GROUP 32 – OBJECTION NO: 164

WARDIE BAY RESIDENTS ASSOCIATION

PROMOTER WITNESS STATEMENT

STUART TURNBULL

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1. Resume

1.1 I am Stuart Turnbull, a Divisional Director with Jacobs Babtie. I have 17 years experience in transport planning and traffic engineering in Scotland. I am a Chartered Engineer and a Member of the Institution of Highways and Transportation and the Chartered Institute of Logistics and Transport.

1.2 I have been responsible for managing the input from Jacobs Babtie on the Edinburgh Tram Line One scheme. This has involved me working closely with other members of tie’s Technical Advisers team and officials of the City of Edinburgh Council in developing appropriate junction configurations along the length of the Edinburgh Tram Line One (ETL1) route that could accommodate the needs of tram and other road users. I was also a member of the Modelling and Appraisal Working Group, the remit of which was to ensure a common approach was being taken by the Technical Advisers working on the three tram lines.

1.3 I am also Project Director on a commission for the City of Edinburgh Council where Jacobs Babtie has been providing transport planning advisory services since November 2001. This commission has involved developing a number of schemes aimed at improving provision for buses, pedestrians and cyclists throughout Edinburgh.

1.4 In addition to my extensive experience within Edinburgh I have worked on the proposed light rail schemes in Dublin, Manchester and South Hampshire.

2 Scope of Evidence

2.1 The scope of evidence relates to the proposed alignment of the Edinburgh Tram Line One (ETL1) within the Starbank section.
2.2 My colleague Mr Andrew Oldfield will present evidence on the route alignment, land requirements in the area adjacent to Starbank. My evidence will cover the highway and traffic requirements associated with the selection of the Tram Line One route, the impact on existing residents transport use and the operational modelling of Lower Granton Road to Granton Square.

3 Route Selection – Highway and Traffic Requirements

3.1 As my colleagues have commented upon, the original proposal identified at the NERTS stage consisted of a twin tram tracks along Starbank Road, accommodating trams operating in both directions. The width of the carriageway here varies from 6.8 to 7.5m allowing for only two traffic lanes and thus trams would run with the traffic. At the west end of Starbank Road there is insufficient room to accommodate two shared traffic/tram lanes together with parking. This would therefore result in a consequential loss of parking and servicing to adjacent properties. My colleague Mr Turner will expand on this issue.

3.2 I will comment on the Highway and Traffic issues relating to the alternative options considered as an alternative to the original proposal utilising Starbank Road. The options considered can be summarised as follows:

Option 1: Tram to run with traffic on Starbank Road and segregated on Lower Granton Road. Originally identified during the OBC study.

Option 2: The Craighall Road option comprising a one-way loop in the westbound direction along Craighall Road, East Trinity Road and York Road. The eastbound alignment would be via Starbank Road as above. Originally identified during WP1.

Option 2 was not seen as a viable alternative and was not supported by the local residents and has not therefore been carried forward in any detail.

Option 3: A two way tramway following the Former Railway Corridor from Lindsay Road to Trinity Crescent.

Option 4: Implementation of widening of Starbank Road to provide a northern footway on a structure founded in the foreshore. The tram would run with traffic as Option 1 and the extra highway capacity would be used to provide formalised parking facilities and to reduce the probability of tram-traffic conflicts.

Option 5: A two way tramway following the Former Railway Corridor from Lindsay Road to Granton Road. From here the alignment would ramp up onto Granton Road and adopt northbound on-street running with traffic. At the junction of Granton Road and Boswall Road the tram
would turn west to run on a segregated on street alignment on Granton Road to Granton Square.

3.3 The above options are illustrated in Figure 3.1 annexed to my statement.

3.4 My comments on the Highway and Traffic issues associated with each option are discussed below;

**Options 1 and 4**

3.5 Starbank Road is subject to congestion and on street parking throughout the day. The current levels of congestion are largely attributable to the existing alignment and operation of the Trinity Crescent/ Lower Granton Road junction. This junction would be re-configured to accommodate tram movements and would also reduce delays to other road users.

3.6 Detailed discussions with Forth Ports are continuing in an attempt to develop a solution for the junction of Lindsay Road / Newhaven Road that enables the tram to operate in a manner that is consistent with the aspirations of the City of Edinburgh Council while enabling traffic to access and egress from the Forth Ports area in a safe and efficient manner. I have reviewed the proposed layouts prepared to date and am content in principle with these. However further design and assessment of the operation of the junctions will be required in order to satisfy the requirements of the Roads Authority.

3.7 In the Starbank Road section of the route, the tram would share the carriageway with the existing traffic, the principles of which are discussed in the subsequent section of my statement. The impact of the tram on this section of the route should be considered within the context of the total number of tram movements per hour. This is proposed as being 8 trams per hour in each direction during a typical day, compared to approximately 1600 vehicles per hour.

3.8 The current proposal at Lower Granton Road has been developed in consultation with local residents. The proposed alignment would consist of segregated running to the north of Lower Granton road. The segregation of the tram through this section, utilising the former railway corridor would minimise the impact on Lower Granton Road.

**Option 3**

3.9 The segregation of the tram alignment utilising the Railway Corridor would reduce the impact on traffic. There are however issues with regards the integration of the tram at Trinity Crescent in the west and Lindsay Road in the east, where the tram would enter / exit the Railway corridor.
3.10 At the junction of Trinity Crescent, an all red stage would require to be called to allow Tram to access and egress the railway corridor, as a result of requiring to cross the Starbank Road / Lower Granton Road corridor. Although an improvement to the existing junction arrangement would be provided to enhance capacity, it could be anticipated that the Tram stage would introduce delay to traffic on all approaches to the junction as a result of the ‘all red’ stage required.

3.11 At the junction with Lindsay Road, a number of options were investigated, which included both at-grade and grade separated solutions. Clearly, an at-grade junction arrangement would have an impact on the operation of the Lindsay Road corridor and introduce delay to traffic at this location, whilst a grade separated solution would have minimal impact.

Option 5

3.12 The Granton Road alignment includes 920m of shared running. Three new signalised junctions would be required at;

- Granton Road-Railway Corridor;
- Granton Road-Boswall Road, and
- Granton Square.

3.13 It is considered likely that in order to achieve an operational junction at Granton Road-Railway Corridor both Rosebank Road and Fraser Avenue would have to be stopped up at their intersection with Granton Road.

Summary

3.14 When considering all of the options from a traffic viewpoint, my preferred route is Option 3 due to the proposed segregation notwithstanding the issue of connection, particularly at Trinity Crescent. However with the proposed junction arrangement at the Trinity Crescent/Lower Granton Road junction and the formalisation of parking on Starbank Road I am content that Option 4 could operate in a satisfactory manner.

3.15 Overall, Option 4 was identified as the preferred solution and my colleague Mr Andrew Oldfield has the process for coming to this decision.

4 Impact on Existing Residents Transport Use

4.1 It is proposed that a shared carriageway would be provided to cater for existing vehicular traffic as well as trams along Starbank Road. This would mean tram and traffic sharing the same road space.
4.2 I will comment, however, on the proposed operation of the Starbank Road section as well as the ‘tools’ available to retain tram priority within the detailed design of the corridor.

4.3 Firstly, it is worth considering the frequency of the tram on the shared section of the route, which would be 8 trams per hour in each direction compared with approximately 1600 vehicles per hour during a typical peak period.

4.4 When a tram approaches the traffic signal controlled junction at the entry of the shared corridor, the traffic signal controller would enable priority to be given to tram to minimise any delay. This would be achieved by providing a green signal to the tram, such that it can progress onto the shared section without stopping and incurring delay.

4.5 The downstream traffic signal controlled junctions would be alerted to the tram’s presence within the shared corridor by means of detectors located within the shared surface at appropriate locations. The detectors allow a ‘green wave’ to be provided at the downstream junctions, such that all traffic (vehicles and tram) within the shared section on Starbank Road receive a green signal. Such an arrangement allows vehicular traffic and tram to progress through the shared section, without incurring significant stops and delays.

4.6 This level of tram priority would impact on the external approaches to the Starbank Road corridor, however this needs to be considered in the context of the tram frequency.

4.7 The principle of the ‘green wave’ tram priority system is represented graphically within Figure 4.1 of my statement.

4.8 In addition to the introduction of tram priority along the shared section, an improvement to the layout of the existing Starbank Road / Lower Granton Road / Trinity Crescent is proposed.

4.9 The existing junction is subject to congestion as a result of operational constraints. Currently each approach to the junction is signalled ‘in turn’ and a significant amount of ‘green time’ is lost each cycle as a result of long intergreen periods (that is time between green signals). The long intergreens are required as a result of the distance between stop lines, attributable to the existing layout and operation of the junction.

4.10 The proposed junction improvement would remove the existing double bend arrangement which would allow both Starbank Road and Lower Granton Road to operate within the same stage. This would allow additional green time to be given to the Starbank Road and Lower Granton Road approaches. The additional green time would reduce queues and delay on approach to the junction, in particular the Starbank Road approach.
4.11 The shared section operation within Starbank Road would be subject to Traffic Regulation Orders prohibiting stopping, loading and waiting, during tram operating hours. Such a measure would be required to ensure traffic and tram throughput is not obstructed by stopped or parked vehicles in the shared section.

4.12 Off line bus stops would be provided along the shared section of carriageway, such that existing bus services would not be affected by the proposed shared section running. In addition, the introduction of off line bus stops would ensure traffic and tram throughput is not obstructed by buses stopping to pick up / drop off passengers.

4.13 Management of traffic growth within the corridor will be required as a result of local development, such that tram priority can be maintained within the Starbank Road shared section. Such measures would be pursued by the local authority along with the operator and would be subject to consultation with both local residents as well as developers at the appropriate juncture.

5 Lower Granton Road to Granton Square

5.1 Throughout the development of the ETL1 alignment proprietary technical software has been used to assess various junction configurations. Annex 1 presents a summary of the various programs used and outlines the particular context in which one is preferred over the others.

5.2 In this locality the VISSIM program has been utilised to model this section of proposed Tram route. Detailed junction modelling has demonstrated that the proposed junction arrangement between Lower Granton Road and Granton Square could accommodate the tram without adversely impacting on other road users.

6 Conclusions

6.1 When considering all of the options from a traffic viewpoint, my preferred route is Option 3 due to the proposed segregation of traffic and tram, notwithstanding the issue of connectivity particularly at Trinity Crescent. However with the proposed junction arrangement at the Trinity Crescent/Lower Granton Road junction and the formalisation of parking on Starbank Road I am content that Option 4 would operate in a satisfactory manner.

6.2 It should always be borne in mind that the satisfactory integration of the tram line and the existing road network is but one of the factors in route selection.

6.3 As a result of the proposed junction improvements and tram priority measures discussed in earlier sections of my statement, it is
anticipated that the tram run times proposed can be achieved with shared section running.

6.4 Based on the design work undertaken to date, I believe that the proposals for Starbank Road as outlined within Mott Macdonald drawings 203011\EDIN\0527\P5 to 203011\EDIN\0530\P5 adequately accommodates the needs of tram without adversely impacting on other road users.

Stuart Turnbull  
Divisional Director  
Jacobs Babtie

04 July 2005
Figure 1: Route options considered at Starbank/Trinity

- Option 1: Starbank Road and Lower Granton Road
- Option 2: Craighall Road one way west bound loop
- Option 3: Former Trinity Railway Corridor and Lower Granton Road
- Option 4: Starbank Road and Lower Granton Road + widening for walkway (promoted route)
- Option 5: Former Trinity Railway Corridor and Granton Road

Figure 3.1 – Alternative Routes in Trinity / Newhaven Area
Figure 4.1 – Tram Priority on Shared Section Running
Annex 1: Traffic Analysis Programs – Definitions

In order to analyse the traffic impacts of the tram and test the design scenarios, one of three computer analysis packages was used. The following statement sets out the background of each program and the circumstances in which each would be deployed.

**LINSIG** is a traffic signal design package. It allows detailed modelling of individual traffic signal controlled junctions. LINSIG has a number of advanced features. It can choose the order of movements throughout the period of time being assessed and switch between these as the traffic demand requires. It has an internal system for assessing the most efficient cycle time (the time for the signals to complete all of the movements required before returning to the start) to use at the junction. LINSIG is an industry standard model used throughout the UK.

This program is used in the following circumstances:

• Individual traffic signal controlled junction.

**TRANSYT** is an acronym for TRAffic Network StudY Tool. It was developed by the Transport and Road Research Laboratory (now TRL) to allow engineers to more easily set up the co-ordination of traffic signal timings in road networks. TRANSYT uses a fixed cycle time (the time for the signals to complete all of the movements required before returning to the start). It also has a fixed order for the different movements to take place. The program calculates the most efficient split of time for the various movements at a junction. It also looks at the timings between neighbouring junctions and selects an ‘offset’ for these so that vehicles can benefit from a ‘green-wave’ effect. TRANSYT is an industry standard program used throughout the UK and abroad.

This program is used in the following circumstances:

• Complex traffic signal junctions; and/or
• Linked traffic signal junctions.

**VISSIM** is a microscopic traffic simulation program. It uses driver behaviour models to predict the movement of traffic through a network. The program calculates the movements of each vehicle and pedestrian on the network over a very short time period (usually between 0.1 and 0.5 seconds) and takes into account how they will interact. It also models the controls such as give ways and traffic signals in a high level of detail. The transport network in VISSIM is represented in a 3D graphics output and vehicle movements are shown on this in real-time. This allows both technical and non-technical audiences to understand how possible schemes will work. VISSIM allows the modelling of different modes of transport such as pedestrians, cyclists, cars, buses and trams, in the same model. VISSIM is an industry standard model used throughout the UK and abroad.

This program is used in the following circumstances:

• Complex layouts;
• Tram ‘hurry’ calls for traffic signals;
• Congested network sections; and/or
• Bus/Tram interaction.
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SCOTT MCINTOSH

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4. Building Fixings - Frequently Asked Questions
5. Wall Fixings technical note.
6. Conclusions

1. Resume

1.1 I am Scott McIntosh. I am a Senior Consultant in Light Rail with Mott MacDonald the Technical Consultants for the Edinburgh Tram. I hold a degree of Master of Arts from the University of Cambridge and various post graduate qualifications, I am a Member of the Permanent Way Institution. I have around 20 years experience in Light Rail, dealing with the planning, promotion, specification, design and commissioning of systems.

1.2 I have been Project Manager for a number of projects, including Croydon Tramlink and was a member of the Board of the public/private Tramlink Project Development Group. I was a member of the UITP [International Public Transport Association] Light Rail Commission and co-author of the UITP ‘Guidelines for the Design and development of Light Rail Schemes’.

1.3 I am currently a Board member of the UK Tram consortium [the objects of which are ‘to encourage the effective development and use of light rapid transit systems in the UK...by... the development of national guidelines, codes of practice and standards based upon experience in the UK and overseas’]. I have advised on tramways in Europe and the Middle East and I am currently advising on tramways and light rail schemes in Blackpool, Glasgow, Manchester and Newcastle, as well as Edinburgh.

2. Scope of Evidence

2.1 The evidence addresses Building fixings, the requirements for their safety, their effects upon building owners and occupiers and the technical questions in arising in connection with their fixing to buildings.
2.2 The use of wall fixings on tramways is well precedented and has been in use for over 120 years on tramways throughout the world. Similar fittings are also used on trolleybus systems. There are approximately 380 tramway systems currently in operation, of these 87 have been built in 25 countries since 1978, there are 29 more to be completed in the next 2 years. There are approximately 400 trolleybus systems currently in operation.

2.3 The text for a public information document in relation to building fixings was prepared earlier this year and it is my belief that a version of this document has been published in the tramtime website. A technical note relating to the actual installation of fixings has also been prepared and it is my belief that tie is proposing to make this document available to relevant parties.

2.4 For the avoidance of doubt, the following text is based upon the two documents referred to in 2.1 and 2.2 above. I believe that this represents a fair and accurate statement as to the likely effects of employing building fixings on the Edinburgh Tram system.
3. **Building Fixings**

![Graz, Austria. Overhead supported from historic buildings in busy shopping street](image)

**Background**

3.1 Trams are usually supplied with electric traction power from overhead line systems at a voltage not exceeding 750 Volts direct current [nominal]. This is currently the maximum voltage approved for on-street sections by Her Majesty’s Railway Inspectorate [HMRI] (1). However operational voltages of 1500Volts direct current are also being considered in the UK and will be reviewed for the Edinburgh Tram. Overhead Line Equipment [OLE] can be supported by poles with cantilever arms. It can also be supported by span wires between poles or building attachments and this minimises the amount of equipment placed in the street (2).

3.2 The height of the contact wire that supplies the electric current to the tram, or any other live part of the overhead electric traction supply system must not be less than 5800mm above the surface of any carriageway except where a lower headroom is necessary beneath existing bridges over the tramway (3). Higher clearances may be used where a road is designated as a High Load Route, or there are technical or aesthetic advantages to be gained by so doing. At other places accessible to the public, the position of the contact wire, or any
other live part of the OLE must not be less than 5200mm above the ground. (4)

3.3 The insulation of the live overhead equipment from the span wire attached to a building is achieved either by the insertion of at least two insulators into a metal span wire, or by the use of non conducting synthetic material for the span. Both systems are currently in use on tramways within the British Isles and meet, or exceed, the requirements set out by HMRI and the appropriate Electricity Regulations.

**Use of buildings to support OLE**

3.4 The use of buildings to support electric traction systems is well established, the approach was used in many of the ‘first generation’ electric tram and trolleybus systems and is used at some point on the majority of the ‘second generation’ systems throughout the World.

3.5 The span ‘wire’ (which can be made of metal or a non metallic and non conducting material) is anchored to the buildings on either side of the street by means of a wall fixing. These usually consist of an expanding bolt that is inserted into the façade of the building from the outside. This is set in a grout material in the drilled hole and is expanded to grip the sides of the hole. In the majority of cases the tramway undertaker does not need to gain access to the interior of the building to fix, or maintain, the fitting. Fittings of this type have been used with success on brick, stone and mass concrete buildings.
3.6 The Tramlink system in Croydon uses wall fixings along two busy shopping streets – George Street and Church Street - and wall fixings have been applied with complete success to buildings along these streets dating from the 18th, 19th and 20th centuries.
Fixings cause no damage to a building as the stress applied to the building façade is within the reserve strength of normally sound building. A waterproof seal can be achieved between the fixing and the building and no damage from water penetration or corrosion staining would be expected, given minimal maintenance by the installer. Indeed, many buildings in Glasgow still have wall fixings from the ‘first generation’ tramway – often over 40 years since they were last used or maintained.
3.8 Where buildings incorporate pre-stressed or reinforced concrete beams and columns, integrity of the beam must not be compromised by drilling into it to provide the fixing. In this case, a band around a structural element has been used successfully to support the wire. This solution is used in Market Street, Manchester. Where a building has an external glass skin, completely enclosing the structure, a flexible grommet may be fitted around a small hole drilled in the glass, allowing the span wire to pass through the outer skin and to be anchored to the building frame.

4 Frequently Asked Questions

4.1 What is the procedure for obtaining powers to affix a rosette to my building?

4.1.1 The powers to attach equipment to a building can be found in section 15 of the Edinburgh Tram Line One and Edinburgh Tram Line Two Bills. Where a Listed Building is specified in part 2 of Schedule 10, no equipment can be attached to that building without first obtaining Listed Building Consent.

4.1.2 If the Bills are enacted then the promoter will have powers (subject to the prior approval procedure of the local planning authority – vide s.70 of Bill) to affix equipment to any building provided that the promoter
gives 28 days notice to the relevant property owners of their intention so to do. There would be an initial structural survey of the building, as required, before a rosette was attached to the building as part of the OLE installation programme.

4.2 How high on my building will the fixing be fitted?

4.2.1 As explained in the Background section of this Note, the height of the contact wire or any other part of the overhead electric traction supply system should not be less than 5800mm above the surface of any carriageway. It may be higher (up to approximately 6.2m) where a road is designated as a High Load Route, or there are technical or aesthetic advantages to be gained by so doing. The span wire will adopt a catenary shape across the road, with the ends where it attaches to the buildings being higher than the point where it supports the contact wire to accommodate the sag of the span wire. The increase in height will depend on the width of the street, but it can be assumed that for most streets the span wire rosettes will be fitted at about second floor level in a typical building.
Orleans, France. Overhead wire supported from buildings [Note nearest span wire on right, between two opening windows].

Dublin, wall fixing by simple eyebolt between 2nd and 3rd set of windows from left.
4.3 Is there any chance that the span wire could make the building live?

4.3.1 No. The span wire will either be fitted with insulators to isolate it from the live overhead wire, or it will be made of a non-conducting material. This means that the span wire cannot become live.

4.4 Will anyone be able to lean out of a window and touch live electrical equipment?

4.4.1 No. The live conductor wires are situated over the tram tracks, the insulators (where they are required) will be provided close to the conductor wire. This means that anyone leaning out of a building will be beyond touching distance from any live electric conductors.

4.5 Will the wall fixing transmit noise or vibration into my building?

4.5.1 No. The overhead line equipment generates very little noise. The only contact between the moving tram and the wire is made by a self-lubricating sliding contact on the top of the collector equipment mounted on the roof of the tram. This generates minimal noise as it
moves along the wire. The overhead wire system is flexible and tends to dissipate any noise and vibration. The insulators serve to break any metal-to-metal path for noise to pass into the building. During operation of the tramway the quantity of acoustic energy transferred through the overhead line equipment will be very small and will not lead to noise or vibration levels that will affect the users of the building.

4.6 Will the presence of span wire fixings interfere with the maintenance of my building?

4.6.1 The promoters will be seeking powers to make safety byelaws regulating the maintenance of buildings to which equipment had been attached as part of the general requirements to ensure the safe maintenance of buildings fronting onto the tramway. Since any byelaws would require confirmation by the relevant Minister of the Scottish Executive there is no risk that the owners affected would be subjected to unreasonable requirements.

4.6.2 The tramway operating company and City of Edinburgh Council will be issuing advice to people owning or occupying buildings along streets traversed by the Edinburgh Tram. This advice will be issued before the system is completed. It will tell you how work can be carried out safely in the vicinity of the operating tramway. The same general rules will apply to streets where the overhead wires are supported from columns and in streets where the overhead wires are supported from the buildings. This advice will cover the use of ladders, scaffolding, ‘cherry pickers’ and collapsible platforms to maintain the outsides of buildings. They will also give a contact address and telephone number that you must contact to seek advice and approval before you erect any ladder or scaffolding, or undertake any work within a reasonable range of any live electrical equipment.

4.6.3 If building maintenance work needs to be undertaken close to the live equipment you will be required to obtain an agreement from the tramway operator as to a safe method of working. This safe method of working may require the electrical isolation of adjacent tramway electrical equipment and hence the work may have to be done outwith normal tramway operating hours. The tramway operator will be issuing advice notices about safe working adjacent to the tramway before the system becomes live.

4.6.4 New generation tramways have now been operating in the UK for over 12 years and many of them have building-supported overhead equipment. We are not aware of any serious problems arising in respect of the maintenance of buildings fronting the tram routes in these cities.

4.7 Will the presence of wires interfere with the work of the Fire or Emergency Services?
4.7.1 No. The tramway operator will be liaising with the Emergency Services to ensure that their employees are fully trained in dealing with an emergency close to the tramway. The Emergency Services will also be consulting their opposite numbers in Birmingham, Blackpool, Croydon, Manchester, Nottingham and Sheffield so that they can learn from experience elsewhere. There will be communications links between the tramway operator and the Emergency services to ensure that the electric traction current can be immediately switched off from sections of the system close to an accident or emergency.

4.8 If the building fixing damages my property will I have any repairs paid for?

4.8.1 Yes. In the unlikely event that the fixing causes any damage then the Edinburgh Tram will be required to pay for the damage to be made good.

4.9 Will the fixing to my building of support for the overhead equipment make my property more difficult to rent or sell?

4.9.1 No. There is no evidence from schemes in the UK, or elsewhere in the EU, that the attachment of the overhead equipment to a building results in loss of value or amenity to the building.

4.10 My building is of architectural or historic significance. Will the fixing respect that?

4.10.1 Yes. In the case of Listed Buildings no equipment can be attached to that building without Listed Buildings Consent, in other cases of buildings with architectural, townscape or historic significance the Edinburgh Tram will take advice from the City of Edinburgh Planning Department and from all other relevant authorities as to the precise location and design of wall rosettes. Wall fixings have been applied sympathetically to many historic buildings elsewhere in Europe [including the Royal Palace in Amsterdam] and the same practices will be followed in Edinburgh.
Ghent, Belgium. Building support taken from mediaeval church

Bremen, Germany tramway in World Heritage site, note wires attached to mediaeval Town Hall

1. para. 172
2. para. 177
3. para. 201
4. para. 202

5 Wall fixings – technical note

5.1 General information as to the use of buildings to support overhead line equipment has been given to petitioners in the tie note ‘Edinburgh Tram - Overhead line system support from buildings’. The purpose of this note is to give a detailed description of a typical form of bolt currently in use for this purpose, the fixing method, representative views of fixings on buildings and a typical example of an overhead line equipment plan for a city-centre location. The illustrations in this Note are taken from work on the two most recent examples of modern tramways in the British Isles – Dublin and Nottingham and can be taken as representative of current best practice.

The wall fixing

5.2 The wall fixing consists of 3 main components; a threaded stud for insertion in the wall, a screw on cap and attachment ring and a locking
nut. The span ‘wire’ – which may be made of metal and fitted with two insulators, or may be made of non-conducting material – (as has been explained in the earlier tie note) - is terminated with a loop and attached to the attachment ring by a fixing link.

5.3 The illustration above is a photograph of a fixing used in Dublin. Note (reading from top to bottom) the length of stud for insertion in the wall, the screw cap (obscuring the locking nut) with attachment ring, the fixing link and the termination ‘eye’ in a section of metallic span wire. The pen laid to the right of the assembled unit gives a general impression of the overall size of the unit.
5.4 The following sketch shows the stud for insertion into the building fabric. Note that the stud is approximately 22mm in diameter and is inserted into a 24mm [1 inch approx.] diameter hole, drilled 175mm [7 inches approx.] into the building. Fixing into the hole is achieved by the insertion of a special grout into the hole. Some 65mm [2.5 inches approx.] of stud is left exposed from the wall to allow the cap to be screwed home and locked by the nut shown.
Dublin, stud in place in building awaiting attachment of screw cap and ring

Dublin, wall fixing by simple eyebolt between 2nd and 3rd set of windows from left

Construction method
5.5 The Overhead line contractor will inform the building owners and occupants of the expected date for the attachment of the fixing to the building. Before the appointed date a survey of the route and buildings will have been undertaken and marks made on the building to indicate where the fixing is to be attached. On the appointed date the contractor will gain access to the exterior of the building, either by ladder. Scaffolding tower or ‘cherry picker’, access to the interior of the building is not normally required. The process of drilling the hole is normally completed in less than 10 minutes. The grout and the stud are then inserted and the contractor departs.

5.6 After a suitable period to allow the grout to mature the fixing is subject to a pull-out test. This test applies a load to the stud of approximately 14kN, this is 200% of the normal working load of 7kN on the attachment. If the fitting passes this test it is ready to support the overhead line equipment which will be fitted at a later date. The individual components of the fixing are designed to provide a factor of safety of 20kN, i.e. almost three times the normal maximum working load.

5.7 Subsequent erection of the overhead is normally undertaken in the evening or at weekends to minimise disruption to users of the street and frontagers.

*Dublin, pull out test being applied to bolt*

*Example of the number of fixings required along a road*
5.8 The precise location of the fixings and the distance apart depends upon the local ground conditions and the degree of curvature of the road – and hence the track – in both the horizontal and vertical plane. Generally speaking the wire will need support and location every 20-40m. The following sketch shows a typical layout along an urban street;

6 Conclusion

6.1 The use of wall fixings to support tramway and trolleybus overhead is well preceded, it would be reasonable to assume that any problems associated with this would have been discovered and documented, given the total of over 780 such systems in the World. The benefits of reducing street clutter and possible obstruction to building facades by use of building fixings in place of support columns is obvious. The impact that tramway building fixings will have on the maintenance regime for buildings is no greater than that created by the provision of overhead power supply lines, overhead telephone lines or the use of wall mounted street lighting apparatus.

6.2 It is my belief that the information set out in sections 3 and 4 of this Witness Statement represent a fair and accurate explanation of the effects of overhead line fixings on buildings. The objective has been to set these out in non-technical terms in a way that can be easily understood by building owners and occupants. It is my understanding that these documents have been made available to the objectors by tie.

Scott McIntosh
Expert Witness
Mott MacDonald

4 July 2005
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WARDIE BAY RESIDENTS ASSOCIATION

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1. Resume

1.1 I am Scott McIntosh. I am a Senior Consultant in Light Rail with Mott MacDonald the Technical Consultants for the Edinburgh Tram. I hold a degree of Master of Arts from the University of Cambridge and various post graduate qualifications, I am a Member of the Permanent Way Institution. I have around 20 years experience in Light Rail, dealing with the planning, promotion, specification, design and commissioning of systems.

1.2 I have been Project Manager for a number of projects, including Croydon Tramlink and was a member of the Board of the public/private Tramlink Project Development Group. I was a member of the UITP [International Public Transport Association] Light Rail Commission and co-author of the UITP ‘Guidelines for the Design and development of Light Rail Schemes’.

1.3 I am currently a Board member of the UK Tram consortium [the objects of which are ‘to encourage the effective development and use of light rapid transit systems in the UK…by… the development of national guidelines, codes of practice and standards based upon experience in the UK and overseas’]. I have advised on tramways in Europe and the Middle East and I am currently advising on tramways and light rail schemes in Blackpool, Glasgow, Manchester and Newcastle, as well as Edinburgh.

2. Scope of Evidence

2.1 The evidence addresses the effect of the introduction of tramways on residential property values, based on the results of independent research into the effects of the three most recent tramways in the British Isles; Croydon, Nottingham and Dublin, Eire.
3. **Croydon Tramlink**

3.1 The South London Partnership is a voluntary forum which promotes the interests of the south London sub-region.

3.2 The South London Partnership (SLP) comprises 15 partners, including:

- the London boroughs of: Bromley, Croydon, Merton, Richmond, Sutton, Wandsworth, the Royal Borough of Kingston upon Thames
- Business Link for London
- London South - Learning & Skills Council,
- South London Council of Chambers of Commerce,
- Kingston University,
- the SW London Health Authority.

3.3 SLP is Chaired by Joanna Simons, Chief Executive London Borough of Sutton.

3.4 The SLP reports that the effect that trams have on image and perception of an area make the schemes important for generating growth and investment. Trams generate civic pride and facilitate urban renewal. They provide an image of dynamism and efficiency that is key to attracting outside investment. Trams can raise the profile of the entire area, attracting higher rents, new developments and private sector investment. Marginal businesses dislodged by construction are replaced with dynamic enterprises.

3.5 The success of Croydon Tramlink in raising the profile of the area in this way is shown by the greater increases in property prices in wards along the route (Figure 1). The Report prepared by Colin Buchanan and Partners (an independent transport consultancy) on behalf of the South London Partnership found, by reference to Her Majesty’s Land Registry residential transaction data, that in Croydon property prices have risen by 4% more in wards served by the tram than those that are not, while in the other Boroughs served there has been no discernible difference.

3.6 The price of property in Croydon on the Tramlink line was found to have risen faster than that off-line both during construction and after opening.

*Figure 1: Property prices in Croydon wards*
3.7 It is to be noted that property prices in the area served by Tramlink were slightly lower than the general level of prices at the beginning of the survey (this possibly reflects poorer accessibility and higher motor car congestion in these areas), but that they were higher post-Tramlink.

3.8 This study also found that Estate Agents used Tramlink as part of their marketing. The estate agents interviewed suggested that properties located close to public transport nodes did attract a premium, with rail the highest, followed by the tram, while few felt that bus routes added value. These premiums were noticeable up to 20 minutes journey time from stations by foot.

**Tramlink Impact Study**

The independent Tramlink Impact Study, undertaken for Transport for London, included a questionnaire survey of local Estate Agents to gain their opinions of the effect of Tramlink on property values, their responses were mainly anecdotal, however, most respondents considered Tramlink to have had a beneficial effect on property values.

"Easy access from Wimbledon to East Croydon has created much greater interest in the area. The new tram has seen prices increase by about 10% above the national trend". Ingletons, Mitcham

"It has made a difference. Demand for the area has gone up and prices have risen by up to 10%. … people can get to East Croydon in about 5-6 minutes. This will add considerably to the attraction of this part of Croydon". Benson and Partners, Addiscombe
4. **Nottingham Express Transit**

4.1 Even before Nottingham Express Transit opened, there were discernable regeneration impacts in the city. During 2003 six months before the scheme was due to open, local Estate Agents were reporting an upturn in the market specifically in those areas through which the tram now runs. Nottingham estate agents have been using proximity to the tram as a selling point. Letting agents now have a regular advert in the Nottingham Evening Post ‘Homes for Rent’ supplement with a box stating “All properties within 10 minutes walk of a tram stop are marked with a NET logo.” As this has been shown to have a beneficial effect on values and the ability to market property.

5. **Dublin**

5.1 The Dublin – LUAS tramway scheme was opened in 2004 and consists of sections of new street running, new green field alignment and sections built upon abandoned railway alignments.

5.2 The LUAS ‘Green’ Line runs for the majority of its route along an old railway corridor through the south of the city. The line, which runs through a relatively prosperous area of the city, is similar in many respects to the Roseburn Corridor. Housing along the route is mixed but comprises a mix of large single occupancy Georgian terraces and detached houses, 20th century semi detached properties and some new build apartments and town houses.

5.3 The route is partly on brick built retained embankment 5-6m high, part deep cutting and on or two short sections it runs at grade. Gardens backing onto the line range in length from nothing to 40m. It is believed that the majority of properties in the area are owner occupied.
5.4 An analysis of property price increases along the two Luas lines to Tallaght and Sandyford confirms that those properties within a five minute walk of a Luas station have seen higher increases in value than other comparable properties with no immediate access to the tram system. Price changes between January 2002 during the early stages of the construction work and January 2005 were analysed for a wide selection of different property types. In Dublin 24 properties close to a Luas station increased on average by 54% between January 2002 and January 2005 whilst the average increase was 37% in areas not within easy walking distance of a station, a differential of 17%. Closer to the city centre in the Dublin 8 area the difference was even more marked with properties close to the Luas seeing an average increase of 65% compared to a 45% increase for properties with no immediate access to the tram system. In South County Dublin on the Sandyford Luas Line there was a differential of 15%, with properties within 5 minutes walk of the line increasing by 70% on average whilst those properties with no immediate pedestrian access rising in value by 55% on average. The figures suggest that over the course of the construction period and during the first few months of Luas opening, the system has added a premium of between 15% and 20% to property values, depending on location.
Less than a week after it began running, the Luas light rail system is already having an impact on the Dublin property market. Estate agents are reporting an increase in enquiries about property along the St Stephen's Green-Sandyford line, and expect the service to have a similar effect on prices to the Dart in the 1980s.

Louise O'Reilly of Sherry FitzGerald in Dundrum believes that the Luas is contributing to a higher than average rate of capital appreciation in the Dublin 14 and 16 areas. We anticipate that, by the end of the year, second-hand house prices throughout Dublin will have risen by around 10 per cent," she said. But in Dundrum that figure is likely to be 15 per cent.

There is an amazing buzz around the place now that the Luas is finally up and running - people are extremely impressed with it and with the standard of service. This time last year, three-bedroom semi-detached houses in the Broadford and Ballaly areas of Dundrum were selling for €330,000.

According to O'Reilly, prices in Broadford have now risen to €380,000 and to €400,000 in Ballaly. "In Woodpark, you are now looking at paying around £420,000 for a three-bed semi," she said. "This time last year, we would have been quoting between €360,000 and €370,000 for that type of house."

The Luas is also significantly boosting property prices in parts of Dublin 8 and Dublin 12, according to Stephen O'Grady of Lowe and Associates in Rathmines. "The arrival of the Luas has meant that people are looking at places which, ten years ago, they simply would not have considered," he said. "There is an expectation that Luas is going to have a very positive impact on areas such as Rialto, Drimnagh and Inchicore, and prices in these areas are performing very well as a result."

According to O'Grady, small one-bedroom cottages in Rialto are now selling for between €180,000 and €190,000, figures, which he said, would previously have been unattainable. "This type of unit is very popular with investors who know that the Luas is likely to boost values and should make their property easier to rent out," he said.

HOK Residential is currently quoting over €254,000 for a 55-square-metre two-bedroom house at 114 Rialto Cottages. The property is around the corner from the Rialto Luas stop. On Mourne Road in Drimnagh, Stephen O'Grady recently sold a two-bedroom house in very poor condition for €231,500. "Prices on Mourne Road have really given a jump, and now range between €225,000 and €300,000,
depending on the condition of the house and whether it has been extended," he said.

6. Conclusion

6.1 Independent evaluation of the effects of tramway system introduction in Croydon, Nottingham and Dublin indicates that such developments have had a beneficial effect upon house prices. There is no reason to believe that Edinburgh should be any different to these other successful cities.

Scott McIntosh
Expert Witness
Mott MacDonald

4 July 2005