1 Transport

Introduction

The way that transportation is managed in relation to construction has a number of implications. Clearly the efficient movement of materials to sites is a fundamental requirement of the construction process. However, there are wider issues that need to be considered. These include the efficiency of transportation in relation to capacity utilisation of vehicles, travel distances and waiting times for unloading. There are also issues relating to the quality of the transportation service in terms of flexibility and responsiveness to customer requirements. These issues have implications, both in terms of how well transportation supports the construction industry and in terms of the wider environmental, social and economic considerations.

This element of the research explored operational issues relating to transport in order to inform the current debate over the optimal arrangements for supplying materials to construction sites. The construction process raises a number of particular issues in relation to transportation. These issues derive from both the inherent characteristics of construction operations and the way in which these operations are generally organised. Construction activities on any one site tend to last for a relatively short time, the profile of materials required for the site will change over the course of the project, and access to the site and to unloading areas is often restricted.

An important characteristic of the way that operations are organised is the practice of individual companies operating on one site being responsible for ordering their own materials. This raises important issues with regard to coordination of material deliveries and storage.

1.1 Lorries have empty or part loads

There can be a high level of inefficiency in the way that lorries are used to transport materials to construction sites. This inefficiency is measured in terms of the amount of lorry movements that involve part loads or lorries travelling empty.

In discussing the issues with regard to part loads and full loads care has to be taken as to how these terms are commonly used. A ‘full’ load in the context of bulk items such as bricks and plasterboard is a load that can be carried on an articulated lorry. A ‘part’ load would be anything less than this amount. However, this ‘part’ load could be delivered as a full load on a rigid lorry or as part of a full load on an articulated lorry when using the 'milk-round'system, in which several part loads are packed together on the same lorry and delivered to different sites.

It was found during the research that vehicle usage was relatively efficient. There is a very large commercial incentive to order in full loads whenever possible. For bulk items such as bricks and blocks lorries were generally travelling to the site carrying full loads. However, for non-bulk items such as electrical fittings and sanitary ware a milk-round system with multiple drop-offs was the norm.

A number of important issues were identified by the research.

1.1.1 There are significant cost savings, typically 30%, for materials ordered in full loads. This reflects the fact that these deliveries will tend to come direct from the manufacturer. A part load that is not part of a milk-round would generally incur additional transportation and handling costs in that a merchant would need to be involved in the process to break up a full load.

1.1.2 There can be a significant variation in the quantity of bulk item materials constituting a full load. This variation depends on the supplier of the material and the way in which it is palleted. For example, the number of bricks in a full load can vary from between 10,000 to 12,000. With blocks the variation is far greater due to differences in density and the height to which blocks can be safely loaded.

1.1.3 A surcharge for a full load on a rigid lorry would be in the order of one to three per cent. However, availability of rigid lorries is not generally as great as it is for articulated lorries. This means that the notification period that has to be given for a delivery is likely to be significantly longer, e.g. 10 days as opposed to five days for an articulated lorry.

1.1.4 There is potential conflict between the financial benefits of ordering in full loads and the ability of a site to accommodate the quantity of materials. Orders placed by the main contractors generally take into account the ability of the site to accommodate the size of the loads. However, there is evidence suggesting that trade contractors place orders with a view to maximising the size of discount without necessarily taking into account the ability of the site to handle and store materials. An example includes a full delivery of plasterboard by a trade contractor. This delivery caused considerable congestion on site as there was insufficient dedicated storage area available.

1.1.5 The situation with part loads tends to vary from case to case. In some instances the management of part loads appears to be conducted in an efficient manner using a milk-round format. A lorry will start off its round with a full load and make drops at various sites. On completion, the lorry will return to its depot.

Small delivery vehicles are sometimes more suited for dropping-off part loads of materials

1.1.6 The potential for lorries leaving the depot full when delivering part loads depends on the characteristics of the market for the product. To ensure a full load at the start of a delivery a supplier must have the ability to aggregate orders. The probability of being able to aggregate orders is dependent on the volume of orders and the responsiveness of the service that is being offered.

In some instances a supplier will not have a sufficient number of orders to aggregate into a full load. The choice is then to wait until further orders are received or to send the lorry out with a part load.

The decision to send full or part loads depends on the responsiveness of the service being offered by the supplier. Suppliers who offer next day delivery or confirmed delivery dates will have less flexibility than suppliers who offer deliveries within a wide time window. An example of the latter case is a kitchen supplier who will only confirm the week of the delivery and not the day of the delivery. This means that they have a high degree of flexibility to ensure that only full loads are dispatched.

1.1.7 The apparent trade-off between the responsiveness of supplier service and the ability to deliver in full loads can partly be reconciled by suppliers having access to a range of different capacity vehicles. However, there are important economic efficiency issues relating to size and mix of the transport fleet. These include the relative costs of fuel consumption, capital cost, maintenance, depreciation, wages etc. associated with different capacity vehicles.

It is often more efficient to maintain vehicles with a margin of excess capacity than to model a fleet of vehicles on what would be considered a typical profile of deliveries. Excess capacity means that the supplier can be more responsive than one whose vehicles provide a capacity closer to the average demand profile.

1.2 Lorry travel distance

1.2.1 Travel distances were generally determined by whether materials came direct from manufacturers or from distributors. A number of delivery strategies were observed ranging from short distance full loads to long distance milk-rounds.

1.2.2 Deliveries direct from the manufacturer would come from all over the country and in some instances from abroad. Typically, for those from within the UK the lorry would leave its depot early in the morning to make its first drop. It would then return to the depot empty. If it had time it might make a second drop close to the depot later in the day.

1.2.3 Manufacturers or distributors delivering part loads would tend to use a milk-round system. One supplier located in the North of England would have a regular delivery run to London twice a week. Other suppliers would arrange a milk-round drop-off as and when they had sufficient orders in the area.

Distributors tend to have depots located close to their customers. In these instances a daily milk-round is commonly used within a defined geographic area.

A rigid backed lorry making its second drop of the day on a 500 mile round trip from Birmingham

1.3 Drop-off and pick-up

1.3.1 Lorries occasionally pick-up materials from sites. These, however, tend to be items that were delivered in error.

Other opportunities for picking up materials from sites include returnable packaging such as pallets. There is evidence that the system for ensuring these items are returned is not effective. Typically a brick pallet has a deposit paid by the customer in the order of £12 per pallet. The idea is that once a lorry has unloaded, any unused pallets are loaded onto the lorry and returned to the depot. However, it was found that drivers are often reluctant to take the time to have these pallets loaded. This could be because many of the drivers are independent hauliers and it is more cost-effective to get back to the depot as soon as they have made their drop in order to pick up another load for delivery.

On one site the brick supplier was contra-charged by the contractor for the cost of disposing of the unwanted pallets, as well as for the deposit.

1.4 Waiting of lorries

Lorries waiting to be unloaded are seen as an inefficient use of a resource. The main occasions when lorries wait is either at the start of the day when they are waiting for the site to open or during the day when they are waiting for either access to the site or the availability of unloading equipment/labour. However, the research identified that not all waiting is uneconomic.

1.4.1 Arrival of lorries

It is common practice for lorry drivers with full loads to arrive at the site significantly before the official site opening times. This practice offers advantages to the lorry drivers for the following reasons:

- the journey to the site takes place before the build up of rush hour traffic and is therefore quicker than if they timed their journey to coincide with the site opening times
- the lorry drivers are able to count the waiting time as rest time for the purposes of complying with tachograph regulations
- the timing of the drop-off means that the return journey will also be out of rush hour.

The research reviewed factors that contribute to extending waiting time for unloading lorries during normal site hours. These broadly fell into three areas:

- access to site or the unloading area
- availability of unloading equipment or unloading gangs
- obtaining authorisation to unload.

1.4.2 Access to site or unloading areas

Lack of access to the site was usually the result of other delivery vehicles waiting or being in the process of unloading. During the peak of construction activity it would be quite common to find up to five lorries waiting at the start of

the day. These could consist of 2 lorries with floor slabs, together with a mobile crane, 2 block deliveries and 1 brick delivery.

Unloading times for a lorry containing a full load of bricks or blocks could be in the region of 30 minutes. This would be to unload the lorry by HIAB grab onto an adjacent storage area. The unloading times for floor slabs could be between 1½ hours to three hours. With a restricted area in which only one lorry at a time could unload, there was the potential for considerable waiting time. The usual arrangement was to get the brick lorries unloaded and out of the way before the floor plank operations started.

In some instances the deliveries would be staggered. However, drivers often preferred to get to site early to avoid the rush hour and wait rather than come later and be held up by traffic.

There were instances when other factors affected access, such as works to the road causing temporary delays.

1.4.3 Availability of unloading equipment

HIAB being used to collect scaffolding from behind the site hoarding

The research suggested that priority over the use of unloading equipment such as cranes and forklift trucks is normally given to unloading lorries. The main reason why this equipment was not available at times to unload a particular delivery was that it was being used to unload an earlier delivery.

There were also numerous instances when the unloading equipment was being used to move materials in order to assist with other elements of the construction process. In these instances, lorries would have to wait until the use of the equipment for that particular activity was either completed or it could be economically interrupted.

Delivery lorry with its own forklift truck for unloading

Some delivery lorries have their own means of unloading. This can be in the form of a HIAB grab mechanism, forklift trucks or trolleys.

The HIAB grab, depending on model, would have a reach of between three and eight metres. It is attached to the lorry and is used to unload materials. Using a HIAB grab means that the materials can be deposited on the ground adjacent to the lorry. Alternatively, it is possible for some HIABs to deposit materials on a suitable loading bay at first floor level.

Some lorries have forklift trucks attached to the back and can be rapidly put into action. This means that the lorry is not dependent on unloading equipment supplied by the site. It also means that the lorry can be unloaded at some distance from the site with the forklift truck being used for transportation over short distances.

1.5 Scheduling of material unloading

Scheduling involves applying a plan and a discipline to the process of unloading lorries. The issues here are the methods of allocating unloading resources, the degree of material delivery coordination and the willingness of suppliers to commit to delivery dates and times.

1.5.1 Allocating unloading resources

How the equipment for unloading is allocated in a situation where there are competing demands will depend on the view of the site manager. The site manager will need to weigh up the relative needs of releasing a lorry compared to progressing the building works.

Situations such as these highlight the need for scheduling the use of unloading equipment. However, in any situation where there is a high level of uncertainty as to delivery times there are clear limitations with regard to the ability to accurately schedule the use of such equipment.

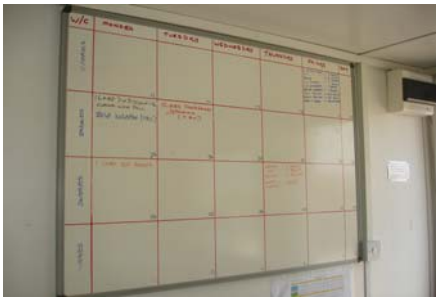
1.5.2 Material delivery coordination

Materials which could have been unloaded directly into site storage areas are instead carried by hand from temporary storage in the street

There was a high degree of variation between the ways in which sites handled material deliveries. On one site there was very little in the way of material delivery scheduling. The trade contractors did not always inform the person on the gate of material deliveries. This resulted in the materials being unloaded temporarily outside the site. The gatekeeper would sign for the materials unchecked and take receipt of the delivery ticket. The trade contractors would from time-to-time check to see if a delivery they had ordered had been delivered. They would then move the material to a storage area on site or to the place of work as appropriate. The gatekeeper would generally hand over the delivery ticket to the trade-contractor.

This lack of coordination would often mean that materials which could have been unloaded and taken directly to their appropriate storage area on site were instead simply dropped off adjacent to the site entrance.

On one site there was a highly organised process of material delivery coordination. This was necessary because of the high usage rate of the crane for key construction activities, combined with very restricted access to the site. All major material deliveries by trade contractors had to be reported to the assistant site manager.



Daily material delivery schedule in the site office

This information, together with materials ordered directly by the main contractor, would be entered onto a daily material delivery schedule. This four-week look-ahead schedule was set out on a whiteboard in the site office.

This schedule enabled material deliveries to be coordinated with the key site activities which had a high demand on the use of the crane. These included concrete pours, formwork table movements and distribution of blocks and mortar.

On certain days, only very limited material deliveries could be arranged, reflecting high crane usage for certain programme construction activities combined with limited vehicle access.

Access to main site storage area blocked during site operations

On these occasions there was concern on behalf of the gatekeeper to ensure that a build-up of lorries outside the site was avoided. In order to turn lorries around as quickly as possible they would be allowed to unload in a designated area outside the site. This meant that materials could be placed temporarily at the side of the road through the use of a pavement closure agreement.

1.5.3 Supplier commitment to deliver on specific dates

There appeared to be a distinct difference of approach between suppliers on committing to delivery on specific dates. The lack of single day commitment by some suppliers made coordinating deliveries problematic.

The kitchen supplier on one site would deliver a full load on an articulated lorry within a five-day time slot. This would provide them with the opportunity of optimising the scheduling of their deliveries. However, it also meant that the site would not necessarily be in a position to effectively manage the receipt of deliveries.

On the site that practised material delivery scheduling, a different kitchen supplier arranged delivery to a committed day. In addition, only one kitchen set was delivered at a time using a transit van. This meant that the kitchen could be delivered directly to the staircase serving the flat in question.

Summary and Conclusions

Overall, the transportation system serving the sites appeared to work effectively.

There was the ability of both sites in the research to take deliveries of bulk items such as bricks and blocks in full-loads. For non-bulk items, the milk-round system used by distributors and suppliers making small deliveries to a number of sites appeared to work well.

Not all lorries on the milk-round would start full. This is an example of a trade-off between efficiency (running with full loads) and responsiveness. Ensuring full loads at the start of the milk-round requires the ability to aggregate orders. Responsiveness requires that orders are despatched without delay which reduces the opportunity for aggregation.

In practice most transport fleets tend operate with spare capacity. The marginal costs of operating larger vehicles tend to be relatively small. The larger vehicles also act as an insurance policy by providing the additional capacity which may be required to deal with peaks in demand.

Another issue explaining why there was a lot of unused capacity on lorries was the fact that there appeared to be very few opportunities for lorries to make pick-ups from sites. Even returnable pallets, stacked ready for collection, were often left behind following a delivery. There did not appear to be an economic incentive on the part of the driver to pick them up. This may have been due to the fact that a lot of transportation is subcontracted by the manufacturers and the arrangements do not include for pick-ups.

One of the characteristics of transportation within construction is the degree of waiting of lorries to be unloaded. The greatest incidence of waiting occurred in the mornings before the site was open. Lorries waiting at the start of the day for unloading was seen by the lorry drivers as a good use of time. It meant that they avoided the rush hour and that the time could count as rest time.

Material delivery scheduling proved to be very effective in managing material deliveries during the day. On the site where material delivery scheduling was used there was a noticeable reduction in waiting times for lorries.