

# ASHGHAL

## Interim Advice Note No. 023

### Tunnel and Underpass Drainage

#### Revision No. A2

EXW-GENL-0000-PE-KBR-IP-00023

#### ADVICE

This Interim Advice Note (IAN) provides information and guidance on new tunnel and underpass drainage design criteria to be used on all Ashghal projects. This IAN takes immediate effect. It is applicable to tunnel and underpasses only and is a supplement to the Ashghal Drainage Design Manual, Volume 1 (Chapter 7) and Volume 3.

This document supersedes IAN 023 Rev A1 dated September 2013. 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.



Rev	Date	Reason For Issue	Author	Chk	App
A2	Dec 2013	Issued for All Relevant Infrastructure Projects	MA	TK	NF
A1	Sept 2013	Issued for All Relevant Infrastructure Projects	DL	AM	AA
0	Feb. 2013	Issued for Expressway Projects	CPL	FF	MG

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**INTERIM ADVICE FOR PWA PROJECTS ONLY**

## 1. Foreword

- 1.1 Interim Advice Notes (IANs) 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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**Abdulla Aahin A A Mohd**

**Acting Manager of Roads & Drainage Networks Design**

Design Management (Roads Section)  
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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:

<p><b>Abdulla Ahin AA Mohd</b></p> <p>Acting Manager of Roads and Drainage Networks Design Design Management (Roads Section) Public Works Authority</p> <p><a href="mailto:aahin@ashghal.gov.qa">aahin@ashghal.gov.qa</a></p>
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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) takes immediate effect and provides additional design guidelines for the design of tunnel and underpass drainage, attenuation tanks and pumping stations. This IAN provides interim guidance prior to the issue of an update to the Ashghal Drainage Design Manual (ADDM).
- 3.2 The guidelines set out in Appendix A are supplementary to the Qatar Highway Design Manual (QHDM) Chapter 8 (Drainage), and the ADDM Volume 1 (General), specifically Chapter 7 (Operation and Maintenance) and Volume 3 (SW Drainage).

### 4 Withdrawn / Amended Standard

- 4.1 This IAN is for application to tunnel and underpass drainage; Volume 3 (SW Drainage) is supplemented by the appended Specification.
- 4.2 This IAN shall take precedence where there is a discrepancy between it and the Volume 3 (SW Drainage).

### 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 (see 5.2 below)
  - All Ashghal projects in Construction Stage (see 5.2 below)
- 5.2 For projects in Tender or Construction Stage, the consultant shall carry out a review of the existing design and prepare a report outlining the changes required including the financial and programme implications. Ashghal or its designated Programme Management Consultant (PMC) will confirm what changes, if any, are to be implemented.
- 5.3 If in doubt, Consultants / Contractors should seek guidance from their respective Ashghal Project Manager or designated PMC on a scheme specific basis.

**Appendix A – Design Guidelines to be adopted for Tunnel and Underpass Drainage, Attenuation Tanks & Pumping Stations**

**INTERIM ADVICE FOR PWA PROJECTS ONLY**

**1. Tunnel and Underpass Drainage**

- 1.1. Wherever possible the tunnel drainage collection system shall be designed so that spills of hazardous or flammable liquids cannot spread or cause flame propagation. An impounding sump to contain road tankers spillages, and tunnel wash down water, which is likely to be heavily polluted must also be provided. A road tunnel is a subsurface highway structure enclosed for a length of 150m, or more. The Consultant shall assess the need to adopt the impounding sump at the underpass drainage collection system (e.g. attenuation tank) at the area supply or ship the heavily polluted, hazardous or flammable material (e.g. industrial area).
- 1.2. The minimum design flow rate of the drainage system shall include, where applicable, the design spill rate for fuel or other hazardous liquids, the standpipe system discharge rate, any fixed fire-fighting system discharge rate, rainfall, tunnel washing, and any other catchments sharing the tunnel drainage system piping.
- 1.3. Wherever possible storm water collection ahead and within of any tunnel or underpass section shall use grated channels, such as ACO mono block or similar type, rather than gullies and positive pipes drainage.
- 1.4. The consultant shall develop an InfoWorks model for the tunnel and underpass surface drainage system. The system capacity shall be checked for 50 years storm to ensure no flooding occurs at any location in the tunnel or underpass.

**2. Supervisory Control and Data Acquisition (SCADA)**

- 2.1. All drainage collection systems within tunnels and underpasses shall make provision for a SCADA control system to monitor water levels. (Please note that along with monitoring, remote control facility shall also be provided. Please coordinate with DNO&MD for the detailed control Philosophy).
- 2.2. The SCADA control system shall be designed such that it sends warning messages to Ashghal Drainage Operation and Maintenance's (O&M) main control room. If applicable, the tunnel or underpasses control room and the Traffic Management Centre (TMC) should also be notified.
- 2.3. The power for SCADA system shall be backed up by UPS System with 6 hours backup capacity, using Ni-Cd Battery.
- 2.4. The tunnel operation and/or associated ITS shall be designed such that the tunnel or underpass can be closed if there is any risk of flooding in the tunnel or underpass.
- 2.5. The underpass maximum water level alarm shall be set with an appropriate safety margin to allow sufficient time for either O&M or the Freeway Control Centre (if applicable) to implement a response.

**3. Attenuation Tanks and Pumping Stations**

- 3.1. Attenuation tank storage shall be sufficient to contain runoff from the 50 year return period storm of 24 hours storm duration.
- 3.2. Where the tunnel or underpass has the ability to be closed and traffic diverted, the tank storage design criteria may be relaxed from 24 hours to 2 hours 50 years storm. The tank storage capacity should be sufficient to contain the generated runoff from the 2 hours 50 year storm return period. In this case, there will be a period of at least 2 hours for O&M to respond and implement remedial action before flooding starts. The pump(s) shall be sized in a way to avoid flooding the drainage system the pump(s) discharging to. Pump(s) sizing shall also take into consideration that the attenuation tank shall be emptied within 24 hours from the start of a storm event. The pump(s) shall be located in a proper sized sump within the attenuation tank. Silt trap shall be provided immediately before the inlet point to the attenuation tank and at the sump
- 3.3. Attenuation tanks and pumping stations shall be used to drain only the minimum catchment area of any tunnel or underpass. Wherever possible the other large areas of higher lying roads shall be drained to the surface drainage system.
- 3.4. An assessment shall be made on the use of additional canopy structures over the main carriageway ramps at the tunnel or underpass portals to further reduce the runoff collected in the underpass. Any canopy system shall take due regard to Tunnel Fire and Life Safety in accordance with Interim Advice Note 020. Any canopy design shall not be developed before the feasibility is approved by the Employer and the Engineer.
- 3.5. Wherever possible the attenuation tank and pumping station shall be one structure. This may or may not be integrated with the underpass structure.
- 3.6. The location and design of attenuation tank and pumping station shall allow for safe maintenance access including safe vehicle access and parking for maintenance to facilitate removal or replacement of any mechanical and electrical devices and periodical inspection and cleaning of the chambers.
- 3.7. The ability to operate and maintain tank safely is essential. The attenuation tanks shall be designed for safe operation and easy maintenance. Wherever possible the following criteria shall be incorporated in the tank design. This list is by no means exhaustive, but is intended to use for an initial design consideration.
  - Provide adequate openings to permit ventilation;
  - Provide safe confined space entry; and
  - Provide suitable lines of sight within the structure.



- 3.8. An Operation and Maintenance Manual shall be developed for each attenuation tank and pumping station. This should include a procedure for closure of the tunnel or underpass both with or without the assistance of ITS system. This Manual shall be reviewed by the Ashghal Drainage Design Department and Operation & Maintenance Department prior to construction and handover of the facility.
- 3.9. Emergency generators shall be provided at each pumping station. The generators shall be capable of providing sufficient power to operate the pump house at full capacity. As the station is a storm water station, necessary load banks shall be attached to the generator, automatically controlled to ensure that the generator load shall not drop below the minimum manufacturer recommended load for long running, during the operation.
- 3.10. DC1 approval for the pumping station shall be obtained at the design stages.

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