10.1 SUMMARY DESCRIPTION

The components of the steam and power conversion system are designed to produce electrical power from the steam coming from the reactor, condense the steam into water, and return the condensate to the reactor as heated feedwater, with a major portion of the gaseous, dissolved, and particulate impurities removed.

The Power conversion system consists of the following components:

1) Turbine Generator with Auxiliaries
2) Main Condenser
3) Condensate Pumps
4) Air Ejector with Water Condenser
5) Gland Steam Condenser
6) Condensate Filters
7) Condensate Demineralizers
8) Five Stages of Feedwater Heaters
9) Reactor Feed Pumps with Turbine Drives and Auxiliaries
10) Interconnecting Piping and Valves
11) Drain Coolers

Steam generated in the reactor is supplied to the high pressure turbine through the main stop and control valves. The steam then passes through the high pressure (HP) turbine and exhausts through cross around lines to two moisture separators which remove moisture from the steam. The dried steam leaves the moisture separators and enters the low pressure (LP) turbines, which share a common shaft with the HP turbine, through combined intercept valves. After passing through the low pressure turbines the steam exhausts to the main condensers where it is condensed by the circulating water system (Subsection 10.4.5), deaerated, and collected in the hotwell of the condenser. The condensate pumps remove the condensate from the hotwell and pump it through the air ejector intercondenser, the gland steam condenser, the condensate filters, the condensate demineralizers, the drain coolers and the five stages of feedwater heaters to the suction of the reactor feed pumps which pump the condensate back into the reactor vessel.

Steam is extracted from the HP and LP turbines and used to heat the condensate as it passes through the various feedwater heaters. The extraction steam is condensed in each heater and the condensed steam drained to the next lowest pressure heater. The total cascaded heater drains are collected in the drain cooler from which they drain back to the condenser. The moisture removed from the steam by the moisture separators is drained to Heater No. 4 where it mixes with the condensed extraction steam and is eventually drained back to the condenser.

Should the water level in any heater or moisture separator become too high, the drains will be dumped directly to the condenser to prevent water damage to the turbine.

If the reactor produces more steam than the turbine can use, the excess, at least 21 percent of reactor rated steam flow, is dumped to the condenser through the bypass valves (See Subsection 10.4.4).

The steam and power conversion systems are sized for the turbine design conditions.

Biological shielding is provided around the main turbine, moisture separators, feedwater heaters, condensers and reactor feed pump turbines to protect operating personnel from exposure to high radiation levels. Section 12.3 provides additional discussion on radiation protection.

Figures 10.1-1a, 10.1-1b, 10.1-2a and 10.1-2b show the guaranteed and VWO turbine heat balances for Units 1 and 2, respectively. The Guaranteed Flow turbine heat balances shown in Figures 10.1-1a and 10.1-1b have a slightly different inlet enthalpy than the exit enthalpy shown for the reactor heat balances in Figures 1.2-49, 1.2-49-1, 1.2-49-2 and 1.2-49-3. The design reactor heat balance is based on actual, measured steam moisture values, with a compensation for pressure drop made to obtain conditions at the MSIV exit. The turbine heat balances shown in Figures 10.1-1a and 10.1-1b are design calculations for the turbine, and input steam conditions are assumed to have a slightly greater moisture fraction.

Typical design parameters are summarized in Table 10.1-1 and Table 10.1-1A.

Instrumentation is commercial quality, designed to meet the process requirements and the turbine generator supplier’s requirements. These instruments are described further in Sections 10.2 through 10.4. The turbine instrumentation for control valve fast closure and stop valve closure which initiates scram in the RPS is discussed in Subsection 7.2.2.1.3.

TABLE 10.1-1

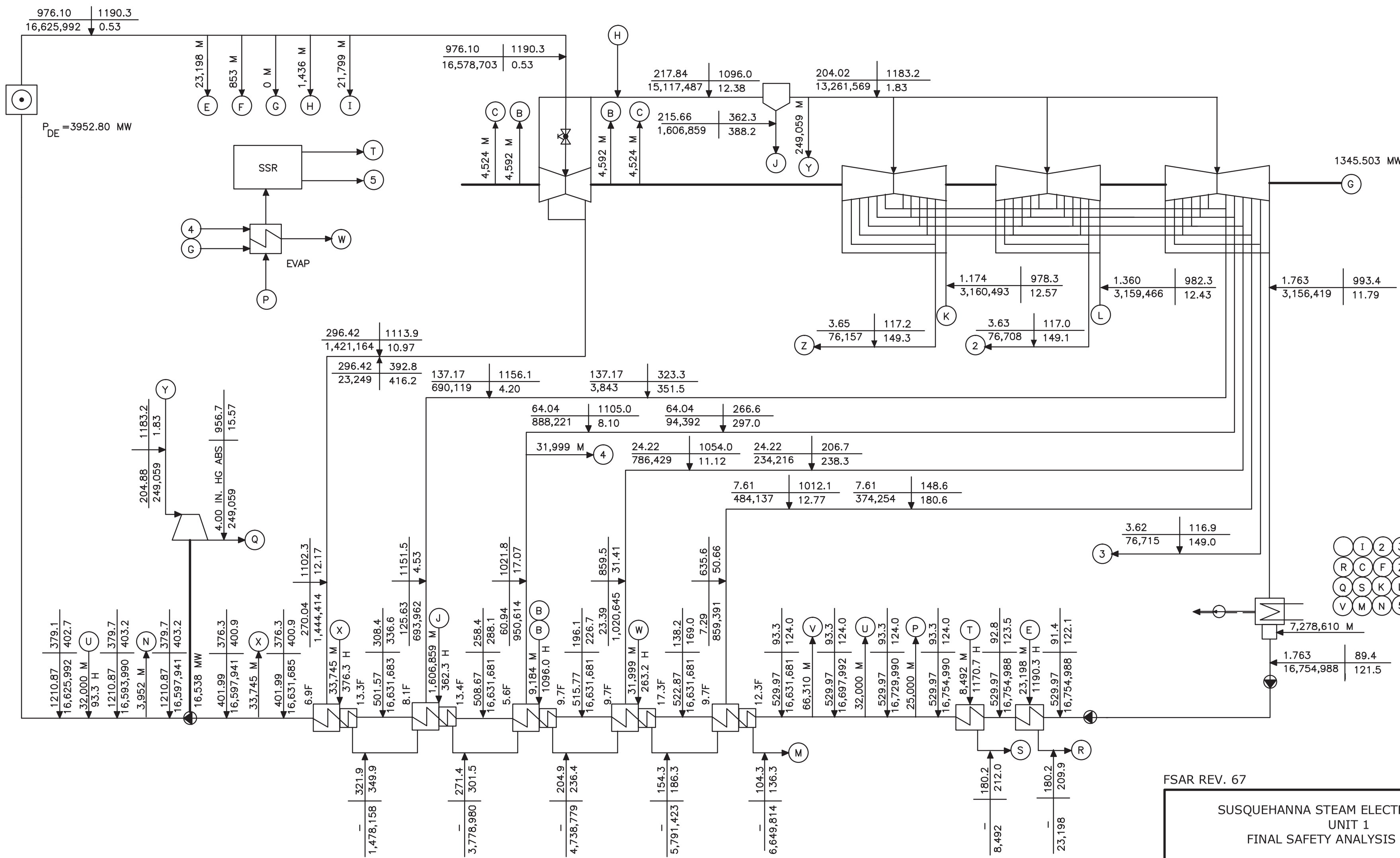
UNIT 1 - SUMMARY OF TYPICAL DESIGN AND PERFORMANCE CHARACTERISTICS OF POWER CONVERSION SYSTEM

1.Steam Conditions at Turbine Throttle Valve	
a. Flow (10^6 lb/hr)	16.58
b. Pressure (psia)	976
c. Temperature (°F)	541.7
d. Enthalphy (Btu/lb)	1190.3
e Moisture Content (%)	0.53
2. Feedwater Conditions	
a. Flow (10^6 lb/hr)	16.59
b. Temperature (°F)	403.2
3. Condenser	
a. Air Inleakage (cfm)	75
b. Hotwell Detention Capacity (min)	2
4. Main Steam Bypass Capacity (%VWO)	≥21

TABLE 10.1-1a

UNIT 2 - SUMMARY OF TYPICAL DESIGN AND PERFORMANCE CHARACTERISTICS OF POWER CONVERSION SYSTEM

1. Steam Conditions at Turbine Throttle Valve	
a. Flow (10^6 lb/hr)	16.58
b. Pressure (psia)	976
c. Temperature (°F)	541.7
d. Enthalphy (Btu/lb)	1190.3
e. Moisture Content (%)	0.53
2. Feedwater Conditions	
a. Flow (10^6 lb/hr)	16.59
b. Temperature (°F)	403.2
3. Condenser	
a. Air Inleakage (cfm)	75
b. Hotwell Detention Capacity (min)	2
4. Main Steam Bypass Capacity (% of reactor rated flow)	$\geq$21



PSIA	BTU/LB
LB/HR	°F OR % MOISTURE

M..MASS FLOW.. LB/HR
H..ENTHALPY.. BTU/LB

- (E) AIR EJECTOR
- (F) VALVE STEM LKG.
- (H) HP BUSHING LKG.
- (T) SSR TO HTR
- (U) CONTROL ROD COOLANT
- (V) TO CONDENSER
- (W) EVAP DRAIN TO HTR
- (4) EVAP STEAM SUPPLY

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UNIT 1
FINAL SAFETY ANALYSIS REPORT

GUARANTEED FLOW

FIGURE 10.1-1A, Rev 54

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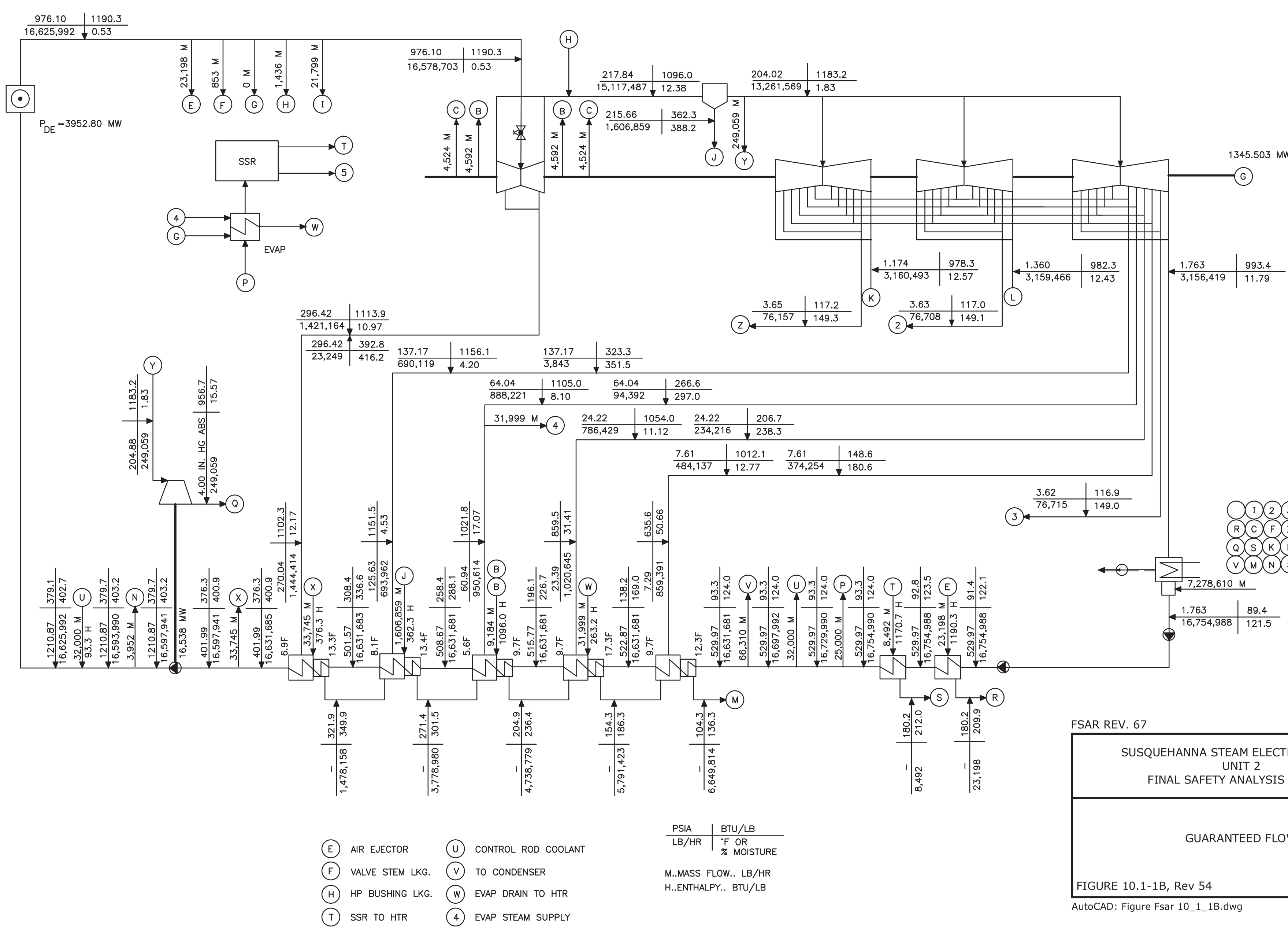

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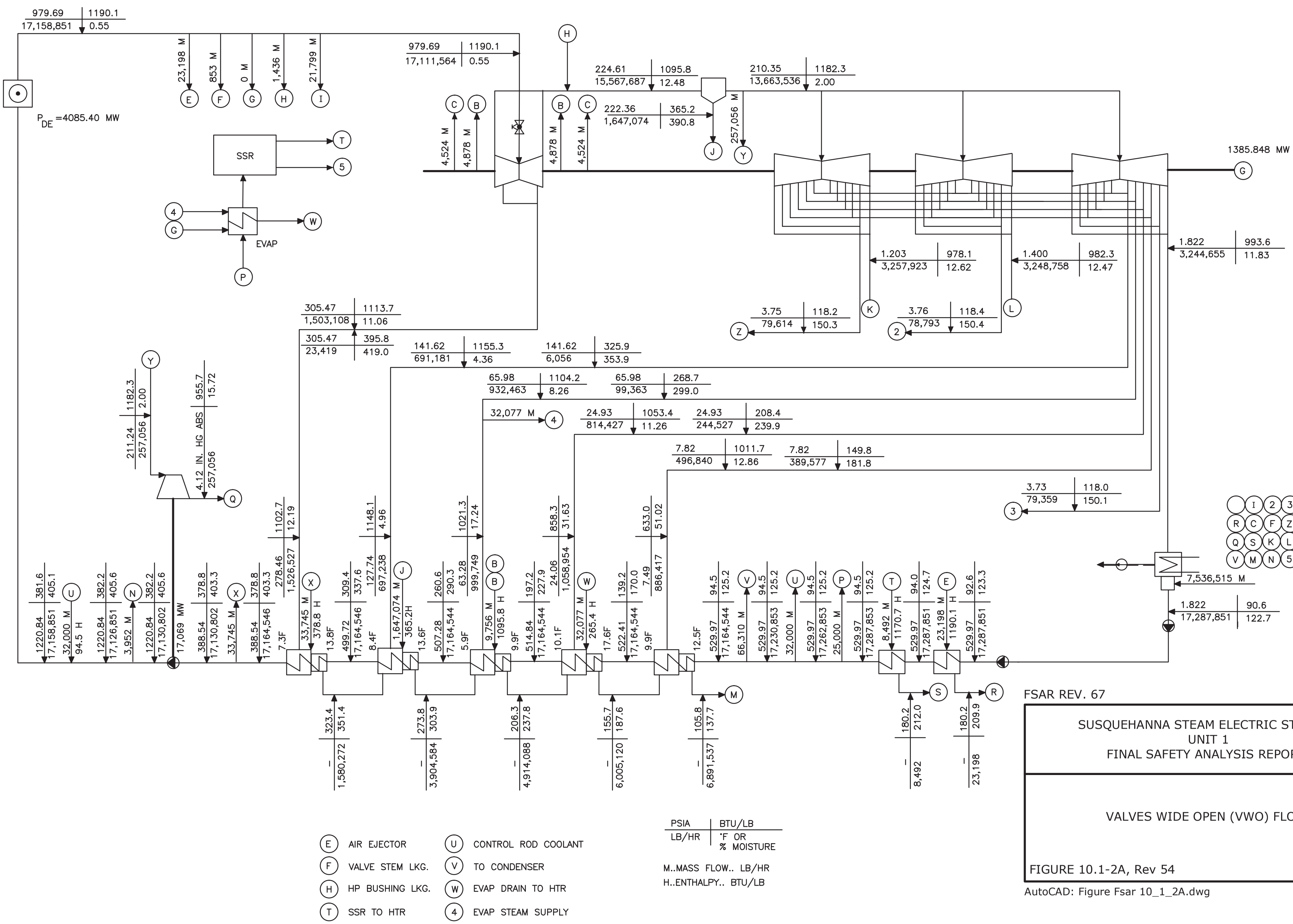
GUARANTEED FLOW

FIGURE 10.1-1B, Rev 54

AutoCAD: Figure Fsar 10_1_1B.dwg



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UNIT 1
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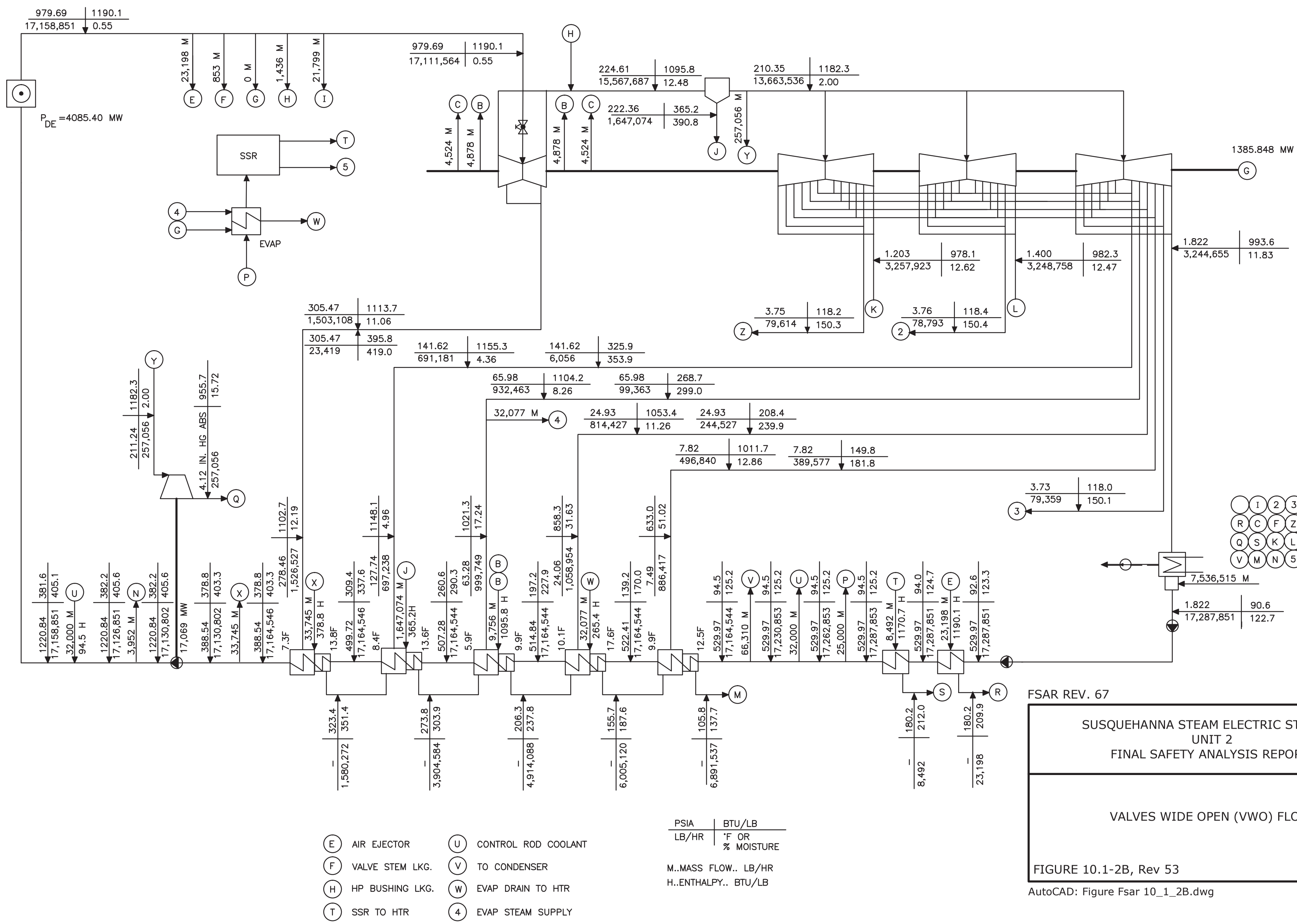
VALVES WIDE OPEN (VWO) FLOW

FIGURE 10.1-2A, Rev 54

AutoCAD: Figure Fsar 10_1_2A.dwg



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UNIT 2
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VALVES WIDE OPEN (VWO) FLOW

FIGURE 10.1-2B, Rev 53

AutoCAD: Figure Fsar 10_1_2B.dwg