9 DRAINAGE

9.1 DRAINAGE SPECIFICATION

9.1.1 General

1 All water entering the completed structures comprising the Works shall be drained into the public drainage systems.

2 The freeboard used in the drainage design shall be minimum 300 mm above a flooding level corresponding to a flood event with a return period of 1in100 years for sections with tunnels, troughs and underground structure and 1in 50 years for sections with elevated and at grade structures, unless the Contractor demonstrates that the risk of flooding is as low as reasonably practicable (ALARP).

3 The environmental (including rainfall) design criteria shall be as defined in the Qatar Rail Development Program Definition Document. Separate drainage systems shall be provided for the following:

4 Tunnel drainage shall deal with water originating from:

(a) Rainwater;
(b) Tunnel condensation;
(c) Tunnel washing;
(d) Testing and discharge of the fire mains;
(e) Condensate from train air-conditioning;
(f) Water in case of fire fighting;
(g) Water from the troughs, emergency exits and ventilation shafts;
(h) Rain water blown into the tunnel or brought into tunnel by wet rolling stock; and
(i) Any other water ingress.

5 Station and underground structure drainage shall deal with water originating from:

(a) Rainwater;
(b) Tunnel condensation;
(c) Tunnel washing;
(d) Testing and discharge of the fire mains;
(e) Condensate from train air-conditioning;
(f) Condensate from Environmental Control System (ECS) associated plants;
(g) Water tank overflow and drainage;
(h) All clean water in the station;
(i) All clean water brought into the station;
(j) Water in case of fire fighting; and
(k) Any other water ingress.

6 Drainage of elevated and at grade sections shall deal with water originating from:

(a) Rainwater;
(b) Testing and discharge of the fire mains; and
(c) Washing water.

7 Storm water drainage shall deal with all rainwater falling on the station roofs and external areas and shall be directed into the public drainage system.

9.1.2 Tunnel Drainage

1 Pump sumps shall be located at the lowest points of the tunnels.

2 The discharge pipes from the tunnel pump sumps shall be routed via the stations, ventilation shafts or emergency exits to the public drainage system.

3 Tunnel drainage sumps shall be monitored at the nearest station.

9.1.3 Drainage on Elevated Sections

1 All water collected by structures shall be drained into the road drainage system if possible.

2 If road drainage is not available, soakaways shall be provided for drainage

3 Surface drains at deck level shall be constructed along the viaduct route. Run off shall be collected through surface drains that shall lead to down drains.

4 Provision for silt removal shall be made.

5 Particular attention is required where pipes pass through the structure, particularly at abutments where relative movement is anticipated between the deck and the sub-structure.

6 Drainage pipes shall be concealed and maintainable.

9.1.4 Trackwork Drainage

1 All water entering the completed structures comprising the Works shall be drained into the drainage systems of the tunnel, elevated and at-grade structures.

2 Drainage of Trackwork sections shall deal with water originating from:

(a) Rainwater;
(b) Condensate from train air-conditioning;
(c) Fire fighting water;
(d) Washing water; and
(e) Any other water ingress.

3 Drainage pipes shall be concealed and maintainable.

END OF PART