

## **1.7 Drawings**

### **1.7.1 Piping and Instrumentation and Process Flow Drawings**

Table 1.7-1 contains a list of system piping and instrumentation diagrams (P&IDs) and process flow diagrams (PFDs) provided in the Lungmen Nuclear Power Station (NPS) Preliminary Safety Analysis Report (PSAR). Figure 1.7-1, sheets 1 and 2 define the symbols used on these drawings.

### **1.7.2 Instrument, Control and Electrical Drawings**

Logic diagrams and one-line diagrams are listed in Table 1.7-2.

### **1.7.3 ASME Standard Units to Preferred Metric Conversion Factors**

The ASME standard units are applied with the numerical values converted to the preferred metric units system as listed in Table 1.7-3.

### **1.7.4 Preferred Metric Conversion to ASME Standard Units**

Selected flow, pressure, temperature, and length preferred metric units are converted to ASME standard units as listed in Table 1.7-4.

### **1.7.5 Drawing Standards**

Guidelines for identifying systems, facilities, equipment types, and numbers and for drawing P&IDs and PFDs are treated in Table 1.7-5.

**Table 1.7-1 Piping and Instrumentation and Process Flow Diagrams**

<b>SSAR Fig. No.</b>	<b>Title</b>	<b>Type</b>
4.6-8	CRD System	P&ID
4.6-9	CRD System	PFD
5.1-3	Main Steam System	P&ID
5.1-4	Feedwater System	P&ID
5.4-4	Reactor Recirculation System	P&ID
5.4-5	Reactor Recirculation System	PFD
5.4-8	Reactor Core Isolation Cooling System	P&ID
5.4-9	Reactor Core Isolation Cooling System	PFD
5.4-10	Residual Heat Removal System	P&ID
5.4-11	Residual Heat Removal System	PFD
5.4-12	Reactor Water Cleanup System	P&ID
5.4-13	Reactor Water Cleanup System	PFD
6.2-39	Atmospheric Control System	P&ID
6.2-40	Flammability Control System	P&ID
6.3-1	High Pressure Core Flooder System	PFD
6.3-7	High Pressure Core Flooder System	P&ID
6.5-1	Standby Gas Treatment System	P&ID
6.7-1	Nitrogen Supply System	P&ID
9.1-1	Fuel Pool Cooling and Cleanup System	P&ID
9.1-2	Fuel Pool Cooling and Cleanup System	PFD
9.2-1	Reactor Building Cooling Water System	P&ID
9.2-2	Normal Chilled Water System	P&ID
9.2-3	Emergency Chilled Water System	P&ID
9.2-4	Makeup Water System	P&ID
9.2-5	Condensate Storage Tank and Transfer System	P&ID
9.2-7	Reactor Building Service Water System	P&ID
9.3-1	Standby Liquid Control System	P&ID
9.3-1A	Standby Liquid Control System	PFD
9.3-6	Instrument Air System	P&ID
9.3-7	Service Air System	P&ID
9.4-1	Control Building HVAC	PFD
9.4-8	Drywell Cooling System	P&ID
9.5-1	Suppression Pool Cleanup System	P&ID
11.2-1	Radwaste System	PFD

**Table 1.7-1 Piping and Instrumentation and Process Flow Diagrams (Continued)**

<b>SSAR Fig. No.</b>	<b>Title</b>	<b>Type</b>
11.2A-1	Radwaste System	PFD
11A.2-2	Radwaste System	P&ID
11.3-1	Offgas System	PFD
11.3-2	Offgas System	P&ID

**Table 1.7-2 Logic and One-Line Diagrams**

<b>SSAR Section No.</b>	<b>Title</b>	<b>Type</b>
5.4	Reactor Water Cleanup System	IBD
7.1	List of Lungmen NPS Logic Diagrams	To be provided in FSAR
8.3	List of Lungmen NPS One-Line Diagrams	

**Table 1.7-3 Conversion to ASME Standard Units**

	<b>From</b>	<b>To convert to</b>	<b>Divide by</b>
<b>(1)</b>	<b>Pressure/Stress</b>		
	kilopascal	1 Pound/Square Inch	6.894757
	kilopascal	1 Atmosphere (STD)	101.325
	kilopascal	1 Foot of Water (39.2°F)	2.98898
	kilopascal	1 Inch of Water (60°F)	0.24884
	kilopascal	1 Inch of HG (32°F)	3.38638
<b>(2)</b>	<b>Force/Weight</b>		
	newton	1 Pound - force	4.448222
	kilogram	1 Ton (Short)	907.1847
	kilogram	1 Tons (Long)	1016.047
<b>(3)</b>	<b>Heat/Energy</b>		
	joule	1 Btu	1055.056
	joule	1 Calorie	4.1868
	kilowatt-hour	1 Btu	0.0002930711
	kilowatt	1 Horsepower (U.K)	0.7456999
	kilowatt-hour	1 Horsepower-Hour	0.7456999
	kilowatt	1 Btu/Min	0.0175725
	joule/gram	1 Btu/Pound	2.326
<b>(4)</b>	<b>Length</b>		
	millimeter	1 Inch	25.4
	centimeter	1 Inch	2.54
	meter	1 Inch	0.0254
	meter	1 Foot	0.3048
	centimeter	1 Foot	30.48
	meter	1 Mile	1609.344
	kilometer	1 Mile	1.609344
<b>(5)</b>	<b>Volume</b>		
	liter	1 Cubic Inch	0.01638706
	cubic centimeter	1 Cubic Inch	16.38706
	cubic meter	1 Cubic Foot	0.02831685

**Table 1.7-3 Conversion to ASME Standard Units (Continued)**

	<b>From</b>	<b>To Convert to</b>	<b>Divide by</b>
	cubic centimeter	1 Cubic Foot	28316.85
	liter	1 Cubic Foot	28.31685
	cubic meter	1 Cubic Yard	0.7645549
	liter	1 Gallon (US)	3.785412
	cubic centimeter	1 Gallon (US)	3785.412
	E-03 cubic centimeter	1 Gallon (US)	3.785412
<b>(6)</b>	<b>Volume Per Unit Time</b>		
	cubic centimeter/s	1 Cubic Foot/Min	471.9474
	cubic meter/h	1 Cubic Foot/Min	1.69901
	liter/s	1 Cubic Foot/Min	0.4719474
	cubic meter/s	1 Cubic Foot/Sec	0.02831685
	E-05 cubic meter/s	1 Gallon/Min (US)	6.30902
	cubic meter/h	1 Gallon/Min (US)	0.22712
	liter/s(101.325 kPaA, 15.56°C)	1 STD CFM (14.696 psia, 60°F)	0.4474
	cubic meter/h (101.325 kPaA, 15.56°C)	1 STD CFM (14.696 psia, 60°F)	1.608
<b>(7)</b>	<b>Velocity</b>		
	centimeter/s	1 Foot/Sec	30.48
	centimeter/s	1 Foot/Min	0.508
	meter/s	1 Foot/Min	0.00508
	meter/min	1 Foot/Min	0.3048
	centimeter/s	1 Inches/Sec	2.45
<b>(8)</b>	<b>Area</b>		
	square centimeter	1 Square Inch	6.4516
	E-04 square meter	1 Square Inch	6.4516
	square centimeter	1 Square Foot	929.0304
	E-02 square meter	1 Square Foot	9.290304
<b>(9)</b>	<b>Torque</b>		
	newton-meter	1 Foot Pound	1.355818
<b>(10)</b>	<b>Mass Per Unit Time</b>		
	kilogram/s	1 Pound/Sec	0.4535924
	kilogram/min	1 Pound/Min	0.4535924

**Table 1.7-3 Conversion to ASME Standard Units (Continued)**

	<b>From</b>	<b>To Convert to</b>	<b>Divide by</b>
	kilogram/h	1 Pound/Min	27.215544
<b>(11)</b>	<b>Mass Per Unit Volume</b>		
	kilogram/cubic meter	1 Pound/Cubic Inch	27679.90
	kilogram/cubic meter	1 Pound/Cubic Foot	16.01846
	kilogram/cubic centimeters	1 Pound/Cubic Inch	0.0276799
	liter/s	1 Gallon/Min	0.0630902
<b>(12)</b>	<b>Dynamic Viscosity</b>		
	Pa*s	1 Pound-Sec/Sq Ft	47.88026
<b>(13)</b>	<b>Specific Heat/Heat Transfer</b>		
	joule/kilogram kelvin	1 Btu/Pound-Deg F	4168.8
	watt/square meter kelvin	1 Btu/Hr-Sq Ft-Deg F	5.678263
	watt/square meter kelvin	1 Btu/Sec-Sq Ft-Deg F	2.044175E+4
	watt/square meter	1 Btu/Hr-Sq Ft	3.154591
<b>(14)</b>	<b>Temperature</b>		
	degrees celsius	Degrees Fahrenheit	$T_{°F} = T_{°C} \times 1.8 + 32$
	Degree C Increment	1 Degree F Increment	0.555556
<b>(15)</b>	<b>Electricity</b>		
	coulomb	1 ampere hour	3600
	seimens/meter	1 mho/centimeter	100
<b>(16)</b>	<b>Light</b>		
	candels/square meter	1 candela/square inch	1550.003
	lux	1 footcandle	10.76391
<b>(17)</b>	<b>Radiation</b>		
	megabequerel	1 curie	37,000
	gray	1 rad	0.01
	sievert	1 rem	0.01

Note:

Rounding of Calculated values per Appendix C of ANSI/IEEE Std 268.

**Table 1.7-4 Conversion Tables—Metric to ASME Standard Units**

<b>Flow-Volume Per Unit Time</b>							
<b>m<sup>3</sup>/h</b>	<b>gal/min</b>	<b>m<sup>3</sup>/h</b>	<b>gal/min</b>	<b>m<sup>3</sup>/h</b>	<b>gal/min</b>	<b>m<sup>3</sup>/h</b>	<b>gal/min</b>
1	4.4	10	44	100	440	1000	4402
2	8.8	20	88	200	881	2000	8805
3	13.2	30	132	300	1321	3000	13207
4	17.6	40	176	400	1761	4000	17610
5	22.0	50	220	500	2201	5000	22012
6	26.4	60	264	600	2641	6000	26414
7	30.8	70	308	700	3082	7000	30817
8	35.2	80	352	800	3522	8000	35219
9	39.6	90	396	900	3962	9000	39621
<b>Temperature</b>							
<b>°C</b>	<b>°F</b>	<b>°C</b>	<b>°F</b>	<b>°C</b>	<b>°F</b>	<b>°C</b>	<b>°F</b>
0.1	32.18	1	33.8	10	50	100	212
0.2	32.36	2	35.6	20	68	200	392
0.3	32.54	3	37.4	30	86	300	572
0.4	32.72	4	39.2	40	104	400	752
0.5	32.90	5	41.0	50	122	500	932
0.6	33.08	6	42.8	60	140	600	1112
0.7	33.26	7	44.6	70	158	700	1292
0.8	33.44	8	46.4	80	176	800	1472
<b>Pressure</b>							
<b>kPa</b>	<b>psi</b>	<b>kPa</b>	<b>psi</b>	<b>kPa</b>	<b>psi</b>	<b>kPa</b>	<b>psi</b>
1	0.145	10	1.45	100	14.51	1000	145.1
2	0.290	20	2.90	200	29.01	2000	290.1
3	0.435	30	4.35	300	43.52	3000	435.2
4	0.580	40	5.80	400	58.02	4000	580.2
5	0.725	50	7.25	500	72.53	5000	725.3
6	0.870	60	8.70	600	87.03	6000	870.3
7	1.015	70	10.15	700	101.54	7000	1015.4
8	1.160	80	11.60	800	116.04	8000	1160.4
9	1.306	90	13.06	900	130.55	9000	1305.5

**Table 1.7-4 Conversion Tables—Metric to ASME Standard Units (Continued)**

Length							
cm	inch	cm	inch	m	ft	m	ft
0.01	0.004	0.1	0.039	1	3.28	10	32.81
0.02	0.008	0.2	0.079	2	6.56	20	65.62
0.03	0.012	0.3	0.118	3	9.84	30	98.43
0.04	0.016	0.4	0.157	4	13.12	40	131.2
0.05	0.020	0.5	0.197	5	16.40	50	164.0
0.06	0.024	0.6	0.236	6	19.69	60	196.9
0.07	0.028	0.7	0.276	7	22.97	70	229.7
0.08	0.032	0.8	0.315	8	26.25	80	262.5
0.09	0.035	0.9	0.354	9	29.53	90	295.3

**Table 1.7-5 Drawing Standards (To be provided in FSAR)**

**Figure 1.7-1 Piping and Instrumentation Diagram Legend (Sheets 1-2)**

(Proprietary information provided in a separate proprietary volume.)

**Figure 1.7-2 Logic Diagram Legend (To be provided in FSAR)**

**Figure 1.7-3 Electrical Graphical Symbols (To be provided in FSAR)**

**Figure 1.7-4 Graphical Symbols for Use in Logic Diagrams (To be provided in FSAR)**