

- H. Vibration Analysis shall be conducted and report be submitted if stipulated in the Contract for big installations.

#### **1.1.29.1 Surge Protection**

- A. The Contractor shall be responsible for designing, manufacturing, installing and testing a safe and proper functioning surge protection system suitable for the proposed system. The surge protection system may include pressurized, non-pressurized vessels, vent valves etc. whereby non-pressurized vessels without bladder are preferred.
- B. Details of the surge suppression equipment specified in the Contract Documents shall be considered as guidance only. The Contractor shall prepare his own surge analysis suitable for the proposed system. Such calculations shall be subject to the approval of the Department and the Engineer.

#### **1.1.29.2 Vibration Control**

- A. Rotating/oscillating parts shall be in static and dynamic balance. Any vibration and noise caused by rotating and/or oscillating equipment, by flow velocity and other operational functions, which are considered by the Engineer as irregular or which are exceeding the manufacturer's recommendations, shall be rectified by the Contractor. Rattling equipment, piping and squeaks in rotating/oscillating equipment components will not be acceptable.
- B. Vibration shall be measured as root mean square displacement RMS in [mm] at the machine bearing houses and the valuation of vibration readings of the pump shall be in accordance with the relevant Hydraulic Institute or ISO Standard latest edition whereas other rotating / oscillating equipment shall be as per VDI Standard 2056 or approved equivalent. The manufacturer shall determine the field vibration limits based on above standards, subject of approval by the Engineer.
- C. Vibration of the equipment is also related to the stiffness of the supporting structure; therefore the structures' natural frequency shall be at least 25% above or below the natural frequency (reed frequency) of the equipment unit. Operation of the equipment unit near or at its natural frequency must be avoided.
- D. Measurement and valuation of noise shall be in accordance with DIN 45635 or approved equivalent.
- E. Foundations, base plates and other supports for rotating / oscillating equipment must be designed to be capable for absorbing, without any shift and without any