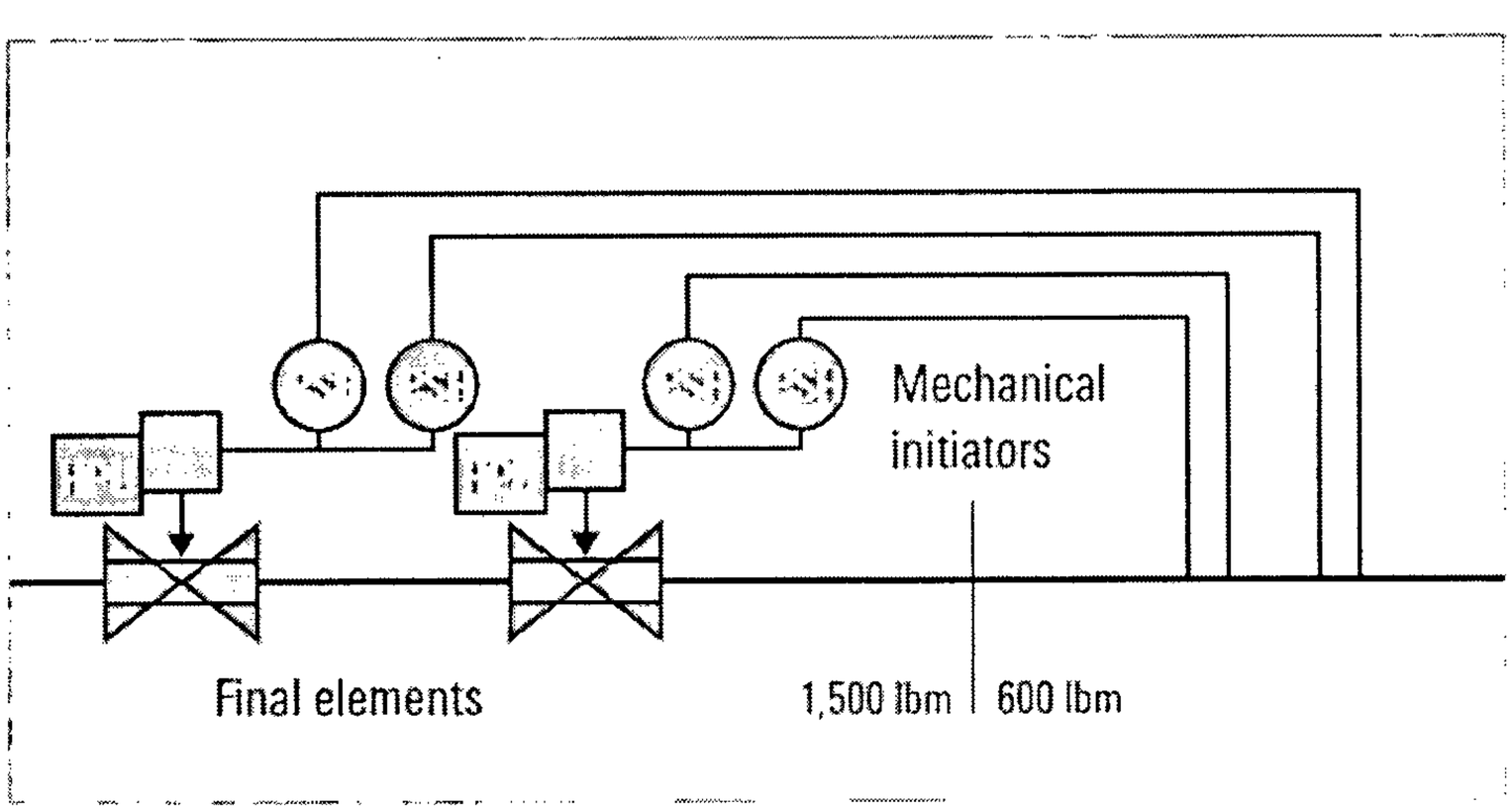
Mechanical / Hydraulic HIPPS
(High Integrity Pressure Protection System)

The hydraulic (mechanical) HIPPS provides a self-contained, independent protection system operated on demand with one-out-of-two (1oo2) or two-out-of-three (2oo3) (voting) pressure sensor inputs, a hydraulic logic solver, and two spring-return hydraulically actuated safety valves.

The unit is typically self-powered and can be provided with additional real-time controls via a hydraulic power unit (HPU). This pressurizes the system and opens the safety shutdown valves. The system remains open (armed) until an abnormal condition is detected. If an abnormal condition is detected, then the system closes the two actuated final element valves, protecting the downstream production or facility.



The primary function of HIPPS is to detect high-pressure conditions and close isolation valves to protect lower-rated downstream infrastructure. The system operates autonomously and is independent of the facilities' process shutdown (PSD), emergency shutdown (ESD), or control systems.

HIPPS are fail-close by design based on the signal of an overpressure event and can be configured to operate on other events, such as a loss of motive power of instrument signal. It is typically fail-close for any loss of hydraulic power, electric power, or instrument signals. Each HIPPS loop is independent. A HIPPS is designed with redundant safety functions to reduce the risk of failure on demand and to maximize availability.

VENDOR's material recommendation shall require COMPANY's approval prior to fabrication.

The instrument installation shall be designed and installed with consideration given to access for operation, maintenance and validation purposes.

The actuators are to be suitable for mounting on valves with the stem orientated to any way without excessive stress on the valve stem arrangement.

The valve actuator and control shall be directly mounted on the valve where practical.

Instrumentation shall be mounted on a sub-panel in such a way that individual components can be removed for repair/replacement without having to remove other components i.e. Items shall not be 'close-coupled' together.

The actuator internals shall be packed with suitable lubricants. Access facilities shall be provided to allow re-packing with the actuator in-situ.

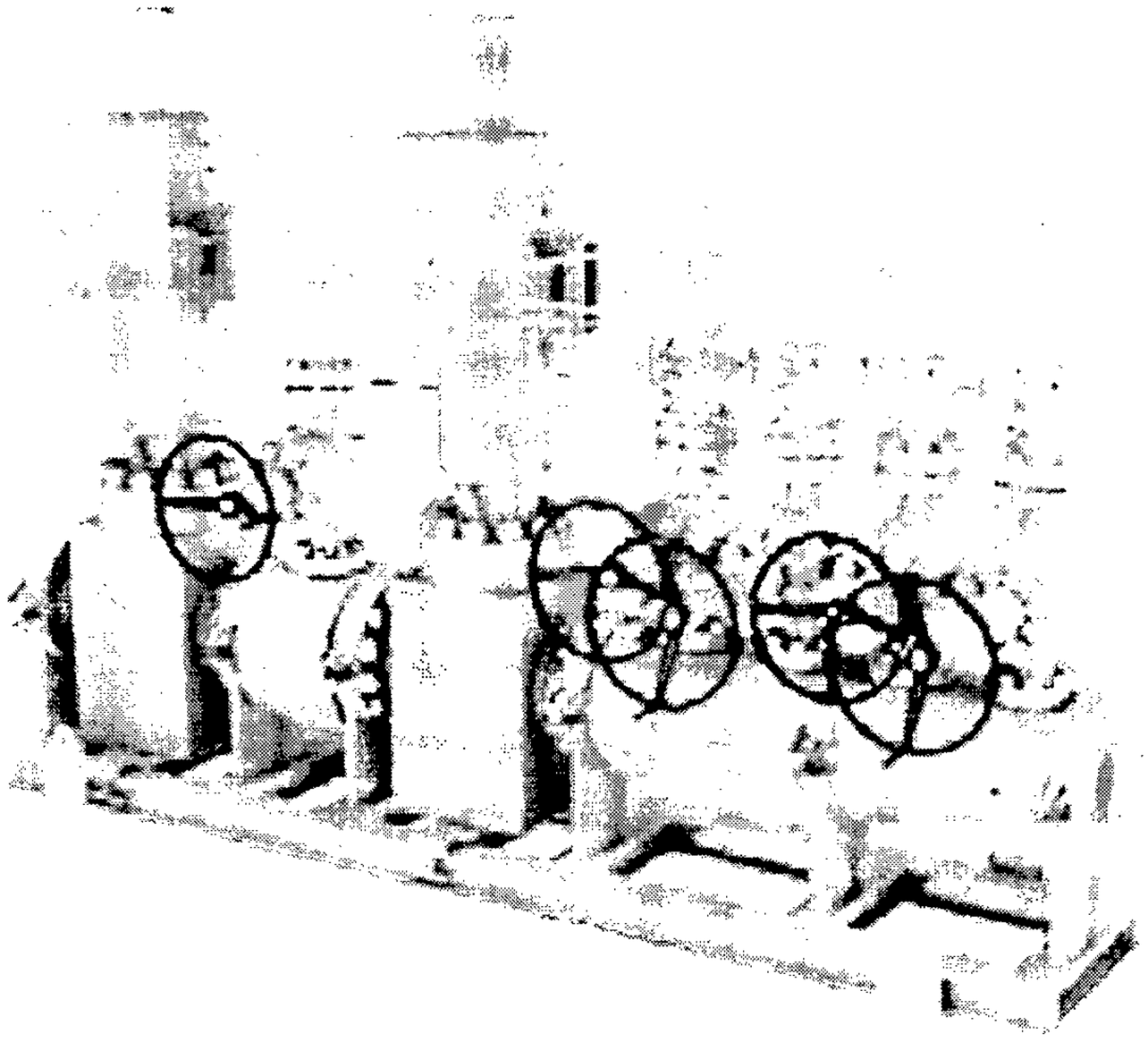
Materials of construction, including all bolt-on components and accessories, shall be suitable for long term exposure to the Offshore environment.

The HIPPS response time is defined as "the time between the process threshold value occurs until the final element has reached its safe state". The HIPPS reaction time is defined as the maximum allowable time in which the HIPPS shall prevent a hazardous operational condition. The required HIPPS reaction time is defined by dedicated studies being part of the HIPPS dossier, to review and approval by Company's HIPPS Committee prior to any implementation.

The use of compact manifolds shall be avoided; the use individual components connected by tubing are strongly preferred, and which allow easy troubleshooting.

The HIPPS process isolation valves are an integral part of the HIPPS package, i.e. they are not part of the piping/valve discipline, and therefore in the scope of supply of the HIPPS Integrator.

Each sensor shall have a dedicated (individual) bleed and calibration facility, to allow for sensor test and calibration without the need for sensor dismantling.



Hydraulic HIPPS.

Main Requirements:

- Complete system design to meet HIPPS standards
- Skids designed for HIPPS
- HPU designs (mechanical)
- Pressure sensors
- Hydraulic Logic Solver
- Offshore Design
- International third Party approval for design and SIL Verification.

Technical Specifications:

Hydraulic Pressure Sensor..... 350-10000 psi
Pressure Sensors ..... 4 PCS
Quick Detection of Pressure Deviations ..... Yes
Initiating a Shutdown When Pressure Reaches a Critical Level..... Yes

Hydraulic Logic Solver:

Logic Configuration ..... 2 No Voting 1oo2
Frame Material and Accessories..... SS-316L
Partial Stroke ..... Yes
Response Time..... Less than 3 seconds
Electrical Power Source ..... No need
Wetted part material in sour service with H2S presence..... NACE MR0175
Field Equipment Certification..... Zone 1, Gas Group IIB, Temperature Class T3
Local Open and Close Pushbuttons for Each Valve..... Yes
Proof Test ..... Scheduled Once Yearly
Indicate System Status ..... Limit Switch Box
Cabinet accessibility ..... Doors with Handle for Easy Access
Cabinet Opening..... on Hinges
Tubing & Fitting material ..... AISI 316L SS
Ingress Protection IP66

Final Element:

Body Material..... ASTM A216 WCB(VTC)
Trim Material..... ASTM A182 F51 (VTC)
Ball Material..... ASTM A182 F51 + Tungsten Carbide on contact surface(VTC)
Stem Material..... ASTM A182 F51 (VTC)
Minimum operating Pressure..... 1500 psi (100BAR)
Maximum operating Pressure.....3000 psi (200 BAR)
Hydraulic Fluid Compatibility ..... Mineral oil-based hydraulic fluids
Actuators type ..... Single Acting- spring return type-Yoke
Mechanism
Open/Close Local Positioner Indicator ..... Yes
Open/Close Monitoring Status at Upstream.....Yes
Operation.....Fail-Safe
Operating Environment ..... offshore , harsh environment , humid, sulfurous and corrosive atmospheres
Mounting position ..... both horizontal and vertical
Quick Exhaust Valve ..... Yes
Quick Exhaust Valve Material AISI-316