively commonplace, but an authentic and original grouping such as at Cultybraggan is not.

This has been recognised by the designation process. The whole camp was listed by Historic Environment Scotland for being one of the best-preserved POW camps in Britain. This preservation is not just of the tangible huts but, perhaps more importantly, of the intangible ambience and narrative of the site. This is acknowledged by the listing description which suggests that the camp:

> provides important evidence of the ways in which POW were detained during this period.[462]

This intangible significance, combined with the rarity of the physical survival, persuaded historic Scotland to designate four of the huts at Category A.

The success and endurance of the Comrie Development Trust is expressed by attendance of local people at the numerous public meetings and considerable investment of volunteer time necessary. This strongly suggests that the people of Comrie share Historic Environment Scotland's view that the site is culturally very significant, since such overt displays of local public interest in a historic monument are comparatively rare.

The CDT are promoting learning and understanding through educational projects, such as the museum and open days. Importantly, they are developing the continuation of the narratives and memories of Cultybraggan by encouraging local and international links between those connected with this narrative. Although some of the Cultybraggan stories are negative, many tell of human resourcefulness, ingenuity and resilience in time of war. An excellent example is the bequest by ex-POW Heinrich Steinmeyer to the town of Comrie, as a mark of gratitude for the kindness he received whilst a prisoner. Steinmeyer was hugely grateful to the town of Comrie for the kindness of the people during his stay in the town as a German prisoner of war. In his will he states that, 'Everything I owned will be sold and given to the people of Comrie because the Scots treated me as a human being.' This has been set up by a Legacy Committee

[462] Listing descriptions for Category A and Category B buildings: Historic Environment Scotland, 'Comrie, Cultybraggan Former Cade Camp, Huts 19 and 20 (Guard's Block) and 44, 45, 45,' accessed 12 August 2019, http://portal.historicenvironment.scot/designation/LB50471 and Historic Environment Scotland, 'Comrie, Cultybraggan Former Cadet Camp, Huts 1-3, 21, 29-39, 47-57 (All Nos Inclusive),' accessed 12 August 2019, http://portal.historicenvironment.scot/designation/LB50472.

4.4 Case Study 4: St Fagans National Museum of History

Figure 4.66. The barn at Llwyn yr eos Farm, St Fagans, Cardiff. Agricultural buildings such as these were mass produced in the nineteenth and twentieth centuries and survive in very large numbers. Because they are so numerous and utilitarian, they have had a major role in influencing perceptions of the significance and value of all corrugated iron buildings. Photograph by the author.

4.4.0 Introduction

St Fagans is a national museum of Wales housing a collection of buildings that represent that country's history. Unlike the previous three case studies, this study looks at the inclusion of a selection of corrugated iron buildings within the setting of a Skansen – St Fagans museum near Cardiff. St Fagans has been chosen because it offers the opportunity of examining the protection of corrugated iron buildings independently of designation. At St Fagans museum some of the buildings are listed, which allows an opportunity to examine if this level of protection has been applied to the corrugated iron buildings in the museum as well as those built with other materials.

The case study will also examine how the corrugated iron buildings are valued by the curators within the museum setting, and what level of conservation is applied to them within that setting.

The aims and conservation strategies at St Fagans are compared with those at other Skansens. The case study will explore how buildings (including corrugated iron buildings) which have been relocated to the museum, gain status and cultural significance from inclusion in a Skansen.

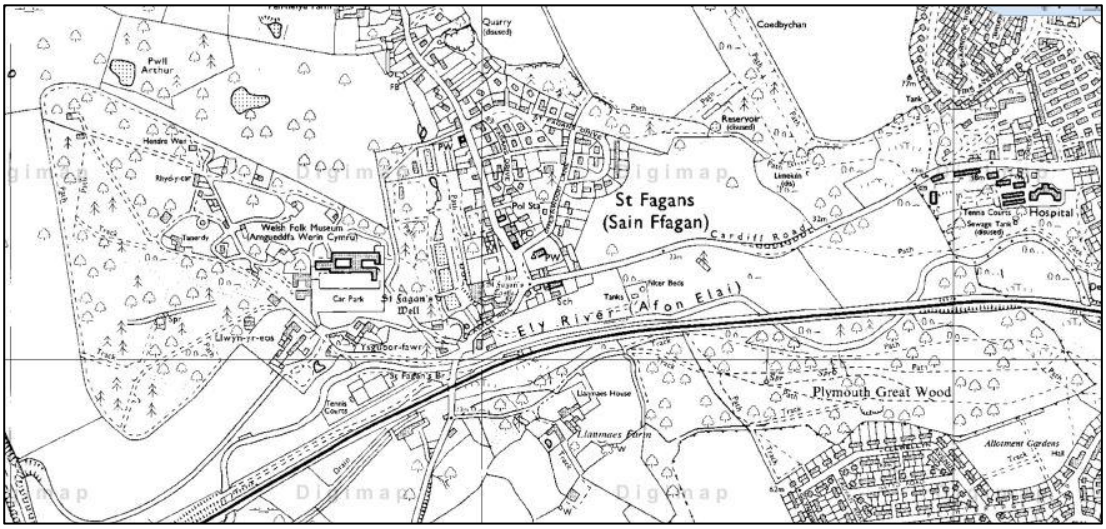

Figure 4.67. St Fagans National Museum of History is situated just west of Cardiff, as shown in this map from the 1980s. Source: Digimap.

4.4.1 The Buildings and their Context

St Fagans castle and estate, situated west of Cardiff, were donated to the state by the Earl of Plymouth in 1946, and in 1948 opened to the public as the Welsh Folk Museum. Since then the name has changed several times from the Museum of Welsh Life, to St Fagans National History Museum, and finally St Fagans National Museum of History.

The ambition of the founder, Iorweth Peate, Welsh poet and scholar, and funder of the Welsh Folk Museum was to create a museum for Welsh life and culture, similar to that at Skansen in Scandinavia. His aims were stated at the opening ceremony:

> [The task] was not to create a museum which preserved the dead past under glass but one which uses the past to link up with the present to provide a strong foundation and a healthy environment for the future of their people.[463]

The open-air section of the museum now has over forty buildings representing the traditional architecture of Wales, most of which have been moved from other parts of the country. They include a chapel, a church, barns and several farmhouses and numerous houses and workshops. Because the museum set out with the intention of preserving elements of Welsh rural life, it includes farm buildings and smaller craft workshops irrespective of elite valuations of their architectural worth. Some of these smaller workshops are made from corrugated iron and include a saddler's workshop, a clog-maker's workshop, a pottery, a bakery and of course an Anderson shelter.

4.4.2 The History and Uses of the Buildings

The forty buildings in the museum represent the architecture of ordinary Welsh people '…from different social backgrounds and from different periods.'[464] These cover many different styles and forms of buildings such as a nonconformist Unitarian chapel, a schoolhouse, a mill and a farmhouse. There are at least seven corrugated iron buildings and several more that have corrugated iron roofs.

Not all the corrugated iron buildings at St Fagans have been relocated from other areas of Wales; three of them are modern speculative constructions designed to convey an impression of what authentic buildings might have looked like. They have been made from new corrugated iron in the style of known similar buildings.

[463] 'A Brief History of St Fagans,' St Fagans National Museum of History, accessed 13 August 2019, https://museum.wales/stfagans/stfagans-history/.
[464] 'Historic Buildings at St Fagans,' St Fagans National Museum of History, accessed 6 May 2018, https://museum.wales/stfagans/buildings/.

4.4.2.1 The Bakehouse

One such example is the Derwen Bakehouse shop. The Derwen bakery was built in 1900 in Aberystwyth and is typical of a communal bakery where women would bring the dough and other items such as meat to be cooked at the bakery, for which there was a small charge. It was much more economical than heating one's own oven on a daily basis. The main bake-house is constructed from brick and can been seen in the photograph (figure 4.68, left) to the right of the corrugated iron building. However, the bakery shop, though made from corrugated iron is not authentic; it is a generalised speculative replica typical of the sort of building that would be found next to a bakery. The bakery shop was constructed from materials that were considered to be appropriate, and were sourced from many different places.[465] It is, in fact, a form of stage scenery.

Figure 4.68. The corrugated iron bakery shop next to the brick-built bakery oven building. Photographs by the author.

[465] Dafydd Wiliam, principal curator for historic buildings at St Fagans, interview by author.

Figure 4.69. The saddler's workshop is from Carmarthenshire, and is typical of a small rural workshop of that area. Photograph by the author.

4.4.2.2 The Saddler's Workshop

Unlike the bakery shop or the pottery and the saddler's workshop dates from 1926, and was found, and moved from, Pen-pitch, St Clears in Carmarthenshire.

Figure 4.70. The Anderson shelter, beautifully displayed at the bottom of garden of a mid-twentieth century terrace house. Photographs by the author.

4.4.2.3 The Barn at Llwyn yr eos Farm

Figure 4.71. The barn before it was moved to St Fagans. Image from National Museum of Wales.

The barn has been moved to its present location in the yard of Llwyn yr eos Farm. The farmhouse in St Fagans itself has not been moved and is thought to date from before the nineteenth century;[466] it was tenanted as part of the Plymouth estate till 1989. Since then it has become part of the museum, but is still run as a working farm, together with its ancillary buildings. The corrugated iron barn was originally part of Penlan Bridell Farm in Boncath, west Wales, and was bought for the Llwyn-yr-eos farm by the agricultural department of St Fagans rather than the historic buildings department. The barn was made by the Penlan Bridell farmer, Lloyd Morris, in about 1950, constructed by him, to his own design, from corrugated iron, rather than bought as a prefabricated barn from a catalogue.

[466] *British Listed Buildings Online*, s.v. 'Llwyn-yr-eos Farmhouse', 28 November 2003, accessed 13 August 2019, https://www.britishlistedbuildings.co.uk/300082233-llwyn-yr-eos-farmhouse-st-fagans#.WusbUYgvzIU.

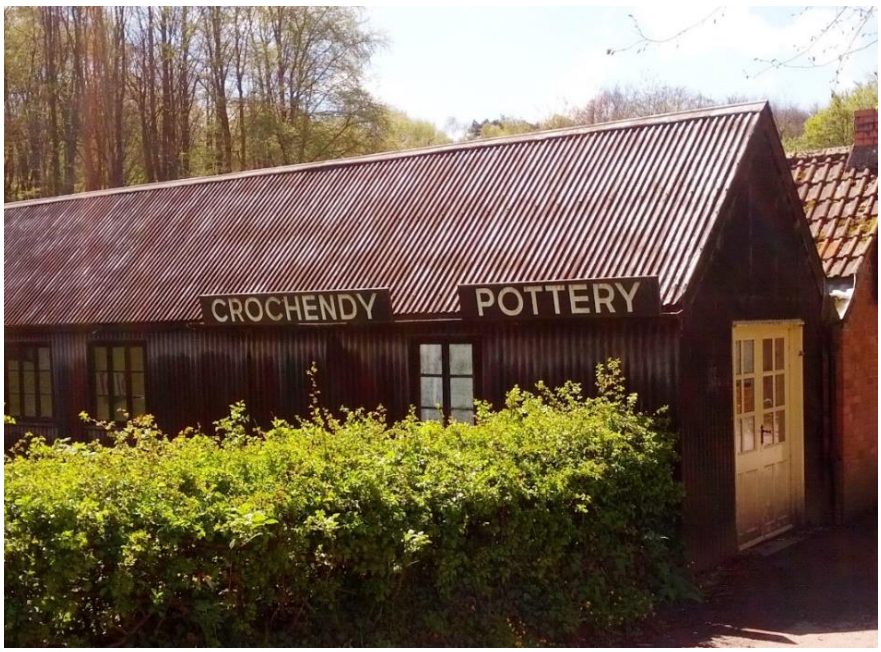

Figure 4.72. The Pottery is, like the bakery shop, a replica, based on a building at Crochendy pottery. Photograph by the author.

4.4.3 The Cultural Significance of Skansens

A self-reinforcing and circular argument results from buildings placed into Skansens. All buildings become exhibits once they are included in a museum and this automatically elevates their cultural significance: if the building were not culturally significant it would not have been put in the museum.

However, it is often argued, for example by Historic England or the SPAB, that the conservation value of buildings is context dependent and if they are moved from their original location much of this value is lost. At St Fagans most of the buildings have been relocated from other areas of Wales where they were at risk, either by neglect or because of an explicit threat of demolition. A similar situation exists in other Skansens in Scotland and England. A peculiarity of St Fagans is that the loss of original context of moved buildings has not prevented their being listed after they have been reconstructed at the museum.[467] Discussions with other Skansen's curators and with Historic England revealed that they find this perplexing, as in England and Scotland it is not possible to

[467] For a full list of the buildings that have been listed after their move to the museum, see appendix.

list a building that has been relocated from its original setting, as the setting is considered integral to the building, where the style and materials they are constructed from are particular to their locality. An email from Simon Wardle, the assistant inspector of Historic Buildings for Cadw, appears to suggest that it is possible to list any building even if might have been relocated.

> The museum at St Fagans and its establishment is very much about Welsh rural life and the claiming of a cultural identity. We have recently listed the post war main entrance block and museum building not only as an architecturally important modern building but in recognition of the role that St Fagans plays in the strengthening of the idea of Wales as a modern nation.
>
> The most important point about the buildings that the museum houses, and this is perhaps not the most obvious one, is that they relate directly to the establishment of the museum and are part of that attempt to claim a Welsh cultural identity. Visually they are 'historic' buildings but they have a much wider evidential and historical value as documents of the history of the museum. This is one of the main reasons why they have been listed.
>
> This occurs elsewhere with buildings that have been relocated, we have fairly recently upgraded to II* the Friends Meeting House in Newtown on account of its fascinating history and as an example of historic reconstruction, not just its use and appearance in its current location. There will I'm sure be other examples, but this is probably straying away from the subject of your research.[468]

These comments are particularly interesting because they highlight the complex relationship between the criteria used for establishing cultural significance. At St Fagans *age* and *rarity* are important but are interpreted within an intellectual framework which accords elevated significance to *Welshness.*

[468] Simon Wardle, email message to author, March 2016.

4.4.4 The Comparative Cultural Significance of Corrugated Iron in Skansens.

There are a surprisingly large number of open-air museums of buildings; Depending somewhat on definitions of a museum there appear to be approximately 30 Skansens in mainland Britain, 21 in England, 7 in Scotland, 2 in Northern Ireland and 1 in Wales, which is St Fagans. This section compares how the cultural significance of corrugated iron is treated at three other leading examples in comparison to St Fagans: The Highland Folk Museum, the Weald and Downland Living Museum, and the Avoncroft Museum of Historic Buildings.

4.4.4.1 St Fagans

In 2013 a discussion with Geralt Nash, then curator for buildings at St Fagans, focused on the role and significance of corrugated iron buildings at the museum. Nash suggested that corrugated iron buildings at St Fagans were seen as fitting in well with the museum's core aim. This was to present a record of Welsh life using buildings that authentically showcase the life and work of the people who built and used them. Thus, to reconstruct the saddler's and the clog-maker's workshops was entirely appropriate. These corrugated iron buildings are seen as being part of the rural *vernacular,* an essential part of a narrative that tells the story of Welsh rural life. They are not seen as exemplars of corrugated iron buildings. This concept particularly applies to the buildings bought from catalogues, which are perceived as 'mass produced and often bought off the shelf,'[469] not created by the craftsman, and therefore never used at St Fagans. The rejection of mass produced corrugated iron buildings has meant that the tin tabernacle is not included as part of the exhibits, even though an Anderson shelter is. Geralt Nash also suggested that they were not included because they were not often found in Wales. However, this is open to dispute as Ashley Batten has identified four in north Wales alone.[470]

[469] Geralt Nash, interview by author, 16 May 2013.
[470] Batten, 'Understanding Corrugated Iron Buildings,' 50.

The corrugated iron buildings at St Fagans museum have gained cultural significance through being housed in a museum, but interestingly none is among the group of buildings that have been listed after reconstruction at the museum.

At St Fagans the corrugated iron buildings are not promoted in the same way as those made from other materials, and the visitor's guide only shows one photograph of a corrugated iron building – the Clog maker's workshop. This compares interestingly with the three other Skansens discussed here.

4.4.4.2 The Highland Folk Museum

The museum opened at Kingussie in the Highlands, at the relatively early date of 1944.The Website states that:

> The museum has a long history prior to its opening in Kinguisse. In 1935 by Isabel Frances Grant. Dr Grant's life passion was to build a collection '…to shelter homely ancient Highland things from destruction.' The first museum was in Iona, and having outgrown the space available eventually moved to the Kinguisse site in 1944. The collections remit expanded to include replica buildings alongside relocated vernacular buildings and became the first open-air museum in Britain. Since the 1980's the museum has been housed at Newtonmore and covers an eighty acre site. It runs in tandem with *Am Fasgadh,* where the folk collection is held. [471]

The eighty-acre site is divided into several themes: a working farm, a village and a Highland township. The corrugated iron buildings are part of the village theme and are exhibited in surprisingly large numbers. They were collected almost at the start of the museum, just after the building of the Highland township commenced.

[471] 'The History of the Highland Folk Museum,' Highland Folk Museum, High Life Highland, accessed 26 February 2018, https://www.highlifehighland.com/highlandfolkmuseum/history-of-the-museum/.

Figure 4.73. A garage of the type frequently found in the Scottish Highlands has become one of the exhibits at the Highland Folk Museum. Photograph by the author.

Figure 4.74. The school at the Highland Folk museum. Photograph by the author.

Figure 4.75. *Left*, the summer house; there is a cast iron pot in the bottom right hand corner, typical of those made by Darby in the eighteenth century. *Right*, photograph is a chapel.

Discussions in 2012, with the curator, Bob Powell, revealed that the museum did not have a formal policy on building acquisitions, and largely took what they were offered, but did reject some buildings that were inappropriate. Bob had the opinion that corrugated iron buildings were definitely part of the Highland vernacular, and the definition should not exclude relatively recent buildings.[472] Unlike the other museums discussed here, the Highland Folk Museum has a robust policy for repairing corrugated iron. Any badly damaged material thought to be beyond repair was automatically replaced with reclaimed materials.

There are interesting contrasts between the treatment of corrugated iron at the Highland Folk Museum and at St Fagans. The Highland Folk museum makes a prominent feature of its corrugated iron collection including a small interpretive film which showcases them.[473] In comparison, St Fagans makes only slight mention of corrugated iron in their main publicity brochure.

[472] Bob Powell, interview with the author, August 2012.
[473] 'Welcome to Britain's First Open Air Museum,' Highland Folk Museum, High Life Highland, accessed 13 August 2019, https://www.highlifehighland.com/highlandfolkmuseum.

4.4.4.3 The Weald and Downland Living Museum

When the museum opened its doors to the public in 1970 it was known as the Weald and Downland Open Air Museum. The aim was to rescue vernacular buildings from the South East of England, and to inspire and educate the general public about historic buildings. Since then, the museum which covers a forty-acre site, displays over fifty historic buildings, of which one is made from corrugated iron: a tin chapel, reconstructed in 2013. There is another corrugated iron building in storage.

Figure 4.76. The relocated tin chapel at the Weald and Downland museum, 2016. The picturesque setting is very important to the Weald and Downland, and it encourages many visitors. Photograph by the author.

It is difficult to overestimate the contextual importance of the picturesque setting of the Weald and Downland museum. Not only is it a vital element in visitor enjoyment of the site - it is a wonderful place for picnics and for children to run free - it also provides a powerfully picturesque setting for all the buildings. There is no doubt that this picturesque context has a major effect on perceptions of the buildings within it, as well as being a major element in the

success of the Museum, enabling it to attract around 150,000 visitors every year.[474] The corrugated iron chapel borrows a hazy romantic nostalgia from this context. This contextual enrichment is much more limited at Avoncroft and positively absent at the Highland Folk Museum, whether bleakness of the setting positively reinforces the theme of marginal struggle inherent in Highland life. At St Fagans, the village environment provides a significant contribution to the narrative of Welsh rural life and enhances the cultural significance of the corrugated iron buildings in that setting.

An interview with Richard Palethorpe, director of the Weald and Downland museum in 2012 revealed that the collection policy at the museum depended on the museum curator. Ten years previously it had not been possible to add a corrugated iron building to the collection, as it did not fit in with the curator's vision for the museum. Recently, after a change of curator, a new vision for the museum included a corrugated iron chapel which was considered '…just the right sort of building as a large number of Weald villages did have tin churches.'

4.4.4.4 The Avoncroft Museum of Historic Buildings

Founded in 1963 as England's first open-air museum,[475] it opened to the public in 1967 with the aim of collecting buildings from the Midlands region of England. It has always been a museum dedicated to rescuing buildings that are severely threatened by neglect or demolition and sees corrugated iron buildings as an integral part of the collection. The three buildings corrugated iron buildings on display are a chapel, an Anderson shelter and a garage.

[474] 'Corporate Profile,' Weald and Downland Living Museum, accessed 6 May 2018, http://www.wealddown.co.uk/corporate-profile/.
[475] St Fagans is earlier, but is not an open-air museum as such. It is rather a folk museum. Nomenclature of these museums is imperative to their outcomes.

Figure 4.77. Avoncroft Museum of Historic Buildings. *Left*, the Anderson shelter. *Right*, the corrugated iron chapel. Photographs by the author.

The table in figure 4.78 has recorded the different aims and opinions given by museum directors on whether corrugated iron could be considered part of the vernacular tradition.

Comparative Skansens
Do corrugated iron buildings fit into the vernacular tradition, and hence your museum as part of your buildings collection?

Name	vernacular	Aims of the museum	Are you happy to have them as part of your collection	Number on display?	Date	Number in storage
St Fagans Museum 1948	yes	A folk museum reflecting Welsh life.	Provided the buildings are created by the craftsmen whose workshop it is, rather than being a prefabricated building from a catalogue.	5+1	1988-2011	no
Weald and Downland Museum 1970	yes	The museum aims to create a picturesque vision of rural life in the South East of England.	Yes, now, but probably not 10 years ago. It depends on the aims of the curator.	1	2013	yes, one chapel
Avoncroft museum of Historic Buildings 1963	no	The museum aims to collect most buildings that need rescuing from the Midlands area of England	They fit well into the museums aims, despite not, in their opinion, being part of the vernacular.	3	1995-2014	no
Highland Folk Museum 1944	yes	To collect buildings and other artefacts reflect the rapidly disappearing Highland life.	Yes, very much part of the Highland tradition.	4	1987-2012	no

Figure 4.78. Table showing how comparative skansens fit into the vernacular tradition. Data drawn from the questionnaires sent to the directors of the four Skansens.

The founding aims of all the museums have remained important and continue to inform the decisions made when deciding which buildings should be included in the collections. St Fagans was set up as a folk museum, reflecting rural Welsh life. It includes corrugated iron buildings only as an incidental setting for the rural craftspeople who occupied them. In contrast, the Avoncroft museum feels that corrugated iron buildings are not part of the vernacular, but it is happy to include them as they reflect the development of the traditional building stock of the West Midlands. The Highland folk Museum continues to see corrugated iron buildings as a vital reflection of the Highland vernacular building tradition, and the Weald and Downland Living Museum somewhat belatedly has accepted corrugated iron as an integral part of building history in the South East of England.

4.4.5 Conclusion: Challenges and Possibilities

St Fagans has a number of corrugated iron buildings, which are intended as illustrations of the buildings used by rural craftsmen. Some, but not all, have been moved to the site because they were under threat of demolition. Alongside the relocated buildings are two that are modern constructs, whose real function is to act as stage scenery in support the narrative of Welsh rural life.

Perhaps surprisingly, the museum feels the corrugated iron buildings are part of the vernacular, but only if they constructed by the craftsmen who use the buildings, and made from sheet corrugated iron, and not bought as a prefabricated building.

St Fagans museum raises questions about how the museum values its corrugated iron buildings. There are over fifty on display and only two of these were on the estate when the museum was created. Out of these fifty, thirteen are listed but this does not include any of the five corrugated iron buildings.

The visitor's guide to St Fagans is written with the general public in mind and attempts to highlight which buildings which are most significant. Analysis of the guide reveals the curatorial perceptions of the corrugated iron buildings at St Fagans. Over fifty buildings are described, but the only corrugated iron example to be illustrated is the clog-maker's workshop.[476] Of the remaining corrugated iron buildings, one is a replica, and the other two, the barn at the farmhouse and the Anderson shelter, are not mentioned at all.

The findings of this research suggest that the corrugated iron at St Fagans is seen by the museum largely as an adjunct to their attempt to display intangible heritage. It is scenery whose only real value lies in providing a physical stage for the presentation of the museum's narrative. This minimal concern for the corrugated iron buildings at St Fagans, is highlighted by the contrasting attitudes taken at the Highland Folk and Avoncroft museums, where these buildings are valorised.

Despite corrugated iron buildings at St Fagans being neither designated nor having a prominent profile in the visitor's guide, do they gain considerable status form the inclusion in a Skansen. Whether this borrowed status translates into practical protection is debatable. Recent changes in policy at St Fagans appear to demonstrate an increased concentration on the intangible narrative supported by the buildings rather than on the buildings themselves.

[476] *St. Fagans National History Museum, Visitor Guide*, 5th ed. (Cardiff: National Museum of Wales, 1998), 47.

4.5 Conclusion of the Case Studies

4.5.0 Introduction

The case studies have examined and compared ways that specific corrugated iron buildings gain valuation, cultural significance and protection in a wide variety of contexts.

4.5.1 Protection

There is little evidence to challenge the assumption that the listing system offers practical protection to buildings. However, this research suggests that the reliability of the protection offered to corrugated iron buildings by the designation system is questionable.

At Cultybraggan, the Category A listed status of some of the huts has contributed to securing grant aid for their repair. The protection offered by Category B listing to the bulk of the huts is much less certain, and it is quite possible that the Comrie Development Trust will have to cannibalise some Category B huts to repair others. Such a repair strategy would most likely not be permitted if the buildings were traditionally constructed in stone. It also raises serious questions about the protection of curtilage that is offered by designation. As the site contains Category A listed buildings, one possible legal interpretation is that the whole site is covered by that listing.

St Fillan's Chapel again raises fundamental questions about the practical administration of listed status. After the repairs, its status was downgraded from Category B to Category C. The reasoning behind this has not been explained to the architect or the owners. It may signify a change in the perception of the value of corrugated iron on the part of Historic Environment Scotland, or it may illustrate a misperception of the extent of the repairs. The downgrading, together with Historic Environment Scotland's failure to take any enforcement action against the local authority or the owners of the Aberfeldy

chapel, support the conclusion that institutional perceptions of corrugated iron's value have changed since these two buildings were first listed.

St Fagans illustrates an anomaly in the way that designation is applied in Wales. In England and Scotland, moving a listed building automatically triggers its de-listing, but at St Fagans buildings have been listed after their re-erection at the museum. Listing one building but excluding another is a positive statement that the excluded building has low cultural significance. None of the corrugated iron buildings at St Fagans are listed, which is a telling statement of their significance in the eyes of the museum. This lack of significance is likely to translate into a practical lack of protection of the corrugated iron buildings.

4.5.2 Context

The Balmoral ballroom benefits from the context of a royal estate. Even though the Factor for the estate was unaware that the building was designated at Category A, it was still being effectively protected and maintained. This is entirely due to a context which values stability and continuity and has sufficient funds to maintain even buildings that it does not understand.

St Fillan's Church at Killin has a benign context in two ways. Killin is a tourist destination and the church is perceived to make a positive contribution to the picturesque, tourist friendly, townscape. It is also a statement of ecumenical harmony which appears to be strongly attractive to many of the residents of Killin.

Cultybraggan Camp has the most complex relationship with its context of all the four case studies. The community of Comrie has taken ownership of the camp in every sense, physically, financially and emotionally, and by doing so has elevated the camp's physical context into the main factor driving its protection. This is supported by the Comrie Development Trust whose

existence demonstrates a commitment to the continued use and maintenance of the site.

St Fagans also illustrates how physical context influences the perception of corrugated iron buildings, and how context is changeable and co-dependent on the perceptions and actions of the people managing it. St Fagans provides a safe context for its buildings because the organisation and management of the buildings is specifically designed to create that context. This is both worrying and reassuring: so long as the aims of the museum management remain focused on the protection of its buildings they will remain safe, but if the focus of management changes that safety may prove to be illusory. Such a change is not inconceivable. In informal conversation, curatorial staff at the museum have pointed out that the primary interest of the museum is not its buildings, but the presentation of an image of Welsh rural life. This is particularly relevant to the corrugated iron architecture currently on display which is not seen as intrinsically valuable, and only enjoys contextual protection because it is perceived to have an educational function.

4.5.2.1 Materials

The designation system does not focus on materials, and it does not generally use construction techniques or materials as an indexing criterion. This is particularly problematic for the identification of all listed corrugated iron buildings. Although one can search the list for *iron*, it is not possible to search for *corrugated iron*; this applies to both Historic England and Historic Environment Scotland's search engines. It is only through personal coversations with employees who might have an interest in corrugated iron buildings, that it is possible to identify those bulings that are listed.

The poor recording of material use within listing descriptions also makes practical identification of corrugated iron survival very difficult. This in turn makes institutional recognition of the cultural significance of corrugated iron on the basis of *age* and *rarity* almost impossible. The Balmoral ballroom is an

excellent illustration of this difficulty. Because listing descriptions do not discriminate between mild steel and wrought iron the technical significance of the ballroom is not properly recorded.

4.5.2.2 Perception

Academic perceptions of value are not likely to be shared by the casual tourist. St Fillan's Church is a good example of this: the congregation who actively use the church may have a different set of perceptions of its value from those of the tourist. The former will be aware of its historical significance and acutely aware of its lighting and heating, whereas the latter is more likely to appreciate the incongruity of corrugated iron a context dominated by stone buildings.

The perceptions of every group, irrespective particular interests, are likely to be strongly influenced by association. This is true of both the Balmoral ballroom and the Cultybraggan Camp. The ballroom is associated with Queen Victoria and the interest of Prince Albert in new technology, whilst the camp holds a narrative of war, imprisonment and murder. It is hard to imagine any two buildings whose associations are so markedly different, and yet equally powerful. Neither monument would enjoy the same level of protection and maintenance effort if it were not for these associations.

4.5.2.3 A Hierarchy of Significance

It is likely that all the Skansens operate an informal hierarchy of significance for their exhibits, with some buildings seen as possessing more cultural significance than others. Although not at the top of these hierarchies the corrugated iron buildings at Avoncroft and the Weald and Downland, are quite definitely an integral part of the collections. At the Highland Folk Museum and at Avoncroft they appear to be equal in status to any of the other exhibits. At St Fagans their conservation value is held to be low. At Balmoral there was no

perception of conservation value, high or low: the significance of the ballroom was simply not recognised.

Skansens, by definition, are environments where the conservation value of buildings might be expected to be based on sound philosophical principles. Why would a museum take on a building without first considering its cultural significance? However, the variety of valuations between different museums suggests that a coherent universal system of conservation valuation has yet to develop. This research suggests there is a pressing need for a system of conservation valuation that elevates the significance of materials technology and function. Such a rebalancing of criteria used to assess conservation value would greatly increase the chances of survival for historic corrugated iron buildings. The most serious threats facing corrugated iron are the negative perceptions based on unchallenged acceptance of the elite values generated in another age.

Synthesis of the data gathered during this research suggests that elite values still hold sway amongst the managers of the designation system, despite gestures towards thematic listing and the publication of guidance for the conservation of new materials. The designation system assumes that the accretion of cultural significance by virtue of *age* and *rarity* is slow and imperceptible. This means that relatively modern corrugated iron buildings can be culturally significant, but they have to meet exceptionally stringent tests to merit that status. Until the designation system adopts a broader system of valuation the cultural significance of corrugated iron is unlikely to be properly recognised.

4.6 Conclusion

This dissertation has set out to explore the cultural significance and conservation challenges presented by historic corrugated iron architecture. To do so it has posed and answered three key research questions. Firstly, why do corrugated iron buildings not achieve cultural significance; secondly, why are corrugated iron buildings' role in British history rarely recognised by either heritage authorities or the wider public; and thirdly, why is it so difficult for these structures to be designated with listed building status? To answer these questions, I have used this thesis to trace the history of corrugated iron, how it came to be used in building, and the type of buildings in which it was used. This exploration placed the history of corrugated iron within the general history of the iron industry, but, more importantly, examined how we value corrugated iron buildings in relation to other building types. This examination has provided in-depth consideration of how cultural significance is accorded to different architectural styles and materials by reviewing the values and attitudes which underpin this attribute. Major historical events and processes such as war and industrialisation have also been examined for their role in creating negative associations between poverty and inequality, deprivation and destruction and suffering. By comparing the cultural significance given to corrugated iron buildings in Australia with those in Britain the question of why there is such a pronounced variation in the perception of these buildings from country to country. Why in the past traditional elite values which dominated the designation of buildings still persisted, despite the Burra Charter and the general democratisation of values, corrugated iron buildings are still not being listed.

Three events needed to be in place before it was possible to invent corrugated iron for use in buildings. Increase in trade and hence wealth in the seventeenth and eighteenth centuries in Britain created the money which gave time to develop new skills and materials. Merchants had need of easily accessible warehouses at the dockside to unload their goods. Without the ability to roll the wrought iron into large, flat sheets it was not possible to make corrugated

iron. The process was long and arduous and many challenges had to be developed to achieve this.

Corrugated iron buildings deserve to enjoy an elevated cultural significance because of their genuinely important historical narrative. Corrugated iron buildings have been in use for nearly 200 years. The patent for using corrugated iron in buildings was taken out in 1829; the development of the concept of the corrugated iron buildings as a system was well underway by the 1840s, and some of the nineteenth century's most innovative buildings were being made in the 1850s. The history and development of the material illustrate advances in Victorian education, the organisation of networks of cultural exchange (in this case the Institution of Civil Engineers), technical advances in the metal industries, and the role played by Prince Albert in modernising the monarchy and giving it a leading role in the support of new technology. The narrative of corrugated iron also highlights the development of human skills of research in the metal industries, the organisation of mechanisms to effectively distribute capital, the development of docks and buildings, and the practical impacts of the growth in trade resulting from industry and empire.

Corrugated iron buildings represent a significant part of the historical narrative of Britain, particularly in the nineteenth century, and have played a major role in the development of the built environment. Through the design and innovation of engineers and fabricators, they have also made a significant contribution to the development of colonial economies, the conduct of war, religious life and the development of agricultural architecture.

Implicit in the development of corrugated iron is its use as an integral part of a building system. Although corrugated iron was neither the first nor the only material used by the pioneers of prefabricated buildings, it has been crucial to the successful development of those systems. The success of prefabrication, by reducing costs and cutting on-site building time has profoundly changed societal expectations of how and where we can live and work. In short, the

historical significance of corrugated iron should not be limited to the material itself: it has been an engine of social change.

Part of the narrative of corrugated iron belongs to the work of the engineers; it was a crucial material in the design of the roofs of the naval slips in dockyards such as Chatham, and as a cladding material for the innovative Boatstore at sheerness docks, both designed by William Scamp and Godfrey Greene, both engineers and surveyors. Without corrugated iron it would not have been possible to cover the large buildings which contributed so much to the development of the British navy.

Why have corrugated iron buildings become so culturally disliked?
Apart from religious buildings, one of the few types of buildings made from corrugated iron for social purposes was the forerunner of the Victoria and Albert museum (V&A). The Brompton Boilers, as the corrugated iron buildings were cruelly dubbed, unfortunately failed to fulfil their design and function adequately, and had a major, lasting impact on public and professional architectural attitudes to corrugated iron. This building was one of the few opportunities in Britain to create a monumental piece of architecture from corrugated iron. It is unfortunate for the survival of corrugate iron that the material has continued to be closely associated with this failure.

Further strong associations have developed from the temporary housing programme which took place after the Second World War. In the early 1950s newly married demobilised servicemen and their young families needed somewhere to live. Bombing damaged much of the national housing stock and Nissen huts provided an answer for temporary housing needs. In December 1947 a debate was held in the House of Commons. The MP for Huntingdon, Mr David Renton, propagated the idea that some people would be grateful for a Nissen hut to live in:

> …the men who are living in these unconverted former Service huts are themselves ex-Service men, and we have to remember that until their demobilisation they were not in a position to be on the look out for houses. They were, so to speak, at the bottom of the lists of the housing applications which started to be made as the

> war approached its end. That is the main reason why those ex-Service men had to scrounge round for anything they could find, and many of them have preferred to live in Service huts than live as lodgers or with their in-laws, or in conditions of squalor due to overcrowding which they might otherwise have to face.[196]

Nissen huts however, though suitable for service men, were not designed for housing young families. In most cases heating was a particular problem in the winter. Many of the huts were heated by cast iron stoves but the cost and availability of coal or coke made it preclusive to poorer families. Consequently, there was a continuous problem of condensation on the walls through the winter months. Living in Nissen huts also had the added problems of bad access to washing facilities,[197] no service roads and no street lighting.[198]

These problems were noted by a Mr Gallacher, MP for Fife West, who in the same debate responded by suggesting that:

> I am not too hopeful that the huts will provide such homes. In my constituency, in Leslie, I was round visiting some huts occupied by squatters who were living in conditions that were appalling. There was an appalling lack of amenities, so far as sanitation was concerned, that would horrify any hon. Member who saw it.[199]

Not only would 'any hon Member' be horrified, but also the residents of the Nissen huts lives in them. One complained stating that, 'The hut was very damp in winter, your clothes and shoes and everything were spoilt,' and

[196] David Renton, speech to the House of Commons, 9 December 1947, *Hansard Parliamentary Debates*, vol. 445, cols. 936–37.
[197] Gerald Williams, speech to the House of Commons, 11 April 1951, *Hansard Parliamentary Debates*, vol. 486, col. 1151.
[198] William Deedes, speech to the House of Commons, 11 April 1951, *Hansard Parliamentary Debates*, vol. 486, col. 1149.
[199] William Gallacher, speech to the House of Commons, 9 December 1947, *Hansard Parliamentary Debates*, vol. 445, cols. 941

another that ‘it has very basic living, cold with condensation problems in winter’.[200]

These experiences have perpetuated into the memories of the children and grandchildren of those who lived in them, and it is from these memories that we get some of the cultural dislike of corrugated iron buildings.

The persistence of John Ruskin and William Morris’s image of an idyllic rural life threatened by the ‘pestilence’ of corrugated iron is neither wholly false nor particularly accurate. We selectively remember the charm of thatched cottages and choose to forget that coating the thatch with corrugated iron was little short of an economic miracle for those living with leaking roofs. The contribution to the general quality of life made by industrial products such as corrugated iron is frequently dismissed because it conflicts with this Ruskinian narrative of idyllic rural life.

Both expert and public perceptions of the cultural significance of corrugated iron have come to be influenced more strongly by its failures than by its successes.

What other factors are affecting the valuing of corrugated iron buildings?

In Britain, despite the rich variety of corrugated iron buildings which have contributed to our national history as well as the vocabulary of architecture, perceptions of its cultural significance are still diminished by its negative associations. These perceptions directly inform institutional attitudes towards statutory protection for corrugated iron buildings.

The research has suggested that the reasons for the low cultural significance accorded to corrugated iron buildings are varied, complex and deeply rooted in national cultural development. Cultures that are associated with frontier development, or who have seen great benefits from industrialisation, perceive corrugated iron as worthy of conservation. It is seen as affordable,

[200] Quoted in ‘Huts for Homes?,’ *The Museum of Thin Objects* (blog), accessed 22 August 2020, https://inlanding.wordpress.com/2013/02/12/nissen-huts-2-huts-for-homes/.

transportable, flexible in design, and strong. Its utilitarian affordability has meant that all individuals can acquire it easily. This has made it symbolic of the struggle for survival in harsh conditions.

Corrugated iron was a key material for the new settlers and adventurers of Australia and New Zealand. Modern antipodeans see corrugated iron as a material that allowed pioneer settlers to survive and succeed. Prefabricated building systems made from corrugated iron were exported from Britain to the frontiers, and enabled the Australian pioneers to settle successfully in a place where a lesser material would have meant failure. It is no wonder that its cultural significance is now celebrated; the Australian National Trust has gone to considerable efforts to conserve and display early corrugated iron buildings, and Australian academics have written learned papers on them;[201] conferences are held to discuss them; a national stamp has been produced showing a picture of a corrugated iron building, and it is favoured for use by modernist architects. In this culture, corrugated iron is seen as a material to be celebrated. Twenty years ago Anne Warr in 'Corrugated Iron – Options for Repair', stated that:

> Thus, although corrugated iron has only been in production for 170 years, it has undergone numerous changes to its constituency, shape, size and finish. To replace a piece of 19th century corrugated iron with its currently available equivalent means replacing iron with steel of a different thickness, finish and possibly pitch. The profiled steel of today is not the corrugated iron of the nineteenth century. Nineteenth century corrugated iron is irreplaceable, and modern equivalents can only be a rough substitute. Once it has been determined that the corrugated steel has significance, for historic, scientific or aesthetic reasons, then the case for retaining and preserving the steel is established. Similarly, if the corrugated steel is not significant, the case for replacement may be clear.[202]

[201] Miles Lewis, Pedro Guedes and Anne Warr all work in the Antipodes.
[202] Warr, 'Corrugated Iron – Options for Repair,' 6.

The research has revealed striking differences between the perception of corrugated iron buildings in Britain and those in Australia and New Zealand. In Australia, corrugated iron is valued for the contribution that it made to the lives of the early settlers. In England corrugated iron has never fulfilled such a vital place in economic and social life, and the difference in valuation between here and Australia reflects this. For the early settlers in Australia, cheap prefabricated shelter was literally a matter of life or death. To some extent the deployment of corrugated iron chapels and housing in the Highlands of Scotland does mirror the Australian experience. The harshness of the Highland environment, together with its relative poverty, creates 'frontier conditions' somewhat akin to those endured by the early Australian settlers.

The high value accorded to corrugated iron by Australians is also a reflection of antipodean scepticism regarding European perceptions of cultural significance. Australia's early colonists had been explicitly rejected by Britain, and in return they had no reason to venerate any aspect of European culture. This produced a cultural open-mindedness that that did not overvalue the romantic attitudes of Ruskin and Morris. That same open-mindedness, and willingness to challenge accepted perceptions, has been demonstrated across intellectual activity. The democratisation challenges thrown down by the Burra Charter were not accidental, but rather naturally representative of Australian attitudes towards European cultural assumptions.

However, if a culture, such as that in Britain, endorses the concept of the picturesque, as developed by the Georgians and the Romantic movement, then stone, thatch and wood will be appreciated instead of corrugated iron. These materials fit into a picturesque concept of the natural environment, where buildings appear to be at one with and created from nature. When in decay and ruin, stone buildings conform to the concept of the picturesque, and are a vital component of the eighteenth and nineteenth century ideal of Arcadia. These prejudices about building materials matter. Britain became culturally invested in the development of idealised landscapes as part of the nineteenth century Romantic reaction against industrialisation. This love affair

with the picturesque has proved enduring, and it is a vision which corrugated iron does not compliment.

Recognition of cultural significance by the general public was found to be more complex and harder to define. Riegl's analysis of the conflicting public appreciation of *newness* value and of the patina of age was found to be completely accurate. As the research developed it became clear that designation criteria are not being evenly applied across all building types and styles. Corrugated iron buildings and Modernist architecture are routinely subjected to more stringent application of conservation principles than are traditional forms and styles. This is officially explained by citing the *newness* value and lack of *rarity* of both corrugated iron buildings and Modernist architecture. However, even limited research shows that corrugated iron buildings can be both old and rare. Modernism is almost always rare even though it is not particularly old. This research suggests that corrugated iron buildings suffer prejudicial evaluation for cultural significance based on factually unsustainable perceptions of its age and rarity. In addition to these perceptions, they are also unfortunately dogged by misperceptions of its permanence and adaptability.

This research has involved in-depth evaluation of the history and workings of the designation system. This has been shown to have many merits, but also to have serious weaknesses. The prevailing dominance of elite values will need to broaden if corrugated iron and Modernist buildings are to be properly protected. Although theoretically the criteria for designation is all-encompassing, and includes all types of buildings, in reality this is not the case.

The criteria set down in the documents of Historic England and Historic Environment Scotland are often not applied or adhered to in corrugated iron buildings. Though Aberfeldy Chapel and Dunelm House are as dissimilar as any two buildings could be, they both illustrate the same key weakness in the designation system. The ultimate executive authority over designation decisions is vested in the Secretary of State, who is a politician and not an expert. It is hard to avoid the suspicion that political pressures, quite

unconnected with the cultural significance of a building, influence initial designation decisions and the practical administration of designation.

The failure to take effective enforcement action to protect the Aberfeldy Chapel and the unexplained decision to downgrade the listing of St Fillan's Church both illustrate how designation is applied to corrugated iron in a very particular way. A corrugated iron building may be listed, but the level of protection offered is not same as that given to traditionally constructed buildings enjoying the same category of designation. Two possible reasons for this are that corrugated iron does not possess the elite values or style of grand traditional buildings, and also that it tends to have few associations with major historical figures: it is architecture for those in poverty, and its intimate associations are with the forgotten poor.

It may be possible that the lack of academic study of corrugated iron is at least partly due to a perception that it is just a material with very little design or social significance. The lack of national surveys of its use and survival may also be explained because its role as a part of a system of building that promoted, and was an integral part of, social change, has not been properly recognised.

The last fifteen years have seen a growing interest in corrugated metal as a material worthy of being used in buildings designed as architectural statements.[651]

In a small way this renaissance of corrugated iron has extended into the heritage industry. Most buildings' museums throughout Britain now include a corrugated iron building as part of their collections. The act of putting corrugated iron in a museum immediately elevates the status of the building, and hence its material, so that it becomes more 'valued'. Corrugated iron is now seen as an integral part of Scotland's vernacular building tradition. It forms a major part of the exhibits at the Highland Folk Museum and the Auchindrain Township, and is certainly sufficiently accepted for Historic Environment Scotland to offer explicit advice on its conservation and repair. The statutory protection system has also been extended to include corrugated iron. For example the Golspie Drill Hall and St Fillan's Church at Killin.

However, despite this recent interest in these buildings, many striking examples continue to be destroyed. Protection by inclusion within the listing system generally appears more accidental and haphazard rather than systematic. There is very little information about why it is worth conserving such buildings, or which corrugated iron buildings are worthy of preservation. Information about repair and conservation is scant, and apart from TAN 29 and an INFORM leaflet, little is available to Scotland's builders or the man in the street.

The future of historic corrugated iron buildings in Britain will ultimately depend on improving the level of knowledge and understanding of their importance to the historical narrative of our country.

Appendix A

The Development of the London Docklands

Introduction

The driving force behind the development of the Port of London was the changing pace of trade. As Hill notes, 'Between 1700 and 1780 English foreign trade nearly doubled; it trebled during the next twenty years.'[1] The necessary development and building of London's dockland is key to the development of corrugated iron technology and without this, the patent for corrugated iron in 1829 may never have been registered.

Medieval London had no purpose-built docks, and cargoes were unloaded to wharves on the sides of the river. The tidal range of the river caused considerable problems, often breaking the backs of boats as they were stranded on the river bed by the outgoing ebb. Larger ships could not directly approach the wharves because of this problem, and had to be unloaded into lighters. These then ferried the cargo to the riverbank wharves and warehouses. Such double handling was slow, hazardous and expensive. The tide was not the only problem.

> 'By the late eighteenth century the increase in London's trade, both overseas and coastal, was producing overcrowding in the river and delays in the discharging of cargoes.'
>
> 'The numbers of vessels engaged in overseas trade that used the port increased from 1,335 in 1705, to 1,682 in 1751, and to 3,663 in 1794, and the cargo tonnage rose even more sharply, from 234,639 tons in 1751 to 620,845 in 1794. The size of ships also increased in the eighteenth century: the number of London-based ships of over 200 tons rose from 205 in 1732 to 751 by 1792. Coastal trade was said to have almost doubled between 1750 and 1796, and was growing rapidly in the 1790s, from 9,287 vessels in 1792 to 11,964 in 1795'.[2]

It was also relatively easy to steal goods from the wharves because of the low or non-existent walls protecting them.[3] This lack of intrinsic security was exacerbated

[1] Christopher Hill, *Reformation to Industrial Revolution* (London: Penguin, 1967), 226.
[2] Hermione Hobhouse, ed., *Survey of London: Volumes 43 and 44: Poplar, Blackwall and Isle of Dogs* (London: London County Council, 1994), British History Online, accessed 22 August 2020, www.british-history.ac.uk/report.aspx?compid=46493.
[3] Mornement and Holloway, *Corrugated Iron*, 10

by the lack of any organised formal police force.[4] The situation had become so bad that by the mid-1790s, a committee of merchants supported a proposal to construct purpose-built docks. Their demand for this system of commercial docks eventually received backing from the Corporation of London, who had overall responsibility for the river. The Corporation became aware that, unless improvements were made, London would lose trade to other British ports.[5]

This new perception of the need to organise docks and warehouses more effectively coincided with the engineering developments that made possible a new approach to dock design. This new approach was based on the idea of non-tidal basins separated from the river by locks and though the locks restricted the passage of shipping, this was far outweighed by their maintenance of a near constant level of water within the dock. These 'wet docks' or 'floating harbours' removed all the risks for new larger ships being grounded and being damaged by a falling tide. The building of the docklands of London in the eighteenth century was an enormous civil engineering project.

Figure A.1. Howland Great Wet Dock (drawn 1717, though originally constructed 1696). The basin was sheltered by deliberately planted trees along the quaysides. Note the two small dry docks either side of the entrance to the basin. These have lock gates whereas the main basin does not. It is probable that the water level in the main basin was maintained by a cill. There were no warehouses.

The first wet docks to be built in the Port of London were the Blackwall Dock in 1614, which was owned by the East India Company, and the Howland Great Wet dock in 1695, located on what is now the Surrey dock site south of the river Thames. Howland Dock was built as part of an eighteenth-century estate improvement rather than being part of an integrated attempt to generally improve facilities at the Port of London. With its two dry docks, basic entrance arrangements and compete lack of warehousing, it was designed as a facility for refurbishing ships and not as a way of unloading and loading goods for transport. There was no new dock construction till

[4] Adams, *The Prometheans*, 177.
[5] Hobhouse, *Survey of London*.

1802, when the West India docks were constructed across the Isle of Dogs, after which further dock development became increasingly rapid.

Docks	Date	Architect/Engineer	notes
Howland, Rotherhithe (south bank of the Thames)	1695	John Wells - shipwright	Built for refurbishing ships; it was apparently never provided with significant warehousing or landside transport links, and was eventually incorporated into the development of the Surrey Docks.
West India Docks	1802	William Jessop - engineer John Rennie - engineer Thomas Morris engineer	The docks had their own road to the city warehouses and a canal, which was built to reduce the waiting time for goods, such as rum, to be processed through the customs. This had previously had taken up to three months to process.
East India Docks	1803	Ralph Walker engineer	Connected from the north-east of the West India docks, to the Thames though an eastern exit. It was used for trade in tea, spices, indigo, silk and Persian carpets.
London Docks	1805-1815	Daniel Alexander - surveyor John Rennie – engineer Henry Robinson Palmer - engineer	Built close to the city for the import of expensive goods, such as ivory, spices, coffee and cocoa. Cost £5.5 million.
St Katharine's Dock	1828	Thomas Telford – engineer (docks) and Thomas Hardwick (Buildings)	To Build this dock nearly 1,250 houses were pulled down, and 11,000 people made homeless. When the dock opened it was already too small to take the new, larger stream powered vessels and eventually amalgamated with the London Dock
Royal Victoria Dock	1855	George Parker Bidder - engineer	For large steam ships and the first dock to be connected to the national railway network.

Millwall Dock	1868	John Fowler-engineer	Included tramways and two pumping steam engines on the south side of the estate to drain the works.
Royal Albert Dock	1880		An extension of the Royal Victoria dock which eventually added King George V dock.

Figure A.2. Construction dates for the London docklands up to the end of the nineteenth century.

Secure warehouses were an integral part of the new dock developments, and an excellent example was the warehouse development next to the West India Docks. Quay-side warehousing was not part of the original scheme here, and the first stage of construction had included a new road to link the docks with existing warehouses in central London.[6]

Figure A.3. 'West India Docks' by Rudolph Akermann (1808). Image from Museum of London.

Developing and building the London Dock

[6] Hobhouse, *Survey of London*.

Both the West India docks and the London docks were built at the same time (1800–1802). This was done under the patronage of two different groups of merchants who, despite different trade interests, had a united aim of making the handling of goods faster, safer and more convenient, and of course, to make more profit.

Figure A.4. Proposed layout for the West India dock showing the extensive planned warehousing.

Acquiring the land and raising the finance for the London Dock project was not easy as there was considerable opposition from watermen, lighter-men and porters who felt their jobs were threatened and demanded compensation. The area was not vacant, as many houses and a rope works were already established on the land designated for the docks. Although an overall plan was laid out in 1797 by surveyor Daniel Alexander,[7] it took till 1800 for an act of parliament to be obtained for the construction of the dock, and till 1805 for the construction begin. The scale of the project is evident from the enormous cost of £1,200,000. To recover this money, the London Dock Company had a monopoly on trade for wares such as tobacco, rice, wine and brandy for twenty-one years.[8]

[7] Daniel Alexander (1768–1846), architect and engineer. Acted as surveyor to the London Dock Company between 1796 and 1831. He also designed lighthouses and prisons.
[8] Dan Cruikshank, *The London Dock: A History and a Description of the Current Proposals and their Effect on the Listed Warehouses in Pennington Street*, Planning Submission (ACS

Using Iron at the London Dock

Given the ambition behind the construction of the new dock, as evidenced by the successful raising of so much capital, it is not surprising that the new warehouses were also ambitious. The aim of the designers of these was to create a set of buildings which would be a showcase to the world of Britain's power in war and trade:

> the dock architecture was to possess a noble and appropriate beauty in which sober neo-classical details and small amounts of white Portland stone offset the heroic, sombre and beautiful wrought brick construction.[9]

So successful was it that the docks became a tourist attraction for the late Georgian residents of London who came to wonder at the fantastic warehouses (but also to taste the rum and brandy that was stored in the vaults).[10]

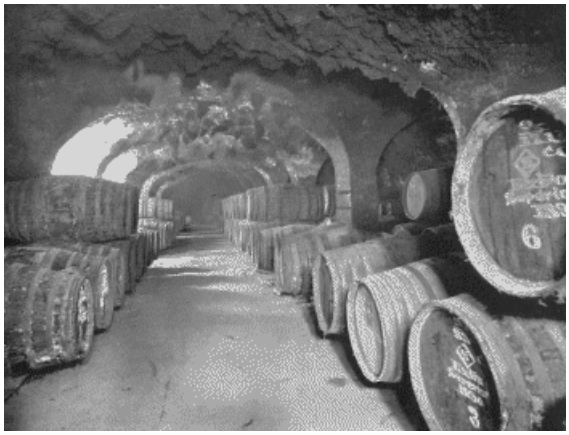

Figure A.5. The wine vaults at St Katharine's dock. 'London Docks,' *The Dictionary of Victorian London*, accessed 28 August 2020, http://www.victorianlondon.org/thames/londondocks.htm.

As Dan Cruickshank notes in his report for development of the Pennington Street warehouse,[11] the construction of the warehouses continued over a considerable period. The vaults were the first part to be built, so that a safe, secure place for the valuable goods was created as soon as possible. When the docks were opened in 1805, only the vaults had been completed and the warehouse stacks were still to be built. Initially these buildings were huge timber framed structures, but by the time the final stack was constructed, the new technology of cast iron stanchions had been adopted. The idea of using cast iron in warehouse buildings was new, despite its earlier use in mill buildings like Ditherington, which had used cast iron in 1796 – ten years earlier. An example of the use of cast iron for columns is shown in the tobacco

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Ltd for News International, January 2009), accessed 19 April 2012, www.planreg.towerhamlets.gov.uk/WAM/doc/Other-506655.pdf, 13.

[9] Cruikshank, *The London Dock*, 13.
[10] George Ticknor, *The Remains of Nathaniel Appleton Haven* (Boston: Hilliard, Gray, Little and Wilkins, 1828), 302.
[11] Cruikshank, *The London Dock*, 10.

warehouse at the London Dock, designed by surveyor Daniel Alexander between 1811 and 1814, which he made use of to form the supporting structure of branching columns of cast iron erected over brick vaults. Built at a time when timber was scarce, it is a good example of the innovative thinking abounding at the dock development at that time. The listing description gives the details of the building and notes that 'the skin floor is one of the earliest surviving examples in southern England of the use of cast iron in building'.[12]

The fascination with this new use of iron is captured by George Ticknor, an American lawyer and journalist who visited the warehouse soon after its completion:

> I have seen one object which very unexpectedly excited my highest admiration and astonishment. It is the tobacco warehouse in the London Dock. This is a building about fifteen feet high, but covering upwards of five acres of ground. The roof is supported by cast-iron pillars, and is covered with shingles of cast-iron, instead of slate. Under the whole of this immense building is a cellar, in which several hundred rows of arches, intersecting one another every twenty or thirty feet, support a stone roof forming the floor of the warehouse above. We provided ourselves with torches, and our whole party walked through it. We almost imagined ourselves in the catacombs of Egypt; and if sixteen thousand pipes of wine, which lay around us, could have been converted into so many mummies, the illusion would have been complete. It is said that the Emperor Alexander expressed more admiration at this and at the warehouse than anything else he had seen in England.[13]

From the point of view of this research it is the gradual replacement of timber with cast iron that is the most important feature of these warehouses whose scale pushed traditional building techniques to their limit. It is no surprise that as part of this culture of innovative use of iron that Henry Roberson Palmer developed the concept of corrugated iron for building.

[12] Historic England, *National Heritage List for England*, s.v. 'A Warehouse (Skin Floor) Including Vaults Extending Under Wapping Lane,' accessed 23 August 2020, https://historicengland.org.uk/listing/the-list/list-entry/1065827.
[13] Ticknor, *Remains of Nathaniel Appleton Haven*, 302.

Figure A.6. The Tobacco warehouse at the London dock showing the early structural ironwork. The branching supports towards the back of the building is the iron installed by architect Daniel Alexander in 1811–14. Photograph by the author (2012).

Figure A.7. ‘Tobacco Warehouse’ by Daniel Alexander. Much of the original 1812 building fabric survives (listed grade I). Image from St George-in-the-East Church, ‘Tobocco Dock,’ accessed 23 August 2020, http://www.stgitehistory.org.uk/media/tobaccodock.html.

Appendix B

Publicly visible buildings at St Fagans

On show at St Fagans National History Museum						
name	**where from**	**material**	**date**	**listing**	**date moved**	**date of listing**
Kennixton Farmhouse	Llangennydd in the Gower Peninsular	stone walls and thatched roof	16th/ 17th c	II	1955	1977
Circular Pigsty	Hendre Ifan Prosser, Pontypridd	stone	1800		1977	
Corn Mill (Melin Bropren)	Cross Inn, Ceredigion	stone +slate tile roof	1852-3		1977	
Llwyn-yr-eos Farmhouse	part of estate	stone with slate roof	19th c	II	always been there	2003
Hendre'r-ywydd Uchaf Farmhouse	Llangynhafal, Denbighshire and early addition to St F	timber frame and thatch	1508	II	1962	1977
Nant Wallter Cottage	Taliaris, Carmarthenshire	Clom (Cob) and thatch				
Llainfadyn cottage	from Rhostryfan, Caernarvonshire	stone boulders and slate	1762	II	1962	1977
Cae Adda Byre	Waunfawr, Gwynedd	stone boulders and slate	early 18th c		2003	
Penparcau Tollhouse	Penparcau	stone with tile roof	1771	II	1968	1977
Derwen Bakehouse	Thespian Street, Aberystwyth	brick	1900		1987	
Tailor's shop	Cross Inn, Ceredigion	timber boarding	1920		1992	
Post Office	Blaen-waun, Carmarthenshire	brick	1936		1993	
Denbigh Cockpit	first building to be displayed	stone and thatch	prob 18th c	II	1970	1977
Gwalia Stores	Ogmore Vale, Bridgend	stone and slate roof	1880		1991	
Urinal	Landrindod Wells	cast iron				
War Memorial	Oakdale Caerphilly	stone				
Workman's Institute	Oakdale Caerphilly	stone and tile roof	1916		1995	
Pottery - kiln	Ewenni, Bridgend	stone	1800 /1900		1988	

Sawmill	Ty'n Rhos, Llanddewi	timber boarding and CI roof	1892		1994	
Rhaeadr Tannery	Rhaeadr, Radnorshire	stone with tile roof	18th/19th c	II	1968	1977
Celtic Village					1992	
Gorse Mill	Deheufryn Farm, Dolwen	stone and slate roof	1842			
Haverford West Trader's House	Pembrokeshire	stone ?	late med		2010	
Timber circle					1998	
St Treilo's Church	Llandeilo Tal-y-Bont, Swansea	stone and slate roof	12th - 16th c		2007	
Y Garreg Fawr Farmhouse	Waunfawr, Gwynedd	stone and slaye roof	1544		1984	
Hendrewe n Barn	Llanwst, Gwynedd	timber boarding with slate roof	1600		1982	
Clogmaker' s workshop	Carnhedryn, Pembrokeshire	corrugated iron				
Maestir School	Maestir, Lampeter	stone and slate tile	1880-1916		1984	
Saddler's workshop	St Clears, Carmarthenshire	no picture	1926		1986	
Llawr-y-glyn Smithy	from Llawr-y-glyn, Montgomeryshire	rubble stone walls with weatherboardig. Slate roof.	late 18th c	II	1972	1977
Communal Oven	Georgetown, Merthyr Tydfil	stone snd slate	1800		1987	
Rhyd-y-car Iron worker's houses	Merthyr Tydfil	stone and slate	1800		1987	
Type B2 Aluminium Prefab Bungalow	Gabalfa, Cardiff	aluminium (tin palace)	1948		2001	
Cilewent Farmhouse	from Radnorshire - reservoir	stone +slate , with timber frame	15th c - 18th c	II	1959	1977
Hayshed, Maentwrog	Gwynedd	slate	1870		1977	
Abernodwy dd Farmhouse	farmhouse	timber frame	1578	II	1955	1977
Capel Pen-rhiw	brought from Carmarthen	stone with slate roof	1777	II	1956	1977
Ty Gwyedd learning centre	new building				2000	

Stryd Lydan Barn	Penley in Flintshire.	timber frame+ slate	1550	II	1951	1977
Esgair Moel Woollen Factory	Llanwrtyd in Brecknockshire	stone and slate roof	1760	II	1952	1977
Boat House and net house	replicas				1973	
Summer House	Bute Park, Cardiff	sawn timber and slate roof	1880		1988	
Dovecote		stone			original site	
Cider Mill and Press	new buildings	no photo				
Corrugated iron buildings which are on show, but not included in the visitor's guide						
Bakery store						
Llwyn-yr-eos barn	Penlan Bridell farm, Boncath		1952		2009	
Saddler's workshop	Pen-pitch. St Clears, Carmarthenshire		1926		1988	
Andreson shelter	not known		c1940		1990	

St Fagans Listed Buildings

St Fagans listed buildings; started 1946							
Building	**Where from?**	**Material**	**Date of building/wall/ item**	**status**	**Date moved**	**Date of listing**	**no**
Abernodwydd Farmhouse	farmhouse	timber frame	1578	II	1955	1977	1
Barn and attached Calf Pens at Llwyn-yr-eos Farm	part of working farm	stone and slate roof	1820	II	always been there	2003	
Barn at Pen-hefyd Farm	part of Plymouth estate	stone and slate roof	mid 19thc	II	always been there	1963	
Barn to west of Pentrebane Farmhouse	part of Plymouth estate	stone and modern roof	mid 18thc - 19th c	II	always been there	1977	
Boundry walls of the Castle gardens	part of Plymouth estate	stone	18th c	II	always been there	1977	
Capel Pen-rhiw	brought from Carmarthen	stone with slate roof	1777	II	1956	1977	2
Church of St Mary the Blessed Virgin		stone	12 c	II*	always been there	1963	
Church of St Michael	south of main complex	stone	med + vic	II	always been there	1963	
Cilewent Farmhouse	from Radnorshire - reservoir	stone +slate , with timber frame	15th c - 18th c	II	1959	1977	3
Cowhouse at Pen-hefyd Farm	part of estate	brick - limewashed	1908	II	always been there	1992	
Cowshed, Stable, Pigsties, Brewery and Worker's House at Llwyn-yr-eos Farm	part of Llwyn-yr-eos Farmstead	stone and slate roof	1890	II	always been there	2003	
Curtain Walls of St Fagans Castle with attached Bothies in the Service Yard	part of estate	stone rubble	17thc -	II	always been there	1977	
Denbigh Cockpit	first buildings on estate, and display	stone and thatch	prob 18th c	II	1970	1977	4
Dovecote in Gardens of St Fagans Castle	part of estate	stone +cement render	prob 18th c	II	always been there	1977	
East Boundary Wall of St Fagans Castle grounds	part of estate	stone	17/18/ 19th c	II	always been there	1977	

East Boundary Wall of the Ilex Grove running north to the lane at Clive Cottages	part of estate	stone	19th c	II	always been there	1977	
Eastern & Western Walls of Rose Garden at St Fagans Castle	part of estate	stone	17/18/ 19th c	II	always been there	1977	
Entrance Gates and Wall forming east boundary of the Entrance Garden at St Fagans Castle	part of estate	stone	17/18/ 19th c	II	always been there	1977	
Esgair Moel Woollen Factory	Llanwrtyd in Brecknockshire	stone and slate roof	1760	II	1952	1977	5
Former St Fagans Church in Wales Primary School	part of estate	lias and slate	1851	II	always been there	1977	
Fountain to north of St Fagans Castle in the Dutch Garden	part of estate	marble	1850	II	always been there	2003	
Front Garden Wall	part of estate	stone	19th c	II	always been there	1977	
Front Garden Wall of Rose Cottage	part of estate	stone		II	always been there	1963	
Front Garden Walls of Nos 1-4 (consec)	part of estate	stone		II	always been there	1964	
Garden Wall of No. 1 The Twyn	part of estate	stone		II	always been there	1977	
Garden Wall to east of Pentrebane Farmhouse	part of estate	stone		II	always been there	1977	
Garden Walls of Nos. 3 & 4	part of estate	stone		II	always been there	1977	
Gardens House	part of estate	stone and slate roof	1865	II	always been there	2003	
Gates, Piers, Steps and Balustrade Wall of Dutch Garden at St Fagans Castle	part of estate	stone	1855	II	always been there	1977	
Great House Farmhouse and attached Barn		stone an slate	16th/17th c	II	always been there	1977	
Hendre'r-ywydd Uchaf Farmhouse	from Llangynhafal, Denbighshire	timber frame and thatch	1508	II	1962	1977	6

	and early addition to St F						
Hill Cottage	part of estate	stone and slate roof	1850	II	always been there	1977	
Implement Shed at Llwyn-yr-eos Farm	part of farm	stone and slate roof	1850	II	always been there	2003	
Italian Terraces on north-east side of Fishponds in Garden of St Fagans Castle	part of estate gardens	stone	1864	II	always been there	1977	
Ivy Cottage	part of estate	? Listing does not say	1852	II	always been there	1977	
Kennixton Farmhouse	Llangennydd in the Gower Peninsular	stone walls and thatched roof	16th/ 17th c	II	1955	1977	7
L-shaped Farmyard Range between Barn and Cowhouse at Pen-hefyd Farm	part of Penhefyd Farm	stone rubble and brick	19th c	II	always been there	1992	
Laundry Cottage	part of estate	cement render +slate roof	early 19th c	II	always been there	1977	
Laurel Cottage	part of estate	cement render +slate roof		II	always been there	1963	
Lead Cistern in the east forecourt of St Fagans Castle	part of estate	lead	1620	II*	always been there	1977	
Llainfadyn cottage	from Rhostryfan, Caernarvonshire	stone boulders and slate	1762	II	1962	1977	8
Llanfair-fach House	part of estate	plastered stone rubble and slate roof	17th c	II*	always been there	1995	
Llanmaes House	part of estate - classical villa	rendered with slate roof	early 19th c	II	always been there	1977	
Llawr-y-glyn Smithy	from Llawr-y-glyn, Montgomeryshire	rubble stone walls with weatherboardig. Slate roof.	late 18th c	II	1972	1977	9
Llwyn-yr-eos Farmhouse	part of estate	stone with slate roof	19th c	II	always been there	2003	
Lychgate at entrance to Churchyard of	part of estate	stone with slate roof	1885	II	always been there	1977	

Church of St Mary the Blessed Virgin							
Memorial to the Reverend Lisle in Churchyard of Church of St Mary the Blessed Virgin	part of estate - funerary monument	ashlar with iron railings	1856	II	always been there	2003	
No. 1 Chestnut Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 1 Clive Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 1 Quarry Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 2 Chestnut Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 2 Clive Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 2 Quarry Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 2 The Twyn	part of estate	stone with slate roof	18th/19th c	II	always been there	1977	
No. 3 Chestnut Cottage	part of estate	does not say	19th c	II	always been there	2003	
No. 3 Clive Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 3 Quarry Cottages	part of estate	does not say	19th c	II	always been there	2003	
No. 4 Clive Cottage	part of estate	does not say	19th c	II	always been there	2003	
No. 4 Quarry Cottages	part of estate	does not say	19th c	II	always been there	2003	
No.1 The Twyn	part of the estate	stone with tile roof	18th/19th c	II	always been there	1977	
North Wall of the Entrance Garden at St Fagans Castle	part of the estate	stone rubble	18th/19thc	II	always been there	1977	
Nos. 1-4 (consec) & front garden walls, Castle Hill	part of the estate	stone with tile roof	18th/19th/ 20th c	II	always been there	1963	
Nos. 1-4 (consec) & front garden walls, Castle Hill	as above	stone with tile roof	ditto	II	ditto	1963	

Nos. 1-4 (consec) & front garden walls, Castle Hill	part of the estate	stone with tile roof	ditto	II	always been there	1963	
Nos. 1-4 (consec) & front garden walls, Castle Hill	part of the estate	stone with tile roof	ditto	II	always been there	1963	
Nos.3 & 4 & Garden Walls, Cardiff Road	part of the estate	stone with tile roof	19th c	II	always been there	1977	
Nos.3 & 4 & Garden Walls, Cardiff Road	part of the estate	stone with tile roof	19th c	II	always been there	1977	
Osmington Cottage	part of the estate	stone with tile roof	19th c	II	always been there	1977	
Penparcau Tollhouse	Penparcau	stone with tile roof	1771	II	1968	1977	10
Pentrebane Farmhouse	part of the estate	rendered lias and brick+slate roof	18th/19th c	II	always been there	2003	
Privy at Llwyn-yr-eos Farm	part of the estate	stone with tile roof	19th c	II	always been there	2003	
Rhaeadr Tannery	Rhaeadr, Radnorshire	stone with tile roof	18th/19th c	II	1968	1977	11
Rhydlafr Farmhouse & The Old Byre	part of the estate	stone + timber +slate	late med/17th/19th c	II	always been there	1963	
Riverside Cottage	part of the estate	rubble stone +tile roof	18th/19th c	II	always been there	1977	
Rose Cottage	part of the estate	rubble stone +tile roof	early 19th c	II	always been there	1963	
Silver Stream	part of the estate	rubble stone + thatch	16th/18th/19th c	II	always been there	1963	
South Boundary Wall of the Stable Court including the Drinking Fountain on Castle Hill	part of the estate	stone	19th c	II	always been there	1977	
South Wall of Forecourt at St Fagans Castle	part of the estate	stone	16th/17th c	II	always been there	1977	
South Wall of the Entrance Garden separating it from the Stable Court at St Fagans Castle	part of the estate	stone	18th c	II	always been there	1977	
St Fagans Castle	part of the estate	stone and slate roof	1580	I	always been there	1977	

Stable Court at St Fagans Castle	part of the estate	stone and slate roof	1868	II	always been there	1977	
Stryd Lydan Barn	Penley in Flintshire.	timber frame+ slate	1550	II	1951	1977	1 2
Telephone Call-box adjoining Old Post Office	part of the estate	K6 GG Scott	1936	II	always been there	1989	
The Mount	part of the estate: 'picturesque'	? No mention made	19th c	II	always been there	1977	
The Old Post Office Restaurant	part of the estate	cement render and slate	18th/19th c	II	always been there	1963	
The Old Rectory	part of the estate	stone and slate roof	1858	II*	always been there	1977	
The Plymouth Arms P H	part of the estate	stone and slate roof	1895	II	always been there	1963	
Ty-capel	part of the estate	stone and slate roof	1837	II	always been there	1989	
Ty-cwrdd	part of the estate	stone and slate roof	1837	II	always been there	1989	
Upper Stockland Farmhouse	part of the estate	stone and slate roof	early 17th c	II	always been there	1963	
Wall and Railings at former St Fagans Church in Wales School	part of the estate	stone	19th c	II	always been there	1977	
Wall bounding north side & part of east side of the Mulberry Garden to north of St Fagans Castle	part of the estate	stone	19th c	II	always been there	1977	
Wall extending west from near the Dovecote in the Garden of St Fagans Castle	part of the estate	stone	17th c	II	always been there	1977	
Wall of the Churchyard of the Church of St Mary the Blessed Virgin with the attached War Memorial	part of the estate	stone	19th c	II	always been there	1963	
West & South Boundary Walls of Gardens to St Fagans Castle	part of the estate	stone	1870	II	always been there	1977	

West and North Walls of the Gardens House enclosure	part of the estate	stone	1859	II	always been there	1977	
West wall of the Dutch Garden at St Fagans Castle with the battlement wall and watchtowers	part of the estate	stone		II	always been there	1977	
Abernodwydd Farmhouse	farmhouse	timber frame	1578	II	1955	1977	1
Capel Pen-rhiw	brought from Carmarthen	stone with slate roof	1777	II	1956	1977	2
Cilewent Farmhouse	from Radnorshire - reservoir	stone +slate , with timber frame	15th c - 18th c	II	1959	1977	3
Denbigh Cockpit	first buildings on estate, and display	stone and thatch	prob 18th c	II	1970	1977	4
Esgair Moel Woollen Factory	Llanwrtyd in Brecknockshire	stone and slate roof	1760	II	1952	1977	5
Hendre'r-ywydd Uchaf Farmhouse	from Llangynhafal, Denbighshire and early addition	timber frame and thatch	1508	II	1962	1977	6
Kennixton Farmhouse	Llangennydd in the Gower Peninsular	stone walls and thatched roof	16th/ 17th c	II	1955	1977	7
Llainfadyn cottage	from Rhostryfan, Caernarvonshire	stone boulders and slate	1762	II	1962	1977	8
Llawr-y-glyn Smithy	from Llawr-y-glyn, Montgomeryshire	rubble stone walls with weatherboardig. Slate roof.	late 18th c	II	1972	1977	9
Penparcau Tollhouse	Penparcau	stone with tile roof	1771	II	1968	1977	10
Rhaeadr Tannery	Rhaeadr, Radnorshire	stone with tile roof	18th/19th c	II	1968	1977	11
Stryd Lydan Barn	Penley in Flintshire.	timber frame+ slate	1550	II	1951	1977	12

Appendix C

Corrugated Iron Churches in Scotland in date order

Church Name	Denomination	Region	Listing Ref	Date built and current status
St Fillan's, Killin	Scottish Episcopalian Church	Stirling	46364 Category **C**(S) since 2006; previously **B** since 1991	Built **1876**; extended 1885. Still in use
Royal Edinburgh Hospital	Church Centre	City of Edinburgh	27713 Category **B** since 1993	Built **1876-7**; re-erected 1884; still in use
Dalwinston Church	Church of Scotland	Dumfries and Galloway	10289; Category **B** since 1986	Built in **1881**; still in use.
Carrick Castle	Church of Scotland	Argyll and Bute	50349;Category **C(S)** since 2006	Built **1892**; closed 2008. On Buildings at Risk Register.
Holy Trinity, Motherwell	Scottish Episcopal Church	North Lanarkshire	In curtilage of 48853; Category **C(S)** since 2001	Built **1884**; church hall from 1894. On Buildings at Risk Register.
Errogie	Former United Free Church	Highland	50029 Category **C(S)**since 2004	Built after **1903**; Disused since 1987.
St Margaret's Chapel of Ease, Barnhill		Dundee	In the curtilage of 25743 Category **B** since 1991; demolished and **delisted**	Originally in Craigsbuckler, Aberdeen; moved to Broughty Ferry and then Barnhill in **1884**. In use till 1895, then a church hall.
Our lady of Mercy, Aberfeldy	Roman Catholic	Perth and Kinross	48853; Category **B** since 2002; **delisted**	Built **1885;** Moved and rebuilt at Dull 2006.
Sanna	Church of Scotland and possibly Free Church	Highland		**1890**
Syre	Church of Scotland (former Free Church)	Highland	7147 Category **C(S)** since 1987	Built **1891**

Elgol	Church of Scotland	Highland		**1900;** possibly by Cowieson and Co., Glasgow
Scourie	Free Presbyterian Church	Highland		**1900**
St Columba's Brora	Scottish Episcopal Church	Highland		**1900,** by Spiers and Co, Glasgow
Skerry Free Church	Free Church	Highland		**1900** F Smith and Co, London
Tomatin	Church of Scotland	Highland		**1903**
St Michael's and All Angels, Elie	Scottish Episcopalian Church	Fife		**1905** Spiers and Co., Glasgow
Strathy and Halladale	Church of Scotland (former United Free)	Highland	12992 Category **B** since 1991	Built **1910**. Proposed redevelopment to include a community hall.
Pirnmill	Church of Scotland	North Ayrshire	49535 Category **C(S**) since 2003	Built c**1920**; Probably in use as a church hall
Kinlochewe	Church of Scotland	Highland		Spiers and Co., Glasgow

Key

Listed

Listed and still in use as a church

Appendix D

Survey of Skansens in Museums and Building Collections

Comparative Skansens					
Do corrugated iron buildings fit into the vernacular tradition, and hence your museum as part of your buildings collection?					
	Do you consider them to be part of the vernacular?	**Are you happy to have them as part of your collection**	**How many to you have on display?**	**When were they erected?**	**Do you have any in storage?**
St Fagans Museum	yes	provided the buildings are created by the craftsmen whose workshop it is, rather than being a prefabricated building from a catalogue	5	1988-2011	no
Weald and Downland	yes	yes, now, but probably not 10 years ago.	1	2013	yes, one chapel
Avoncroft museum	no	very happy to have them	3	1995-2014	no
Highland Folk museum	yes	yes, very much part of the Highland tradition	4	1987-2012	no

Appendix E

Survey Data

Introduction

To reinforce data from secondary sources and site visits, four separate surveys were conducted to gather primary source material on perceptions of the cultural significance of corrugated iron:

1. An interview survey of open-air museum directors. This was designed to produce in-depth qualitative data on the opinions of key professionals.

2. A questionnaire distributed to approximately 100 current and past conservation students at Kingston and Cardiff universities and the Building Crafts College. This group was chosen because it was known that the majority had visited one or more open-air museums containing corrugated iron exhibits, and because they might reasonably be expected to have specialist knowledge and refined opinions on the significance of corrugated iron.

3. A third survey was attempted to obtain structured interview-based data from randomly chosen members of the general public whilst they were visiting the Weald and Downland Living Museum.

4. The fourth and final survey was by a questionnaire distributed to all known reachable local authority conservation officers. This was designed to produce both quantitative and qualitative data on the attitudes of specialists within local authorities towards the designation of corrugated iron buildings.

Survey 1: Structured interviews with open-air museum directors

Structure of the survey

These interviews were aimed at gaining an insight into the practical management of collections of corrugated iron buildings in a museum environment. It was hoped that the basic framework of questions would stimulate informal discussion with the museum directors, but this proved to be overly optimistic. Although useful information was gained about acquisition policies, little light was shed on how the museums perceived the cultural significance of their corrugated iron exhibits.

Name of Museum: Avoncroft

Name of curator at the present time Hamish Wood

1. Date when the museum began? 1967 it is a building's museum for the Midlands.

2. Do you have any corrugated iron buildings as part of your collection? Yes.

3. If so, how many on display? Tin church and 2 Anderson shelters with a garage on the way.

4. How many in store? None

5. When the building/s was/were erected did you have to repair it/them? Minor repairs, such as painting the woodwork. Avoncroft is short of money, so would not take a building that needed extensive repairs.

6. Were you able to buy new sheets of corrugated iron easily N/A

7. Where from? If necessary, they would put out an internet appeal, try other museums or salvage.

8. Do you have any records of visitor's responses to your corrugated iron buildings? No.

Building name	**Date of original erection**	**Date of museum erection**	**Type of building – church etc**	**Original maker / *erected by***	**Original location**
Chapel	1891	1995/6	chapel	JC Humphries, London	Bringsty Common, Herefordshire
Anderson shelter	1938	2007			Upper Arley, Worcester

Jack French's Garage	1947	2014	Garage	Made from asbestos and ci. Start of Formula 1	

Questionnaire for Avoncroft

1. Do you think that corrugated iron buildings are part of the vernacular building tradition? No

2. Do they fit well into the Avoncroft Museum? Yes

3. Traditionally corrugated iron buildings were insulated with felt. Do you know how your buildings were insulated if at all? None

4. Do you have Acquisitions & Disposals or Collections Development Policies? Yes, useful for reference, channels the mind when collecting buildings

5. Are you accredited by the Arts Council? Yes

Name of Museum: Weald and Downland

Name of curator at the present time Julian Bell

1. Date when the museum began - Began 1967, Opened 1970.

2 Do you have any corrugated iron buildings as part of your collection? Yes

3 If so, how many on display? .1

4. How many in store? 1

5. When the building was erected did you have to repair it? Yes

6. Were you able to buy new sheets of corrugated iron easily? Yes

7. Where from? SLE Cladding

8. Do you have any records of visitor's responses to your corrugated iron buildings? No

9. Do you have further information you think I might like to know? No

Building name	Date of original erection	Date of museum erection	Type of building – church etc	Original maker	Original location
South Wonston Church	1909	2010	Church	Humphreys of Knightsbridge	South Wonston, Hampshire
Ovingdean Hall School Chapel	1890s	N/A	Chapel	William Cooper Ltd, Old Kent Road	Ovingdean, West Sussex

Questionnaire for Weald and Downland

1. Do you think that corrugated iron buildings are part of the vernacular building tradition? Yes, at grass roots level it revolutionised ordinary people's lives. It was simple and cost effective.

2. Do they fit well into the Weald and Downland Museum? 10 years ago, no. Now, yes. A part of the story of the museum.

3. What particular building type of corrugated iron do you think fits best into the W and D?

The Tin tabernacle is just the right sort of building. A large number of the Weald villages have tin buildings – village halls as well as churches.

4. As well as being an educational and historical resource, do you have any ideas for other uses? Possible for weddings; problems getting it consecrated and established as part of the parish. Meeting place.

5. Traditionally corrugated iron buildings were insulated with felt. Why was it seen as appropriate to use modern insulation materials?

It was done this was to reduce long term maintenance

6. Why? No answer

7. What difference do you think it will make to the building, in terms of practical use, and longevity? No answer

8. There is still a corrugated iron building stored at the railway cutting. Do you have any plans for it? Yes, as and when; no plans as yet.

Name of Museum: National History Museum, St Fagans

Name of curator at the present time Senior Curator of Historic Buildings: Geralllt D. Nash

1. Date when the museum began? Museum opened to the public 1 June 1948

2. Do you have any corrugated iron buildings as part of your collection? *Yes*/No

3. If so, how many on display? 7 (also 3 replicas (modern) and several buildings with corr. iron roofs)

4. How many in store? None

5. When the building/s was/were erected did you have to repair it/them? Yes/no - a certain amount of repair and occasional replacement was necessary with these buildings

6. Were you able to buy new sheets of corrugated iron easily? Yes (although sourcing heavy gauge corrugated iron sheeting is more difficult)

7. Where from? Builders' merchants or agricultural suppliers – Thomas Panels & Profiles Ltd, Leominster can supply curved sheets (e.g. as used on barns) tel no. 01568.610000

8. Do you have any records of visitor's responses to your corrugated iron buildings? No, not specifically.

9. Do you have further information you think I might like to know?

Building name	**Date of original erection**	**Date of museum erection**	**Type of building – church etc**	**Listed?**	**Original maker / *erected by***	**Original location**
Llwyn-yr-eos farmstead	Not known, but probably early 20th c.	N/A	lean-to (implement store)	no	Not known	In-situ
Llwyn-yr-eos farmstead	1952	2009	Hay shed		Lloyd Morris, Boncath, Pembs	Penlan Bridell, Boncath, Pembs.

Saddler's workshop	1926	1988or 86	Workshop		Alfred James, St Clears	Pen-pitch, St Clears, Carmarthenshire
Ty'n-rhos Sawmill	1892	1997or 94	Sawmill		John Williams	Ty'n-rhos, Llanddewi Brefi, Ceredigion
Prefab bungalow	1948	2001 or 1998	Prefab		Erected for Cardiff City Council	Llandinam Crescent, Gabalfa, Cardiff
Clogmaker's workshop	1914	2011	Workshop		Thomas James	Ysgeifiog, Solva, Pembrokeshire
Anderson shelter	c. 1940	c. 1990	Air-raid shelter		Not known	Not known

Questionnaire for St Fagans

1. **Do you think that corrugated iron buildings are part of the vernacular building tradition?**
   By now, yes, they are considered part of the 'vernacular'. The museum has recognised this probably from the 1980s
2. **Do they fit well into St Fagans Museum?** Yes
3. **What particular building type of corrugated iron do you think fits best into St Fagans?**
   Workshops that were made by the craftsmen themselves can be said to be in the 'vernacular' tradition. Not 'tin tabernacles' as they are not vernacular, - they were mass-produced and often bought 'off the shelf' or from catalogues. The They still have a place in museums of social history like St Fagans though. Pre-Fab is mass produced – you have included that, why?
   It is representative of an important element of the needs of the local people.
4. **As well as being an educational and historical resource, do have any ideas for other uses?** Possibly re-enactments.
5. **Traditionally corrugated iron buildings were insulated with felt. Do you know how your buildings were insulated if at all?**
   We try to reflect tradition, but legislation encourages us to keep people working at the museum (and visitors!) warm in cold weather. There was a cast iron stove in the clog-maker's workshop, but that might be hazardous to the

public. Consequently, modern insulation is used in the corrugated iron workshops at St Fagans. This was put just under the tin.

6. **What difference do you think it will make to the building, in terms of practical use, and longevity?**
   There might be a problem of condensation, though we do try to ensure air circulation.
7. **Do you have Acquisitions & Disposals or Collections Development Policies?**
   Yes. We have a strategy for collecting representative buildings, many of which are in the vernacular tradition, whilst others reflect the types of buildings used for trade, work, habitation or assembly, that were found in Wales from the Middle Ages to the present day. We try to have buildings that are typical of the region.
8. **Are you accredited by the Arts Council of Wales?** No

Other comments: The building acting as a baker's shop is a replica, there is also a modern extension, in corrugated iron, to the pottery building.
Agricultural merchants are good places to buy corrugated iron sheeting.
The museum etches the galvanised tin before painting

1. What sort of paint did /do you use for painting the corrugated iron?
Oil-based paint gloss finish or black bitumastic

2. How did you etch the galvanisation? Using acid-based etching solution, but can also use some proprietary metal primers (e.g. *Dulux* produce a Quick-drying metal primer which can be over-painted with water- or oil-based paint)

Name of Museum: Highland Folk Museum

Name of curator at the present time Bob Powell

1. **Date when the museum began?** 1935 / 1944/ 1987.
2. **Do you have any corrugated iron buildings as part of your collection?** Yes
3. **If so how many on display?** Church / School / Cottage / Smokehouse PLUS others with C.iron
4. **How many in store?** None.

5. **When the building was erected did you have to repair it?** Not really.
6. **Were you able to buy new sheets of corrugated iron easily?** We can do but poor stuff.
7. **Where from?** Local builders merchants.
8. **Do you have any records of visitor's responses to your corrugated iron buildings?** Verbally.

8 **Do you have further information you think I might like to know?** Yes plus my William Cooper, 761 Old Kent Road, London catalog very early 1900s.

Building name	Date of original erection	Date of museum erection	Type of building – church etc	Original maker	Original location
Leanach Church	c1890	1987	Church	Spiers of Glasgow	Leanach, Culloden near Inverness
Knockbain School	1925	1999	School	Unknown	Knockbain, Kirkhill near Inverness
Fairburn Estate Smoke House	C1900???	First 1980s then relocated 2012	Fish or Meat Smoke House	Probably Estate made.	Fairburn Estate, Maryburgh, Ross-shire
Tin Cottage	C1900	Original	Farm Servant's Cottage / Summer House	Local joiner	Aultlarie Farm on Highland Folk Museum site.

Appendix F

Corrugated Iron and the Cauldron of Enterprise

At a superficial level it is easy to credit Henry Robinson Palmer with the invention of corrugated iron in 1829. In reality he could not have done this without the coming together of six factors. It was the combination of these factors that created the Cauldron of Enterprise.

Money

Iron was expensive in the eighteenth century; it became significantly cheaper in the nineteenth century due to innovation in the iron industry, but remained a highly priced commodity.[1] Any invention demanding a large scale supply of iron needed rich backers who could not only afford the material, but who could afford the risk of failure attendant on any experiment.

From Tudor times the English merchant class had become rapidly wealthier. This was due to the vast increase in international trade. Products such as timber, tobacco, hides, sugar and wines were imported from all parts of the world. Improvements in all aspects of navigation made this possible. Britain's emergence as a global naval power was also a crucial factor in the development of trade through London's docks.[2]

The merchants developing the new dockland in London were not only rich enough to finance the experimental use of corrugated iron; they were rich enough to accept the risk that the new material might not be a success. However, the scale of the dockland merchants' gamble on developing corrugated iron needs to be seen in context: although the development of corrugated iron was risky, the money spent was only a tiny proportion of the invested in the whole dockland project.[3]

Materials

It was not possible to produce corrugated iron before the late eighteenth century, because corrugated iron could only be made from 'wrought iron.' Wrought iron does not come directly from the iron smelting process. The cast iron produced from the blast furnace is brittle and cannot be rolled into thin sheets. It was not until the puddling process was developed in 1783 by Henry Cort,[4] that large quantities of wrought iron were available at a reasonable price. Once cheaper wrought iron had

[1] Guedes, 'Iron in Building,' ii.
[2] Hill, *Reformation to Industrial Revolution*, 160.
[3] Hobhouse, *Survey of London*.
[4] Adams, *The Prometheans*, 19.

become available, and techniques of rolling it into flat sheets had been perfected, a new material had been created.

It was the new opportunities offered by this material that made possible the Industrial Revolution.

One small part of this Victorian cauldron of enterprise was Henry Palmer's realisation that flat sheets of wrought iron could be stiffened by rolling corrugations into them.

People

Henry Robinson Palmer was an engineer and inventor. Although we have no detailed biographical records, we do know that he was the favourite pupil of Thomas Telford,[5] and that he was a zealous networker who believed in communicating engineering knowledge to a wide audience. He was the founder of the Institute of Civil Engineers, and a prolific inventor, devising such diverse machines as the monorail and the embossing stamp.[6] Given this background it is not surprising that he also invented the concept of corrugated iron.

However, networkers and inventors do not prosper without support; the practical production of corrugated iron was not achieved by Palmer alone. As resident engineer for the London Dock, he was in daily contact with James Jones and Richard Walker.[7] Jones was a mechanical engineer and model maker. Walker was a building contractor and keen entrepreneur. Together these three formed an ideal team to both exchange and develop ideas. With the financial backing of the London Dock Company, the concepts of Palmer, the mechanical engineering skills of Jones, and the business sense of Walker, corrugated iron became a successful material.

All the people involved in the invention of corrugated iron share a common feature: they all benefitted from the extraordinary growth in public scientific education which occurred at this time. This was directly founded on the eighteenth-century Enlightenment. For the first time in English society it became possible to achieve social status solely on the basis of intellectual ability.

Need

The combination of money, materials and people might well have produced the invention of corrugated iron, but would not have guaranteed its commercial success. It was the need for clear-span, low cost and accessible warehousing to complement the new London Dock that propelled the practical development of the corrugated iron

[5] 'Henry Robinson Palmer,' *Grace's Guide to British Industrial History*, accessed 10 September 2012, http://www.gracesguide.co.uk/Henry_Robinson_Palmer.
[6] 'Henry Robinson Palmer,' *Grace's Guide to British Industrial History*, accessed 10 September 2012, http://www.gracesguide.co.uk/Henry_Robinson_Palmer.
[7] Guedes, 'Iron in Building,' 209.

concept. In other words, because there was a need for innovative warehouse design, the financial backing to develop corrugated iron was available.

Machinery

The development of machinery is usually incremental. The first sheets of corrugated iron were produced by adapting existing press designs. The crucial feature of this process was the adaptation of steam power to drive the press.[8] This was possible because the London Dock Company was already using a Boulton and Watt steam engine to power dock excavation, and Jones appears to have adapted this to drive the press to make the corrugations.[9]

After initial experiments, rollers were used to produce the corrugated iron sheets. Such rolling technology was not new and had already been used by Henry Cort for both flattening and shaping wrought iron. Once again the success of corrugated iron depended on the harnessing of steam power to drive the rollers.

Earlier iron roofs

One final factor that made the invention of corrugated iron possible was previous experiment with iron roofs. The concept of replacing clay or stone tiles with iron tiles was not new.[10] Examples include Tomlinson's and Elias Carter's patented iron roof tiles.[11]

More importantly, Thomas Botfield, a Staffordshire iron worker, had patented the design for a sheet iron roof with a semi-circular profile similar to Palmer's initial application for corrugated iron.[12]

Conclusion

The pace of Victorian invention, including the invention of corrugated iron, was only possible because these factors came together at the same time and the same place. Corrugated iron came out of this cauldron of enterprise.

6 August 2013

[8] Peter Manktelow, *Steam Shovels* (Oxford: Shire Publications, 2004), 31.
[9] Coleman, *The Railway Navvies*.
[10] Peterson, 'Iron in Early American Roofs,' 41– 47.
[11] Cox, 'Patent Cast Iron Roof Tiles'.
[12] Guedes, 'Iron in Building'.

Appendix G

The cultural significance of corrugated iron

This paper is based on my current research at Edinburgh College of Art into the history and cultural significance of corrugated iron. I chose to base this study in Scotland because my perception from the outset was that the material generated more interest in Scotland than in the rest of the UK. For example, corrugated iron has been written about in Historic Environment Scotland's publication, Technical Advice Note (TAN) 29 – *Corrugated Iron and Other Ferrous Cladding* by Bruce Walker[13] – and also in the INFORM leaflet, *Care and Maintenance of Corrugate Iron*, by David Mitchell.[14]

My studies at Edinburgh have confirmed that Scotland is more aware of the cultural significance of corrugated iron, than the rest of the UK, but have also revealed that Australia and New Zealand are where the material is most highly regarded.

Figure A.8. This building, by contemporary Australian architect Glenn Murcutt, would likely be seen in England as a perverse personal whimsy, but in Australia it is considered sufficiently iconic to be depicted on a postage stamp.

My PhD explores why there is a pronounced variation in the perceived cultural significance of corrugated iron. Why do some countries and some cultures show

[13] Walker, 'Corrugated Iron and Other Ferrous Cladding'.
[14] Mitchell, *Inform Guide*.

disdain to the point of hatred, whilst others see corrugated iron as a positive reflection of the roots of their culture?

Cultural Differences

To understand this difference, it is necessary to examine the different values that influence a society's definition of cultural significance. *Age* and *rarity* are the values most used to assess the cultural significance of buildings, and in fact corrugated iron embodies these very well. Corrugated iron buildings have been in use for nearly 200 years. The patent for using corrugated iron in buildings was taken out in 1829, and the development of the concept of the corrugated iron buildings system was well underway by the 1840s, with some of the nineteenth century's most innovative buildings being made in the 1850s. As to *rarity,* though once found on every street corner, historic corrugated iron is now a rapidly diminishing building type. Corrugated iron buildings have suffered very high levels of demolition in recent years. Yet despite becoming rare and often being old, they are still not a valued type of historic building, and few efforts are made to halt their removal.

My research suggests that reactions to corrugated iron are varied, complex and deeply rooted in national cultural development. Cultures that are associated with frontier development, work and industry, perceive corrugated iron as worthy of conservation. It is seen as affordable, transportable, flexible in design, strong, and utilitarian in that all individuals can acquire it easily. It is symbolic of struggle in harsh conditions. However, if a culture endorses the picturesque, an idea developed by the Georgians and the Romantics, then stone, thatch and wood will be appreciated instead of corrugated iron. These materials fit into a picturesque concept of the natural environment, where buildings appear to be at one with, and created from nature. Even when in decay and ruin, stone buildings conform to the concept of the picturesque. The material matters. Britain became culturally invested in the development of idealised landscapes as part of the nineteenth century Romantic reaction against industrialisation. This love affair with the picturesque has proved enduring, and it is a vision which corrugated iron does not compliment.

Corrugated iron was a key material for the new settlers and adventurers of Australia and New Zealand. Modern Antipodeans see corrugated iron as a material that allowed pioneer settlers to survive and succeed. Corrugated iron, especially in the ready-made flat pack building systems that were exported from Britain, enabled the Australian pioneers to settle successfully in a place where a lesser material would have meant failure. It is no wonder its cultural significance is now recognised. Here, old corrugated iron buildings are preserved by the Australian National Trust; academics write learned papers on them,[15] conferences are held to discuss them; a national stamp has been produced showing a picture of a corrugated iron building and Modernist buildings are made from it.

How have we come to these cultural associations in Britain?

The values we attribute to corrugated iron are culturally developed rather than intrinsic to the material itself. The cultural significance of corrugated iron has not stayed constant through British history. When a turpentine warehouse was erected at the London Dock, George Herbert, as editor of the Register of Arts and Sciences, wrote, in 1830:

> EXTRAORDINARY LIGHT AND SIMPLE ROOF.
> On passing through the London docks a short time ago, we were much gratified in meeting…with a practical application of Mr Palmer's newly-invented roofing…This singular roof, supported by light cast iron pillars, forms a shed on one side of the basin near Wapping Church, and covers an area of about 4000 feet. Every observing person on passing by it, cannot fail being struck (considering it is a shed) with its elegance and simplicity, and a little reflection will we think, convince them of its effectiveness and economy. It is, we should think, the lightest and strongest roof (for its weight), that has been constructed by man, since the days of Adam.*[16]*

[15] Miles Lewis, Pedro Guedes and Anne Warr all work in the Antipodes
[16] Herbert, 'Register of Arts and Sciences,' 153–54.

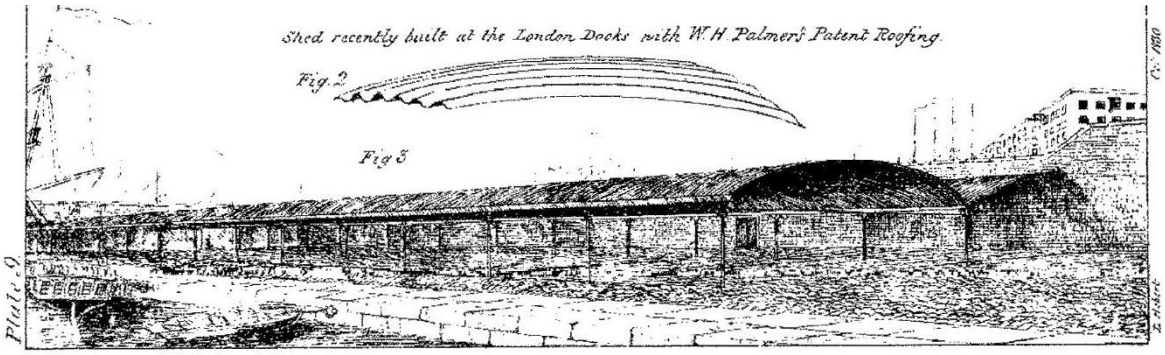

Figure A.9. Corrugated iron sheds at the London Docks, drawn by George Herbert. *Register of Arts and Sciences*, October 1830.

Other favourable reports were also published, one of which is John Claudius Loudon's Encyclopaedia of Cottage, Farm and Villa Architecture (1833)[17] , saying that '*in short, no material hitherto brought into notice at all approaches this (corrugated iron), in its capacity for forming light and economical roofs of the great extent of span, and with the least loss of interior room*.'

Figure A.10. Oban Cathedral, built by the Marquis of Bute in 1886.

[17] Loudon, *An Encyclopaedia*, 207.

At the Great Exhibition of 1851 in London, E.T. Bellhouse[18] exhibited a prefabricated corrugated iron house, which was seen by Prince Albert. The Prince, who was a great admirer of new technology, immediately ordered a corrugated iron ballroom for Balmoral Castle.[19]

Nothing could indicate more strongly the high status of corrugated iron than a royal order.

This was an exciting new material created in an age when innovation was seen as supremely praiseworthy. Many of the early Victorians were in love with new engineering, and their enthusiasm for corrugated iron is expressed brilliantly by Gilbert Herbert in *Pioneers of Prefabrication*:

> the development of corrugated iron resulted in a system of construction, a quick and inexpensive means of enclosure that was relevant to all buildings, both large and small. Corrugated iron was considered a material whose strength, portability, impermeability to water, invulnerability to termites, and presumed resistance to fire, gave promise of a sheathing and roofing system infinitely superior to wood. It was a material, moreover, entirely consonant with the spirit of the times, for if it lacked the fruity richness of cast iron, it nevertheless reflected that other attribute of the Victorian era, the quality of stern utility.[20]

Although corrugated iron has never been used for monuments or grand buildings such as stately homes, it has been used in some very big and important buildings and engineers were delighted with such an exciting new material, which made spacious and lightweight buildings possible. A notable Scottish example was the original Oban Cathedral, erected in the 1880s using funds provided by the Marquis of Bute; it was intended as a temporary measure while finances were sought for a permanent structure, though it ended up serving the town for nearly half a century. Colonel Godfrey Greene's Sheerness boat store[21] and covered slipway at Chatham Dockyard in Kent, are fine examples of engineering vision creating new forms of building. The

[18] David Bellhouse, 'David Bellhouse & Son: a Manchester Building Business' (typescript paper, c. 1986, prepared for publication in the *Manchester Memoirs* of the Manchester Literary and Philosophical Society)

[19] Thomson, 'A Study of Early Corrugated Iron'.

[20] Herbert, *Pioneers of Prefabrication*.

[21] Built in 1858–60, it is an early example of a multi-storey iron framed building. Neither the boat store nor the covered slip retains their original corrugated iron sheeting.

boatstore, built in 1858-60, is a pioneering specimen of a multi-storey iron-framed building.

The invention and development of corrugated iron coincided with the expansion of towns and cities in Britain and with the massive spread of the British Empire. Both these developments created intense demand for new buildings that could be transported and erected quickly. Corrugated iron fulfilled this need. Cheap, easily transportable and near instantly erectable buildings were designed and created for every conceivable purpose- industrial, religious, military and domestic buildings could all be formed from corrugated iron. Most could be bought as a building system from catalogues, such as William Cooper's.[22] By the late 1890s there were makers all over Britain: Walkers, Speirs, Morewood and Rogers, Lysaghts and many more; corrugated iron was literally on every street corner. Anything could be made – anytime, and anyplace. It was a hugely successful material, but its success, and thus its ubiquity, actually damaged its cultural significance.

A British reaction to industry and mass production

The love of corrugated iron did not last. The late nineteenth century saw a reaction to the mass industrialisation of the towns and cities in Britain. Fear of the loss of the countryside to urbanisation, and of artisan craftsmen's skill being usurped by soulless machines, spurred both John Ruskin and William Morris to rage against anything industrial. Their reaction was not without logic. Victorian industrialisation created great wealth, but much was lost in the process. Traditional buildings, landscapes and ways of life all suffered. As part of his hatred of the Industrial Revolution, William Morris characterised corrugated iron "now spreading like a pestilence over the country,"[23] and in doing so he captured the mood of many intellectual Victorians. The foundation of the National Trust and the start of legal protection for ancient monuments were other faces of a widespread concern about the wider implications of change and technological invention. Corrugated iron became symbolic of industrialisation and the erosion of England's traditional countryside. In 1914, Mark Kennaway[24] described corrugated iron as 'frankly hideous' and continued 'we may instance Hennock and

[22] Cooper, *Gardeners' and Poultry Keepers' Guide*.
[23] Walker, 'Corrugated Iron,' ix
[24] A Devon solicitor described in Cox and Thorpse, *Devon Thatch*.

Ashton, in the Teign Valley as examples of exquisitely picturesque villages, the charm of which has been completely destroyed by unsightly roofs…'[of corrugated iron].

The use of corrugated iron to build Nissen huts, during the World Wars, has created an unfortunate association between the material and war itself. Nissen huts may have been brilliantly designed and far superior to canvas tents, but in the mind of the common soldier, and grieving relatives, corrugated iron became symbolic of privation and death. Demobbed soldiers effectively spread these attitudes to wider society.

The associations of corrugated iron with war and the evils of industrialisation, persists today. Aside from some limited research in the 1970s there was almost no academic interest or serious literature about the material whatsoever" until Paul Dadson's dissertation in 1989.[25] The 1990s saw a gradual re-awakening of interest, probably due to the obviously increasing rate of demolition of corrugated iron buildings, but also due to a growing interest in use of industrial materials in modern design. The spell cast by Ruskin and Morris has started to wear off.

A slow change in cultural values

Cultural significance and cultural values are not static. In almost every field of creativity, fashions come and go. Corrugated iron has never lost its popularity with industrial unit designers, because of its overwhelming utility, but its use outside industrial estates was limited. There are signs that this is changing.

The last fifteen years have seen a growing interest in corrugated metal and its value as a material not only worthy of conservation, but also as a material to be used in buildings designed as architecture. Good examples include the Tinhouse in Glendale, Skye, a modern celebration of the material by the Skye-based practice Rural Design Architects, and Kestle Barton, an old farmstead in Cornwall, converted to an art gallery and holiday accommodation by Alison Bunning, with corrugated metal sheeting used to cover a part that was found never to have been slated.

The renaissance of corrugated iron has extended into conservation. Most buildings' museums throughout Britain now include a corrugated iron building as part of their collections. The act of putting corrugated iron in a museum immediately elevates the

[25] Dadson, 'Rediscovering Corrugated Iron'.

status of the building, and hence material, and it becomes more 'valued'. Corrugated iron is now firmly part of the Scottish vernacular. It is an integral part of the exhibits at the Highland Folk Museum and the Auchindrain Township, and is certainly sufficiently accepted for Historic Scotland (now Historic Environment Scotland) to offer explicit advice on its conservation and repair.[26] The statutory protection system has also been extended to include corrugated iron, for example the Golspie Drill Hall and St Fillan's Church at Killin.

It is particularly interesting that corrugated iron buildings are now attracting all the technical and philosophical subtleties of conservation. St Fillan's at Killin is an outstanding example of the conservation approach of minimal repair to a corrugated iron building.[27] This is an implicit recognition that an industrial material is acquiring the cultural significances of *age* and *rarity*.

All these small cultural changes make a difference, but we have a long way to go before corrugated iron is accorded the same level of cultural significance that it has achieved in Australia and New Zealand. As Ingval Maxwell states in the foreword to *TAN 29* 'Unlike our International colleagues we have not yet come to fully recognise the intrinsic value, or significance, that exists in our continuing reliance on "ageing" corrugated iron sheeting on our Scottish buildings.'[28] Britain, and especially England, needs to question and examine its history to discover why some materials are valued more than others for the purposes of conservation.

[26] Walker, 'Corrugated Iron' and Mitchell, *Inform Guide*.
[27] Linskaill, 'St. Fillan's Episcopal Church,' 21–34.
[28] Walker, 'Corrugated Iron,' vii.

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