

JALAN DUTA, KUALA LUMPUR ROAD WIDENING PROJECT

RETAINING WALL PROJECT

Project Name	Permanent Sheet Piling and Ground Anchor System Along Wall 4 and Wall 8
Client	Jabatan Kerja Raya Malaysia and Ahmad Zaki Sdn Bhd
Location	Kuala Lumpur, Malaysia
Product	Retaining Wall and Ground Anchors
Date	May 2005

INTRODUCTION

ESC Projects (M) Sdn. Bhd. (ESC's construction arm), carried out a project in Kuala Lumpur, Malaysia for the Jabatan Kerja Raya, Malaysia (Public Works Department of Malaysia) where ESC sheet piles were used in a permanent situation. This allowed for faster construction time, lower cost and an aesthetically pleasing finished product.



Wall 4 before construction.

ESC SCOPE OF SUPPLY

RETAINING WALL & GROUND ANCHORS

ESC's scope was to provide the design, supply and construction of the complete retaining wall and the associated ground anchors for the sections with greater exposure. The design is based on a permanent sheet pile system that is supported by permanent ground anchors at W4 and permanent cantilever wall system at W8. The objectives of the system were;

To stabilise the existing slope in the long term against slides and movement caused by the additional engineering loads (backfill) on top of it and the subsequent traffic flow.

The geotechnical analysis will determined the requirements of the sheet pile retaining wall and anchoring system. The parameters determined were:

1. Earth and groundwater pressures
2. Structural forces
3. Settlements and displacements

Standards used in this section are;

BS 8002: Code of practice for earth retaining structures

PROJECT DETAILS

Soil parameters were obtained from the borelogs. For wall W4, the results from the Standard Penetration Test indicated that there was a hard impenetrable layer varying from 9.0m to 12.0m from top of the road finished level, where the Very Dense Sand and Hard Silt layers are found. Therefore, the required embedment for 9.0m piles should be achieved with the usage of high frequency vibro hammer and / or hydraulic drop hammer. Different values of ϕ' were used for wall W8. This is due to the actual soil conditions on site are much higher than the conditions indicated in soil log. The existing slope with the range of 26.5° - 29.1° steepness could actually stand up stably by itself with the existing soil conditions, which means that the soil frictions on site must be sufficiently high. Moreover the available bore log was carried out 3 years ago about 20m away from wall W8.

An analysis of the entire retaining wall system was carried out using the ReWaRD Retaining Wall software.

In accordance with BS8002, the following considerations were made to the analysis of the retaining wall in order to comply with the limit state design requirements;

- Minimum over excavation of 0.5m
- Minimum surcharge of 10 kPa
- Use of design soil parameters, which are defined as the representative soil parameters divided by a mobilisation factor (M) of 1.2 (effective stress design).

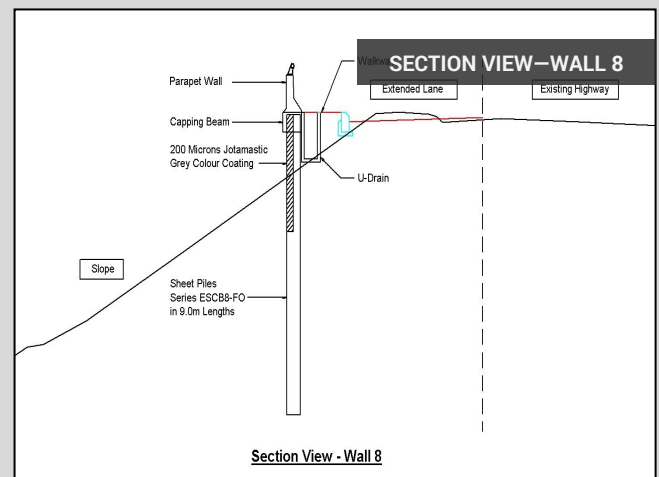
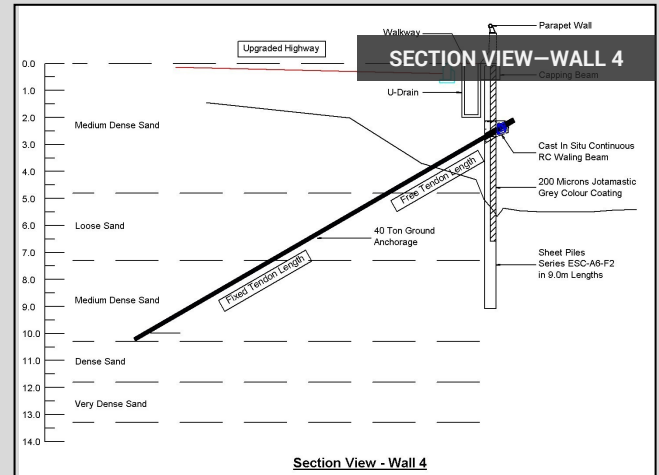
During all analysis, active water tables were set conservatively at 1.2m depth on retained side and passive water tables at 0.5m depth on excavated side for wall W4. While wall W8, the active and passive water table were set at 6.0m below the finished road level, since wall W8 is located on top of an embankment.

In accordance with BS 8081 the anchor load design was done in compliance with working load design, therefore the representative soil parameters are used in the analysis of the required anchor loadings.

Due to the different soil conditions required to satisfy the different codes, two cases were analysed of the structure using the ReWaRD software;

- SP case to determine sheet pile requirements (BS 8002)
- ANC case to determine anchor loadings (Eurocode – Serviceability)

While Wall W8 was analysed using the most critical case (Section on Ch 30.00), with the highest retained soil and steepest slope profile. And the largest factored bending moment recorded was 56.7kNm/m. Please refer to Appendix B for ReWaRD analysis



results.

The retaining wall design will consist of two major components;

- Main Wall Sheet Piles
- Ground Anchor System

Standards used in this Section are;

- BS 5950: Code of practice for structural use of steelwork in building
- BS 8002: Code of practice for Earth retaining Structures
- BS 8081: Code of practice for Ground Anchorages
- BS 449: Specification for the use of structural steel in building

The moment capacity of the Main Wall is based on;

$$M_c = f_y * Z \quad (\text{eq. 3.3.1})$$

Where;

M_c = ultimate design moment capacity

Z = section modulus

f_y = material yield strength

PROJECT DETAILS

The preliminary designs for wall W4 were carried out based on the following sequences of works:-

- i. Installation of the sheet piles.
- ii. Backfill to the ground anchorage level at the back of sheet pile wall.
- iii. Installation of ground anchors and RC waler
- iv. Backfill to the finished road level
- v. Construction of the capping beam.

And the preliminary designs for wall W8 were carried out based on the following sequences of works:-

- i. Installation of the sheet piles.
- ii. Backfill at the back of sheet pile wall up to the finished road level.
- iii. Construction of the capping beam.

ESC Projects (M) Sdn. Bhd provides the Client with complete solutions to their retaining wall needs. The experience gained in the last 10 years have allowed the company to provide basement,

BEFORE INSTALLATION



ON-SITE INSTALLATION



PROJECT COMPLETED



PROJECT COMPLETED



COMPLETED PROJECT

