CONSTRUCTION SITE TRANSPORT

THE NEXT BIG THING

Why transport is important
What you can do about it

April 2003

Transport accounts for 10-20% of construction costs. CBI estimate the annual cost of road congestion to the economy is £20 billion. Construction vehicles account for a proportion of this congestion, and construction sites suffer with poor reliability of deliveries.

Reducing site transport is possible, and can cut costs. Financial and productivity benefits of adopting a more efficient approach to transport and logistics include:

- reduced fuel and delivery costs;
- increased delivery efficiency and reliability;
- reduced costs for parking;
- increased profitability.

BAA has estimated that its workforce spend 10-40% of their time dealing with ordering and transporting materials to where they are needed. Logistics professionals estimate that if transport and logistics were dealt with more efficiently, trades people would be free to concentrate on their core areas, reducing staff and materials costs by 15%.

This leaflet summarises a BRE study to develop indicators for construction site transport funded by DTI.

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WHY TRANSPORT IS IMPORTANT

CONGESTION CHARGING

Congestion charging is a reality in central London, with another 30-40 local authorities considering the implementation of similar schemes. Recent coverage in 'Building' shows how the charge is affecting the construction industry. Examples publicised in 'Building' show that delivery companies' are over-charging, and smaller companies' margins are being threatened. The Mayor Ken Livingstone has ruled out an exemption for construction vehicles.

Nicky Gavron (the deputy mayor) has stated that the industry needs to prove that measures to control transport are being taken. Public or private vehicles with nine or more seats can apply for exemption, so organising workforce transport can help. Lorry pooling and using 'green fuel' vehicles will reduce transport and allow exemption.

FREIGHT ROAD USER CHARGING

In the 2002 Budget, The Chancellor committed to introducing distance-based freight road user charging by 2006. This will probably be an electronic system that will operate via a global positioning system (GPS).

DEVELOPMENT CONTROL

Increasing numbers of planning authorities are considering construction site transport as part of the consent. They require accurate estimations of road transport according to the design and work plan. When information is not needed for an application, it can still be required for planning the site management. Transport issues can only be addressed if they are accounted for from inception, including the design team and supply chain.

YOUR PEOPLE

Transport has a large impact on quality of life for the workforce and the surrounding community: it is a key aspect to address under Corporate Social Responsibility and Health and Safety. Improvements in the transport associated with a construction project will benefit clients and contractors through:

- improved image and community relations for the client, contractor and the users of the finished product;
- fewer accidents on site and in the surrounding area;
- a more productive workforce, who have had their transport problems considered, are dealing with fewer complaints and are enabled by effective deliveries.

OUR ENVIRONMENT

Construction transport accounts for 13% of UK fuel use[1]. This makes it a key target for reduction to meet climate change protection policies. Road vehicle pollution also causes acidification and low level ozone, both of which have negative impacts on human health. Companies are now reporting on such environmental concerns, and looking to minimise their impacts. Measuring and controlling construction site transport helps to improve the rating when seeking certification of new projects through schemes such as BRE's Environmental Assessment Method (BREEAM) and the Civil Engineering Environmental Quality Assessment (CEEQUAL).

[1] The Construction Industry Mass Balace. Viridis 2002.

WHAT YOU CAN DO ABOUT IT

MEASUREMENT

All these pressures mean transport must be managed. As the old adage put it, you need to measure to manage. The BRE study has taken the M4I environmental performance indicator[2] on transport as a starting point. Indicators allow:

- clients to specify performance and assess achievement;
- designers to compare the performance of methods and materials they specify;
- contractors and the supply chain to measure and improve performance.

The indicators simply consider road vehicle movements and road vehicle distance for workforce and commercial traffic (see tables 1 and 2). Straightforward calculations have been developed for cost and emissions.

Table One

Definition Number of road vehicle movements to site, per £100,000 project value. Consider:

- Workforce movements
- Delivery of materials and plant to site
- Movement of waste off site

Methods

Workforce Either during construction, or on completion, using induction questions, actual numbers of vehicles in on site car parks, or security records, ascertain the total number of workforce vehicle movements onto site and the value of the project completed.

Commercial Either during construction, or on completion, using security or other gate records, contractor notes and waste transfer notes, ascertain the total number of commercial vehicle movements onto site and the value of the project completed.

Total Performance score (workforce and commercial vehicle movements per £100,000) =

$$\frac{\text{Total number of workforce and commercial vehicle movements}}{\text{Value of the project completed}} \times £100{,}000$$

Example Without on-site parking, the induction question yielded the following data: 70% drive in their own car, 10% share a van with one other, 10% drive on a motorbike, 10% come by public transport. On average 100 people come to site every working day.

Therefore there are on average 85 vehicle movements daily (70 singly occupied cars, 5 shared vans, 10 motorbikes, ignore public transport.). From records kept at the gate, it is known that during the project, there were 1000 deliveries to site and 250 waste vehicles arrived. With 100 working days on site and a project value of £1M, the workforce and commercial vehicle movements per £100,000 project value is:

$$\frac{(85 \times 100) + 1250}{1{,}000{,}000} \times 100{,}000 = 875$$

[2] www.m4i.org.uk/publications/epis

Table Two

Definition The distance (km) vehicles travel to site, per £100,000 of project value. Consider:

- Workforce movements
- Delivery of materials and plant to site
- Movement of waste off site

Methods

Workforce Either during construction, or on completion, using induction questions, and travel diaries, ascertain the total workforce distance travelled onto site and the value of the project completed.

Commercial Either during construction, or on completion, using security or other gate records, contractor notes and waste transfer notes, ascertain the total distance travelled by commercial vehicles and the value of the project completed.

Total Performance score (workforce and commercial vehicle distance per £100,000) =

$$\frac{\text{Total number of workforce and commercial kilometres}}{\text{Value of the project completed}} \times £100{,}000$$

Example The induction question was used to calculate the average round-trip distance travelled for each transport mode: the car drivers come 30 km on average, van drivers 40 km, the motorcyclists 50 km, ignore public transport. (Remembering that 70% drive in their own car, 10% share a van with one other, 10% drive on a motorbike, 10% come by public transport.)

On average 100 people come to site every working day, there were 100 working days on site, with a project value of £1M.

The suppliers kept records of mileage attributable to the site (ie when a vehicle was loaded 50% or more with a load for or from the site). The 1000 deliveries resulted in 10,000 km. The 250 waste deliveries were all by the same vehicle type, all to the same waste management site 25 km away, resulting in 12500 km.

So the workforce and commercial distance travelled per £100,000 project value is:

$$\frac{\text{Workforce} + \text{Commercial}}{\frac{(((30 \times 70) + (40 \times 5) + (50 \times 10)) \times 100) + (10{,}000 + 12{,}500)}{1{,}000{,}000}} \times 100{,}000$$

= 30250 km per £100,000

- Only road vehicles have been considered, to encourage the transfer of transport to other modes, such as river and rail, and to simplify data collection. To enable comparison between sites and companies project value is the denominator.
- These indicators simply consider the final delivery journey to site from the suppliers' depot or contractors' yard.
- Contract clauses may aid data gathering of movement and distance data from the workforce and suppliers. Partnering arrangements similarly help data gathering.

COST AND EMISSIONS CALCULATIONS

Movements and distances were found to be the most straightforward measures of transport, but the actual impacts of transport are cost and emissions. Rather than separate indicators for these areas, guidelines have been developed to help indicator users to calculate cost and emissions.

For onsite plant, energy use is employed as a proxy for distance. This is not reported with the distance indicator to avoid confusion, and is simply used for the cost and emissions calculations. Measurement should include sub-contractor fuel stores and all relevant energy sources, for example electricity (kWh), gas LPG or LNG (litres), gas oil (litres) and diesel (litres).

In the cost calculation, the distance travelled by the workforce and commercial vehicles is used, plus the onsite fuel costs. In line with standard vehicle mileage claims, the charge used is 50p/km, plus actual cost of all onsite fuel used. Staff time, car parking and other charges could be added as appropriate.

If emissions calculation is desired, data collection must also identify the vehicle type, size and fuel uses (for example car, van, lorry, petrol, diesel). Then the DEFRA[3] factors can be applied to distances by different vehicle types and onsite fuel use to calculate emissions.

OTHER INDICATORS AND BENCHMARKS

The study has found the range of transport performance is large, depending on the location of the site (eg rural versus urban), the construction techniques employed and the extent of demolition and ground works. Therefore this study has not collected a benchmark.

The DTI construction industry survey of contractors has introduced a question on commercial vehicle movements. The results will be launched with the KPI data in summer 2003, to provide a benchmark for construction site transport. Summary data shows a great range of 50-600 movements per £100,000 of project value, indicating significant opportunities to reduce transport and cost.

The Construction Products Association[4] is developing Key Performance Indicators for the construction products industry, including one on transport movements.

[3] Guidelines for Company Reporting on Greenhouse Gas Emissions, Annex 1 Fuel conversion factors and Annex 6 Transport conversion tables, DEFRA 2002.

[4] www.constrprod.org.uk

The Considerate Constructors Scheme (CCS) considers aspects of site transport. It rewards site managers who attempt to avoid on-street car parking, ensure routes to site are well identified and keep deliveries out of rush hours or other sensitive times. Using CCS to help manage a site will probably result in improved transport performance.

The 'Respect for People' toolkits produced by Rethinking Construction consider transport as part of the working environment. In the planning and on-site checklist, respondents are asked to rate transport arrangements for:

- getting the workforce to site;
- workforce car parking that minimises impact on the neighbourhood;
- access to the site.

Companies are also realising the importance of travel time in employee satisfaction. This is generally being included in management in an informal way, such as trying to ensure staff do not have a journey to work of more than 45 minutes. One of the 'Respect for People' Key Performance Indicators is travel time for direct employees. The average time reported in 2002 was 30 minutes, though the maximum travel time was 185 minutes.

The Department for Transport (DfT) provides advice and information on staff travel plans and has recently launched industrial sector transport benchmarks[5]. The Transport Economics Note provides more details for those interested in travel time and vehicle operating costs[6].

SITE PRACTICES

The study included a survey of site managers. Half had considered transport before, usually through using local materials or labour. No respondents had carried out formal monitoring. Achieving standards such as ISO14001 was encouraging measurement of impacts. Almost all respondents would consider measuring in the future. Apart from the ever present time pressures, many site managers thought transport needed to be considered in the design and procurement process.

To show the cost of construction, and how site practices can be changed, examples of data collection and management have been collected:

- Cheshire County Council specified the transport indicator for the Weston and Cronkinson Farm primary schools. The site manager recorded workforce and commercial vehicle movements and distances. Data collection was aided by the partnering aspect of the project. Managers found transport cost twice the scaffolding budget.

[5] www.transportenergy.org.uk/bestpractice

[6] www.roads.dft.gov.uk/roadnetwork

- Greenwich Millennium Village Phase 1B provided data on waste management, fuel deliveries and onsite fuel use. The management held a database of workforce postcodes for proof to the planning authority of local employment. This could be used to calculate workforce transport if data was collected on mode choice.

- A housing project employing offsite construction, recorded materials deliveries and waste collections. The supplier was within 21 miles of the site and the waste management facilities within 12 miles, so the transport impact was relatively low.

- BAA in conjunction with Mace Ltd and Wilson James Ltd have been operating a Consolidation Centre (CC) since November 2001 to facilitate the efficient and sustainable movement of materials from supply chains to construction projects at Heathrow airport. The CC operation consists of a 'distribution centre' located adjacent to the airport which: accepts deliveries of construction materials, consolidates those materials into workpacks based upon trade contractors needs and distributes those materials direct to the workface on a just-in-time basis. The main benefits of the CC from a project and client perspective are: increased plan reliability on projects, net cost savings on trade contractor package costs and significantly reduced carbon dioxide emissions for local construction journeys.

- Canary Wharf presented a wide range of transport difficulties. The site is in a heavily congested part of London, bounded by the river and there is little space for storage of materials or waste. River transport has been used extensively for the removal of excavation spoil from site and for delivery of sand and aggregates for the on site concrete batching plants. There have been up to 350 road deliveries a day. All deliveries must be booked into the site on the Zone Manager System which also schedules hoists and cranes. Some 10% of deliveries are turned away from site as they arrive without a booking, encouraging better management by contractors. The Jubilee Line underground link and the Docklands Light Railway give direct access to the site and facilitate travel to and from the site for a workforce that peaked at over 8000. No on site parking is available.

- The Beddington Zero Energy Development (BedZED) in Sutton sourced 52% of its materials (by weight) from within 35 miles of the site[7]. Compared to a traditional site, this resulted in an average of 40% fewer miles per tonne of materials. This was considered a cost neutral achievement, through thoughtful management.

[7] www.bioregional.com/zero/constructionmaterialsreport.htm

LESSONS LEARNED

- Start considering transport during design and project planning.
- Partnering and supply chain integration – formal or informal arrangements – can aid data collection and innovative savings.
- For sites in urban areas, consider group transport for the workforce, and provide facilities to encourage use of public transport.
- For materials, use local suppliers, share deliveries and arrange with the supplier to send vehicles back full with off-cuts or other waste.
- Reducing waste reduces transport – for example packaging can be reduced through partnering between the contractor and supplier.
- Offsite construction – reduced waste, reduced workforce, reduced transport – can reduce numbers of movements, but may not reduce distances, and larger loads may cause more disturbance to neighbours.

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