

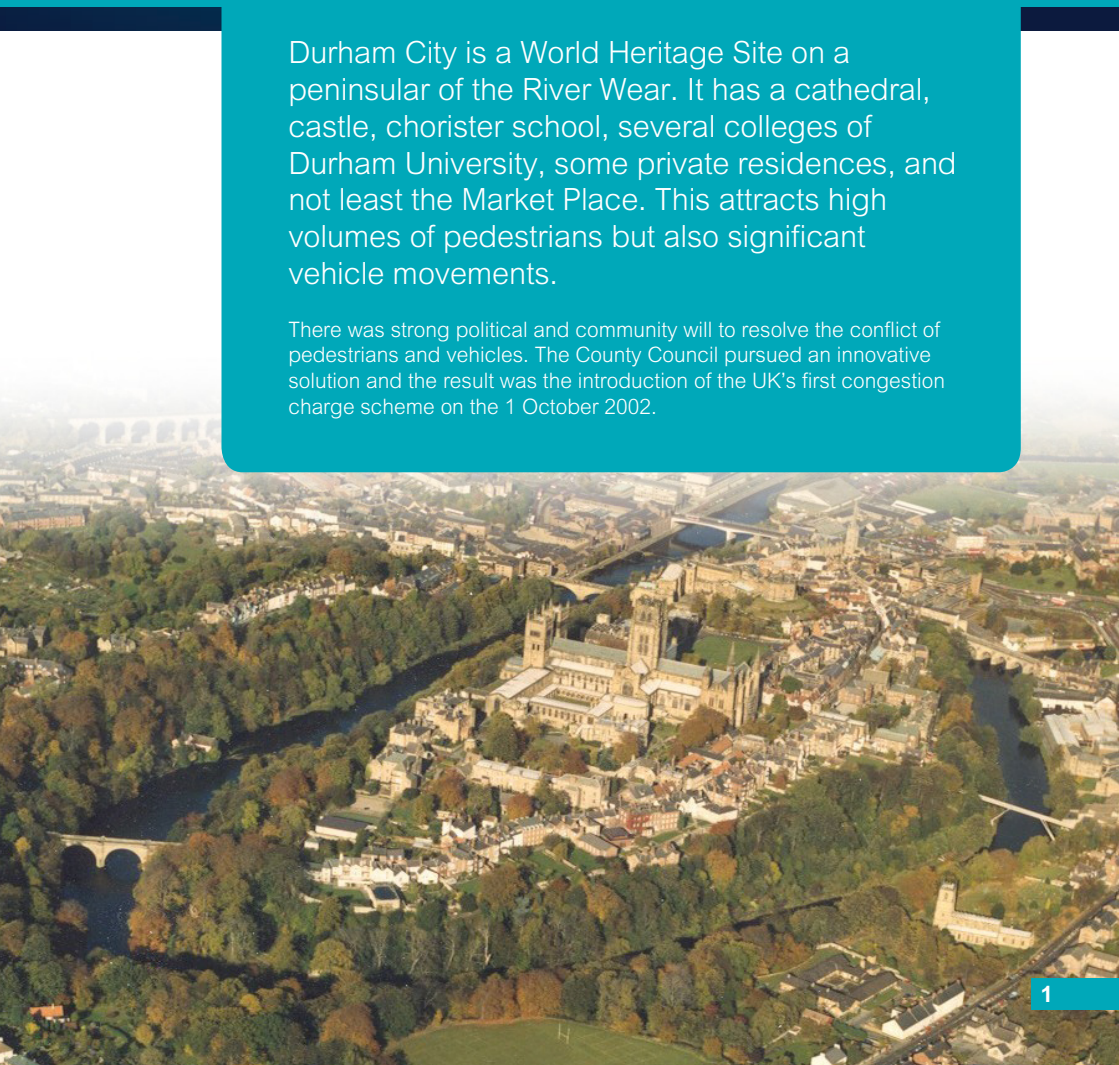


Sixty Years of
Concepts and
Innovations

Durham City Centre Road Charging Scheme

Durham City is a World Heritage Site on a peninsular of the River Wear. It has a cathedral, castle, chorister school, several colleges of Durham University, some private residences, and not least the Market Place. This attracts high volumes of pedestrians but also significant vehicle movements.

There was strong political and community will to resolve the conflict of pedestrians and vehicles. The County Council pursued an innovative solution and the result was the introduction of the UK's first congestion charge scheme on the 1 October 2002.





The City of Durham

Durham City has a unique character and is famous for the quality of its architecture and townscape. The Norman Cathedral and Castle in their spectacular setting on the Peninsula above the banks of the River Wear are acknowledged as being of international importance by their designation as a World Heritage Site. The quality of the landscape surrounding the City Centre afford it a unique setting amongst the historic Cities of England and it has become a major tourist attraction (more than 500,000 visitors a year) and an attractive place in which to live and work.

The City remains a centre of economic activity in an area blighted by the decline of traditional industries such as mining. It is an educational centre containing Durham University (12,000 students) and a number of major colleges and secondary schools serving the district and region. The City itself has some 38,000 residents (excluding students), with a further 42,000 in the small towns and villages of the surrounding area.

Historic Problems

Despite major road building around Durham during the late 1970s, the problems of a historic and little changed city centre in the late twentieth century compounded year on year. These included access and parking, the requirements of modern retailers, changing expectations of tourists, the needs and demands of students, the implications of a burgeoning evening economy and a city divided by significant traffic routes.

A travel study undertaken by Colin Buchanan and Partners in 1997 highlighted the difficulties on Durham's Historic Peninsula due to the conflict between high volumes of traffic and pedestrians in a confined area.



The Peninsula incorporates the Cathedral and Castle, designated World Heritage Sites, the main retail centre of the City, the Chorister School, several colleges of Durham University, some private residences, and the Market Place. The County Council recognised that there was the need to “significantly reduce pedestrian and vehicular conflict by removal of a substantial proportion of the existing traffic”.

To achieve this, it was identified that any such solution must:

- *increase pedestrian safety*
- *improve access for the disabled*
- *enhance the World Heritage Site*
- *preserve the viability of the Peninsula as a working part of the City Centre*

The only vehicular access to the Peninsula was through the busiest shopping and tourist area of Durham City including the historic Market Place. Vehicles accessing the University, Cathedral and Castle travelled along a narrow single carriageway where traffic signals controlled access. Although the flow of 3,000 vehicles per day prior to controls being introduced seemed low, compared to other city centres, they share a narrow, confined space with up to 17,000 pedestrians per day.





Innovative Solutions

Although previous proposals had been developed to reduce traffic by the introduction of a permit type scheme, a solution could not be identified that would deter casual use whilst retaining access for essential traffic. The introduction of the Transport Act 2000 provided the opportunity to deliver an effective solution through road user charging to differentiate between essential and non-essential users.

A strong political will to resolve this growing problem, together with support from the main commercial organisations including the Chamber of Commerce, the University and the Cathedral enabled the County Council to pursue a more innovative solution. In November 2000 a consultation exercise was commenced regarding the introduction of a £2 charge for vehicles using Saddler Street and the Market Place during a period from 10.00 am and 4.00 pm Monday to Saturday. This period was chosen as it coincided with peak pedestrian flows.

The physical constraints of the highway and the sensitivity of the locality had to be taken into account in sourcing a suitable system for access control. It was decided that an automatic bollard system managed from a remote parking control office would provide the most appropriate solution. The scheme depended on the development of a successful control system based on the use of CCTV, an automatic bollard, and specifically modified payment equipment.

Telecommunication links to a remote office enabled assistance to be provided to drivers experiencing difficulties using the system. The link provided for uploading statistical and alert data and diagnostic support from the equipment supplier. Automatic incident detection and CCTV surveillance also formed an important part of the system.

It was also necessary to accommodate a very limited number of frequent users who required access. These users and Public Transport Operators travelling through the controlled area on a regular basis were supplied with Autotag transponders capable of being detected on approach to the system and providing an automatic exit facility. To provide an attractive alternative to the car, new low emission easy access buses was introduced to provide an easily identifiable and frequent ‘Cathedral Bus’ service around the City Centre and into the Peninsula area.

To allow ease of use of permits by visitors, and mitigate against any congestion, payment collection was located on exit rather than on entry.

The £2 charge was considered to be sufficient to deter particularly those undertaking short duration shopping or commercial activities or dropping off and collecting passengers. Such trips were known to constitute over half of the total trips prior to the introduction of the charge.





Enhanced Environments

The UK's first city-centre congestion charge opened on 1st October 2002, several months ahead of its much larger London equivalent.

After a period of monitoring, the scheme's benefits were revealed:

- *a reduction of 85% in traffic volumes*
- *an increase in pedestrian activity by 10%*
- *a 50% reduction in HGV/LGV activity during the restricted period*
- *HGV/LGV activity increased outside restricted period*
- *an increase in bus patronage*
- *a 10% increase in those interviewed who considered Durham Peninsula to be a safe environment*
- *70% of those interviewed considered Durham Road User Charge to be 'A Good Idea'*
- *83% of businesses did not have to alter any servicing arrangements*

At the time of introduction, the £2 charge, payable Monday to Saturday 10 am to 4 pm, generated enough income to subsidise an enhanced ‘Cathedral’ bus service, and supported a Shopmobility scheme

This unique and innovative charging scheme attracted an exceptionally high level of both national and international media interest, especially as it preceded the London Congestion Charge. Positive press coverage focussed on the long term effectiveness of the scheme and it generated significant interest from other highway authorities, although no others have yet implemented a local road charging scheme.

The scheme continues to operate today with the only significant change being the removal of the automatic bollard in favour of an Automatic Number Plate Recognition (ANPR) system. The current charge of £2 remains, however the local authority is considering whether this should be increased.

It is considered the Durham Congestion Charge is a proven initiative of what can be achieved and may yet prove to be a forerunner of similar projects in years to come, particularly in the historic cores and pedestrianised areas of city centres.

Thanks to Dave Wafer at Durham County Council for preparing this article.



Home Zone Residential Areas

Traditionally, streets were designed with vehicle access in mind, but as car ownership increased they became less safe for pedestrians and children playing in the street all but disappeared. Streets became predominantly car parks.

Over the last twenty years this approach has been changing and more recognition given to pedestrians and cyclists. In parallel, the concept of Home Zones has developed where people and vehicles share the whole of the street space safely, and on equal terms, and where the quality of life takes precedence over the ease of traffic movement. The concept has been used for both new developments and for converting traditional streets.



Traditional designs

Traditionally, roads in England have been designed according to national standards developed by the Department for Transport (DfT) for use on the national trunk road network managed and operated by the Highways Agency. These standards have been commended as best practice to all local highway authorities and local networks have been expanded, improved and maintained on this basis.

This approach caters primarily for the needs of movement – particularly for motor vehicles and less importance has been given to the other functions that a complex and naturally developed highway network fulfils. The wider needs of non-motorised users (pedestrians, cyclists and public transport) have historically been of lesser importance.

Roads are highways where movement is the prime function and streets where other activities take place. These can include simple residential streets or major public spaces – anywhere where non-movement activities happen. For too long the focus was on the movement function of residential streets, the result often being places dominated by motor vehicles to the extent that they fail to make a positive contribution to the quality of life. Over the last twenty years this approach has been changing and more recognition given to the distinction between roads and streets, particularly in the urban area.

Until recently, the generally used standard for designing housing estates has been ‘Design Bulletin 32’ which was first published in 1977. This concentrated on street layouts that were comfortable for vehicle movements and more often than not resulted in streets where vehicles and pedestrians were separated, on carriageways and footways respectively. This was replaced through the publication of the DfT’s Manual for Streets (MfS). It demonstrates the benefits that flow from

good design and assigns a higher priority to pedestrians and cyclists. MfS1, as it is now referred, focused on lightly traffic streets but the more recent MfS2 developed this concept to apply to busier local roads. Prior to the publication of MfS, the concept of Home Zones was developed.



Home Zones

A Home Zone is defined as a residential street where people and vehicles share the whole of the street space safely, and on equal terms, where quality of life takes precedence over the ease of traffic movement. It is a concept that is new in UK, but present in Europe in various forms for more than thirty years. The layout of the street should emphasise this change of use, so that motorists perceive that they should give equal priority to others. The concept can be applied to either new housing areas or to existing streets of a more conventional nature. For an extensive new development or established area, its use would be limited to a small number of streets within the larger area.

The approach adopted in UK to create Home Zones has been to re-engineer the space around people's homes so that they feel more able to undertake social and leisure activities within the overall street space. As well as addressing the traffic aspects, Home Zone schemes also develop a greater pride and responsibility in residents for the care and wellbeing of their surroundings. This has been achieved by the active involvement of residents in the design process.

The strength of community ownership developed through the inclusive participation process also encourages new residents to accept the ethos of the community. As the involvement of the community has been at the core of successful Home Zones, it has been perceived that these cannot be applied to new developments and can only be used to change and improve the streets around existing homes.

However, the North East has been prominent in developing Home Zones for both new and existing residential streets. Formal Home Zones have been designated in Gateshead, Blyth, North Tyneside, Middlesbrough and Darlington using powers in Section 268 of the Transport Act 2000. The legal procedure for creating a Home Zone is



set out in Quiet Lanes and Home Zones (England) Regulations 2006 and guidance is provided in DfT Circular 02/2006.

Developers sometimes implement ‘Home Zone style’ schemes without formal designation, and this can omit many of the non-highway benefits that are achieved with formal designation. If it is an entirely new estate, the requirement for community consultation is thereby difficult to achieve. In those cases, the efforts and skill of the local planning officers can be crucial in achieving a good community Home Zone development.

The principle of a Home Zone is to be flexible with the use of space and not to be over prescriptive as to the use of streets. A Home Zone may consist of shared surfaces, indirect traffic routes, areas of planting, and features to encourage the use of the street, such as seating and informal play features. Traffic speeds will be low enough that walking in the middle of the street is not unsafe. Clear indications are needed at the entry and exit from an area that is fundamentally different from normal roads in its design, layout and use.

Much of the improvement therefore comes from the “feel” of an area and changing the use from transport or access corridors to overall community space. Importantly, it is intended that the speed of vehicles should be constrained by design, using the different elements that make up a Home Zone in an innovative way to constrain vehicle speeds and make it clear to drivers they are not within a conventional highway. The slow traffic speeds within residential areas allow for a greater degree of priority for non-motorised users. The aim is to give equal priority to pedestrians and traffic and encourage the use of streets for uses other than the passage of vehicles. Drivers should feel that the car was a guest in the street.

The practical differences between a conventional housing estate road and a Home Zone street should be evident. For example there would be few if any kerbs and little, if any, distinction between a footway and carriageway. These ‘shared areas’ are not uncommon but in a Home Zone it would be compounded by a lack of rounded corners. The line a vehicle would take driving through the street would not always be well defined, the driving line would be relatively narrow, and passing vehicles would have to wait at short, wider areas.

Visibility at corners might be deliberately constrained so that vehicles slow down. The width of a street would vary as it led through the estate. Landscaped blocks, parking areas, play or sitting areas could be part of the communal street width adding variety to the street scene and supporting the non-conventional feel of the area.

Practical aspects cannot be ignored. Emergency vehicles must have guaranteed access and a minimum width between obstructions. They must have a reasonably obvious route through an estate so as not to be delayed. Heavy vehicles such as refuse collection vehicles need to be able to manoeuvre without undue difficulty and, where there are culs-de-sacs, they need to be able to turn around or reverse with ease.

The competing demands of vehicles and people are difficult enough to balance in a new green field Home Zone estate. In an established residential area, for example an area of terraced streets, it can be more difficult. The UK Children’s Play Council and some resident groups were concerned that children in particular were denied the opportunity to play safely in areas around their houses where they could easily be observed and supervised by their parents. The increasing use of cars was also turning traditional residential streets into nothing more than car parks and people were becoming isolated within their own homes, taking no part in, or responsibility for, the activities that historically had led to strong and close local communities. The car was seen as a positive disincentive to sustainable community life.



The Home Zone concepts can be brought into conventional streets by creating a different outdoor environment where traffic still has access and is tolerated, but not to the exclusion of other activities. High quality materials and finish help to show that the space differs from a conventional highway. Nevertheless, many residents prefer a conservative approach that has resulted in a mixture of surfaces either by creating specific defensible spaces, or by creating specific ‘feature’ areas.

The creation of these areas within what would otherwise have been conventional carriageway can be achieved by the use of contrasting surface colours and/or textures. It achieves the break-up of the street’s linearity and constant width but care is still needed to ensure that the spacing of these ‘feature’ areas still constrains vehicle speeds.

Parking has been a major issue throughout the schemes even in areas of relatively low car ownership. In most areas the existing parking provision was at a premium and any reduction was strongly resisted. Therefore maintaining or increasing parking provision has been necessary. This has been accommodated either by improved in-curtilage parking or laying out parking blocks along the street, leaving a narrower and variable width for vehicle movements. In some schemes, by providing more formalised parking arrangements, on-street parking provision has been increased.

One of the key objectives of Home Zones, to increase the opportunity for children to play, can be achieved through play spaces. Formal play spaces have been developed as segregated areas with play equipment, sited where they are well overlooked and catering for a range of different ages. Sensitive placing is necessary to ensure that the play space can be adequately observed, but at the same time not creating an unacceptable nuisance for neighbours.



The provision of formal play facilities has been one of the most contentious issues raised during the consultation process. It is particularly important to involve children and young people throughout the design process in achieving acceptable schemes.

As well as the positive traffic impacts, it is important to understand the wider impacts that have accrued. As a consequence of implementing a conventional layout to Home Zone standards, many other benefits can arise, benefiting the community as a whole.

The main outcome of successful Home Zones has been the development of stronger and more integrated local communities. This was achieved by the active involvement of residents at all levels in the design process and is evident through community events such as Christmas carol services and barbecues as well setting up ongoing activities such as gardening clubs. Formal designation of an area under the Home Zone Regulations allows alternative use of otherwise highway space as agreed by the community as a whole.

Home Zones have built on the natural affinity for people to socialise and provided them with opportunities to mix safely with others in areas where they previously felt intimidated or isolated. This can be equally true in new and existing communities.

Thanks to John Barrell at TRL for preparing this article.

If you enjoyed this article, try also:

Creating New Town Infrastructure

Road Safety Auditing



Creating New Town Infrastructure

There was a need for massive reconstruction of UK housing stock following the Second World War. Birth rates were rising and many old slums and war damaged areas were considered no longer suitable for modern family living.

To cater for the demand in housing, one solution was to develop a number of “new towns” – entirely new communities on previously undeveloped land. In our region it saw the creation of Newton Aycliffe, Peterlee and Washington in County Durham, and Cramlington and Killingworth in Northumberland.



Planning New Towns

The immediate years following the Second World War saw a major reconstruction of the UK's housing stock. Along with a sharp rise in population, to meet the imminent demand, a number of “new towns” were proposed. This became legislation in the New Towns Act 1946, updated in 1964, allowing Government to designate areas of proposed land.

Responsibility for delivering New Towns fell to Development Corporations, who employed multi-discipline teams, including highways and transportation professionals, in the design process. More often than not, they started with a “blank sheet of paper”.

The most productive design period was from 1946 to 1950, but then came a long gestation through the planning process and eventual start of construction. The first wave of New Towns completed between 1961 and 1964, with a second trench between 1967 and 1970.





Newton Aycliffe was the first New Town in the North East and was designated on 19th April 1947, originally as Aycliffe New Town, 'Newton' being added later as a simple abbreviation of New Town. It has a current population of approximately of 29,000. Within a 10-mile radius are Darlington, Bishop Auckland and Shildon, and just south is the original village of Aycliffe.

There are no "streets" in Newton Aycliffe – the main road running through the centre is called 'Central Avenue', off which there are several Roads, Closes, Crescents and even a Parade. In older parts of the town streets are named after Bishops of Durham and Saints – Van Mildert Road, St. Aidan's Walk, Biscop Crescent; some after prominent local families – Shafto Way, Eden Road, Bowes Road, for example. Others celebrated the 'movers and shakers' of the New Town Movement, such as Lord Lewis Silkin (Silkin Way) and Lord Beveridge (Beveridge Way).

A feature of New Towns was the landscaping of industrial areas to look more aesthetically pleasing and not be left as the 'ugly' part of town.

Two further phases of development saw the completion of Newton Aycliffe – a residential area named after trees, Beechfield, Oakfield, for example, and Agnew stages 1, 2, and 3, named after the architect.

On the edge of town is the Bishop Auckland to Darlington branch railway line, part of the original 1825 Stockton and Darlington Railway. Newton Aycliffe station is a relative newcomer to the line, being opened in 1978. The Great North Road (A1) also passed through the town until 1969, when it was bypassed with the A1(M).

Peterlee was also part of the first wave of New Towns, being designated a new town on 10th March 1948, originally as Easington New Town. Its aim was to provide more modern housing for coal miners and their families and was subsequently named after the celebrated Durham miners' leader Peter Lee. It has a current population of approximately 30,000 and, while the mining industry has all but disappeared, retains strong economic and community ties with Sunderland and Hartlepool.

The town is served by two main roads – the A19 trunk road, to the west, serving Tyne and Wear and Teesside, and the A1086, which runs east of the town to Easington and Hartlepool. The B1320 also provides connections from the town centre, via the above routes to Horden and Shotton Colliery.

Peterlee was served by the railway station at Horden on the Durham Coast Line, until it was closed in 1964.

The old village of **Washington** was designated a New Town on 24th July 1964. It expanded dramatically through the creation of new 'villages' as well as absorbing areas of Chester-le-Street to house overspill population from the adjacent Tyne & Wear conurbation. By 2002 it had a population of approximately 53,000.

Developed through the 'New Towns concept', which aimed to achieve sustainable socio-economic growth, Washington was divided into 15 small, self-sufficient "villages", each simply with a designated number, much to the confusion of visitors to the area. Gradually, these and subsequent districts were given names, which now appear on road signs instead of simply a number.



Washington is located on the mothballed Leamside Line which, until the mid 1960s, carried regular passenger services to Sunderland, Newcastle and beyond. Freight transport continued until 1991, making the town one of the largest in the UK without an operational railway station. However most of the infrastructure remains intact and, in June 2009, the Association of Train Operating Companies called for funding to reopen the station as part of a £500m national scheme to recommence passenger services on 14 lines closed in the 1960s as a result of the Beeching Report.

New Townships in Northumberland

At the same time as the region's first New Towns were being planned in County Durham, similar proposals were being drawn up in Northumberland. However, by the early 1960s it was clear there would be no government sponsorship was not forthcoming. Northumberland County Council took the bold move to promote two locally financed "townships" – Cramlington and Killingworth.

The development model for Cramlington was radically different to the government sponsored New Town. While the County Council supported the town's infrastructure, the majority of development was planned by two house building companies, William Leech Ltd. and John T Bell Ltd. Killingworth, on the other hand was developed using the more conventional model.

Cramlington, situated 9 miles north of Newcastle upon Tyne, was a small mining village until 1964, when it was chosen by Northumberland County Council as the location for a new "township". It was a developer-led project, with house builders William Leech and J T Bell creating a number of large residential estates. However, with little in the way of shops, schools, or community areas, the town effectively became a dormitory of urban Tyneside. Facilities have improved in recent years and the population in 2004 was estimated at 39,000.

In terms of transport, Cramlington is well connected, with a railway station and direct train services to Morpeth, Newcastle and the Metro Centre. The town also has an extensive bus service, including express services to Newcastle. Good road links to the A1, A19 and A189 means Cramlington remains a popular place to live, cheaper than the city but still with easy access to it.

Like many of the New Towns in the rest of the UK, Cramlington has an extensive bicycle network, the majority of which are segregated cycle routes, free of motorised traffic.

Killingworth township was built on 760 acres (3.1 km²) of former colliery land near old Killingworth Village, the mine having been abandoned since 1884. Started in 1963, it was originally intended to create around 7,000 jobs and house a population of 20,000.

Unlike Cramlington, which had little identity of its own, Killingworth was built with a sizeable commercial centre, with strong bus links to the rest of Tyne and Wear for commuting and leisure purposes. The design was radical, with a large citadel complex, comprising the shops and community buildings. Baileys, or loop roads, ran off each side, where the Garths, or housing would be built. The result was an avant-garde, brutalist style of high-rise buildings, stepping down in scale away from



the centre. It won awards for architecture, dynamic industry and attractive environment. A boating lake was provided close to the centre and nearby housing.

While the township incorporated typical architectural features of the time, there were also some quirks. One example is the pre-cast concrete houses, which had millions of small shells embedded into their external walls. Offices, industrial units, service buildings, shops and multi-storey car parks were interconnected by ramps and walkways to residential flats, constructed to the Swedish Skarne ‘deck method’. It was very experimental – the five to ten storey flats proved extremely unpopular, leading to that element being demolished in 1987 and redeveloped with more conventional housing.

With construction more or less completed by 1973, Killingworth Development Group produced a Case Study of planning and developing New Towns in the North East, concluding that “...*the key to success of a New Town is the ability to integrate a plan over a large area rather than undertake piecemeal development.*”

Thanks to J Michael Taylor MBE, CEng, MICE, FICHT, for preparing this article.

If you enjoyed this article, try also:

Home Zones



Road Safety Auditing

Any change to the highway network, whether new roads or improvements to existing ones, will involve a change in user behaviour. This leads to increased risk and potential accidents.

A formal road safety audit process is now employed to give an independent assessment of a scheme. It ensures, at key stages, that safety aspects of design and implementation have been scrutinised and addressed. This benefits both the road user and community alike.

The photos in this article all highlight particular issues that would be reported in a road safety audit. See if you can spot them! Answers are given at the end.



The Road Safety Audit process is a formal, independent assessment of the operational safety of a section of road. They are undertaken during the design and implementation of a new scheme or improvements to an existing road, but the process can equally be used to assess other transport projects, such as junction improvements, public transport interchanges and pedestrianisation schemes. While all road schemes are designed and built to the highest safety standards at the time, road safety can never be taken for granted. The aim of the audit is to minimise the number and severity of situations in which road users are injured whilst using the streets and roads.



Road safety audits are undertaken by an independent team not involved with scheme design. They provide fresh eyes not influenced by design considerations and which can spot aspects of a scheme that could be made safer. This is a low cost process with potential to produce significant benefits if carried out in a formal and co-ordinated manner, throughout the planning, design and implementation stages of a road project. It requires strong management commitment, skilled auditors, cooperation from design teams, and an on-going training programme.

Development of road safety checking or auditing in the UK started in the 1970s, specifically the Road Traffic Act 1974. Section 8 of the Act requires that Highway Authorities:

“...in constructing new roads, shall take such measures as appear to the authority to be appropriate to reduce the possibilities of such accidents when the roads come into use”.

In meeting the requirements of the Act, highway authorities were able to determine themselves what were ‘appropriate measures’. However, with many local authorities lacking the capability and experience, the initial response was limited.

This changed following local government reorganisation in 1974. Many smaller authorities were merged into the municipal county councils and, prompted by the legislation and pooling of resources, began to set up dedicated engineering safety teams. Tyne and Wear, Durham and Northumberland County Councils were all pro-active from the start, enabling them to be at the forefront of developing data-led approaches to accident reduction, of which road safety audits are now a key element.

Development of assessment techniques continued over the years, culminating in road safety audits being formalised into the UK highway design process. It is now a formal requirement for them to be carried out on all schemes on the trunk road network, under the Highways Agency,

and recommended as good practice, for local schemes. Consequently the majority of highway authorities have their own procedures for safety audits on most highway works.

The purpose of a road safety audit is to review a scheme's ongoing design, ensuring, wherever possible, any potential hazards are eliminated or minimised before construction begins. It follows the principle that "prevention is better than cure" and that it's far easier (and cheaper) to change design elements on a page than to make alterations to a new piece of highway.



The following stages (or types) of audit are commonly recognised:

- Stage 1 - Preliminary Design
- Stage 2 - Detailed Design
- Stage 3 - Pre-Opening (on completion of construction)
- Stage 4 - Post-Opening and existing roads
- Audit of Traffic Management Schemes
- Audit of Building Development (e.g. shopping malls, sports stadia)

Audits are required even when professional highway designers are expected to use the latest design standards. This is because each scheme is a unique design and, generally, a balance between operational efficiency, cost, environmental factors and the priorities of the client. Even when full compliance with the latest standards is achieved:

- compliance does not guarantee safety – there will be situations not covered by the standards and, sometimes, individual elements, which are all designed to standard, when combined, may be deemed unsafe
- safety can be compromised in the trade-off between conflicting requirements – it is difficult to produce a highway design that meets all objectives, and safety is not always given adequate priority
- highway designers may lack the skills to spot potential safety hazards, especially the knowledge of human-vehicle-road interaction



Road safety audits check that a scheme meets the safety needs of all road users – drivers, pedestrians and cyclists. Special attention is given to whether the needs of vulnerable road users are being met, as experience indicates that highway designs focus largely on motor vehicles. In this case, vulnerable would mean anyone not in control of a vehicle, such as pedestrians, passengers waiting for transport, and roadside vendors. However that may also include motorcyclists and bicycle users. The audit process ensures the scheme design takes account of all road users but also factors in other considerations, such as the local climate and weather, road user indiscipline, difficulties of law enforcement and whether the proportion of vulnerable road users is higher than average.

Safety audits involve three parties, each with a defined role:

- **the Audit Team** is composed of safety specialists (at least 2) who are commissioned by the client to perform the audit and produce a report that identifies potential safety problems and offers solutions
- **the Scheme Design Team** will be asked to comment on the audit report and will, if necessary, be instructed by the client to alter the design in response to the audit; these duties should be included in their terms of reference
- **the Client** usually represents the highway authority (Highways Agency or local government) who commissions the audit and decides whether its recommendations should be accepted or rejected





The audit team should be independent of the design team and be instructed to carry out the audit directly from the client. As the process, by its very nature, is subjective, more than one person is usually required to increase the chances of spotting safety problems. In any event, discussion amongst team members generates fresh observations and ideas, and usually enhances the assessment.

Road safety audits at different stages call for different skills. For example, at the Detailed Design stage, knowledge of design standards is fundamental, along with the experience to check specific elements like signs, safety barriers and street lighting. For a Pre-Opening audit it is not uncommon to include a traffic police officer with knowledge of local travel patterns, congestion and accident hot-spots, as part of the team.

A good auditor will be able to read engineering drawings and visualise what the scheme will look like. They should be capable of putting themselves in the shoes of each road user and imagining what it would be like, for example, to be a pedestrian crossing the road at night, or a motorist turning right at a junction.

Typical things that auditors will look for include:

- Mistakes or misunderstandings in the design
- Departure from design standards
- How all types of road user would react to the scheme, at all times and conditions
- Interaction between design elements
- Opportunities to include accident-reducing elements

In organising road safety audits, highway authorities have three options:

- **In-house audit teams** – this has the advantage of being quick and easy to arrange and means auditors can see the scheme through to completion; there has to be a degree of caution in keeping the team independent, and members from outside an authority are often recruited to prevent ‘in-house complacency’ developing
- **Design consultant carries out the audit** – if this option is used, the client must instruct the consultant to use auditors not involved in the design work; it may be difficult for auditors to be completely objective if there is a conflict of interest when assessing colleagues’ work but, for the avoidance of doubt, a member from the client’s engineering team, or other independent party, are usually involved
- **Independent consultant** - this option ensures the audit is completely independent but, in a competitive market, the appropriate checks and balances will assist in assessing the consultant’s credentials for the work

It is important to understand that road safety audits:

- are not technical audits or checks for design standard compliance - they are only concerned with road safety
- are not informal checks or design reviews - these may still be useful
- will not involve redesigning aspects of a scheme considered to be unsafe - this is the responsibility of the design team
- are not just for large schemes - even small projects can give rise to serious safety problems
- help sensitise road engineers to safety issues, and feedback from audits lead to improved design standards
- cannot demand changes to the design – that final responsibility rests with the client, and it is not necessary for them to have the agreement of the auditor or the designer



Audits are relatively inexpensive and typically take no more than a few weeks to complete. Many of the recommendations from audits cost little or even nothing to implement and evidence from countries that have adopted safety auditing suggest the costs of any changes are significantly outweighed by the safety benefits. These may include avoiding expensive reconstruction to remedy safety deficiencies, less damage to road furniture and lower liability claims. Lifecycle costs may also drop, as safer designs tend to carry lower maintenance costs. Benefits to road users are lower risks of injury.

Road safety audits are undoubtedly of benefit but the auditor is not superhuman and may not always be fully aware of the constraints placed on a project and its designers. While safety is important it is not the only factor and improvements cannot be highlighted without regard for cost or potential adverse impact in other areas of the scheme. It is a level of diplomacy that comes with continuous training and awareness of an auditor's role by all parties involved in the scheme.

The Chartered Institution of Highways and Transportation (CIHT) play a prominent role in supporting the road safety audit process. They have published a number of detailed guides, not least of which is the 'Safety Audit of Highways', issued in 1996. In 2003 the Highways Agency issued the standard 'Road Safety Audit HD19/03' guidelines, using feedback and experience to bring their audit process up-to-date. The CIHT responded in kind with an update to 'Road Safety Audit', published on 1st October 2008. HD19/03 must be used on trunk road schemes but the CIHT guidelines are more expansive and aimed at local authorities, for more minor road improvements.

Not least, the CIHT has formed the **Society of Road Safety Auditors (SoRSA)**, representing an exciting initiative for developing professional highways safety auditing best practice. SoRSA was established as a response to growing calls from UK safety auditors and

safety practice engineers, for a forum to exchange knowledge, ideas and, importantly, provide advice and routes to professional recognition.

Thanks to John Barrell of TRL, for preparing this article. John has many years experience as a road safety auditor and is a member of SoRSA.

- Page 2 - **Lack of foresight or co-operation** – which came first, the sign or the tree growth? Even on new road schemes, it is not uncommon for the traffic signs designer and landscape designer to work oblivious to each other's plans.
- Page 4 - **Lack of attention to detail or co-operation** – an out of control vehicle will be guided along the bridge parapet to hit the lamp column. Was the lamp column location and safety fence on different drawings? If so, the two were not co-ordinated to make it clear the column should be behind the fence.
- Page 6 - **Lack of awareness and oversight** – the pedestrian is apparently guided along the footway by the guardrail but there is nowhere to go. It is not uncommon for highway work, in this case, a bridge replacement, to compound an already existing problem, rather than resolving it.
- Page 7 - **Lack of understanding and oversight** – there appears to be little empathy for visually impaired pedestrians. They are guided into an object that is not lined up with the route of the footway. Was the designer concerned only with the exit from the building? Could a continuous footway have been provided with exiting vehicles giving way to pedestrians?
- Page 8 - **The very purpose of audits** – sometimes it is difficult to foresee the actual impact of road furniture (signs in this case) until they are already in place. While traffic signs sometimes block a motorist's view momentarily, in this case, the auditor established the view of the road was blocked for a considerable length to emerging motorists by road signs too close to the edge of the road.
- Page 10 - **Some situations can be difficult to resolve** – there are many constraints on design, not least the land available to a scheme and the topography. In this case, the road curves sharply into a roundabout, slowing approaching vehicles. Awareness of the roundabout is vital as the line of sight goes off to the horizon, meaning the position of the warning chevron boards is crucial. In this case however, the safety signs actually obscure the boards.

The Newton Cap Railway Viaduct Conversion

Newton Cap Railway Viaduct is a fine example of Victorian engineering and carried the railway high over the River Wear at Bishop Auckland from 1857 to the closure of the railway line in 1968.

It was subsequently incorporated into Durham County Council's network of country walks, but reassumed its importance as a key transport link in 1995 when converted to carry the A689 over the river, replacing the nearby narrow 14th century Bishop Skirlaw Bridge. It is thought to be the first such conversion scheme in the UK.



History

Newton Cap Railway Viaduct was built between 1854 and 1857 to carry the North Eastern Railway's branch line linking Darlington, Bishop Auckland and Durham over the River Wear, just north of Bishop Auckland. It was one of three almost identical viaducts on the 15 mile long line. It was designed under the auspices of the chief engineer of the North Eastern Railway, Thomas Elliot Harrison, who had been a pupil of Robert Stephenson and with whom he worked and shared credit for the High Level Bridge in Newcastle. The contractor was R. Cail.

The line was formally opened on the 1st April 1857 by a special train of 22 carriages, drawn by one of George Stephenson's patent engines (No.55). A supplement to the Durham Chronicle on the 3rd April 1857 concluded by reflecting that the Engineer and Contractor of the Bishop Auckland Branch as having erected "viaducts which will endure for ages, and carry down the fame of the designer and builder to the remotest time". This epitaph seems just as appropriate over 150 years later.

The viaduct is constructed in stone and brick and is 828ft long with 11 arches each spanning 60ft. The elevation is 100ft above the river. Its original use continued until 1968 when the railway line was closed. In 1972 Durham County Council acquired the Grade II listed structure and converted it into a footpath, as part of the County's network of country walks.

In the shadow of the railway viaduct is the narrow Bishop Skirlaw Bridge which was the only road crossing (A689) of the River Wear in the vicinity since it was built in the 14th century. The Grade I listed structure has two arches of unequal lengths.



Conversion of the Railway Viaduct to a Road Bridge

In the early 1980s it was evident the narrow Bishop Skirlaw Bridge was showing signs of distress from modern day traffic. Durham County Council determined an alternative river crossing was required to relieve the bottlenecks on the old bridge, and to cater for future, traffic growth on the A689. A number of route options were identified which would also provide a bypass to the nearby village of Toronto.

Durham County Council chose to make use of the Newton Cap Railway Viaduct, shown to be structurally sound, and convert it to a road bridge to carry a realigned A689 to the north of Toronto. It is believed this conversion of a railway viaduct to road use was the first of its kind in the country.

Work included the provision of a new concrete deck which was 13ft wider than the viaduct and included footways on either side. It increased the weight of the structure by some 2%, to 48,000 tonnes. The total cost of conversion was £4.25m, with the Toronto Bypass adding a further £1.6m.





Conversion work on the viaduct began in September 1993, with road realignment starting in March 1994. The scheme was completed in July 1995. It has given this fine Victorian structure a new lease of life and restored its rightful importance as a key communications link, carrying the busy A689 over the River Wear at Bishop Auckland.

The scheme was warmly welcomed by both English Heritage and the Royal Fine Art Commission, who congratulated Durham County Council for “achieving the use of the existing viaduct and securing its wellbeing for the future”. At the time it was hoped the conversion could be “made an exemplar for other similar situations”. The Bishop Skirlaw Bridge was retained for vehicle use but with vastly reduced traffic volumes.

‘Paving the Past’ at Beamish Museum

To celebrate its Golden Jubilee in 2002, the North Eastern Branch carried out a commemorative transportation project at Beamish Museum in County Durham.

With help from sponsors, an important ‘missing link’ along the Museum’s perimeter road was completed, allowing visitors to be transported around the site in period vehicles, such as vintage buses and trolley buses. It was a rewarding project for the Branch, which left a permanent legacy for visitors to enjoy.





The transport corridor around the perimeter of Beamish Museum consists of a tramway and adjacent roadway, allowing visitors to be transported around the site in period vehicles such as vintage buses and trolley buses, along with being an important service road.

While constructed to a reasonable standard, one section in the north-western quadrant, used as the main route for visitors to the Old Town, was still unmade, with an irregular, badly potholed surface and poor drainage. This 550 metre long and 5 metre wide section detracted from the high quality of the rest of the route.

The Branch was delighted with the enthusiastic response of ten sponsors who readily offered their services to design and construct the remaining section. It gave them an opportunity to contribute to the further development of the Museum while also celebrate the Branch's Golden Jubilee.

A sustainable 'foam mix' bound road base was laid, which incorporated foamed bitumen and cement, and was produced almost entirely from secondary aggregates, to significant environmental benefit. A high quality 'Fibre-Dec' surface dressing completed the construction and sealed the surface. Reconstruction work was completed in five days, just prior to the start of the 2002 tourist season. It remains serviceable to this day, providing a smoother ride for visitors and extending the service life of the vintage vehicles.



An old stone milestone was erected on the route and engraved with 'IHT', to commemorate the Golden Jubilee and the generous contribution made by the sponsors, without whom the project could not have been carried out:

- *Bruce Cook Road Planing Ltd*
- *Roadstone Recycling Ltd*
- *Tarmac Ltd*
- *Colas Ltd*
- *Nynas UK*
- *Ballast Phoenix Ltd*
- *Lafarge Aggregates Ltd*
- *RMC Aggregates (Northern) Ltd*
- *William Smith & Sons Ltd*
- *Durham County Council*



Pictured with the milestone is the Branch Chairman during 2002/3, Jim Davidson, the former Regional Director, Department for Transport, Newcastle. The 'IHT' subsequently became the CIHT – the Chartered Institution of Highways and Transportation.

Thanks to Roger Elphick OBE of the CIHT North Eastern Branch for preparing this article. Roger is the former Director of Environment at Durham County Council.

