

PT/298/0410 – AS (April 2010)
Assessment Schedule for the Hydro-Valve
vortex flow control device produced by JFC
Manufacturing Co. Ltd.



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1. Scope

1.1 To assess the performance of the Hydro-Valve vortex flow control device manufactured by JFC Manufacturing Co. Ltd. The Hydro-Valve is mounted within manholes and chambers to control the outlet rate of stormwater. This assessment covers Hydro-Valve devices with a design flow rate between 1 and 35 litres per second.

1.2 The Hydro-Valve vortex flow control device is manufactured from polyethylene and can be installed in either circular chambers (with a diameter of 1200, 1350 or 1500 mm) or flat wall chambers. The Hydro-Valve is sealed to the chamber wall with a neoprene gasket. A service plate on the vortex chamber can be removed to facilitate roding if required. There is also a manual bypass plate on the side of Hydro-Valve which can be operated via a wire rope from the inside of the manhole/chamber cover.

1.3 The Hydro-Valve device controls fluid flow by hydraulic effect without moving parts. At low flow rates, water entering the device inlet passes through the vortex chamber to the outlet without restriction. As the water head increases, hydrostatic pressure increases and this forces the water through the valve with enough energy to create a vortex within the device. This results in a considerable pressure drop between the inlet and outlet that restricts the maximum flow to the set discharge rate.

1.4 For each Hydro-Valve design, a mathematical model determines the

manufacturing information (i.e. dimensions) and calculates a performance curve. A design flow rate between 1 and 35 l/s with a head height between 400 and 2500 mm is available. Each Hydro-Valve is specifically designed and manufactured according to the following design parameters supplied by the customer:

- design flow;
- design head;
- proposed type and size of installation manhole; and
- application.

1.5 The Hydro-Valve has the following attributes:

- no power source required;
- self cleansing; and
- self activating.

2. Assessment schedule

2.1 A review of hydraulic performance, including hydraulic testing and Computational Fluid Dynamics (CFD).

2.2 A review of the design procedure including the suitability assessment of the mathematical modelling.

2.3 An audit of production facilities, including a review of quality control procedures.

2.4 An audit of installation procedures for the Hydro-Valve, including witnessing of installation and collection of feedback from end-users.

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3. Review of hydraulic performance

3.1 Hydraulic testing of the Hydro-Valve shall be witnessed by WRc at JFC Manufacturing Co. Ltd's premises according to the test procedure developed for the Hydro-Valve⁽¹⁾. The performance of two Hydro-Valves, with design flow rates of 5 and 20 l/s, shall be assessed.

3.2 The Computational Fluid Dynamics (CFD) model shall be reviewed and verified against the hydraulic testing for low flows. The CFD model review shall look at the meshing and mesh settings, the properties of material type, the solution parameters, the initial conditions, the boundary conditions and the operational conditions.

4. Design Review

4.1 The mathematical model used to determine the manufacturing dimensions of the Hydro-Valve according to the design parameters supplied by the customer shall be assessed for its suitability.

4.2 A number of actual design projects shall be selected by WRc and reviewed with respect to the mathematical model and the hydraulic testing carried out in section 3 above.

5. Production quality audit

5.1 An audit of the production quality control systems procedures shall be undertaken. A visit to the

manufacturing site shall be made to witness the production process.

5.2 The quality control records shall be checked for the design and the manufacturing process, as well as the validity of the ISO 9001 quality standards certificate.

6. Installation, operation and maintenance

6.1 The installation instructions provided by JFC Manufacturing Co. Ltd. for the Hydro-Valve shall be reviewed.

6.2 WRc shall witness the installation of two Hydro-Valves (at least one of which shall be in a circular manhole or chamber) and audit the process against the installation instructions. The effectiveness of the neoprene gasket as a watertight seal shall be checked.

6.3 Two installed devices shall be witnessed by WRc (at least one of which shall be in a circular manhole or chamber) to assess the current operation of the Hydro-Valve. The operation of the bypass valve shall also be assessed.

6.4 Feedback from end-users of the Hydro-Valve shall be gathered to assess the performance of the Hydro-Valve, particularly with regard to maintenance.

7. Reference documents

1. Hydro-Valve Design, Hydraulic Testing & Modelling. Document

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HV-DHT01 Revision 002
01/09/2009. JFC.

2. Hydro-Valve Technical
Specification. Document D-VS-TS
Revision 003. JFC.