A. EQUIPMENT OVERVIEW

This order consists of the following components:

QUANTITY	DESCRIPTION	CULLIGAN PART NUMBER
2	HD-120 Depth Filter Internals	00X47728
2	HD-120 Depth Filter Harness Less Timer	00X47727
3	Signet Flow Transmitter 3-8510	00X47177
3	Signet Flow Sensor MK 515	00X3A465
3	Signet Installation Fitting	00X44642
66	Cullsan® Mineral, Medium, 100 lb	D0162109
228	Cullsan Mineral, Coarse, 100 lb	D0162209
176	Cullsan Mineral A, 55 lb	D0163210
140	Cullsan Mineral U, 50 lb	D0163811
88	Cullsan Mineral G50, 100 lb	D0163009
236	Cullcite® Mineral, 50 lb Bag	D0161016
1	Control Panel Assembly with Koyo PLC	00X47731
2	Solenoid Panel Assy.	00X47732
2	Cla-Val #631-01ABC Valve	D0X47807
2	Tank 120" x 60"	D0X47676
1	M-Roy Metering Pump EFR152B48	D0X47802
2	Tank 100 gallon and Stand	D0X47820
2	Mixer ¼ hp	D0X47821

B. PROCESS DESCRIPTION

The system will receive water from a variable speed pump in differing amounts with a constant pressure, 250 - 1100 gpm @ 75 psi, (supplied by others). Alum chemical ($Al_2(SO_4)_3.18H_2O$, aluminum sulfate) is fed ahead of the filters. This chemical neutralizes surface charges on colloidal particles and forms a floc that "sweeps" particles from the water. (See Section 4 - Chemical Feed and Section 5 - Chemical Dosage Calculations.)

The filtration system will feed into an open atmosphere storage tank of 15,000 gallon capacity. The storage tank will be equipped with a level control which will output a continuous 4-20 mA signal. Storage tank and level control are to be supplied by others.

The primary operation mode of the filter system is duplex alternating, one service/one standby. At periods of high demand when the level in the storage tank drops below 50%, the second unit will be automatically placed into service. (See Section 3, Figure 3.)

All control of this system is accomplished by a PLC based master panel working in conjunction with two auxiliary solenoid panels. Backwash of the filters will be initiated by differential pressure switches across each filter bed. Once backwash has started and has finished on the primary unit, its unit status will change to "standby". This means both filters will have equal service time.

Duplex Alternating Mode

When the level in the storage tank is between half full and full, the system will operate with one unit in service and one unit in standby. The flow of the unit in service will be proportioned between 250 gpm and 550 gpm. This control will be achieved through a combination of the 4-20 mA signal from the level control, the PLC, and an electronic PID valve controller. The valve controller uses product water flow monitors as feed back. When the highest sensing point of the tank is met, the PLC will shut off the outlet valve of the filter in service. After a full tank level signal is received from the level control, the PLC program will not allow product water to flow to service until a sufficient deadband is allowed from the level control signal. This programming feature reduces excessive cycling of the primary filter during low flow periods.

NOTICE:	*It is recommended to keep the filters pressurized or at least full of water during shut down periods. This will decrease the tendency for excessive water hammer.*

Duplex Parallel Mode

When one filter cannot keep up with the demand flow and the level in the tank drops below the half full point, the standby unit is brought on-line. The first unit will stay at full flow (550 gpm) and the second unit will be proportioned by a second control circuit, as explained above in "duplex alternating mode". At the lowest sensor level of the tank, the PLC will output a signal to shut down the pump/pumps drawing from the storage tank.

NOTICE:	*When either filter is in the reconditioning cycle, the other unit will be taken off line. This means that no water will be flowing to service, but it ensures there is an adequate backwash water supply.*

Chemical Feed System - See Section 4.