



MATCHSTICK ARENA FOUNDATION RECOMMENDATION

Joseph O'Donnell

Abstract

Analysis of results from Ground investigation

O'DONNELL, Joseph (UWTSD)
2118883@student.uwtsd.ac.uk

Introduction

This report will look into the analysis of the borehole record that was performed on the proposed Matchstick Arena area in Merthyr Tydfil, on 20/02/2025. It will conclude looking at the variety of different foundations that could be used for the construction project, with a conclusion to INJR construction decision for the foundation type.

Types of Foundation

There is a variety of different reason when deciding the correct foundation type for a building. Aspects for the building that need to be considered are ground conditions, space, presence of water and accessibility. For this construction project, all these considerations are a factor the construction works of Matchstick Arena.

Pile Foundation

Pile foundations are long, slender columns that are made from reinforcement concrete and is classified as a 'piled' foundation when its depth is more than three times its breadth. The purpose of pile foundation is used to transfer loads from superstructures through weak strata and are typically used for large structure or if soil is not suitable to prevent excessive settlement. There are different types of pile foundations such as end bearing piles, friction piles, driven piles, and bored piles. (Designing Buildings, 2022)

For this report, it is going to investigate the use of bored piles and bored piles are typically used when foundations are required around existing building and are a popular use in urban areas as there provide a minimal amount of vibration reducing risk to the surrounding building. Bored piles are also suitable for wet soil conditions and is a suitable foundation type that can penetrate weak over burden and bear on micaceous sandstone as found in the Borehole Log reference 00211883 (Designing Buildings, 2022).

Pad Foundation

This type of foundation provides support for structure by transfer the load to layer of the soil or rock that has a sufficient bearing capacity and suitable settlement characteristic. It can be used to prevent settlement and can provide a permit for construction on ground conditions that may have poor bearing capacity. Pad Foundations are generally shallow foundations but can be deep depending on the ground conditions. Typically designed at a square or rectangle shape, the concrete support pads encourage localised single point loads such a columns or framed structures to allow the load to spread through the pad into the bearing layers of the ground conditions. (Designing Buildings, 2015)

The concern with the use of pad foundation on this construction project is the top 15m consisting of overburden that can include demolition waste, landfill, or old foundation from the previous infrastructure (Merthyr Tydfil Bus station), as well as the consisting of alluvium and glacial till layers that are typically compressible and weak soil types. The issue with pad foundation is that it would sit within these unstable layers that could cause uneven settlement and poor load bearing capacity.

Raft Foundation

Raft foundations are typically formed as reinforcement concrete slabs that have a uniform thickness that covers a wide area for the entire area of the building. This foundation type is most suitable when structural loadings are low such as a two-story domestic building, ground conditions are poor and pad foundation would require a significant amount of excavation, as well as when settlement is likely. An

advantage with the use of this type of foundation is the speed and inexpensive to construct due to a limited amount of excavation required in order to make the foundation.

Final Recommendation

For the Matchstick Arena in a tight urban site near a river, the best foundation choice is bored cast-in-place piles reaching the micaceous sandstone. This method balances noise control, space limitations, and structural stability, ensuring a strong foundation with minimal disturbance to the surroundings. Raft foundation is also considered an option for the building due to its speed of construction and cost efficiency.

References

Designing Buildings (2022). Pile foundations. [online] Designingbuildings.co.uk. Available at: https://www.designingbuildings.co.uk/wiki/Pile_foundations.

Designing Buildings (2015). Pad foundation. [online] Designingbuildings.co.uk. Available at: https://www.designingbuildings.co.uk/wiki/Pad_foundation.

INJR Construction Ltd			Borehole Ref: 00211883		
DATE STARTED: 17/02/2025		COMPLETED: 20/02/2025		BOREHOLE DEPTH: 50m	
DRILLING CONTRACTOR: INJR CONSTRUCTION LTD		DRILLING METHOD: 6INCH AUGER		CLIENT: ACE CAPITAL LTD	
LOGGED BY: JOSEPH O'DONNELL		CHECKED BY: JOSEPH O'DONNELL		GROUNDWATER AT TIME OF DRILLING: N/A	
HAMMER TYPE: 140LB HAMMER		COORDINATES: X: 304752 , Y:206184		GROUNDWATER AT END OF DRILLING: N/A	
DEPTH	GRAPHIC LOG	MATERIAL DESCRIPTION	SPT VALUE (N) BLOW COUNTS	THICKNESS	DEPTH
5.0M		Over burden (consists of demolition waste, landfill deposits and old foundations of infrastructure usage)	50	4.5m	4.5m
10.0M		ALLUVIUM, GLACIAL TILL	40	5.5m	10.0m
15.0M		MUDSTONE (GREY CARBONACEOUS)	30	4.0m	14.0m
20.0M		MUDSTONE and CLAY (GREY CARBONACEOUS & KAOLINITIC CLAYSTONE)	15	4.0m	18.0m
25.0M		CLAY (KAOLINITIC CLAYSTONE)	40	6.5m	24.5m
30.0M		MUDSTONE (GREY CARBONACEOUS)	40	2.8m	27.3m
35.0M		MUDSTONE with COAL TRACES (GREY CARBONACEOUS & BANDED MUDSTONE)	40	9.5m	36.8m
40.0M		MUDSTONE (BANDED MUDSTONE)	50	1.6m	38.4m
45.0M		MUDSTONE AND SANDSTONE (BANDED MUDSTONE & MICACEOUS SANDSTONE)	50	4.1m	42.5m
50.0M		SANDSTONE (MICACEOUS STANDSTONE)	50	7.5m	50.0m