

Our ref: 25.1.201/KDR/6728  
Your ref: INF CORR 5400

Bilfinger Berger-Siemens- CAF  
Consortium

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**For the attention of Steven Bell, Tram Project Director**

Dear Sirs,

**Edinburgh Tram Network Infraco  
Infraco Contract: Extensive Defective Works in Princes Street**

We refer to your letter dated 18 June 2010 (INF CORR 5400), received on 21 June 2010 relating to the works in Princes Street.

We deny that our letter dated 9 June 2010 (25.1.201/BDo/5937) admits that the works carried out to Section 1C/D are not in accordance with the Agreement. The letter was a response to tie letter dated 16 April 2010 (INF CORR 4822/DB), in which tie requested explanations as to the causes of specific snags or defects and how these are to be rectified and, in some cases, prevented from recurring. Our letter very clearly and concisely provided the information requested.

The works in Princes Street were subjected to delay and disruption from a number of matters completely outwith the Infraco's control. By way of example:

06/11/08	Requirement to allow bus traffic to run Westbound	Ref: INF CORR 340
12/01/09	Instruction – Princes Street Construction Works	Ref: INF CORR 573
10/11/09	Scottish Water valve leak in South David Street	Ref: Prog Mtg 10/11/09
03/11/09	Crawley tunnel repairs by MUDFA	Ref: Prog Mtg 03/11/09
03/11/09	Scottish Water valve leak in South David Street	Ref: Prog Mtg 03/11/09
07/11/09	BT cables obstructing works	Ref: Period Report 2-8
07/08/09	Delayed handover at Lothian Rd by MUDFA	Ref: Period Report 2-8
25/09/09	Crawley Tunnel remedial works necessary	Ref: Period Report 2-8
07/11/09	Comms cables awaiting diversion S Ch St	Ref: Period Report 2-8
07/11/09	Power cables awaiting diversion S Ch St	Ref: Period Report 2-8
30/10/09	Scottish Water live pipes to be renewed in Crawley Trl	Ref: 25.1.201/DG/3945

The impacts of these items, in addition to an increased scope of road construction, effectively reduced the time available for Infraco to complete the Princes Street construction works to the agreed construction programme (10 March 2010 completion). Infraco was forced to continue working 24/7 through periods of adverse weather because tie would not delay the 29 November 2009 reopening of Princes Street.

Further, your Chief Executive, Mr Richard Jeffrey advised Stakeholders of progress via email dated 26 November 2009 where he stated:

*"We remain on track to reopen Princes Street at 05.00 Sunday morning. This is despite a very difficult 24 hrs since my last report where the shocking weather significantly hampered progress on issues such as laying of the final road surfaces, white lining and mastic jointing, all of which are activities which cannot be carried out in severe weather. (it has been an exceptionally wet November which has not helped progress generally)."*

The rainfall for the period when construction activities were most intense was exceptionally high. For example, on 20 November 2009, around 40mm of rain fell in 24 hours, more than half the average rainfall for November. The Met Office issued warnings of "persistent heavy, and occasionally torrential, rain", and there were flood warnings in the Lothian area. Met Office records confirm the exceptionally bad weather conditions during the Princes Street works.

Working under such conditions carried risk and tie was warned many times that, due to the delays, some of which have been listed above, the targeted completion date of 29 November 2009 would not be achieved. tie did not instruct an extension to the completion date, with the result that:

- Work continued through unsuitable weather conditions, which undoubtedly affected quality
- Some work was installed on a temporary basis
- Some work could not be completed in the timeframe, rendering it vulnerable to damage from traffic

Infraco communicated in various ways including formal correspondence, meetings, and verbally to tie that the 29 November 2009 completion date was at risk or could not be met, together with the reasons, some are listed below but are not exhaustive:

- BSC letter 25.1.201/DG/3426 dated 3/9/09
- BSC letter 25/1/201/DG/3468 dated 9/9/09
- Period Report 2-6 dated 9/9/09
- BSC letter 25.1.201/PWI/3590
- BSC letter 25/1/201/3788 dated 9/10/09
- BSC letter 25.1.201/DG/3945 dated 2/11/09
- Period report 2-8 dated 7/11/09
- BSC letter 25.1.201/DG/4023 dated 16/11/09
- Weekly Site Meetings
- Project Management Panel Meetings
- Infraco Progress Report Meetings

We have addressed the headings contained within your letter as follows:

#### Evidence you refer to

We acknowledge that, for reasons which to a large extent are not attributable to Infraco, there are defects in the road surface adjacent to the rails. We can confirm that the material is indeed Hot Rolled Asphalt (HRA); is permitted in the specification and was the correct surface course in

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the circumstances in respect of performance when subjected to loading from the buses; the high element of hand laying required in confined spaces and adjacent extensive street furniture in the carriageway. A design mix for each supply source was carried out as per BS 594.

We have identified the locations where the HRA has flexed and then broken away where it was laid over the chamber filling element but not milled out prior to the opening of Princes Street traffic. This occurred because delays had occurred due to reasons not attributable to Infraco given above, so the work could not be completed before reopening of Princes Street on 29 November 2009. Subsequently, further investigation has identified that these same areas are subjected to intensive bus wheel turning and braking forces which has compounded the problems highlighted by you.

Safety critical remedial work has been carried out since December 2009 during night shifts and, with full road closure, on 3 July 2010 and, in straight sections of road, these remedial works are proving to be effective and durable.

We also acknowledge that the joint sealant is unsatisfactory in some areas, although this is not necessarily due to reasons attributable to Infraco. Infraco have sought and obtained expert opinion on the causes of the defects on Princes Street. These experts concluded that this was due to a combination of reasons:

- In areas asphalted in the final days and nights before 29 November 2009, Infraco was not given the opportunity to mill, sandblast or seal the rail/road interface before Princes Street was reopened to traffic. This meant traffic was running on asphalt directly over the rubber made chamber filling element, causing the asphalt to break up. We authorised incomplete Infraco works to be completed during the night shifts of 12 to 20 December 2009 whereby Infraco carried out milling and sealant installation on the road which had already suffered damage. The irregularity you correctly noted was due to the sealant filling gaps in the wearing course created by allowing traffic to be reinstated onto Princes Street with Infraco works simply being incomplete. Refer to photographic storyboard appended to this letter. This affected significant lengths of Princes Street, the main section being between chainages 1580 to 1920, approximately Castle Street to Hanover Street.
- Where the road surface level is now lower than the rails, and/or where the sealant was much wider than specified for the above reason, the sealant has been left exposed and has again been torn out by traffic.
- Both asphalt and sealant were applied in adverse weather conditions, both cold and wet, due to programme constraints imposed by us to reopen Princes Street on 29 November 2009. This has led to premature failure in some areas. You are referred again to Mr Richard Jeffrey's email of 26 November 2009, the text of which was quoted above.
- In the last sections asphalted in Princes Street, we prevented Infraco from undertaking sandblasting of the rails during night shifts due to the noise it can create. As a consequence, the sealant had to be applied in some areas where sandblasting was not carried out.

We also acknowledge that some of the granite setts were not installed to the required standard. The granite setts were laid in adverse weather conditions in the latter stages of the construction, in agreement with us, in order to achieve the opening of Princes Street on 29 November 2009.

Subsequently, further investigation has identified that these same areas are subjected to intensive bus braking and accelerating forces which has compounded the problems highlighted by you. Nevertheless, we note and agree with your comment that the design and choice of materials is sound.

Infraco took advice from noted experts in the field of asphalt and on-street tram systems. Initial indications are that there was a lack of compaction due to the asphalt being laid at temperatures at the lower end of the specification. The solution to be proposed takes cognisance of the following points:

- This is remedial work, not new work and asphalt laying equipment is not best suited to the widths required.
- Observations of the worst affected areas indicate that, there are extremely high incidences of bus wheels turning and stopping on the junction of rail and road. All the experts concurred that the traffic pattern in Princes Street are unique for any tram system constructed to date.
- The large aggregates in the surface has led to a more ragged line after milling, which is unsightly, even if technically acceptable within the specification.

#### Comment on design & choice of material

Whilst not necessarily a fundamental contribution to the problems in Princes Street, we acknowledge that there are differences between materials used in the UK and those used in Germany and Infraco have taken extensive advice from noted experts in road construction and tram systems both in the UK and Germany. We are pleased to confirm that the design used for Princes Street has been endorsed by the experts and the consensus amongst them is that, given the recommended conditions and adherence to the specification and method statements, an acceptable, fit for purpose solution would be achieved.

To this end, Infraco has held a series of workshops over the past few months, by way of securing continuous improvement in the way the Infraco works are conducted. We have critically reviewed both the manner in which the works in Princes Street were carried out and the end product and taken advice from experts. As a result, we have made some changes to both Method Statements and Inspection & Test Plans, which we are confident will bring the required results.

The asphalt design has been carried out in accordance with HD2606 and produced to the Contract Specification Appendix 7/1 of the Contract.

We can confirm that the wearing course material is HRA and all material supplied and laid is compliant with all sections of the contract documents. With regard to your comment regarding the material being 'fatty' implies high binder content, if this was the case the pre coated chips would not have yielded the required texture depth values which have been identified in our testing scheduled in Appendix 7/1 and are compliant with the requirements therein despite the adverse weather conditions at the later stages of the construction, in agreement with tie in order to achieve the opening of Princes Street on 29 November 2009.

With regard to level control of HRA we concur with your statement hence the use of HRA as surface course. HRA has numerous advantages with respect to performance when subjected to heavy loading and the ability of hand laying in confined spaces.

In newly laid surfaces the bond coat was laid in accordance with schedule 4 cl 920.1 of Appendix 7/1. In areas which had been trafficked and required remediation these were thoroughly cleaned by road brush and power washed prior to the application of the bond coat. The bond coat was applied one hour prior to the next laying operation to ensure that the heat bond was achieved. The testing records and ITPs indicate that the bond coat materials delivered were to the upper permissible temperature limits for the specified material which ensured the bond adherence despite the adverse weather conditions at the later stages of the construction, in agreement with tie in order to achieve the opening of Princes Street on 29 November 2009.

Your comments on pavement life are subjective and should be based on technical facts.

BSC's performance and failures to comply with obligations.

Infraco denies that it has failed in its obligations pursuant to Clause 7.2 of the Infraco Contract. At the start of this letter, we have set out, giving examples where necessary, the circumstances which resulted in some defective work in Princes Street. We refute your statements regarding choice of materials and inappropriate design and these have been addressed in the earlier sections of this letter. In particular:

- The design of both road/rail interface is an integrated design which has been endorsed by experts in road construction and tram systems and has been successfully used in Europe.
- The materials are the correct choice and will work well together given the right weather conditions for application and applied in accordance with the specification.
- The work was properly supervised. ITPs for the works have been audited by both tie and CEC. Records can be provided to demonstrate who was in charge at all times during the Princes Street works and that they have the necessary credentials and experience.
- The main reason that defects occurred was due to the imposition by tie of an opening date to traffic compounded with extreme weather conditions as recognised by tie's CEO, the consequence of which was to restrict the time available to complete the works to the required standard and not due to the incorrect choice of materials. Infraco consistently reminded tie that the completion date could not be met by implementing the construction to the standards required. Under these circumstances, tie's obligation should have been to request from their stakeholders a postponement of the 29 November 2009 deadline. Tie simply decided not to do so and even reassured their stakeholders that the deadline would be met. It is a fact that traffic was reinstated onto Princes Street with Infraco works simply being incomplete. Between chainages 1580 to 1920, approximately Castle Street to Hanover Street this has resulted in visible damage at the rail/joint/asphalt interface. As stated above, the completion of said Infraco works was only authorised later during night shifts (12 to 20 December 2009), by which date, most of the damage had already taken place and the sealant logically has to fill a very oversized, irregular groove.
- Good Industry Practice is to allow the best standard of workmanship with the associated components in conditions that are fit to do so.
- In due course, tie will be provided with both design and Construction Assurance Statements.

tie's failure to recognise the impact of the increase in scope, late completion/handover of MUDFA works sites, unidentified services, ongoing stakeholder requirements (Festival embargo,

etc) and adverse weather conditions and their insistence for the completion of works on 29 November 2009 has largely contributed to the current situation on Princes Street.

Payment

Infraco's position on payment due is aligned with the conditions outlined in the Princes Street Supplemental Agreement and we will continue to seek reimbursement under this agreement. To the extent not attributable to Infraco, the ongoing remedial work to the defects you have referred to are subject to the same payment terms.

Yours faithfully,



**M Foerder**  
Project Director  
Bilfinger Berger Siemens CAF Consortium

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