CONSERVATION OF FUNCTIONAL HERITAGE RAILWAY BUILDINGS AS AN ARCHETYPE FOR THE CONSERVATION OF FUNCTIONAL HERITAGE BUILDINGS

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CONSERVATION OF FUNCTIONAL HERITAGE RAILWAY BUILDINGS AS AN ARCHITYPE FOR THE CONSERVATION OF FUNCTIONAL HERITAGE BUILDINGS

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Abstract

Conservation of heritage buildings has a theoretical basis dating from the Renaissance, popularised by the 18th Century 'grand tour' and codified by the 19th Century. This approach recognised great works of architecture and artistry, while consciously eschewing contemporary 'functional' buildings developed throughout the Industrial Revolution. Subsequent writers identify that these functional buildings are an integral part of a wider cultural significance and equally worthy of conservation, while recognising that these buildings present new problems in applying the accepted principles of building conservation. One suggested approach to defining an approach to conservation of these functional buildings is to identify the context and narrative presented by these buildings, possibly by using a survey process to identify the taxonomical values.

There is an apparent hesitancy in recognising the development of functional buildings, with discussion of the revolutionary nature of structures associated with Industrial Revolution transport tending to concentrate on the engineering aspects, such as bridges or passenger station train sheds. However, many of the functional buildings developed as railways matured during the 19th Century were innovatory. Included in these innovatory structures are railway signal boxes, small specialist structures that present difficulties in conversion to a different use without losing the original significance, presented as an exemplar of functional buildings. After defining the case and imposing a constraint of mainland Great Britain, the chosen sample for taxonomy survey covered a range in terms of type, age, location, and custodianship. The taxonomy survey identified the context of each building and applied a narrative to a sample as conceptually perceived by a casual observer of the building.

For each sample case study building it was possible to identify a context and apply an effective narrative. Results suggest that for functional buildings such as railway signal boxes there is a clear divergence from accepted theories of building conservation, with a sense of context more critical than the purity of location or building. Furthermore, this conservation is strongly narrative driven,

requiring a wider participation than a purely academic discourse that, nevertheless, needs protecting from an idealised, even sentimental, mythologising narrative that this wider discourse could potentially attach to functional buildings. There is a further weakness that the custodians of functional buildings predominately have a limited motivation, and may even be hostile, concerning accepted philosophies of building conservation. To apply the principle of using a narrative to define conservation of heritage functional buildings, this narrative must encapsulate the history, articulate the social aspects, reinvent excellence, and facilitate the experiential.

Research findings that include narrative results present a potential cultural shift in building conservation, a shift that fully encompasses conservation of heritage functional buildings. Applying to every building a clearly defined evidential value that looks beyond traditional values provides a multifaceted perception, thus creating an approach that draws upon the perception of disparate people connected with a heritage building rather than only the custodian or building conservationists. This process is dynamic and transferrable, so using a narrative that includes intangible values strengthens the processes for conserving heritage functional buildings.

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Nomenclature

In presenting heritage buildings and railways, contemporary descriptions will often use gender specific language. Although descriptions such as signalman, stationmaster and fireman are archaic compared with modern acceptability, these descriptions will appear when in quotes or a contemporaneous context. Otherwise, the accepted modern version of the descriptions are signaller and station manager. There appears to be no consensus on a meaningful modern equivalent for fireman as the role is obsolete other than on heritage railways.

Acronyms

ARS: Automatic Route Setting

ASC: Area Signalling Centre

AWS: Automatic Warning System

BER: Bristol & Exeter Railway

BoT: Board of Trade

BR: British Railways/British Rail

BRB: British Railways Board

BR(ER): British Rail (Eastern Region)

BR(LMR): British Rail (London Midland Region)

BR(NER): British Rail (North Eastern Railway)

BR(ScR): British Rail (Scottish Region)

BR(SR): British Rail (Southern Region)

BR(WR): British Rail (Western Region)

BTC: British Transport Commission

CHR: Chester & Holyhead Railway

CLC: Cheshire Lines Committee

CR: Caledonian Railway [Caledonian]

CR: Cambrian Railway [Cambrian]

CTRL: Channel Tunnel Rail Link

ECML: East Coast Main Line

EOD: Evans O'Donnell (company specific variant in parathesis)

FR: Furness Railway [Furness]

GCR: Great Central Railway

GER: Great Eastern Railway

GNR: Great Northern Railway

GNSR: Great North of Scotland Railway

GWR: Great Western Railway

GSWR: Glasgow & South Western Railway

HMRI: Her Majesty's Rail Inspectorate

HR: Highland Railway [Highland]

IECC: Integrated Electronic Control Centre

LBSCR: London, Brighton & South Coast Railway
LCDR: London, Chatham & Dover Railway
LMS: London Midland and Scottish Railway
LNER: London and North Eastern Railway
LNWR: London & North Western Railway
LSWR: London & South Western Railway
LYR: Lancashire & Yorkshire Railway
McK&H: McKenzie & Holland (company specific variant in parathesis)
MGNR: Midland & Great Northern Joint Railway
MR: Metropolitan Railway [Metropolitan]
MR: Midland Railway [Midland]
MSLR: Manchester, Sheffield & Lincolnshire Railway
NBR: North British Railway
NR: Network Rail
NRM: National Railway Museum
NER: North Eastern Railway
NSR: North Staffordshire Railway
OfQ: Organising for Quality
ORR: Office of Rail Regulation/Office for Rail and Road
PSB: Panel/Power Signal Box
RAIB: Rail Accident Investigation Branch
RE: Railway Executive
RI: Railway Inspectorate
ROC: Regional Operating Centre
RSCo: Railway Signal Company (company specific variant in parathesis)
SECR: South Eastern & Chatham Railway
SER: South Eastern Railway
S&F: Saxby & Farmer (company specific variant in parathesis)
SSI: Solid State Interlocking
SR: Southern Railway
TVR: Taff Vale Railway
WCML: West Coast Main Line
WHE: West Highland Extension

Preface

As a child growing up just outside Oxford, one Sunday in the early 1970s we made a family visit to the then newly restored Crofton Pumping Station on the Kennet and Avon Canal in Wiltshire. Built in 1812 to provide a reliable water supply for the canal, this pumping station is effectively the structure for two steam powered beam engines. Replaced by electric pumps, after closure the Kennet and Avon Trust purchased the pumping station in 1968 and by 1971 restored it to full working order as a tourist attraction.

Impressions from my visit are varied. Immediately alongside the pumping station is the ‘Berks and Hants’ main railway line where, to my disappointment, no train passed during our visit. Creating a vivid impression was a working coal fired large scale model of a steam traction engine, such that the Mamod model steam traction engine received next Christmas was a delight which I still possess. And then there was the pumping station. Children are only aware of buildings for people, such as home or school. Yet, here was a building where the people were insignificant, a diversion from the building’s very function. Immense boilers built into the structure, seemingly not in and more part of the building, powering beam engines supported by the building fabric, such that the building becomes an integral part of the medley of sounds and movements, leaving an overall sense that this functional building represented something separate from my previous perception of buildings.

Acknowledgements

It is with pleasure that I thank the many people who helped and guided me throughout this research.

Preeminent in every sense of the word are my supervisors. Having three supervisors during my research could so easily be a negative, yet was positive as each individually contributed something vital at exactly the right stage in developing my research. Dr Kevin Thomas saw the potential of my ideas in thinking about the conservation of railway signal boxes when others were doubtful. Professor Ruth Dalton was an indefatigable source of ideas that allowed me to develop my ideas and make progress. And finally, Dr Giovanni Pesce, who with his wisdom, tremendous insight and ever supportive good humour guided me safely to completion. Thanks also go to Professor Martin Crapper, who throughout supplied support to my supervisors and perceptive insights to me. In addition to my supervisors, my line manager, Professor Paul Greenhalgh, provided tremendous support delivered with necessary patience. And a particular thanks to Minnie Fraser for her graciousness and good humour that made our office a haven.

For consenting to discuss the signal boxes on their heritage railway and have their thoughts formally recorded in this thesis, I thank Mike Stanbury at the East Anglian Railway Museum and Steve Growcett at the Chinnor & Princes Risborough Railway. Besides recording my thanks, I want all to know that both heritage railway centres are a pleasure to visit.

For providing some of the photographs in this research, my gratitude goes to several people including Julian Harrop, archivist at Beamish Museum, who freely provided from his archive of signal box photographs, and to Derek Thompson for permission to use his photo of the now demolished signal box at Dawlish. Likewise thank you to Adrian Vaughan, writer on signal boxes and matters Great Western, for permission to use photographs from his archive collection.

Staff in the Search Engine at the National Railway Museum were unfailingly helpful, even when I needed information at short notice.

A profound thank you goes to the unnamed railway staff at various stations who, when they found out why I was taking photographs of their signal box, without exception showed me tremendous courtesy. There is a tradition of pride in railway service and these people lived up to that tradition, for which they have my gratitude. Equally unnamed are the various people on signal box social media who took time to answer my questions, no matter how obscure. Where possible, I thanked them at the time and repeat here my thanks.

While not referenced directly, several undergraduates in preparing their dissertations provided inspiration that led to this work, with their ideas informing my nascent thinking concerning the possibilities of a separate way of perceiving unusual heritage buildings. Leading the way, of course, is Beaudene Kilty, with his dissertation in asking how we conserve railway signal boxes that started a discussion in recognising the problems of how to perceive these buildings. Also inspirational was the work of Claire Burden, who identified the issues inherent with conserving heritage buildings where public access is intrinsically limited.

Deep thanks go to my family, and in particular Sylvia, for their forbearance over the time preparing this work, all of whom on occasions have been patient while I stopped on a journey to, “quickly look at this signal box”. This includes thanking my youngest daughter Liza who, in a change from her work as a fashion photographer, humoured her father by undertaking a detailed photo survey of one of the signal boxes. Also thank you to my father and stepmother for reviewing the final draft and making helpful suggestions.

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the faculty ethics committee on 7 August 2017.

I declare that the word count for this thesis is 45022 words (67332 words including appendices).

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Date: 14 July 2021

Chapter 1
Introduction

1.1 Foreword

One outcome of the Industrial Revolution was construction of buildings with a primary function of accommodating equipment, with the morphology of these ‘functional buildings’ following this necessity rather than the hitherto primary function of buildings in accommodating people. Whether constructed in a massive, unpretentious style exemplified by 18th Century cotton mills in Manchester up to the ornateness of buildings such as Temple Mill in Leeds, 19th Century conservation thinking considered these buildings as unworthy, an opinion that when it came to conservation left the surviving buildings as merely embodying a grim past worthy only for demolition. Even when conservation is a possibility, especially with an increasing understanding that these buildings have significance in a wider cultural heritage, there are concerns that there is a limited systematic study of these buildings, along with a limited awareness in how to present the buildings in a meaningful manner that includes a proper balance between the technology and social aspects.

Railway signal boxes, structures containing equipment to control train movements, are an architype of functional building built for a specific purpose representing technology at the time of construction. Usually of a modest size and architecturally unprepossessing, the nature of the building positioning and installed equipment defines the building, making them difficult to repurpose for another use. Furthermore, the conservation environment for those signal boxes nominally protected by listing is often unsympathetic compared with other categories of listed buildings, in effect becoming heritage buildings that will become impossible to conserve using the conventional thinking regarding building conservation. To address this dilemma is a proposition that by considering how all observers of a functional building bring their unique perspective of the building taxonomy, it will become possible to apply this taxonomy of functional buildings to a context that will provide stronger emphasis on how interpretation of the functional building leads into a more effective, and relevant, conservation methodology.

Addressing the issues relating to signal boxes potentially provides a methodology that becomes transferrable to other types of heritage functional building.

1.2 Hypothesis, Aim and Objectives

Using signal boxes as an exemplar for the many varied functional building types created during the Industrial Revolution, it is appropriate to explore further the systematic application of taxonomy surveys as a basis for conservation narrative, taking account the motivations of all involved with each building, to deliver strategies for the effective conservation or reuse of these functional buildings. Delivering strategies relies upon proving of the following hypothesis:

1.2.1 Hypothesis

> Conserving heritage functional buildings is achievable without compromising the acquired heritage values.

Measurable aim from proving the hypothesis will be:

1.2.2 Aim

> Using railway signal boxes as an exemplar, develop strategies for the conservation of heritage functional buildings that are effective while sensitive to heritage values.

Achieving the aim will require fulfilling the following objectives:

1.2.3 Objectives

- Explore the theory of building conservation as it will apply to the conservation of heritage functional buildings.

- Determine the conservation challenge presented by heritage functional buildings.
- Identify existing knowledge for the design and context of railway signal boxes along with the architectural context and heritage policies for these heritage functional buildings.
- Survey a significant representative sample of remaining signal boxes in Great Britain to record taxonomical data by heritage values.
- Develop a framework for effective signal box conservation that presents as transferrable conservation principles, for heritage functional buildings with recognised heritage value.

Identified contributions to knowledge inherent in addressing the aim and objectives are issues relating to the conservation environment for heritage functional buildings, including:

- Where a building has no viable reuse, exploring answers to the practical and philosophical questions of conservation in-situ, or relocation for interpretative value within a museum or heritage site.

- Conservation in-situ where there is a risk that the building will lose contextual narrative unless conserved as a group.

- The motivations of organisations, such as heritage railways owning signal boxes, where the heritage functional buildings become an integral part of a themed visitor attraction rather than conservation.

Assuming the problems of conserving heritage signal boxes are systemic for conserving heritage functional buildings, in addressing these issues the expectation is that this will inform conservation theory for all types of functional buildings and clarify if contextual taxonomy to support narrative interpretation is an acceptable conservation approach.

1.3 Structure of Research

The following research stages apply:

1.3.1 Principles of Building Conservation

Identifying significant areas in building conservation theories, including theoretical ideas for heritage and relocation of heritage buildings. Consider authenticity and the problems of applying authenticity in building conservation.

1.3.2 Conserving Functional Railway Buildings

Defining the nature, perceptions, and presentation of functional buildings, specifically those from the Industrial Revolution. Considering functional railway buildings as a specific category of heritage buildings and the issues of effective conservation for buildings in this category, including heritage building museums. Review the structure of Britain's heritage railway movement as this sector represents a 'custodian of last resort' for many heritage railway buildings. Identify case study signal boxes.

1.3.3 Signal Boxes as a Unique Functional Railway Building Type

Define signal boxes in terms of developmental history, building morphology and working environment, the building being an exemplar of functional buildings from Industrial Revolution, with a working environment developed as narrative for ordinary working people in the Industrial Revolution. With functional buildings existing for the operational use and not for the people occupying the building, accepted wisdom of conserving in context is potentially anachronistic.

1.3.4 Methodology

Defines case study research appropriate where subjects display operation processes over time, developing a case study approach using railway signal boxes as an exemplar of heritage functional building. Develop earlier work testing the idea of assessing taxonomy of buildings into a methodology for a comprehensive survey of signal box taxonomy as a process to test the taxonomical approach.

1.3.5 Results

Taxonomical survey on a signal box sample representing cross-section of types, ownership, and geographical spread. Identify common themes that provide appropriate heritage values beyond established conservation values, developing the taxonomical findings into narratives of heritage significance.

1.3.6 Discussion

Analyse findings from taxonomy surveys against conventional theory on heritage building conservation, identifying areas of commonality along with detailing divergence of practice from established theory and practice for heritage functional buildings.

1.3.7 Conclusions

Recommendations for identified changes in accepted conservation practice.

Appendices detail data taxonomy surveys by tranche and signal boxes in Great Britain with statutory protection.

Chapter 2
Principles of Building Conservation

2.1 Context for Principles

To provide a context for investigating the interpretation of functional builders as represented by signal boxes, it is necessary to establish the accepted theoretical framework for conserving buildings with identified heritage values. This framework therefore requires an understanding as to acknowledged principles in selecting those buildings to conserve along with the nuances of restoration, preservation, and repair. In this, the context needs to track the changes in perception of suitable buildings from those which are architecturally significant to a more inclusive understanding that recognises buildings with a sometimes loosely defined cultural significance. The question becomes how much heritage defines cultural significance, and the extent heritage is a response to cultural values as displayed by a place or building.

With signal boxes very specific to a location and built for a particular function, there is also a need to understand the importance of location and, when conserving, authenticity. Accepted theory of conservation is that location provides a sense of memorial for the building, yet where the reason for conservation is more the building function rather than architecture, there is a stronger need to conserve in a way that emphasises the building's contextual location. For such a building, preserving out of context presents a risk that the heritage building will potentially lose authenticity. In building conservation, this authenticity becomes a paradox, in that an unaltered authentic structure can lose meaning, challenging appreciation of experiential authenticity.

2.2 Theory of Building Conservation

Building conservation, in the sense of recognising historic buildings as having a heritage value, dates from the Renaissance and popularised, in Britain, by the 18th Century 'grand tour' where the education of young aristocrats consequently, “generated an interest in the protection of mediaeval monuments back in Britain” (Orbaşli 2008, p16-7*)*. Before this, the perception of buildings was of permanence, with preservation of any individual building merely for the practical reason of the building representing a utility value to the owner (Earl 2003, p9), this resource being available for exploitation with the presumption that older buildings present a heavier maintenance burden (Orbaşli 2008, p4). However, central to the grand tour was great works of art, which for 19th Century writers and art critics such as John Ruskin, in exploring the ideas of conservation against restoration and developing initiatives concerning building conservation, included a careful distinction between architecture and building (Ruskin 1849, p7). Aware of new materials for the Industrial Revolution and seeing architecture as truth, Ruskin (*ibid*, p15) continues,

> *“For architecture being in its perfection the earliest, as in its elements it is necessarily the first, of arts, will always precede, in a barbarous nation, the possession of the science necessary either for the obtaining or the management of iron … or the iron roofs and pillars of our railway stations, and of some of our churches, are not architecture at all*

Thus, for a building to have heritage value it needed to have “symbolic significance … some claim to be considered as works of art, or works of deliberate ‘historical landmarking’ in their own right” (Earl 2003, p12), therefore potentially excluding buildings that are either, “politically unacceptable or architecturally unfashionable” (*ibid*, p13). Exemplifying this duality, McCaig (2013, p14) describes how the 19th Century architect Augustin Pugin saw architecture strongly in terms of a religious and moral fervour, with an imperative to restore rather than restore, an argument developed by the French architect, Eugène Viollet-le-Duc (*ibid*, p15). Ruskin (1849, p66) takes a contrastingly didactic approach to the question of repair or restoration, arguing that for,

> *the preservation of the architecture we possess … the true meaning of the word restoration[1] … means the most total destruction which a building can suffer”*

[1] Italic in original.

For this, Ruskin argues that, “the principle of honest must govern our treatment” (*ibid*, p15), of architecture. Demonstrating an inherent tension in this 19th Century perception of conservation is the discussion by Birignani (2009, p69) concerning the work of the conservationist Camillo Boito, who notes,

> *“a theory of conservation that rejects the dualism between the stylistic restoration school of Viollet-Le-Duc and the pure conservation school of John Ruskin and the Society for the Protection of Ancient Buildings.”*

This emphasis on architectural significance or historical landmarking continues to have relevance, as seen in the ‘Venice Charter’ (ICOMOS 1964), where Article 3 states that the, “intention in conserving and restoring monuments is to safeguard them no less as works of art than as historical evidence”, and Article 12 concludes, “restoration does not falsify the artistic or historic evidence.”

Earl (2003, pp61-4) and Orbaşli (2008, pp21-3) trace the development of conservation philosophy based upon the principles espoused by the Society for the Protection of Ancient Buildings (SPAB), founded in 1877 by William Morris. Earl (2003 pp158-9) summarises the ‘SPAB manifesto’, “which had emerged in decades of controversy”, as embodying the four principles of custodianship of ancient buildings, principles that thereby constrain freedom for a building custodian to do as they please with their building. These principles demand that honest repair should always be the first consideration, doing no more than prudence demands, avoiding scholarly or artistic ambitions, and any permanently necessary new work should be clearly distinguishable from the old and should not reproduce any past style. Jokilehto (1996, p75) notes that the SPAB Manifesto defines historic structures as, “anything which can be looked on as artistic, picturesque, historical, antique, or substantial”, for which the Manifesto advocates daily care as the most effective way of preventing decay. Subsequent statements concerning building conservation adopt the underlying thinking of the SPAB Manifesto with Earl (2003, p63) describing how the SPAB Manifesto has an appeal to, “recent painful experiences”, through the Venice Charter (ICOMOS 1964), “somewhat pre-emptory bylaw tone”, to the Burra Charter (Australia-ICOMOS 1979)[2] that has, according to Earl (*ibid*),

> *“… a rather more practical flavour, insisting that detailed knowledge of the building or place is the key to correct action, a recipe that is clearly as applicable to the humble cottage as to the magnificent palace.”*

Regarding the Venice Charter, Jokilehto (1998, p230) points out that although the charter’s conceptual heart is the ‘historic monument’, the charter extends this concept to urban areas, plus makes no distinction between ‘dead’ or ‘living’ monuments. Nevertheless, each statement takes forward the four principles set out in the SPAB Manifesto, turned by Orbaşli (2008, p53) into a checklist encompassing:

- Understanding
    - Working with the evidence
    - Understanding layers
    - Setting and context
- Implementation
    - Appropriate uses
    - Material repairs
    - Tradition and technology
    - Legibility
    - Patina of time
- Evaluation
    - New problems may require new approaches
    - Sustainability
    - Interpretation

One point of note is how only in the SPAB Manifesto was it “necessary to argue that the position being taken was a sound one and better than any of the alternatives” (Earl 2003, p62), with all subsequent statements assuming this argument to have proven validity. This creates a tension in the conservation process, defined by Saunders (1996, p18) as where even the

[2] Since updated by the Burra Charter 2013.

most sympathetic of building custodians find themselves frustrated by the listed building consent procedures and there are those who, “reject the whole notion of conservation”. This leads to pressure on conservation from a variety of sources, including those who see disused heritage buildings as a maintenance encumbrance, a source of authentic architectural salvage building materials or something that stands in the way of a, “brave new scheme”. Saunders (*ibid*, p29-30) goes onto argue, that conservation becomes a, “triumph of the letter over the spirit”, singling out unsympathetic modifications, particularly replacement of original and repairable windows with uPVC as a, “fate worse than death or demolition”, and how some building types, “already in retreat will decline further”. In discussing repairs to fire damaged Windsor Castle and Uppark House, Pickard (1996, pp147-50) explores this weakness in depth when considering restoration or repair as a continuing debate. With both buildings open to the public, there was an intention to see the repaired buildings in, “grandeur of the original historical design … [t]his then begs the question whether something is allowed to be recreated for the tourist who is too unfamiliar to be critical” (*ibid*, p148), so becoming a debate as to whether sympathetic alterations are a modern design or honest repair. The problem Pickard argues (*ibid*, p149) is that many of the terms adopted in the various statements, such as ‘special character’, ‘original materials’ and ‘cultural significance’, all present difficulties in effective interpretation or are undefined, such as for example:

> *“… if the control procedures are to insist that only honest repairs are carried out, over the course of time in the process of continually undertaking honest repairs may actually damage the special character of a historic building”*

Likewise, there is a doubt about ‘original’, which it is possible to interpret as, “meaning anything comprised in the history of a building at any given point in time”, which Pickard concludes brings a doubt to the safeguards offered by the Venice Charter and noting that the Burra Charter does not actually define what is meant by the term cultural significance. Reflecting this tension in conservation values, Hudson & James (2007, p261) note how the dominant values within conservation legislation rely upon, “academic disciplines such as architectural history and archaeology", while arguing that there is, "growing recognition that a range of heritage values are also generated within specific communities", requiring, "a possible model for incorporating local heritage values into the conservation planning system". There is often legislative basis for this, such the English 'National Planning Policy Framework requiring conservation strategy to consider, "the wider social, cultural, economic and environmental benefits that conservation of the historic environment can bring … draw on the contribution made by the historic environment to the character of a place" (Ministry of Housing, Communities & Local Government 2021, p55). In considering the input of local communities, particularly where the buildings symbolise identity and continuity, Bold & Pickard (2013, p107) comment that where the, "public is involved in the decision-making process the more that trust in process and outcome must be engendered and maintained".

In considering those 'new problems' requiring a new approach in evaluation, Orbaşli (2008, p60-1) specifically identifies intangible values such as the challenges presented by industrial heritage buildings. To writers such as William Morris, Burman (1997, p22) observes, "what constituted value was clearly intended to embrace the cottage and the farmhouse as well as the castle or cathedral, but it is difficult to apply his thinking to railway heritage", as an exemplar for industrial heritage. Two specific challenges present, being how industrial heritage buildings do not immediately possess a fully established 'nostalgic memory', so owners or users may not expect conservation protection and the only means of repair for some former industrial or working building is to replace components. Another aspect, explored later, is the sense of how interpretation, "presenting the cultural significance of a building or place to its users, visitors and wider community" (Orbaşli 2008, p62), forms a significant challenge, particularly if there is an imperative to provide an 'authentic visitor experience'. Another aspect in building conservation discussed by Saunders, and an aspect that affects conservation of industrial heritage buildings, including buildings owned by heritage railways, is the growth in conservation led by the voluntary movement (Saunders 1996, pp9-14). Commenting upon such organisations as SPAB and SAVE Britain's Heritage, along with the work of individuals such as Sir Nikolas

Pevsner and Sir John Betjeman, Saunders (*ibid*, p11) describes how this, “coming together of the like-minded is unparalleled in the world”. This group of conservation supporters represent a wide range of interests or building types (including railway buildings) and generically labelled National Amenity Societies, formally drawn into the planning process as statutory consultees. Nevertheless, attempts to save redundant railway buildings are often not part of a national programme and instead represent the efforts of, “enterprising voluntary groups and charitable organisations” (Binney 1979, p206).

2.3 Heritage

Mydland & Grahn (2012, p566) define analytical discourse concerning heritage as typically conceived with an official understanding that stresses the importance of expert knowledge. Applying this to current definitions of built heritage, Tweed & Sutherland (2007, p63) state that this leads to a narrow interpretation relying on conventional conceptions of architectural and historical value, stating that, “in addition to understanding *how* to preserve built heritage, therefore, it is important firstly to elaborate *what* qualifies as cultural heritage and to explain *why* it is so”. Uzzell (1998, p11) expresses a sympathy for this narrow interpretation, with conservation programmes accused of trivialising history and thereby, “inculcating with the public a reactionary, superficial and romantic view of the past”, leading to a cynical promotion of heritage to satisfy, “the public’s appetite for reconstructing and fabricating comforting and nostalgic images and myths about the past”. However, Maeer & Campbell (2008, p14) state that there is a direct connection between heritage and culture to concepts of identity, whether of others or self, and understanding. Furthermore, this imagery is variable. Tweed & Sutherland (2007, p65) comment, “people will extract different meanings from an environment depending on the immediate purposes”, so what people actually extract from heritage is, “according to the contemporary concerns and experiences” (Harvey 2001, p320), providing a reason to understand, as a means to create more imaginative conservation solutions, the relationship between people and meaning is enshrined in built heritage (Tweed & Sutherland 2007, p68). Included in nostalgia is the concept of heritage by appropriation that, “generally emerges from public behaviour … it might also be referred to as *de facto* heritage, because it acquires its status through use rather than through deliberate consideration” (Tweed & Sutherland 2007, p63).

Although covering many of the same themes, there are a diversity of ways to describe the heritage of building or place, with Earl (2003, pp11-24) defining heritage as:

- Celebratory and magnificent
- Rare and curious
- Commemorative and associative
- Exemplary and instructive
- Pleasing and picturesque

Drury & McPherson (2008, pp27-32), in setting policy for Historic England, describe heritage values relating to place or built environment in terms of evidential, historical, aesthetic and communal values, defined as:

> **Evidential value** (*ibid*, p28). The potential of a building or place to yield evidence about past human activity derives from physical remains of human activity. This particularly applies where the remains represent the primary source to understand human activity of the place and goes beyond the earliest archaeological deposits to cover any poorly documented aspect for which remains inherited from the past provide an ability in understanding.
>
> **Historical value** (*ibid*, pp28-30). This value derives from the ways in which past people, events and aspects of life connect through a place to the present, the connection tending towards either *illustrative* or *associative*. Illustrative is where it is possible to see the past through surviving artefacts, whether, “design, technology or social organisation”. There is a crossover, such as machinery might be illustrative in providing an insight to past communities. Association, providing an affiliation to historical value, is where people or events, “give historical value a particular resonance”, linking the place to the events, the place

acquires a political affiliation, or the place becomes associated with cultural heritage, “such as literature, art, music or film”.

Aesthetic value (*ibid*, p30-1). People drawing sensory and intellectual stimulation from a place provide for an aesthetic value. Primarily this relates to the value in a design, whether through quality of design or innovation, for a building, structure or created landscape. The aesthetic value draws a distinction between design and artistic value, plus recognises aesthetic value can develop fortuitously over time through a cultural framework or action of nature as, “the patina of age”.

Communal value (*ibid*, p31-2). Where a place has meaning for the people who relate to it, or where the place has collective experience or memory, the place acquires a communal value. While a communal value may have historical (particularly associative) or aesthetic elements, communal values have additional and identifiable aspects such as commemorative or social. Commemorative can symbolise wider values, yet can equally remind of uncomfortable events within the collective memory. Social, including spiritual, describe how people perceive the place as a source of identity or how the place, “fulfilled a community function that has generated a deeper attachment”. Importantly, social values may have no direct relationship with historical or aesthetic values, and are identifiably less dependent on the physical fabric of a place, or may signify spiritual values attached to a place or location.

It is important to recognise how different, “people and communities may attach different weight to the same heritage values of a place at the same time” (*ibid*, p36), so that, “conservation is not simply about buildings, it is also about people, and the approaches to conservation at any time will inevitably be linked to the values of society at that time” (Orbaşli 2008, p6). Illustrating this are how the criteria used for the UNESCO World Heritage Site designation of Liverpool as the ‘Maritime Mercantile City’ (UNESCO 2004) include how the city was a centre of the ‘Maafa’ slave trading, the criterion attached to a place commemorating events even if collectively uncomfortable. In support of this

Olusoga (2016, p18) writes about the, “almost surgical excision of slavery and the slave trade from the histories of Britain of the seventeenth, eighteenth and nineteenth centuries”, and rendering almost invisible, “the long presence of black people within Britain” (*ibid*), so even if collectively uncomfortable, events attached to place becomes critical for the whole community (*ibid*, p518). These are the intangible cultural properties (Jokilehto 1996, p63-4), “where the material evidence of the place is at times non-existent or secondary to the significance of the place” (Araoz 2008, p36). These heritage values, that Araoz describes as, “spatial qualities of … public space” (*ibid*), can include communal memories and rituals.

Heritage thereby is a process (Harvey 2001, p335) that has a contextual basis (*ibid*, p321), where, “understanding of cultural heritage becomes a social process rather than a physical object to be preserved” (Mydland & Grahn, 2012, p583). In commenting upon the continuing legacy of SPAB, Harvey (2001, p323) comments that the, “practice of preserving ‘authentic’ physical artefacts in aspic … constitute a partial spectrum of the wider potential of the heritage field”. In questioning the value of museums, potentially physical artefacts in aspic, Jenkins (2018) states that, “the wonder of an object lies not in its material antiquity but in its story and its appearance.” However, focusing on the story risks what Harvey (2001, pp323-4) describes as a postmodernist way of defining heritage along commercial lines that fails heritage because it:

- Becomes possible to define heritage through economic commodification
- Creates one-dimensional thinking of heritage as a leisure activity
- Implies heritage is a modern concept reflecting modern concerns

Heritage, Harvey (*ibid*, p337) concludes, reflects a sense of nostalgia and it is therefore essential to “acknowledge, understand and embrace the very long-term temporal trajectory of the heritage phenomenon”. While designating heritage is the traditional process (Tweed & Sutherland 2007, p63), Mydland & Grahn (2012, p584) identify the necessity of rearticulating, “the understanding of heritage in a way that emphasizes social aspects of heritage rather than its apparent tangible and inherent qualities”. This change in understanding, "one which requires something of a paradigm shift within the professional heritage community" (Gentry 2013, p518), to an inclusive, narrative driven discourse.

Reflecting this paradigm shift, addressing the new thinking previously identified as necessary (Burman 1997, p22 and Orbaşli 2008, p62), are the 'Dublin Principles' (ICOMOS-TICCIH 2011). Underlying this new thinking is the development of industrial archaeology since the 1950s, connecting conservation to understanding industrial heritage (Palmer 2005, p11), although Buchanan (1980, pp372-3) comments that the interdisciplinary nature in understanding, "probably retarded the emergence of industrial archaeology as a clearly defined academic discipline", leading to an attitude of scholarly dismissal. Whereas the Venice Charter couples art with cultural significance (ICOMOS 1964, p1), the Dublin Principles define the cultural significance of industrial heritage as consisting of (ICOMOS-TICCIH 2011, pp2-3):

> *"… sites, structures, complexes, areas and landscapes as well as the related machinery, objects or documents … the related energy and transport infrastructures … includes both material assets … and intangible dimensions such as technical know … organisation of work and workers, and the complex social and cultural legacy that shaped the life of communities"*

Furthermore, conserving this heritage requires (*ibid*, pp3-4):

> *"… an interdisciplinary approach supported by interdisciplinary research and educational programmes … should benefit from a diversity of sources of expertise and information including site surveys and recording, historical and archaeological investigation … oral history … evaluation and assessment of documents should be undertaken by an appropriate specialist in the industry … The participation of communities and other stakeholders is also an integral part of this exercise … knowledge … is necessary to understand the significance of industrial heritage sites or structures … accessible and searchable by the public, scholars as well as managers"*

Palmer (2005, p10) comments that for industrial heritage, "the full meaning of a site can only be extracted if the material evidence is considered within a framework of inference which seeks to establish social as well as economic and technological significance". This reading of the building and processes (*ibid*) supports an adaptive reuse of workplace buildings, enhancing the longer-term usefulness of the heritage building (Bullen 2007, p28).

2.4 Location and Building Relocation

For buildings, the sense of memorial or monument was one of Ruskin's tenets in trying to achieve true perfection (Ruskin 1849, p171). Ruskin saw this memory within a Christian context, an idea that Maddrell (2009, p689) examines in how a cairn erected as a place of remembrance provides, though the act of witness, a contextual association within the landscape, an association that has the potential to be dynamic. Location can therefore have a multiplicity of meanings to those that interact with a specific location, the phenomenology of place that, "crystallises and focuses one essential aspect of human existence – the inescapable requirement to always be somewhere" (Coates & Seamon 1984, p6). Heritage buildings impact as location specific cultural icons, providing, "community well-being, sense of place and therefore social sustainability … a sense of connection with local surroundings" (Bullen & Love 2011, p419). In a heritage industrial context, place can be, "site, area, building or other work, group of or other works together with associated contents and surrounds" (Burman 1997, p27). Pickard (1996, p58) identifies setting as being particularly of relevance where listed buildings are integral to regeneration or redevelopment schemes, stating that several legal decisions safeguard, "the townscape value of attractive historic streets, village locations and individually in the context", of the heritage building. This connection between heritage asset and location legislation can be explicit, such as the National Planning Policy Framework stating that significance includes the contribution made by heritage assets to their setting (Ministry of Housing, Communities & Local Government 2021, p56). However, in understanding this meaning of location, the dynamic association of place, it is important to note how it potentially changes over time so that motivations to interact with a specific location risk becoming, "less to do with remembrance and more to do with a day-trip excursion" (Uzzell 1998, p13).

Another aspect of the contextual association with specific locations is the potential for differing groups of people to have individual perceptions about place, that is the space they inhabit or observe. Cialone *et al* (2017, p21) concluded from observation that professional perception, “profoundly relates to how we think about space”, and that there is a consistently, “profound relation between profession and spatial concepts” (*ibid*, p22). Tenbrick *et al* (2014, p268) defines the cognition of a building in terms of three vertices, being architects, users and clients, the idea of special knowledge is acquired by continuously, or quantitatively, adding information (Tenbrink *et al* 2016, p211), while Coates & Seamon (1984, p9) argue that although phenomenology of architectural aesthetics evokes symbolic qualities, “phenomenology of place must be holistic, joining qualities of nature and physical environment with qualities of humanness and human community”. Finding structure in an environment facilitates organisation of descriptions, these descriptions for spatial layouts are, as a context of location, “highly coherent and represent … underlying conceptualisation of the configuration at hand” (Tenbrink *et al* 2016, p208). In discussing this conceptualisation of place, Dalton (2017, p25) contrasts five factors that can define place, being fixed position, a setting for social interactions, emotionally meaningful, definable and inhabitable rather than viewed, with conceptualising a place as larger than any individual component that defines the space. Dalton goes onto argue (*ibid*, pp25-6) that direct experience provides meaningfulness to place, especially where place provides an ‘exceptional setting’ as a location.

This sense of connection of a monumental building with location is therefore an integral part of the various conventions concerned with heritage buildings. In considering setting, Article 6 in the Venice Charter (ICOMOS 1964, p2) states,

> *“The conservation of a monument implies preserving a setting which is not out of scale. Wherever the traditional setting exists, it must be kept. No new construction, demolition or modification which would alter the relations of mass and colour must be allowed.”*

Article 7 (*ibid*) therefore follows that,

> *"A monument is inseparable from the history to which it bears witness and from the setting in which it occurs. The moving of all or part of a monument cannot be allowed except where the safeguarding of that monument demands it or where it is justified by national or international interest of paramount importance."*

Each party signing to the Convention for the Protection of the Architectural Heritage of Europe (1985) undertook, in Article 5,

> *"… to prohibit the removal, in whole or in part, of any protected monument, except where the material safeguarding of such monuments makes removal imperative. In these circumstances the competent authority shall take the necessary precautions for its dismantling, transfer and reinstatement at a suitable location."*

Tweed & Sutherland (2007, p63) discuss how, "areas within towns and cities that are not considered worthy as conservation areas and yet form an essential part of the urban character", comprise urban fragments that give context to the more obvious heritage assets. Conversely, Mills (2007, p117) notes that leaving, "a structure in an utterly changed original location may be recognized as untenable", and may even, "demonstrate little more than an inflexible and an imaginative, indeed fetishistic dedication to coordinates of latitude and longitude", despite relocation being just as inappropriate.

Linked with relocation is anastylosis, defined in Article 15 of the Venice Charter (ICOMOS 1964, p3) as, "the re-assembling of existing but dismembered parts", of a heritage structure. While generally applied to archaeological sites, with Earl (2003, p137) citing the various restorations of Stonehenge, Jokilehto (1996, p69) warns that it is necessary to understand this provision in the context of the various charters concerning conservation and to keep in mind the objective of maintaining items of cultural heritage in the full richness of authenticity. Jokilehto (*ibid*) goes onto to observe that decisions concerning anastylosis are, "often made under pressure from clients, politicians, tourism operators, and also the general public". Bold & Pickard (2013, p119) stress that where anastylosis includes any new materials, a scrupulous approach to conservation means using these new materials must be recognisable.

Despite this emphasis on the unacceptability of relocating historic buildings, there are examples of relocation for reasons that range from international interest in safeguarding to political expediency. Regarding the technology of relocation, Earl (2003, p134) comments that some forms of construction are more amenable, with framed structures presenting less of a technical challenge than the potential need, where a building is of masonry construction, to corset, lift and transport the entire building. Allais (2013), developing from writers such as Berg (1978), discusses the rescue operations between 1964 and 1969 where construction of the Aswan High Dam in Egypt threatened the Abu Simbel Temples. Of the identified problems regarding this UNESCO supported project, the main difficulties were technical aspects in ensuring integrity after relocation (Allais 2013, p20). Noteworthy regarding how location is a critical element of any historic structure, it was necessary to create a landscape to ensure the relocated temple should have the same visibly centred orientation as compared with the original setting, “a reenactment of the grid that must have been part of the temples’ original making” (*ibid*, p30). Another concern was the use of modern materials in the relocated monument that needed to meet criteria (*ibid*, p31) of not disturbing the temple appearance, not affecting elements of the temple and have appropriate longevity so as not to endanger the temple durability. The solutions adopted were to ensure positioning of the modern materials, specified for durability, out of sight. In contrast to the Abu Simbel Temples were the relocation of 13 churches in Bucharest between 1982 and 1988 (Gillet 2016) as part of the city centre remodelling to enable construction of the, “vanity project”, Palace of the People for the communist dictator Nicolae Ceaușescu. Given a choice of demolition or relocation, a civil engineer, Eugeniu Iordăchescu, created a system of stabilising the buildings on a reinforced concrete raft and moved the buildings on temporary railway tracks. The final location for these relocated churches were not always satisfactory, as Gillet notes (*ibid*),

> *“Many of the moved churches, though, ended up being relocated in the shadows of large, soviet-style apartment blocks, often sandwiched tightly as if daring those who pass by to blink and miss them. Visitors to the city can find Schitul Maicilor hidden behind a huge building that contains several government ministries.”*

Furthermore, the relocation projects were time constrained, with the 22 churches eventually destroyed including some that already had official permission for relocation and impossible to relocate in time. For one of these churches, the workers refused to demolish it, “so Ceaușescu got people from prison to do it” (*ibid*).

In cases of necessity, Bold & Pickard (2013, p120) state, “relocation and dismantling of an existing resource should be employed only as a last resort, if protection cannot be achieved by any other means”. The 2019 relocation of the Rubjerg Knude lighthouse in Denmark (Guardian/Associated Press 2019), a ‘national treasure’ threatened by coastal erosion plus shifting sands and moved inland on rails, is an example of such a last resort relocation, as was the 2008 relocation of the nearby Mårup church, built in 1250 and another building threatened by coastal erosion[3]. Gregory (2008, p114-9) describes how construction of the Channel Tunnel Rail Link in Britain employed a mixture of the dismantle to relocate and move entire building methodologies to rescue heritage buildings standing on the Channel Tunnel Rail Link route, with decisions on methodology varying according to whether there was a risk of creating a rebuilt facsimile rather than conserving heritage infrastructure. Buildings dismantled for rebuilding elsewhere were those identified as already blighted and there was a sense that the rebuilding was an, “exceptional opportunity” (*ibid*, p118), to train apprentices in traditional building techniques to perpetuate skills as way of benefiting the future conservation of heritage buildings. This relocation of heritage buildings includes heritage railway buildings, notably the listed steam locomotive water tower at St Pancras, “removed in three parts and re-erected 700 m north of its old location” (Historic England 2003).

Earl (2003, p134) refers to the relocated destinations of threatened heritage buildings, either to recreate a specific historic museum, citing Colonial Williamsburg in the USA as a precedent, or relocation to rescue museums as,

[3] Beside the conservation value in protecting this Romanesque building, the building’s cultural significance includes being, “one of the filming locations for the 1987 film Babette’s Feast, which became the first Danish film to win an Academy award for best foreign language film” (Guardian/Associated Press 2019).

“rescue homes of last resort”. Stratton (2000, p122) describes these museums as, “a discredited concept”, that, “blur the distinction between museum exhibit and heritage site” (Mills 2007, p111) and, “such collecting too often reflects an increasingly outmoded scientific method: facts should be fixed, and then the debate would move on” (*ibid*, p114). Hudson & James (2007, p260) identify a dichotomy between ‘monument’ and ‘ordinary’ environments, where monumental becomes the focus of conservation legislation. For the relocation of some heritage buildings, Earl (2003, pp134-5) describes the outcome as sometimes ludicrous, even if well-intentioned, citing an example in Manchester of a timber framed inn scheduled as an ancient moment, where the relocation involved lifting the structure to a level 10 metres above original and incorporating into a new development such that,

> *“… the spectacular resiting was really no more than a symbol of preservation in an ocean of destruction … It is hard to believe that, in the process of redesigning a whole city centre, there was no will to find a solution that would leave the last timber frame buildings in central Manchester in situ, to form an interesting link between the ancient and modern topography of the city.”*

Gregory (2008, p125) states much, “that is intended to replicate the past authentically bears no resemblance to the ‘real’ past … [s]o-called heritage cities may be less authentic than is claimed”. As a solution, Hudson & James (2007, p261) suggest the possibility of how a historic landscape character appraisal will allow a way of recognising the historic element within the whole environment, providing context and setting for relocated buildings. For visitors and experts, Mills (2007, p118) comments that they will, “need to be aware the viewing buildings wrenched out of the context may actually inhibit our understanding of the past”, before concluding that relocated buildings at least deserve a warning, “Beware: this relocated building can seriously damage your view of the past”. Conversely, Gregory (2008, pp127-8) argues that the, “dilemma for heritage professionals is that to accept relocation as an adequate response to development pressure is to set a precedent that may tear apart the fragile network of regulations protecting our heritage”. Finally, while removing a building from an original setting destroys authenticity, Gregory (*ibid*, p127) asserts it might equally be valid, even if rarely acknowledged, that the setting of a building is also subject to change.

2.5 Authenticity for Building Conservation

Authenticity in building conservation, "is a paradox that, in order to maintain the fabric of an old building, it is often necessary to destroy some of it in the first place" (Cantacuzino 1996, p164). Gregory (2008, p125) comments how authenticity is the subject of intense debate. This especially applies where reconstruction is necessary following catastrophic damage, with Bold & Pickard (2013, p115) identifying whether it is possible to reproduce or renew with authenticity raises profound practical and philosophical difficulties, if rebuilding is, "justifiable only in exceptional circumstances", or if, "decisions to reconstruct are political … with all the risks inherent in political subjectivities in decision-making, partiality of purpose, and experience in implementation" (*ibid*, p117). Cantacuzino (1996, p165), in expanding the authenticity paradox presenting profound difficulties, comments that redundant buildings need new functions upon redundancy to keep the building alive, although finding new uses for buildings means the building fabric, especially surface treatments, will often become expendable. Cantacuzino (*ibid*) specifically identifies that,

> *"Single-space structures, like churches, railway sheds or exchanges, should not be subdivided and made into cellular structures. To do so is to change the very nature."*

This need for a new function particularly applies to redundant industrial buildings, adjudged to be, "rarely of the first rank in an artistic sense and … loss of original fabric is therefore more easily acceptable, especially if the new work has flair and imagination" (*ibid*, p166). In effect, this argument satisfies legislative importance regarding a viable use consistent with conservation will enhance a heritage asset (Ministry of Housing, Communities & Local Government 2021, p56). Khalif (2018, p42) accordingly interprets authenticity,

> *"to mean how well tangible and/or intangible attributes (information sources) truthfully and credibly communicate values within the cultural context to which the heritage belongs"*

There is uncertainty, with Dovey (1985, p36) identifying that, “replications are forms that attempt to carry authentic meanings”. Khalaf (2018, p40) points out that generally, “the term ‘authentic’ can be used interchangeably with the terms ‘of undisputed origin’, ‘genuine’, ‘true’ and ‘real’”, so, “authenticity is a problematic and insufficiently explored concept” (Kolar & Zabkar 2010, p652), and therefore, “any purist notion of authenticity is flawed” (Gregory 2008, p127).

One viable way of judging the effectiveness, the authenticity, of building conservation is to define the underlying thought processes in terms of either an ethical or aesthetic approach (Warren 1996, pp46-7). While apparently entirely different, these two processes Warren describes as being, “indissolubly linked”, such that it is possible to judge any work of conservation according to the aesthetic predilections of an observer or for the work to be truthful, whether aesthetically satisfying or unsatisfactory. One important ethical consideration Warren identifies (*ibid*, p48) is the reason behind a building’s purpose with the risk that, “too often, the reason evaporates leaving the objects stranded on the shores of history”, with the best solution being to retain a use as close as possible to original to retain, “the ethic of integrity of unaltered structure; but the decision will be one of degree, demanding a balanced judgement”. Dovey (1985, pp38-9) describes this balance as finding an equilibrium between deception, “the moral problem of authenticity”, and the experiential depth of environmental purity. In considering these aspects, Warren (1996, p49) makes two conclusions, being, “the impact of an intervention should be sympathetic or neutral”, and, “an intervention should move towards a full appreciation of the building”. To achieve these objectives requires high ethical standards (*ibid*, p50) achieved through research, calling upon the expertise of relevant experts where the required information is beyond the skills typically available for a building conservationist, especially as the aesthetic, “consists of nuances, infections and accents”, of which a skilled observer will be aware. This nuanced process is indigenous (Dovey 1985, p43-4), where form emerges out of everyday life and context of place, whereas searching for authenticity in the past will turn authenticity into a commodity. In fact, Dovey concludes that, “inauthenticity emerges out of our very attempts to find and recreate a lost authenticity" (*ibid*, p47), so that a reliable, trustworthy authenticity exhibits a connection, "between the form of the phenomenon and the processes that produce it" (*ibid*, p46).

In applying theories concerning authenticity to conserving heritage buildings, Alberts & Hazen (2010, p62) differentiate between preservation, defined as conserving the site of building in as original condition as possible, and restoration, encompassing a range of work ranging from keeping as much original structure as possible to a new structure based upon original designs. This latter option they identify as essential for extensively damaged heritage structures where context is an intrinsic part of the heritage value, although Bold & Pickard (2013, p121) define replicating a building to create an exact copy as, "intrinsically deceptive in intent", even if acceptable for interpretation or display. For conservation works that are not replication, Bold & Pickard (*ibid*, p120) separate reconstruction, requiring new material, from restoration, all with, "appropriate documentation including detailed records of the entire reconstruction progress which distinguishes reconstructed and existing original parts". Conservation works must display evocation and interpretation of the earlier form (*ibid*), human indicators reconnecting different interest groups and stakeholders that Khalaf (2018, pp45-6) cites as important when rebuilding damaged World Heritage cities, where those ties that drive reconstruction Khalaf (*ibid*) classifies as including place attachment, emotions, and cultural identities, balancing, "expert driven and more anthropological understandings of heritage" (*ibid*). This changes authenticity to a construct derived in part from how various interest groups perceive the building rather than largely unchallengeable criteria proclaimed by academic and professional experts (Ehrentraut 1993, p270). Tellingly, even where people feel an emotional attachment towards a building, where reusing a building, "practical economic considerations tend to have a higher priority than other considerations" (Velthuis & Spennemann 2007, p64).

Tourism can, "challenge authenticity and integrity" (Alberts & Hazen 2010, p68), with owners of heritage buildings potentially preoccupied in providing visitors interpretation that may compromise authenticity, even if the tourists value authenticity. Yet, what the tourists may get instead is an authentic experience that has a staged quality, giving an aura of superficiality (MacCannell 1973, pp595-6) that Wang (1999, p351) classifies into objective, constructive and existential authenticity. Of these, objective and constructive are object-related, where the tourist interaction with heritage objects is direct or projected, with authenticity becoming symbolic, while existential is where the tourist activity has no reliance upon heritage objects. Complicating this analysis are possibilities presented through the advent of virtual reality, with Jenkins (2018) asserting that the closer virtual comes to reality, the more authenticity loses its appeal and seeking authenticity becomes a cult. There is often the possibility, identified by Halewood & Hannam (2001, pp567-8) using the Jorvik Viking visitor attraction in York as an example, of authenticity being, “consciously invoked as an actual marketing strategy”, with the awareness that,

> *“In looking for authenticity, some tourists focus on the product in terms of its uniqueness and originality, its workmanship, its cultural and historical integrity, its aesthetics, and/or its functions and use. Academic expertise is widely used to confer this quality authenticity and a sense of place …”*

In this case, invoking academic expertise for authenticity is by presenting ‘back room’ aspects of archaeological investigation during the prescribed tourist route lends, “support to the authenticity and integrity of the reconstructions” (*ibid*, pp574-5), for which Mills (2007, p117) concludes that maintaining the, “Viking remains *in situ* despite the discontinuity with recent developments seems appropriate”. Wang (1999, p353) describes this process relating to authenticity as something, “judged as inauthentic or staged authenticity by experts, intellectuals, or elite may be experienced as authentic and real from an emic perspective”, and Uzzell (1998, pp14-5) defining this approach to interpretation being, “typically past-orientated”, with the information taking a symbolic view so that, “interpretation becomes a form of manipulation and therapy.” Halewood & Hannam (2001, p568) describe this process as a commodification, becoming a, “key factor in the negotiation of authenticity”, that ultimately leads to the monetarisation of heritage where, “heritage not only has to pay for itself but must also deliver monetary benefits” (Orbaşil 2017, p165), such that once this commodification of heritage is accepted, “it is inevitable that approaches to its conservation will also be centred on increasing market value" (*ibid*).

For 'object-related' heritage buildings or sites, Wang (1999, p353) observes that viewing, "authenticity as the original or the attribute of the original is too simple to capture its complexity". While authenticity relating to heritage sites means original as opposed to a copy, constructivism is not a coherent doctrine, with a different range of meanings such that, "people may adopt different constructed meanings dependent on the particular contextual situation" (*ibid*, p354). Nevertheless, Willson & McIntosh (2007, p78) note that, "there is a significant relationship between heritage buildings and tourists' experiences", with findings from research into tourist narratives revealing, "three key themes of the heritage building experience: visual appeal, personal reflections and engaging experiences" (*ibid*, p88). Another finding is how heritage buildings, "render townscapes an experiential space filled with emotional, mindful, engaging and personally imbued significance" (*ibid*), although in research to interpret heritage Uzzell (1998, pp18-9) states concerning the social identity of place,

> *"The research also sought to ascertain which particular elements of the town (past and present) were most meaningful to respondents in terms of creating a sense of place: the people of the town, the natural and man-made spaces and buildings in the town, or the activities and industries within the town. It is noteworthy that of these three elements, the only one which did not emerge as a coherent scale was that concerned with spaces and buildings in the town. This suggests that it is the people and activities of the town, rather than the buildings or areas within it, that contribute to its identity."*

This idea of experiential space that encompasses more than the heritage buildings lead Willson & McIntosh (2007, p89) to argue for placing an increased attention, "upon the experiential evaluations of heritage buildings from differing viewpoints", to influence, "policy regarding the preservation of heritage buildings" (*ibid*), including understanding the tourist perspective, especially as, "many heritage buildings are likely to be altered by 21st century progression" (*ibid*, p88).

2.6 Identified Challenges in Applying Authenticity

Accepted principles of building conservation, which in the European context date back to the Renaissance, focus on a thinking where the value of symbolically significant buildings exceeds the simple utility value, where analytical discourse concerning heritage typically stresses expert knowledge, potentially leading to a conventional conception of architectural and historical value. Developing these ideas explored the differences between conservation against restoration for buildings of an artistic or historical nature, with the idea that owners of heritage buildings are custodians, constrained to conserve the fabric for future generations through prudent, honest repair. Another aspect of this conventional thinking is how buildings provide a sense of memorial, possessing a dynamic contextual association within the landscape that extends to an emotionally definable sense of place, so heritage buildings have a connection with location that needs perceiving as the character of location.

These ideas endure, whether expressed dogmatically or subtly, although applying these principles to the wider built heritage rather than buildings possessing architectural or historic value, such as heritage industrial buildings, presents challenges where owners are not expecting a need for conservation and how the specific nature of building use becomes the heritage value. There is a sense that conventional thinking concerning building conservation is unable to address the challenges of conserving those buildings associated with industrial heritage, with study of these buildings being an adjunct to industrial archaeology and likewise struggling for academic analysis into the very particular character of heritage industrial buildings. Authenticity for building conservation is a known paradox, in that keeping a building alive after redundancy requires an acceptance that there is risk of rendering the original building fabric as expendable, such that any purist notion of authenticity is flawed. This is causing a tension in conservation, where strict guidelines lead to the idea of conservation falling into disrepute, where an inflexibility in interpreting original may be damaging to the long-term conservation of a building’s ‘special character’, especially where repairs need to convey the special character to visitors who are unfamiliar with the distinctions of originality. Furthermore, tourism can challenge authenticity, creating a situation where authenticity can become objective, or even monetarised, and the presentation of conserved buildings without intrinsic architectural or historic value becomes object related. Accordingly, people may adopt different meanings about the building depending on the context, so presentation of this type of object related, functionally purposed, heritage building relies upon a mixture of visual appeal, personal reflections and experiential engagement, needing an understanding of the differing perceptions.

These ‘personal reflections’ strongly apply where the heritage buildings symbolise local community identity representing a specific use rather than presenting clearly definable architectural or historic value, with this community identity demanding a greater need to involve the wider public in decision making rather than a limited, academic focused, influence on policy and legislation concerning heritage buildings. There is a risk, therefore, that heritage can become a social process, focusing so much on the heritage artefact that it becomes possible to define heritage through an economic commodification activity embracing nostalgia rather than emphasising the social aspects attached to heritage. With a specific connection between heritage and concepts of identity, with people extracting contemporary experiences from heritage or buildings acquiring heritage by appropriation, so it becomes necessary to fully understand these functional buildings to properly define approaches to conservation, or what is important to conserve.

Chapter 3

Conserving Functional Railway Buildings

3.1 Context for Functional Buildings

Defining specialist buildings for the Industrial Revolution is through the innovatory nature of the functions accommodated by the building, along with an interdependency of buildings for a specific industry. Railways are one Industrial Revolution industry that required a range of these functional buildings designed for purposes that developed as the railways matured from wagonway to recognisably mature undertakings. For all industries, these functional buildings developed over time, acquiring a social history in addition to the economic necessity that caused the original development, with for the railways a stronger public awareness of the railway station as opposed to the fleetingly glimpsed range of buildings essential for running the railway.

Conservation of heritage buildings can be controversial, the debate centring on what defines heritage, along with whether conservation is a regressive pressure on the built environment. For functional buildings, these perceptions particularly apply through a lingering perception of these buildings lacking artistry, with functional buildings more vulnerable to loss than any other type of heritage structure. This tension in conserving heritage functional buildings strongly applies to heritage railway buildings, with the predominant custodian presenting an ambiguous attitude to conservation despite railways having a powerful cultural significance.

Museums or heritage centres, including heritage railways, are one way of conserving heritage functional buildings. Either developed around existing sites, or created by relocation of buildings, these centres present visitors with an interpretation of the industry and social history attached to the functional buildings. There is a debate concerning authenticity, especially sites with relocated buildings, with a concern about narratives orientated to visitor expectations rather than engaging in systematic study. This especially affects the heritage railway movement, with a core philosophy of preservation that is neither conservation nor authenticity, motivated by a predominately volunteer workforce presenting an amalgam of romanticism about the past. In this environment, the heritage functional buildings serve as part of a carefully staged mimesis.

3.2 Defining Functional Buildings

Identifying the idea of functional as an act of appreciation applied to buildings of the Industrial Revolution emerged during the mid-20th Century, with recognition that the building's character derives, "directly from the way the challenge of function is met" (Richards 1958, p15). These, "functionally conceived buildings" (*ibid*, p17), include mills, warehouses and factories unprecedented in scale, use of new materials and structural prefabrication compared with the small, utilitarian pre-Industrial Revolution additions to homes (Pearson, 2016, p9). This change Hudson (1992, p81) attributes to how the Industrial Revolution provided capital, labour predominately released from agriculture and innovation, such that as manufacturing regions became more successful, there was a transition from cottage industries to industry requiring buildings forming the specialist infrastructure associated with the Industrial Revolution. An important part of this 'specialist infrastructure' was the early railways, which Stokes (1998, p313) describes as facilitating this move in economic activity from agriculture and small-scale manufacturing into regionally defined industries that Hudson (1992, p106) notes, "accentuated the difference between regions by making them more functionally distinct and specialised".

In discussing conservation of 19th Century industrial heritage, Jones & Munday (2001, p587) draw a clear distinction between a building landscape associated with manufacturing activity, including transport, effectively a landscape of 'functionally conceived buildings', against a network of buildings for the workers, such as chapels, schools, institutes and housing. Buildings for the Industrial Revolution therefore represent a clear separation of buildings for process as opposed to human occupation, such that the main defining characteristic of these functionally conceived buildings is that they represent buildings housing machinery, processes or specific functions with human occupation ancillary to and serving the building's purpose. These are the buildings of which Cantacuzino (1996, pp164-5) noted, "it would not be unreasonable to regard all those buildings that came out of the Industrial Revolution … as industrial products of a functional kind". Steam power made possible this growth in dedicated manufacturing buildings, requiring boiler houses as part of the machinery associated with many types of functional buildings (Pearson 2016, p13, p41). Scale is a significant factor in defining these functional buildings. Whereas previously buildings, whether cathedrals or barns, had features such as doorways as a reminder of design in relation to human scale, these new buildings introduced, "into the landscape … structures that had nothing to with human scale, but reflected rather the superhuman nature of the new industrial activities" (Richards 1958, p20). Lawrence (2018, p32) defined Richard's 'functional tradition' as having a clarity of form unobscured by the irrelevancies of ornament.

Steam railways transported the Industrial Revolution, yet there is an apparent hesitancy in recognising development of the associated functional buildings, with discussion of the revolutionary nature of Industrial Revolution transport structures tending to concentrate on the engineering aspects such as bridges or passenger station train sheds (Richards 1958, p16, and Jones 1985, pp74-5). However, Biddle (2011, p21) defines railway buildings, including signal boxes, amongst the many innovatory railway structures developed as railways matured during the 19th Century. These buildings represent heritage infrastructure, using Pickard's (1996, p3) criteria of three dimensional and securely fixed to ground, criteria that Pickard goes onto suggest can include a range of unusual buildings. Placing functional buildings within the context of their period includes recognising that for, "industrial buildings … [t]he mill and the warehouse, no less than the church or the country mansion" (Jones 1985, p12), becomes a case of recognising this context and the specialist designers of such buildings. However, unlike the church or country house, the design of these buildings was primarily engineer led rather than by an architect (Pearson 2016, p24), in part because many architects perceived designing functional buildings such as factories or mills was lowering themselves (*ibid*, p11). It therefore fell to engineers to design the functional buildings demanded by the Industrial Revolution, with architects, often family friends or acquaintances, sometimes employed to, “make a splash” (Pearson 2016, p58), in a specific architecture style for features such as entrances. Nevertheless, as the 19th Century progressed, some architects gained a reputation by specialising in designing certain types of functional buildings. This was either through patronage of wealthy investors, such as George Townsend Andrews, whose fortunes in designing railway buildings rose and subsequently fell with the career and downfall of ‘The Railway King’, George Hudson (Fawcett 2011, pp41, 61-3), or as industrial architects, including Francis Edwards or Richard Tattersall (Pearson 2016, p12). Amongst these industrial architects is William Bradford, who designed characteristically ornate, yet functional, breweries (*ibid*, p93), with the grade II listing for Bradford’s design for Hook Norton Brewery noting the ornamental exterior design while recognising that integral is the functional purpose provided by the brewing equipment and steam engine (Historic England 1984). For these reasons, addressing the ‘new problems’ identified by Orbaşli (2008, pp60-1) indicate a stronger emphasis on relevancy in conserving functional heritage buildings. This relevancy, that Buchanan (2005, p20) defines as the dynamic concept of industrial landscapes, such that an “understanding of industrial buildings increases as we see them in broader context” (Stratton & Trinder 1997, p120). Whereas such a building may only be one element in context that developed over time, it is essential to understand the relationship that this building will have with other buildings, and to compare with other buildings located elsewhere designed to contain the same technology (*ibid*), an interdependency the ‘Dublin Principles’ asserts is intrinsic to understanding industrial structure or sites (ICOMOS-TICCIH 2011, p3).

3.3 Railway buildings for the Industrial Revolution

Railways were a consequence of the Industrial Revolution and, in the same way as the Industrial Revolution, the early development of the railways was hesitant, with origins dating back to early 17th Century private wagonways built by landowners exploiting mineral rights on their land (Simmons & Biddle 2000, p567). Development of a canal network for use by the public became the model for railway construction (Biddle 1990, pp22-3, 24-5), the world's first public railways being the Surrey Iron Railway opened in 1805 (Bayliss 1978, pp328-31 and Simmons & Biddle 2000, p487), followed next year by the Swansea & Mumbles Railway (Simmons & Biddle 2000, pp490-1). Opened in 1825 as a distinct break with precursor colliery wagonways, the Stockton & Darlington Railway was the world's first public railway authorised to use steam locomotives (Simmons & Biddle 2000, p478). The final advance in bringing together all elements of a recognisably modern railway was the Liverpool & Manchester Railway, opened in 1830 (Simmons & Biddle 2000, p412), where extensive civil engineering works in construction along with complete control of the trains comes to define a railway (Biddle 1990, p27).

Buildings constructed for use by these early railways expressed a hesitancy of purpose that reflected an incomplete comprehension as to the potential of railways. Early railway buildings, "owed more to pre-railway precedent" (Minnis 2014, p33), with Parissien (2014, p3) observing that,

> *"… the earliest railways were not actually very interested in passengers: goods traffic was, the railway companies assumed, always going to remain their principal business, while carrying people would remain, they predicted, merely a sideline"*

In time it became necessary to separate the passenger and freight traffic, where the archetypical station had separate facilities for passenger traffic, including parcels, and freight traffic (Richards & MacKenzie 1986, pp19-20), each served by specialist buildings along with a hierarchy of staff. An enduring weakness in understanding railway buildings is intrinsically the railway itself, which Freeman (1999, pp163-4) describes as disconnecting with a wider cultural profile such that most understanding of railway history is in isolation due to a, "discursive insularity". Freeman (*ibid*, pp160-1) sets this weakness in the Victorian context where, within a wider cultural framework, assessments about the railway,

> *"… tell little about frames for thought and ways of seeing, about beliefs and sympathies, hopes and despairs. Yet these are vital features of any fully rounded assessment of the Victorian railway."*

This assessment includes railway architecture, linking railway architectural history to the, "economic, social and indeed business history" (Gourvish 1993, p122). Biddle (2011, p11), in specifically addressing Freeman's comments, describe how railways, "cover a wider range of human activity than almost any other industry", that Henderson (2011, p73) describes as affording, "insights into historical changes". There is only a relatively recent examination of railway contribution towards architecture and civil engineering, despite these railway structures sometimes being, "innovatory, spearheading new techniques and answering new demands" (Biddle 2011, p11). Biddle goes onto list railway historic infrastructure as represented by the civil engineering structures of bridges, viaducts and tunnels, operational railway building of stations, goods shed, warehouse, signal boxes to control train movements and engine sheds, along with hotels and houses (*ibid*, pp15-22). However, within this list there are immense complications and variations, such as the brick vaults constructed by the London and Birmingham Railway at Camden to accommodate steam winding engines and only in use until 1844 when steam locomotives became powerful enough to pull trains up the Camden Incline out of London Euston station (*ibid*, p43). These grade II* listed and long abandoned vaults represent functional structures, specific for one use, difficult to effectively adapt and possessing strong heritage values. Overall, railway buildings, "are architectural and civil engineering elements of great value, and above all, they represent a great potential for generating active resources for our society" (Llano-Castresana *et al* 2013, p62).

Of the collection of structures described by Biddle, the passenger railway station building is the least specialist structure, in that the processes carried out within the building are unconstrained by the building morphology. Indeed, early railway stations represent a hesitancy regarding railway buildings, and indeed even carrying passengers. Facilities therefore reflected a stagecoach precedent (Simmons & Biddle 2000, p473), such as passengers on the newly opened Stockton & Darlington Railway paying their fares in Stockton at a converted house, the now grade II* listed 48 Bridge Road (Historic England 1951), before boarding the train in a similar manner to boarding a stagecoach (Parissien 2014, p2). Similarly, the Liverpool Road Terminus in Manchester constructed by George Stephenson in 1830 for the Liverpool & Manchester Railway, now grade I listed and described in the listing as, "the oldest surviving passenger railway station in the world" (Historic England 1963), is a red brick with sandstone ashlar and stucco structure in Classical style that Parissien (2014, p3) describes as, "effectively little more than a stuccoed house". As it became apparent to the railways that passenger traffic could be lucrative, there was a move to provide improved passenger facilities. While the first permanent railways stations were, following the Manchester Liverpool Road example, in the, "stylistic precepts of domestic architecture" (*ibid*, p4), in part to provide a reassuring start to the journey on the new and sometimes then quite unsafe mode of transport, the railway companies were very aware that if the station is, "the point at which the public encounters the railway system, that it is also the place where the image of the system could be manipulated to reassure travellers" (Lawrence 2018, p8). Redolent of Pearson's already cited desire for building owners to 'make a splash', railway companies engaged prominent architects. These architects, influenced by the critical comments made by Pugin (Jones 1985, p114) and Ruskin's comment that railway architecture, "has, or would have, a dignity of its own if it were only left to its work" (Ruskin 1849, p117), designed railway station buildings with, "requisite Ruskian dignity", while, "simultaneously solid and spectacular" (Parissien 2014, p8). Early examples were Classical in the style of Georgian buildings, usually because the architect already had a professional connection with the wealthy landowners investing in the railway, such as James Pritchett's strongly Classical design, complete with pedimented portico, for Huddersfield (*ibid*). Similar designs from the same era were John Dobson's Newcastle Central and Thomas Moore's Monkwearmouth (*ibid*, pp9-10). However, the influence of Pugin asserted itself, with the works of architects such as Sir William Tite reflecting a more mid-19th Century ethos (Lloyd 1979, pp48-67), mixing Gothic with Italianate and Tudor (Parissien 2014, pp30-3). Station design was not the sole preserve of architects, as it was not only George Stephenson amongst the railway building engineers who were designing station buildings reflecting the style of the era. Particularly influential was Isambard Kingdom Brunel, whose designs include the now Grade I listed Tudor Revival design for Bristol Temple Meads (English Heritage 1966a), later extended by his assistant, Sir Matthew Digby Wyatt (Parrisien 2016, p24), this extension also listed Grade I (Historic English 1966b). This was the era of engineer led designs, pushing the boundaries of using iron to produce train sheds over increasing large stations (Brindle 2004, p30), yet Wyatt at Paddington, influenced by Ruskin, built a train shed deliberately with, “meretricious and adventitious”, ornamentation (*ibid*, p40). Perhaps the most interesting insight into Brunel’s influence is how his simple, relatively standardised, Tudor chalet railway station designs for the Great Western Railway were the inspiration for the 1980’s British Railways Regional Architect’s ‘Rat-Trad: Rational-Traditional’ design of semi-modular station building (Lawrence 2018, p171).

Whereas the passenger railway station is the public face of a railway (Biddle 2011, p20), away from this public gaze are the more functional railway buildings, the goods shed, engine sheds, signal boxes, locomotive works and other functional buildings that Denthier (1978, p9) described as, “only fleetingly glimpsed by the traveller … places where a staff never seen goes about its business …”. And only fleetingly glimpsed by writers on railway buildings, who tend to take an architectural view and thereby seeing the passenger railway station, “as the centrepiece of the railway system” (Nevell 2010, p103). For other buildings, even when the designs were, “simple but elegant” (Minnis & Hickman 2016, p17), the perception of buildings such as good sheds were always of them being functional structures having little commonality with adjacent passenger stations (*ibid*). Nevell (2010, p103) discusses this in terms of an ‘art-historical’ view that presents as a variant interpretation of Pearson’s already cited divide between the social standing of buildings designed by architects and functional buildings, which most architects would not wish to lower themselves by designing. Thus, railway functional buildings remained the preserve of an engineering led design process (Kay 1989, p41) with simple design solutions, such as the railway warehouse Nevell (2010, p108) described of ashlar blocks still displaying the mason’s marks, coursed rubble platform and king-post roof trusses mixing timber with wrought iron. Nevell

(2010, p103), Biddle (2011, p11) and Minnis (2012, p1) all point to how until the late 1980s and into the 1990s there was little in the way of systematic study regarding the various types of functional railway buildings, with Biddle (2011, p11) identifying how the orientation of study into railway history is traditionally locomotives and trains. Regarding the study of railway buildings, Minnis (2014, p20) confirms the previously cited discursive insularity identified by Freeman by observing that,

> *"The subject has not received the degree of study that it warrants from those professionally involved either as architectural historians or industrial archaeologists. Their attitude has, perhaps, been that it's best left to the railway enthusiast. But much of the enthusiasts' interest remain narrowly focused… with an emphasis very much on locomotives and train working…"*

Minnis (*ibid*, p21-2) recognises that while many, "gifted amateurs", amongst the railway enthusiast community have made systematic studies of various railway buildings, there is an identified perception of railway enthusiasm doing little to further the study of railway buildings, to the detriment of the understanding and preservation of these buildings. In identifying the work done in studying railway buildings, Minnis cites an orientation towards the passenger railway station, noting (*ibid*, p28),

> *"if only the main station building is listed, it may stand in isolation, losing much of its impact the removal of all the ancillary structures are surrounded it such as signal box, good shed, awnings and waiting shelter, not to mention such details as traditional paling fences, light fittings and signage. These groups of buildings and details have, over the years often been whittled away one by one so that what is left lacks coherence."*

Minnis (*ibid*) concludes that railway buildings, "are best not seen in isolation", representing the dynamic referred to in section 3.2 based upon the 'Dublin Principles' (ICOMOS-TICCIH 2011, p3) interdependency of industrial sites.

One important grouping of railway buildings is where railway companies established engineering workshops, leading to the associated establishment of railway towns. Whether these railway towns caused the rapid expansion of existing settlements (Derby), subsumed existing towns (Swindon), or formed completely new towns at previously greenfield locations selected for railway operational convenience (Crewe), establishing the workshops prompted a rapid expansion of the settlements around the workshops (Simmons & Biddle 2000, p519). In describing Horwich Works built for the Lancashire and Yorkshire railway, Stratton & Trinder (1997, p85), state that the buildings and layout of processes within, "incorporated the most advanced thinking", at the time of construction. Besides those buildings directly part of railway operations, these railway towns reflected Victorian paternalism, such as how the Great Western Railway at Swindon (Biddle 2011, pp221-2) laid out streets and services so that contractors, under, "somewhat complicated leasing arrangements, which later caused much trouble", could construct, "well built and solid" (Andreae 1979, p177), housing for those employed in the rapidly expanding railway workshops. In addition, the Great Western Railway contributed towards an Anglican church, St Mark's (Cattell & Falconer 1995, pp61-2), and encouraged construction of the Mechanics' Institution (*ibid* pp79-81, 153-4) to provide a, "centre of the social and cultural life of the new town for nearly a hundred years" (Andreae 1979, p185). The extent that these works were influential is that the architects for St Marks were Scott & Moffatt (Cattell & Falconer 1995, p61), of whom Scott was later, by then Sir George Gilbert Scott, the architect for London St Pancras and previously responsible for the remodelling of St Albans Abbey, a remodelling influential in the debate concerning building conservation. And at the heart of the railway town are the workshops which, for Swindon Works, comprise functional buildings encompassing a wide number of actual functions, including engine shed, stores, boiler making, steam-hammers, foundries for both ferrous and brass, rolling mills, smithy, various specialist manufacturing shops, paint shops and the main erecting shops, along with support facilities such as offices and canteens (Cattell & Falconer 1995, pp140-53). The main erecting shops at Cattell & Falconer (*ibid*, p96, 129-31) describe as being, "immense", with space to move locomotives under repair. The earliest buildings onsite had timber columns, although these were substituted by cast-iron columns during subsequent rebuilding's, the typical construction being, "light metal-framed roofs … and clerestory windows" (*ibid*, pp94-5), clad by masonry pier and panel walls with, "brick dressed blind arcading and window openings, and brick cobbles to the cornice" (*ibid*). In contrast, the design of the later 'A Shop' from 1900, was (*ibid*, p129),

> *"an austere building with a steel-framed skeleton, brick panel walls, large windows and a north-lit sawtooth roof, very much designed for the streamlined assembly, repair and testing of locomotives. In contrast to previous generations of buildings, no attempt was made to present an imposing façade to the main line; gone was the architectural embellishment with which GWR designers, from Brunel onwards, had graced their buildings"*

Extended again in 1921, 'A shop' was of such a size that the powerful cranes forming part of the structure could lift and carry the heaviest locomotives over any other locomotives to wherever needed (*ibid*, p132-3).

Swindon works closed in 1986[4] and redevelopment of the site involving demolition of all unlisted buildings and replacement by a mixed retail, office and residential development (Biddle 2011, p219). Buildings in the older 'core' of the works, representing about half of the total floor area of the works at peak (*ibid*) remain, most with a listing at grade II or II*, and the entire site designated the Swindon Railway Works Conservation Area, although many other significant buildings were demolished, including the 'A shop' about which Biddle (*ibid*, p226) comments that with a sense of cruel irony the site is now a car park. Amongst the surviving buildings is the grade II* former 'V shop', converted into a large shopping mall with, "overhead cranes and other equipment cleverly retained" (*ibid*, p221). This demolition of historically significant railway works is normal and ongoing, with Johnston (2020, p46) reporting how efforts to list the, "towering and distinctive red brick", main erecting shops at Horwich Works failed leading to Horwich,

> *"Going the same way as many other classic works, notably Swindon and Derby, and large portions of Doncaster and Crewe."*

Johnston (*ibid*, p48) goes onto describe how the works were in a conservation area with a master plan to develop the works as a heritage core within a

[4] The actual closure announcement made during events celebrating the 150th anniversary of the GWR, a decision described as abrasive (Kingston 1986, p137), and led to workshop staff boycotting events at the works (Railway Magazine 1985, p333).

redevelopment, yet hazardous levels of chemical and asbestos contamination throughout the site resulted in failure of the conservation efforts.

3.4 Perceptions in Conserving Functional Buildings

Preservation of heritage buildings can be controversial. It is often possible to find references regarding statutory protection of heritage buildings expressed in negative terms, even for buildings accepted by most people as possessing significant heritage values. As an example, in discussing conservation in the Neoclassical style Grainger Town area of Newcastle upon Tyne, Pendlebury (2002, pp145-58) notes how developers view the buildings in this, “quality”, area as run down and unusable against the requirements of modern commercial users who, “want a more modern image than an olde [*sic*] image for their business” (*ibid*). This risk to heritage buildings McCarthy (2012, p633) determines as being, “current built heritage protection strategies privilege the values of a small part of the community because the strategies do not reflect the ways most people perceive risks and make decisions.” These views are unsupported by the legislation, with the National Planning Policy Framework in England, cited in section 2.2, stressing how conservation strategies bring wider benefits to communities, making a, “positive contribution to local character and distinctiveness” (Ministry of Housing, Communities & Local Government 2021, p55).

In an area of conflicted engagement with architectural heritage and protection (McCarthy 2012, p633), functional buildings of any era, particularly those of an unusual design or construction, will always attract a significant degree of controversy, such the mid 20th Century grade II listed signal box at Birmingham New Street station, fully commissioned on 3 July 1966 (Railway Magazine 1966, pp564-6). Unusually for a signal box, this building was architect designed, with the London Midland Region of British Railways regional architect in collaboration with the architectural practice Bicknell and Hamilton designing a building described in the listing as, “very much a ‘one off’ … of exceptional architectural quality” (Historic England 1995). Viewed as ultra-modern and setting a world standard when first constructed (Nock 1966, pp153-5, and Railway Magazine 1966, p564), Wright (2015) calls the design of Birmingham New Street Signal Box as divisive, noting that the building is, "big, blocky and uncompromising", and a sample of public comments (Signalboxes and Signalling [Facebook] 2017 and 2019) reflects this divisiveness:

> *"… ugly … definitely got a certain presence"*
> *"… definitely a 'marmite' building. You either love it or hate it."*
> *"Ugly 1960s monstrosity I find it ugly & wouldn't miss it if it were demolished"*
> *"It oozes a suave kind of authority. Imposing and unmissable in terms of size and location."*
> *"Should be listed for demolition"*
> *"It's ugly but that's the way it was built & has value."*
> *"… single architectural gem dating from the unfortunate 1960s redevelopment of New Street station"*

Reflecting the contradiction in these comments, Miller (2003) describes the building as a, "first-rate essay in Brutalism", a dour sculpture looking, "vaguely like part of a coastal defence system … never going to fit most definitions of beauty", and the appropriate motto for an embattled post-industrial city through being, "proudly and unapologetically itself". Despite this description, reportedly Paul Hamilton from Bicknell and Hamilton said of himself, "I was never a Brutalist, always a Modernist" (Sharp 2013). In contrast, the only other architect designed listed signal box is the circa 1875 signal box at St Bees in Cumbria, designed by the Lancaster based architectural practice of Paley and Austin (Historic England 2013).

For functional buildings built during the Industrial Revolution, Jones (1985, p112-3) describes how the Pugin viewed the purpose of a building critically determined the style of architecture, drawing upon Pugin's comments concerning enrichment of the building. It therefore followed that industrial building, with a purpose merely to manufacture goods and thereby entirely functional, were, "unworthy of the attentions of an architect". This prejudice Pugin carried over into railway buildings, Jones (*ibid*, p114) suggesting that Pugin's dislike of industrialisation meant the functional nature of railway buildings rendered them unsuitable for the preeminent attentions of architectural skill. Nevertheless, in terms of massiveness, fitness of materials and design reference to English Mediaeval buildings, Jones (*ibid*, p115) describes how Pugin influenced, and indeed designed (Pearson 2016, p81) the style of functional Industrial Revolution buildings. Richards (1958, p16) defines the thread connecting these buildings as, “new interest in structure and materials”, making innovative use of materials such as iron and steel available for the imaginative realisation of buildings for the Industrial Revolution. This was not to the taste of everybody, as Crook (2003, pp131-2) reports how Ruskin saw the ornamental arrangements of zigzag bricks, contrasting colour tiles and cast-iron foliage as indicating all railway architecture as bad, commenting that Mediaeval masons would have put life into the iron of railway structures.

Potentially, it would seem that functional ironwork can develop a wider cultural significance, as O’Carroll (2016) noted in discussing gasometers, a functional structure for 19th Century gasworks made obsolete by North Sea gas with high-pressure pipeline gas storage, admiring the, “ornate supporting structures”, that are, “frames stark against the sky, dominating their surroundings”. As obsolete structures, O’Carroll (*ibid*) observes,

> *“… only examples that are likely to be spared are those granted listed status, like Gasholder No 1 near the Oval in south London, famous as the backdrop to so many cricket matches”*

In fact, so dominant a backdrop to the Oval that the cricket commentator Henry Blofeld once mused during a Test Match broadcast, “As the bowler runs in, it’s so quiet you can hear the creak of the gasometer” (O’Hagan, 2015). O’Carroll (2016) concludes that with redevelopment of sites, the options are demolition of the distinctive frames leads to losing a link with history or incorporating the gasometer frames into a redevelopment scheme. This latter option comes with a seemingly expressed wisp of sadness for the three gasometers near London Kings Cross station, where the buildings dominate the delicate frame (*ibid*). However, O’Carroll and cricket test match aficionados may not be alone in cherishing gasometers, with Davies (2017) describing the heritage at risk Gasholder No 2 at Fulham gasworks in London as an, “icon of England’s industrial past", and Ficenec (2013) commenting that gasometers may, "have been a ubiquitous, if not always appreciated, feature of our skyline".

Size, or even an austerity in design, is not necessarily a determinant for functional buildings. Richards (1958, p168) describes how the overhanging roofs of 19th Century country railway stations are functional within the romantic tradition often associated with railway buildings of the era. Confirming this contradictory argument, Minnis & Hickman (2016, pp17-8) describe how the railway goods shed, seen as a simple, functional structure compared with adjacent passenger stations, were nevertheless sometimes subject to definite attempts to produce an elegant design. In some cases, such as where Minnis & Hickman (*ibid*) cite the work of the architect George Townsend Andrews, these design influences are the restrained styling of model farms or stable blocks designed for those country houses owned by early investors in the railway companies (Fawcett 2011, pp48, 55). Yet, even with the involvement of noted architects, Pearson (2016, p142) describes how there was little appreciation of functional buildings from the Industrial revolution, even without any consideration of conservation, citing the buildings being, "reminders of a grim past", and academic neglect contributing to the indifference concerning industrial landmarks. Possibly this was because the involvement of noted architects in functional buildings was comparatively rare through the previously described situation where functional buildings were, for a 19th Century architect, near the bottom of an accepted hierarchy of building, with a tremendous divide between specialist industrial architects, often based in large industrial towns or cities such as Birmingham, and the whole profession (Pearson 2016, p36). It therefore follows that there remains unfulfileld potential for conservation of functional buildings to reflect the social processes that articulate the building's heritage nature (Mydland & Grahn, 2012, p583), becoming the 'Wylam Question' advanced by Reeves (2016, p52) as the unanswerable question concerning a functional building with no obvious alternative use.

Davies (2008, p24) comments that it is possible to challenge the notion that, "function attaches for perpetuity to the structures which first embody it", such that there is a, “possibility for space and structure to tell a variety of different stories relative to use”. This is the contextual perception defined by Reeves *et al* (2020, pp249-51), where distinctly defined groups of people interact with heritage buildings according to their experiences and knowledge, with the conclusion that, “Conservation must include every aspect that supports the reason for the functional building’s existence” (*ibid*, p253). This would imply a need to focus on the evidential aspects rather than the social or economic history of a building, which presents challenges in conservation (Nevell 2014, p1). However, for this conclusion to have complete validity, it is necessary to hold in stasis the landscape in which the conserved building exists or, as Davies (2008, p13) suggests, reinterpret the building by using any potential for re-imagining the site.

Citing Manchester as an exemplar, Nevell (2019, p101) comments that “industrial sites are more vulnerable to damage and loss than any other class of archaeological monument because of their high rate of survival, frequent urban location and the continuing pressure for re-use”. However, this historic environment is recognisably a heritage asset (*ibid*, p115), for which Orbaşli (2008, pp29-31), in discussing how urban regeneration projects have transformed industrial heritage, comments that it is not necessary for the buildings and structures to be pretty in the conventional sense of heritage buildings. This needs a shift, which moves away from, “industrial places of machinery, noise and dirt to the sanitised uses of today” (*ibid*), presenting challenges with incorporating the machinery and the contamination left by former industrial zones. In considering functional, Orbaşli (*ibid*) widens the definition to include modern military structures possessing heritage value, a point developed by Osborne (2011, p218) in questioning how a Roman fort has, “a greater importance, both intrinsic and extrinsic, than, say, a First World War coast defence battery, simply by virtue of its age”, leading to, Osborne assets, an, “insidious element in the values question”. Whereas the older structures are often in picturesque locations and there is a romantic element with Mediaeval structures, it is easier to perceive more recent structures as eyesores (*ibid*). Complicating the analysis is that many modern military functional structures overlay older structures at militarily significant locations such as ports and estuaries (*ibid*, p219). While Osborne accepts that no landscape stands still (*ibid*, p220), Orbaşli (2008, p31) points out that the, “architecture of warfare has always been part of the cultural heritage”, while modern structures are, “significant testimonials to a period of history”, before asking if, “the great power stations or petroleum refineries of today become the heritage concern of tomorrow?”. This question Gorman (2020) takes further to the cultural heritage of artifacts, ‘engineering heritage’, left on the Moon after human and robotic missions, describing a, “moral weight to the idea that human sites on the Moon are worth preserving for future generations”, that needs a ‘Burra Charter’ for space, drawing a parallel with how the Burra Charter arose from a realisation that indigenous Australian heritage fitted uneasily with European heritage charters.

3.5 Conserving Heritage Railway Buildings

Demolition in 1962 of the Euston Arch, a substantial Doric propylaeum standing at the entrance of London Euston station, represents a significant, and widely accepted, moment in recognising the heritage legacy of railway buildings. Controversy surrounding the proposed demolition, seen as a symbolic act of national modernisation (McCaig 2013, pp34-5), ultimately needed approval by the prime minister, Harold Macmillan (Gwyn 2010, p75). Gwyn (*ibid*) goes onto suggest that the demolition was a deliberate move, destroying an iconic symbol associated with Stephenson and the soon to be obsolete steam locomotive. Minnis (2014, p7) defines this demolition of, “arguably the finest example of railway architecture to have ever been built in Britain”, as, “a turning point in conservation”. Parissien (2014, p111) describes how trying to save Euston, “galvanised the nation’s fledging conservation movement”[5], about which Parissien (1997, p38) comments that,

[5] Parissien notes that the Minister of Transport approving railway closures, Ernest Marples, stood to profit, through the contracting firm of Marples Ridgeway, from redevelopment and motorway construction schemes. Marples, who had tangential involvement in the Profumo Affair, eventually fled to Monaco to evade accusations of tax fraud and other offences.

> *"One beneficial by-product of the demise of so many first-rate station buildings, however, was the impetus that this destruction gave to the emerging conservation movement during the 1970s"*

McCaig (2013, p35) describes how this created an interest in preserving Victorian buildings, about which Stamp (2007) comments it, "encouraged a change in the climate of opinion that prevented British Railways from doing away with both St Pancras and King's Cross stations just a few years later". In 1977 British Rail appointed their Chief Architect, Bernard Kaukas, as Director of Environment with a portfolio including conservation of railway infrastructure identified as having heritage value (Lawrence 2018, p138). Lawrence describes this appointment as successfully handling, "potentially conflicting interests of a railway committed to continuous modernisation, and communities who wanted to what they considered to be *their* heritage of historic buildings" (*ibid*). Contemporary reports suggest resistance to conservation, with the chair of British Rail, Sir Richard Marsh, delivering a speech in 1976 concerning railway buildings (Haresnape 1977a, p11),

> *"They were built to last – sometimes I wish that they would fall down some dark and stormy night. Our forebears – excellent architects, builders and engineers – did not know what they were letting us in for in terms of repainting and repairs."*

This theme Marsh's successor, Sir Peter Parker, commented upon in a speech to the Victorian Society in 1978 (Slater 1978, p573), describing the listing of railway buildings as, "overgenerous", leaving British Rail responsible for an architectural museum of which, "many were only of marginal significance, while others were at the end of their useful lives and should be replaced". Biddle (1997, p68) remarks upon one anomalous factor in listing is that Great Britain has three national public organisations responsible for conservation, speculating that the main reason for listing similar signal boxes in Rhyl and Shrewsbury is that they are in Wales and England respectively.

In part driving this resistance were the ambitions of contemporary architects, recruited to the railway from schools of architecture that at the time, influenced by the works of such architects as Ludwig Mies van de Rohe, stressed the importance of modernity (Lawrence 2018, pp32-3). Lawrence observes that these young architects were happy to see the past cleared away and Haresnape (1977a, p11) goes onto quote an anonymous British Rail architect,

> *"Who in their right senses would try to run a modern hospital operating theatre in a museum. But we are expected to run a new and technologically-advanced passenger train service to and from out-dated structures which have had preservation orders slapped upon them!"*

Minnis (2014, p29), quoted an introduction by Simon Jenkins in the booklet for SAVE Britain's Heritage's 'Off the Rails' exhibition at RIBA in 1977,

> *"No group of British architects have had their work less cared for then railway architects. No aspect of British craftsmanship has been less conserved then that of our railway engineers."*

While it is the major stations that attract the most attention, it is the smaller stations with reduced facilities, such as closure of the goods yard, needing less staff where economy became detrimental to potentially heritage buildings. Pearce (1979, pp194-5) identifies how changes in required accommodation modifies a perception of what the railway should keep, along with a temptation to sweep away, "junk of the past". Furthermore, where buildings become unstaffed and mothballed, the result is inevitably deterioration, with Haresnape (1977a, p13) describing the process,

> *"As soon as a building loses its staff it becomes prey for vandalism and neglect … preservation orders and lack of finance hinder progress … a Victorian classic of rural station architecture … vandalised to the extent that every pane of glass has gone and every inch of wall … sprayed with … idiotic slogans"*

As examples of railway buildings that remain staffed, Haresnape (1977b, p276) compares the station buildings of Honiton, "of modern unit construction type, never likely to be hailed as architectural gems … scale well suited to the traffic handled", and Par, "a solid GWR structure of unassuming character … impeccably clean and the station staff evidently take a pride in their job, despite the modest amount of traffic handled". Notwithstanding the renewed emphasis on conservation, Lawrence (2018, p171) describes how tension between conservation groups, arguing for conservation of traditional railway buildings, and the reality of increasingly difficult to maintain buildings was the motivation for designing the previously described ‘Rat-Trad: Rational-Traditional’ modular buildings that, starting in the early 1980s, replaced many smaller stations (compare figures 3.1 and 3.2).

Figure 3.1: GWR station building, Droitwich Spa. (Author, 1981)

Figure 3.2: Replacement station building at Droitwich Spa to a standardised modern design. (Author, 2016)

Burman (1997, p18) describes an, “enormous potential for railway structures to be adapted for new uses, without necessarily losing their associational or cultural values in the process”, where, “imaginative reuse… is often the answer to preserving railway heritage… without impairing significantly its cultural value" (*ibid*, p32). Notably, railway buildings, "are archetypal examples of the functional building, tailor-made for a single purpose: for this reason, it is all the more remarkable that they have been adapted to such a wide range of new uses" (Binney 1979, p206). Yet, this adaptation process is problematic.

Statutory protection for railway buildings can, in addition to the normal statutory protection for buildings of architectural and historic value, be through legislation designed to preserve railway artefacts. Before 1923 there was little official interest in preserving significant railway artefacts (Hopkin 1992, p88), a situation that slowly changed following formation of the publicity conscious 'Big Four'[6] and prompted by the Stockton and Darlington Railway centenary celebrations in 1925. Even in identifying the early selection of objects for the nascent Science Museum, the objective was "more with education and ensuring the future through a scientifically literate population than with preserving evidence of the past" (Cossons 1997, p10). Influenced by a sense of regional pride and concurrent with planning for the Stockton and Darlington Railway centenary celebrations, the London and North Eastern Railway went ahead with forming a railway museum in York (Hopkin 2003, pp243-5). Hopkin (*ibid*, p248) goes on to describe how the changing role of the museum came to encompass artefacts from other railway companies. Nevertheless, the fate of railway artefacts depended upon decisions by individual personalities within a railway company (*ibid*, p98), plus fundamental issues concerning museum theory and practice to connect with a shared popular consciousness for the visitor (Divall & Scott, 2003, pp260-1). Following nationalisation of the railways, official recognition concerning the haphazard fate of railway artefacts led to the British Transport Commission reporting on the preservation of relics and records (Hopkin 2003, pp253-5 and Lambert 2017, pp148-90). Morgan (2010, p61) describes how legislation, during privatisation of the railways, initially omitted any requirement to preserve historic relics, thus necessitating a late amendment, section 125, to the Railways Act 1993 setting up the Railway

[6] Under the Railways Act 1921, on 1 January 1923 most railway companies in Great Britain amalgamated into the so called 'Big Four' of Great Western Railway, London Midland & Scottish Railway, London & North Eastern Railway and Southern Railway,

Heritage Committee with powers to designate records or artefacts, “of sufficient interest to warrant preservation” without explicitly defining artefact. These provisions transferred into the Railway Heritage Act 1996 and The Public Bodies (Abolition of the Railway Heritage Committee) Order 2013 transferred all functions of the Railway Heritage Committee to the Science Museum’s Board of Trustees, the committee becoming the Railway Heritage Designation Advisory Board. This board continues to designate artefacts for statutory preservation under the Railway Heritage Act 1996, interpreting artefacts to include railway buildings, such as the designation of the signal box at Edgware Road on the London Underground (Bickerdyke 2019, p86). Supplementing the statutory provision in conserving Britain’s heritage railway building is the Railway Heritage Trust (Minnis 2014, pp29-30). Set up in 1985 as a direct response to the criticism received by British Rail, “continuing to demolish worthwhile buildings … out of step with a new conservation-minded outlook”, this independent body, now funded by Network Rail, provides grant and support for conserving railway buildings and structures. Minnis (*ibid*) goes onto the comment that there is greater appreciation in Network Rail of the value of architecture, including, “sympathetic treatment to a group of mainly unlisted signal boxes”.

Railway structures are, “part of the mainstream of historic buildings” (Burman 1997, pp18-9), expressing cultural significance in, “aesthetic, historical, scientific or social value for past, present or future generations” (*ibid*, p27). “Imaginative reuse”, Burman asserts (ibid, p32), “is often the answer to preserving railway heritage”, where heritage invests and impacts the well-being of local communities through preserving, by adaptive reuse, the cultural icons of heritage buildings (Bullen & Love 2011, p419). Conservation is by not distorting the original fabric of a heritage building and retaining the cultural significance of place (Burman 1997, p28). However, for conservation of functional buildings, the significance must include why the heritage railway building existed, the culture of transport technology (Divall & Revill 2005, p15), which may be something that no longer applies in the changed environment of modern railway infrastructure.

Figure 3.3: Listed coaling stage within the railway heritage railway centre at Didcot. (Author 2016)

3.6 Critique of Museums for Building Conservation

For the tourist in Britain, beside the choice of visiting a traditional historic building, archetypically the English country house or a castle, there are an expanding number of industrial museums and heritage centres (Stratton 2000, p117). These take a variety of forms, including former industrial sites presented as museums such as the Woodhorn Museum of mining in Northumberland, museums of stand-alone and out of context relocated buildings such as Avoncroft in Worcestershire, or museums of industrial heritage consisting of relocated buildings such as Beamish in County Durham or the Black Country Museum in the West Midlands. Included in the former industrial sites are various heritage railway centres, such as the Great Western Society at Didcot in Oxfordshire (figure 3.3), developed around a former locomotive shed (Great Western Society 2020), and East Anglian Railway Museum at Chappel & Wakes Colne in Essex, developed around a former goods yard, while heritage railways are potentially analogous to museums of industrial heritage (Bhati 2014, p115). Section 2.5 identified how tourism can challenge authenticity, so presentation of functional buildings in whatever form needs to be in terms of meeting the aspirational demands presented by museum visitors, defined by Kolar & Zabkar (2010, p654) as 'existential', perceiving authenticity through exhibited artefacts, 'aesthetical', perceiving history mainly through art, and 'social', emphasising learning or social aspects. However, while former industrial buildings and sites become the focus of renewal and reconstruction of old towns, this needs to be with shared understanding as to the value of preservation (Wang & Jiang 2007, p479).

Stratton (2000, p122) described the origins of using museums to save and interpret buildings as drawn from the movement to preserve 'folk life', a description confirmed by Mills (2007, p112) who defines the intention of these folk museums to identify a locality with wider processes, particularly migration and modernization, "to better proclaim a local, regional or national identity … not just to confirm a local identity to local visitors, but to make some statement about long-distance transfers of culture and identity". Furthermore, Cossons & Trinder (2002, p107) make the case that a single structure, such the Iron Bridge at Coalbrookdale (figure 3.4), can become a symbol of regional history for the Industrial Revolution. While British open-air museums adopt the formula of relocating redundant buildings, Stratton (2000, p122) states from the early 1970s many conservationists expressed disquiet over removing buildings from their original setting and that the focus should be, "more extensive protection of industrial buildings through listing", with in-situ preservation. However, Buchanan (1980, pp364-5) comments established of these museums was, "in part a defensive reaction to the forces of redevelopment and urban renewal which were sweeping away so many industrial monuments at the time". As Davis (2008, p24) points out, obsolescence of a functional building is 'relative' rather than 'absolute', and it is possible to challenge, "the notion that function attaches for perpetuity to the structures which first embody it", freeing the structure for a released and reimagined future. The open-air museums cite education as a conservation rationale (Mills 2007, p112), creating synthetic landscapes that invite the, "visitor to see amalgams as fundamentally authentic mainly because the individual buildings are deemed authentic" (*ibid*, p116), providing a narrative sequence that is, "grand tour in miniature" (*ibid*, p115). Stratton (2000, p117) offers the contrast that at best, “industrial heritage projects can present challenging and important concepts relating to technology, industrialization and urban life”, while at worst, “offering history and culture in its most trite and flavourless form.”

Figure 3.4: Iron Bridge, Industrial Revolution symbolism. (Author 2021)

Museums of all types are thought to be facing an identity crisis (Jenkins 2018). Stratton (2000, p120) asserts that while, “academics justify preservation and interpretation of a particular site in terms of historical and archaeological significance”, surveys indicate that visitors are more likely to be seeking, “authentic representation nineteenth-century life and industry”, and thereby presenting a risk that the projects become more orientated towards visitor expectations rather than conservation and interpretation (*ibid*, p 117). Despite this, Nevell & Nevell (2020, pp32-3) identify that not only is high quality information integral in helping visitors understand the past, the provision of this information, reinforced by breaking down barriers between professionals and volunteers, facilitates visitors engaging with historic sites. This presentation of a systematic study of the past, a scholarly debate over what the artefacts represented by the heritage buildings might actually mean, therefore becomes, “the prime imprimatur that distinguishes such sites from theme parks” (Mills 2007, p116). In considering factors for industrial heritage tourism, Xie (2006, p1323) includes authenticity, seen as the opposite of generic and representing the aesthetic attributes of place, and perceptions made up of, "community perception and aesthetic preferences, together with a highly simplified vision of history and heritage". For authenticity, the aesthetic attribute, Taksa (2003, p65) asks to what extent do conserved industrial landscapes display 'intangible' aspects of material culture. This creates a heavy responsibility upon the choice of the artefacts chosen to represent the heritage site and the wider themes as to what they indicate (Mills 2007, p114), with the reported dilemma for conservation of one functional site where, "questions about the importance of built fabric were left to architects, while assessments of the machinery contained in factory buildings were the sole province of industrial archaeologists" (Taksa 2003, p72), and rarely do historians have any input (*ibid*). Even though sites and structures are intrinsically historical documents, they carry messages, "from the past to us and the future about how we thought, how we lived, and how we built" (Yates 1997, p122), such that there is, "growing recognition that the social value of heritage assets is tied to the meanings people attach to past experiences" (Taksa 2003, p76), with buildings becoming, "repositories of collective memory" (Henderson 2011, p78). As the industrial era fades, Taksa (2003, p84) concludes that there is an increasing need to engage with the cultural significance, the attributes that have meaning, of industrial heritage to go beyond the value, "architects, archaeologists and heritage managers attach … to the grand scale of … buildings … collection of industrial relics and … technological history". The Dublin Principles develop this theme, declaring that presentation of industrial centres should, "raise awareness and appreciation for the industrial heritage in the full richness of its meaning for contemporary societies" (ICOMOS-TICCIH 2011, p7).

Development of industrial museums is more to create a positive image for commercial investment rather than serving the communities that the industry once sustained (Stratton 2000, p118), although Stratton notes the remarkable success of these museums (*ibid*, p129), whether established on derelict land or set on redundant sites (*ibid*, p119) to, "otherwise bland new towns", by becoming, "a source of public nostalgia … for … the close-knit communities", represented by the industries. Attaching social value to meaning requires interpretation to explain the significance of meaning, with interpretation having the aim of provocation rather than instruction (Grimwade & Carter 2000, p44), with meaning to the community, whether local or visiting, being fundamental to conservation of heritage sites (*ibid*, p48). Effective heritage management needs local communities to work in partnership with heritage professionals (*ibid*) in a process that Landorf (2009, p506) defines as a, "community-led vision that incorporates local values and attitudes", to achieve a sustainable, long-term planning framework for heritage conservation. Jones & Munday (2001, p589) describe an example policy of involving the community in developing an industrial heritage site, "through the establishment of a local community heritage group". While there is evidence for consistent participation by stakeholders, including the community, there is no way of measuring the effectiveness of including community values and attitudes into sustainable management of industrial heritage sites (Landorf 2009, pp506-7).

3.7 Authenticity in the Heritage Railway Movement

Authenticity relating to historic artefacts is an issue that goes wider than heritage buildings, so where custodianship of heritage buildings is part of a wider remit for an organisation, the organisational culture will influence how they conserve their heritage buildings. An example of this opportunistic ownership of heritage buildings is the heritage railway movement (Reeves 2016, p54). There was no masterplan for heritage railways in Britain, with Carter (2008, p113) attributing the organic growth of the sector from the 1963 Beeching Report on reshaping British Railways. Implementation of Beeching's report, accompanied by the Transport Act 1962 removing the common carrier obligation to transport all freight offered, shrunk network route miles by a third, sometimes by methods of questionable legality (Divall 2016, pp486-9), transforming a railway orientated towards freight to one structured around transporting passengers (Reeves *et al* 2020, p236). With an emphasis on inter-urban passenger flows, this had the effect of transforming the railway into an urban environment, creating an, "aesthetic degradation of architectural and historic vistas" (Divall 2020, p99). Carter (2008, p113) observes that in this environment Beeching, "slashed and burned the national railway network, so more and more enthusiasts – *amateurs*, in the word's root sense – moved from spotting to preserving", with the number of British heritage railways expanding from four in 1960 to 25 in 1965 and 130 by 2003 (*ibid*, pp114-5). With a tendency for railway enthusiasts to move, "steadily from celebrating novelty to mourning loss" (Carter 2008, p110)[7], the substantial Beeching era changes represented a growing sense of looking backwards such that, "by comparison with what *they* had known as lads, contemporary Britain's railway system was a poor and colour-bleached thing". This thinking represents the culture identified by Burman (1997, p20), where,

> *"In considering a philosophy for railway heritage, we are perhaps hampered by … the present day debate about 'authenticity' … a [backward looking] conservation philosophy …"*

Fundamentally defining the heritage railway movement is the preserved steam locomotive, with 'preservation' as a fundamental concept that is neither conservation nor authenticity, leading to a core heritage railway movement philosophy where decisions about heritage assets do not have a conservation-driven approach (Rees *et al* 2010, p92) within a broader culture where nostalgia becomes detached from directly lived experience (Strangleman 1999, p743). Early preservation schemes, reviving or purchasing moribund railways (Carter 2008, pp112-4), set the sense of what is possible in an era where matching the 'supply' of discarded infrastructure and technology with public 'demand' for the preservation of this infrastructure and technology (Lambert 2017, p213). This use of revived infrastructure allowed the heritage railway movement to present preserved working steam locomotives (Carter 2008, p214), although Divall & Scott (2001, p10) note that the enthusiasm that motivates railway preservation, or any field of endeavour, comes with it, "a rather narrow range of ways of understanding the world".

One significant characteristic regarding the organisation of heritage railways, reflecting upon previously cited work by Saunders in section 2.2 about

[7] Contrast Belt (1976, p150) stating that the then new InterCity 125 high speed trains would never compete in nostalgia with famous trains of yesterday, with national news reports of the enthusiast response to last service of these very same these trains out of Paddington (BBC News 2019)

conservation led by the voluntary movement, is the degree of volunteer, and thereby arguably amateur, participation. Carter (2008, p126) states the extent of volunteer participation is 90% of the workforce, higher than any other industry and higher than the next category that relies upon volunteer labour, churches, where 84% of the workforce are volunteers[8]. While many of these volunteers possess specialist railway or engineering skills that are of value for the heritage railways (Rhoden *et al* 2009, p25), much of this workforce do not have relevant experience or technical qualifications (Crapper *et al* 2014, p344), with occasional incidents where enthusiasm outweighed ability (Slater 1979, p209). This presents potential tensions between railway management and volunteers (Carter 2008, pp132-5), resulting in railways with poor governance (Raxton 2012). Wallace (2006, p223) identifies how volunteers perceive, "a transition from industrial to post-industrial society", where volunteering attempts to, recreate, "the romanticism of an industrial past", confirming an observation by Cossons (1997, p9), that Britain's deindustrialisation created an environment where, "widespread attention has been paid to preserving remnants of industrial culture". Central to the culture of volunteering is the steam locomotive (Rhoden *et al* 2009, p28), which poses the question as to what a heritage railway will mean when, "all those who experienced the modern steam railway as an everyday transport mode have long gone" (Carter 2008, pp285-6). As volunteer labour created and sustains the heritage railways, Carter (*ibid*, pp126-7) observes that, "preserved railways occupy a curious space between social movements … and small businesses".

In this 'curious space' trading on an intense sense of nostalgia that disparages the current in favour of the past, there is an enduring debate concerning the nature of the movement. Furthermore, there is a blurred distinction between heritage railway and museums, with heritage railways incorporating museums and museums supporting running of heritage trains, the sector effectively seen as, "museum-orientated … heritage railways" (Divall 2002, pp4-9). Flinders

[8] In considering the architectural legacy represented by England's churches, Jenkins (2016) uses the heritage railway sector as an exemplar for effective conservation.

(1976, p150) provides a former perspective on the uneasy relationship between railway enthusiasm and the national railway system,

> *"What is a reasonable position for the responsible enthusiast … concerned about the future of the national railways system as a public utility or only as a big train set … railway enthusiasm has always been a case of tiger by the tail … if that is our idea of a railway enthusiast we don't deserve a railway …"*

With a lack of any consistent forward planning (New 1979, p168), there is also a long-held expectation that the heritage railway movement is sowing the seeds of its own destruction (Brown 2017, p266), with Price (2019, pp98-9) warning,

> *"Railways that have their heads stuck in the past, still purely preserving and growing without considering the implications, will do so until the changes required are extreme and painful."*

> *"… we are largely not-for-profit organisations … [b]ut when railways are under investing in the infrastructure to keep the cash flow in control, then quite simply they are mortgaging the railway"*

Despite heritage railways and museums operating in, "a resource constrained environment" (Tillman (2002, p38), there is tendency to, "maximise preferred outputs rather than maximise profits", while marketing, "myths", in pursuit of visitor income (*ibid*, p40). Here the myth of heritage represents an, "often conflicting purposes of the present ('heritage') and that which tries to understand the past in its own terms ('history')" (Divall & Scott 2003, pp262-3), presenting the problem of how to, "reconcile scholarly approaches to history with the personalized ways through which most people connect with the past" (*ibid*, p265). Despite the railway preservation movement being conscious of historical authenticity (Pilcher 1997, p134), nevertheless the focus is restoration of rolling stock to, "recreate the atmosphere and character of the working railway" (*ibid*, p133). The result is variable, as some preserved railways are, "more visitor attraction than heritage site" (Yates 1978, p127), while others successfully conserve the architectural or historic character (*ibid*). Divall (2002, p4) defines this presentation as 'mimesis', a staged authenticity as a facsimile of the past,

> *"… a complete package of sensual and historically 'authentic' experiences … more concerned with physical conservation than elucidating the social parameters of industrial development".*

In achieving this package, this redefines the railway to, "become absorbed into a picturesque rural landscape and thus divorced from the history as parts of industrial society", a pastoralising movement that (*ibid*, p6),

> *"… extends to station buildings and certain other structures, such as signal-boxes. These become redefined as examples of rural vernacular architecture, another aspect of the picturesque gaze, rather than acknowledged as standardized or the semi-standardized industrial products."*

Figure 3.5: Mimesis, attractively staged rural vernacular in the railway heritage centre at Didcot. (Author 2016)

Heritage railways seeking to emulate this pastoralising idea will become, in effect, a linear heritage attraction where tourism safeguards the railway despite the potential for, "loss of authentic railway structures or erosion of its integrity as a whole" (Orbaşli & Woodward 2008, p168). This includes railway buildings, about which Yates (1997, p123) comments:

> *"A large part of the traditional appeal of old buildings and places is romantic … romantic associations are sustainable only if the structure*

> *is at least in part materially authentic … romantic view can degenerate into personal nostalgia – a dangerously transient companion for conservation, although it has been the driving force behind all too much transport conservation"*

Pacey (2002, p306) describes how the, "appeal of the Picturesque Railway remains irresistible", an aesthetic ideal from a perfected past world that in, "delighting eye, may well conceal injustice, hardship, or suffering" (*ibid*). In this 'perfected' railway landscape, buildings used by the railway become old and decrepit enough to bring the same nostalgia as other buildings, "eldritchly incorporated", into picturesque landscapes (*ibid*, p291). Freeman (1999, p164) asks, "How far do we wish to reduce the role and influence of the railway to quantitative economic measures?". For this, Llano-Castresana *et al* (2013, p67) defines the need for, "a global analysis of railway heritage, a rethinking of the social model to which we aspire".

3.8 Defining a Case

Functional buildings are those where the character derives from the specialist infrastructure intrinsic to buildings associated with the Industrial Revolution change into regionally defined industries plus large-scale transport infrastructure, with one specific defining characteristic of functional buildings is how they represent a clear separation of buildings for process rather than human occupation, the process being machinery or specific functions. Although often engineer rather than architect designed, functional buildings fulfil the accepted criteria for heritage infrastructure, while representing contradictions when subject to the normally accepted principles of building conservation as there is a stronger emphasis on contextual relevancy. Size or austerity in design is not a determinant for functional buildings, as often there was an attempt to produce designs that were elegant. For many buildings there is the potential for conversion that articulates the heritage nature, although this does not apply to all buildings and any redevelopment risks losing the fundamental building nature that represents a tangible link with the building's history.

Statutory protection of heritage buildings can be controversial and often perceived as representing the opinions of a small part of the community. This particularly applies to buildings of an unusual design or construction, where statutory protection becomes divisive. This also applied to functional buildings from the Industrial Revolution, considered unworthy by contemporary writers who were concurrently developing what are now the accepted principles of building conservation while, paradoxically, the architectural ideas of these writers were influencing designs for the same building types they were denigrating. Characterising functional buildings from the Industrial Revolution are innovative use of materials and technology, that any redevelopment risks losing, either totally or as a tangible link with the building's history, even if, without considering size or design, whether austere of elegant, for many buildings there is the potential for conversion that articulates the heritage nature. Notionally heritage attaches to heritage buildings in perpetuity, with conservation needing to include the building's original reason, including the contextual perception, defined by experiences and knowledge, of all people who interact with the heritage building. Presentation of heritage functional buildings can challenge authenticity, so for effective conservation presentation must become a repository of collective memory, having a social value that goes beyond the heritage experts towards an engagement with cultural significance and communities once associated with the industry served by the building. All museums create some form of interpretation, an amalgam of authenticity providing that narrative sequence which is a 'grand tour in miniature', with conservationists expressing specific disquiet about removal of buildings instead of in-situ preservation of buildings where the obsolescence is relative rather than absolute, thereby freeing the structure for a reimagined, perhaps contextual, future. This presents as a case study, where the building displays an operation purpose over time, such that, "the boundaries between phenomenon and context may not be clearly evident" (Yin 2018, p10).

Railways are integral to the Industrial Revolution, yet most understanding of railway history is set in a discursive insularity, an insularity that precludes a full understanding of how railway architecture links to the economic, social and business history of the railways, including a very limited understanding as to the contribution made by innovatory railway structures towards architecture and civil engineering. For railway buildings, designs tended toward the engineering led resulting in simple, even if sometimes elegant buildings that demonstrated a clear divide in social standing between architect designed and functional buildings, a divide that delayed the systematic study of functional railway buildings by academics and left the buildings ignored by railway enthusiasts mainly interested in locomotives. The previously cited comment by Binney (1979, p206) presents an optimistic observation about adaptation of railway functional heritage buildings. However, other than within the heritage railway movement, custodians of most British railway buildings seek, by demolition, to reduce the maintenance liability represented by a redundant railway building without statutory protection, with evidence of a historical antipathy towards statutory protection. In contrast, the heritage railway movement has a core philosophy that seeks to create a mimesis of staged authenticity that redefines the railway into a rural vernacular rather than a part of industrial history, trading on an intense nostalgia that outweighs any careful planning for the future in a resource constrained environment that at worst is marketing myths concerning heritage and history. Furthermore, the nature and structure of the heritage railway movement, staffed by volunteers looking back to that mythologised past, orientates towards the rolling stock with an emphasis on the steam locomotive, the preservation of which inn working order is neither conservation or authenticity and thereby defines a core philosophy concerning other heritage railway assets. The extent of volunteer participation in the heritage railway movement strongly shapes this core philosophy, with a shared communitas around preserving remnants of industrial culture for the post-industrial society, with heritage buildings in their custardy often treated as a usable part of the myth created to support the mimesis. Railway heritage buildings express cultural significance, so need conservation that does not distort the original building fabric, this conservation needing a sensitivity to the original function and an awareness of the changed environment around the heritage building.

Of these functional heritage buildings, it seems that signal boxes are the most problematic, with Minnis (2014, pp18-20) describing how after closure,

> *"… the great majority have been destroyed as a matter of course as, being located close to the running lines for operational reasons, it is difficult to convert them to other uses unless removed to another site … few people recognised their significance as important markers in the evolution of a distinctive nineteenth-century building type."*

Reeves (2016, pp52-3) identifies that where, "a signal box remains adjacent to an operational railway, especially where rail locked and therefore inaccessible without crossing a railway, reuse in situ starts to become difficult", creating a situation where projected closure and mothballing of a signal box in a difficult location creates the unanswerable 'Wylam question' concerning conservation. As an example, Reeves (*ibid*, pp54-5) describes how, despite all parties acting in apparent good faith, the listed signal box in an exposed coastal location at Dawlish (figure 3.6) deteriorated to such an extent that delisting allowed demolition in 2013 (Davies 2013, and Marsden 2013, p16). McLean observes that there is, "little structure or co-ordinated management to the preservation of signal boxes as historic buildings" (1996, p118), and comments that, "listed signal boxes often receive treatment that would be very unusual for other categories of listed structures" (2010, p319).

Figure 3.6: Dawlish Signal Box, tentatively conserved against the coastal environment, seen shortly before demolition. (Thompson, D. 2013, used with permission)

It is impossible to see individual railway buildings in isolation, with the railway station made up of a multiplicity of buildings all serving separate and complementary functions. For some of the buildings, it is possible to repurpose the building while retaining a sense of the visual contribution that the building makes to the group value. However, this does not apply to all railway buildings, and it is these buildings where it is evident that accepted principles of building conservation are failing to meet specific conservation needs. It therefore follows that in addressing as an exemplar the conservation challenges represented by that most difficult to conserve, the signal box defined by internal equipment and location, it should be possible to define a conservation framework for all functional heritage buildings.

Chapter 4

Signal Boxes as a Unique Functional Railway Building Type

4.1 Describing Signal Boxes

Strongly evolutionary in design, signal boxes developed from a simple lineside hut for the operator of points and signalling equipment to advanced computerised operating centres, with each stage a logical development to meet increasing railway traffic and trains speeds, coupled with demands for safer operation. By the late 19th Century, these requirements were settled into an established method of train control by the block system, with signal boxes controlling entry into each block. It is possible to trace this evolution in the morphology of signal boxes, with the 'classic' mechanical signal box effectively a structure built around the interlocking frame, providing a two-storey building with equipment at the lower level and accommodation for the signaller on an upper operating level. Within this established morphology, there are variations in procurement and material for construction, with designs, in an 'engineer's vernacular', being distinctive to either a supplying signalling equipment manufacturer or to standard designs developed by each railway company.

Although functional buildings are characterised by the function, it is impossible to develop a narrative for these buildings without considering the social aspects of industrial heritage. For signal boxes, these narratives become a variation in the social narrative, ranging from signal boxes at busy locations to a very different narrative in isolated locations, with ties to a wider socio-economic environment of, with historical retrospection, a potentially idealised pastoral perspective of the society in which signal boxes developed, a narrative that sometimes forgets dangers or difficulties.

Representing functional buildings positioned in sometimes difficult to access locations, there are considerable difficulties in repurposing redundant signal boxes to alternative uses, with successful reuse usually dependant on easy to arrange public access. Where there is no statutory protection, demolition removes the maintenance liability presented by the redundant building, although Network Rail, as the predominant custodian of signal boxes, will permit relocation, albeit this is not always successful. Statutorily protected buildings that are impossible to repurpose are mothballed to minimise deterioration. Use of heritage functional buildings by heritage railways is opportunistic, with signal boxes in operational use as designed yet the conservation approach is to be part of the mimesis, a staged backdrop for heritage railways rather than building conservation.

4.2 Origins and Purpose of Railway Signal Boxes

As the early wagonways gradually evolved into recognisably modern railways, and especially as train speeds increased from the pace of a horse drawn wagon to hitherto unprecedented speeds, there evolved a parallel need to control trains (Kichenside & Williams 1998, pp13-5). Running the pioneering Stockton & Darlington Railway on rules influenced by colliery wagonway 'line of sight' principles was unsuccessful[9], so recognising these problems the Liverpool & Manchester Railway appointed police constables to control train movements by operating points and signalling to drivers (*ibid*, pp16-7), the constable becaming known as a 'signalman'[10]. At an early, although unknown, date the practice emerged of grouping point levers at a focal point for convenience in operation (Dow 2014, p90). This grouping of levers would usually be without any protection from the weather and Kay (1998, p3) comments that, "it would have been against human nature if many men had not contrived some form of 'watchman's hut' on their own initiative", these huts evolving into the recognisable signal box. Signalling at junctions was a specific early concern and, after about 1839, the practice emerged of raising these rudimentary huts above ground level to allow the signaller a clear view of trains

[9] Wolmar (2007, p18) reports contemporary accounts of drivers of heavy coal trains, who by rule had priority, having fistfights with passenger train drivers for right of way, the passenger train drivers goaded on, or even assisted, by their impatient passengers.

[10] Train drivers still refer to signallers as 'bobbies' (Kay 1998, p2), a traditional seemingly dating back to the Liverpool & Manchester Railway (Ferneyhough 1980, pp96-7).

(*ibid*, pp8-9), this trend to raise the platform continuing throughout the 1850s to eventually create the basic two-storey signal box morphology (*ibid*, p12).

Another significant development affecting signal box positioning was development of electric telegraph communication between signal boxes to report on the location of increasingly fast trains in the ‘block’ between signal boxes. By the 1850s, this developed into the ‘block instrument’ (Kichenside & Williams 1998, p45), combining communication by bell codes, attributed to Charles Walker from the South Eastern Railway, and a visual indication of a train ‘on line’ attributed to Charles Spagnoletti of the Great Western Railway. Highlighting the value of this merged communication was the Railway Inspectorate[11] report into a collision within Clayton Tunnel (Tyler 1861), where inadequate reporting concerning the location of three trains caused two to collide with heavy loss of life[12]. Accordingly, the Railway Inspectorate started to demand operation of railways by an absolute block, with only one train allowed at a time between signal boxes, which railway companies resisted, preferring to continue with a permissive block, permitting subsequent trains into a block under caution, largely because on busy lines absolute block requires intermediate signal boxes between stations (Kay 1998, p5).

In 1856, John Saxby (1821-1913), an employee of the London, Brighton & South Coast Railway, patented a mechanism for, “working simultaneously the points and signals”, a mechanism to prevent setting of contradictory routes, reputedly after seeing an error made by a points operator (Kay 1998, pp12-5). While there were experimental installations beforehand, this was the beginning of interlocking integral with the lever frame, with compulsory installation of interlocking occurring after 1859 when Colonel Yolland of the Railway Inspectorate refused permission for a new railway to open because of a lack of interlocking between points and signals (*ibid*, p15). However, much

[11] The Board of Trade Railway Inspectorate, now Her Majesty’s Railway Inspectorate, formed in 1840 for the statutory oversight of railway safety had the dual role of inspecting before authorizing for use new or modified railways, and investigating accidents. For many years, inspectors were retired members of the Royal Engineers. Since 2005, an independent Rail Accident Investigation Branch investigates accidents, while HMRI is now part of Office of Rail and Road safety directorate.

[12] An accident that inspired the Charles Dickens ghost story, ‘The Signal-Man’ (Dickens 1866)

of the railway system built before then had no interlocking, contributing to accidents such as at Walton Junction near Warrington in 1867, where the signaller cleared the signal for an express train while inadvertently leaving open points to divert the train into collision with another train. The Railway Inspectorate report (Yolland 1867) condemned the lack of interlocking despite a previous similar accident at the same location.

Parris (1965, p212) defines 1867 as the turning point in relations between railways and the state, with increasing state intervention in safety (*ibid*, pp214-7). However, the Railway Inspectorate had no powers to compel railway companies to adopt any of the recommendations, leaving absolute block, interlocking between signals and points and or effective brakes on trains, the so-called, ‘Block, Lock and Brake’, only achievable by persuasion (Hall 1990, pp29-31). On 12 June 1889 two trains, one with inadequate brakes and the other admitted into the block under time interval rules, collided near Armagh in Northern Ireland killing 78 people, including 22 children (Hutchinson 1889, p42). In the Railway Inspectorate report, Hutchinson (*ibid*, p55) wrote, “it becomes consequently a grave question whether legislative power should not be sought to make the block system compulsory on old lines, as it has been for many years past on new lines.” Legislation quickly went before Parliament and the Regulation of Railways Act 1889 finally gave the Railway Inspectorate powers to enforce ‘Block, Lock and Brake’. In October 1889 railway companies were informed they had twelve months to adopt the block system, interlock points and signals, and provide passenger trains with continuous brakes. Kay (1998, p24) comments that the railway companies were horrified, yet by 1895 most railway companies complied with the Act[13].

[13] Poorer railways, or those perceiving themselves remote from the Railway Inspectorate, were dilatory in complying. Poor and remote, the Highland Railway claimed their partially braked trains mixing passenger and freight vehicles were safe (Vallance 1985, p111). Undermining this claim was an accident at Achnashellach on the dark evening of 14 October 1892 (McConnell 1997, pp302), where an unbraked part of a train ran away on a steep gradient. Panicking and forgetting the gradient lead to a dip, the crew took their locomotive in pursuit and ran into their runaway train, injuring nine passengers, as it returned towards them in the darkness from the opposite gradient. By 1893, the Highland Railway had fully interlocked signalling (Stirling 1997, pp326-7) and by 1897 had compliant brakes (Vallance 1985, p111).

With the spread of interlocking, signal box design matured and designs emerging from the 1860s, becoming universal after about 1895, represented the 'classic' mechanical signal box design in terms of layout and function (*ibid*). Each signal box, whether at a station or between stations, has control of a block either side of the signal box and connected by telegraph using bell signals to the neighbouring signal boxes, with trains within 'station limits' under direct control of the signaller (Kichenside & Williams 1998, pp69-74). To send a train forward to a neighbouring signal box, the two signallers must establish the line is clear and then, once they confirm this using their block instruments, clearing their signals. Interlocking makes it impossible to clear signals with points incorrectly set and, as the technology became increasingly available, this interlocking extended to occupancy of certain key 'track circuits' that automatically detect trains. A significant constraint in the layout and provision of mechanical signal boxes is how far the signaller can supervise operation of points and signalling (Kay 1998, p41), or even how the heavy mechanical linkages impose a constraint on the signaller (Kichenside & Williams 1998, p111). Large or busy stations therefore required more than one signal box, with consequential expenditure in capital and staffing costs, presenting an incentive for experiments in powered working of points and signals.

Early powered working installations were either all-electric or electro-pneumatic, the first British installations of both types of 'power frames' brought into use in 1899, although development in power frame installation was slow and overtaken by later developments in 'panel' boxes[14] (Kay 1998, p25). Significantly for signal box design, power frames do not need large levers, reducing the space required in a signal box which, along with track circuits to remotely detect trains, allowed a single signal box to replace many boxes at large stations or to control a longer length of line. Replacing mechanical signals with colour lights allowed a further extension of control area and the

[14] Neither Kay or any other authority is consistent regarding whether the nomenclature is panel or power box. Signaller social media (Signalboxes and Signalling Group [Facebook] 2021) suggests that the difference is regional, with generally the Western Region, channelling the historic Great Western Railway desire to be different, preferring 'panel' while elsewhere opting for 'power' to describe the same type of installation. And even this explanation is not definitive.

‘panel’ signal box emerged in the 1930s (*ibid*, pp205-6). With a panel box, the operator does not need to change individual points or signals. Instead, in the complete development of panel box technology, the operator selects on a panel showing the track diagram the entrance and exit point before electro-mechanical relays set up the entire route, changing points and signals as required (Kichenside & Williams 1998, pp145-6). A key development was at Northallerton, opened in 1939, where white lights on the panel indicated the route set-up with electro-mechanical relays for interlocking (*ibid*). As this set route can be many kilometres from the panel box, signal box design is without the constraint imposed on a mechanical signal box affording the operator a view of the trains. However, accommodating electro-mechanical relays requires a considerable amount of space, so the layout tended to follow the two-storey arrangement used for mechanical signal boxes (Kay 1998, p200).

Following the Second World War, and particularly following the 1954 ‘Modernisation Plan’ (British Transport Commission 1954, pp10-1), panel signal boxes progressively replaced mechanical signal boxes on main lines, expanding in size to become area signalling centres, although mechanical signalling continues to persist on secondary routes (Kay 1998, pp209-10). One side effect of this development is that there are very few surviving mechanical signal boxes on main lines or in the larger conurbations. By the 1980s, experiments in new solid-state interlocking and computerised automatic route setting technologies (Ford 1983, pp488-9, Ford 1984, pp262-4, and Singer 1989, pp532-4) meant the panel box was becoming obsolete, with the 1989 Waterloo resignalling scheme considered the last significant panel scheme (Kichenside & Williams 1998, pp179-80). A new signal box with solid state interlocking opened in 1985 at Leamington Spa (*ibid*, p200), becoming a precursor to the first integrated electronic control centre schemes at London Liverpool Street, York and Yoker (North Clydeside) in 1989 (Mitchell 2003, pp49-50). These established a signal box layout where the signaller interfaces with the signalling system through a computer workstation, allowing each signaller, supported by computerised automatic route setting making most signalling decisions, to control even larger areas than a panel box. In 2012, Network Rail announced the replacement of all main line signal boxes by 14 regional operating centres, extending the principles of integrated electronic control centres to a regional level (Network Rail 2012). Paradoxically, in many cases newer panel signal boxes serving busier main lines are due for replacement before remaining mechanical signal boxes on secondary lines, with the last of these mechanical signal boxes not due to close until at least 2050 (Milner 2014, pp17-21).

4.3 Signal Box Morphology, Procurement and Design

Minnis (2012, p1) comments that before the 1980s there was little attempt to study signal boxes as a building type and that Kay's study of signal boxes is, "highly accurate". In the absence of any evidence contradicting this statement, and the extensive used of Kay's nomenclature, which includes a typography, in subsequent publications (Mackay & Fleetwood 2016, p182), the presumption is that this assessment is appropriate. Signalling contractors and railway companies each had a standard design of signal box that varied only in size according to location and, other than the London & North Western Railway, without any designation (Kay, pvi-vii). However, these designs would vary due to modifications through experience, so in studying signal box design Kay (*ibid*) proposed extending the numerical system to classify each standard design, whether by a contractor or railway company. Even though Kay (*ibid*) defines the classification as, "rough-and-ready", subsequent writers make extensive use of the typology, including Minnis (2012, p1) using this, "… universally adopted … typology of signal box designs", when proposing signal boxes for statutory protection on behalf of Historic England, with the typography now appearing on list entries. This typology is usually sequential by date for each of the standard designs, although there are exceptions according to specific circumstances, such as where construction of the same standard design layout is in either brick or timber.

With the widespread adoption of interlocking, the development of the 'classic' mechanical signal box dates from 1870-1930 (Kay 1998, pp24-5) with a specific design to fit around the frame and interlocking. Actual architectural styles changed slightly through this period, with the earliest signal boxes being an austere design giving way to a more ornately decorated Victorian style before becoming less decorated for economy, or as a reaction against Victorian excess. Locating signal boxes with reference to the operating limits of points and signals, or adjacent to a level crossing controlled by the signal box, leads to a relatively standard trackside positioning (*ibid*, p41), although various location specific positions include in a bridge over the tracks, combined with station buildings, in a tunnel wall, with Kay (*ibid*, p76) asserting that River Signal Box in the Mersey Tunnel was the only known instance of an underwater signal box, and as part of a swing bridge (*ibid*, pp69-78).

Constraining the layout of a mechanical signal box is the frame (*ibid*, pp41-45). Prefabricated and tested before installation, this consists of the lever frame mounted on top of the interlocking mechanism, such that the levers are at first floor level and the interlocking at ground level. Around this fits the signal box, with a first floor ‘operating floor’, heavily glazed to allow the signaller see train movements plus all the signals, and a ground floor ‘locking room’. Besides the lever frame itself, the operating floor has a shelf above the lever frame for the block instruments. This shelf tended to obstruct the signaller’s view with the original positioning of lever frames at the front of the operating floor, so after about 1910 it became standard practice to position the lever frame at the rear of the operating floor. Other equipment on the operating floor would include a gate wheel if required for operating a level crossing, equipment for single line working where applicable, a stove or small fireplace, plus a desk for the train register. Contemporary evidence indicates that it was normal practice to keep the operating floor in a pristine state and signallers would endeavour to make their space homely. In contrast, besides the interlocking equipment plus rods and wires leading away from the interlocking, the locking room contained battery equipment and, “any other equipment which the signalling and telegraph fitters wished to keep protected from the elements … becoming something of a junk heap” (*ibid*, p45). Overall length of a mechanical signal box is a function of lever frame length, the frame having levers for the track layout under control, with a percentage of spare levers to allow flexibility for any changes, plus space both ends for access and ancillary equipment such as level crossing controls. Some designs, particularly for timber signal boxes, would be multiples of standard components. Depth is a function of space to allow lever throw, space behind for the signaller to move safely and furniture or fittings. Whereas length is variable, width tended to be standard for individual designs, although for restricted sites this creates problems, often addressed by oversailing the operating floor.

Timber or brick are the predominant structural materials for signal boxes, with a few in stone according to local circumstance's, the choice often being a simple preference by the railway company rather than any functional consideration (*ibid*, pp49-53). There are also a few experiments in concrete blocks, and later signal boxes made use of concrete or steel framing (*ibid*, p49). Contemporary plans for classic signal boxes show concrete strip foundations and corbelled brickwork to ground level, with timber signal boxes also having the option of timber or in-situ concrete piles. Timber was the material choice for earlier signal boxes and has the advantage of being lightweight, so suitable where ground conditions are less than optimum such as embankments, and relocatable. Structurally, timber signal boxes follow vernacular timber construction, using a variation of 'box framing' (Yeomans 1985, p65) with substantial corner posts from ground to eaves, cross-braced to intermediate posts and horizontal beams at operating floor level (Kay 1998, p51). Common timber choices are oak, deal or pitch pine. Weather protection is by a variety of timber boarding, the actual style varying according to the specific signal box design and occasionally subject to variation when replacing the original boarding. In contrast, brick offers durability, although even brick signal boxes tend to have a timber operating floor level. Kay (*ibid*, pp49-50) defines brick signal boxes according to whether the brickwork extends to operating floor, operating floor windowsill or to the roof, although notes that contemporary railway practice is to describe such buildings as 'composite'. Brickwork is usually single skin 9" (229 mm) thick normally executed in English, Flemish or English garden wall bond, although some designs feature 13" (330 mm) thick plinths or, particularly for larger signal boxes, are 13" thick brickwork with 9" thick recessed panels. Bricks are usually local vernacular, although there are variations such as using 'Staffordshire Blue' engineering brick for features such as quoins or door and window surrounds.

Overwhelmingly, classic signal boxes have coupled pitched roofs built to the contemporaneous vernacular (*ibid*, pp57-60), the pitch typically being around 30 degrees and the roof, according to railway company preferences, either hipped or gable, finished with slate, 'Bangor Countess' being the preferred size, on a close-boarded timber substrate. Flashings are in lead. As built, the roof would have no ceiling, the roof interior finish being the board underside. Bargeboards, plus finials, for gable roofs were, as befits late Victorian designs, decorative, although subject to decay and often replaced with simpler designs. Other roof variations exist for specific locations and flat roofs became increasingly common after 1923.

Doors and windows also tend follow the contemporaneous vernacular (*ibid*, pp56-7). Doors are invariably timber, usually framed, ledged and braced, and usually inward opening with the operating floor doors half glazed. Locking room windows, important before widespread availability of electric lighting, are either fixed or sliding sash, usually in timber although the fixed are sometimes iron framed. In brick signal boxes, an arch usually supports the opening, with variations in the arch shape according to the design with segmental predominating. Glazing to the operating floors is usually continuous along the front and for at least part of each side, most of the glazing being multi-pane timber sliding sash opening lights, although some designs have fixed upper lights. The opening lights are usually horizontal sliding. Larger signal boxes might also include an oriel window. To facilitate cleaning, some signal box designs incorporate a narrow balcony or, where sliding sashes allow access to all windows from inside, a wrought iron rail for safety. While the large expanse of glazing makes the interior environment subject to wide seasonal variations in temperature, equally this large, greenhouse style, area of glazing area facilitated any signallers, "willing to exploit the horticultural potential" (*ibid*, p41). An additional opening into a signal box is the space through which the point rodding and signal wires leave the signal box, the lead-way[15], the lintel

[15] Nomenclature apparently varies, sometimes lead-away or even lead-off referring to the lead-way and lead-off as one installation. Woolford (2004) does not define. Some serving signallers suggest, 'rats entrance', or, 'air conditioning', giving an insight into the realities of signal box life (Signalboxes and Signalling Group [Facebook] 2017).

for this opening in brick signal boxes often formed by reusing old rails, with the rods or wires then routed through cranks on a lead-off bed to the individual points and signals (IRSE 2013, p21). Access to the operating floor of classic signal boxes was invariably by way of an external, timber staircase (Kay 1998, p55). This staircase was usually single flight, parallel with the adjacent track and for most designs the staircase terminated with a landing. Some designs incorporated a porch with the landing, sometimes later modified to incorporate a lavatory.

Services, where provided, were initially rudimentary (*ibid*, pp60-1). The operating floor stove or fireplace would normally have a conventional hearth, the flue being a chimney or stovepipe. Lighting was by oil or gas lamps. With heating and lighting in this way, it was necessary to provide adequate ventilation, often by way of iron vents in the roof or louvered vents on gables. Mains electricity supply came later, or never for some signal boxes, with the only electricity on site being batteries, regularly replaced by signalling technicians, for the telegraph. Except for signal boxes in towns, supply of mains water was difficult to arrange, so some signal boxes relied upon a daily delivery of water from a nominated train (Frater 1983, p47). This lack of water also constrained lavatory provision, with most classic signal boxes initially equipped with an earth closet, either in an adjacent hut, as part of the porch or in a portioned off area somewhere inside the signal box (Kay 1998, p61).

Defined as, “engineer’s vernacular” (*ibid*, p41), rather than architecture, the design of early signal boxes reflected contemporary tastes and the engineer’s department of each railway company were responsible for providing signal boxes, whether designed by the engineer’s department or purchased from a manufacturer of signalling equipment. While architects were responsible for designing many early railway buildings, by 1860, railways presented a mature business requiring economy to maintain dividends resulting in, standardised, “buildings and their components … distinctive company styles appeared … which no longer owed any allegiance to their surroundings” (Biddle 1986, p18). Thus, the era where railway companies made heaviest investment in new signal boxes to meet orders made under the 1889 Act represented an era of standardised designs that were location specific and represented the individual railway company vernacular. There were anomalies, including the North Eastern Railway where, made up of such venerable railway companies as the Stockton & Darlington Railway maintaining a semi-independent existence (Fawcett 2003, p18), this standardisation was at divisional level within the company (Mackay & Fleetwood 2016, pp181-2). However sourced, the designs were often attractive, with Kay (1998, p41) commenting on design detailing, "In accord with contemporary tastes in domestic architecture". Bespoke designs from this era are hard to identify, a rare exception being St Bees Signal Box on the Furness Railway, an Arts and Crafts influenced design from 1891 by, it is conjectured, John Harrison from the Lancaster based architectural practice Paley and Austin (Historic England 2013b). This engineering led and standardised approach to signal box design persisted until the very last mechanical signal boxes (Kay 1998, pp209-10), with Uttoxeter Signal Box constructed in 1981, a standard British Railways (London Midland) Type 15, being the last purpose-built survivor of these new constructions (Kay 2010, p28). One development from the 1930s onwards was an increasing tendency for the design influence of new signal boxes to be the contemporary Modernist architectural style (Kay 1998, p199), with 1960's signal boxes either architect designed or representing the nadir of prefabricated aesthetic (*ibid*, pp208-9). In contrast, the standard Network Rail design for small panel signal boxes has a similar morphology to the 'classic' signal box (Kay 2010, p6).

Regarding procurement of the frame and a signal box to contain the frame, Kay (1998, p31) identifies that this presented the railway company with a fundamental equipment procurement choice. Initially most railway companies purchased everything from the signalling contractors, using the signalling contractors standard signal box designs. However, increasing experience allowed some railway companies, with some very pronounced regional variations in practice, to take full or partial responsibility for signalling provision. Typically, this started by building signal boxes to the railway company design around frames sourced from the signalling contractors, although the 'Big Four' railway companies created in 1923 usually manufactured their own frames while usually sourcing of equipment for power and panel signal boxes from specialist manufacturers. Actual signal box construction was by a mixture of signalling contractor, local building contractors or direct railway labour, the actual choice depending upon the specific railway company or local conditions. Where using contractors, on a negotiated fixed price or competitive tender basis, to construct a signal box to a standard railway company design, the railway company would supply full drawings and specifications. Another increasing frequent practice after 1890 was for the railway companies to modify and relocate frames, or even complete signal boxes, between locations.

4.4 Signal Boxes as Social Narrative

Despite the elemental purpose of a functional building is to house equipment, any conservation discourse concerning the signal box needs to consider the narrative of those who worked in the building, defined in the 'Dublin Principles' as balancing, "historical, technological and socio-economic dimensions" (ICOMOS-TICCIH 2011, p3). This is especially because, as a place of work, the traditional mechanical signal box presented an operating environment for safe and punctual running of trains that could range from the intense to the bucolic. Vaughan (1994, p163) evokes the intense nature of this work in his description of working each of the three mechanical signal boxes at Oxford,

> "*The lever frame appears to be the most complicated part of a signal box, but that is not what took the most time to learn. However complicated the frame was, the train service and the shunting movements took much more time to learn.*
>
> *To work successfully at a busy place … the signalman had to think quickly, make quick decisions and only then move rapidly along his levers, pulling this one, putting that one back. The whole train service for the next 24 hours was in his head, together with the shunting movements performed by each train. He had to remember what was going to be required in 10 or 20 minutes when he made a decision with a train now."*

In a census of work conducted over 24 hours on Thursday 28 November 1946 at Oxford Station North Signal Box, the duty signallers had to signal 291 trains requiring 6,078 lever movements (*ibid*, pp170-81). In describing the 90 minutes after 6 am, Vaughan comments,

"… 30 trains or engines passed the box and an unknown number of shunting movements were made. Thus the work went on, non-stop, minute by minute, hour after hour, as the signalman, knowing what was required at that minute … tried to make hundreds of constantly correct decisions. If their concentration slipped, and a wrong decision was made over which shunt to allow or which train to bring on into their section, it would cause delays."

In contrast, isolated signal boxes, whether block posts between stations or signal boxes supervising level crossings, evoked a quite dissimilar cultural perspective. In contrast to the signal boxes forming part of a busy station, this is the work of an isolated person sometimes requiring a robust strength of character, as shown by this signaller's account at the since abolished Hamstead Crossing Signal Box in Berkshire (Canning 1976, pp124-5),

"At 03.20 … eerie, dark and silent … I don't know why, but for the first time since I have been a signalman I felt scared, alone, miles from no-where; and something seemed wrong. Don't be stupid, I thought, and made for the box. As I entered the door there was a blinding flash, and a crack, followed instantly by an almighty crash as a fork shot from the sky into a clump of trees no more than twenty yards from where I stood. The lights went out, bells rang and all hell was let loose.

I made for the chair in the centre of the box and sat down shaking like a jelly. Within seconds another crack behind the box was followed by a crash, and another; I sat glued to the chair, wondering what would happen next. I soon found out. A fork seemed to come straight at the box. There was the familiar crack and crash, but this time the structure shook, sparks came through the wall and everything in the box glowed, every bell and phone rang together, and the smell was nauseating."[16]

It is at the country station where the signal box becomes the most evocative. Richards & Mackenzie (1986, p179) describe the country station as a community of buildings and staff that represent a potent source of contact with the outside world. "What is more English than the country railway station?", declared Belloc (1908, pp59-60), "a little smudge of human activity", in the country town that everybody loves brings together all ranks in which the

[16] As a prominent, potentially isolated structure, there are regular reports of lightning strikes to signal boxes. Par Signal Box (detailed in appendix A) was stuck on 10 February 2020 during Storm Ciara (RailUK Forums, 2020). Despite damage to signalling equipment, the signaller was unharmed and successfully evacuated the box.

stationmaster has a place. Belloc goes onto argue that the country station preserves country communities from decline, allowing people to live in the country with easy access to urban necessities. This thinking is an example of a process where from the 1870s writers and artists created a coherent image of rural England in response to increasing urbanisation, the world of ‘The Railway Children’ (Carter 2001, p6), such that into, “this ruralist revision (and long public habitation to railway travel) settled the train comfortably in the English landscape” (*ibid*, pp246-7). Here, the railway station, “provided a new focus for settlements, away from the traditional centre around the church and market square” (Gwyn 2010, p75). For those now living in the cities, the railway facilitated exploring the rural past (Everitt 2003, p184), whereby the railway in opening access to the countryside played a part in an awakening interest in British vernacular traditions, with influences felt in Vernacular Revival architecture along with the Arts and Crafts Movement. The widespread closure of country stations changed this dynamic, with Harris (2016, p128) commenting that most rail replacement bus services lacked the statutory protection required by train services, leaving communities without public transport, condemning, “many villages to long, slow, lingering decline” (Richards & Mackenzie 1986, p180) and leaving “transport deserts” (Tickle 2019) struggling to access civic necessities. Pacey (2002, p300) draws together descriptions as to how nostalgia replaces the fading railway in Britain, establishing a, “whimsically elegiac”, thinking concerning the lost railways.

Included in this whimsical elegiac to the lost country station is the signal box. Richards & Mackenzie (1986, p237) comment that, “Like all aspects of railway life, the signal-box was susceptible of a romantic evocation”, even if the evocation turns out to be simply prosaic, such as Frater (1983, p87) describing, while arriving by train at Machynlleth in Wales, “the signalman there idly watching us from his box, mug of tea in hand”. Of the building itself, Minnis (2014, p18) describes signal boxes as, “utilitarian yet often delightful structures, which manage to combine function and decoration to an extraordinary degree”. At many small British stations, Richards & Mackenzie (1986, p232, 237-8) describe how a stationmaster would be responsible for a small number of staff including those staffing the signal box. Nevertheless, although part of a station, working a signal box was a solitary task with onerous responsibility. Amongst the most solitary was the former signal box at the isolated station of Gorton on remote Rannoch Moor in the Scottish Highlands, where in the 1930's, "the Kings Cross sleeping car express calls every morning in order to pick up the signalman's children and convey them to school, in Fort William, 42 miles further on" (Nock 1937, p37).

Figure 4.1: 'On Early Shift', by Terence Cuneo (1948), evoking the atmosphere of a mechanical signal box. (NRM/Science Museum Group, Creative Commons Attribution)

However, working the signal box at a country station had compensatory advantages such as Vaughan (1994, p63) recounting how the signaller at Yarnton Junction, "a perfect signal box indeed; peaceful countryside, an interesting layout and a busy train service". From this 'perfect' signal box, the signaller had elevated views over the countryside and on a clear frosty morning could see when trains departed from the next station three miles away as a, "pure, white sunlit blossom of steam" (*ibid*). In contrast, a modern signaller recounting a shift at St Erth Signal Box in Cornwall during a winter weekend affected by torrential rain and flooding, where dusk came early, yet inside the darkened, wind buffeted signal box it feels, "cosy and safe regardless of the conditions outside" (Munday 2012).

However, romantic evocation often sits uneasily with reality, such as the early morning of 24 December 1910 where, "the tragic figure of Alfred Sutton"

(Baughan 1987, p387) was the signaller on duty at Hawes Junction (since renamed Garsdale) deep in the Pennines where (*ibid*, pp390-1):

> *"Early in the morning, with a high wind buffeting the windows in the box, signalman Sutton was a … very busy signalman, with relief trains and a number of light engines[17] to deal with, as well as the normal traffic, all taking place on the eve of Christmas in a lonely box shaken by the winds which howl through the night over the northern Pennines."*

Sutton forgot about two light engines, inadvertently sending them into a block section in front of the down Scotch express. The express caught up and collided with the light engines at Ais Gill, causing ten deaths. In the Railway Inspectorate report, Pringle (1911, p8) notes that Sutton had been on duty for 9¾ hours at this location where a, "… duty period extending to 10 hours would not be considered by the Board of Trade to be excessive", although later states that for the work at Hawes Junction, "the hours of duty of the signalman might be limited to eight" (*ibid*, p12)[18]. Having been equivocal about duty hours, Pringle focused on the possibility of providing track circuits at the starting signals (*ibid*). A similar accident occurred on 22 May 1915 at Quintinshill in southwest Scotland, where a sequence of operating irregularities by two signallers, Meakin and Tinsley, led to a triple collision between a local train, troop train and express train, with the loss of 227 lives[19] (Druitt 1915, pp22-3), Britain's worst railway accident (Nock 1961, pp143-6). One seemingly inexplicable aspect of this accident was how, having just alighted from the local train, Signaller Tinsley completely forgot about this train (Druitt 1915, p25), with the possibility, according to a medical examination made of Tinsley after the accident, this oversight was due to epilepsy (National Records of Scotland 1915).

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[17] A light engine is a locomotive or locomotives running without a train.

[18] Duty hours and fatigue reoccur in official reports. While investigating a fatal accident at Manor House near Thirsk in 1892, the inspecting officer noted the signaller was compelled to work despite being unfit for duty having earlier walked 15 miles trying to find a doctor for his dying daughter (Marindin 1892). Public sympathy was with the signaller, who received an absolute discharge when convicted of manslaughter (Pulleyn & Mackay 2016, p270-3). Fatigue remains a signalling issue, as evidence by an accident near Thetford in 2016 (Rail Accident Investigation Branch 2017).

[19] The official report states 227 while admitting uncertainty (Druitt 1915, p30), while Hall (1990, p83) puts the death toll at 224. Loss of the regimental roll call in the ensuing post collision fire means it is unlikely the exact number will ever be known.

Correspondingly less than evocative is where an incident connected with railway work presents danger to the signaller. Such an incident occurred in the early morning of 2 June 1944 at Soham in Cambridgeshire, when the leading wagon caught fire in a freight train conveying bombs. The driver and fireman hastily isolated the wagon, drawing it forward from the train and got as far as the station before it exploded, killing the fireman and signaller, seen just before the explosion carrying a fire bucket towards the burning wagon, plus severely injuring the driver (Wilson 1944, pp1-4). While the explosion destroyed the station, it spared the town, so for their bravery both driver and fireman received the George Cross, posthumously for the fireman. Wilson (*ibid*, p11) observes:

> *Signalman F.C. Bridges also lost his life in the performance of his duty … it was common knowledge to the staff that ammunition traffic was regularly conveyed by this train, and it is clear that Bridges was making preparations to fight the fire …"*

A memorial to him in Soham laconically, and poignantly, records, "He died with Honour" (Soham Remembers n.d.).[20]

Surprisingly, the modern panel signal boxes that replaced the traditional mechanical signal boxes can evoke a response, as seen in this description (Goer 2013) of the, previously cited, 1960s panel signal box at Birmingham New Street where,

> *"… the Operational Floor, is reminiscent of the lair of a 1960s Bond villain. From their elevated perch a dedicated team operates … in front of a gigantic processing unit, which maps out the rail network with intertwining lines of LED lights and buttons … for every train between Birmingham International and Wolverhampton."*

Tellingly for nostalgia, Goer (*ibid*) comments how this revolutionary technology for its time is due for replacement by the new regional operating centres.

[20] An almost analogous incident occurred in April 1969, when an observant signaller at Cotehill Signal Box near Carlisle observed an overheating wheel bearing in a passing freight train and had the defective wagon shunted into a siding near the signal box. Half an hour later the wagon caught fire, causing the contents, armour-piercing artillery shells, to progressively explode over the next two hours, fortunately without injury and only minimal material damage (Railway Magazine 1969, p346).

4.5 Current Approach to Signal Box Conservation

Network Rail's strategy for end of operational life signal boxes is to reduce the maintenance liability represented by a redundant building (Network Rail/Shaw 2015, p4). Overall, the policy is to demolish after closure any signal box without statutory protection, having first removed for preservation any artefacts designated through the Railway Heritage Act 1996, with the usual destination for these artefacts being the National Railway Museum as part of the Science Museum Group, along with retention of other appropriate material by the Network Rail Archivist (*ibid*, p9). This policy to demolish covers non-listed signal boxes within conservation areas (ibid, p11). Demolition will not proceed if there is, with appropriate permission, an identified alternative use (*ibid*, pp10-2). In lieu of demolition, relocation to a heritage railway or community use is permissible, with the recipients paying relocation costs, although how this works in practice can be contentious and historically has not always ensured conservation of the relocated signal box. In 1969, Brooksby Signal Box was bought for £15 and relocated as a pavilion to an adjacent sports field (Railway Magazine 1969, p47), yet no longer shows as extant (Kay 2010, p71) and therefore presumably lost over time. Reeves (2016, p47) describes one community reuse as, "well meaning, yet clumsy", when Network Rail presented the redundant Deeping Saint James Signal Box, identified by the community as an integral part of their village, in a demolished, stored condition pending development of a village heritage centre.

For statutorily protected buildings, the policy identifies five options while recognising that options requiring relocation need planning permission or unsuitable where the listing has group value (Network Rail/Shaw 2015, pp12-9). As the design of many signal boxes facilitated relocation, relocation to a heritage railway is the optimum option with perceived benefits include use of the building for its designed purpose and public access in a controlled manner, while for Network Rail they no longer have a maintenance liability. Where no heritage railway operational use presents itself, relocation of the signal box for a community or other heritage use relieves Network Rail of a maintenance liability, although experience suggests that relocated signal boxes are more vulnerable to deliberate damage, and particularly vulnerable to arson (BBC News 2010 and Brodrick 2015, p65). The third option provides for community use, by long lease or sale, of the redundant signal box in situ by physically separating the signal box, including access signal box, from the operational railway. In contrast, if providing safe public access to the interior is possible while Network Rail retains control of the exterior structure adjacent to the operational railway, another option is leasing the redundant signal box interior. This is site specific, the policy mentioning reuse of the GWR Type 7d Totnes Signal Box as a café (figure 4.2), cafés being a popular choice for redundant signal boxes remaining in situ, with other examples including the GWR type 3 at Bodmin Parkway and bespoke NER design at York Station Platform. Finally, where impossible to relocate the signal box or provide access, mothballing the signal box, in consultation with the relevant local authority conservation officer, will minimise the rate of deterioration and likelihood of vandalism. Typically mothballing will remove all deleterious material, such as asbestos or anything attractive to vermin, some equipment, although leaving the frame in situ, and then isolate services before exterior timber repairs, redecoration and adding protection to windows and doors (figure 4.3). Nevertheless, as described in section 3.5 mothballing of railway buildings inevitably leads to deterioration and McCaig (2013, p253) states that the best way of protecting a heritage building is to keep it occupied, even if on a temporary or partial basis.

Figure 4.2: Totnes Signal Box repurposed as a café. (Author, 2018)

Figure 4.3: Applied protection to windows and doors, Woolston Signal Box. (Author 2018)

As previously described (section 3.7), fundamental to the heritage railway movement is preservation of the steam locomotive, along with other railway rolling stock, with this preservation conceptually being neither conservation nor authenticity. In this environment buildings tend to be part of the mimesis, that staged authenticity necessary as a backdrop to the running of trains (Divall 2002, p4). Use of heritage buildings by a heritage railway therefore becomes opportunistic (Reeves 2016, p54), where the building matches an operational need rather than the priority being conservation of the building itself. As functional buildings serving a core railway operational need, this strongly applies to signal boxes, eroding the authenticity in pursuit of the tourist value (Orbaşli & Woodward 2008, p168). Where heritage railway signal boxes are not in operational use, the custodians find themselves in the same position as Network Rail in mothballing their built environment assets, although there is minimal evidence of formal documentation in the same manner as prepared by Network Rail or recommended minimum standard of good mothballing practice (McCaig (2013, pp253-4).

4.6 Conclusions

As the modern railway developed it became increasingly important to have a formal method of controlling trains of increasing speed and weight. Grouping the control points and signals into one location, often on a raised platform to provide a good view of approaching trains, saved on staff cost, although the provision of weather protection for this raised platform was slow to develop. Development of the electric telegraph allowed for communication between these ‘signal stations’, and adoption of the concept of ‘block sections’ into which there could only be one train at a time, safeguarded by ‘locking’ of the signalling equipment, with the trains controlled by efficient braking provided unprecedented levels of safety compared with the early railway system. With these principles accepted, the classic mechanical railway signal box emerged in terms of layout in function from 1860 onwards and becoming universal in application after about 1895. Developments since then included electro-mechanical operation with remote detection of trains, allowing signal boxes to control many kilometres of railway from one location and leading to progressive replacement of the original mechanical signal boxes. Culminating the developments to date are solid state interlockings, where a computerised interface ensures most train control is automatic from regionally based operating centres.

With detail variations, the classic signal box dating predominately from 1870 until 1930 is a functional design built around the frame and interlocking. Constraining the layout and morphology is the frame, so the typical layout is a two-storey structure, with a lower-level locking room and a heavily glazed upper-level operating floor. Structure is predominately either in timber or brick, the actual choice depending upon location and company preferences, and the building will invariably have a pitched roof finished in slate. Window frames, doors and staircase are in timber. Services are basic, the rudimentary nature of the installation persisting in many surviving signal boxes. Design was a company standard ‘engineer’s vernacular’ in a style that represented contemporary tastes in domestic architecture, with only a minority of signal boxes built to a bespoke design. Procurement varies according to the railway company, with more in-house procurement of the machinery after 1923, and relocation of the frame, or even the entire building, becoming an increasingly common practice after 1890.

For the signallers, the working environment could range from the intense to bucolic according to location, with a busy location making intense demands on the signaller whereas isolated signal boxes evoke a contrasting cultural perspective, with these perspectives often captured in personal accounts by signallers. By the early 20th Century, the country station represented part of the idealised British social fabric, with the signal box an integral part of this whimsical elegiac and susceptible to romantic evocation that persists in the surviving mechanical signal boxes. Yet, reality was harsher, with even a moment of inattention by the signaller leading to serious accidents, and the signaller is not immune to the dangers that can befall working on the railway. It is interesting to note that even for the modern signal boxes, there is a romantic evocation that requires an understanding of the narrative presented by signal boxes.

Conserving signal boxes presents several contradictory issues regarding conservation and evocation of heritage functional buildings. Prescriptive views of building conservation, formed with the original philosophy concerning custodianship of buildings with artistic or historical value for future generations, is creating a tension when applied to buildings the original custodians never envisaged as worthy of conservation. As described in the last chapter, functional buildings, representing a clear separation of buildings for process rather than human occupation, are a noteworthy example of this change, demonstrating a direct connection between heritage and cultural identify that allows heritage to acquire status through use rather than deliberate consideration. However, the framework remains unchanged, with expert knowledge typically driving analytical discourse concerning heritage buildings, in part to avoid trivialising of history to provide a romantic view of the past. All aspects of railway life are susceptible to romantic evocation (Richards & Mackenzie 1986, p237), and in this the signal box displays several facets. This narrative is so much a norm that preserved railways represent a paradox, where the act of preservation, “inevitably leads to the loss, sometimes, of the original atmosphere of the line” (Waller 2018, p297). However, to understand these facets more fully requires an understanding as to the narrative context, the builders, and subsequent custodians of these romantically evoked buildings.

Custodianship is changing from that envisage by pioneers in building conservation. Signifying an interest with the intangible values of culture is the increasing volunteer participation in conservation for a wide range of heritage buildings, including opportunistic custodianships of heritage buildings as part of a wider heritage movement, as exemplified by heritage railways. Coupled with this are the pressures of heritage tourism, leading to concerns that tourism can compromise authenticity, where conservation must display interpretation that connects with all stakeholders, yet risks turning authenticity, often defined as an unchallengeable criterion, into a commodity. Heritage sites made up of relocated buildings are, particularly, criticised as discredited concepts, although meaning depends upon the contextual situation with an increasing awareness as to how activities in a town contribute to the identity of place, so experiential evaluations of heritage buildings rely upon the differing viewpoints of everybody involved. The heritage railway movement characterises many of the pressures involved, with a backwards looking mentality that, while conscious of historical authenticity, is neither conservation nor authenticity and instead creates staged authenticity as a facsimile of some perfected past world disconnected from history.

Heritage becomes a process driven spectrum, from preserving in an unchanging stasis to the postmodernism thinking of commodifying heritage for selling to modern concerns. In this environment, to preserve the inherent qualities of heritage there is an identifiable necessity to emphasise the social aspects with functional buildings, such as operational railway buildings, expressing a cultural significance requiring conservation that balances sensitivity to original function and awareness of a changed environment. In developing the ideas of including public in the heritage process and the need for multiple narratives, Reeves *et al* (2020, pp249-53), Gentry (2013, p518) and Orbaşli (2017, p168) all explore how differing groups of people with different perceptions and skills will perceive functional buildings. This faceted approached suggests, as an innovative contribution to an enhanced understanding of processes in conserving heritage functional buildings, that there is a wider need to include all stakeholders in the decision-making process concerning these heritage buildings. Rather than the unchanged framework that forces consideration of functional buildings against the symbolic achievements of great art, this discourse indicates a need for submitting functional buildings to similar levels of scholarly scrutiny as applied to, for example, church architecture. Conservation policies for heritage functional buildings therefore seem to need a strong emphasis on relevancy along with an understanding as the motivations of all people, including the custodians, connected with the building (Reeves *et al* 2020, p254). Testing this conclusion requires taking a representative functional building sample, the signal box as a clear exemplar of an ‘engineering led’ design for specific purpose with contradictory requirements regarding effective conservation (Reeves 2016, pp54-5), and exploring how social history or potential for specific narrative, including such concepts as group value and location, can become definable factors in determining conservation policy.

Chapter 5
Methodology

5.1 Methodologies

Achieving conservation of functional buildings, as a specific building type emerging during the Industrial Revolution, without compromising acquired heritage values, thereby supporting the hypothesis, requires development of a methodology that tests the possibility of defining the narrative attached to heritage values by a taxonomy survey of case study buildings to provide this contextual meaning (Proverbs & Gameson 2008, p100). Yin (2018, p27) defines research by case study as answering the 'how' or 'why' through observing in context (*ibid*, p114) supported by, to give perspectives on the case, interviews (*ibid*, p102) in the form of guided conversations (*ibid*, p118) or carefully cross-checked use of social media (*ibid*, p137). While it is possible to present case studies of buildings by category or type, Plevoets & Van Cleempoel (2011, pp157-8) identify a typological approach to analysis, considering contemporary aspects of the building rather than historical by identifying a heritage taxonomy (Reeves *et al* 2020, p238). Therefore, in investigating the chosen exemplar of functional building by case study to address the 'how' of effective conservation, the following structure of data collection applies:

- Taxonomy surveys:
    - Define building morphology.
    - Define social narrative.
- Conversations with experts.

For the identified case study functional buildings, defining and bounding the case is through defining building morphology, the essence of the building, and the social context of the prosaic stories for those who worked in these buildings that becomes the narrative leading into developing a conservation strategy. In effect, this becomes an information-orientated selection (Flyvbjerg 2006, pp230-1) for which there is, “no universal methodological principles”, in the data collection other than to define likely cases.

In identifying the contradictory requirements relating to signal boxes, Reeves (2016, pp54-5) recommended analysis for a wide sample of heritage signal boxes. Flyvbjerg (2006, p236) discusses how large samples allow the researcher to, “place themselves within the context being studied”, with Reeves *et al* (2020, p253) testing the idea of interpreting contextual relevancy for all observers of functional buildings to support conservation. Dawson (2020, p124) observes, “Conservation, often in a new location, may challenge authenticity … require a level of interpretation that is uncomfortable for experts in … heritage buildings, but nevertheless satisfies a more inclusive demand for heritage as entertainment”. It is to test this idea of interpretation, even if it represents a challenge to authenticity, that prompts the taxonomy surveys of case study buildings, representing a large-scale testing of the novel taxonomy methodology trialled by Reeves *et al* (2020, pp238-52) as a basis for deriving a comprehensive narrative attached to each building. Although not central to the taxonomy surveys, it is a reasonable expectation that conversations with experts may form part of the case study observation process and thereby admitted as open-ended interviews, a narrative inquiry attached to the case study as part of the phenomenological detailing (Flyvbjerg 2006, pp239-40).

5.2 Development of Taxonomy Survey Model

Development of a taxonomy survey model to record signal box heritage values involved three levels of data collection, being initial data collection stages, covering a scoping exercise and piloting the taxonomy survey model, two main tranches of data collection with slightly different objectives from analysis of the first tranche, and a tertiary stage. Section 3.4 discussed how functional buildings fit uneasily into the scholarly scrutiny applied to heritage buildings possessing intrinsic artistic or historic merit, and decisions concerning conservation of functional buildings needs to include a wider range of stakeholders in the decision-making process. Defining the contribution that each signal box makes towards a specific railway heritage environment, thereby informing a public narrative, will orientate the taxonomy information towards how all potential stakeholders, defined as observers, could perceive the building morphology and character. It therefore follows that the survey methodology orientation is towards buildings that are, within reason, visible to the public to viably support a perception of the sample buildings.

Kay (2010) lists a total of 1109 signal boxes in Great Britain, noting that this number is declining, with the status of many of these buildings uncertain, so the initial consideration for a scoping exercise is the extent to which it is possible to develop a representative taxonomy sampling model. This scoping exercise concentrated, although not exclusively, on distinct geographical areas with a relatively high density of surviving main line signal boxes, being Northumberland, east Lincolnshire, Dumfries & Galloway, and York, along with a representative heritage railway signal box in Peterborough. For each signal box there was, other than a photographic record, no immediately established methodology. While the scoping exercise results were diverse within the geographical areas and demonstrated potential to develop a suitable taxonomy survey model, there was no incontrovertible way of demonstrating whether the results represented an inclusive, wide-ranging representation, with the decision to realign sampling on a national scale rather than surveying all buildings in specific geographical areas. Using data from the scoping exercise ultimately required backward iteration of key taxonomy information derived by applying the main tranche methodology to scoping exercise signal boxes.

Analysis of the scoping exercise results allowed the tentative creation of a structured data collection process to capture the taxonomy as it affects the perception of all building users, with this model then subject to a pilot study validation process. Developing a methodology from the scoping study identified no specific requirement for a taxonomy study to address details of signal box designs, this work already comprehensively covered by Kay (1989 and 2010). Neither is there any requirement for a full building survey, as the main objective is the narrative presented by each signal box, informing how the heritage value promotes an optimum understanding of the conservation needs. Instead, the taxonomy survey covers how each signal box presents in terms of heritage values, considering the narrative driven approach that is intrinsic to how all potential stakeholders interact with heritage functional buildings rather than a purely expert driven discourse.

Validation of the survey model was by a pilot study involving the selection of six signal boxes to sample covering a range of railway company designs constructed between 1884 and 1966. Due to the pilot study being a small-scale validation of the model rather than the planned inclusive taxonomy survey data collection exercise, there is a slight regional bias in the sampling, with the signal boxes covering an arc from the West Midlands through the Welsh Marches and into Merseyside. As a small sample there was no intention to draw any immediate heritage value conclusions, with the pilot study objective being validation of the survey model. The pilot study revealed no issues with the survey model other than the main learning point of becoming familiar with the survey process, and the results were suitable for feeding forward to the main taxonomy model. The developed model therefore became a checklist of those aspects of the building that most affect the heritage value, seen within the narrative driven discourse identified as a potential process for informing the conservation of heritage functional buildings, covering the following aspects:

5.2.1 Basic data about the signal box

Information includes signal box identity, location defined by the Ordnance Survey national grid and converted to administrative location, date surveyed, any survey constraints, design using the Kay (1989) nomenclature, year of construction (including relocation where appropriate) and listing status.

5.2.2 Constraints

Constraints records the effective level of taxonomy survey detail and gives an indication of the likely level of public awareness of the building:

- Close: Able to observe detail on at least two elevations.

- Reasonable: Able to observe some detail on at least one elevation.
- Distant: not close enough to observe detail, yet able to form an overall impression.

5.2.3 Status

Whether in use, or partially in use, as a signal box or out of use (OOU) as a signal box even if in some other operational use, along with information about the current operator, being:

- Main line (ML): Effectively the national railway network with the infrastructure owned by Network Rail.
- Light rail (LR): Generic description covering city or regionally based commercial passenger railway systems, such as the London Underground or Tyne & Wear Metro.
- Commercial private (PR): Signal box remaining adjacent or close to an active railway yet in an alternative non-operational railway or converted into a commercial use.
- Heritage railway (HR): Owned by a railway company of local interest as a tourist or museum attraction (Office of Rail and Road 2018).
- Isolated from the railway network (IS): Signal box no longer connected with the railway network, either through relocation or closure of the adjacent railway.

5.2.4 Future use

For currently operational signal boxes operated by Network Rail, that is ‘main line’, Milner (2014, pp17-21) provides provisional information concerning the projected future use subject to changes in resignalling programmes, so banding the projected closure dates allows for changes in programmes. Heritage railways are separately classified and there were no currently operational light rail signal boxes surveyed. The future use bands are therefore:

- Short term use: Closure projected by 2022.
- Medium term use: Closure projected after 2022 and before 2040.
- Long term use: Closure projected after 2040.
- Heritage: Assumed to have an indefinite use.

For non-operational signal boxes, noting the current use, including:

- Café: Including retail.
- Storage.
- Offices.
- Functional: In use as control or equipment rooms.
- Residential: Domestic or holiday accommodation.
- Museum: Whether of signalling or another subject.
- Mothballed: Out of use with measures taken to protect the building infrastructure.
- Abandoned: Out of use with no measures taken to protect the building infrastructure.
- Remnants: Out of use and degraded to point where only remnants of the original building remain.

5.2.5 Heritage value

Heritage values are, as already demonstrated, a potentially indefinable mixture of authenticity and narrative. Narrative allows for the modification of a building over the building life cycle, while heritage authenticity may prefer an unmodified building. McCaig (2013, p92) comments that all buildings, "encapsulate unique information about their own evolution", so in any discussion concerning the heritage value presented by any individual signal box, the first stage in determining heritage value is by identifying evidential originality as visible, even if not obvious, to somebody from a publicly accessible place:

- Original: Where there are no significant modifications.

- Modified: Giving details, where there are a small number of significant modifications.
- Degraded: Giving details, where significant modifications extensively impact upon the evidential originality.

In addition, notes on heritage value may include other aspects that potentially enhance the heritage value, including:

- Historical: Noting any historical events associated with the signal box.
- Aesthetic: If the signal box has any specific architectural or design merit.
- Communal: Measuring the collective experience (McCaig 2013, p95) by known 'ownership', defined as active community association with the signal box, or identifiable ability for public contact with the signal box, for example the signal box in a prominent location, such as signal boxes on a platform or, particularly in a rural context where the station is gone or unstaffed, adjacent to a level crossing.

5.2.6 Overall condition

With the taxonomy surveying model designed to inform a narrative driven discourse, an assessment of condition is a visual assessment rather than a full building survey. Hollis (2010, p3) defines this visual only type of assessment as a condition survey and points out that there are intrinsic limitations with this type of survey against a full building survey, although for conservation purposes Orbaşli (2008, p92) states that the information required is dependent upon the building and can include a simple visual site survey. As the taxonomy surveying is to support the presented morphology and narrative, then it is appropriate to accept the descriptive limitation inherent in a condition survey, applying a variation to the condition categories proposed by McCaig (2013, p200-1) for assessment of heritage asset checklist, substituting 'deficient' for 'poor' and 'derelict' for 'very bad'. Actual surveying process relies upon a considered opinion presented by a properly qualified surveyor (Hollis 2010, p44), noting parts of the building falling below a minimum level of acceptance (*ibid*, p45). Categories are:

- Good: Good overall order or insignificant wants of repair.
- Fair: Identified on-going, identifiable wants of repair that do not compromise watertightness or structural integrity.
- Deficient: Identified defects that affect watertightness or structural integrity.
- Derelict: Restoring to a serviceable level requires significant repairs.
- Remnants: Only the demolished structure or debris remains.

5.2.7 Reuse potential

This is a subjective, as any reuse relies upon a specific set of circumstances, and needs to recognise those signal boxes already effectively reused. Aside from this consideration, the two factors that support reuse are accessibility, where the public would be able to access a signal box converted into a new use, and identifiable reuse. Access can be either from public areas within a railway station or from public circulation spaces. This category therefore identifies the extent these criteria are realisable:

- Good: Possible to arrange access for alternative use with easily identifiable obvious uses.
- Accessible: Possible to arrange access for alternative use, although no easily identifiable obvious uses.
- Reuse: Easily identifiable obvious uses, although arranging access would be difficult or impossible.
- Poor: Inaccessible with no easily identifiable alternative uses.
- None: On-going long-term or heritage use, or current reuse, of the signal box makes no reuse consideration currently necessary.

5.2.8 Relocation potential

As discussed in section 2.3, relocation of heritage buildings is only acceptable in the most exceptional of circumstances as location is an intrinsic part of the heritage value, yet there are examples of relocated heritage building and, furthermore, the modular nature of many signal boxes supports relocation, so relocation potential needs addressing:

- Yes: Possible to relocate the entire, usually timber, building.
- Difficult: Specialist relocation for a small masonry building might be feasible.
- Partially: Possible to relocate a timber superstructure while demolishing and rebuilding the plinth.
- No: Any form of relocation is impossible at reasonable cost, defined subjectively as a medium or large masonry building.
- None: On-going long-term or heritage use, or current reuse, of the signal box makes any relocation consideration currently necessary.

5.2.9 Damage risk

While not directly affecting heritage value, associated with the building condition are the probability of any identifiable weather or deliberate damage risks accelerating building degradation:

- Normal: No identifiable exceptional risk of weather or deliberate damage.
- Weather: Signal box in an exposed or vulnerable location presenting an above average risk of weather or environment related damage.
- Deliberate: Signal box in a location vulnerable, whether based upon damage to neighbouring buildings or lack of effective supervision, to deliberate damage, with weighting given to a timber building risk of arson.
- High: Above average risk of weather and deliberate damage.

McCaig (2013, p196) proposes a methodology concerning variability that determines the variables as threat against the nature and condition of building fabric. With a need to determine the taxonomy to an external perspective and a relatively standardised fabric, allowing for a modicum of subjectivity it was appropriate for the taxonomy surveys to summarise vulnerability to the predominant vulnerability factors experienced by a signal box.

5.2.10 Comments

Anything that does not fit any other categories for the model needs recording as a comment. This includes noting when a conversation occurred about the building, whether prearranged or casual, with the conversation either formally recorded or forming part of the narrative.

Using the validated taxonomy survey model, the principal objective of tranche 1 was to survey a representative sample of 31 signal boxes, constructed between 1880 and 1984, covering a broad range in terms of design and geographic spread. There was no focus on specific heritage assets, although the surveys included two signal boxes relocated to a heritage railway centre, plus two other relocated or reconstructed signal boxes.

With completion of tranche 1, analysis identified weaknesses including the lack of long-term assets and a perception of some regional bias in the results to this point, complicated by an intrinsic regional concentration of surviving signal boxes, all factors that needed addressing in tranche 2. Therefore, tranche 2 continues with the model employed in tranche 1 while the selected sample, constructed between 1866 and 2017, has additional surveys in underrepresented areas, predominately in southwest England, southeast England and Scotland, along with an increased emphasis on signal boxes with a long-term future, either through statutory protection or in the custodianship of heritage railways, especially operational signal boxes where there will be an on-going ‘narrative’.

Primary data collection is by way of testing the taxonomy survey model. However, tranche 2 also included, as part of the increased emphasis of signal boxes with a long-term future and as a limited enhancement to the main data collection process, two prearranged interviews with senior representative of custodians for signal boxes conserved by their heritage railway, the signal boxes in question exemplifying specific issues for heritage railway conservation. These signal boxes were the relocated Chappel North and under active conservation Princes Risborough North Signal Boxes. Proverbs & Gameson (2008, p102) identifies that this approach to case study research provides a perspective for specific cases, with the methodology adopted as recommended by Yin (2018, p118) where interviews, "resemble guided conversations rather than structured queries … actual stream of questions in a case study interview is likely to be fluid rather than rigid". For both interviews there was no set questions other than a pre-briefed open-ended objective, using the fluidity of questioning suggested by Yin (*ibid*), of exploring the conservation philosophy adopted by the building custodians. To facilitate the conversational nature of the interviews, conduct of these interviews were while inspecting the case study buildings, allowing a free-ranging discussion and concurrent notetaking in conjunction with the actual taxonomy survey. Outcome is a summary of the discussion reported with the relevant taxonomy survey.

Whereas the buildings surveyed in tranches 1 and 2 were deliberately selected, the taxonomy survey includes an opportunistic category, covering buildings constructed between 1872 to 1959. This represents signal boxes surveyed either as an opportunity randomly presented or identified as having significance yet surveyed outside the tranche 1 and 2 survey campaigns, this latter group comprising Borough Market Junction, Broomielaw, Chathill, Eastbourne, Knaresborough, Plumpton and Ty Croes Signal Boxes. Within this category there is no identifiable reason to differentiate between the method for selecting a building to survey, with the results accepted as having equal standing with the other survey data.

Survey data from social media was one potential method for collecting data, yet this method would, in most circumstances, allow no way of normalising the results and therefore viewed as problematic, for which Yin (2018, p137) cautions a highly sceptical view along with the importance of cross-checking this information. Without any clearly defined advantage of using social media to directly support taxonomy survey data collection, this data collection option was rejected. Conversely, the methodology does allow flexibility in admitting data recorded by appropriately skilled observers under controllable situations in a manner that enables data triangulation for corroboration of findings (*ibid*, p128). Two surveys fulfilled these criteria and thereby admitted as valid data.

Analytical strategy was to identify patterns (*ibid*, p167) in the case study signal boxes, being aware that although collected against a specific structure the actual data was unconstrained, requiring categorisation of evidential data to emerging reflect themes (Boulton & Hammersley 2006, p243) in a pattern matching process (Yin 2018, p175). With patterns defined it was then possible to define a ‘how’ in conservation of heritage functional buildings, addressing the objective of developing a transferrable conservation framework.

5.3 Ethical Considerations

Criteria for ethical research includes (Abbott & Sapsford 2006, pp293-4):

- Research should be by suitably qualified researchers using appropriate professional expertise and integrity, including respect for the law.
- Respect for all participants in the result, the respect covering their voluntary participation.

Taxonomy surveys undertaken by a suitably qualified surveyor fulfilled the criteria of appropriate professional expertise. It therefore follows that the main identifiable ethical issue is participants in conversations, whether prearranged guided conversations with custodians or casual conversations concerning a specific signal box, and any consideration of potential harm for the researcher. Proverbs & Gameson (2008, p106) stress that ethical research must include participant consent. Custodians of heritage functional buildings are unlikely to fall into any normally recognised vulnerable group, although it remains incumbent upon the researcher to be aware of any issues that may arise during the interview process. Consequently, for this research it was only necessary to explain the nature of the research and obtain consent to use the interview data.

Allied with ethical considerations is potential harm for the researcher[21], discernible for this research as fieldwork safety, covering awareness of potential threats, notification of time/location and preplanning for any contingencies (Yin 2018, pp143-4). As the proposed methodology is a sole researcher surveying buildings in an operational railway and, potentially, urban environment, guidance (RICS 2006, pp5-8) allows a generic identification of the following risks for analysis and mitigation:

- Lone working, including potential threats from members of the public.
- Any identifiable wants of repair in any structure that may present a risk.
- Working on or adjacent to railway premises.
- Trip hazards, such as platform edges.

Taking each identified risk in turn:

5.3.1 Lone working

Overall, the risk was low, although an elevated risk where working locations are remote. Mitigation measures were:

- Notification of itinerary with a responsible person.
- Mobile phone (check for charge before starting survey).
- Awareness of environs with predetermined response to abandon research and retreat to a safe place for perceived increasing risk.

[21] All fieldwork undertaken before Covid-19

5.3.2 Wants of repair

Overall, the risk was low as envisaged exterior only observation of the buildings, although risk consequences had moderate to severe potential. Mitigation measures were:

- Before undertaking and throughout each survey, make a site-specific appraisal of risk.

5.3.3 Railway premises

Overall, the risk was low in areas accessible to the public, or in the case of museums subject to a visitor risk assessment, although risk consequences had severe potential. Mitigation measures were:

- Where appropriate, notify railway staff of the reason for surveying and following any instructions for safe working.
- Where legally crossing the railway, such as at level or occupation crossings, giving absolute awareness to rail and, for level crossing, road traffic.

5.3.4 Trip hazards

Overall, the risk was low in publicly accessible areas, although risk consequences had severe potential. Mitigation measures were:

- Before undertaking and throughout each survey, making a site-specific appraisal of risk.
- Rigid application of the unattributable, yet widely used surveying maxim, ‘walk or survey, not both’.

It is also appropriate to note that restricting surveying to areas that the public can legally access supports the identified methodology that this research relates to public perception.

5.4 Limitations

While multiple sources of evidence for case study research is optimal (Proverbs & Gameson (2008, pp100-1), collection of this data was adjudged to be time-consuming, and the chosen process therefore imposed selectivity (Yin 2018, p114). As detailed in section 5.2, in 2010 there were 1109 signal boxes in Great Britain (Kay 2010), the majority under the custodianship of Network Rail. Even with this number declining, a cross-sectional study capturing a situation in time (Proverbs & Gameson 2008, p100) forced a selectivity, otherwise the research would introduce an unacceptable level of longitudinal tracing for the processes over time. It was possible to control the selectivity by carrying the research in three distinct levels of data collection, where each level provided support for subsequent stages, the control also supporting identification of categories (Boulton & Hammersley 2006, p251). Nevertheless, even with this control to reduce the risk of a skewed sample, the size of the potential case study data pool imposed a potential limitation on the data validity. Another limitation that was necessary to accept at this stage were potential case study signal boxes inaccessible to the public, providing a degree of self-selection to the pool of signal boxes available for surveying.

Chapter 6

Results and Analysis

6.1 Survey Overview

Surveying a representative sample of signal boxes in Great Britain involved 150 taxonomy surveys spread over a sequence of data collection stages (breakdown of stages and full survey findings detailed in Appendix A). Section 5.2 details the data collection stages, allowing for backward iteration so that there is a commonality in presentation of the findings.

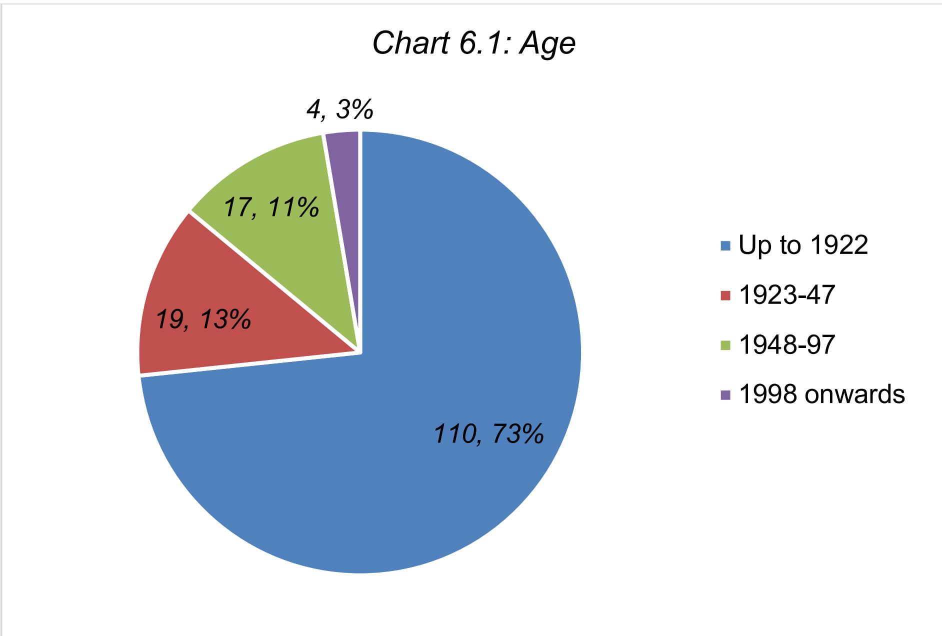


Chart 6.1 details a breakdown by age range of the 150 signal boxes surveyed, the key dates broadly represent the pre-grouping, 'Big Four, British Rail and post-British rail eras, although there will be crossovers between the eras in terms of actual ownership, design and dates of construction. Selection of signal boxes for surveying was without any consideration as to the building age and the age ranges broadly replicate the balance of age range for surviving signal boxes (Kay 2010). Noticeable is how most signal boxes surveyed, 73% date from the most significant era of signal box construction under the impetus of 'Block, Lock and Brake'.

Chart 6.2: Statutory Protection

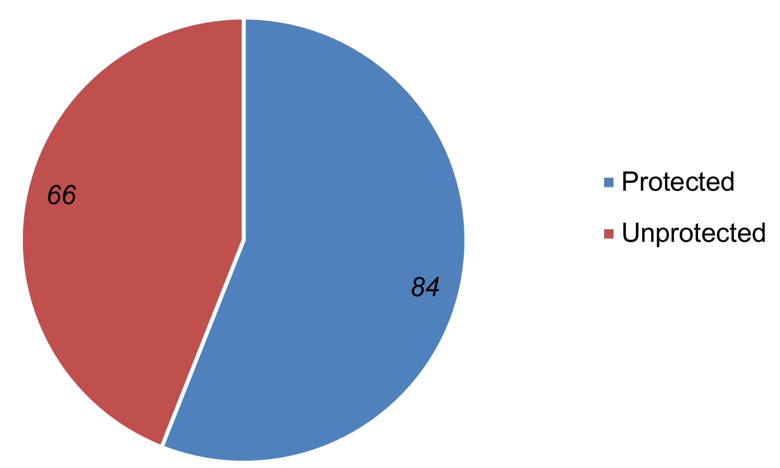
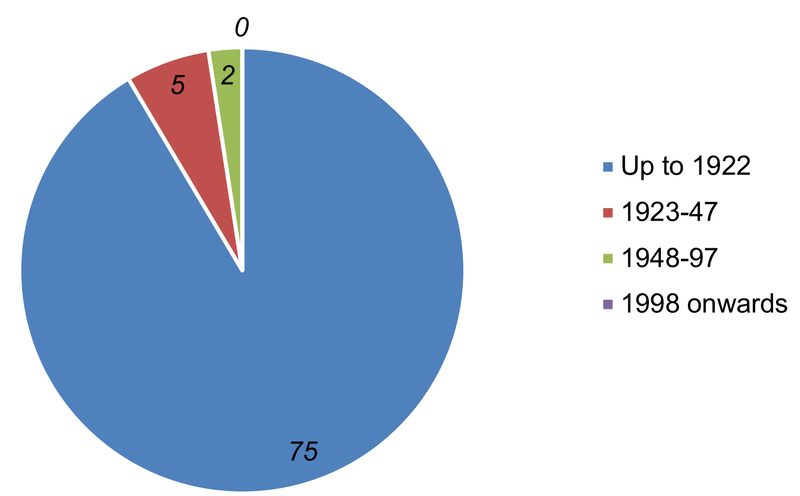


Chart 6.2 details those signal boxes surveyed with or without some form of statutory protection, usually through the listing process. For this sample, the majority have some form of statutory protection, largely because the sampling in the later data collection stages prioritised signal boxes with an expected long-term future (section 5.2), which does not reflect the actual proportion between protected and unprotected (Appendix B details every signal box with statutory protection in Great Britain). Prioritising signal boxes with a long-term future, as opposed to those signal boxes with a projected reduced lifespan, reflects the conservation aim.

Chart 6.3: Statutory Protection by Age Group



For the statutorily protected part of the sample, chart 6.3 shows the protection by age group. With protection nominally following a '30-year rule' and older buildings more likely to attract protection (McCaig 2013, p30), the distribution of protection by age group presents no surprises, although there may be an argument that this leaves unprotected significant buildings from the 'Big Four' and British Rail eras despite the work of Minnis (2012).

Chart 6.4 Operational Status

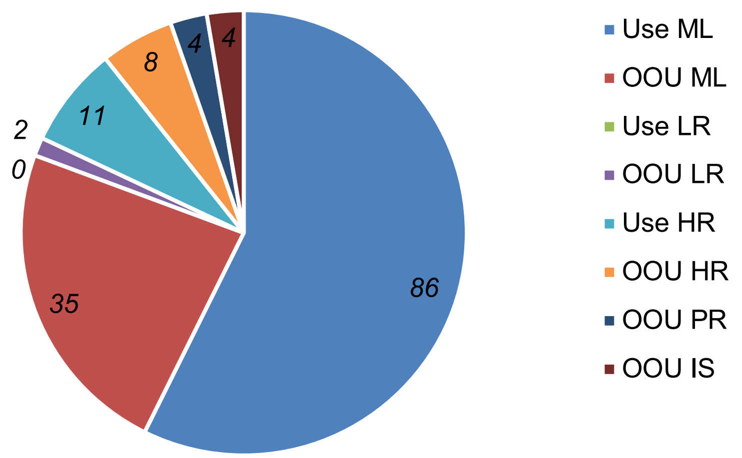
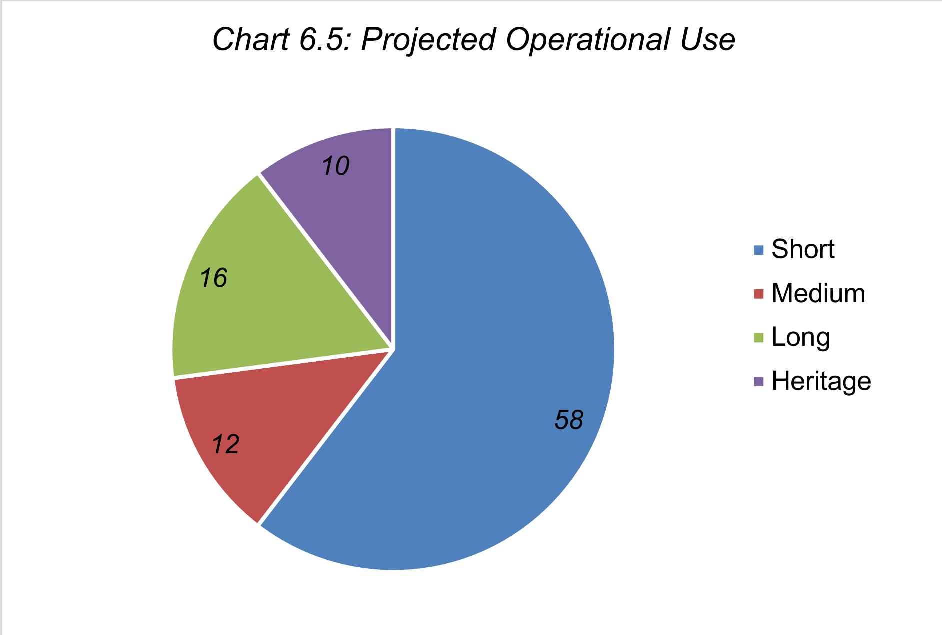


Chart 6.4 details the operational status of those signal boxes surveyed[22]. Noted is the prevalence of out of use signal boxes owned by Network Rail. Under-represented are signal boxes in light rail use, largely because these local systems use more centralised control than the dispersed national rail network. Heritage railways signal boxes, including museum structures, represents an expected long-term future for those buildings in heritage railway custodianship.

6.2 Statistical Summary

For the 150 signal boxes subject to the taxonomy survey, it is possible to illustrate the main findings using a sequence of elementary statistical analysis to identify important points in the data.

[22] See section 5.2.3 for acronyms used to define status.



Even with a developing emphasis on signal boxes with a long-term future, chart 6.5 is noteworthy how signal boxes are an endangered type of building. It is probably reasonable to assume that the balance between short and medium against long or heritage would be even more acute were the sample not orientated towards long-term assets.

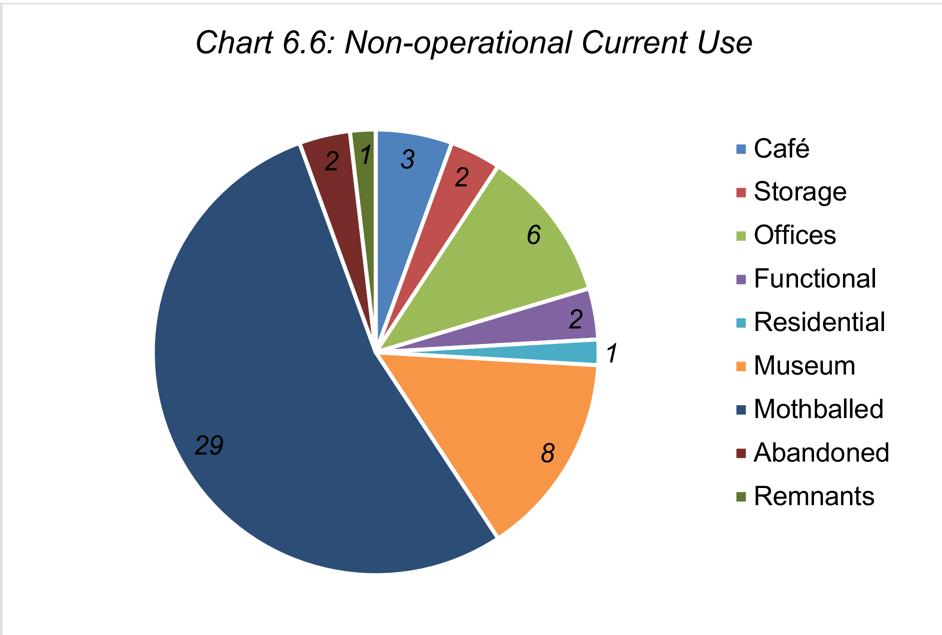


Chart 6.6 shows how more than half of the non-operational signal boxes surveyed are mothballed, suggesting a significant issue in finding appropriate alternative uses. Of the other alternative uses, the number in use as museum

objects reflects the emphasis on long-term assets, the museum use including several relocated buildings.

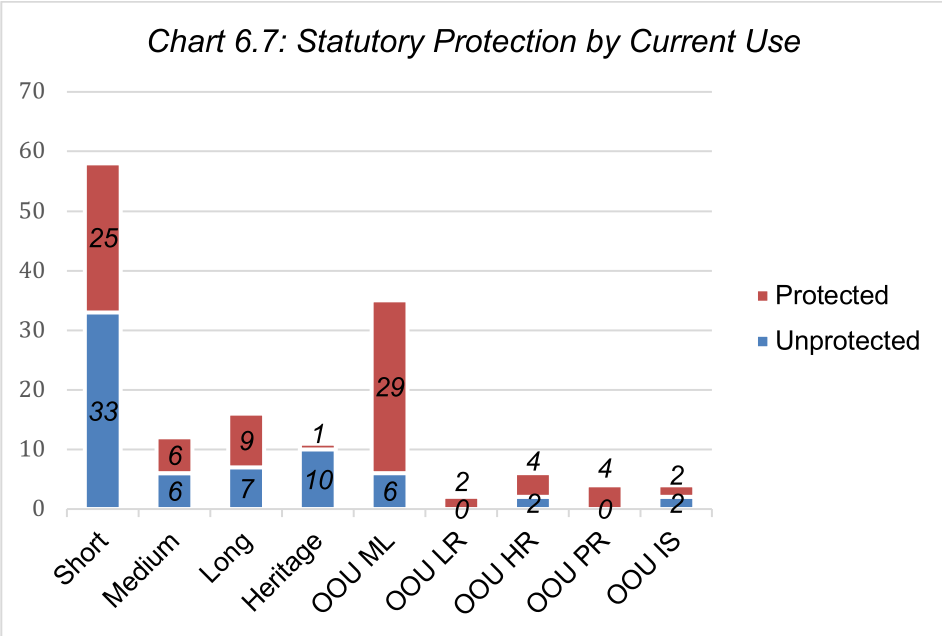
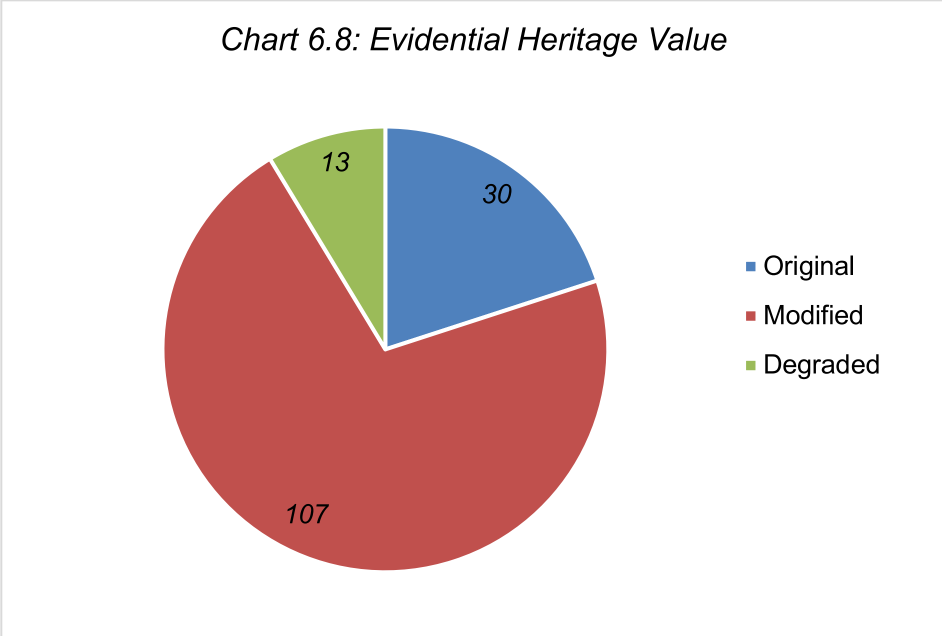


Chart 6.7 breaks down statutory protection by current signal box use[23]. That the overwhelming proportion of out of use signal boxes in main line custodianship are statutorily protected confirms that the relatively large number of unprotected signal boxes with a short-term future will be quickly demolished after closure. The same could apply to light rail signal boxes, although the relatively small sample of light rail signal boxes surveyed compared with the total number surveyed, as noted in section 6.1, probably affects the light rail part of this analysis.

Another conspicuous observation is the low proportion of statutorily protected signal boxes in the custodianship of the heritage railway movement, suggesting a presumption that signal boxes in the custodianship of this sector are consequentially assured a long-term future. This is a difficult presumption to uphold, as seen in section 3.7 how the heritage railway movement potentially has an approach that is more preservation for presentation, a mimesis, than conservation.

[23] See section 5.2.3 for acronyms used to define status.



Determining the narrative of each signal box relies upon the evidential value displayed by the building, so chart 6.8 details the number of signal boxes with original, modified or degraded evidential values (section 5.2.5) against the building on construction. The majority are modified, typically by replacement of windows or staircases, modifications that arguably express the lifetime narrative of a building.

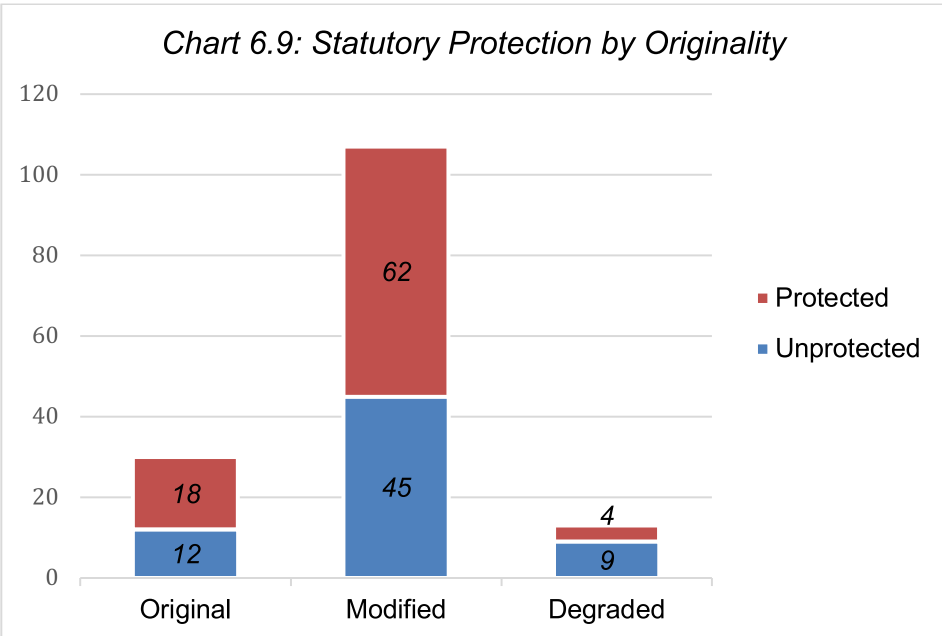
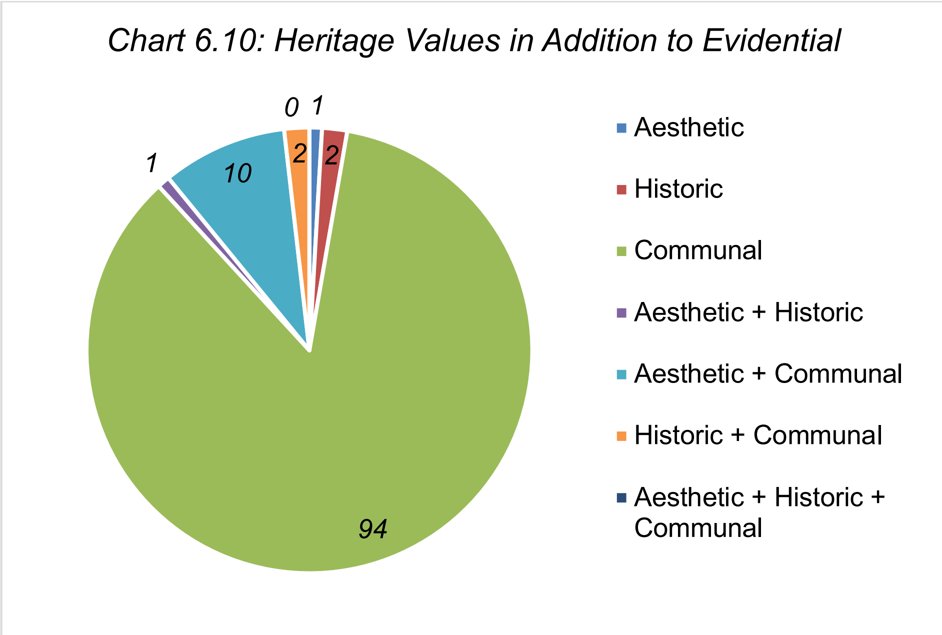


Chart 6.9 identifies the extent that statutory protection affects originality. Unsurprisingly, significant changes in originality are more likely to occur with

unprotected signal boxes, with the most limited number of changes from original condition for those with protection. However, the number of modified signal boxes, often with relatively recent modifications, is a strong indication that there is widespread acceptance that these are working buildings where changes form part of an ongoing narrative.



All the signal boxes surveyed expressed some form of evidential value. However, for many of the signal boxes there were other identified heritage values, as shown in chart 6.10. Predominant value is communal, using the criteria defined in section 5.2.5 by attaching communal to a signal box through the community recognition of a building in a prominent or public location, such as beside a level crossing. Alternatively, as evidenced by Eastbourne Signal Box and Llanelli West Signal Box, communities recognise or take an interest in signal boxes as contributing to the townscape.

Functional buildings will, as discussed in section 3.2, vary in terms of the aesthetic intent attached to the design and construction. Besides those listed as architecturally significant (being Birmingham New Street PSB and St Bees Signal Box), there are a few signal boxes identified on the taxonomy survey as having aesthetic value. Very few surviving signal boxes have a specific historic value, and knowledge of this historic value is usually not accessible to a casual observer of the building, and lost are other signal boxes with significant history, such as Quintinshill Signal Box (section 4.4).

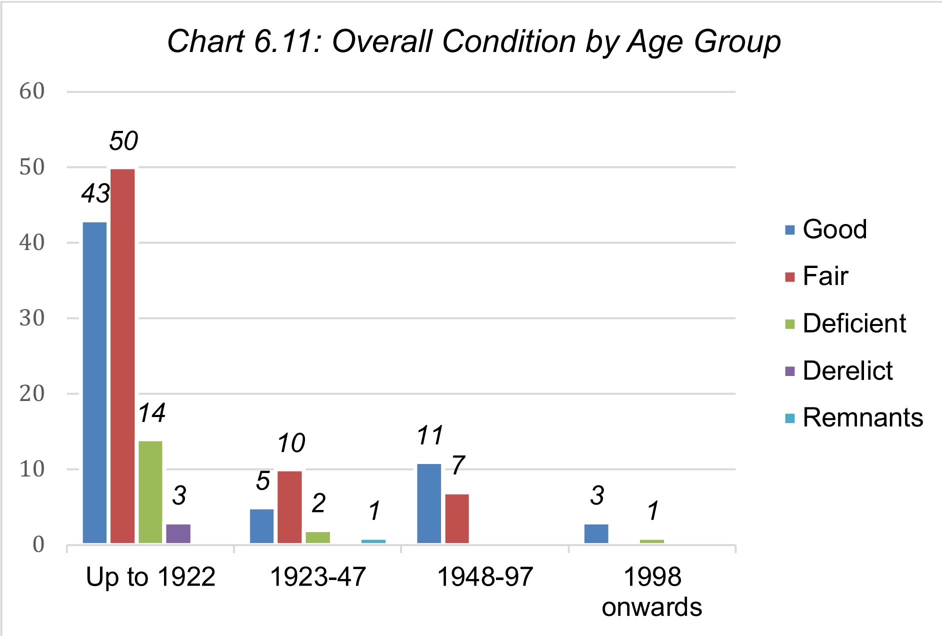


Chart 6.11 breaks down the visual assessment of condition, accepting the limitations discussed in section 5.2, by the four assigned age ranges. Despite being sometimes potentially fragile buildings in awkward to maintain locations, the results indicate that most signal boxes, in age ranges where there is a statistically significant sample, are in an acceptable condition. This suggests that the various signal box custodians are taking a reasonably careful approach to maintenance of their built assets.

Chart 6.12 plots the potential for reusing the surveyed signal boxes. Excluding where there is an ongoing identified use that precludes any consideration for reuse, the main identified potential is where the signal box is accessible for an alternative use, without any use being obvious, with a smaller number with access and an obvious alternative use. The single reuse only potential applies to Torre Signal Box, where there is an identified reuse, albeit with access problems.

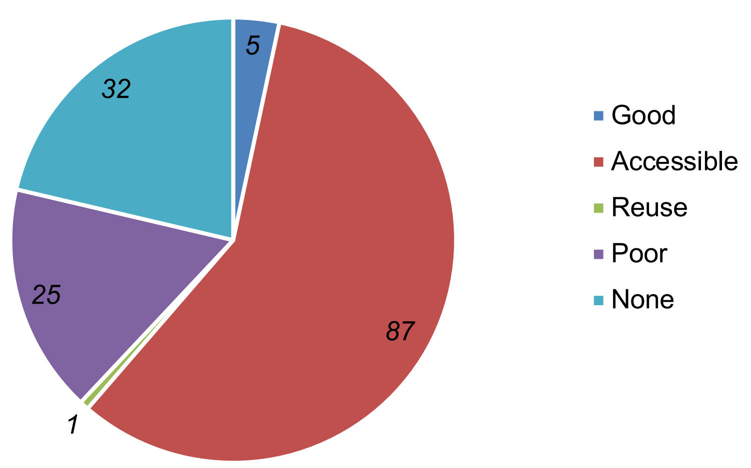


Chart 6.12: Reuse Potential

Of the signal boxes identified as having poor potential for reuse, eight out of the 25 are statutorily protected. There may be scope for some short-term, perhaps expedient, innovation, such as decanting the signalling arrangements at Haltwhistle from the temporary signal box within a portable building into the protected building. However, the overall impression is that these eight signal boxes will, accepting that it is easier to justify maintenance funding for a building in use, present the most intractable ongoing problems in terms of building conservation.

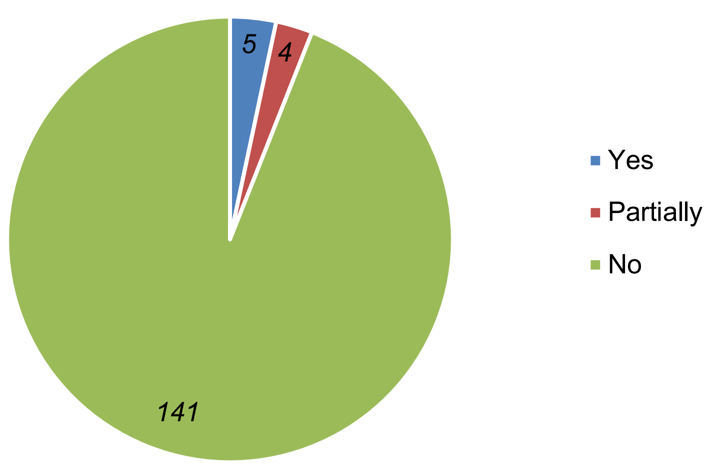
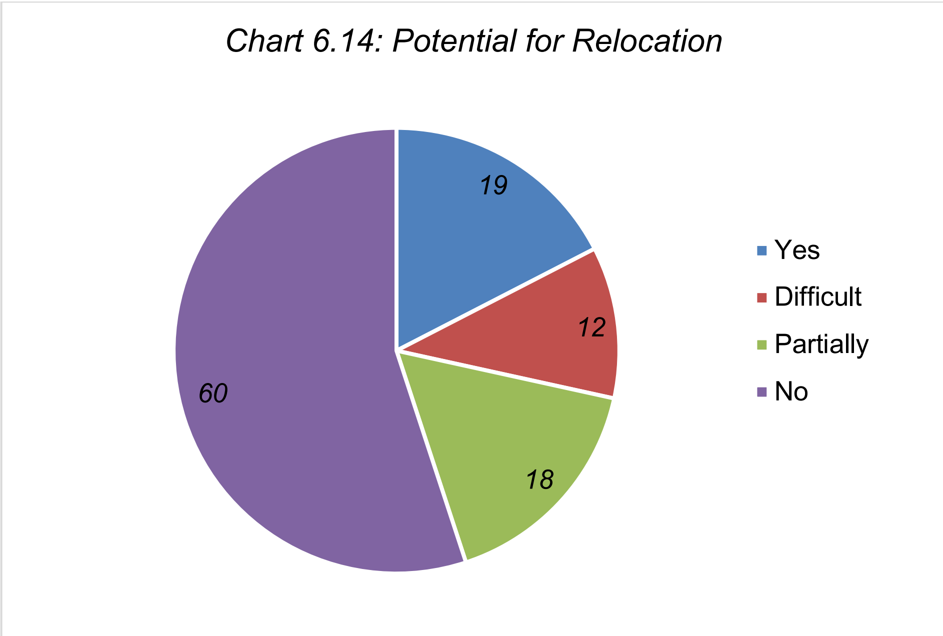


Table 6.13: Relocated

With the modular nature of many signal box designs, relocation becomes a greater possibility than many buildings. Chart 6.13 details the proportion surveyed that were either partially, always the timber operating level, or completely relocated.



Excluding those signal boxes with a long-term future and those not relocated, chart 6.14 shows the potential for relocation. Of this group, the majority have no possibility for relocation. As Winchcombe Signal Box demonstrates, there is a subjectivity in assigning building between impossible or difficult to relocate, and a final decision will rather depend upon the motivation behind relocation. It is unlikely that there could ever be relocation for the substantial panel signal boxes such as Exeter PSB, reuse constrained by accessibility and no obvious reuse, or Westbury PSB, with good reuse enhanced by accessibility, even if larger framed buildings do provide a greater flexibility for conversion.

There was an expectation in developing the taxonomy survey model that there would be a significant risk of damage that, while not directly affecting heritage value, will give an indicator of issues in conservation. Chart 6.15 rather disproves this, with a considerable number of surveyed signal boxes showing no elevated risk of damage. However, there are enough signal boxes assessed at risk of weather or deliberate damage that it must inevitably become a factor in planning conservation. Where assessed at above normal risk, those with statutory protection are, respectively for weather, deliberate and high risks, 25 (69%), 18 (56%) and 4 (26%) of the number identified. A higher percentage for weather risk suggests the extent that an attractive location, often coastal, enhances the case for statutory protection, although as evidenced by Dawlish Signal Box (section 3.8) or the perceived risk presented as a reason to explore demolition of Petersfield Signal Box, this protection does not provide certainty for signal boxes suffering damage deterioration.

Chart 6.15: Damage Risk

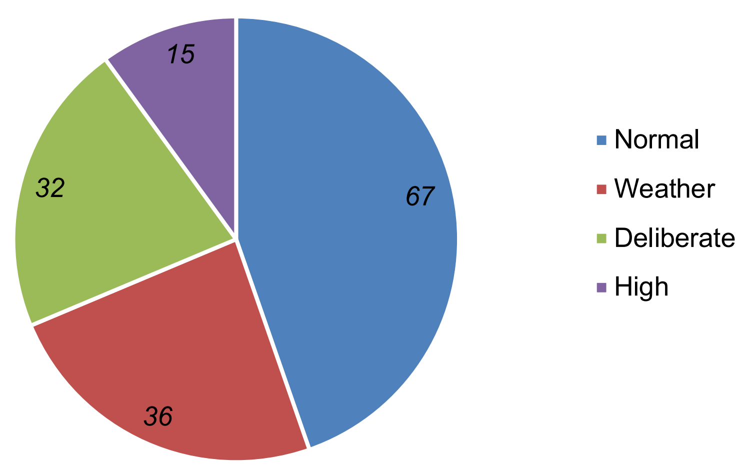
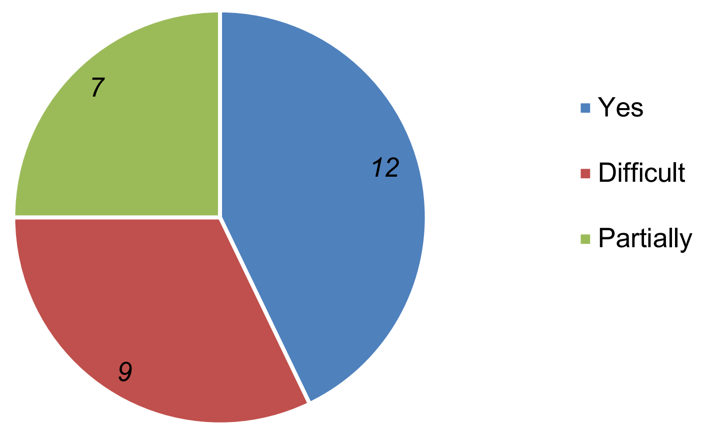


Chart 6.16: Relocation Potential for Damage Risk Signal Boxes



Finally, chart 6.16 shows the relocation potential for those signal boxes in one of the three risk damage categories, with relatively low numbers indicating that the custodians will usually have to manage *in situ* signal boxes presenting with a risk of damage.

Measured against how the methodology seeks, through the taxonomy survey model, to define the contribution each signal box makes towards a narrative of railway heritage, it was possible to identify that all the signal boxes surveyed presented some form of narrative contribution. This applies to all uses and categories, including whether statutorily protected or otherwise, or indeed any other arrangement of statistical analysis. With a sample of 150 representing 14% against a declining population assessed at 1109 in 2010 (Kay 2010 and discussed in section 5.2), provides a strong case that the taxonomy surveys presented fulfil the objective of surveying a significant representative sample. Using this representative sample to develop a narrative based approach allows development of a framework for signal box conservation that should thereby be transferrable to all variants of heritage functional buildings.

6.3 Analysis of Taxonomy Survey Findings

Despite most signal boxes being nominally to a standardised design, the data presented indicates there is no such thing as a typical signal box, proving the assertion that there is, “scope for almost infinite variety in the details of a signal box” (Minnis 2012, p1). Primary data methodology is to test whether it is possible to use a taxonomy survey to test the idea of public perception of heritage values, achieved by matching an assessment of building morphology that normally applies to an assessment of heritage buildings against a narrative, derived from the taxonomy surveys, accessible to everybody who interacts with the building. Interaction is a flexible definition, and everybody identified is therefore a potential stakeholder in the conservation process. Except where the signal box is part of a display concerning the history and nature of railway signalling, usually at a heritage railway centre, the public are not normally able to see inside a signal box, so reporting of taxonomy data follows this constraint to accurately test public perception[24]. Overall, it was possible to apply a taxonomy survey methodology that records external construction and condition alongside a narrative based assessment. From this, even allowing for the variety of building morphology and distinctiveness of location, it is possible to notice some commonality in the observations.

For the evidential value represented by each of the surveyed signal boxes, every signal box demonstrates some level of evidential value, although in 71% of cases unsympathetic modifications of one form or another detract from this value. Typical modifications are replacement of windows, cladding and staircases, with materials chosen for cost-effective convenience rather than sympathetic to the original building morphology, along with removal of balconies and the closing of lead-ways. Each of these modifications are visible in the external taxonomy survey process, even if recognising significant changes in the building fabric may not be immediately apparent to all observers of the building. Whereas noting evidential details specific to signal boxes will require expert interpretation, some relocated signal boxes display evidence of relocation that may be possible for an observer who is an expert in buildings, yet without any specific knowledge on the relocation of signal boxes, to notice. The taxonomy survey records some heritage values that are unlikely to be accessible, even if of interest should they be known, for casual observers of the signal box and would form the accepted assessment process for determining the building's heritage value. Typically, these are historical events connected with the building, such as the historical event that forms part of the listing for Garsdale Signal Box, and are rare in the taxonomy survey data.

For those aspects of the taxonomy survey accessible by everybody who views the building, the most commonly identifiable values are the communal and, to a lesser extent, aesthetic. These are accessible by everybody who interacts

[24] During the surveys, in a few cases local managers arranged internal inspection, either a full inspection or only the operating level, of the signal boxes. While interesting and valuable in providing context for the research process, this is not normally publicly accessible information and, other than conversations with experts concerning the approach adopted by heritage railways, reporting of taxonomy excluded this data.

with the building and expressed in the taxonomy surveys as a description, where each description represents a narrative. In determining this narrative, the taxonomy survey gave additional weighting where the public interacted with the signal box, such as at a level crossing or known community interest. Aesthetic value is more complicated, as public perception of aesthetic value potentially leans towards the idealised ‘whimsical elegiac’ considered in section 4.4, that thereby would place a greater aesthetic weighting on the standardised ‘engineer’s vernacular’ Wainfleet Signal Box rather than the bespoke ‘Modernist’ Hubberts Bridge Signal Box only 23 miles away. As observed in section 3.3 concerning Birmingham New Street PSB, perception of aesthetics can become an area of conflicted engagement, so any weighting given to aesthetics on the taxonomy survey needed to consider this dichotomy.

While the sampling covers a reasonable distribution in terms of age and geographical spread of surviving signal boxes, the decision to opt for buildings with a long-term future (section 5.2), for which conservation is a priority, presents the possibility that the sample self-selected the more ‘attractive’ buildings. In developing a conservation assessment strategy using a taxonomy survey for heritage functional buildings, this needs to be demonstrably effective for all functional buildings. However, chart 6.5 demonstrates that there were sufficient signal boxes surveyed that do not possess a defined long-term future, and indeed as demonstrated some were demolished since the taxonomy survey. As it was possible to apply the taxonomy survey model to even those signal boxes that were not intrinsically attractive, and along with a significant sample size against the declining population, there is a reasonable expectation that the assessment strategy developed is strongly transferrable as the basis for facilitating a narrative.

6.4 Case Study Narratives

Using the methodology proposed by Flyvbjerg (2006, pp239-40), section 5.1 sets the context where, “a narrative inquiry attached to the case study as part of the phenomenological detailing”. For this, Reeves *et al* (2020, p238) links the idea that taxonomy surveys can facilitate specific cognitive perceptions as narratives for heritage values that are possible to apply, using railway signal boxes as the exemplar, to heritage functional buildings. Reeves *et al* (ibid, p252) identified these perceptions as coming from stakeholder information without limiting the range of stakeholders, which Hill (2016, pp41-4) suggests is possible to draw from the five influencers of design, owner, community, economic and heritage, with heritage components covering fabric, evolution, history, significance and conservation needs. To test how it is possible to facilitate transferring taxonomy survey data into conservation narratives, developing this methodology involves taking a sample range from the taxonomy surveys and analytically applying as considered narratives expected stakeholder perceptions, identified in chapters 2 and 3, for those stakeholders most likely to interact with the case study buildings. These stakeholders, for railway signal boxes, are the custodians, public, building conservation experts, workers within or with the building (including oral history), railway enthusiasts and historians. To allow identification of any anomalies in the narrative process, sample buildings are a mixture of eras, operational status, conservation status and custodianship.

6.4.1 Birmingham New Street PSB

Listed grade II for a specific aesthetic quality contemporary at the time of construction, as outlined in section 3.4 Birmingham New Street PSB is divisive for these same aesthetic qualities.

For the custodian, this signal box represents a large asset declining in use and, once out of use, will become, other than a possible marginal use for communications, an expensive mothballed asset with an ongoing maintenance liability that possibly includes asbestos contamination. Were the building not listed, a city centre location means that the land occupied by the signal box may have redevelopment value, although it is a reasonable expectation that the custodian will be unwilling give up land within a space constrained operational area, even if there is no immediate operational need to reuse the site.

As a building imbued with function, in a similar manner to more traditional signal boxes there was no real requirement for public presence. Indeed, located towards the end of the longest station platforms, at station level the expectation is only a limited public awareness. In contrast, this is a signal box with a substantial contribution to the streetscape and, even if the function is relatively anonymous from the street (figure 6.1), inevitably there will be reasonable public awareness of this substantial building.

Figure 6.1: Contribution of Birmingham New Street PSB to the Birmingham streetscape. (Author 2016)

Redolent of the Brutalist genre, despite the architect claiming to be strictly Modernist (section 3.4) and the list entry describing it a one-off sculptural form (Historic England 1995), the building takes a place with other Brutalist buildings of the era, and thereby a building conservation expert will judge it according to the purity of design. The details are significant (figure 6.2), with the triangular form cladding finish, deep fascia for the operating level and a strongly contrasting red external fire escape, all contributing to a building that is atypical of the elegiac associated with traditional signal boxes and makes the building narrative that of a specific era in architecture.

With the signal box still open, there is going to be a continuing signaller narrative. Strongly evident in section 4.4 is a signaller narrative working alone in sometimes inhospitable environments, yet the narrative here is more convivial, of signallers working together at the busy panel. And whereas when signallers retire from a traditional signal box they leave no tangible trace, perhaps the most poignant aspect of this continuing narrative includes those who once worked at Birmingham New Street PSB, with the tradition at this signal box of those who retire leaving their mug on top of the panel. In amongst the technology that represents the 'state of art' for 1960s signalling, this row of mugs becomes a human narrative, something that could become tangible evidence of a narrative that may even survive when the signal box is no longer in operation.

Figure 6.2: Details of cladding, deep fascia and fire escape, Birmingham New Street PSB. (Author 2016)

Even if slightly remote from any of the platforms at Birmingham New Street Station, the signal box will be a very real presence for any interested at this popular railway enthusiast destination. Doubtless the awareness of presence would include a desire for 'real time' information from the panel, yet the absence of this information will not detract from knowledge concerning signalling functions. It is also likely that railway enthusiasts might know something about the building's history, tied within the context of introduction of electric trains during the 1960's and redevelopment of what was previously two separate stations on the one site (Nock 1966 and Smith 1984). They might also be aware that within the control area of the signal box was a serious accident at Stechford on 28 February 1966, for which the Railway Inspectorate report exonerated the signallers and then newly commissioned signalling equipment (McMullen 1968, p10), and a less serious collision at Oldbury on 27 May 1970, where the Railway Inspectorate report deemed actions by the signaller to be reasonable (Rose 1971, p7)

While there is no significant history attached to this building other than the Stechford and Oldbury collisions, historians will attach great importance to the city centre context. Typical of post Second World War city centre redevelopments, Birmingham's redevelopment included significant provision for motor traffic, heavily symbolic for a city associated with the British motor industry, and substantial shopping centres over Birmingham New Street station along with the Bull Ring Shopping Centre. Subsequent redevelopments are progressively leaving Birmingham New Street Signal Box as an exemplar for a specific era of architecture in the city, an era representing the last days of that manufacturing history associated with the city, along with a certain irony of a railway building representing an era associated with development of road systems.

6.4.2 Chappel & Wakes Colne Signal Box

This signal box is part of a heritage railway centre, and one of three signal boxes at the centre although the only original signal box on site. It is also the only listed building at the centre, despite some erroneous information on the centre website.

While forming one of the buildings in the custodianship of a heritage railway centre situated on the former goods yard, this signal box is on the opposite side of an operational main line railway from the main site.

This presents the custodian with two problems, that of making the building an integral part of the site, which includes ensuring visitors do not trespass on an operational railway, and access for maintenance purposes without encroaching on the operational railway. As the building is adjacent to the former station building that now forms the site main entrance, the custodian uses the building as a small museum of signalling, yet the slightly awkward positioning compared with the main site makes this building not part of the custodian's central display. Despite this, there is a country station narrative, the signal box demonstrating grouping with main station building, goods shed and other buildings that make up the archetypical country station.

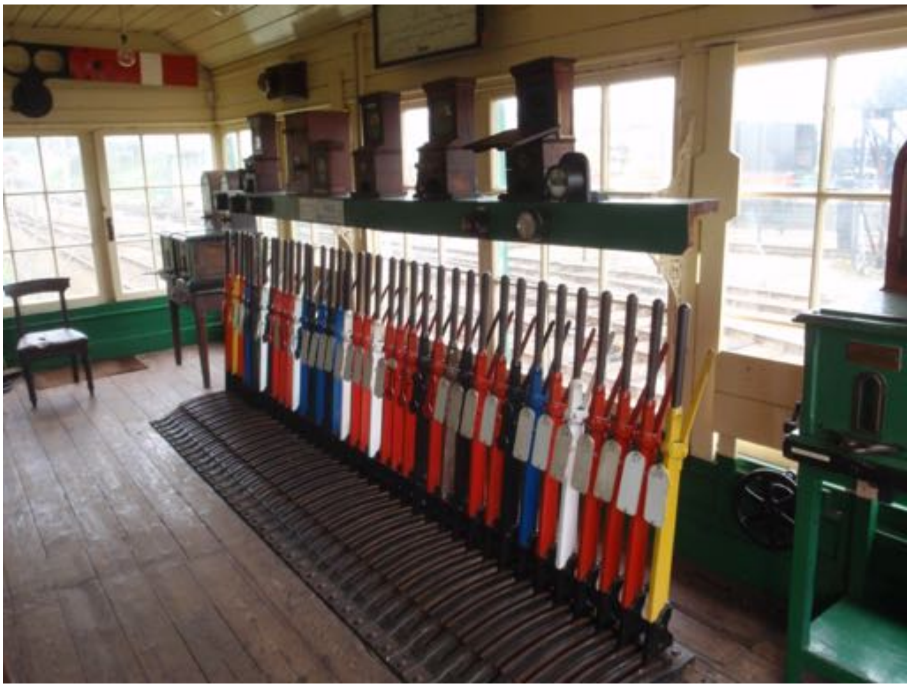


Figure 6.3: Operating floor of Chappel & Wakes Colne Signal Box. Visible on the equipment shelf are some explanatory display labels. The closest railway line is the operational main line railway while the other railways and buildings are the museum main site. (Author 2018)

Predominant public awareness of this building will be as part of a visit to the museum, with the narrative carefully curated to present this building as part of the country railway elegiac (section 4.4). In a sense, this reinforces the criticisms of industrial sites discussed in section 3.6, except that this building is one of those on site in an original position and there is an attempt to provide quality information that Nevell & Nevell (2020, p32) identify as integral in helping visitors understand the past.

For building conservation experts, primary narrative is evidential, a specific example of the engineering vernacular that so often defines functional buildings, and conserved for this reason without consideration of a wider narrative. A similarly constrained narrative applies for the railway enthusiast, who while potentially recognising a specific Great Eastern Railway design, this is not a building with a widely known or popular enthusiast consciousness, so the narrative becomes generic relating to traditional railway signal boxes. Specific oral history for those who worked in this building is limited, with that information available part of the curated information presented by the custodian museum, so in a similar manner to the railway enthusiast, the worker narrative becomes generic to the type of building rather than specific to this building.

Besides the custodian presented narrative, strongest narrative for this building will be in the historical context of the rural community. In a sense, this narrative becomes an integral part of the local history for agricultural rural England, a situation where a wider history of post enclosure rural development that created the rural environment which the railway grew up to serve reinforces the country station elegiac.

6.4.3 Heckington and Hubberts Bridge Signal Boxes

While narrative can apply to a single building, it might also be possible to test narrative on consecutive signal boxes. Heckington and Hubberts Bridge control each end of a 7.94 miles block section (Jacobs 2006, p25), yet are strongly contrasting in design and location, potentially leading to very divergent narratives despite proximity.

Positioned on a relatively lightly used railway, albeit one with identifiable seasonal traffic to the holiday destination of Skegness, for the custodians these signal boxes represent expensively staffed infrastructure for which there will be a significant savings in operating costs once replaced by a regional operating centre. Once closed the buildings will become assets to either mothball, the listed Heckington Signal Box, or demolish, the unlisted Hubberts Bridge Signal Box.

Public perception, probably conditioned by ideas of an elegiac village, will approach these neighbouring buildings with a different narrative. For Heckington Signal Box, as an attractive example of engineering vernacular if becomes the epitome and part of the elegiac village, atmospherically paired with the adjacent windmill. In contrast, while there will be a public awareness of Hubberts Bridge Signal Box, this is a 1960s structure in the bleak landscape adjacent to a busy road junction and a straight fenland river, so carries little of the elegiac that forms a positive narrative, yet visible awareness will carry a narrative.

Figure 6.4: Hubberts Bridge Signal Box, with main road to right and commercial property the other side of South Forty Foot Drain bridged left of the level crossing. (Author 2016)

Paradoxically, building conservation experts may see these buildings presenting a very different narrative. Heckington Signal Box is like

Chappel & Wakes Colne Signal Box, with an evidential primary narrative and conserved as engineering vernacular. In contrast Hubberts Bridge Signal Box is like Birmingham New Street PSB, very much a one-off representative of the construction era, perhaps even celebrating bleak location with a bleak building.

As for Chappel & Wakes Colne Signal Box, specific oral history for those who worked in these buildings is limited, although there will be an ongoing narrative until closure. Taking as a precedent some of the accounts in section 4.4, the expectation is that Hubberts Bridge Signal Box will, particularly, present a strong narrative of signaller experience.

For the railway enthusiast these signal boxes are way markers on the way to a destination, with only a limited narrative other than operational aspects or specific events affecting their journey.

There are two aspects for which the narrative of these buildings is part of the local or regional historical context. Predating the railway are the various fenland drainage schemes, which have a profound impact on the local social narrative and the railway, with associated infrastructure including signal boxes, becomes part of this narrative. The other aspect is the social impact of seaside holidays, the railway line controlled by these signal boxes being part of the routes to Skegness. With development of seaside holidays being in parallel, and partially driven by, the railways, all aspects of the infrastructure contribute to a wider social narrative.

6.4.4 Maiden Newton Signal Box

Maiden Newton railway station fits in many respects the idealised elegiac country railway station discussed in section 4.4. On the secondary main line between Dorchester and Yeovil as it runs through Dorset in culturally rural Wessex, the station was also formerly the junction for a now closed branch line to Bridport West Bay.

With the station now an unstaffed halt, the custodian makes minimal active use of the listed buildings and will thereby treat the buildings as a mothballed maintenance liability. This includes the signal box, not specifically mentioned in the listing yet treated as within the curtilage and the ongoing narrative is of a custodian clearly taking a careful approach to conservation of this redundant building.

Main public perception will be a redundant building adjacent to the foot crossing, with the narrative depending upon whatever awareness the public will have of former signalling methods.

For building conservation experts, railway enthusiasts and signallers who worked in this building, the narratives will be remarkably similar with those applying to Chappel & Wakes Colne Signal Box (section 6.4.2). In this case, the expert will note that the engineering vernacular is a standard Great Western railway design, and worker narrative will most likely be generic rather than specific to this building. There is a possibility that the railway enthusiast narrative will be slightly more informed, although this is less about the signal box itself and more historical awareness of the circumstances surrounding closure of the branch line.

In contrast to the signal boxes at Heckington and Hubberts Bridge, the historical narrative is one of a proposed seaside resort development not living up to the expectations. Historians will note several seaside locations to which 19^{th} Century railway companies speculatively built railways, only for the resort not to develop as profitably as anticipated. Bridport West Bay is one such location, and the narrative of Maiden Newton Signal Box is partially tied to this failed attempt at significant holiday traffic.

6.4.5 Nairn East and Nairn West Signal Boxes

Whereas most signal boxes centralise control at a specific location, the specific requirements of the Highland Railway led to the practice of a pair of simple signal boxes, positioned each end of the station and not permanently staffed, with block instruments in the station building. Nairn is a classic example of this arrangement.

Both buildings are small timber huts at platform ends, so for the custodian represent modest maintenance requirements to support an ongoing narrative.

Figure 6.5: See from the station footbridge, platform end Nairn West (left, far end right hand platform) and Nairn East (right, far end left hand platform). (Author 2018)

As there will be minimal public awareness of these buildings, public participation in the ongoing narrative is minimal.

These are further examples where narrative contributed by building conservation experts and signaller is minimal. The building design is once again engineering vernacular to a standard design, in this case the Highland Railway adaptation of a design by the signalling manufacturer McKenzie & Holland. While there is an expectation is that worker narrative will again be generic, complicating this generic narrative is the wider context of why the Highland Railway used paired signal boxes.

Railway enthusiasts will be aware of the peculiar signalling arrangements adopted by the Highland Railway, with infrequent, sometimes seasonally lengthy, trains on a largely single-track railway. Wealthier railway companies could afford staffed signal boxes at either end of the station passing loops[25], yet the impoverished Highland Railway economised on staffing costs by having staff travel between the small signal boxes controlling the passing loops. Nairn East and Nairn West, although closed, remain as narrative of this peculiar arrangement, without the railway enthusiast placing this in a wider social context.

Providing the social context for this narrative is the historian, with Highland impoverishment a legacy of the Highland Clearances during the 100-years before arrival of the railway, with ruins of hundreds of houses in each strath (Prebble 1969, p289) and land intended for sheep proving uneconomic so becoming the place for sport shooting (*ibid*, p303). Without people or agriculture, the long seasonal trains for shooting parties are the narrative spoken by the Highland 'pairs'.

6.4.6 Plumpton Signal Box

In many respects, a simple signal box controlling travel plus a level crossing at the wayside station of Plumpton on the edge of Plumpton Green. Except, there is evidence of strong social involvement in the closure process and a longer social narrative connected with this station.

Following replacement of signaller operated level crossing by a modern automatic system, the listed Plumpton Signal Box serves no further purpose for the custodian. The ongoing narrative is therefore a mothballed maintenance liability.

[25] Short section of double track to allow trains approaching in opposite directions on single track to pass each other.

Figure 6.5: Plumpton Signal Box, showing some of the controversial replacement level crossing equipment and trackside control equipment. (Author 2016)

Conversely, there is evidence of public engagement with this building that provides a strong narrative. Plumpton Green has elements of the elegiac village and Topham (2018) records how villagers treat the signal box as integral to the, “vernacular”, of their village environment after the proposed replacement of level crossing gates, a proposal described as causing, “substantial harm to the significance of the signal box” (BBC 2015). Despite replacement going ahead, it was clear that public engagement with the building is substantial, and this contributes to a robust narrative.

Once again, this is a building where narrative contributed by building conservation experts, railway enthusiasts and signallers is minimal. For the building expert, the engineering vernacular is a standard London, Brighton and South Coast Railway design, with the peculiarity that this design has a nod towards Sussex domestic vernacular, so there is a specific contribution to local narrative. Railway enthusiast and signaller narrative will tend towards the generic rather than specific to this building.

> Plumpton Railway Station is immediately adjacent to Plumpton Racecourse, with a history of race day special trains. It therefore follows that the historian will identify a narrative that includes the railway, including railway infrastructure such as the signal box, into an overall narrative of the social and economic history of horse racing.

For each of the same signal boxes, data from the taxonomy survey effectively serves into a narrative, with the quality of the narrative showing some characteristics needing analysis.

6.5 Summary of Findings

Using a standardised range of potential stakeholders, it is possible to identify predominate themes for each group and how these responses contribute to a discursively structured narrative.

Of the stakeholders, the custodians tended toward the most pragmatic. For operational signal boxes, the building is an asset for functional use, so the pragmatism is unsurprising. For those buildings either out of use or scheduled for closure, there is a sense of enduring the situation, in the railway context a vestige of the thinking reported in section 3.5 of running a modern railway in a museum. However, even for the conserved signal box in a museum context, there is an element of pragmatism with a carefully curated presentation, even if with the intent of providing high quality information, the engagement with cultural significance described by Taksa (2003, p84) in section 3.6.

Section 2.6 discusses a tendency for building conservation experts to adopt a dogmatic thinking that presents a challenge when engaging with buildings that are not intrinsically architecturally or historically significant. In transferring this position into a narrative for these functional buildings, it becomes noticeable how the narrative remains within the confines of accepted engagement for building conservation experts, resulting in an effective narrative only if the heritage functional building presents conventionally accepted heritage values.

Accurately predicting an overall contribution to narrative from the diversity of public engagement is inevitably going to be problematic with, as developed in section 2.3, people extracting different meanings according to their experiences. Heritage thereby becomes a communal activity for when the building is most visible, with a tendency to view presentation of the building in terms of leisure potential rather than intangible cultural properties, with an expectation that influencing the perception for these functional buildings are accepted norms as to what makes an attractive building. Nevertheless, there is evidence that education, the high-quality information coupled with intent inherent within the ‘Dublin Principles’, will have a substantial influence on narrative engagement by this group of stakeholders.

One identifiably parochial stakeholder group within public engagement with heritage railway buildings will be railway enthusiasts. This group, considered in section 3.7, have a specific outlook that will, for most of the group, tend to treat railway buildings as a backdrop to their enthusiasm, constrained either as an awareness or as part of a heritage railway staged authenticity. In the right context, this stakeholder group will have tremendous knowledge that can inform presentation of information, yet coverall perception of heritage functional buildings will exclude intangible cultural properties.

To the extent it is not already happening, testing of narrative indicates there is a tremendous need for worker engagement in any historical narrative concerning functional buildings. Those who work in the buildings will have their cultural experiences, yet this experience is transitory and without a record the stakeholder memory will be generic, identified as somehow falling into the public or railway enthusiast perception[26].

Significantly, the stakeholder with the most substantial contribution to narrative for all the tested case studies is the historian. The contribution is contextual, an assessment of the locational environment for each building. There is a paradoxical element here, as while the building conservation expert stakeholder apparently struggles with functional buildings not offering architectural or historical significance, this contextual value reinforces another

[26] This deficiency is recognised, with the National Railway Museum hosting NAROH, National Archive of Railway History (Stewardson 2002, p11), plus FARSAP, Film Archive of Railway Signalling & People, a joint initiative with the Signalling Record Society and Network Rail (Rollings 2014, p39).

tenet of conventional building conservation thinking, the sense, explored in section 2.4, of memorial as an act of witness in a location. Here the historian is defining the functional building as a place defined by social interactions, inhabited with meaning (Dalton 2017, p25).

Finally, Flyvbjerg (2006, p236) provides an overall observation that where undertaking case study research the researcher will, "place themselves in the context being studied". Inevitably there are personal aspects, while not admissible in the context of research, in collecting data which, along with previous experience of the buildings, means the researcher becomes part of the narrative, potentially influencing the outcomes of any narrative driven approach.

Chapter 7
Discussion

7.1 Discussion of Findings from Taxonomy Surveys

Very few of the railway signal box functional buildings surveyed for the taxonomy modelling are possible to acknowledge as works of architecture or possess identifiable historical significance. Furthermore, of the two acknowledged as works of architecture, modern changes degrade the heritage significance of one, St Bees Signal Box, while the other, Birmingham New Street PSB, has all the controversy that attaches to 1960's architecture. Of the remaining buildings surveyed only one, Garsdale Signal Box, directly plays a part with history, although a few others tangentially connect with history, such as Wolferton Signal Box witnessing royal arrivals and departures for the Sandringham Estate, or exist due to historical events, such as Thornhill Signal Box serving the wartime munitions factories in southwest Scotland. Otherwise, the buildings overwhelmingly demonstrate evidential and communal values (section 6.2, chart 6.10), being a tangible record of the technology formerly employed to control train movements and social aspects associated with the specialist role of signaller, along with public awareness of what is sometimes a visible building. Awareness is very subjective, especially as local mixed-traffic stations fully staffed by a traditional hierarchy of roles that includes the signaller fade into historical memory, leaving the potential of an idealised history that risks the romanticised view of history dissonant with accuracy. Untested is the level of knowledge most people have concerning the role of railway signal boxes, although the overall presumption is a low level of knowledge (Reeves *et al* 2020, pp250-1), so for casual observers of signal boxes the building represents an old building somehow connected with railway operation, yet disconnected from immediate experience and lacking an accepted significance. For many people, the probability is that their only close interaction to signal boxes is with those adjacent to level crossings, so during the taxonomy surveys this aspect of place attracted a high value in assessing communal value.

Questioning the accepted principles needs tempering by a recognition that building conservation had a passionately argued starting point. Writers such as Ruskin and Pugin, motivated by the ideas of antiquity and Renaissance ideals of architecture as artistic beauty, gave recognition to the idea that buildings have a significance beyond a simple value through utility. However, motivating these writers was solely the conservation, as custodians for future generations, of architecturally significant or historically important buildings, this choice of building inspired by, and reflecting the interests of, those aristocrats undertaking their Grand Tour. Validating and supporting these ideas requires an expert knowledge of the architecture and the historical context, this rigidly defined academic, even elitist, approach having a predominant influence on setting policy and legislation concerning heritage buildings. Subsequent writers note that an unwillingness to challenge this accepted position can weaken the case in support of conservation of a heritage building, especially where the building character changes over time. Coupled with this are problems created when applying the accepted precepts of building conservation to problems the original writers either did not envisage or thought would never become an issue. Seen through the perspective of history, Pugin's assertation as to the unworthiness of industrial buildings and Ruskin's dismissal of all railway architecture as bad can appear condescending and short-sighted regarding the historical impact that industrialisation would have on society. Demonstrably, there is divide that feels typical of the era, lauding the architect designed buildings for aristocrats benefiting from their grand tour, while the engineer designed buildings for the uncultured masses are unworthy of refined tastes. Nevertheless, these 19th Century ideas that divide worthy or unworthy buildings, along with holding an idea of custodianship that brings with it a responsibility of minimal intervention, apparently continue to influence thinking about buildings and thereby inform the principles of building conservation. This is creating a tension that, at the most extreme, threatens the essential concepts of building conservation.

Perhaps symbolising this tension is the question of building relocation. Buildings are an act of witness, a contextual, indeed spiritual, association with place that makes the building itself a memorial, possessing history. It was inevitable that this sense of place is intrinsic to original thinking in defining building conservation, with this idea of connecting heritage buildings to place providing a contextual sense for the community. Even if the building occupies an unchanged space, the perceptions of differing individuals about this place will differ according to that knowledge, social interaction, emotion, or experience. Furthermore, this assumes an unchanging space, as context changes for a building out of place in the original space, where the act of remembrance provided by a heritage building ceases to occupy an association with the context. Reeves *et al* (2020, p241) identified how changes in the railway 'townscape' have the reality of leaving some railway signal boxes in the same location yet in a totally changed environment, a finding confirmed by the taxonomy surveys. In some cases, such as Llanelli West Signal Box, an original townscape influenced the building morphology, leaving a mark on the building even after the townscape changed out of all recognition. Pulborough Signal Box is a typical example of the usual situation, standing isolated facing the location of a bay platform removed for many years and adjacent to a closed goods yard (figure 7.1), with the station now merely a main line halt, albeit in this case retaining some of the original charm. It then becomes a case whether this heritage fragment is really providing the context as a sense of memorial or merely an obsessive adherence to a purist notion of conservation that leaves the building, "abandoned on the shores of history" (Warren 1996, p48). Complicating the argument with signal boxes is that many of the designs are intrinsically relocatable with, of the sample surveyed, Magdalen Road Signal Box an example of this facility to reuse a building outside the original geographical design area and Llandudno Junction Signal Box demonstrating the reuse of significant components, in this case the operating floor, from another signal box. In accepting the principle of reusing these functional buildings in operation use, there is no valid premise to criticise the relocation for heritage reuse of an entire building to a geographically dissonant area, such as Lydney Junction Signal Box, or relocation of significant components on a modern structure, such as Radstock North Signal Box. With no attempt at pretence concerning these relocated buildings, and what these buildings retain, in a demonstrably substantial form, the original purpose adds to the sense of authenticity. Despite, while considering normally accepted conservation principles, Stratton (2000, p122) defining tourist sites of relocated buildings as discredited concepts, for functional buildings the evidence suggests that a sense of context is more critical than the purity of a spiritual location attached to an original place. Ultimately there is a sense of location being dynamic and human existence is about the place.

Figure 7.1: Pulborough Signal Box within the context of closed facilities and separate from modern operational railway. (Author 2016)

Ever since the nature of building conservation moved from the architecturally or historically important towards a more inclusive environment, it is functional buildings that are demonstrably disrupting the selective narrative associated with the established, 19th Century, thinking regarding building conservation. Research and writing provides recognition of how conventional thinking provides constraints that are difficult to reconcile with any individual situation. Pickard (1996, p147-50) describes how concepts such as ‘special character’ or ‘cultural significance’ present difficulties in effective interpretation for the wider public when repairing damaged heritage buildings, while Hudson & James (2007, p261) argue for a wider involvement in building conservation than the traditional academic disciplines. There is a sense that functional buildings represent the anomaly that demonstrates the weaknesses in the established conservation narrative, with attempts to adapt this established thinking consistently proving awkward when conserving buildings having a social resonance instead of being intrinsically great works of architecture. The question that needs asking is if instead of adapting the thinking, it might be better to have a process of establishing the nature of heritage and authenticity for functional buildings as a way of defining the conservation processes, especially as these buildings acquire heritage status through use rather than any deliberate consideration (Tweed & Sutherland 2007, p63). Academic discourse concerning building conservation is wary of a tendency for the public, especially in the context of tourism, to trivialise history and derive a romantic view of the past. For functional buildings a paradox emerges, in that the nostalgia associated with buildings with a social history are most at risk of the myths concerning the past. This is especially the case where the functional buildings form part of a larger social construct, as in the case of heritage railways potentially becoming linear theme parks presenting tourists with an idealised pastoral idyll of a mythical past age. For this mythological construct, the social memory of a signaller leans towards the evocative encouraged by descriptions of the past. In such an environment, it is clear that the building conservation process must centre on the importance of authenticity, the ethical responsibility for any intervention to fully appreciate the building, connecting the phenomenon of heritage, including those reasons why interest groups perceive the building as heritage, to the processes that produced the building.

7.2 Analysis Against Conservation Theory

Accepted thinking and established practice concerning building conservation stresses the sense of custodianship for the future, yet there is an assumption that the custodians accept this reasoning without demure. This idealism reflects the categories of buildings originally identified as having significance, a sense of, for example, that building a church for the glory of God comes with it an implicit assumption that preserving the building shows a predisposed interest in maintaining that which made the building glorious to God. However, there is not a universal sharing of this idealism, summarised by the idea that building conservation strategies privilege the values of a small part of the community (McCarthy 2012, p633), leading to a conflicted engagement with protection policies and a stronger need to demonstrate relevancy. Buildings built with a specific function rather than to be architecturally significant fit uneasily into the accepted thinking when the question of conservation arises, so to advance the thinking for functional buildings it is necessary to consider what motivations impel the custodians. Specifically for signal boxes in Great Britain, where most surviving buildings, whether identified for conservation through listing or merely survivors without any statutory protection, are in the custodianship of Network Rail or the heritage railway movement, this needs an understanding as to the motivation of custodians who view their functional buildings purely for the intrinsic function.

With a few exceptions, construction of signal boxes was without any intention to be great works of architecture or monuments of the age, so the utterly functional nature of the buildings means maintenance and modifications are notably pragmatic. These are also, apparently, temporary buildings that are possible to discard without further consideration, as included with each scheme to modernise signalling is the presumption to demolish any signal box without statutory protection, indeed it seems even with statutory protection, regardless of any perceived heritage value or, unless by chance, sentiment. For signal boxes owned by Network Rail the maintenance regime, as befits functional buildings not perceived as presenting the public face of the railways, clearly focuses on the essential rather than the heritage significance. Repairs are functional, with the emphasis on safety, such as replacement of staircases plus addition of fire escape ladders, and health, such as enhancing the internal environment by closing of lead-ways plus replacement of windows with the late 20th and early 21st Century architype windows for non-prestige buildings, uPVC framed double glazing that are inward opening to facilitate cleaning, thus allowing removal any previously existing external balconies. Internal changes carried on this theme of providing a comfortable working environment, with provision of suspended ceilings, with a reasonable presumable that these include insulation, under formally open roof structures and replacement of coal stoves with modern heating. In contrast, even though heritage railway signal boxes are, like their main line counterparts, not overtly public facing, overall maintenance standards are higher and where replacing life-expired components becomes a necessity there is a conscious effort to ensure the replacements match the removed components. The overall emphasis is on ensuring nothing affects the mimesis, that presented 'period' environment the railway provides for the visitors. Interestingly, this emphasis on period extends to the internal environment, heritage railway signal boxes invariably retaining the original open roof structure and coal stove heating, presumably because this retains an in-depth period presentation, combined with operation that is predominately during the daytime in summer which makes signaller comfort less of a problem. Where relocated to a heritage railway, there is a mixed effort at achieving fidelity to detail, ranging from the notably modern in a period idiom brickwork for Radstock North Signal Box to rebuilding period brickwork with reasonable fidelity at Winchcombe Signal Box (Figure 7.2). In keeping with the restoration ethos that characterises the heritage railway movement, there is evidence that the volunteers responsible have an awareness of authenticity, as demonstrated by the care taken with window repairs at Princes Risborough North Signal Box.

Construction of these heritage buildings was for a specific function by organisations that viewed the utility value of the buildings only in terms of the function. That the two sectors who continue as custodians for most survivors of these buildings still derive the same utility value rather constrains how these organisations define custodianship. This presents a dilemma. Judged by accepted thinking concerning building conservation, neither sector is acting as a proper custodian of heritage functional buildings for future generations. However, defined in terms of the reasons to construct functional buildings, it is unreasonable to be critical of the custodian's actions to retain the building's utility value. This is the dilemma summarised as the 'Wylam Question' (section 3.4), where different parties have contradictory agendas concerning a building that presents an unsolvable conservation problem.

Figure 7.2: Left to right comparison of original brickwork at Truro East to replica brickwork for relocated Radstock North and reconstructed brickwork for relocated Winchcombe. (Author 2016-8)

Network Rail, as the predominant custodian of British signal boxes, has an organisational attitude to heritage buildings that appears inherited from British Rail, representing an official approach overlaid with a multitude of attitudes. In running an operational railway, buildings are just another part of the infrastructure, a completely functional component in meeting the fundamental organisational purpose. This allows no place for sentiment or nostalgia, indeed there is a culture that any form of nostalgia reflects a weakness in running a modern railway, even maybe to consciously keeping a plausible distance from the heritage railway movement 'amateurs', and there exists a deep-seated institutional hostility to listed buildings as not in keeping with image of the modern railway. Official pronouncements about how the organisation attaches a value to heritage railway infrastructure, including heritage buildings, therefore sit uneasily with long-standing beliefs about the railways burdened by unwanted, and perceived as liability, heritage buildings that need sweeping away in the name of progress, as demonstrated by the preapplication enquiry concerning demolition of the listed Petersfield Signal Box. Despite statutory protections, stated official appreciation and detailed guidance on how to preserve signal boxes, the fate of Dawlish Signal Box (section 3.8) somewhat seems to negate the intent of these conservation assertions, leading to a consistent belief that should a listed signal box suffer structural failure following neglect the first response will be demolition with permissions sorted on a *post hoc* basis. That Network Rail has a policy regarding redundant signal boxes is constructive, indicating a positive engagement with the principles of building conservation that any commentary questioning the application of this policy may seem churlish. Nevertheless, there are evident issues with a policy that stresses the primacy of railway operational convenience by relieving Network Rail of the maintenance liability of buildings for which there is an organisational custodianship, along with an application of the policy that potentially follows established precedent routed in a deep-seated culture of questioning the need for conserving heritage railway buildings. Principally, this guidance leads with the desire to relocate all redundant signal boxes away from the railway, a policy that completely contradicts the conservation proposition, even if earlier questioned, that location is such an intrinsic part of a building that relocation devalues the building's contextual authority. Furthermore, relocation favours timber rather than masonry structures, or structures such as Knaresborough Signal Box possessing a strong association with a specific location, so conservation becomes a lottery based upon the nature of the building rather than conserving evidential value. Despite this, the relocation of Mistley Signal Box suggests a core of sentimentality can exist at an organisational level, as one can only presume a British Rail engineer with a sentimental attachment to a specific signal box and exaggerating the heritage value so that a museum organises the relocation.

Sentiment might be one way of characterising some part of the motivation for another significant grouping of organisations owning heritage railway buildings. The heritage railway movement epitomises an organic, grassroots movement, having no masterplan and growing through the input of volunteer labour motivated by a backward-looking conservation philosophy to a greater age that has a demonstrable resonance with 19th Century writers on building conservation. This creates a strong collective sense as to the meaning of authenticity, yet the focus of this interpretation are the trains, principally although not exclusively, the steam locomotive, rather than the buildings. Expressing this focus is the preserved railway, the concept of preservation being through creating a working railway that, with the compromises necessary to present past technology in a modern setting, mythologises the past for the benefit of the visitors that the preserved railway relies upon to keep running. This presentation of preservation rather than heritage conservation is pragmatic and yet leads to a criticism that preserved railways are *de facto* linear theme parks. In this carefully curated and presented environment centred around the trains, heritage buildings serve the two purposes of an operational necessity and a backdrop to the visitor environment. Paradoxically, for signal boxes the operational necessity serves more of a heritage advantage than signal boxes mothballed by Network Rail, as it supports the very function as to why the heritage building has value. This means that the buildings are not in a conservation stasis, yet the utility value to the preserved railway makes facsimiles of original designs, such as Broadway Signal Box, more attractive than the costs of relocating and conserving a heritage building. Authenticity, especially as expressed to visitors who, it is reasonable to presume, will have no knowledge of the heritage value articulated in the functional buildings, therefore becomes less of the actual building and more about the concepts leading to a particular type of functional building. Appropriately for organisations that are social constructs of like-minded volunteers, the presentation for visitors of functional buildings is the purpose these buildings serve within the complicated mixture of society and technology that defines organisation of an operational railway.

7.3 Conserving Functional Buildings

When considering the conservation of Wylam Signal Box, irreconcilable factors include an almost unique style of building, with no obvious alternative use partly because it is over an active railway, situated in an attractive location with potential for high local esteem. On this basis, it is impossible to answer the ‘Wylam Question’. However, the taxonomy survey data demonstrates that this building is evidential rather than the two predominant building conservation criteria, architectural significance or historical importance, normally applied to a heritage building as having unchanging significance. Furthermore, applying a contextual test to Wylam station presents a changed railway environment. As constructed, the signal box controlled mechanical signalling, a gated level crossing and was integral with a staffed station with goods yard, whereas now the station is an unstaffed halt and the signalling is modern. For the signal box, this changed environment represents a narrative, the story told by a building in a changing environment, and the dynamic nature of narrative represents a break with the static conservation philosophy structured around an unchanging significance. Testing the taxonomy methodology followed is the means for validating the proposition set out in the aim (section 1.2.2) that, using the idea of social history or presenting a specific narrative, considering the motivations of all people, including custodians, connected with a functional building augments the conservation process. This requires the building conservationist to take an 'Everyman' role, to conceptualise this role while assessing the narrative behind conservation of functional buildings through considering how each group of people having an interest in the building will interpret the narrative. There is a tremendous paradox in this role, as any narrative about preserving functional buildings must include societal facet, representing a social construct for humble jobs carried out within a building where the building occupants are subsidiary to the building's function, besides the evidential value exhibited by the building.

Everyman will notice from the taxonomy survey that these functional buildings display a clearly defined evidential value, a narrative that, by definition, for a functional building to exist it had, and generally continues to have, a function with everything this says concerning the advance in technology represented as the railways matured from crude wagonway to established transport undertaking. Everyman will then notice that many of the buildings have a communal value, implying that not only are the community aware of the building, social history also attaches to a functional building that provides a human narrative, along with the building itself, as a discrete identity, having a group value with other railway buildings or as a historic element within the townscape environment. With this awareness, it is now possible to define the relationship, the individual personification narratives, that everybody has with functional buildings, represented by using signal boxes as exemplar, where the rigid academic discourse embodies only one facet of understanding and appreciating heritage value. Everyman will therefore observe that the academic will consider minimal intervention and the railway historian will want to preserve, the custodian has a railway to run, this being an attitude encouraged by the passenger wanting to reach their destination, while the former employee will want to tell their story and the tourist seeks an authentic experience. Not all of this will, of course, apply in every situation. More importantly, what everybody wants from heritage buildings is, for most participants in this conservation process, demonstrably contradictory, with discourse therefore defaulting to accepting principles of minimal intervention and functional buildings are lost or, as for example Weston-Super-Mare Signal Box, end up as sad relics lost in a sterile space. At this point Everyman will conclude that the established principles for building conservation, the ideas from the grand tour and codified by writers such as Ruskin, cannot properly serve the needs of functional buildings. So instead of thinking of functional buildings disrupting the accepted principles, it is clearly better to take the taxonomy data to develop and validate an adaptable conservation model that provides meaning in context for all stakeholders.

There is a possibility that Everyman will eventually conclude it is not possible to rely upon the custodians of heritage functional buildings for effective building conservation. While in one sense this is true, as it is demonstrably valid that the custodians of railway signal boxes are more concerned about the utility functionality of a building than what the building represents and, particularly for the main line custodians, there is a cultural precedent for unemotionally disposing of outdated equipment. Conversely, there is an organisational motivation to consider and embrace heritage, even if the details, such as prioritising relocation or multiple evidence of a willingness to demolish heritage buildings, suggest organisational motivation disappoints when faced with reality. It is easy to portray the heritage railway movement in a negative light, seeing them at best as amateurs looking backwards towards some romanticised version of the past, yet railway enthusiasm reaches back into the 19th Century and the oldest heritage railways are now more than 60 years old, so there is a resilience in the movement that belies the negativity. As there is a perceived contrast between conservation of church and functional buildings, it is worth observing that there are similarities between the heritage railway movement and the Church, as both are constructs of the membership, possessing a high degree of volunteerism having a broad agreement on objectives while troubled by factionalism[27], and constantly reinventing itself with belief of what is possible. Therefore, Everyman might wonder if there is any essential difference between the motivations that drove, for example, the ‘Oxford Movement’ to that which drives the rebuilding of abandoned railways to create a backward-looking paradigm. For the heritage railway movement, this backward-looking centres around human experience of the steam locomotive, celebrating the fabric of Industrial Revolution driven by coal. Here the railway presents heritage as an experiential presentation of movement, sounds and, considering the burning coal, smells within a railway community, despite many roles, such as clerks or buffet staff, only existing in support of the active railway. In this culture, management of buildings for use by heritage railways has a maturity based upon the priority of operational need rather than conservation, with the signal box an intrinsic part central to the heritage railway community. Where the use of a signal box justifies the building’s existence, there is a pragmatic sense that for functional structures the only thing that makes them meaningful is the actuality of function. Nevertheless, connection to heritage is part of the process, with signalling as developed in the Industrial Revolution demonstrably being, in modern terms, narrow band communication, along with a preservationist ethos that if preserving the last example in location of some railway technology proves impossible, then rather than losing the artefact it is better to preserve it somewhere else.

Separating out custodianship from functional buildings leaves, as seen in the taxonomy surveys, a sense of how these heritage buildings have meaning in context, the assessment of narrative that provides an integrated conservation rationale. For context, this centres around the spirit of place, a sense of memorial expressed with integrity, that as buildings and places change, the building, by displaying the narrative of these changes as part of the holistic

[27] For the heritage railway movement, factionalism apparently comes in a range of styles, whether loyalty to railway companies extinct since 1948 or the volunteer movement viewing the official, embodied by the National Railway Museum, as anodyne, good for and yet not good at research or education.

sense of physical evidence, remains as a testament to the changes providing meaningfulness to a place. In considering buildings this needs an acceptance that heritage buildings are not in stasis and carrying an awareness of function forwards, ideally by attaching function in perpetuity, avoids a discursive insularity. As exemplars for heritage functional buildings, this applies to each of the signal boxes in the taxonomy survey, where it is impossible to attach the immobile, unchanging conservation values dictated by conventional discourse and instead, as functional buildings, they display a significance through dynamic narrative. It also follows that as function is the decisive element, if relocation is unavoidable, the preference therefore is for relocation to an environment where that narrative naturally continues.

Signal boxes on the main line are rapidly disappearing as the culmination of a trend that reaches back to the earliest power frames. From the taxonomy surveys there is no such thing as a typical, generic signal box, with each of these buildings having a specific narrative, so considering the idea of custodianship for future generations the narrative needs extending to what should the narrative say to these future generations. As tempting as it may be to meet the expediency of current circumstances, any arguments that attempt to define an economic reason, a one-dimensional economic commodification of heritage consciously invoking the discredited concept of a staged authenticity as marketing strategy, will compromise the very authenticity, a tangible link with history, that the tourists are seeking. If wonder of an object lies in the story and appearance, then narrative must follow the same path. Therefore, answering the Wylam Question is by creating a dynamic narrative that provides something for the knowledge of everybody who interacts with the building, then from the taxonomy survey the elements of this functional building narrative will include:

> **Encapsulate the history.** Functional buildings are an amalgam of the reason for construction, the technology embodied within the building, the method of construction and the operational history. This applied to all signal boxes in the taxonomy survey, with only a few having tangible historical events attached to this history, such as the evidence of a

bomb near miss during the Second World War becoming an intrinsic part of Cuxton Signal Box. All the surveyed signal boxes display their heritage as an integral part of the transport and communication revolution that moved the Industrial Revolution, and the narrative needs to impart this developing role. Each building displays the specific engineering vernacular from the time of construction, ranging from the 19th Century ornateness of Heckington Signal Box through the Art Deco style of Horsham Signal Box, desperate Second World War austerity of Runcorn Signal Box, derived Modernism of Hubberts Bridge Signal Box to the strained architecture of Westbury PSB. The principles are flexible and as signal boxes are an exemplar, it is therefore reasonable to apply these principles to all types of heritage functional buildings.

Articulate the social aspects. In considering, section 4.4, the evocation of working in a signal box, it is indicative of the decline in signal boxes that the only survivor amongst of all those mentioned, with the intrinsic commentary on early 20th Century employment practices, is Garsdale Signal Box. What remains of the social aspect is the written and oral record, whether the oral history concerning Cuxton Signal Box or involvement of a Member of Parliament in the future of Llanelli West Signal Box. Whereas Denthier (1978, p9) described the traveller only fleetingly glimpsing many railway buildings, the converse is true, in that the signal boxes stand aside and fleetingly glimpse travellers, featuring as an observer in the countless stories that pass and unchanging as the society changes. Heritage buildings are a tangible link with the past, including all aspects of the social fabric making up the past, and the narrative for this link needs expressing in conservation of heritage functional buildings.

Reinvent excellence. Engineering vernacular, in whatever form it takes, is as functional as the functional buildings it serves. The vernacular is dynamic, in that this is not great architecture where purity of form is preeminent, and is instead making a building work for a specific function. Nevertheless, once the building attains significance, it takes on another form where it is necessary to make an interpretation of Ruskin's ideas concerning the finest expression of craft. If these buildings are the finest examples of the craft of functional building, then even if the dynamic continues, which potentially includes relocation as demonstrated by Magdalen Road Signal Box, then it becomes essential to undertake a higher standard of maintenance that shows a stronger respect to the initial fabric. There is tension in the dynamic, seen by comparing the careful timber window frame repairs at Princes Risborough North Signal Box to replacement uPVC window frames with framing arrangements to match the originals, such as Par Signal Box. Dynamic more readily allows relocation than the static interpretation of conservation, yet even here a higher standard applies, respecting the original fabric and providing the relocated building an appropriate context. Discredited concept or not, surveyed signal boxes at museums of railway heritage are demonstrably providing a context that encapsulates the history and facilitates the social aspects.

Facilitate the experiential. As providing a dynamic narrative involves providing people who interact with the building a tangible connection with the physical and social aspects of the building, it becomes essential to facilitate an experiential interaction. Opening up Chappel North Signal Box, the former Mistley Signal Box, for visitors is the reference point of experiential. Sub-dividing the operating floor at Princes Risborough North Signal Box may frustrate a purist notion of conservation, yet in demonstrating the technology of a functional building in operation it encapsulates another facet of history and the social history of a signaller's work. Effective conservation of heritage functional buildings must therefore allow an experiential element to support the dynamic narrative presented by these buildings.

There is no effective way of guarding against the dilution of authenticity other than by holding the building in an artificial stasis, so presenting the building with a dynamic narrative includes all facets that go towards the physical and social significance, plus ensuring the finest standards in presenting the building thereby allowing the presentation to catch the imagination of all who interact with the conserved building.

Figure 7.3: Dynamic mimesis, relocated Winchcombe Signal Box as an integral part of the heritage railway dynamic narrative, volunteer railway workers with preserved British Rail diesel and Great Western Railway steam. (Author 2018)

Chapter 8
Conclusions

8.1 Conclusions

In defining building conservation, Pugin created two classes of buildings, a worthy class such as churches, or unworthy, with functional industrial buildings, including signal boxes, firmly in the class unworthy of conservation and thereby dismissed. Writers such as Pickard and Orbaşli identify that these hitherto unworthy buildings have intangible values that are worthy of study, in part to separate the intrinsic heritage value from the sentimental, that unworthy culture dismissed by Pugin. There is a significant shift in culture from Pugin to Orbaşli, a democratisation in society that articulates how we can recognise the contribution made by the whole of society, and in this change the buildings worthy of contribution are not just those influenced by tastes refined from the Grand Tour, it must include the engineering led buildings that made possible the Industrial Revolution. To understand, it is necessary to see the whole and therefore to provide understanding for future generations, custodianship of heritage needs to provide those generations with all buildings and structures that make up where we are today. Yet, the narrative of worthy or unworthy persists, subtly creating a culture where the archaeology and conservation of functional industrial buildings must struggle for influence to make changes in defining culture. It is possible to see this persisting division between worthy and unworthy in many ways as it affects railway signal boxes, whether in the official policies enacted by the main line railway custodians, the heritage railway approach in using buildings to create the sentimental attraction or official policies where the railway signal box is an ancillary building to the glories of railway architecture. Crucially, while the principles of building conservation originated for a culture where only the worthy was consequential enough to merit conservation, the changing cultural framework, a sense of heritage extending to encompass a wider view of society, creates an uneasy misunderstanding as to the purposes of conservation. With this misunderstanding, a belief perceived as conservation is all about keeping the old rather than curating heritage, comes ambiguity or even deliberately unsympathetic actions. In the railway context, the Network Rail desire to discard heritage assets is a direct descendant of the British Rail architects commenting about an operating theatre in a museum, where individuals have a direct impact on the outcome, whether inspired directors or the anonymous person who arranged for the relocation of Mistley Signal Box. Furthermore, the heritage railway movement is equally complicit in this thinking, where organisations perpetually under-resourced against the vision of what is achievable rely upon individual initiative to understand effective conservation of heritage buildings as opposed to the endlessly discussed philosophy of conserving locomotives.

Railway signal boxes demonstrably have a narrative, expressed in the history and designs, along with events or the place the buildings have within the community that worked in, around or profited from the existence of railway signalling for their travel or freight transport. Furthermore, the written record, along with conversations during the taxonomy surveying, reveal a deep affection for the buildings, expressed as the cultural aspects. There is a strong paradox in operation, that not for people functional concept, yet the people make it culturally significant. Another aspect demonstrated by the taxonomy surveys was how functional buildings are contextual, so where railway signal boxes have, by definition, a strong context to a railway, enhancing this context is existing in an unchanged environment from the date of building construction. Being contextual in nature therefore implies functional buildings have less of that sense of locational specific memorial normally applied to heritage buildings, with instead the memorial being the function. This strengthens the case for relocation, especially in cases where this is an integral part of the functionality. Using the signal box relocations discussed in section 7.1 as an exemplar means that the original custodians relocating a signal box, whether in entirety or only the operating level, creates a positive precedent for relocation of heritage signal boxes. Thus, relocation of the signal box from Heysham Harbour to Lydney Junction is an entirely justified practice presenting the building as narrative. Furthermore, the custodians of Radstock

North Signal Box would have a solid case for arguing that the reconstructed plinth, with anomalies only obvious to an expert, is truer to a conventional conservation theory of authenticity than the carefully reconstructed structure of Winchcombe Signal Box. With context a decisive part in interpreting heritage vales for a functional building, location therefore becomes less important than for Pugin's 'worthy' buildings. It therefore follows that to ensure the cultural significance in conserving heritage functional buildings, identifying the quality of context is an intrinsic part of the narrative.

In addressing the objective to record taxonomical values for a representative sample of railway signal boxes, for each case study was possible to determine how a narrative became part of that taxonomy. This made it possible to assign every building a clearly defined evidential value, the extent varying between the buildings and dependent upon intangible values that different observers have about the building. This has a subjectivity, yet the heritage value of functional buildings relies entirely upon the perception of disparate people connected with the building, the Everyman individual proposed in the analysis, so there is no advantage in believing it is possible to provide one prescriptive measure of significance.

8.2 Conservation Practice for Functional Buildings

Demonstrating the hypothesis, that conserving functional Industrial Revolution buildings is achievable without compromising the acquired heritage values, carries the important caveat that this requires a change in the culture of building conservation to accommodate the contextual nature of functional buildings. For this conservation process to work required development of strategies applicable to these buildings, an aim that while using railway signal boxes as an exemplar becomes a transferrable technique to identify the conservation requirements for varying types of heritage functional buildings, with the technique demonstrating a sensitivity to the associated building specific heritage values.

Fundamental to the identified cultural change is that for heritage functional buildings the conventional process adopted for engaging with heritage values demonstrably does not work. Instead, this needs an integrated approach to heritage that engages with all stakeholders, with the conservation process stressing the uniqueness of each structure rather than perpetuating a misnomer that conservation is about keeping something that is old. It also, and this may be the most intractable problem to solve, needs a consensus that finishes the differentiation of heritage buildings into an artificial construct of worthy or unworthy, with the unworthy more vulnerable to the dismissive attitudes that wishes these buildings to collapse on some stormy night, or encourages casually passing them onto custodians with more enthusiasm than ability. Conservation is achievable, and this conservation can respect the heritage values if custodians do not dismiss their buildings as unworthy. Exhortation will not change this thinking, as that in a sense is the current situation and it leaves functional buildings vulnerable. However, there is a consensus on the idea of significance, proven through analysis of the taxonomy surveys as applying the dynamic to the narrative presented by a functional building. Narrative is significance, and the process experimented in carrying out taxonomy surveys on railway signal boxes showed an ability in attaching a narrative to the value for each building. Furthermore, this process is dynamic and transferrable, so for every functional building there will be a narrative that varies between everybody associated with the building, and not confined to the custodians or building conservationists.

For heritage functional buildings, the framework developed in section 7.3 for transferrable conservation principles creates a taxonomy survey narrative so that conservation is a dynamic process to:

- Encapsulate the history
- Articulate the social aspects
- Reinvent excellence
- Facilitate the experiential

Far from being unworthy buildings, these conserved buildings will present the dynamic that contributed to the reasons for construction and the narrative that buildings continue to display. Furthermore, with a change of emphasis arising from employing a narrative based approach, this strengthens the intellectual case for conservation of functional buildings, that is those buildings characterising an archaeological and architectural legacy from the Industrial Revolution, along with an imaginative presentation of the intangible values imparted by these buildings.

8.3 Recommendations for Further Research

While the conclusion identifies using narrative through taxonomy surveys as a transferrable technique for generically identifying the heritage value of heritage functional buildings, an obvious area for further research would be to validate this conclusion on a range of heritage functional buildings. Drawing this sample from a wide range of heritage functional buildings, looking at other types of railway buildings and particularly looking beyond the railway context so far explored, would test the resilience of this technique to identify areas for potentially refining the technique.

It is unlikely that further taxonomy surveys of railway signal boxes would reveal any further evidence to support the process. Nevertheless, there would be merit in further work with those railway signal boxes that are listed, or otherwise identified as having specific heritage values, to apply the methodology of taxonomical narrative to enhance the conservation process for these buildings. The taxonomy surveys revealed a strong communal tie to many of these buildings, so a creative methodology that considers all who interact with the building will ensure an optimum conservation environment.

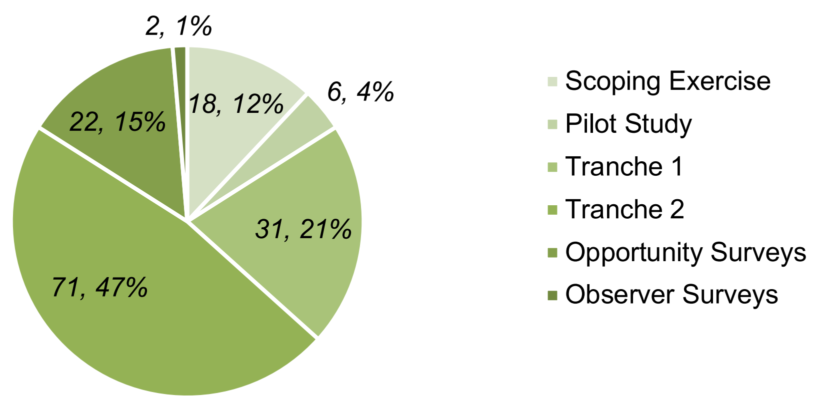
Appendix A

Survey Data Collection Stages

A.1 Survey Tranches

Collection of the survey data was in several distinct tranches enabling, as detailed in section 5.2, reflection regarding the collection process between tranches. Chart A.1 shows the breakdown of surveys between tranches and the signal boxes in each tranche listed as follows.

Chart A.1: Survey Tranches



A.1.1 Scoping Exercise

Alnmouth, Blaydon, Haltwhistle (NER), Haltwhistle, Heckington, Hubberts Bridge, Kirkconnel, Lincoln High Street, Morpeth PSB, Skegness, Stallingborough, Thornhill, Wainfleet, Wansford, West Street Junction, Wylam, York ROC, York Station Platform.

A.1.2 Pilot Study

Birmingham New Street PSB, Droitwich Spa, Hereford, Liverpool Lime Street, Shrewsbury Crewe Junction, Shrewsbury Severn Bridge.

A.1.3 Tranche 1

Aberdeen PSB, Aviemore, Bognor Regis, Bournemouth Central, Carlisle No 4, Clachnaharry, Dorchester South, Downham Market, Frome Mineral Junction (Great Western Society, Didcot), Garsdale, Holyhead, Horsham, Kings Lynn Junction, Littlehampton, Llandudno Junction, Magdalen Road (Watlington), Maiden Newton, Montrose North, Portsmouth Harbour, Pulborough, Radstock North (Great Western Society, Didcot), Rhyl No 1, Rhyl No 2, Salwick No 2, St Bees, Stirling Middle, Stirling North, Three Bridges ASC, Wareham, Westbury PSB, Wimbledon A.

A.1.4 Tranche 2

Arbroath North, Aylesford, Bedlington North, Bedlington South, Birkdale, Bodmin Parkway [Bodmin Road], Bristol Old Station, Bristol PSB, Broadway, Bromley Cross, Brundall, Bury St Edmunds Yard, Canterbury East, Canterbury West, Chappel & Wakes Colne, Chappel North [Mistley], Chappel South [Fotherby], Chesham, Chichester, Corrour, Crainlarich, Cromer, Cuxton, Dalmally, Dunkeld & Birnam, Elgin Centre, Exeter Central, Exeter PSB, Freemans, Hale, Haslemere, Havant Junction East, Hebden Bridge, Kingussie, Liskeard, Llanelli West, Lostwithiel, March East Junction, March South Junction, Marcheys House, Nairn East, Nairn West, Newsham, North Seaton, Par, Parbold, Perth Down Centre, Petersfield, Pitlochry, Princes Risborough North, Ramsbottom, Rawtenstall West, Ruislip, Runcorn, Shepherds Well, Sheringham East, Sheringham West [Wensum Junction], Stowmarket, Sutton Bridge, Torquay South, Torre, Totnes, Townsend Fold, Upper Tyndrum, Weston-Super-Mare, Winchcombe [Hall Green], Winning, Wolferton, Woolston, Wroxham.

A.1.5 Opportunity

Alstone Crossing, Borough Market Junction (National Railway Museum, York), Broomielaw, Chathill, Dover Priory, Eastbourne, Faversham

PSB, Harrogate, Hastings, Henwick, Knaresborough, Llanrwst, Lydney Junction [Heysham Harbour], Merrygill, Newhaven Harbour, Newhaven Town, Penmaenmawr, Plumpton, Stockport No 1, Stockport No 2, Truro, Ty Croes.

A.1.6 Observer

Abergavenny, Wateringbury.

Survey data presented here is after normalisation of data collected in the scoping and pilot study tranches using the fully developed model applied from tranche 1 onwards.

A.2 Surveys

This section provides, in alphabetical order, normalised summary data from the taxonomy surveys on a sample of 150 signal boxes.

A.2.1 Aberdeen PSB

Figure A.1: Aberdeen PSB. (Author 2016)

Administrative location: Aberdeen City, Scotland. Constraints: Reasonable. Design: BR(ScR) PB. Built: 1981. Listing: n/a. Status: Use ML. Future/use: Medium term. Heritage value: Modified (uPVC windows). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Seen from the road behind the signal box, the aesthetically anodyne Aberdeen PSB has a public presence without displaying any sense of the building's function to an unaware observer.

A.2.2 Abergavenny Signal Box

Figure A.2: Abergavenny Signal Box. (Fraser, M., 2016)

Administrative location: Monmouthshire, Wales. Constraints: Reasonable. Design: GWR 28b. Built: 1934. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows). Overall condition: Fair. Reuse potential: Poor. Relocatable: Yes. Risk: Normal. Comment: Conversation.

Slightly remote from public circulation and with modified heritage value diminishes the heritage value of Abergavenny Signal Box. One interesting feature concerning the replacement uPVC framed windows is that the glazing bars used for effect match those of the original timber windows specified for a GWR 28b (Kay 1998, p225), a detail apparently requested by the signallers.

A.2.3 Alnmouth Signal Box

Figure A.3: Alnmouth Signal Box. (Author 2015)

Administrative location: Northumberland, England. Constraints: Reasonable. Design: NER N3. Built: 1907. Listing: n/a. Status: Use ML. Future use: Medium term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase, removal of balcony), communal. Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Alnmouth, formerly Alnmouth North, is the oldest operational signal box directly controlling part of the East Coast Main Line[28], albeit with the original mechanical equipment replaced by a panel (Kay 2010, p15), and retained to provide local supervision of eight level crossings

[28] There is an older signal box visible from the ECML at Peterborough. Eastfield Signal Box, a Great Northern Railway type 1 dating from 1893, however only controls movements in the freight yard and does not control trains on the ECML (Kay 2010, p19)

between Acklington and Chathill (Jacobs 2006, p23). Situated at the north end of the up[29] (southbound) platform, the signal box is visible to passengers. Extensive modifications to the rare design reduce heritage value. The North Sea is nearby, hence the indication for weather risk.

A.2.4 Alstone Crossing Signal Box

Figure A.4: Alstone Crossing Signal Box. (Author 2018)

Administrative location: Gloucestershire, England. Constraints: Close. Design: Midland 2a. Built: 1891. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement steel and timber staircase), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: Yes. Risk: Deliberate.

Being next to a level crossing will give some public awareness of Alstone Crossing Signal Box. This modified, well maintained building

[29] 'Up' and 'down' are railway terminology for travel towards or away from London, or a nominal zero point where the line does not travel directly to London.

has a narrative, even if the limited heritage value means that the narrative is likely to be short term.

A.2.5 Arbroath North Signal Box

Figure A.5: Arbroath North Signal Box. (Author 2018)

Administrative location: Angus, Scotland. Constraints: Close. Design: NBR 7. Built: 1911. Listing: B. Status: Use ML. Future/use: Medium term. Heritage value: Modified (replacement uPVC windows, replacement timber staircase), aesthetic (unusual oversail), communal (level crossing and footbridge). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: High.

Next to a level crossing and associated footbridge strengthens public awareness of Arbroath North Signal Box. Structurally it is of an unusual design that oversails one of the main running lines, with a precarious looking balcony to allow window cleaning access for the signaller.

A.2.6 Aviemore Signal Box

Figure A.6: Aviemore Signal Box. (Author 2016)

Administrative location: Highland, Scotland. Constraints: Reasonable. Design: McK&H 3 [Highland]. Built: 1898. Listing: B. Status: Use ML. Future/use: Short term. Heritage value: Modified (uPVC windows, replacement staircase). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Yes. Risk: Weather.

Aviemore Railway Station serves main line and heritage railway operations, thereby presenting with considerable heritage value in a popular tourist destination. Aviemore Signal Box has a group value within this location and is, as seen here, publicly visible from the heritage railway premises.

A.2.7 Aylesford Signal Box

Administrative location: Kent, England. Constraints: Close. Design: SECR/SR 11a. Built: 1921. Listing: II. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement galvanised steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: None. Risk: Normal.

Figure A.7: Aylesford Signal Box. (Author 2018)

While being next to a level crossing strengthens public awareness of Aylesford Signal Box, in comparison with the almost flamboyant ‘chintz gothic’ station and correspondingly styled crossing keeper’s cottage, both also listed grade II, the standard design signal box feels restrained.

A.2.8 Bedlington North Signal Box

Administrative location: Northumberland, England. Constraints: Reasonable. Design: NER N4+. Built: 1912. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement galvanised steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: High.

Built at a time when the prosperity of Bedlington was coal mining and in 1913 the North Eastern Railway carried over 44 million tons of coal (Atkins 1992, p13), in a much-changed environment Bedlington North Signal Box stands as a modified evidential testament amid the changes all around. It is unlikely that most observers of the building will be aware of the historical element, although being next to a level crossing strengthens public awareness of this signal box.

Figure A.8: Bedlington North Signal Box. (Author 2019)

A.2.9 Bedlington South Signal Box

Administrative location: Northumberland, England. Constraints: Close. Design: NER N1. Built: Unknown. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: High.

In the same way as its immediate neighbour, Bedlington South Signal Box dates from a vanished era of local prosperity and the main public awareness of this signal box is through being next to a level crossing.

Figure A.9: Bedlington South Signal Box. Visible in the distance is Bedlington North Signal Box, illustrating the close co-location of signal boxes at formerly busy locations. (Author 2019)

A.2.10 Birkdale Signal Box

Figure A.10: Birkdale Signal Box. (Author 2018)

Administrative location: Sefton, England. Constraints: Reasonable. Design: LYR Hipped. Built: 1905. Listing: II. Status: OOU ML.

Future/use: Mothballed. Heritage value: Modified (balcony partially missing, staircase either internal or external no longer extant), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Yes. Risk: Deliberate.

Prominently located within a pleasant streetscape and next to a level crossing strengthens public awareness attributable to Birkdale Signal Box. However, the problems of mothballing a timber structure are evident.

A.2.11 Birmingham New Street PSB

Figure A.11: Birmingham New Street PSB. (Author 2016)

Administrative location: Birmingham, England. Constraints: Close. Design: BR bespoke. Built: 1966. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Original, aesthetic (bespoke architect design), communal. Overall condition: Good, possible *asbestos contamination. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.*

Listed due to the unique architect designed aesthetic, Birmingham New Street PSB is, as discussed in section 3.3, a controversial building. Yet even the detractors admit it has presence, watching like a silent sentinel over the ceaseless movements of the busiest railway station in Britain outside of London. As is the fate of all signal boxes on the busiest part of the railway network, operations of this signal box are due for replacement by a regional operating centre, in this case the West Midlands ROC just outside Birmingham New Street, leaving the problem of finding a future use for this imposing and unexpectedly handsome building.

A.2.12 Blaydon Signal Box

Figure A.12: Blaydon Signal Box. (Author 2015)

Administrative location: Gateshead, England. Constraints: Close. Design: NER N2. Built: Not known. Listing: n/a. Status: Use ML. Future use: Short term. Heritage value: Degraded (replacement uPVC windows, replacement steel staircase, shortened), aesthetic (unusual *positioning due to line closures), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.*

Unusually, the back of Blaydon faces the railway, an aesthetic curiosity reflecting the former status as the signal box controlling a junction where the now closed main line passed the front of the building (Cobb 2005, p476). Users of the busy level crossing will be aware of the signal box, doubtlessly without any great affection, and the degraded environment plus modifications reduce the heritage value.

A.2.13 Bodmin Parkway Signal Box

Figure A.13: Bodmin Parkway (formerly Bodmin Road) Signal Box. (Author 2018)

Administrative location: Cornwall, England. Constraints: Close. Design: GWR 3. Built: 1887. Listing: II. Status: OOU PR. Future/use: Café. Heritage value: Modified (replacement steel staircase), communal (platform location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal. Comment: Conversation.

For railway stations a distance from the settlement served, the GWR used the suffix ‘Road’ to denote what to expect before arriving at the named town. The modern variant of this concept is ‘Parkway’, with Bodmin Parkway, the erstwhile Bodmin Road, having been both. The platform location provides a modicum of public awareness, augmented by reuse as a café.

A.2.14 Bognor Regis Signal Box

Figure A.14: Bognor Regis Signal Box. (Author 2016)

Administrative location: West Sussex, England. Constraints: Close. Design: SR 13. Built: 1938. Listing: n/a. Status: Use ML. Future/use: Long term. Heritage value: Original (other than rebuilding of brickwork to south following accident), communal (public location). Overall condition: Deficient, roof oversail structurally unsound and propped. Reuse potential: None. Relocatable: None. Risk: High.

Although nominally identified as having a long-term use, this building displays evidence of maintenance issues. Most obvious is scaffold propping to the oversail. Additionally, the survey noted rebuilding to the south end ground floor, apparently after collision damage in November 1995 from an unattended train rolling away and into the building.

A.2.15 Borough Market Junction Signal Box

Figure A.15: Borough Market Junction Signal Box operating level relocated to the National Railway Museum, York. (Author 2018)

Administrative location: York, England. Constraints: Close. Design: SER. Built: unknown/unknown. Listing: NH83. Status: OOU HR. Future/use: Museum. Heritage value: Modified (grounded operating floor, missing staircase), communal. Overall condition: Good. Reuse potential: None. Relocatable: None, previously relocated. Risk: Normal.

Depressingly degraded through missing the original, demolished plinth as part of the relocation, leaving the operating floor as an out of context exhibit. However, as an exhibit of signalling history from a significant railway junction the operating floor of Borough Market Junction Signal Box has a strong narrative that is currently untold.

A.2.16 Bournemouth Central Signal Box

Administrative location: Bournemouth, Christchurch & Poole, England. Constraints: Reasonable. Design: SR 11c. Built: 1928. Listing: II [GV].

Status: OOU ML. Future/use: Mothballed. Heritage value: Original, listing as integral with listed station. Overall condition: Deficient. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Figure A.16: Bournemouth Central Signal Box. (Author 2016)

While not specifically mentioned in the listing, Bournemouth Central Signal Box comes within the curtilage of the grade II listed station. The through canopy arrangement is unusual. As an indicator of potential for public perception of a building, no public access to the platform section under the signal box limits reuse potential, although the signal box is visible from the station car park that replaced a steam locomotive shed.

A.2.17 Bristol Old Station Signal Box

Administrative location: Bristol, England. Constraints: Close. Design: Midland/GWR n/s. Built: Unknown. Listing: I [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, historical (partly inside and partly outside Brunel station building). Overall condition: Fair. Reuse potential: Accessible, tentative proposal to bring station back into use. Relocatable: No. Risk: Normal.

Figure A.17a: Bristol Old Station Signal Box. (Author 2018)

Figure A.17b: Rear of Bristol Old Station Signal Box, showing the awkward insertion into the station building. (Author 2018)

Slightly awkwardly inserted into Brunel's trainshed at Bristol Temple Meads, Bristol Old Station Signal Box is England's only grade I listed signal box though being an integral part of the station structure. Closed on 6 September 1965, with the old station itself now in use as car park, there is persuasive evidence that few of the car park users will be even aware of this signal box. There are proposals to bring the old station back into railway use.

A.2.18 Bristol PSB

Figure A.18: Bristol PSB. (Author 2018)

Administrative location: Bristol, England. Constraints: Reasonable. Design: BR(WR) PB. Built: 1970. Listing: n/a. Status: Use ML. Future/use: Short term, potential demolition on closure to allow reuse of old station. Heritage value: Modified (replacement uPVC windows). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

This modern signal box has a more uncertain future than many surviving mechanical signal boxes. The positioning of Bristol PSB across the entrance to Brunel’s trainshed means that once operation passes to Thames Valley ROC demolition is likely to quickly follow. Positioned away from much of the public circulation, other than a path from the car park, means a low level of public awareness for this building.

A.2.19 Broadway Signal Box

Figure A.19: Broadway Signal Box. (Author 2018)

Administrative location: Worcestershire, England. Constraints: Reasonable. Design: Replica GWR. Built: 2017. Listing: n/a. Status: Use HR. Future/use: New build for heritage operational. Heritage value: Original (new building). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Deliberate.

Broadway Railway Station is an entirely new development designed to create a replica of original infrastructure in the tourist destination of Broadway. The platform location of the new-build Broadway Signal Box provides a modicum of public awareness.

A.2.20 Bromley Cross Signal Box

Administrative location: Bolton, England. Constraints: Close. Design: Yardley 1. Built: 1875. Listing: II [G]. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC windows, replacement steel staircase, security cage). Communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Deliberate.

Figure A.20: Bromley Cross Signal Box. (Author 2018)

Next to a level crossing and access to one of the station platforms, there will be considerable public awareness of Bromley Cross Signal Box. Awareness includes the hard to ignore substantial modifications, including an unpleasantly uncompromising security cage.

A.2.21 Broomielaw Signal Box

Administrative location: County Durham, England. Constraints: Close. Design: NER C2a. Built: 1897. Listing: n/a. Status: OOU IS. Future/use: Abandoned. Heritage value: Degraded (staircase missing, windows/doors missing, structurally deficient), evidential (well-preserved despite abandoned since 1965). Overall condition: Derelict. Reuse potential: Poor. Relocatable: Difficult. Risk: Weather.

Out of use and derelict for as long as it was in use, Broomielaw Signal Box is a remarkable survivor. The original quality of construction is clear in the minimal deterioration of joinery, yet to view this building takes preplanning and without the benefit of statutory protection it is vulnerable to demolition without notice.

Figure A.21: Broomielaw Signal Box. (Author 2017)

A.2.22 Brundall Signal Box

Figure A.22: Brundall Signal Box. (Author 2018)

Administrative location: Norfolk, England. Constraints: Reasonable. Design: GER 3 [Stevens]. Built: 1883. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement steel staircase). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Yes. Risk: Normal.

Situated at the far end of one of the platforms at Brundall Railway Station, the location of Brundall Signal Box significantly contributes to making it remote from public awareness other than from a woodland footpath across the railway.

A.2.23 Bury St Edmunds Yard Signal Box

Figure A.23: Bury St Edmunds Yard Signal Box. (Author 2018)

Administrative location: Suffolk, England. Constraints: Distant. Design: GER 7 [McK&H]. Built: c1882. Listing: II [GV]. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (probably *replacement timber staircase). Overall condition: Good. Reuse potential: Poor. Relocatable: Yes. Risk: Normal. Comment: Conversation.*

The remains of a goods yard means that Bury St Edmunds Yard Signal Box continues to exist in more of a railway environment than many surviving signal boxes. However, being remote from close public observation will limit awareness.

A.2.24 Canterbury East Signal Box

Figure A.24: Canterbury East Signal Box. (Author 2018)

Administrative location: Kent, England. Constraints: Reasonable. Design: SECR. Built: 1911. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (replacement timber staircase), communal (station location). Overall condition: Deficient. Reuse potential: Accessible. Relocatable: Difficult. Risk: Weather. Comments: Rare steel/wrought iron structure

Situated on a framed structure to give the required height, Canterbury East Signal Box is a hard to ignore building clearly visible from the station, so there will be some public awareness. However, the height does seem to present problems with conservation of this mothballed building.

A.2.25 Canterbury West Signal Box

Figure A.25: Canterbury West Signal Box. (Author 2018)

Administrative location: Kent, England. Constraints: Distant. Design: Bespoke overhead. Built: 1928. Listing: II. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement timber staircase), communal (station location). Overall condition: Fair. Reuse potential: Accessible. Relocatable: None. Risk: Weather. Comments: Rare steel/wrought iron bridge structure.

Canterbury West Signal Box is an imposing structure, the largest surviving overtrack signal box which, along with being located at one end of the station, should make for a reasonable public awareness.

A.2.26 Carlisle No 4 Signal Box

Administrative location: Cumbria, England. Constraints: Close. Design: LNWR bespoke. Built: 1880. Listing: II [GV]. Status: OOU ML.*

Future/use: Offices. Heritage value: Original. Overall condition: Good. Reuse potential: Good. Relocatable: No. Risk: Normal.

Figure A.26: Carlisle No 4 Signal Box. (Author 2016)

Carlisle, in the same way as York and other large railway stations, had originally many mechanical signal boxes to control train movements, with Carlisle No 4 Signal Box in a similar position to York Platform Signal Box, albeit less imaginatively named. It is equally doubtful that casual observers will recognise that this attractive structure added to Carlisle Railway Station was once a signal box.

A.2.27 Chappel & Wakes Colne Signal Box

Administrative location: Essex, England. Constraints: Close. Design: GER 7. Built: 1891. Listing: II. Status: OOU HR. Future/use: Museum. Heritage value: Modified (replacement timber staircase/balcony 2005 to match original), communal (station location). Overall condition: Fair.

Reuse potential: None. Relocatable: None. Risk: Normal. Comment: Conversation.

Figure A.27: Chappel & Wakes Colne Signal Box. (Author 2018)

Chappel & Wakes Colne mixes the main line railway station using one platform and, covering the other station platform along with the former goods yard, a heritage railway centre. This signal box is the original signal box on site and the only listed signal box, although in the heritage railway centre publicity there was a modicum of confusion on this point.

A.2.28 Chappel North (Mistley) Signal Box

Administrative location: Essex, England. Constraints: Close. Design: GER 3. Built: 1882/1986. Listing: n/a. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified (rebuilt plinth to match original, replacement timber staircase to match original), communal (visitor area inside). Overall condition: Fair. Reuse potential: None. Relocatable: None, relocated 1986. Risk: Normal. Comments: Conversation, relocated because British Rail erroneously assumed listed.

Figure A.28: Chappel North (Mistley) Signal Box. (Author 2018)

Relocated from Mistley in 1986, Chappel North Signal Box features on the publicity material for this heritage railway centre. That the relocation was with the mistaken belief concerning the listed status of the building, the taxonomy survey included a discussion, summary as follows, with a senior officer of the centre, this officer also involved with the Heritage Railway Association.

> *Heritage railways are, in a sense, artificial. For example, positioning of the former Mistley signal box is not authentic. Where a signal box is operational the continuing narrative is valid, and even a relocated signal box has a story.*
>
> *Relocation of Mistley Signal Box started with an approach by Tendring Council on behalf of British Rail who needed to demolish the box to clear the space it was occupying. The museum had space and an ability to accommodate. Relocation of the upper, timber part of the box was in entirety, with no damage other than one broken pane of glass and the, on removal from site, accidental cutting of a telecom cable that British Rail technicians repaired. The base is entirely new using*

brick available in stock, taking the view that the new plinth is supporting the building going into the future, so is part of the building's narrative.

Relocation needs flexibility. Network Rail prefers removal and erection elsewhere, with the relevant Network Rail senior manager supporting preservation and with whom it is a revelation to work. The approach to conservation seems to depend upon the individual, such that the recent retirement of an equally supportive equivalent senior manager at Transport for London means that there is a concern for the future.

After an approach from the Heritage Railway Trust, the museum is currently rebuilding the 1882 water tower from Chelmsford, with the train operating company Greater Anglia bearing some relocation costs and the Railway Heritage Trust paying for the foundations. Demolition of the water tower was by a specialist contractor, who took care to remove the lime mortar, praising the patient work by a couple of Polish bricklayers, and the bricks now stored on site. There are enough bricks for the exterior, although with support in the original location shared with another building these will need supplementing with stock bricks, which the museum will use for the plastered interior. The museum is very much aware of the need for using lime mortar and the response from potential contractors is that using lime mortar is no problem.

There was a discussion concerning the purity of conservation and restoration for use, recognising the pressure to restore buildings in exactly their former conditions. However, it is possible to consider restoration of the railway stations at Sheffield, Cambridge and Newcastle, using glass infill to the original opening, as both an improvement for the benefit of the public and adaptative conservation for a modern use.

While some signal boxes win awards, including Chesham Signal Box, listed signal boxes no longer have validity if the station becomes an unstaffed halt in place of a former thriving community, as the signal box is now out of context with no validity. If there is another signal box of the same type in preservation, then this, as a crucial consideration, devalues the reason to save.

Relocation is totally part of the building's narrative.

A.2.29 Chappel South Signal Box

Figure A.29: Chappel South (Fotherby) Signal Box. (Author 2018)

Administrative location: Essex, England. Constraints: Close. Design: GNR Hut. Built: 1886/1986. Listing: n/a. Status: OOU HR. Future/use: Museum. Heritage value: Modified (rebuilt plinth to match original), communal (museum location). Overall condition: Good. Reuse *potential: None. Relocatable: None, relocated 1986. Risk: Normal. Comment: Conversation.*

Another relocated signal box with a future as museum exhibit, currently home to a small display on the history of railway safety. Again, the plinth is modern and although it has a leadway, the context is still under development.

A.2.30 Chathill Signal Box

Figure A.30: Chathill Signal Box. (Author 2017)

Administrative location: Northumberland, England. Constraints: Close. Design: NER N1. Built: c1873. Listing: II. Status: OOU ML. Future/use: Switchroom. Heritage value: Modified (balcony removed, replacement steel staircase), communal (level crossing). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal. Comments: Unusual drop sill design variant.

Next to a level crossing and access to one of the station platforms, there will be considerable public awareness of Chathill Signal Box. There is a group value of this signal box within the station context, and the design is an interesting variant of the standard design. Degrading the heritage value by removal of the balcony was an operational necessity when erecting the 25kV wiring, yet it is possible to argue that this forms part of an ongoing narrative.

A.2.31 Chesham Signal Box

Figure A.31: Chesham Signal Box. (Author 2018)

Administrative location: Buckinghamshire, England. Constraints: Reasonable. Design: Metropolitan 1. Built: 1889. Listing: II [G]. Status: OOU LR. Future/use: Mothballed. Heritage value: Modified (probably replacement timber staircase), communal (station location). Overall condition: Good. Reuse potential: Poor. Relocatable: Partially. Risk: Normal. Comment: Conversation.

Chesham is the furthest reach of the London Underground from central London, reached with a slightly anomalous feel of an underground train travelling through open country. Chesham Signal Box being visible from the platform location will provide a modicum of public awareness, yet the heritage structure fits with the overall anomalous feel.

A.2.32 Chichester Signal Box

Figure A.32: Chichester Signal Box. (Author 2018)

Administrative location: West Sussex, England. Constraints: Distant. Design: S&F 5 [LBSCR]. Built: 1882. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Original. Overall condition: Good. Reuse potential: Poor. Relocatable: Partially. Risk: Normal.

An attractive and well-maintained example of the design type. The taxonomy survey notes a doubt about the staircase. As the listing (Historic England 2013a) describes the staircase without comment, if it is a replacement, then it is sensitive to the original design.

A.2.33 Clachnaharry Signal Box

Administrative location: Highland, Scotland. Constraints: Close. Design: McK&H 3 [Highland]. Built: 1890s. Listing: B. Status: Use ML. Future/use: Medium term. Heritage value: Modified (timber replacement staircase). Overall condition: Fair. Reuse potential:

Accessible. Relocatable: Yes. Risk: Deliberate. Comment: Conversation.

Figure A.33: Clachnaharry Signal Box. (Author 2016)

While some signal boxes survive solely to control a level crossing, Clachnaharry Signal Box unusually survives to control a swing bridge over the Caledonian Canal, with the list entry covering the swing bridge and signal box. Having only four levels to control (Kay 2010, p17) and a limited train service, the signaller will have plenty of time to enjoy the superb view over Beauly Firth. Users of the foot crossing and minor road alongside the railway provide the only public awareness of the signal box, which has a supporting tourist potential to the swing bridge.

A.2.34 Corrour Signal Box

Administrative location: Highland, Scotland. Constraints: Close. Design: NBR 6a. Built: 1894. Listing: C [G]. Status: OOU PR. Future/use: Hotel. Heritage value: Modified (rendered board overcladding, possible replacement timber windows), communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Weather.

Figure A.34: Corrour Signal Box. (Author 2018)

Britain’s highest and most remote signal box is finding an active use as hotel accommodation for those wishing to enjoy the solitude of a Scottish moor. Other than a track, there is no road access to Corrour and only a few trains a day, even if one of the trains is a sleeper train providing a direct journey to London Euston. The lowest level of listing facilitates a robust approach to weather protection that is in keeping with the original design, even if clearly new work. However, this provides a use for this group of buildings in an attractive and challenging location.

A.2.35 Crainlarich Signal Box

Administrative location: Stirling, Scotland. Constraints: Close. Design: NBR 6. Built: 1894. Listing: n/a. Status: OOU ML. Future/use: Office. Heritage value: Original, communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal.

While the platform location should provide a modicum of public awareness, Crainlarich Signal Box is only now recognisable as a signal box because it has the same distinctive design as other signal boxes on the West Highland Line. However, the office use of Crainlarich Signal Box ensures an effective future for the building without any real reference to the original use.

Figure A.35a: Crainlarich Signal Box. (Author 2018)

Figure A.35b: Crainlarich Signal Box. Seen here in operational use and demonstrating the signal box as surveyed unchanged in external appearance other than a few cosmetic details. (Harrop, J., 1980)

A.2.36 Cromer Signal Box

Figure A.36: Cromer Signal Box. (Author 2018)

Administrative location: Norfolk, England. Constraints: Reasonable. Design: MGNR bespoke. Built: c1920. Listing: II. Status: OOU HR. Future/use: Museum. Heritage value: Modified (replacement steel staircase), aesthetic (rare use of concrete blockwork), communal (museum). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal. Comment: Conversation.

Visible from the far end of a platform at Cromer Railway Station and open intermittently as a museum, there will be a small amount of public awareness of Cromer Signal Box. In terms of building conservation, noteworthy is the rare use of concrete blockwork for a heritage signal box.

A.2.37 Cuxton Signal Box

Administrative location: Kent, England. Constraints: Close. Design: SER. Built: c1887-9. Listing: II [GV]. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement timber staircase), historical (unusual reason for structural defect), communal (level *crossing). Overall condition: Deficient, leaning structure from a bomb near miss during the Second World War. Reuse potential: Accessible. Relocatable: Yes. Risk: High. Comment: Conversation.*

Figure A.37: Cuxton Signal Box. (Author 2018)

Whereas the heavy frame is why many signal boxes, especially those with a timber structure, display a lean, this signal box is an interesting exception, with the signaller explaining that a Second World War bomb intended for the Chatham Naval Dockyard landed nearby, leaving the structure permanently deformed. There is, however, no way of verifying what is clearly oral history amongst the signallers that, according to the signaller, passes to each new signaller who works in this signal box. Being next to a level crossing strengthens public awareness of this signal box.

A.2.38 Dalmally Signal Box

Administrative location: Argyll & Bute, Scotland. Constraints: Close. Design: Caledonian N2. Built: 1896. Listing: C [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (staircase removed), *communal (platform location). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.*

Figure A.38: Dalmally Signal Box. (Author 2018)

The platform location will provide a modicum of public awareness in an area that has tourist potential. Dalmally Signal Box is backing onto a garden and there is reason to assume that it is informally functioning as a garden shed. The wheels positioned in front of the building are an idiosyncratic decoration.

A.2.39 Dorchester South Signal Box

Administrative location: Dorset, England. Constraints: Reasonable. Design: BR(SR) 16. Built: 1959. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows), evidential enhanced as represents last BR(SR) design. Overall condition: Fair. Reuse potential: Poor. Relocatable: No. Risk: Normal.

The BR(SR) Type 16 is an austere design very typical of its era, yet the simplicity of design, reflecting Modernist optimism in simplicity, gives a modicum of attractiveness that coupled with the uniqueness provides strong evidential value. One immediately obvious feature that remains impossible to explain is the stepped, apparently paintwork, pattern on the brickwork. Comparison with original design drawings for the BR(SR) Type 16 design held by the National Railway Museum reveals no reason for this pattern.

Figure A.39: Dorchester South Signal Box. (Author 2016)

A.2.40 Dover Priory Signal Box

Administrative location: Kent, England. Constraints: Close. Design: SR 12. Built: 1930. Listing: n/a. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (replacement steel staircase), communal (station location). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

The platform location will provide a modicum of public awareness for Dover Priory Signal Box, although limiting this awareness is the signal box being remote from the main circulation areas and in a slightly set back location.

Figure A.40: Dover Priory Signal Box. (Author 2018)

A.2.41 Downham Market Signal Box

Figure A.41: Downham Market Signal Box. (Author 2016)

Administrative location: Norfolk, England. Constraints: Close. Design: GER 2. Built: 1881. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement timber staircase), communal (by *level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Yes. Risk: Deliberate. Comment: Conversation.*

Although Downham Market Railway Station has lost the goods yard, survival of the adjacent flour mills provides a context with the original infrastructure. Next to a level crossing and access to one of the station platforms, there will be considerable public awareness of this signal box.

A.2.42 Droitwich Spa Signal Box

Figure A.42: Droitwich Spa Signal Box. (Author 2016)

Administrative location: Worcestershire, England. Constraints: Distant. Design: GWR 7d. Built: 1907. Listing: n/a. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase). Overall condition: Deficient, apparent structural movement. Reuse potential: Poor. Relocatable: None. Risk: Normal.

Remote from public areas, displaying a modified external condition, the structure displaying evidence of a dip towards the canal cutting at the north end and the GWR 7d being a common surviving design, in terms of heritage values it is difficult to make an effective conservation case.

A.2.43 Dunkeld & Birnam Signal Box

Figure A.43: Dunkeld & Birnam Signal Box. (Author 2018)

Administrative location: Perth & Kinross, Scotland. Constraints: Close. Design: Highland. Built: 1919. Listing: B. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement timber staircase), communal (visible public location). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Clearly visible from the adjacent, and busy, A9 main road may, paradoxically, provide the most public awareness. Besides the obvious modifications, the use of masonry paint is noticeably popular for brick built Scottish signal boxes, with mixed success as the well-maintained appearance is potentially distorting conservation values

A.2.44 Eastbourne Signal Box

Figure A.44: Eastbourne Signal Box. (Author 2017)

Administrative location: East Sussex, England. Constraints: Close. Design: S&F 5 [LBSCR]. Built: 1882. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (timber staircase possibly a replacement), communal (station location, listing through local community support). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

While the end of platform location and being next to a road will provide a modicum of public awareness of Eastbourne Signal Box, the main communal awareness is local interest in the heritage buildings of Eastbourne. This signal box is a contradiction, being a well-preserved and substantial example of a S&F Type 5. However, and although the main station building is a beautiful Italianate structure, the immediate location is unedifying, protected by unsightly security fencing and overshadowed by a multistorey car park.

A.2.45 Elgin Centre Signal Box

Figure A.45: Elgin Centre Signal Box. (Author 2018)

Administrative location: Moray, Scotland. Constraints: Reasonable. Design: GNSR 2a. Built: 1888. Listing: C. Status: OOU ML. Future/use: Abandoned. Heritage value: Modified (staircase missing). Overall condition: Derelict. Reuse potential: Poor. Relocatable: Yes. Risk: Normal.

Despite nominal protection provided by the listing, the condition of Elgin Centre Signal Box provides cause for concern. With limited public awareness, with the only public view being from a road bridge there is, other than a legal obligation, little apparent incentive to maintain this building and the structure may already be too fragile to allow for relocation.

A.2.46 Exeter Central Signal Box

Administrative location: Devon, England. Constraints: Distant. Design: SR 11c. Built: 1925. Listing: n/a. Status: OOU ML. Future/use: Storage. Heritage value: Original, communal (station location). Overall condition:

Fair. Reuse potential: None, in use as a store. Relocatable: No. Risk: Normal. Comments: Unusual concrete staircase.

Figure A.46: Exeter Central Signal Box. (Author 2018)

Visible either from the platform end or road overbridge, the lack of public awareness balances by the heritage nature of the SR 11c being an interim design, making a tentative use of concrete, between the more traditional signal box developed in the late 19th Century and the elegant SR 13.

A.2.47 Exeter PSB

Administrative location: Devon, England. Constraints: Reasonable. Design: BR(WR) PB. Built: 1985. Listing: n/a. Status: Use ML. Future/use: Medium term. Heritage value: Original. Overall condition: Good. Reuse potential: Poor. Relocatable: No. Risk: Normal.

Exeter PSB is visible from Exeter St David's Railway Station, yet is architecturally bland and thereby going to be minimal public awareness. Windows decorated with plants show that signaller traditions carry forward into the age of panel signal boxes, and eventually there will be a need to recognise the narrative presented by panel signal boxes in railway history.


Figure A.47: Exeter PSB. (Author 2018)

A.2.48 Faversham PSB


Figure A.48: Faversham PSB. (Author 2018)

Administrative location: Kent, England. Constraints: Distant. Design: BR(SR) 17. Built: 1959. Listing: n/a. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, evidential (example of design from period). Overall condition: Fair. Reuse potential: Poor. Relocatable: No. Risk: Normal.

Positioned well beyond the station platforms and with no other way of viewing, there will be minimal public awareness of Faversham PSB. This is regrettable, as this good example of a 1950s functional building is representative for a specific era of investment in railway infrastructure.

A.2.49 Freemans Signal Box

Figure A.49: Freemans Signal Box. (Author 2019)

Administrative location: Northumberland, England. Constraints: Reasonable. Design: BR(NER) 16b. Built: 1956. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows seemingly matching original glazing pattern), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: Difficult. Risk: High.

Being next to a level crossing strengthens public awareness of this signal box that is, otherwise, potentially viewed as an example of the typically utilitarian designs from the construction era. The modifications are sensitive to the original design and therefore only slightly degrade the appearance which, coupled with the good condition, presents a positive heritage value.

A.2.50 Frome Mineral Junction Signal Box

Figure A.50: Frome Mineral Junction Signal Box as relocated to the Great Western Society at Didcot. (Author 2016)

Administrative location: Oxfordshire, England. Constraints: Close. Design: GWR 2. Built: 1875/1990s. Listing: n/a. Status: Use HR. Future/use: Museum and heritage operational. Heritage value: Modified (modern brickwork plinth, replacement timber staircase), communal (museum location). Overall condition: Good. Reuse potential: None. Relocatable: None, relocated 1990s. Risk: Normal.

One of the two relocated heritage signal boxes at this heritage railway centre, this displays the signal box in a late 19th Century condition, albeit with what is obvious modern brickwork for the reconstructed locking room plinth under the relocated operating room superstructure.

Relocation of this signal box was after the other signal box on site, Radstock North Signal Box, and there is a noticeable difference in the brickwork quality between the two signal boxes.

A.2.51 Garsdale Signal Box

Figure A.51a: Garsdale Signal Box. (Author 2016)

Administrative location: Cumbria, England. Constraints: Close. Design: Midland 4c. Built: 1910. Listing: II. Status: Use ML. Future/use: Medium term. Heritage value: Modified (replacement timber staircase), historical (Ais Gill Disaster 1910). Overall condition: Deficient, significant movement controlled by piles to rear. Reuse potential: Accessible. Relocatable: Yes. Risk: Weather.

Section 4.4 outlines the almost Gothic melodrama, occurring on the dark and stormy night of Christmas Eve 1910, that defines the historical heritage value of Garsdale Signal Box. This timber structure contrasts with the dour solidity of the stone station buildings, a surprisingly attractive contrast even if the signal box feels fragile in such an exposed location. Noted is the significant lean backwards of the structure, a quite common defect attributable to the weight of the frame. The platform location will provide some public awareness, although overwhelmingly the principal heritage value is the history.

Figure A.51b: Piles and beams to prevent further structural movement of Garsdale Signal Box. (Author 2016)

A.2.52 Hale Signal Box

Figure A.52: Hale Signal Box. (Author 2018)

Administrative location: Trafford, England. Constraints: Close. Design: S&F [CLC]. Built: c1875. Listing: II [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.

Next to a level crossing should provide public awareness of Hale Signal Box, although the strong integration within the attractive station building will diminish the distinctiveness associated with awareness.

A.2.53 Haltwhistle (NER) Signal Box

Figure A.53: Haltwhistle (NER) Signal Box. (Author 2015)

Administrative location: Northumberland, England. Constraints: Close. Design: NER bespoke. Built: Late 19th C. Listing: II. Status: OOU ML. Future use: Mothballed. Heritage value: Modified (replacement timber staircase), aesthetic, communal (station location). Overall condition: Good. Reuse potential: Poor. Relocatable: No. Risk: Normal.

Positioning of this imposing and elegant structure with high aesthetic appeal was between the main line, still extant, and lines serving the erstwhile branch line to Alston, with the height enabling a view of trains approaching from three directions. Closure of the branch line allowed modification of the staircase to better align with modern building regulations, the change in direction near ground level being impossible until removal of the branch line.

A.2.54 Haltwhistle Signal Box

Figure A.54: Haltwhistle Signal Box. (Author 2015)

Administrative location: Northumberland, England. Constraints: Reasonable. Design: Portable building. Built: 2009. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Original. Overall condition: Deficient. Reuse potential: Accessible. Relocatable: Yes. Risk: Normal.

As a replacement for the NER structure, in terms of visual appeal Haltwhistle Signal Box is the anthesis of its elegant forebear. Easily overlooked and thereby noted as having no heritage value, at some point it will be necessary to preserve a late 20th to early 21st Century prefabricated building as an example of the era in the same way as the listing of surviving Nissen huts or Second World War prefabricated houses.

A.2.55 Harrogate Signal Box

Figure A.55: Harrogate Signal Box. (Author 2019)

Administrative location: North Yorkshire, England. Constraints: Reasonable. Design: LNER 15+. Built: 1947. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

That Harrogate Signal Box is visible from a platform location and a footpath behind will provide a modicum of public awareness. Aesthetically is would be easy to dismiss this as another dreary, and modified, design from the era, yet there are details that reflect the prestige of the spa town location, most noticeably with the Harrogate town emblem on some of the original cast iron drainpipes.

A.2.56 Haslemere Signal Box

Figure A.56: Haslemere Signal Box. (Author 2018)

Administrative location: Surrey, England. Constraints: Close. Design: LSWR 4. Built: 1895. Listing: II [GV]. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows, replacement timber staircase), communal (station location). Overall condition: Good. Reuse potential: Accessible. Relocatable: None. Risk: Normal.

The platform location will provide a modicum of public awareness and the modifications are sensitive to the original design, so the overall effect contributes to the heritage value of Haslemere Railway Station.

A.2.57 Hastings Signal Box

Administrative location: East Sussex, England. Constraints: Close. Design: SR 12. Built: 1930. Listing: n/a. Status: Use ML. Future/use: Long term. Heritage value: Degraded (replacement uPVC windows, replacement staircase toilet extension), communal (station location). Overall condition: Fair. Reuse potential: Poor. Relocatable: None. Risk: Weather.

Figure A.57: Hastings Signal Box. (Author 2017)

Visible from the platforms will provide a modicum of public awareness for Hastings Signal Box. However, the obvious degraded heritage value and overall condition will do little to endear this building to observers.

A.2.58 Havant Junction East Signal Box


Figure A.58: Havant Junction East Signal Box. (Author 2018)

Administrative location: Hampshire, England. Constraints: Close. Design: S&F 5 [LBSCR]. Built: 1876. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Original as extended (possibly with internal staircase) to original design upon rebuilding of Havant station 1937-8 (Reeve and Hawkins 1980, p66), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.

Being next to a level crossing strengthens public awareness of Havant Junction East Signal Box. Viewed in terms of building morphology, other than a flat roof rear extension the Southern Railway were unusually sensitive to the original design when extending the signal box, with Reeve & Hawkins (*ibid*) commenting that, "the Southern copied the old 'Brighton' design implicitly".

A.2.59 Hebden Bridge Signal Box

Figure A.59: Hebden Bridge Signal Box. (Author 2018)

Administrative location: West Yorkshire, England. Constraints: Close. Design: LYR. Built: 1891. Listing: II [GV]. Status: Use ML. Future/use: Short term. Since closed (2018). Heritage value: Modified (replacement *uPVC windows, replacement steel staircase), communal (station location, community involvement). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal.*

Visible from an opposite platform and next to a lane behind will provide a modicum of public awareness, along with local public interest in conserving the now closed Hebden Bridge Signal Box. This is another example where an attractive design, despite modified heritage value, in a picturesque station setting creates a pleasing synergy.

A.2.60 Heckington Signal Box

Figure A.60: Heckington Signal Box. (Author 2015)

Administrative location: Lincolnshire, England. Constraints: Close. Design: GNR 1. Built: 187A. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement steel staircase), communal (level crossing, proximity to grade I listed building). Overall condition: Good. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal.

That this grade II listed building is next to a grade I listed windmill in station environment retaining much of the original character within an attractive village location potentially makes this an idealised version of conservation. Users of the station and passing public will be aware of the signal box. The modifications are discrete, although the replacement signal post is uncompromisingly modern.

A.2.61 Henwick Signal Box

Figure A.61: Henwick Signal Box. (Author 2017)

Administrative location: Worcestershire, England. Constraints: Close. Design: McK&H 1 [GWR]. Built: c1875. Listing: n/a. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: None. Risk: Deliberate.

Next to a level crossing will strengthen public awareness of Henwick Signal Box, although the overall location will make this communal appeal marginal. Furthermore, even though there is little detracting from the heritage value and the building is in a good condition, the context leaves a marginal impression.

A.2.62 Hereford Signal Box

Figure A.62: Hereford Signal Box. (Author 2016)

Administrative location: Herefordshire, England. Constraints: Close. Design: LNWR/GWR Joint 2. Built: 1884. Listing: n/a. Status: Use ML. Future/use: Partial, short/long term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (public location). Overall condition: Fair, structural movement. Reuse potential: Accessible. Relocatable: No. Risk: Normal. Comment: Conversation.

Reflecting the original joint ownership of the railway through Hereford, Hereford Signal Box is a hybrid design for the two railway companies. However, it is unlikely that most members of the public observing this signal box from the station car park or adjacent road bridge will be aware of this subtlety.

A.2.63 Holyhead Signal Box

Administrative location: Isle of Anglesey, Wales. Constraints: Distant. Design: LMS 11c. Built: 1937. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC cladding to *superstructure, replacement uPVC windows, replacement steel staircase). Overall condition: Good. Reuse potential: Poor. Relocatable: No. Risk: Weather.*

Figure A.63: Holyhead Signal Box. (Author 2016)

Remote from public areas and displaying a degraded external condition in terms of heritage values, it is difficult to make an effective conservation case for Holyhead Signal Box.

A.2.64 Horsham Signal Box

Administrative location: West Sussex, England. Constraints: Close. Design: SR 13. Built: 1938. Listing: II. Status: OOU ML. Future/use: Offices. Heritage value: Original, communal (relatively unmodified railway environment). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

Not a conventionally understood communal environment, yet the railway environment for Horsham Signal Box, redeveloped in conjunction with the also listed International Modernist railway station, provides a rare example of a railway environment unchanged other than removal of a steam locomotive depot behind the signal box (Reeves *et al* 2020, p244).

Figure A.64: Horsham Signal Box. (Author 2016)

A.2.65 Hubberts Bridge Signal Box

Figure A.65: Hubberts Bridge Signal Box. (Author 2015)

Administrative location: Lincolnshire, England. Constraints: Close. Design: BR(ER) n/s. Built: 1961. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC cladding and entrance door), aesthetic (unique 1960s design), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Unapologetically Modernist, this bespoke building is an anomaly. The location is bleak, controlling a level crossing at a crossroads where the railway runs through dreary fenland countryside between a main road and a drain river. There seems to be no reason to have a bespoke design at this location, yet despite a lack of reason, the structure exists and is possibly more attractive than most observers would admit.

A.2.66 Kings Lynn Junction Signal Box

Figure A.66: Kings Lynn Junction Signal Box. (Author 2016)

Administrative location: Norfolk, England. Constraints: Close. Design: GER 2. Built: c1880. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, *replacement timber staircase). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.*

Conventionally being next to a level crossing strengthens public awareness of a signal box, yet Kings Lynn Junction Signal Box presents as a large, obviously railway building with hard to identify heritage value looming over a supermarket car park. In effect, this is a building with some heritage merit that feels out of context.

A.2.67 Kingussie Signal Box

Figure A.67: Kingussie Signal Box. (Author 2018)

Administrative location: Highland, Scotland. Constraints: Close. Design: McK&H 3 [Highland]. Built: Unknown. Listing: B [G]. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement steel staircase, extended), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: Yes. Risk: Weather.

Next to a level crossing and access to one of the station platforms, there will be considerable public awareness of Kingussie Signal Box. The toilet block extension is slightly awkward, and thereby detracts from the heritage value, yet the design matches the main building design style and is thereby an effective part of the building narrative.

A.2.68 Kirkconnel Signal Box

Figure A.68: Kirkconnel Signal Box. (Author 2015)

Administrative location: Dumfries & Galloway, Scotland. Constraints: Distant. Design: GSWR 7. Built: 1911. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Degraded (utilitarian extension, replacement uPVC windows, replacement steel staircase). Overall condition: Fair. Reuse potential: Poor. Relocatable: No. Risk: Normal.

Somewhere inside the mixture of uPVC and degraded timber cladding, plus inside an extension, is the original and believed to be attractive building. While it would be easy to dismiss the hodgepodge modern result, these changes are utterly functional and therefore an intrinsic part of the functional building ethos.

A.2.69 Knaresborough Signal Box

Administrative location: North Yorkshire, England. Constraints: Close. Design: NER bespoke. Built: c1873. Listing: II. Status: Use ML.

Future/use: Short term. Heritage value: Modified (replacement timber staircase), aesthetics (unusual end of terrace design), communal (public location). Overall condition: Good. Reuse potential: Good. Relocatable: No. Risk: Normal.

Figure A.69: Knaresborough Signal Box. (Author 2017)

Despite being in a very public location, along with a sense of spectacle from being next to the viaduct over the River Nidd, the end of terrace morphology of Knaresborough Signal Box means it will be remarkably easy for a casual observer to be unaware of the building function. The accessible location with views over the River Nidd suggests potential for an imaginative reuse.

A.2.70 Lincoln High Street Signal Box

Administrative location: Lincolnshire, England. Constraints: Reasonable. Design: GNR 1. Built: 1874. Listing: II. Status: OOU ML.

Future/use: Mothballed. Heritage value: Modified (replacement steel and timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.

Figure A.70: Lincoln High Street Signal Box. (Author 2015)

As befits the 'engineer's vernacular', construction of this signal box is in a standard design, other than an extension added in 1925, although unusually in London stock bricks rather than the Fletton bricks more usually used for masonry signal box construction. The list entry notes the very public location.

A.2.71 Liskeard Signal Box

Administrative location: Cornwall, England. Constraints: Reasonable. Design: GWR 27c. Built: 1915. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows), possible communal (visible location). Overall condition: Fair. Reuse potential: Poor. Relocatable: Yes. Risk: Possible deliberate.

Visible from publicly accessible areas across the railway provides a modicum of public awareness for Liskeard Signal Box. As an unlisted building, that the replacement uPVC windows are to the original window pattern shows sympathetic treatment of the building.

Figure A.71: Liskeard Signal Box. (Author 2018)

A.2.72 Littlehampton Signal Box

Figure A.72: Littlehampton Signal Box. (Author 2016)

Administrative location: West Sussex, England. Constraints: Close. Design: LBSCR 2a. Built: 1886. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Original (staircase seems modified, nominally to original design), communal (public location). Overall condition: Deficient, timber superstructure in poor condition. Reuse potential: Accessible. Relocatable: Difficult. Risk: High.

Next to a road and visible from across the railway makes for some public perception of Littlehampton Signal Box. There are elements of heritage originality, and the quaint decorative valancing characteristic of the LBSCR 2a design will appeal for those seeking ornate Victorian decorative style. More pragmatic observers will note how the addition of services devalues the front elevation despite other efforts to maintain heritage detailing.

A.2.73 Liverpool Lime Street Signal Box

Figure A.73: Liverpool Lime Street Signal Box. (Author 2016)

Administrative location: Liverpool, England. Constraints: Close. Design: LMS 13. Built: 1948. Listing: II [GV]. Status: Use ML. Future/use: Short term, since closed (2018). Heritage value: Modified (some replacement *uPVC windows). Overall condition: Fair. Reuse potential: Poor. Relocatable: No. Risk: Normal. Comment: Conversation.*

While not specifically mentioned in the listing, Liverpool Lime Street Signal Box comes within the curtilage of the grade II listed station and within the buffer zone for the Liverpool World Heritage Site. The design is a relatively rare late 1940's design, started by the LMS and completed by BR, that bears comparison with the other surveyed LMS 'austerity' designs from the era at Runcorn and Thornhill.

A.2.74 Llandudno Junction Signal Box

Figure A.74: Llandudno Junction Signal Box. (Author 2016)

Administrative location: Conwy, Wales. Constraints: Distant. Design: BR(LMR) 15. Built: 1985. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (lower half of box built 1980 with superstructure assembled from second-hand sections). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal.

Postdating Uttoxeter Signal Box, constructed in 1981 and considered the last mechanical signal box (Kay 2010, p108), Llandudno Junction

Signal Box is an interesting hybrid made up of relocated operating level on a new locking room standing in front of the since demolished original LNWR 4. With limited opportunity for public observation, the main heritage value is the hybrid nature of this partially relocated building.

A.2.75 Llanelli West Signal Box

Figure A.75a: Llanelli West Signal Box. (Author 2018)

Administrative location: Carmarthenshire, Wales. Constraints: Close. Design: GWR 2. Built: 1877. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (replacement steel staircase), communal (level crossing, local interest including MP). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Deliberate. Comment: Conversation.

Besides the public awareness from the closed Llanelli West Signal Box being adjacent to a level crossing, there is acknowledged public interest, apparently including from the constituency MP, in conservation of the building. One interesting feature is the chamfered plan at the east end of the building, built to accommodate a since removed siding serving industrial premises that once stood to the southwest of the railway (Tilt 2020, pp215-6).

Figure A.75b: South elevation of Llanelli West Signal Box, showing chamfer at east end. (Author 2018)

A.2.76 Llanrwst Signal Box

Administrative location: Conwy, Wales. Constraints: Distant. Design: LNWR 4. Built: 1880. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC cladding to superstructure, replacement uPVC windows, replacement steel staircase). Overall condition: Fair. Reuse potential: Poor. Relocatable: Partially. Risk: Normal.

Originally Llanrwst North Signal Box, Llanrwst Signal Box shows minimal substantive heritage value or potential for public awareness despite the location of Llanrwst close to the Snowdonia National Park. This building is another building analogous to Kirkconnel Signal Box, as somewhere inside the uPVC is the original building carrying out the same function and displaying a strong narrative of functional building ethos.

Figure A.76: Llanrwst Signal Box. (Author 2017)

A.2.77 Lostwithiel Signal Box

Administrative location: Cornwall, England. Constraints: Close. Design: GWR 5. Built: 1893. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, possibly replacement timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Being both next to a level crossing and access to one of the station platforms, there will be considerable public awareness of Lostwithiel Signal Box. In a comparable manner to Liskeard Signal Box, replacement uPVC windows to the original window pattern shows sympathetic treatment of this building.

Figure A.77: Lostwithiel Signal Box. (Author 2018)

A.2.78 Lydney Junction (Heysham Harbour) Signal Box

Figure A.78: Lydney Junction (Heysham Harbour) Signal Box. (Author 2017)

Administrative location: Gloucestershire, England. Constraints: Close. Design: BR(LMR) 15. Built: 1970/1996. Listing: n/a. Status: Use HR.

Future/use: Heritage operational. Heritage value: Modified (replacement steel staircase), communal (level crossing). Overall condition: Good. Reuse potential: None. Relocatable: None, relocated 1996. Risk: Deliberate.

Next to a level crossing strengthens public awareness of this signal box, and it forms an integral part of the heritage railway operations. Relocation to a different regional area, from London Midland Region to Western Region, invites criticism that this relocation doubly goes against the spirit of building conservation. However, Magdalen Road Signal Box is a 1920s precedent, and it is difficult to identify a case for a heritage railway also not making use of this precedent if the signal box has a viable use in the original function.

A.2.79 Magdalen Road Signal Box

Figure A.79: Magdalen Road [Watlington] Signal Box. (Author 2016)

Administrative location: Norfolk, England. Constraints: Close. Design: GCR 5. Built: unknown/1927. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (level crossing). Overall *condition: Deficient. Reuse potential: Accessible. Relocatable: Yes, previously relocated by LNER. Risk: Deliberate. Comment: Conversation.*

Magdalen Road Signal Box is the oldest extant relocated signal box, being a Great Central Railway design now positioned on Great Eastern Railway territory and thereby an exemplar for relocation of a signal box away from the original geographical area. Besides this anomaly of relocation, positioned next to a level crossing and access to a station platform means that there will be considerable public awareness of this signal box.

A.2.80 Maiden Newton Signal Box

Figure A.80: Maiden Newton Signal Box. (Author 2016)

Administrative location: Dorset, England. Constraints: Close. Design: GWR 7d. Built: 1921. Listing: II [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, communal (group value with station). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate. Comment: Conversation.

Treated by the local planning department as within the curtilage, and thereby one of the 'subsidiary buildings' of the listed railway station, the location of Maiden Newton Signal Box by the public foot crossing means that there will be a reasonable awareness of this building within the attractive station setting. Maiden Newton was, until 1975, a junction station for a branch line, the closure post-dating the main Beeching closures so attracting more publicity.

A.2.81 March East Junction Signal Box

Figure A.81a: March East Junction Signal Box. (Author 2018)

Administrative location: Cambridgeshire, England. Constraints: Reasonable. Design: GER 6 [S&F]. Built: 1885. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC windows, replacement timber staircase, toilet block extension), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Tall, imposing, and next to a busy level crossing suggests potential for considerable public awareness of March East Junction Signal Box. Although strictly applying the heritage value shows as degraded, the sympathetic treatment of the replacement uPVC windows and replacement staircase in a layout matching the original have only a marginal impact on heritage value, with the high-level rear toilet block extension being the only modification that detracts from the heritage value.

Figure A.81b: Rear elevation of March East Junction Signal Box, showing high-level toilet block extension and supporting structure. (Author 2018)

A.2.82 March South Junction Signal Box

Administrative location: Cambridgeshire, England. Constraints: Reasonable. Design: LNER 11a. Built: 1927. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Adjacent to a level crossing strengthens public awareness of March South Signal Box, although compared with the more imposing March East Junction neighbour, the more modest building dimensions and less busy road crossing the level crossing means this signal box will always be the forgotten neighbour. However, there is a modicum of heritage value in the rare survivor for this design.

Figure A.82: March South Junction Signal Box. (Author 2018)

A.2.83 Marcheys House Signal Box

Figure A.83: Marcheys House Signal Box. (Author 2019)

Administrative location: Northumberland, England. Constraints: Close. Design: NER N2+. Built: 1895. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, *replacement galvanised steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Difficult. Risk: High.*

Adjacent to a level crossing will give some public awareness of Marcheys House Signal Box, although taking together the modified heritage value and overall building condition means the public perception may lead to recognition more than appreciation.

A.2.84 Merrygill Signal Box

Figure A.84: Merrygill Signal Box. (Author 2017)

Administrative location: Cumbria, England. Constraints: Close. Design: NER, design unknown and assumed to S4. Built: 1925? Listing: n/a. Status: OOU IS. Future/use: Remnants. Heritage value: Degraded (missing everything other than parts of plinth and some equipment), communal (preserved as remnant on public footpath along former trackbed). Overall condition: Remnants. Reuse potential: None. Relocatable: None. Risk: Normal.

These surviving remnants of Merrygill Signal Box are inevitably going to be of more interest to an industrial archaeologist than building conservationist. There is an information display by these remnants to inform people using the footpath that now occupies the former railway.

A.2.85 Montrose North Signal Box

Figure A.85: Montrose North Signal Box. (Author 2016)

Administrative location: Angus, Scotland. Constraints: Close. Design: NBR 1. Built: 1881. Listing: C. Status: Use ML. Future/use: Medium term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase). Overall condition: Fair. Reuse potential: Poor. Relocatable: No. Risk: High.

Besides the obvious modifications, use of masonry paint on Montrose North Signal Box presents that same mixed success noted for Dunkeld & Birnam Signal Box, a well-maintained appearance while potentially distorting conservation values. Public perception for Montrose North Signal Box will mostly be from the main road next to the railway.

A.2.86 Morpeth PSB

Administrative location: Northumberland, England. Constraints: Reasonable. Design: BR(ER) 20. Built: 1978. Listing: n/a. Status: Use

ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: None. Risk: Deliberate.

Figure A.86: Morpeth PSB. (Author 2015)

Representing the last iteration of British Rail (Eastern Region) designs, only a few of the BR(ER) 20 design were constructed for resignalling schemes outside the remit of larger area signalling centres. As these lines are now under the control of the new regional operating centres, most BR(ER) 20s are redundant, with the main purpose of those that survive to provide local supervision of level crossings.

A.2.87 Nairn East Signal Box

Administrative location: Highland, Scotland. Constraints: Reasonable. Design: McK&H 3 [Highland]. Built: 1891. Listing: B [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original. Overall condition: Good. Reuse potential: Accessible. Relocatable: Yes. Risk: Normal. Comments: Heritage value enhanced as surviving Highland 'pair'.

Figure A.87: Nairn East Signal Box. (Author 2018)

Unlike most main line railways, the Highland Railway was extensively single track with longer than normal passing loops, so the railway had an unusual method of signalling, with boxes at each end of the passing loop to control points and signals, with the communication instruments in the main station building, the porter signaller moving between the signal boxes as required (Nock 1973, p128). Nairn East and West are amongst the last surviving examples of this peculiar Highland Railway signalling installation.

A.2.88 Nairn West Signal Box

Administrative location: Highland, Scotland. Constraints: Distant. Design: McK&H 3 [Highland]. Built: 1891. Listing: B [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original. Overall condition: Good. Reuse potential: Accessible. Relocatable: Yes. Risk: Normal. Comments: Heritage value enhanced as surviving Highland 'pair'

Less accessible than its counterpart means it is hard to recognise the significance of Nairn West Signal Box being part of a Highland ‘pair’.

Figure A.88: Nairn West Signal Box. (Author 2018)

A.2.89 Newhaven Harbour Signal Box

Figure A.89: Newhaven Harbour Signal Box. (Author 2016)

Administrative location: East Sussex, England. Constraints: Close. Design: S&F 5 [LBSCR]. Built: 1886. Listing: n/a. Status: Use ML. Future/use: Short term, since demolished (2020). Heritage value:

Modified (replacement uPVC windows, replacement timber staircase). Overall condition: Fair. Reuse potential: Poor. Relocatable: Partially. Risk: Weather.

Located within a partially controlled area, Newhaven Harbour Signal Box had minimal public observation and conservation value will depend upon any intrinsic heritage value of the building. The most obvious heritage value is a tangible link with the now obsolete traditional of 'boat trains' (Simmons & Biddle 2000, p36), although the link is tenuous.

A.2.90 Newhaven Town Signal Box

Figure A.90: Newhaven Town Signal Box. (Author 2016)

Administrative location: East Sussex, England. Constraints: Close. Design: S&F 5 [LBSCR]. Built: 1879. Listing: n/a. Status: Use ML. Future/use: Short term, since demolished (2020). Heritage value: Modified (brick extension to rear, replacement timber staircase), communal (level crossing). Overall condition: Deficient, structural movement. Reuse potential: Accessible. Relocatable: Partially. Risk: High.

Being next to a level crossing strengthened public awareness of Newhaven Town Signal Box. With minimal maintenance pending closure, demolition was inevitable as the main body of the signal box appears to be structurally deficient and a tentative analysis suggests that the brick-built toilet block extension to the rear elevation was effectively propping up the main building.

A.2.91 Newsham Signal Box

Figure A.91: Newsham Signal Box. (Author 2019)

Administrative location: Northumberland, England. Constraints: Reasonable. Design: NER N1. Built: Unknown. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC windows, replacement galvanised steel, uPVC clad toilet block extension), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: High.

Adjacent to a level crossing strengthens public awareness of Newsham Signal Box. However, the location and degraded heritage value of the building does not support any significant heritage recognition.

A.2.92 North Seaton Signal Box

Figure A.92a: North Seaton Signal Box. (Author 2019)

Figure A.92b: Roof detail for North Seaton Signal Box, retaining the diamond slate detailing redolent of original detailing despite the otherwise substantial evidential degrading. (Author 2019)

Administrative location: Northumberland, England. Constraints: Reasonable. Design: NER N/S+. Built: 1872, unconfirmed. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Degraded (replacement uPVC windows, timber superstructure overclad with replacement uPVC, replacement galvanised steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Difficult. Risk: High.

Being next to a level crossing strengthens public awareness of this North Seaton Signal Box. In many ways, this building is analogous to

Kirkconnel Signal Box, as somewhere inside this mixture of uPVC is the original building carrying out the same function and displaying a strong narrative of functional building ethos. One, almost charming, anomaly in this uncompromising updating is the slate roof finish preserving the original diamond slate detailing.

A.2.93 Par Signal Box

Figure A.93: Par Signal Box. (Author 2018)

Administrative location: Cornwall, England. Constraints: Close. Design: GWR 2. Built: c1879. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (station location). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

The end of platform location will provide marginal public awareness for Par Signal Box, enhanced as very visible looking west from where passengers will congregate. This is another signal box where replacement uPVC windows to the original window pattern shows sympathetic treatment of the building.

A.2.94 Parbold Signal Box

Figure A.94: Parbold Signal Box. (Author 2018)

Administrative location: Lancashire, England. Constraints: Close. Design: S&F [LYR]. Built: 1877. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal.

Adjacent to a level crossing and the station strengthens public awareness of the attractive, minimally modified, Parbold Signal Box. Parbold is a typical example of a substantially changed railway environment, with the former goods yard now a housing estate, yet the signal box continues to assert a narrative.

A.2.95 Penmaenmawr Signal Box

Administrative location: Conwy, Wales. Constraints: Close. Design: BR(LMR) 14. Built: 1952. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC and profiled sheet infill windows), historical (replaced original signal box implicated *in fatal accident). Overall condition: Fair (structural movement). Reuse potential: Accessible. Relocatable: No. Risk: Weather.*

Figure A.95: Penmaenmawr Signal Box. (Author 2017)

Strongest public perception of Penmaenmawr Signal Box will be from the adjacent road, although most likely this is another easy to overlook 1950s building with, in this case, structural problems. The design is rare and driving the reason for construction was a fatal accident that had similarities with the Ais Gill Disaster associated with Garsdale Signal Box (Wilson 1951, pp12-3).

A.2.96 Perth Down Centre Signal Box

Administrative location: Perth & Kinross, Scotland. Constraints: Close. Design: Caledonian bespoke. Built: 1886. Listing: B [G]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, communal (station location). Overall condition: Good. Reuse potential: Good. Relocatable: No. Risk: Normal. Comment: Conversation.

The closed Perth Down Centre Signal Box once served a similar function to Carlisle No 4 or York Platform, being one of several mechanical signal boxes controlling trains at this busy location, and it is equally unlikely that casual observers will recognise that this attractive structure integral to Perth Railway Station was once a signal box.

Figure A.96: Perth Down Centre Signal Box. (Author 2018)

A.2.97 Petersfield Signal Box

Administrative location: Hampshire, England. Constraints: Reasonable. Design: LSWR 3a. Built: 1880s. Listing: II [GV]. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows, replacement timber staircase), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

In making the case for listing, Minnis (2012, p20) describes Petersfield Signal Box as a particularly striking and well-preserved example of a design hitherto not presented by listing. Nevertheless, in 2020 the custodians, Network Rail, were in pre-application discussion with South Downs National Park and East Hampshire council concerning complete demolition for a new level crossing pedestal base (Private Eye 2020, p23), with Network Rail counterintuitively justifying complete demolition to prevent vandalism (*ibid*). Paradoxically, being next to the level crossing in contention strengthens public awareness of this signal box.

Figure A.97: Petersfield Signal Box. (Author 2018)

A.2.98 Pitlochry Signal Box

Administrative location: Perth & Kinross, Scotland. Constraints: Close. Design: Highland. Built: 1911. Listing: A [G]. Status: Use ML. Future/use: Short term. Heritage value: Degraded (partially replacement uPVC windows, replacement steel staircase, extended), communal (station location). Overall condition: Good. Reuse potential: Accessible. Relocatable: Yes. Risk: Weather.

This signal box is an enigma. Individually the modifications reduce the heritage value, plus the toilet block extension is, in the same way as Kingussie Signal Box, slightly awkward. Taken together, this detracts from the heritage value even if the extension design matches the main building design style and is thereby an effective part of the building narrative. Yet the signal box forms a group with the Grade A listed station as integrated railway environment.

Figure A.98: Pitlochry Signal Box. (Author 2018)

A.2.99 Plumpton Signal Box

Figure A.99: Plumpton Signal Box. (Author 2016)

Administrative location: East Sussex, England. Constraints: Close. Design: LBSCR 2b. Built: 1891. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (replacement timber staircase), communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: Difficult. Risk: Normal.

Besides being next to a level crossing strengthening public awareness of this signal box, there is considerable evidence that the arrangements for this level crossing were the subject of intense public scrutiny (Topham 2013). Plumpton Railway Station, in Plumpton Green rather Plumpton itself, is adjacent to Plumpton Racecourse.

A.2.100 Portsmouth Harbour Signal Box

Administrative location: Portsmouth, England. Constraints: Close. Design: SR 13. Built: 1946. Listing: n/a. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, communal (street presence). Overall condition: Good. Reuse potential: Good, street level apparent conversion to (unlet) retail units. Relocatable: No. Risk: High.

Figure A.100a: Portsmouth Harbour Signal Box. (Author 2016)

Figure A.100b: Street level view of Portsmouth Harbour Signal Box, showing voids with potential for retail use. (Author 2016)

Presumably after modifications to the railway station track layout, Portsmouth Harbour Signal Box is slightly remote from the railway and presents a limited public perception at track level. However, the viaduct location of this station means that the street level elevation of this signal box has recognised potential for reuse as retail units.

A.2.101 Princes Risborough North Signal Box

Administrative location: Buckinghamshire, England. Constraints: Close. Design: GWR 7b. Built: 1905. Listing: II. Status: HR. Future/use: Heritage operational. Heritage value: Modified (replacement timber staircase to original design), communal (station location). Overall condition: Fair, under restoration. Reuse potential: None. Relocatable: None. Risk: Deliberate. Comment: Conversation.

Although slightly remote from the station, Princes Risborough North Signal Box is enough of a visibly imposing structure to unmistakably present as heritage railway infrastructure. In the custodianship of a heritage railway since 2013, for users of this heritage railway the building will be part of the heritage ambiance that forms an essential part of the visit.

Figure A.101a: Princes Risborough North Signal Box. (Author 2018)

Figure A.101b: Context of Princes Risborough North Signal Box, seen from the main line railway station with the heritage railway running behind the signal box. (Author 2018)

The taxonomy survey included a discussion, summary as follows, with a volunteer director from the heritage railway society who is, with a background in railway signalling, responsible for extension of the railway and renovation of the signal box.

While it is good to preserve one of the larger GWR boxes, indeed this is now the largest surviving GWR signal box, the main aim is to preserve the railway, with the signal box being ancillary to the main aim. The team working to restore this signal box are therefore part of the signalling working group. Railway preservation is both conservation and interpretation, with a need to balance revenue and conservation. If running this heritage railway in the same way as when the railway was open in former main line use, there would be no Sunday trains. However, Sunday is the busiest day of a heritage railway week.

It is important to be aware that a signal box as a building is a tool for the signalling equipment and located very specifically for that purpose, in this case because of the junction and not the station. The locking and lever frame date from a 1958 refurbishment of the signal box, although shortened in 1968 with the operating floor sub-divided at the same time, and the idea is to use one end to control the operational railway and reinstate the division, using a window and door frame from another signal box, to allow use of the other end for public demonstration. To allow public access will need separate public access and fire escape as the GWR layout is not Part B compliant. This will need conservation and building control permission, although if consent is not forthcoming this idea is not crucial as the railway does not depend upon the public using the signal box for revenue. The railway has landlord consent to seek listed building consent and there is a precedent, in the now demolished Banbury South Signal Box, for having an internal staircase.

Use of the signal box is part of the narrative and therefore, in the same way that past modifications became part of a narrative, the current modifications are equally part of the narrative, serving to preserve the building character. This is important for Princes Risborough North Signal Box as this GWR signal box design is *less modular and more scalable, which is what makes it architecturally significant.*

Another signal box on the railway was originally relocated to a garden after becoming redundant on the main line, so after relocation to the railway needed a lot of work to fit into the overall style of the station where it now is positioned. Relocation is a way to save buildings from destruction and, if listed, financial support is a possibility, as happened with the relocation of Oxford Rewley Road station building to the Buckinghamshire Railway Centre.

For the same price it is often easier to build something new, except that politics can get in the way and there is a realisation that, 'we do the best with what we have or there would be nothing'. When the society moved into the signal box, they found timber framing was either missing or a lot of the remaining timber was rotten. As Network Rail place a higher priority on keeping trains running than listed buildings, there was a fear that any structural movement compromising safe working of the trains would entail immediate demolition with paperwork to follow.

Figure A.101c: Movement prevention and monitoring using tension wire and tell-tale ruler with laser spot, Princes Risborough North Signal Box. (Author 2018)

Figure A.101d: Rotten timber frame sections used as a pattern for fabrication of replacement timber frame sections, Princes Risborough North Signal Box. (Author 2018)

To ensure the roof would not move, the society put two steel sections behind the fascia and a tension wire can keep movement in check. This solved the immediate structural risk and retention of the wire, along with a means to watch for movement, protects against any consequential movement during other works. The most important feature of a signal box *are the windows, and with a large amount of rotten timber to replace took some pragmatic solutions for the problems met.*

The chimneys were another problem. Capping of the south chimney occurred in the 1970s and rebuilt in the 1990s. In 2017 the north chimney needed stabilising to avoid collapse, and there was a conscious decision to keep a pre-existing lean for authenticity.

Figure A.101e: Chimney rebuilt with pre-existing lean for authenticity, Princes Risborough North Signal Box. (Author 2018)

A.2.102 Pulborough Signal Box

Administrative location: West Sussex, England. Constraints: Close. Design: S&F 5 [LBSCR]. Built: 1878. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (porch/toilet added before 1930s, replacement staircase). Overall condition: Fair. Reuse potential: Poor. Relocatable: Difficult. Risk: Normal.

Figure A.102a: Pulborough Signal Box. (Author 2016)

Slightly set back from one of the station platforms after removal of the bay platform[30] following closure of the Midhurst Branch Line in 1955 and removal of the goods yard (Cobb 2005, p62), the pretty, other than the insensitive additional porch, Pulborough Signal Box is slightly remote from direct public awareness, although continues to have a group value with the attractive station.

[30] Subsidiary platform for holding local or branch trains clear of the main line.

Figure A.102b: Pulborough Signal Box. Seemingly taken in 1938 after electrification of the Arun Valley main line, this photo shows the original context, with goods yard and bay platform for Midhurst branch line. This photo provides evidence of the porch addition before 1938. (Photo unknown, used by permission of Adrian Vaughan Collection)

A.2.103 Radstock North Signal Box

Figure A.103: Radstock North Signal Box as relocated to the Great Western Society at Didcot. (Author 2016)

Administrative location: Oxfordshire, England. Constraints: Close. Design: GWR 27c. Built: 1909/1985. Listing: n/a. Status: Use HR. Future/use: Museum and heritage operational. Heritage value: Modified (modern brickwork plinth, timber staircase matches original), communal (museum location). Overall condition: Good. Reuse potential: None. Relocatable: None, relocated 1985. Risk: Normal.

Radstock North Signal Box is the other relocated heritage signal box at this heritage railway centre, in this case the signal box displayed in a middle 20th Century condition. For the visitor, this very well-presented display within a fascinating heritage site will evoke a keen sense of public awareness in the signal box, yet it is probable that the display presents an idealised version of the period. Furthermore, brickwork detailing for the reconstructed locking room shows notable differences compared with early 20th Century, although it is probable that most visitors will unaware of this subtlety.

A.2.104 Ramsbottom Signal Box

Figure A.104: Ramsbottom Signal Box. (Author 2018)

Administrative location: Bury, England. Constraints: Close. Design: LMS 11c. Built: 1938. Listing: n/a. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified (replacement steel staircase with timber treads), communal (level crossing). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Possibly deliberate.

Being next to a level crossing strengthens public awareness of this signal box, augmented by a strong incentive for the heritage railway to present an attractive face in a very public place to enhance the narrative they are trying to present.

A.2.105 Rawtenstall West Signal Box

Figure A.105: Rawtenstall West Signal Box. (Author 2018)

Administrative location: Lancashire, England. Constraints: Close. Design: BR(LMR) 15. Built: 1957. Listing: n/a. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified (replacement steel staircase with timber treads), communal (level crossing). Overall condition: Fair. Reuse potential: None. Relocatable: None. Risk: Normal.

Being next to a level crossing strengthens public awareness of this signal box, although not as close to the railway station as Ramsbottom Signal Box so the distinctive 1950s style of Rawtenstall West Signal Box fulfils a strongly functional purpose rather than selling the heritage railway narrative.

A.2.106 Rhyl No 1 Signal Box

Figure A.106: Rhyl No 1 Signal Box. (Author 2016)

Administrative location: Denbighshire, Wales. Constraints: Close. Design: LNWR 4. Built: 1900. Listing: II. Status: Use ML. Future/use: Short term, since closed (2018). Heritage value: Modified (additional steel external ladder), communal (large building in public place). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Easternmost of the two signal boxes at Rhyl and latterly the only one in operation, Rhyl No 1 Signal Box is modestly sized for a LNWR 4 design. Visually remote from the main part of the railway station by a road overbridge, main public awareness will be from the rear, where it backs onto a car park.

A.2.107 Rhyl No 2 Signal Box

Figure A.107: Rhyl No 2 Signal Box. (Author 2016)

Administrative location: Denbighshire, Wales. Constraints: Close. Design: LNWR 4. Built: 1900. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (additional steel external ladder), communal (large building in public place). Overall condition: Derelict, station staff comment that the floors are, "gone through". Reuse potential: Accessible. Relocatable: No. Risk: Weather. Comment: Conversation.

Westernmost of the two signal boxes at Rhyl and out of use, Rhyl No 2 Signal Box is the more publicly visible, and thereby promoting public awareness, of the two signal boxes in Rhyl, being visible from the main part of the railway station and next to a public footpath. Although carefully mothballed, there is evidence that, besides the comments by station staff, that this large building presents a maintenance challenge.

A.2.108 Ruislip Signal Box

Administrative location: Hillingdon, England. Constraints: Reasonable. Design: Metropolitan 2. Built: 1904. Listing: II [G]. Status: OOU LR.

Future/use: Mothballed. Heritage value: Modified (apparently replaced timber staircase). Overall condition: Good. Reuse potential: Poor. Relocatable: Partially. Risk: Normal.

Figure A.108a: Ruislip Signal Box. (Author 2018)

Figure A.108b: London Underground context for Ruislip Signal Box. (Author 2018)

Carefully conserved yet presenting a strongly incongruous impression within the London Underground environment and rather out of an immediate public awareness.

A.2.109 Runcorn Signal Box

Figure A.109: Runcorn Signal Box. (Author 2018)

Administrative location: Halton, England. Constraints: Reasonable. Design: LMS 13. Built: 1940. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Degraded (replacement uPVC opening lights, replacement steel staircase, toilet block extension), communal (station location). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Seen from the station platform, there will a modicum of public awareness concerning Runcorn Signal Box. There may not be a strong appreciation, as it is not a pretty building, although that allows a visual tolerance for the modifications. As befits a building completed in 1940 to play a part in the 'war effort', the design is deliberately austere and the structure reinforced.

A.2.110 Rye Signal Box

Administrative location: East Sussex, England. Constraints: Reasonable. Design: S&F 12a. Built: 1894. Listing: II [GV]. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement *timber staircase), communal (station location). Overall condition: Fair. Reuse potential: Accessible. Relocatable: None. Risk: Normal.*

Figure A.110 Rye Signal Box. (Author 2018)

Being directly opposite the main station building and one of the platforms ensures a strong public awareness of this well conserved building.

A.2.111 St Bees Signal Box

Administrative location: Cumbria, England. Constraints: Close. Design: Furness 3+. Built: 1891. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), aesthetic (unique architect design), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Difficult. Risk: Weather.

Located next to a level crossing and access to one of the station platforms will promote considerable public awareness of the architect designed St Bees Signal Box. Degrading the finesse of this design, constructed with local sandstone with a slight batter that gives an enhanced impression of solidity, is an insensitive replacement of the original windows with uPVC framed substitutes. The replacement steel staircase also feels insensitive, although less offensive than the windows.

Figure A.111: St Bees Signal Box. (Author 2016)

A.2.112 Salwick No 2 Signal Box

Figure A.112: Salwick No 2 Signal Box. (Author 2016)

Administrative location: Lancashire, England. Constraints: Distant. Design: RSCo [LYR]. Built: 1889. Listing: n/a. Status: Use ML. Future/use: Short term, since demolished (2017). Heritage value: Modified (uPVC replacement windows, replacement steel staircase). Overall condition: Deficient, propped. Reuse potential: Poor. Relocatable: Partially. Risk: Normal.

Clearly on a minimal maintenance regime pending replacement by replacement of signalling between Preston and Blackpool, Salwick Signal Box when surveyed displayed a degraded evidential value and a location remote from public access presented no communal value.

A.2.113 Shepherds Well Signal Box

Figure A.113: Shepherds Well Signal Box. Notice the 'for sale' and 'sold' graffiti. (Author 2018)

Administrative location: Kent, England. Constraints: Reasonable. Design: LCDR. Built: c1878. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (replacement timber staircase). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal. Comment: Conversation.

As an anomaly of spellings, the station of Shepherds Well serves the village of Shepherdswell, and Shepherds Well Signal Box follows this anomaly. Best viewed from a restricted location within the grounds of an adjacent heritage railway will limit public awareness. Noted is the faintly ironic graffiti for this disused building.

A.2.114 Sheringham East Signal Box

Figure A.114: Sheringham East Signal Box. (Author 2018)

Administrative location: Norfolk, England. Constraints: Close. Design: MGNR 1. Built: 1906. Listing: n/a. Status: OOU HR. Future/use: Railway offices. Heritage value: Modified (modern brickwork to half plinth/locking room, replacement timber staircase to match original), communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: High.

Next to a level crossing, public car park and heritage railway circulation area means that there will be considerable public awareness of Sheringham East Signal Box. The location, in effect a gateway to the heritage railway, means that the heritage railway has a considerable incentive to ensure a high standard of presentation for the building

A.2.115 Sheringham West (Wensum Junction) Signal Box

Figure A.115: Sheringham West (Wensum Junction) Signal Box. (Author 2018)

Administrative location: Norfolk, England. Constraints: Distant. Design: GER 7. Built: Unknown/1985. Listing: n/a. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified (modern brickwork plinth). Overall condition: Good. Reuse potential: None. Relocatable: None, relocated 1985. Risk: Weather.

Unlike its very public neighbour, Sheringham West Signal Box commands limited public awareness, although paradoxically it is the signal box at Sheringham serving the original function, albeit in this case relocated.

A.2.116 Shrewsbury Crewe Junction Signal Box

Administrative location: Shropshire, England. Constraints: Close. Design: LNWR 4. Built: 1903. Listing: II. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement timber staircase), *communal (public location). Overall condition: Good. Reuse potential: Accessible. Relocatable: None. Risk: Normal.*

Figure A.116a: Shrewsbury Crewe Junction Signal Box as seen from Shrewsbury Railway Station. (Author 2016)

Figure A.116b: Shrewsbury Crewe Junction Signal Box as seen from street level. (Author 2016)

From platform level at the north end of Shrewsbury Railway Station, Shrewsbury Crewe Junction Signal Box appears to be a modest size compared with the substantial size normally associated with LNWR 4 signal boxes. However, seen from street level the signal box has a substantial presence.

A.2.117 Shrewsbury Severn Bridge Signal Box

Figure A.117: Shrewsbury Severn Bridge Signal Box. (Author 2016)

Administrative location: Shropshire, England. Constraints: Reasonable. Design: LNWR 4. Built: 1903. Listing: II. Status: Use ML. Future/use: Long term. Heritage value: Modified (supplementary steel external ladder, communal (largest surviving mechanical signal box in Europe). Overall condition: Fair. Reuse potential: Poor. Relocatable: None. Risk: Normal.

The LNWR Type 4 designs invariably tended towards lavishly sized, and the doyen is Shrewsbury Severn Bridge Signal Box. Situated within a rail-locked location that makes comparison with other buildings difficult, it is difficult to convey the superlative impression of this building, stated by Minnis (2012, p26) to be, “the largest mechanical signal box in operation in Europe". Notice the retrofit fire escape ladder and buttressed closing to the ground floor windows.

A.2.118 Skegness Signal Box

Figure A.118: Skegness Signal Box. (Author 2015)

Administrative location: Lincolnshire, England. Constraints: Reasonable. Design: GNR 1. Built: 1901. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement timber staircase), communal (station location). Overall condition: Deficient. Reuse potential: Accessible. Relocatable: Yes. Risk: Weather. Comment: Conversation.

An all-timber version of the GNR 1 design, thus showing the flexibility in standard designs for specific locations. Although the taxonomy survey gives a communal weighting for the station location, this is marginal as the signal box is remote from where passengers may circulate, and one can presume there is more drawing people to Skegness than the signal box.

A.2.119 Stallingborough Signal Box

Figure A.119: Stallingborough Signal Box. (Author 2015)

Administrative location: North East Lincolnshire, England. Constraints: Close. Design: NR gabled. Built: 2007. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Original, Communal (level crossing). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

The Network Rail standard designs, whether hipped or gabled, are an interesting modern reinvention of the traditional engineering vernacular style, reinterpreting the style in a slightly larger building containing a panel that controls a larger area than the traditional mechanical design. The result is architecturally anodyne, yet in this village context is pleasantly inoffensive.

A.2.120 Stirling Middle Signal Box

Administrative location: Stirling, Scotland. Constraints: Close. Design: Caledonian N2. Built: 1901. Listing: A [GV]. Status: Use ML. Future/use: Medium term. Heritage value: Modified (presumed replacement timber staircase), communal (public location). Overall *condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.*

Figure A.120: Stirling Middle Signal Box. (Author 2016)

Listed as a group within the, "outstanding" (Historic Environment Scotland 1978), Stirling Railway Station, Stirling Middle Signal Box is the most publicly visible of the two signal boxes at Stirling, being next to stone built 19th Century former military buildings conserved as an enterprise park.

A.2.121 Stirling North Signal Box

Administrative location: Stirling, Scotland. Constraints: Distant. Design: Caledonian N2. Built: 1900. Listing: A [GV]. Status: Use ML. Future/use: Medium term. Heritage value: Modified (presumed replacement timber staircase). Overall condition: Fair. Reuse potential: Possible accessible. Relocatable: No. Risk: Deliberate.

Less publicly visible than Stirling Middle Signal Box means a commensurately reduced public awareness of Stirling North Signal Box, although the group value of both signal boxes in the context of Stirling Railway Station is immense.

Figure A.121: Stirling North Signal Box. (Author 2016)

A.2.122 Stockport No 1 Signal Box

Figure A.122: Stockport No 1 Signal Box. (Author 2018)

Administrative location: Stockport, England. Constraints: Close. Design: LNWR 4. Built: 1884. Listing: n/a. Status: Use ML. Future/use: Medium term. Heritage value: Modified (replacement uPVC windows, *replacement steel staircase, supplementary steel fire escape), communal (station location). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.*

The platform location and scale of Stockport No 1 Signal Box will provide a public awareness, although the extent of recognition at this busy location is questionable.

A.2.123 Stockport No 2 Signal Box

Figure A.123: Stockport No 2 Signal Box. (Author 2018)

Administrative location: Stockport, England. Constraints: Reasonable. Design: LNWR 4. Built: 1890. Listing: n/a. Status: Use ML. Future/use: Medium term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (station location). Overall condition: Good. Reuse potential: Poor. Relocatable: No. Risk: Normal

Visible from a platform location, along with the building scale, will provide a modicum of public awareness for Stockport No 2 Signal Box. However, in an equivalent manner to its twin at the other end of Stockport Railway Station there is a question as to the actual extent of recognition at this busy location.

A.2.124 Stowmarket Signal Box

Figure 124: Stowmarket Signal Box. (Author 2018)

Administrative location: Suffolk, England. Constraints: Close. Design: GER 3. Built: c1882. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (probably replacement timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

Being next to a level crossing there will be considerable public awareness of Stowmarket Signal Box. However, the building presents a dowdy appearance in a context changed from the time of construction, so the heritage value is hard to justify.

A.2.125 Sutton Bridge Signal Box

Administrative location: Lincolnshire, England. Constraints: Reasonable. Design: Midland bespoke. Built: 1897. Listing: II. Status: OOU IS. Future/use: Swing bridge control. Heritage value: Original, communal (public location). Overall condition: Fair. Reuse potential: None. Relocatable: None. Risk: Weather. Comments: Heritage value* *unusual iron/steel superstructure, controls formerly mixed rail/road use now only road swing bridge*

Figure A.125: Sutton Bridge Signal Box. This carriageway was that originally used by the railway. (Author 2018)

Public awareness of this unusual structure will be high, yet it is questionable how many of the drivers will be aware that the control room was once a railway signal box and that one of the carriageways was, in fact, once in use as a railway.

A.2.126 Thornhill Signal Box

Administrative location: Dumfries & Galloway, Scotland. Constraints: Reasonable. Design: LMS 13. Built: 1943. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (toilet block extension, replacement uPVC windows, replacement steel handrails), aesthetic (unusual austerity design), historical (local railway expansion for Second World War munitions factories). Overall condition: Good. Reuse potential: Poor. Relocatable: No. Risk: Normal.

During both the First and Second World Wars, the southwest of Scotland was the location of munitions factories, with a consequential increase in freight traffic that required an upgrade of signalling for the local railway system. Coupled with a link to local history, this austere, and extended with a toilet block, LMS 13 design has an aesthetic representative of the era.

Figure A.126: Thornhill Signal Box. (Author 2015)

A.2.127 Three Bridges ASC

Administrative location: West Sussex, England. Constraints: Reasonable. Design: BR(SR) PB. Built: 1983. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Original. Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.

Architecturally anodyne and to any casual observers the function of this building will be unknown. Despite this signal box, an area signalling centre, being young relative to many signal boxes forming part of the taxonomy survey, it controls most of the main line between London and Brighton (Kay 2010, pp90-3) means that control functions will shortly pass to the Three Bridges ROC.

Figure A.127: Three Bridges ASC. (Author 2016)

A.2.128 Torquay South Signal Box

Figure A.128: Torquay South Signal Box. (Author 2018)

Administrative location: Torbay, England. Constraints: Close. Design: GWR n/s. Built: c1876. Listing: II. Status: OOU PR. Future/use: Office. Heritage value: Modified (probably replacement timber staircase), *aesthetic (stone construction), communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Weather.*

In a finish that matches the station buildings and thereby has a certain group value, the end of platform location, plus being next to a car park, will provide a modicum of public awareness for the unusual, non-standard design, Torquay South Signal Box. However, awareness of the original function is going to be unlikely and there is nothing to provide curiosity concerning the building.

A.2.129 Torre Signal Box

Figure A.129a: Torre Signal Box. (Author 2018)

Administrative location: Torbay, England. Constraints: Close. Design: GWR 7d. Built: 1921. Listing: II [GV]. Status: OOU ML. Future/use: Mothballed. Heritage value: Original, communal (station location). Overall condition: Deficient. Reuse potential: Reuse. Relocatable: No. Risk: Weather.

While the platform location will provide a modicum of public awareness, this imposing structure would under normal circumstances present difficulties in reuse, fronting the railway and with commercial activities behind. However, situated in Torbay, it has potential for conversion into a holiday let and thereby offered for sale by auction in 2021 with a guide price of £54,000.

Figure A.129b: Plans for converting Torre Signal Box into holiday accommodation. (Right Move 2021)

A.2.130 Totnes Signal Box

Administrative location: Devon, England. Constraints: Close. Design: GWR 7d. Built: 1923. Listing: II. Status: OOU PR. Future/use: Café. Heritage value: Modified (replacement steel staircase), communal (station location). Overall condition: Fair. Reuse potential: None. Relocatable: None. Risk: Possible deliberate.

The platform location and reuse as a café, ‘The Signal Box Café’, ensures a strong public awareness of Totnes Signal Box. Reusing redundant signal boxes as a café appears to be one of the more resilient ways of reusing the building and appreciated by the traveller, even if constraints of space do not allow any meaningful connection with the original use.


Figure A.130: Totnes Signal Box. (Author 2018)

A.2.131 Townsend Fold Signal Box


Figure A.131: Townsend Fold Signal Box. (Author 2018)

Administrative location: Lancashire, England. Constraints: Close. Design: BR(LMR) 15. Built: 1959. Listing: n/a. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified *(replacement steel staircase with timber treads), communal (level crossing). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Deliberate.*

In a manner akin to its near neighbour at Rawtenstall West, and also in a strongly 1950s style, the location of Townsend Fold Signal Box next to a level crossing will strengthen public awareness of this building, although on a minor road remote from the heritage railway station means this signal box fulfils a strongly functional purpose rather than selling the heritage railway narrative.

A.2.132 Truro Signal Box

Figure A.132: Truro Signal Box. (Author 2016)

Administrative location: Cornwall, England. Constraints: Close. Design: GWR 7a. Built: 1899. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (level crossing). Overall condition: Deficient, structural movement. Reuse potential: Accessible. Relocatable: No. Risk: Deliberate.

Formerly Truro East Signal Box, being next to a level crossing and within a station environment strengthens public awareness of Truro Signal Box. However, structural movement and obvious modifications degrade the conservation value of the building.

A.2.133 Ty Croes Signal Box

Figure A.133: Ty Croes Signal Box. (Author 2017)

Administrative location: Isle of Anglesey, Wales. Constraints: Close. Design: CHR/LNWR. Built: 1872. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement timber staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: No. Risk: Weather.

Although by 1872 the LNWR had absorbed the Chester and Holyhead Railway, structures along the line kept a distinctive style, so Ty Croes Signal Box has a noticeably dissimilar style to LNWR designs. Being next to a level crossing strengthens public awareness of this signal box.

A.2.134 Upper Tyndrum Signal Box

Figure A.134: Upper Tyndrum Signal Box. (Author 2018)

Administrative location: Stirling, Scotland. Constraints: Close. Design: NBR 6a. Built: 1894. Listing: B [G]. Status: OOU ML. Future/use: Storage. Heritage value: Original, communal (station location). Overall condition: Good. Reuse potential: Good. Relocatable: Difficult. Risk: Weather.

The platform location will provide a modicum of public awareness for Upper Tyndrum Signal Box, although the former function of the building will not be so apparent. The sense of group value of the buildings at this station are a strong feature of the stations on this line, where the late 19th Century construction of the railway means that the signal boxes are integral with other buildings.

A.2.135 Wareham Signal Box

Administrative location: Dorset, England. Constraints: Close. Design: LSWR 4. Built: 1928. Listing: n/a. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement uPVC windows, replacement galvanised steel staircase), communal (public location).

Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Deliberate.

Figure A.135a: Wareham Signal Box. (Author 2016)

Figure A.135b: Former goods shed at Wareham now in use as an architect's office. (Author 2016)

Next to the former level crossing, now in use as a foot crossing, an access road and overlooked by the station footbridge means that there will be some public awareness of Wareham Signal Box. However, in terms of sensitivity to original design, the former goods shed now converted into an architect's office is an exemplar of what is possible with a functional building.

A.2.136 Wainfleet Signal Box

Figure A.136: Wainfleet Signal Box. (Author 2015)

Administrative location: Lincolnshire, England. Constraints: Close. Design: GNR 1. Built: 1882. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Modified (replacement steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Weather.

Another variant, with the more usual style of brickwork, of a GNR 1 design. While listed and retaining much of the original aesthetic, noteworthy is the extent of modification required to adapt this signal box for use by the modern railway.

A.2.137 Wansford Signal Box

Figure A.137: Wansford Signal Box. (Author 2015)

Administrative location: Peterborough, England. Constraints: Close. Design: LNWR 5. Built: 1907. Listing: II. Status: Use HR. Future/use: Heritage operational. Heritage value: Modified (replacement timber staircase), communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal.

Less common, and smaller, than the LNWR 4 design, this signal box in the custodianship of a heritage railway serves an ongoing operational function, for which the communication aerial is noticeable, besides providing an effective backdrop for the ‘picturesque railway’.

A.2.138 Wateringbury Signal Box

Administrative location: Kent, England. Constraints: Close. Design: S&F 12a. Built: 1893. Listing: II [GV]. Status: Use ML. Future/use: Long term. Heritage value: Modified (replacement uPVC windows, replacement steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: None. Risk: Deliberate.

Figure A.138: Wateringbury Signal Box. (Reeves, L., 2018)

Being next to both a level crossing and access to one of the station platforms, there is scope for considerable public awareness of this signal box, although the modifications diminish some of the heritage value.

A.2.139 West Street Junction Signal Box

Administrative location: Lincolnshire, England. Constraints: Reasonable. Design: GNR 1. Built: 1874. Listing: II. Status: Use ML. Future use: Short term. Heritage value: Modified (replacement steel staircase), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Deliberate.

Next to Boston Railway Station, which with the rundown of railways in Lincolnshire presents as an austere shadow of a former grandeur, this signal box feels isolated compared with the amount of railway it once supervised. However, even if the setting feels bleak, the location of this building by the level crossing allows for a strong public perception of communal weighting in assessing the heritage value.

Figure A.139: West Street Junction Signal Box. (Author 2015)

A.2.140 Westbury PSB

Figure A.140: Westbury PSB. (Author 2016)

Administrative location: Wiltshire, England. Constraints: Distant. Design: BR(WR) PB. Built: 1984. Listing: n/a. Status: Use ML. Future/use: Medium term. Heritage value: Original, aesthetic (unusual *bespoke design). Overall condition: Good. Reuse potential: Accessible. Relocatable: No. Risk: Normal.*

Mixing an imposing multistorey massing, steep roof pitch and high security fencing, the signallers nicknamed Westbury PSB ‘Colditz Castle’ after the similarly massed and secure famous German castle (Allen & Woolstenholmes 1991, pp112-3). While facing the railway, its set back location surrounded by vegetation and a more modern housing estate, plus the actual design, makes this an ambiguous building.

A.2.141 Weston-Super-Mare Signal Box

Figure A.141: Weston-Super-Mare Signal Box. (Author 2018)

Administrative location: North Somerset, England. Constraints: Close. Design: BER. Built: c1866. Listing: II. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (staircase missing, windows boarded up). Overall condition: Deficient. Reuse potential: Accessible. Relocatable: Difficult. Risk: Deliberate.

Believed to be the oldest surviving extant signal box, the location of Weston-Super-Mare Signal Box in a railway staff car park and deficient condition means that it will be difficult for the public to have any awareness of this deeply significant building.

A.2.142 Wimbledon A Signal Box

Figure A.142: Wimbledon A Signal Box. (Author 2016)

Administrative location: Merton, England. Constraints: Reasonable. Design: SR 13. Built: 1948. Listing: n/a. Status: OOU ML. Future/use: Signalling and telecoms training. Heritage value: Modified (addition of steel fire escape), communal (station location). Overall condition: Fair. Reuse potential: None, in use for signalling and telecommunications training. Relocatable: No. Risk: Normal.

Completed by British Railways, Wimbledon A Signal Box is amongst the last of the elegant Type 13 signal box designs developed by the Southern Railway before replacement by designs such as the Type 16 seen at Dorchester South Signal Box. “Like a tiny ocean liner carried inland on a freak wave” (Wright 2013), located at the furthest end of Wimbledon Railway Station from the main station buildings limits public awareness, other than from those intent upon graffiti.

A.2.143 Winchcombe (Hall Green) Signal Box

Figure A.143: Winchcombe (Hall Green) Signal Box. (Author 2018)

Administrative location: Gloucestershire, England. Constraints: Close. Design: GWR 7d. Built: 1907/1987. Listing: n/a. Status: Use HR. Future/use: Operational heritage. Heritage value: Modified (brick plinth to match original, evidence suggests replacement timber staircase), communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None, relocated 1987. Risk: Deliberate. Comment: Conversation.

Careful relocation makes Winchcombe Signal Box a building conservation dilemma, especially as this relocation was to create a group with an equally carefully relocated station building, delivering a harmonious whole in an attractive village environment that augments the heritage railway experience.

A.2.144 Winning Signal Box

Administrative location: Northumberland, England. Constraints: Close. Design: NER N2+. Built: 1895. Listing: n/a. Status: Use ML. Future/use:

Short term. Heritage value: Modified (replacement uPVC windows, replacement timber staircase), communal (level crossing). Overall condition: Deficient. Reuse potential: Accessible. Relocatable: No. Risk: High.

Figure A.144a: Winning Signal Box. (Author 2019)

Figure A.144b: Winning Signal Box retains this noteworthy semaphore signal installation on modern posts. (Author 2019)

Being near a level crossing and next to a road might give some public awareness of Winning Signal Box, coupled with a nearby display concerning the local coal-mining heritage, although it is reasonable to assume there will be more awareness of the substantial semaphore signal gantry controlled by the signal box.

A.2.145 Wolferton Signal Box

Figure A.145: Wolferton Signal Box. (Author 2018)

Administrative location: Norfolk, England. Constraints: Close. Design: GER 5. Built: 1897. Listing: II [G]. Status: OOU IS. Future/use: Museum. Heritage value: Original, historical plus communal (group value with former station on royal estate). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal. Comment: Conversation.

The so-called 'royal' signal box, Wolferton Signal Box is on the Sandringham Estate and forms an attractive group with the closed railway station. Very well presented, the narrative of this signal box includes a record of royal and society arrivals.

A.2.146 Woolston Signal Box

Figure A.146: Woolston Signal Box. (Author 2018)

Administrative location: Southampton, England. Constraints: Close. Design: LSWR 4. Built: 1901. Listing: II [GV]. Status: OOU ML. Future/use: Mothballed. Heritage value: Modified (staircase removed), communal (station location, apparently some community interest in restoration). Overall condition: Deficient. Reuse potential: Accessible. Relocatable: Difficult. Risk: Deliberate.

Although in a deficient condition, and modifications to protect the building adding to this condition, the platform location of Woolston Signal Box will provide a modicum of public awareness. There is local interest in protecting this building, which does have a group value with the station building.

A.2.147 Wroxham Signal Box

Administrative location: Norfolk, England. Constraints: Close. Design: GER 7. Built: 1900. Listing: II. Status: OOU HR. Future/use: Museum. Heritage value: Modified (probably replacement timber staircase to match original design), communal (museum location). Overall *condition: Good. Reuse potential: None. Relocatable: None, repositioned on site. Risk: Normal.*

Figure A.147: Wroxham Signal Box. (Author 2018)

Conserved within a railway heritage centre as a signalling exhibit, public awareness of Wroxham Signal Box is deliberate and controlled. Significantly degrading the heritage value is a repositioning on site, moving the signal box back from the railway to improve the view drivers have of new signalling. Bower (2021, p17) describes how in 2000, Network Rail were planning to apply for listed building consent for demolition of the recently listed signal box to improve the signalling sightlines, and that protracted negotiations led, in 2007, to a repositioning on site by moving the building using air skates. This is a more subtle change than repositioning to a new site and gives all round access, yet this subtlety devalues the immediate trackside context that is part of the essential character for a mechanical signal box.

A.2.148 Wylam Signal Box

Figure A.148: Wylam Signal Box. (Author 2015)

Administrative location: Northumberland, England. Constraints: Close. Design: NER N5 overhead. Built: c1897. Listing: II. Status: Use ML. Future/use: Short term. Heritage value: Original. Aesthetic (unusual over track design), communal (level crossing). Overall condition: Fair. Reuse potential: Accessible. Relocatable: Partially. Risk: Normal.

One of three surviving overtrack signal boxes (Kay 2010). Described in section 3.4 are the dilemmas in conserving this signal box once it closes, defined as the unsolvable problems where contradictory agendas present in conservation. There is no question that the signal box occupies an attractive, riverside location in the heart of this Northumberland village. Furthermore, the constrained site suggests only a small original goods yard, with the railway environment not so degraded than surrounding many equivalent signal boxes, so the discussion in section 7.3 suggests that there is less of a case for justifying radical solutions to future conservation.

A.2.149 York ROC

Figure A.149: York ROC. (Author 2015)

Administrative location: York, England. Constraints: Reasonable. Design: NR bespoke. Built: 2014. Listing: n/a. Status: Use ML. Future/use: Long term. Heritage value: Original. Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal.

Representing the future, when resignalling is complete this regional operating centre will control a geographical area from Northumberland to Lincolnshire and as far west as the boundary of West Yorkshire with Greater Manchester (Milner 2014, pp18-9). The building is anodyne, and the expectation is that most observers will assume it to only be an office block.

A.2.150 York Station Platform Signal Box

Administrative location: York, England. Constraints: Close. Design: NER bespoke. Built: 1907. Listing: II. Status: OOU PR. Future/use: Café/retail. Heritage value: Modified (conversion into café/retail),* *communal (station location). Overall condition: Good. Reuse potential: None. Relocatable: None. Risk: Normal.*

Figure A.150: York Station Platform Signal Box. (Author 2015)

Displaced in 1951 by a power signalling system planned from before the Second World War to replace the substantial number of mechanical signal boxes controlling the railways around York, this attractive bespoke design survives in good condition by the fortuitous location in the main circulation area of York Railway Station. It is unlikely that anybody using the locking room shop or operating level café is aware of the former use as a signal box.

Appendix B
Listed Signal Boxes in Great Britain

Surprisingly, there is no source identifying every listed signal box in Great Britain. Available directories, such as Kay (2010), tend to record signal boxes by sector and operational status, which are indirect considerations in terms of conservation as they only mention listing in passing. Therefore, the methodology adopted was to use information from available directories to compile an interim database of listed or statutorily protected signal boxes before verifying against the registers for Historic England, Historic Scotland and Cadw. For each signal box, the database records basic conservation information of planning authority, country, category and list reference, plus summary information, using Kay's taxonomy, concerning the date and design (design information, in notable contrast to the precise detail for more conventional heritage buildings, is occasionally missing from listing descriptions). Where relocated, the database notes current and original locations, with dates for relocation and original construction.

Inevitably, there were anomalies that needed addressing. Most intriguing concerns two signal boxes at Chappel and Wakes Colne, the original onsite GER 7 dating from 1891 plus a GER 3 from Mistley dating from 1882 and relocated, as believed listed, in 1986. Historic England records only one listed signal box on site and, with detailed information helpfully provided by the curator at East Anglian Railway Museum, all evidence indicates that this listing applies to the 1891 signal box. There is no available evidence of a listing for the erstwhile Mistley signal box, and with Mistley station itself not listed until 2005 it is impossible to infer group value. One conjecture is that some British Rail engineer with a sentimental regard for Mistley signal box invented, or presumed, a listing to save the building? However, this is conjecture and the reason for this presumed listing is likely to forever remain a mystery

For listing category, the database notes if the listing is a group listing or if the listing identifies the signal box having a group value with other nearby buildings.

Group listing has the potential to be problematic where the listing does not specifically identify a signal box. Usually there is no problem, so noted listed through insertion into or integral with the main structure include Bristol Old Station and Carlisle No 4a, while the listing for York station explicitly identifies York Platform (1909) and York (1951) Signal Boxes. Less clear includes Bournemouth Central Signal Box, inserted into the listed station building canopy extension, while other signal boxes, such as the ‘subsidiary buildings’ at Maiden Newton, needed advice from the relevant planning department conservation officers. Invariably, and very helpfully, Heritage Scotland listings very carefully identify signal boxes within a group of buildings and this principle of viewing heritage signal boxes as having a context within a grouping of station buildings is looking increasingly like an exemplar of best practice. Conversely, Cadw organise their register principally by location, so separating out any signal boxes from the register is difficult and the database covering Wales might have significant unidentified anomalies.

Aside from the main database, the database also identifies a few special categories of signal boxes. Most, such as those signal boxes delisted and now no longer extant, are self-explanatory. One database is those signal boxes Kay identifies as listed for which there no confirmatory evidence and seems to derive from proposals for listing, although the only confirmation found was a decision not to list Wye Signal Box. There is also Feock, which Minnis (2012, p51) firmly states is not a railway signal box despite the listing description.

The list is correct to 14 July 2021.

Listed or Other Statutory Protection

Aberdour

Location: Fife, Scotland. Listing: B [G], LB3629. Design: NBR 2, 1890.

Abergele and Pensarn

Location: Conwy, Wales. Listing: II, 8698. Design: LNWR 4, 1902.

Aberthaw

Location: Vale of Glamorgan, Wales. Listing: II, 83145. Design: Barry 2, 1897.

Aiskew [Bedale]

Location: North Yorkshire, England. Listing: II, 1252652. Design: NER S1a, 1875.

Amberley/Billingshurst

Location: West Sussex, England. Listing: II, 1271531. Design: S&F 1b [LBSCR], 2014/1876.

Annan

Location: Dumfries and Galloway, Scotland. Listing: B [G], LB21127. Design: GSWR 1, 1877.

Appleby

Location: North Lincolnshire, England. Listing: II, 1161513. Design: RSCo [MSLR], 1884.

Arbroath North

Location: Angus, Scotland. Listing: B, LB52054, Design: NBR 7, 1911.

Arisaig

Location: Highland, Scotland. Listing: B [G], LB326. Design: RSCo/WHE, 1901.

Arnside

Location: Cumbria, England. Listing: II, 1412051. Design: Furness 4, 1897.

Askam in Furness

Location: Cumbria, England. Listing: II [GV], 1197891. Design: Furness 4, 1890.

Attleborough

Location: Norfolk, England. Listing: II [G], 1401582. Design: GER 4/McK&H, 1883.

Auldbar Road

Location: Angus, Scotland. Listing: C [G], LB48696. Design: Caledonian N1, c1876.

Aviemore North

Location: Highland, Scotland. Listing: B [G], LB52063. Design: McK&H 3 [Highland], 1898.

Aylesford

Location: Kent, England. Listing: II, 1415110. Design: SECR/SR 11a, 1921.

Barmouth South

Location: Gwynedd, Wales. Listing: II, 5204. Design: Dutton 1 [Cambrian], 1890.

Baschurch

Location: Shropshire, England. Listing: II, 1386582. Design: McK&H 3 [GWR], 1880.

Beckingham

Location: Nottinghamshire, England. Listing: II [GV], 1045091. Design: GNR 1, 1877.

Berwick

Location: East Sussex, England. Listing: II [GV], 1413793. Design: S&F 5 [LBSCR], 1879.

Beverley

Location: East Riding of Yorkshire, England. Listing: II [GV], 1084065. Design: NER S4, 1911.

Biggar

Location: South Lanarkshire, Scotland. Listing: B [G], LB44553. Design: Caledonian S4, 1906.

Birkdale

Location: Sefton, England. Listing: II, 1412052. Design: LYR Hipped, 1905.

Birmingham New Street

Location: Birmingham, England. Listing: II, 1117383. Design: BR(LMR) n/s, 1966.

Blankney

Location: Lincolnshire, England. Listing: II, 1413991. Design: GNR 4b, 1928.

Bo'ness/Garnqueen South Junction

Location: Falkirk, Scotland. Listing: A [G], LB22337. Design: Caledonian S4, 1999/1899.

Boat Of Garten North

Location: Highland, Scotland. Listing: B [G], LB258. Design: McK&H 3 [Highland], 1885.

Boat Of Garten South

Location: Highland, Scotland. Listing: B [G], LB258. Design: Highland, 1922.

Bodmin Road [Bodmin Parkway]

Location: Cornwall, England. Listing: II, 1430613. Design: GWR 3, 1887.

Bollo Lane Junction

Location: Greater London, England. Listing: II, 1323687. Design: LSWR 2, 1878.

Bootle

Location: Cumbria, England. Listing: II, 1412053. Design: Furness 1, c1871.

Boston Dock Swing Bridge

Location: Lincolnshire, England. Listing: II, 1388922. Design: Boston Corporation, 1887.

Bournemouth Central

Location: Dorset, England. Listing: II [G], 1324706. Design: SR 11c, 1928.

Bournemouth West Junction

Location: Dorset, England. Listing: II, 1413713. Design: LSWR 3a, 1882.

Brading

Location: Isle of Wight, England. Listing: II [GV], 1034364. Design: IOWR, 1882.

Bridge of Orchy

Location: Argyll and Bute, Scotland. Listing: B [G], LB13072. Design: NBR 6a, 1894.

Bristol Old Station

Location: Bristol, England. Listing: I [G], 1209622. Design: Midland/GWR n/s, Box n/k.

Brocklesby Junction

Location: North Lincolnshire, England. Listing: II, 1249630. Design: GCR 5, 1914.

Bromley Cross

Location: Bolton, England, II [G]. Listing: 1422397. Design: Yardley 1 [LYR], 1875.

Brundall

Location: Norfolk, England. Listing: II, 1414004. Design: GER 3/Stevens, 1883.

Burton Agnes

Location: East Riding of Yorkshire, England. Listing: II [G], 1420282. Design: NER S1b, 1875.

Bury St Edmunds Yard

Location: Suffolk, England. Listing: II [GV], 1414231. Design: GER 7/McK&H, 1888.

Butterley/Ais Gill

Location: Derbyshire, England. Listing: II, 1335401. Design: Midland 2b, c1985/1906.

Caersws

Location: Powys, Wales. Listing: II [GV], 8698. Design: Dutton 1 [Cambrian], 1891.

Canterbury East

Location: Kent, England. Listing: II, 1413579. Design: SECR, 1911.

Canterbury West

Location: Kent, England. Listing: II, 1258154. Design: Overhead n/s relocated, 1928.

Carlisle No 4a

Location: Cumbria, England. Listing: II* [G], 1196969. Design: LNWR n/s, 1880.

Carnforth Station Junction (New)

Location: Lancashire, England. Listing: II [GV], 1078212. Design: Furness 4+, 1903.

Carnforth Station Junction (Old)

Location: Lancashire, England. Listing: II, 1071920. Design: Furness n/s, 1882.

Carnforth/Selside

Location: Lancashire, England. Listing: II, 1078214. Design: Midland 4a, 1976/1907.

Carrbridge

Location: Highland, Scotland. Listing: B [G], LB6636. Design: BR(ScR) n/s, 1957.

Chappel and Wakes Colne

Location: Essex, England. Listing: II, 1225566. Design: GER 7, 1891.

Chathill

Location: Northumberland, England. Listing: II, 1276364. Design: NER N1, c1873.

Chesham

Location: Buckinghamshire, England. Listing: II [G], 1401704. Design: Metropolitan 1, 1889.

Chichester

Location: West Sussex, England. Listing: II, 1413573. Design: S&F 5 [LBSCR], 1882.

Clachnaharry

Location: Highland, Scotland. Listing: B [G], LB46540. Design: McK&H 3 [Highland], 1890s.

Corrour

Location: Highland, Scotland. Listing: C [G], LB52057. Design: NBR 6a, 1894.

Crawley

Location: West Sussex, England. Listing: II, 1298887. Design: S&F 5 [LBSCR], 1877.

Crediton

Location: Devon, England. Listing: II, 1292537. Design: LSWR 1, 1875.

Cromer

Location: Norfolk, England. Listing: II, 1380342. Design: MGNR n/s, c1920.

Cuxton

Location: Kent, England. Listing: II [GV], 1413571. Design: SER, c1887-9.

Daisyfield

Location: Blackburn with Darwen, England. Listing: II, 1412054. Design: S&F 6 [LYR], 1873.

Dalmally

Location: Argyll and Bute, Scotland. Listing: C [G], LB13352. Design: Caledonian N2, 1896.

Downham Market

Location: Norfolk, England. Listing: II [GV], 1414022. Design: GER 2, 1881.

Dumfries

Location: Dumfries and Galloway, Scotland. Listing: B [G], LB26343. Design: BR(ScR) 16c, 1957.

Dunkeld and Birnam

Location: Perth and Kinross, Scotland. Listing: B, LB52055. Design: Highland, 1919.

Dunragit

Location: Dumfries and Galloway, Scotland. Listing: B, LB16766. Design: LMS 12, 1927.

East Holmes

Location: Lincolnshire, England. Listing: II, 1391954. Design: GNR 1, 1873.

Eastbourne

Location: East Sussex, England. Listing: II [GV], 1413815. Design: S&F 5 [LBSCR], 1882.

Eastfield

Location: Peterborough, England. Listing: II, 1119749. Design: GNR 1, 1893.

Elgin Centre

Location: Moray, Scotland. Listing: C, LB52053. Design: GNSR 2a, 1888.

Elsham

Location: North Lincolnshire, England. Listing: II, 1346846. Design: RSCo [MSLR], 1885.

Embsay Station

Location: North Yorkshire, England. Listing: II, 1301523. Design: Midland 4a, c1923.

Errol

Location: Perth and Kinross, Scotland. Listing: B, LB11603. Design: Caledonian N1, 1877.

Falsgrave

Location: North Yorkshire, England. Listing: II, 1243660. Design: NER S4, 1908.

Ferryside

Location: Carmarthenshire, Wales. Listing: II, 87670. Design: GWR 3, 1880s.

Forden

Location: Powys, Wales. Listing: II, 87673. Design: Dutton 3 [Cambrian], 1897.

Garelochhead

Location: Argyll and Bute, Scotland. Listing: B [G], LB19490. Design: NBR 6a, 1894.

Garsdale

Location: Cumbria, England. Listing: II, 1412055. Design: Midland 4c, 1910.

Girvan

Location: South Ayrshire, Scotland. Listing: B [G], LB50007. Design: GSWR 3, 1893.

Glenfinnan

Location: Highland, Scotland. Listing: B [G], LB312. Design: RSCo/WHE, 1901.

Goole Swing Bridge

Location: East Riding of Yorkshire, England. Listing: II*, 1346710. Design: NER n/s, 1869.

Grain Crossing

Location: Kent, England. Listing: II, 1415162. Design: Stevens [SER], 1882.

Hale

Location: Trafford, England. Listing: II [G], 1356499. Design: S&F [CLC], c1875.

Haltwhistle

Location: Northumberland, England. Listing: II, 1156315. Design: NER n/s, Late C19.

Hammersmith/Kilby Bridge

Location: Derbyshire, England. Listing: II, 1329374. Design: Midland 3b, 1984/1900.

Hammerton

Location: North Yorkshire, England. Listing: II, 1416398. Design: n/s, Early C20.

Haslemere

Location: Surrey, England. Listing: II [GV], 1415807. Design: LSWR 4, 1895.

Havant Junction East,

Location: Hampshire, England. Listing: II, 1271846. Design: S&F 5 [LBSCR], 1876.

Hebden Bridge

Location: West Yorkshire, England. Listing: II [GV], 1412056. Design: LYR, 1891.

Heckington

Location: Lincolnshire, England. Listing: II [GV], 1061808. Design: GNR 1, 1898.

Heighington

Location: Co Durham, England. Listing: II [GV], 1391940. Design: NER C1, c1872.

Helmsdale South

Location: Highland, Scotland. Listing: B [G], LB7184. Design: Dutton 1/Highland, 1894.

Helsby Junction

Location: Cheshire, England. Listing: II [GV], 1412057. Design: LNWR 4, 1900.

Hensall

Location: North Yorkshire, England. Listing: II [GV], 1412058. Design: Yardley 1 [LYR], 1875.

Hertford East

Location: Hertfordshire, England. Listing: II, 1268761. Design: GER 7/McK&H, 1888.

Hexham East

Location: Northumberland, England. Listing: II, 1042523. Design: NER N5 overhead, c1896.

High Street [Lincoln]

Location: Lincolnshire, England. Listing: II, 1392292. Design: GNR 1, 1874.

Holmwood

Location: Surrey, England. Listing: II, 1376781. Design: S&F 5 [LBSCR], 1877.

Holywell Junction

Location: Flintshire, Wales. Listing: II, 511. Design: LNWR 4, 1902.

Horsham

Location: West Sussex, England. Listing: II, 1390051. Design: SR 13, 1938.

Horsted Keynes

Location: East Sussex, England. Listing: II, 1257907. Design: LBSCR 1, 1882.

Howden

Location: East Riding of Yorkshire, England. Listing: II [GV], 1233349. Design: NER S1a, c1873.

Instow

Location: Devon, England. Listing: II, 1107599. Design: LSWR 1, c1874.

Isfield

Location: East Sussex, England. Listing: II [GV], 1392068. Design: S&F 5 [LBSCR], 1877.

Keighley Station Junction

Location: Bradford, England. Listing: II, 1134151. Design: Midland 2a, 1884.

Kingussie North

Location: Highland, Scotland. Listing: B [G], LB36282. Design: McK&H 3 [Highland], 1894.

Kippen

Location: Stirling, Scotland. Listing: C, LB8181. Design: NBR n/s, 1893.

Kirkham Abbey

Location: North Yorkshire, England. Listing: II, 131576. Design: NER S1a, c1873.

Kirton Lime Sidings [Hibaldstow]

Location: North Lincolnshire, England. Listing: II, 1260906. Design: RSCo [MSLR], 1886.

Knaresborough

Location: North Yorkshire, England. Listing: II, 1248970. Design: NER N/S, c1873.

Knockando

Location: Moray, Scotland. Listing: C [G], LB8502. Design: GNSR 3a, 1899.

Leek Brook Junction

Location: Staffordshire, England. Listing: II, 1392398. Design: McK&H 1 [NSR], c1872.

Lewes

Location: East Sussex, England. Listing: II [GV], 1450545. Design: S&F 5 [LBSCR], 1888.

Littlehampton

Location: West Sussex, England. Listing: II, 1413574. Design: LBSCR 2a, 1886.

Liverpool Street

Location: Greater London, England. Listing: II, 1413844. Design: Metropolitan n/s, 1875.

Llandrindod Wells No1

Location: Powys, Wales. Listing: II, 9357. Design: LNWR 4, 1876.

Llanelli West

Location: Carmarthenshire, Wales. Listing: II, 87663. Design: GWR 2, 1877.

Llangollen

Location: Denbighshire, Wales. Listing: II, 1084. Design: GWR 7a, 1898.

Lostwithiel

Location: Cornwall, England. Listing: II, 1413727. Design: GWR 5, 1893.

Loughborough

Location: Leicestershire, England. Listing: II [GV], 1391315. Design: MSLR 4, 1896.

Louth North

Location: Lincolnshire, England. Listing: II, 1389137. Design: GNR 1, 1890.

Maiden Newton

Location: Dorset, England. Listing: II [G], 1386820. Design: GWR 7d, 1921.

Maidstone West

Location: Kent, England. Listing: II, 1415105. Design: EOD [SER], 1899.

March East Junction

Location: Cambridgeshire, England. Listing: II, 1408197. Design: GER 5/S&F, 1885.

Marsh Brook

Location: Shropshire, England. Listing: II, 1412942. Design: LNWR/GWR Joint 1, 1872.

Marston Moor

Location: North Yorkshire, England. Listing: II, 1412060. Design: NER S5, 1910.

Monk's Siding,

Location: Warrington, England. Listing: II, 1412064. Design: LNWR 3, 1875.

Montrose North

Location: Angus, Scotland. Listing: C, LB46226. Design: NBR 1, 1881.

Mostyn No 1

Location: Flintshire, Wales. Listing: II [GV], 597. Design: LNWR 4, 1902.

Murthly South/Inverness

Location: Perth and Kinross, Scotland. Listing: B, LB43644. Design: McK&H 3/Highland, 1919/1898.

Nairn East

Location: Highland, Scotland. Listing: B [G], LB38454, Design: McK&H 3/Highland, 1891.

Nairn West

Location: Highland, Scotland. Listing: B [G], LB38454. Design: McK&H 3/Highland, 1892.

New Bridge [Pickering]

Location: North Yorkshire, England. Listing: II [GV], 1241471. Design: NER S1a, 1876.

Norham

Location: Northumberland, England. Listing: II, 1155048. Design: NER N2, c1880.

Norton East

Location: Stockton-on-Tees, England. Listing: II, 1412065. Design: NER C n/s, 1870.

NRM/Borough Market Junction

Location: York, England. Listing: NH83, n/a. Design: SER, unknown/unknown.

Nunthorpe

Location: North Yorkshire, England. Listing: II, 1412066. Design: NER C2b, 1903.

Oakham Level Crossing

Location: Rutland, England. Listing: II [GV], 1252769. Design: Midland 2b, 1899.

Oswestry

Location: Shropshire, England. Listing: II [GV], 1176559. Design: Dutton 2 [Cambrian], 1892.

Pantyffynon

Location: Carmarthenshire, Wales. Listing: II, 14813. Design: GWR 5, 1892.

Par

Location: Cornwall, England. Listing: II, 1413731. Design: GWR 2, c1879.

Parbold

Location: Lancashire, England. Listing: II, 1361805. Design: S&F [LYR], 1877.

Park Junction

Location: Newport, Wales. Listing: II, 87671. Design: McK&H 3 [GWR], 1885.

Perth Down Centre

Location: Perth and Kinross, Scotland. Listing: B [G], LB39340. Design: Caledonian n/s, 1886.

Petersfield

Location: Hampshire, England. Listing: II [GV], 1415912. Design: LSWR 3a, 1880s.

Pitlochry

Location: Perth and Kinross, Scotland. Listing: A [G], LB39867. Design: Highland, 1911.

Plumpton

Location: East Sussex, England. Listing: II, 1238580. Design: LBSCR 2b, 1891.

Princes Risborough North

Location: Buckinghamshire, England. Listing: II, 1276408. Design: GWR 7b, 1905.

Pulborough

Location: West Sussex, England. Listing: II [G], 1413381. Design: S&F 5 [LBSCR], 1878.

Rannoch

Location: Perth and Kinross, Scotland. Listing: B [G], LB12245. Design: NBR 6a, 1894.

Rhondda Branch Junction [Pontypridd]

Location: Rhondda Cynon Taff, Wales. Listing: II [GV], 13527. Design: TVR, 1902.

Rhyl No 1

Location: Denbighshire, Wales. Listing: II, 1515. Design: LNWR 4, 1900.

Rhyl No 2

Location: Denbighshire, Wales. Listing: II, 1514. Design: LNWR 4, 1900.

Rogart

Location: Highland, Scotland. Listing: C, LB52062. Design: Dutton 1/Highland, 1894.

Rosyth Dockyard

Location: Fife, Scotland. Listing: B, LB50785. Design: NBR 7, 1917.

Ruislip

Location: Greater London, England. Listing: II [G], 1380983. Design: Metropolitan 2, 1904.

Runcorn

Location: Cheshire, England. Listing: II, 1412067. Design: LMS 13, 1940.

Rye

Location: East Sussex, England. Listing: II [GV], 1415163. Design: S&F 12a [SER], 1894.

Settle

Location: North Yorkshire, England. Listing: II [GV], 1412069. Design: Midland 2a, 1891.

Shepherds Well

Location: Kent, England. Listing: II, 1413576. Design: LCDR, c1878.

Shildon

Location: Co Durham, England. Listing: II, 1390827. Design: NER C2a, 1887.

Shrewsbury Crewe Junction

Location: Shropshire, England. Listing: II, 1247161. Design: LNWR 4, 1903.

Shrewsbury Severn Bridge Junction

Location: Shropshire, England. Listing: II, 1271480. Design: LNWR 4, 1903.

Skegness

Location: Lincolnshire, England. Listing: II, 1413516. Design: GNR 1, 1882.

Sleaford East

Location: Lincolnshire, England. Listing: II [GV], 1261326. Design: GNR 1, 1882.

Snodland

Location: Kent, England. Listing: II [GV], 1413577. Design: SER, 1870s.

Spean Bridge

Location: Highland, Scotland. Listing: C [G], LB51615. Design: LNER 15, 1949.

St Albans South

Location: Hertfordshire, England. Listing: II, 1103005. Design: Midland 2a, 1892.

St Bees

Location: Cumbria, England. Listing: II, 1412068. Design: Furness 3+, 1891.

St Fillans

Location: Perth and Kinross, Scotland. Listing: B [G], LB50380. Design: Caledonian n/s, 1901.

St Marys Crossing [Brimscombe]

Location: Gloucestershire, England. Listing: II, 1340480. Design: GWR 2, 1870s.

Stirling Middle

Location: Stirling, Scotland. Listing: A [G], LB41131. Design: Caledonian N2, 1901.

Stirling North

Location: Stirling, Scotland. Listing: A [G], LB41131. Design: Caledonian N2, 1900.

Stoke Canon Crossing

Location: Devon, England. Listing: II, 1262013. Design: S&F 4 [BER], 1874.

Stonehaven

Location: Aberdeenshire, Scotland. Listing: B [G], LB41672. Design: Caledonian N2, 1901.

Stow Park

Location: Lincolnshire, England. Listing: II [GV], 1146606. Design: GNR 1, 1877.

Sudbury Crossing

Location: Staffordshire, England. Listing: II, 1038322. Design: NSR 1, 1885.

Sutton Bridge [swing bridge cabin]

Location: Lincolnshire, England. Listing: II*, 1064536. Design: Midland Bridge Box, 1897.

Swanwick Junction/Kettering Station

Location: Northamptonshire, England. Listing: II [GV], 1051649. Design: Midland 4c, 1990/1913.

Swinderby

Location: Lincolnshire, England. Listing: II [GV], 1165196. Design: Midland 3a, 1901.

Thetford

Location: Norfolk, England. Listing: II [GV], 1414027. Design: GER 4/McK&H, 1883.

Tintern

Location: Monmouthshire, Wales. Listing: II, 24042. Design: McK&H 3 [GWR], 1876.

Topsham

Location: Devon, England. Listing: II [GV], 1224484. Design: LSWR 1, 1870s.

Torquay South

Location: Torbay, England. Listing: II, 1218283. Design: GWR n/s, c1876.

Torre

Location: Torbay, England. Listing: II [GV], 1414397. Design: GWR 7d, 1921

Totnes

Location: Devon, England. Listing: II, 1413738. Design: GWR 7d, 1923

Tutbury Crossing

Location: Derbyshire, England. Listing: II, 1413816. Design: McK&H 1 [NSR], c1872.

Ty Croes

Location: Isle of Anglesey, Wales. Listing: II, 5733. Design: LNWR C&H, 1872.

Upper Tyndrum

Location: Stirling, Scotland. Listing: B [G], LB8290. Design: NBR 6a, 1894.

Valley

Location: Isle of Anglesey, Wales. Listing: II, 19233. Design: LNWR 5, 1904.

Wainfleet

Location: Lincolnshire, England. Listing: II, 1414000. Design: GNR 1, 1899.

Wansford

Location: Cambridgeshire, England. Listing: II, 1274859. Design: LNWR 5, 1907.

Warmley

Location: South Gloucestershire, England. Listing: II, 1231481. Design: Midland 4d, 1918.

Wateringbury

Location: Kent, England. Listing: II [GV], 1414978. Design: S&F 12a [SER], 1893.

Waverley West

Location: Edinburgh, Scotland. Listing: B, LB52052. Design: LNER 13 (modified), 1936.

Weaverthorpe

Location: North Yorkshire, England. Listing: II [GV], 1308300. Design: NER S1a, c1873.

Wellow

Location: Bath and North East Somerset, England. Listing: II, 1413358. Design: SDJR 2, 1892.

West Street Junction [Boston]

Location: Lincolnshire, England. Listing: II, 1388986. Design: GNR 1, 1874.

Weston-Super-Mare

Location: North Somerset, England. Listing: II, 1129748. Design: BER, c1866.

Williton

Location: Somerset, England. Listing: II [GV], 1174890. Design: BER, 1875.

Woking

Location: Surrey, England. Listing: II, 1236967. Design: SR 13, 1937.

Wolferton

Location: Norfolk, England. Listing: II [G], 1077592. Design: GER 5, 1897.

Woolston

Location: Hampshire, England. Listing: II [GV], 1413387. Design: LSWR 4, 1901.

Worksop East

Location: Nottinghamshire, England. Listing: II [GV], 1277083. Design: MS&RL 2, c1880.

Wrawby Junction

Location: North Lincolnshire, England. Listing: II, 1249229. Design: GCR 5, 1916.

Wroxham

Location: Norfolk, England. Listing: II, 1356772. Design: GER 7, 1900.

Wylam

Location: Northumberland, England. Listing: II, 1155046. Design: NER N5 overhead, c1897

Wymondham South Junction

Location: Norfolk, England. Listing: II [GV], 1414469. Design: GER 2, 1877.

York

Location: York, England. Listing: II* [G], 1256554. Design: LNER/BR n/s, 1951.

York Platform

Location: York, England. Listing: II* [G], 1256554. Design: NER n/s, 1907.

Ystrad Mynach South

Location: Caerphilly, Wales. Listing: II, 87669. Design: McK&H 3 [Rhymney], c1890.

Noted as listed in error

Chappel North/Mistley

Location: Essex, England. Listing: n/a, No record. Design: GER 3, 1986/1882.
Reportedly listed as reason for relocation.

Listed and Stored

Gorse Hill Bridges

Location: Wiltshire, England. Listing: II, 1023159. Design: S&F type unknown [GWR], c1870.
At Purton, not extant.

Decision Not to List

Wye

Location: Kent, England. Listing: n/a, 1416279. Design: S&F 12a [SER], 1893.
Historic England decision 23 July 2013.

Delisted and Stored

Codsall

Location: England. Listing: No record. Design: GWR 28b, 1929.
Relocated (dismantled), Parkend, Dean Forest Railway

Broughty Ferry Passenger

Location: Scotland. Listing: No record. Design: Caledonian N1, 1887.

Relocated (dismantled)

Walnut Tree Junction

Location: Wales. Listing: No record. Design: TVR, 1910s.

Relocated (top only), Parkend, Dean Forest Railway

Listed/Delisted, No Longer Extant

Burton Agnes

Location: East Riding of Yorkshire, England. Listing: 1420511. Design: Unknown, 1903.

First listed 14 November 1985, delisted 19 May 2014 as structure no longer extant.

Dawlish

Location: Devon, England. Listing: 1414827. Design: GWR 26c, 1918.

First listed 23 February 2004, delisted 17 April 2013 as not unique design and better examples, demolished

Ecclesfield

Location: Sheffield, England. Listing: II, 1240614. Design: MR, Late C19.

No longer extant, no details

Nafferton

Location: East Riding of Yorkshire, England. Listing: unknown, 1434069. Design: unknown, 1906.

First listed 16 October 1998, delisted 2 March 2016 as structure no longer extant.

Unknown Status

Feock

Location: Cornwall, England. Listing: II, 1329007. Design: non-standard, 1854. Minnis (2012, p51) states that not a railway signal box.

Kay (2010) Shows as Listed

Amberley

Location: England. Listing: No record. Design: Built over 1950s.

Arrochar & Tarbet

Location: Scotland. Listing: No record. Design: NBR 6a, 1894. Shown in Wikipedia, no definitive record.

Garden Street Junction

Location: England. Listing: No record. Design: MS&LR 2, 1881.

Hackney Downs

Location: England. Listing: No record. Design: BR(ER) 18, 1960.

Highams Park

Location: England. Listing: No record. Design: LNER 11a, 1925.

Queens Road East

Location: Greater London, England. Listing: No record. Design: LSWR 4, 1897. Queenstown Road Station listed (1389413, category II).

Roydon

Location: Essex, England. Listing: No record. Design: GER/S&F, 1876. Station listed (1111121, category II).

Sandford & Banwell

Location: England. Listing: No record. Design: GWR 7a, 1905.

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