Activity Group Report

Activity Number: 1

Activity Name: Diversion and Protection of Apparatus

Rev.	Date	Status	Author	Checker	Approver	Comments
	11.6.10	Final	DJR	Activity Team Leader	Steering Group	

Contents

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4. Description of Problem/Background to Work stream

- General
  The appearance of even the quietest, most uncluttered street belies the presence below ground of a large number of pipes and cables carrying water, gas, sewage, electricity and communications, providing services that are all essential elements of our way of life. This apparatus has been placed there under statutory authority.

  Interruption of the services for even a short time would represent, at best, an inconvenience. In some cases their absence would be more significant. A lack of heat, lighting and power in hospitals would make it impossible to carry out many operations, and would endanger the lives

of patients. Similarly the lack of heating in homes for the elderly could have severe consequences. Absence of communication systems would interfere with the operations of the emergency services. ***Continuous availability of services is consequently a necessary condition of civilised life.***

Apparatus may be placed anywhere in the street, with sewers and large, high capacity items generally to be found in the carriageway, with more minor apparatus in the footway. An important requirement for all apparatus, regardless of where it is placed, is for the owner to be able to get access to it quickly when it has to be maintained or repaired. Interruption of service for long periods will generally be unacceptable.

When a tramway is introduced into a street, the infrastructure will invariably affect some of this apparatus by interfering with the access to it. In some cases parts of the apparatus may be physically in the way of the construction process. This might particularly apply to manholes and chambers belonging to sewers or communication networks, and to fittings associated with gas and water pipes such as stop taps, valves, washouts and fire hydrants. Moving equipment of this kind clear of the tramway will often result in the need to also move the apparatus to which it is attached. In addition, much of the buried apparatus is laid at a depth that is likely to conflict with the construction of the tramway. The consequence is that, before tramway construction can begin, it will be necessary to examine the conflicts between the tramway and the utilities' apparatus. Some apparatus will need to be moved into new positions where it will not interfere with the construction or operation of the tramway. Ideally it will then be freely accessible to the utility company when it is necessary to repair or maintain the apparatus, or extend the companies' network by connecting new apparatus to it.
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- Technical
  A tramway will normally consist of one or more track slabs, each of which will support a pair of rails forming a track. The underside of the slab will be at a depth of approximately 500mm beneath the road surface. Each slab will typically have a width of about 2.5m, and will need to be founded on a suitable bedding material. This will often be the same material that supports the existing highway, but in some cases this may not go deep enough, and additional excavation will be necessary.

  In addition to the rails and slab, the tramway infrastructure will include one or more nests of ducts running parallel to the slab to carry power and communications cables, and masts to support the overhead line contact wires. In general, preference will be given to supporting the overhead line from buildings adjacent to the track, but it is seldom possible to achieve this everywhere along the route. There will also be other isolated pieces of apparatus such as drainage, signals, signal controllers and other street furniture, platforms and platform equipment.

Apparatus belonging to the utility companies may include pipes in a variety of materials, including cast iron, steel, plastic, vitreous enamel, concrete, asbestos cement and brick. These will normally be used to carry gas, water or sewerage. Communication cables are enclosed in ducts which link manholes or chambers, where the cables are connected together. This allows the cables to be easily changed when necessary, by disconnecting and pulling them out of the duct, and pulling in a new one. Electricity cables are normally laid directly in the ground, in a bed and surround of sand. This allows the heat generated by the current flowing through the cable to be dissipated. The exception to this is where the cables are laid beneath a carriageway, when they are generally contained in a duct. This allows them to be replaced without interfering with traffic. The disadvantage of doing this is that the heat does not dissipate as readily, and it may be necessary to use a cable with a larger cross section to compensate.

The depth of apparatus can vary considerably, from as little as 250mm in footways, to several metres for sewers and some BT apparatus. More detail on the types of apparatus and their significance for major works can be found in Appendices A and B of the HAUC publication *Measures Necessary Where Apparatus is Affected by Major Works (Diversionary Works)*.

- Commercial
  Diversion of apparatus is priced at cost, meaning that there is no profit element for the undertaker. Furthermore, the undertaker contributes to the cost of the works in two ways, as described under the heading Legislative. The cost includes an allowance for the undertaker's overheads, but it should be understood that the undertaker does not (or should not) gain from the exercise. In fact the opposite is true, in that the exercise costs him money, while at the same time it prevents his employees from carrying out profitable work.

  The majority of the cost of the works will normally be met by the authority. The greater the amount spent on moving apparatus, the more difficult it will be to justify a scheme through the benefit to cost ratio. Under certain circumstances it may be possible to agree with the undertaker that certain pieces or types of apparatus will not need to be replaced. While this will save money in the short term, there will always be a need to balance the capital saving against possible future loss of revenue if apparatus fails and the trams have to be halted, or worse, the tramway infrastructure has to be demolished and reconstructed to allow repair of the undertaker's apparatus to be carried out. The risk of disruption to services will also have to be taken into account in assessing the viability of the project, particularly if the tramway is constructed and operated under a PFI arrangement.

- Legislative
  All apparatus placed in the highway has been put there as a result of a statutory right to do so, or occasionally under the terms of a street

works licence (known in Scotland as a permission to execute road works) granted by the street or road works authority.

Power to install gas pipes and ancillary equipment is given by the Gas Act 1986. In the case of apparatus for the distribution of electricity, powers are granted by the Electricity Act 1989; for water and sewerage authorities, the powers come from the Water Industry Act 1991; and for communications providers, from the Telecommunications Act 1984.

The power to construct and operate a tramway will generally come from an order made by the Secretary of State under the Transport and Works Act 1992. This will authorise the placing of the tramway infrastructure in the highway.

All works carried out in the highway by way of installation, maintenance or repair of apparatus are governed by the New Roads and Street Works Act 1991 ("NRSWA"). This does not authorise the works, but sets out the ground rules that bind people who are so authorised. The subjects covered include the obligation of the undertakers to give notice that they propose to excavate in the highway to carry out street works, and the periods of notice to be given; the obligation of the undertaker to maintain the apparatus to an acceptable standard, to pay compensation to people suffering damage from the failure of the apparatus, and to reinstate the highway to an acceptable standard after work has been carried out; the duty of the street authority to co-ordinate all street works carried out in their area, and the corresponding duty of the undertakers carrying out the works to assist the street authority in this process; the obligation of utility companies to keep accurate records of the positions of apparatus as installed; and to carry out works in a safe manner while avoiding unnecessary delay and obstruction to other users of the highway.

Under normal circumstances, no utility has precedence over another. It is the responsibility of a utility wishing to place apparatus in the street to find room for it; if room cannot be found, the utility company will have to negotiate with other utilities so that they first move existing apparatus to make room. However, NRSWA makes specific provision for the movement of apparatus by incumbent utilities under specific circumstances: when major highway works are to be carried out; when a bridge needs to be reconstructed, or maintenance needs to be carried out on it; and when major transport works (such as the construction of a tramway) are to be undertaken. In each case, the authority carrying out the works and each utility company affected by it are required to identify the measures necessary to allow the authority's work to proceed without unnecessary delay. This will frequently mean that utilities' apparatus will need to be moved to a new position clear of the tracks.

The cost of modifying the apparatus is to be calculated and shared in accordance with the Act and accompanying regulations. The

regulations in question are the Street Works (Sharing of Costs of Works) (England) Regulations 2000 and the Street Works (Recovery of Costs) (England) Regulations 2002 (NB: different regulations apply in Scotland and Wales). The first provides that the utility should absorb 7½% of the cost of moving apparatus to make way for the tramway infrastructure, and 18% of the cost of moving apparatus to allow the highway to be altered to compensate for its introduction. In addition, where the life of the apparatus is extended as a result of the works, either because new apparatus has been installed in place of old, or because the apparatus has been refurbished, the utility will be required to absorb a further percentage of the cost of the works. The percentage will be calculated using the Bacon-Woodrow formula. A utility is entitled to recover overheads on their expenditure (but not profit), so long as it is calculated in accordance with the Recovery of Costs regulations.

5. Proposed Elements of Study:

1. Review of existing data, studies and reports related to this work stream.

   There is little in the way of written data on the subject of diversion of utilities' apparatus, specifically related to tramway schemes. The Department for Transport sponsored a publication prepared by HAUC (Highway Authorities and Utilities Committee) published in 1992 and issued under section 84 of NRSWA, called *Measures Necessary Where Apparatus is Affected by Major Works (Diversionary Works)*. This is now only available as a photocopy. While attempts have been made to update it over a number of years, there is no firm date for a new version to be made available. The original document contained no guidance on diversion of apparatus in connection with major transport works.

   In 1993 the Passenger Transport Executives Group (PTEG) commissioned a book called *Diversionary Works for Tramway Promoters* which covered the areas omitted by the official Diversionary Works Code of Practice. This is now also out of date. An updated version was produced in 2005, but was never formally published. Had it been, this would now also be out of date, and there are now proposals for a new version to be produced.

   Consideration of both documents is included in the output of this study.

2. Case study analysis by reference to UK tramways.

   The main purpose of this study has been to understand the approach to diversion of apparatus adopted by the relatively small number of UK tramways constructed in the last 20 years, and to attempt to compare this with experience on the Continent. Three

questionnaires were developed to try and draw out this experience. One of these was sent to the promoters and operators of UK tramways, the second to operators of Continental European tramways, and the third to UK utility companies. The response was patchy. It became clear that the use of PFI for the introduction of tramways, whatever the financial benefits may be, does not lend itself to free dissemination of useful information, due to the apparent necessity for commercial confidentiality.

Following the receipt of the questionnaires, a set of case studies of UK tramways was undertaken. The networks considered were Manchester Metrolink, Edinburgh, Croydon and West London Trams. The first of these is the longest established, with three operating lines and a further three under construction. Edinburgh is also in the process of being constructed, with the diversion of utilities' apparatus being substantially complete. Croydon is complete, with no extensions currently in hand, while the West London Trams project only progressed as far as the planning stage.

3. Case study analysis by reference to Continental European tramways.

   No attempt was made to prepare case studies in respect of Continental tramways. It is questionable whether Continental experience would have much relevance for the UK situation, because the legislative background is generally very different.

4. Details of proposed study including scoping report which identifies additional information requirements and methodology

   A scoping report was prepared at the start of the project.

6. Applicable BS Standards, EU Norms, Best Practice Guidelines and industry working practices.

There are currently no British Standards, and no known EuroNorms dealing with the subject of diversionary works in respect of tramway schemes. There are several trade organisations associated with the utility companies that produce guidance on aspects of the introduction of apparatus into the highway. The chief of these is NJUG (the National Joint Utilities Group) who also represent utilities on the HAUC working parties. None of their documents directly address issues related to diversionary works associated with tramways.

The chief official document related to this subject is the Diversionary Works Code referred to above. Considerable progress has been made over several years to raise HAUC's awareness of its failings in respect of tramway works, and ensure that when it is revised, it pays attention to

providing advice specifically related to tramways and other transport schemes. There is currently an Advice Note issued for consultation, which is intended to complement the Code. Once all comments have been considered, this will be posted on the HAUC website.

7. Expected Benefits from Study:

It is intended that this study will provide tramway promoters with a better understanding of the legal framework governing the diversion of utilities' apparatus, and why utilities may reasonably require its removal from the immediate vicinity of the tramway. It also aims to provide an understanding of how the costs of the diversion work are to be apportioned between the two parties.

Life-time costs of the scheme will be minimised if the scope of diversion works is correctly identified. This does not necessarily mean either that the maximum amount of apparatus should be diverted before the tramway construction begins, or that no apparatus should be moved. Both options imply a cost. In the first case, the capital cost of construction will be greater, while the second case may lead to major and frequent disruption to tram services, resulting in loss of revenue. This study therefore presents the issues that should be considered when attempting to reach the most beneficial balance of work. ***It must always be appreciated, however, that the utility companies are an integral part of the decision process, as it must continue to be practicable for them to operate and maintain their services.***

Alongside choosing the correct scope, it will also be necessary to ensure that the costs claimed by the utility companies are only those to which they are entitled. ***It will be important to adopt appropriate auditing procedures, based on a full understanding of the regulations governing cost share.***

The following general conclusions can be drawn:

- The chosen alignment should always seek to avoid high capacity apparatus due to both the cost and the programme implications of having to replace them – gas pipes above medium pressure, electricity cables above 11kV, communication cables forming part of a trunk route (whether copper or fibre optic), gas and water pipes close to a major source of supply.

Always explore options for safeguarding apparatus that does not involve total replacement:

- Where possible, reconstruct manholes to move access clear of tracks without the need to replace and rejoin all the cables within them

- Provide empty communications ducts clear of the tracks. Future replacement cables can be pulled into these until all cables beneath the tracks are eventually decommissioned
- Consider internal sleeving of gas and water pipes where they are close to but not beneath the tracks, and an adequate quantity of gas or water can still be provided through the reduced cross section. This will reduce the probability of having to maintain the pipes to a level that is likely to be acceptable to both sides. The layout of pipes needs to take into account the possibility that new supplies may be needed in the future, meaning that new pipes may need to be connected to the pipe close to the tracks.
- Where iron gas mains are to be diverted, ensure that deferment of renewal calculations take into account the limited residual life of the pipe.
- Provide empty ducts across the tracks for future use by the electricity distribution network operator or communication companies, in case it is necessary to expand the network at a future date.
- It is not always possible to reposition sewers. If this is the case, they should be refurbished to an appropriate standard and access provided via side access manholes. Agreement would need to be reached between the authority and the sewerage undertaker as to the necessity for relaxation of the duty to compensate the tramway operator in the event of failure of the sewer, and on the valuation of any extension of the life of the sewer resulting from the refurbishment, and contributed to by the authority.
- Consider incorporating communications ducts crossing the tracks within the track slab, specially thickened for the purpose. The ducts would need to be positioned in a zone between approximately 450 and 650mm below the top of rail level.

Considerable benefits to the project will be obtained from ensuring that the people dealing with the utilities have a thorough understanding of the legislation, and the characteristics of the apparatus employed by the utilities. All proposals made by the utility companies need to be reviewed critically to see if there are alternative, cheaper ways of achieving the same ends. Recent experience in Manchester and Birmingham demonstrates that the cost of diversions can be reduced if this approach is adopted.

8. Planned Output of Study

The work has been planned in three phases, of which the first two have been completed.

8.1 Phase 1.

This was divided into two sub-phases. Part 1a was the production of a scoping report identifying additional information requirements. Part 1b involved the issue of questionnaires to UK and Continental tramway promoters and operators, and UK utility companies and trade bodies. This was followed by the preparation of a summary of the responses. A summary report was also prepared setting out the general principles of diversion and protection of apparatus.

8.2 Phase 2

Phase 2 comprised the preparation of three separate guidelines:

- Guideline 1 – Standard methodology for assessing utilities' works requirements
- Guideline 2 – Mitigation of Utility Diversion Requirements
- Guideline 3 – The Causes and Control of Cost Creep and Cost Escalation

8.3 Phase 3

This phase is to identify desirable changes to legislation that will help to make tramway schemes easier to justify in terms of their benefit cost ratio, and to clarify inconsistencies and anomalies in the existing legislation.

This work will need to keep in mind that similar work is being undertaken by a HAUC working party, sponsored by the DfT, preparing an update of the Diversionary Works Code. Some of the proposals to be put forward under this phase of the study will be considered unacceptable by NJUG (the National Joint Utilities Group) who are represented on the HAUC working party.

9. Timetable for Delivery of the Output/Likely Timescale to Completion

Phases 1 and 2 are now complete. Phase 3 will need two stages: the first will be the identification of the desirable changes. The second will be lobbying of Ministers to reach agreement on making the changes, and agreeing how these may best be put into practice. While the first part can be completed in a matter of weeks, no timescale can be attached to the second.

10. Actual Output of Study (including current status with each Phase)

The documents produced in this study are listed in Appendix 1. They have addressed the issues of the governing legislation, minimisation of the life-time costs of dealing with apparatus belonging to utility companies, and the practices adopted by most of the tramway promoters and operators in the UK, together with some Continental operators, to achieve this end.

UK promoters have to date preferred to adopt a policy of moving the great majority of apparatus away from the tramway path, to minimise the possibility of having to interfere with or stop tramway operations once the system has been commissioned. A similar approach has been adopted on

the Continent, but the legislative background is generally different, and more of the cost of diversions has to be absorbed by the utility providers.

There needs always to be a common sense approach to dealing with utilities apparatus, informed by an understanding of the legislative background, and an acceptance of the importance of the services provided by the utility companies. Decisions about moving or retaining apparatus in its current location could be made more rigorously if statistics about failure rates were available. To the extent that these are available, they are in the hands of the utility companies, and are unlikely to be made available to promoters unless this is required by statute.

The final stage in the project is to agree on desirable changes to the legislation, and lobby for their implementation.

APPENDICES

Appendix 1 - Previous reports issued by this Activity Group

- **Summary Report – Guide to dealing with utilities and their apparatus**
- **Phase 1a – Scoping Report**
- **Phase 1b – Analysis of Responses to Questionnaires sent to UK Tramway Promoters and Operators, Continental Operators and Utility Companies**
- **Phase 2: Guideline 1 – Standard methodology for assessing utilities' works requirements**
- **Phase 2: Guideline 2 – Mitigation of utility diversion requirements**
- **Phase 2: Guideline 3 – The Causes and Control of Cost Creep and Cost Escalation**

Appendix 2 - Glossary of Terms

Apparatus	The equipment owned by a utility and used in the provision of the service for which they are licensed. Apparatus includes fittings such as stop valves, fire hydrants and washouts, as well as ducts containing cables and means of access such as manholes and chambers
Cost share	The way in which the cost of the necessary measures are apportioned between the transport authority and the utility
Deferment of renewal	Recognition that refurbishment or renewal of apparatus extends its life and provides a benefit to a utility, leading to a reduction in the amount payable by the tramway promoter for diversion or protection works
Diversionary Works Code	The code of practice titled *Measures necessary where apparatus is affected by major works (diversionary works)*
NRSWA	New Roads and Street Works Act 1991
Regulations	Street Works (Sharing of Costs of Works)(England) Regulations 2000
Transport authority	An organisation authorised by statute to construct and operate a transport undertaking
Transport undertaking	A system of transport authorised by statute, being a railway, tramway, dock, harbour, pier, canal or inland navigation undertaking
Utility	Private company authorised or licensed to provide a public service – gas, water, electricity, communications or sewerage