


Category II (Competent Independent Team in same Organisation) Check Certificate for the validation of the 3rd Party Developer's proposals for protection of Crossrail Infrastructure at risk within the Zone of influence of works
3rd Party Development: <ul style="list-style-type: none"> Shaftesbury Theatre, 210 Shaftesbury Avenue, London, WC2H 8DP
Category II Checking Organisation: <ul style="list-style-type: none"> RSK Environment Ltd. Geotechnical Consultancy
Designer for 3rd Party Development: <ul style="list-style-type: none"> RSK Environment Ltd. Geosciences
Category II Check Scope: <ul style="list-style-type: none"> Assessment of Ground Movement Impact on Crossrail Infrastructure, predicted to result from implementation of the design for development Calculation of load take down before, during and on completion of development
Brief description of the subject of Category II Check including all disciplines covered and geographical extent: <ul style="list-style-type: none"> Review of all available information pertaining to the site, including available BGS data, environmental database reports and previous investigation works on site; Review of all available plans and drawings of the current proposals for the site; Adopting soil parameters and ground model for the analysis, and load take down at various stages of the construction; and Undertaking elastic Ground Movements Analysis (GMA) to determine the anticipated vertical displacements at the Crossrail Tunnel level
Documents Checked: <ul style="list-style-type: none"> 371647-L04(00) CRL Category 2 Check 10th February 2020
Requirements, Standards and Codes applied in this Check <ul style="list-style-type: none"> CRL Safeguarding BS5930: 2015; BS EN ISO 22476-3: 2005; BS1377-3 (2003) – site investigation, in-situ and geotechnical laboratory testing; Stroud (1974); Jamiolkowski, et al from CIRIA Special Publication 27, 1983; Stroud (1989) from CIRIA Publication 143, 1995 – geotechnical soil parameters; Boussinesq, J. (1885) Applications des potentiels a l'etude de l'equilibre et de mouvement des solides elastiques (Gauthier-Villars, Paris); Poulos, H.G. and Davis, E.H (1974) Elastic solutions for soil and rock mechanics – Ground Movements Analysis
Any other relevant details: This check has been carried on the Category II Check of the GMA in relation to the Crossrail asset only.
Declaration by Checking Organisation:
By Validation Team Leader of the Organisation undertaking Category II Check: I certify that, exercising reasonable professional skill and care, I have checked the assessment of the Crossrail Tunnel movements associated with the 3 rd Party Development presented in Report 371647-L04(00) 10 th February 2020, with the objective of ensuring that the predicted ground movement have been appropriately calculated. This work; <ul style="list-style-type: none"> Complies with the Requirements, Standards, Codes and any other relevant details stated above; Is accurate in its adoption of correctly calculated surcharge loading, interpreted soil parameters and intended construction sequences applicable to this development

Category II Check Certificate for Shaftesbury Theatre

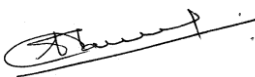
In my reasonable opinion the Crossrail tunnel displacements have been appropriately assessed indicating that only very minor movements of between 0mm and a maximum of 1.5mm will be experienced by the tunnel over a length of 40m. This results in a tunnel curvature well in excess of the limiting minimum value of 10kM specified in the Crossrail document "Information for Developers".

I confirm that the Category II check was undertaken by a team wholly independent of the team responsible for the assessment and design of infrastructure protection to mitigate the 3rd Party Development impact on Crossrail infrastructure.

Name: Dr. Shon Williams	Position: Director	Signature: 	Date: 14 th February 2020
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By Project Director of the Organisation undertaking Category II Check:

I certify that the staff who have completed the above check are competent to carry out their duties and that they have used reasonable skill and care, and that inter-discipline interfaces have been managed and coordinated appropriately

Name: Dr. Thiruchelvam Navaneethan	Position: Associate Technical Director	Signature: 	Date: 14 th February 2020
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Acceptance by Crossrail: The certificate is accepted by CRL's Safeguarding team

Name	Position	Signature	Date

Attachment 1.0 – Documents Checked

Documents listed below comprise those made available for the review, and are included in this Category III check.

Document Reference	Title	Notes

Attachment 2.0 – Documents for Information

Documents listed below comprise those made available for the review, and are included in this Category III check.

Document Reference	Title	Notes