ASHGHAL

Interim Advice Note No. 005

Specification for the Excavation and Backfill of Highway Structures

Revision No. A1

EXW-GENL-0000-PE-KBR-IP-00005

Summary
This Interim Advice Note (IAN) provides information and guidance on the specification to be adopted for excavation and backfill of highway structures.

This IAN takes immediate effect. It is applicable to highway structures only and supplements Section 6, Part 3 of the Qatar Construction Specifications (QCS) 2010 for such structures. The following shall be noted:

- Section 6, Part 3 remains relevant, supplemented by new Clause 3.11 for highways structures only.

This document supersedes IAN 005 Rev 0 dated February 2012. Third parties not working on Ashghal projects make use of this document at their own risk. Paper copies of this document are uncontrolled. Refer to Ashghal's website for the most recent version.

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A1	Sept 2013	Issued for All Relevant Infrastructure Projects	DL	AM	AA
0	Feb. 2012	For issue to EXW Consultants & Contractors	IF	EDF	MG
Rev	**Date**	**Reason For Issue**	**Auth**	**Chk**	**App**

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1. Foreword

1.1 Interim Advice Notes (IAN) may be issued by Ashghal from time to time. They define specific requirements for works on Ashghal projects only, subject to any specific implementation instructions contained within each IAN.

1.2 Whilst IANs shall be read in conjunction with the Qatar Highway Design Manual (QHDM), the Qatar Traffic Manual (QTM) and the Qatar Construction Specifications (QCS), and may incorporate amendments or additions to these documents, they are not official updates to the QHDM, QTM, QCS or any other standards.

1.3 Ashghal directs which IANs shall be applied to its projects on a case by case basis. Where it is agreed that the guidance contained within a particular IAN is not to be incorporated on a particular project (e.g. physical constraints make implementation prohibitive in terms of land use, cost impact or time delay), a departure from standard shall be applied for by the relevant Consultant / Contractor.

1.4 IANs are generally based on international standards and industry best practice and may include modifications to such standards in order to suit Qatar conditions. Their purpose is to fill gaps in existing Qatar standards where relevant guidance is missing and/or provide higher standards in line with current, international best practice.

1.5 The IANs specify Ashghal's requirements in the interim until such time as the current Qatar standards (such as QHDM, QTM, etc.) are updated. These requirements may be incorporated into future updates of the QHDM, QTM or QCS, however this cannot be guaranteed. Therefore, third parties who are not engaged on Ashghal projects make use of Ashghal IANs at their own risk.

1.6 All IANs are owned, controlled and updated as necessary by Ashghal. All technical queries relating to IANs should be directed to Ashghal's Manager of the Design Department, Infrastructure Affairs.

Signed on behalf of Design Department:

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2. Ashghal Interim Advice Note (IAN) – Feedback Form

Ashghal IANs represent the product of consideration of international standards and best practice against what would work most appropriately for Qatar. However, it is possible that not all issues have been considered, or that there are errors or inconsistencies in an IAN.

If you identify any such issues, it would be appreciated if you could let us know so that amendments can be incorporated into the next revision. Similarly, we would be pleased to receive any general comments you may wish to make. Please use the form below for noting any items that you wish to raise.

Please complete all fields necessary to identify the relevant item			
IAN title:			
IAN number:		Appendix letter:	
Page number:		Table number:	
Paragraph number:		Figure number:	
Description comment: Please continue on a separate sheet if required:			
Your name and contact details (optional):			
Name:		Telephone:	
Organisation:		Email:	
Position:		Address:	

Please email the completed form to:

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We cannot acknowledge every response, but we thank you for contributions. Those contributions which bring new issues to our attention will ensure that the IANs will continue to assist in improving quality on Ashghal's infrastructure projects.

3. Introduction

3.1 This Interim Advice Note (IAN), which takes immediate effect, provides Specification Clauses with regard to excavation and backfill for highway structures which are supplemental to the Qatar Construction Specifications (QCS) 2010. This IAN will provide interim guidance prior to the issue of the next update to the QCS.

3.2 The nature and extent of backfill material is defined together with requirements for placing and compaction.

4. Withdrawn / Amended Standard

4.1 For application to highway structures; Section 6, Part 3 of the Qatar Construction Specifications (QCS) 2010 is supplemented by the appended Specification.

4.2 The appended Specification shall take precedence where there is a discrepancy between it and the Qatar Construction Specifications (QCS) 2010.

5. Implementation

5.1 This IAN is to be used with immediate effect on projects as follows:

- All Ashghal projects in Design Stage
- All Ashghal projects in Tender Stage

5.2 Ashghal projects in Construction Stage shall be reviewed by the Project Consultant / Contractor and the implications of adoption of this Interim Advice Note discussed with the respective Ashghal Project Manager.

5.3 The only exceptions are:-

- Projects already in Construction, where a significant proportion of excavation and backfilling has already been completed, where this would result in a significant additional cost or delay

5.4 If in doubt, Consultants / Contractors should seek guidance from the respective Ashghal Project Manager or designated Programme Management Consultant (PMC) on a scheme specific basis.

Appendix A – QATAR CONSTRUCTION SPECIFICATIONS (QCS) 2010 Supplemental Clauses to Section 6, Part 3 (Highway Structures Only)

3.11 ADDITIONAL CLAUSES APPLICABLE TO HIGHWAY STRUCTURES

3.11.1 General

1. These Specification Clauses shall apply to backfilled structures such as retaining walls, trough structures, bridge abutments and cut & cover tunnels. They do not apply to:
   (i) fill for reinforced earth structures, including associated drainage layers;
   (ii) fill for anchored earth structures including associated drainage layers.
   (iii) backfilling of utility excavations such as for trenches, manholes, chambers etc.
2. For integral bridges, there may be additional requirements for the properties of backfill material to limit the settlement of backfill due to the effects of thermal movements of the structure. These requirements are not specified herein.
3. Any references to a superseded standard in Clause 3.11 shall be taken as a reference to the replacement standard that was current forty-two days prior to the date of return of Tenders. If no replacement standard exists, then the reference shall be taken as referring to a comparable, internationally recognized standard as directed by or approved by the Engineer.
4. Except as noted in sub-Clause 6 below, excavation shall be profiled to a slope no steeper than 1.0 horizontally to 1.0 vertically as shown in Figures 1 and 2. Additionally, excavations shall be benched as necessary to achieve full compaction of all of the backfill material.
5. Except as noted in sub-Clause 6 below, backfilling material as specified in Clause 3.11.2 to walls shall form a wedge of material as illustrated in Figures 1 and 2.
6. Excavations in rock may be benched to an angle steeper than 1 horizontal in 1 vertical, provided that the backfill material used is lean mix concrete with minimum 28 day strength of 15kN/m^2.
7. Backfill material as specified in Clause 3.11.2 shall be placed on the roofs of buried structures as illustrated in Figure 2.
8. Waterproofing shall be protected from damage at all times during backfilling and compaction operations.
9. Backfilling and compaction shall be completed in layers in accordance with the Qatar National Construction Standard (QCS).

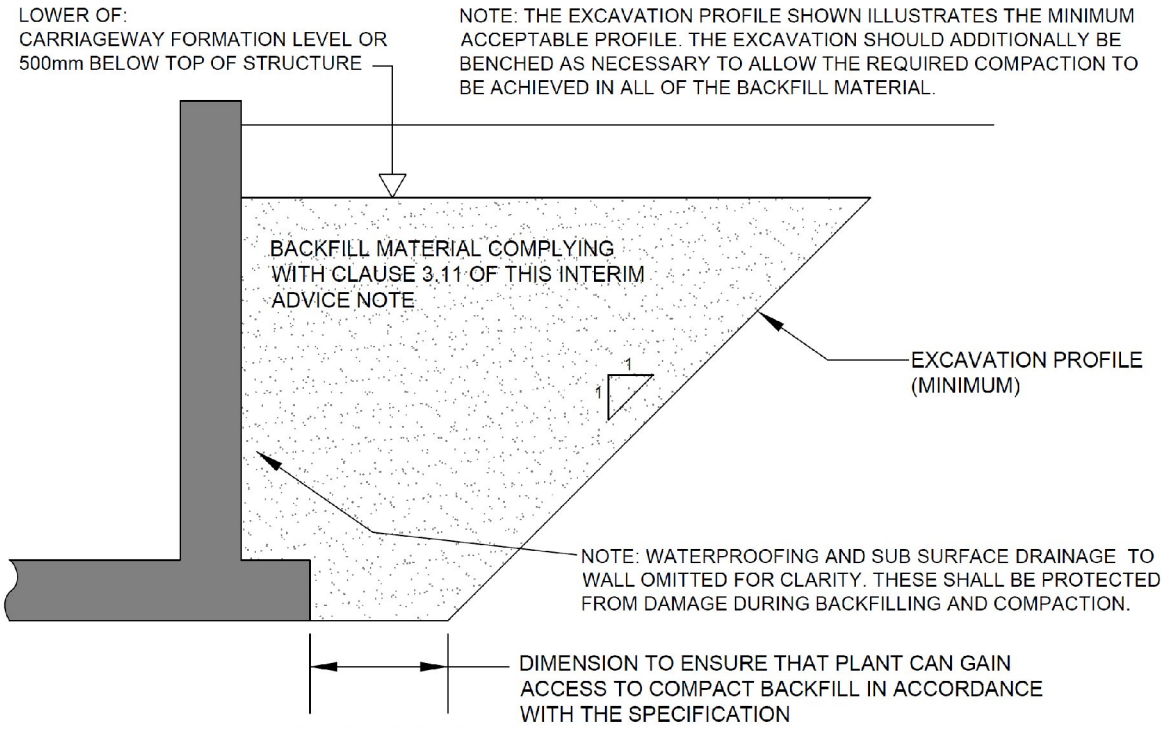

FIGURE 1: RETAINING WALL
EXCAVATION AND BACKFILL REQUIREMENTS
(NOT TO SCALE)

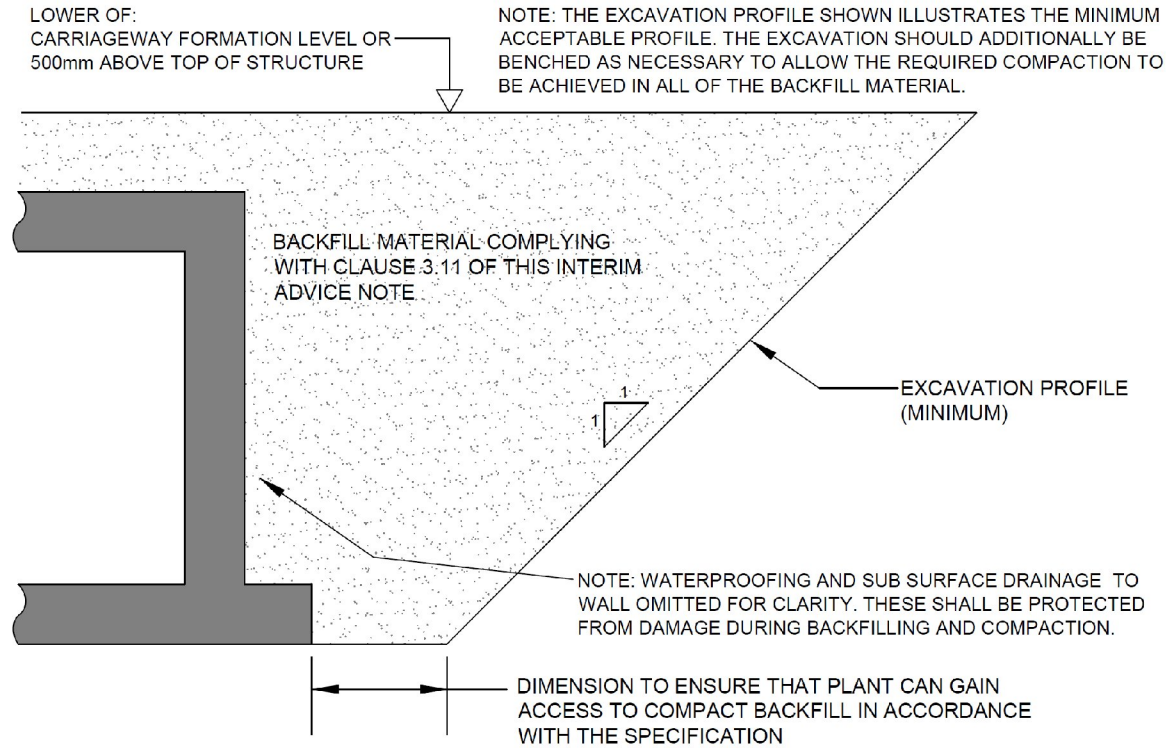

FIGURE 2: BURIED STRUCTURE
EXCAVATION AND BACKFILL REQUIREMENTS
(NOT TO SCALE)

3.11.2 Materials

1. Except as noted in 3.11.1 (4) above, Type 1 or Type 2 material as specified below shall be used as backfill to structures:

   Type 1

   Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Material shall meet the requirements indicated in the table below in addition to any other requirements of the QCS:

Material Properties Required for Acceptability (In Addition to other Requirements in the Specification)				
Property	**Defined and Tested in Accordance with**	**Acceptable Limits Within:**		**Testing Frequency**
		Lower	**Upper**	
Grading	BS 1377:Part 2 (On-site)	See 3.11.2 (2)	See 3.11.2 (2)	1 per 400 tonnes
	BS EN 933-2 (Off-site)	See 3.11.2 (3)	See 3.11.2 (3)	1 per 400 tonnes
Uniformity coefficient	See 3.11.2 (4)	10	-	1 per 400 tonnes
Los Angeles coefficient	See 3.11.2 (5)	-	40	Weekly

   Type 2

   Natural gravel, natural sand, crushed gravel, crushed rock, crushed concrete, slag, chalk, well burnt colliery spoil or any combination thereof. None of these constituents shall include any argillaceous rock. Recycled aggregate except recycled asphalt. Material shall meet the requirements indicated in the table below in addition to any other requirements of the QCS:

Material Properties Required for Acceptability (In Addition to other Requirements in the Specification)				
Property	**Defined and Tested in Accordance with:**	**Acceptable Limits Within:**		**Testing Frequency**
		Lower	**Upper**	
Grading	BS 1377 : Part 2 (On-site)	See 3.11.2 (2)	See 3.11.2 (2)	1 per 400 tonnes
	BS EN 933-2 (Off-site)	See 3.11.2 (3)	See 3.11.2 (3)	1 per 400 tonnes
Uniformity coefficient	See 3.11.2 (4)	5	-	1 per 400 tonnes
Los Angeles coefficient	See 3.11.2 (5)	-	60	Weekly

2. Grading requirement to BS 1377 : Part 2 (On-site)

% by Mass Passing Sieve Size Shown																
Size (mm) BS Series													**Size (microns) BS Series**			
125	90	75	37.5	28	20	14	10	6.3	5	3.25	2	1.18	600	300	150	63
		100														<15

3. Grading requirement to BS EN 933-2 (Off-site)

% by Mass Passing Sieve Size Shown																
Size (mm) BS EN 933-2 Series													**Size (microns) BS EN 933-2 Series**			
125	80	63	40	31.5	20	16	10	8	6.3	4	2	1	500	250	125	63
	100															<15

4. Uniformity coefficient is defined as the ratio of the particle diameters D60 to D10 on the particle-size distribution curve, where:

   D60 = particle diameter at which 60% of the soil by weight is finer;

   D10 = particle diameter at which 10% of the soil by weight is finer.

5. Los Angeles and Other Tests for Particle Soundness

   Resistance to Fragmentation - Los Angeles Coefficient (LA)

   The value of Los Angeles coefficient shall be determined in accordance with BS EN 1097-2.

3.11.3 Compaction

1. The Contractor shall compact the backfill, in compliance with the Qatar National Construction Standard, as supplemented/amended below.
2. The Contractor shall at least 7 days before commencement of end-product compaction make available the following to the Engineer:
   (i) the values of maximum dry density and the optimum moisture content obtained in accordance with BS 1377 : Part 4 using the 2.5 kg rammer method or vibrating hammer method as appropriate for each of the fills he intends to use which meet the requirements of the permitted material;
   (ii) a graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
3. Once the information contained in sub-Clause 2 of this Clause has been made available to the Engineer it shall form the basis for compaction.
4. Fill shall have a field dry density, measured in accordance with sub-Clause 5 of this Clause, equal to or greater than end product 98% of maximum dry density of BS 1377 : Part 4 (vibrating hammer method) of the maximum dry density for the relevant material previously made available to the Engineer in accordance with sub-Clause 2 above.
5. The field dry density referred to in sub-Clause 4 of this Clause shall be measured in accordance with BS 1377 : Part 9, except that nuclear methods shall only be used where required or permitted in the Specification. Where nuclear methods are used, the gauge shall be calibrated in accordance with BS 1377 : Part 9.
6. Where fill to structures is required to the same level on more than one side of a structural element or buried structure, it shall be maintained at heights not differing by more than 250 mm after compaction on opposing sides of the structural element as filling proceeds, unless otherwise permitted by the Engineer. Finished levels shall be as shown on the drawings.
7. The Contractor shall restrict compaction plant used on fill to structures, within 2 m of a structure, to the following items as:

(i) vibratory roller having a mass per metre width of roll not exceeding 1,300 kg with a total mass not exceeding 1,000 kg;
(ii) vibrating plate compactor having a mass not exceeding 1,000 kg;
(iii) vibro-tamper having a mass not exceeding 75 kg.

The compacted level of the fill within this zone shall not differ during construction from the compacted level of the remainder of the adjoining fill to structures by more than 250mm.

8. Backfill material shall be shown, by means of a trial utilising not less than 20 m^3 of the material, deposited and compacted in accordance with sub-Clause 3 above, to be stable in the opinion of the Engineer, when it is trimmed to a slope of 1 vertical to 1.5 horizontal.