

U.S.C.G. Merchant Marine Exam

QMED

Q800 Junior Engineer - Part I

(Sample Examination)

Choose the best answer to the following Multiple Choice Questions:

1. What is the function of the aftercoolers installed in the diesel engine air intake system?

- (A) Decrease the air density
- (B) Increase the exhaust temperature
- (C) Decrease the lube oil temperature
- (D) Increase the air density

If choice D is selected set score to 1.

2. The primary source of steam to the auxiliary exhaust system is typically supplied directly from _____.

- (A) the turbine gland exhaust system
- (B) turbine driven and reciprocating steam pumps
- (C) the main engine LP bleed
- (D) all of the above

If choice B is selected set score to 1.

3. What is the purpose of the item labeled "nozzle" located on the illustrated steam turbine?
Illustration SE-0003

- (A) Convert the potential energy of the supply steam to kinetic energy.
- (B) Convert the potential energy of the supply steam to mechanical energy.
- (C) Convert the kinetic energy of the supply steam to potential energy.
- (D) Convert the kinetic energy of the supply steam to mechanical energy.

If choice A is selected set score to 1.

4. If an attempted light off of an idle boiler fails, what should be done?

- (A) The fuel should be secured to the boiler and the boiler allowed to remain idle for a few minutes before another light off attempt is made.
- (B) The fuel should be secured to the boiler and the furnace purged of combustible vapors with the forced draft fan before another light off attempt is made.
- (C) Another light off attempt (just one) can be undertaken before any additional precautions need to be observed.
- (D) Another light off attempt (with no limit) can be undertaken before any additional precautions need to be observed.

If choice B is selected set score to 1.

5. Greases used for most marine applications would have what National Lubricating Grease Institute (NLGI) grade?

- (A) 00
- (B) 2
- (C) 4
- (D) 6

If choice B is selected set score to 1.

6. The jacking gear on main propulsion turbines can be used to _____.

- (A) reduce turbine speed during maneuvering
- (B) lift the reduction gear casing
- (C) provide reduction gear tooth inspection
- (D) provide propulsion in emergencies

If choice C is selected set score to 1.

7. The primary reason low-pressure evaporators produce distillate more efficiently, and with less scale formation, than high-pressure evaporators is _____.

- (A) evaporation in a submerged medium produces more distillate
- (B) evaporation is accomplished in a vacuum
- (C) due to the latent heat of evaporation principle
- (D) due to the higher temperature of the incoming feed

If choice B is selected set score to 1.

8. Which of the following reasons represents why the designed compression ratio of a gasoline engine is lower than that of a diesel engine?

- (A) Compression must be low to have effective pre-ignition.
- (B) The heat of compression is not used as an ignition source of the fuel.
- (C) Compression must be low for effective spark ignition.
- (D) Compression must be low for smooth operation.

If choice B is selected set score to 1.

9. What does gland sealing steam prevent the loss of during steam turbine operation?

- (A) oil
- (B) temperature
- (C) air
- (D) vacuum

If choice D is selected set score to 1.

10. What is the reason that P-type or S-type traps are fitted on the sinks in a head?

- (A) to reduce water velocity and minimize erosion
- (B) to create a strong siphon effect
- (C) to provide a cushion of water to reduce the effects of water hammer
- (D) to provide a seal against sewer gas rising into the compartment

If choice D is selected set score to 1.

11. Starting air check valves are held firmly on their seats by _____.

- (A) cam rollers on the camshaft
- (B) spring force
- (C) air pressure on top of the valve differential piston
- (D) air pressure on the bottom of the valve differential piston

If choice B is selected set score to 1.

12. Fuel oil settling tanks are used to _____.

- (A) facilitate the stripping of sludge and water
- (B) precipitate out water and solids
- (C) store oil for immediate use
- (D) all of the above

If choice D is selected set score to 1.

13. Cooling water to the vent condenser in a DC heater is supplied by the _____.

- (A) main and/or auxiliary condensate pump
- (B) salt water circulator
- (C) feed booster pump
- (D) main feed pump

If choice A is selected set score to 1.

14. The best indication that a bearing is being properly lubricated is by the _____.

- (A) oil temperature indicated by the bearing thermometer
- (B) oil pressure at the lube oil pump discharge
- (C) lube oil strainer condition during cleaning and inspection
- (D) oil temperature leaving the lube oil cooler

If choice A is selected set score to 1.

15. In terms of the completeness of combustion, in viewing the condition of the stack, what would be the indication of the MOST complete combustion and HIGHEST boiler efficiency?

- (A) Light brown haze
- (B) White smoke
- (C) Clear stack
- (D) Black smoke

If choice A is selected set score to 1.

16. Fuel piping should be regularly inspected for leaks. What leak location would be particularly troublesome in terms of presenting a fire hazard?

- (A) Fuel oil transfer pump suction strainer.
- (B) Fuel oil service pump discharge strainer.
- (C) Fuel oil service pump shaft seal.
- (D) Fuel oil service pump suction strainer.

If choice B is selected set score to 1.

17. In a two-stage flash evaporator, the sea water feed temperature is increased as it passes through the _____.

- (A) second stage distilling condenser
- (B) first stage distilling condenser
- (C) salt water feed heater
- (D) all of the above

If choice D is selected set score to 1.

18. If a slow-speed two-stroke cycle diesel engine is fitted with exhaust valves located in the cylinder heads, what scavenging flow-pattern is utilized?

- (A) Loop scavenging
- (B) Cross-flow scavenging
- (C) Uniflow scavenging
- (D) Return-flow scavenging

If choice C is selected set score to 1.

19. The purpose of try-cocks used on an auxiliary boiler is to _____.

- (A) provide an alternate means of determining the water level, if the gage glass fails
- (B) provide a means of adding chemical feed to the boiler water
- (C) provide a means for blowing down the gage glass
- (D) act as a steam sentinel valve, if any of the fusible plugs should melt

If choice A is selected set score to 1.

20. In a diesel engine closed fresh water cooling system employing a radiator, proper water temperature can be obtained by _____.

- (A) passing cooling water through a space heater
- (B) piping exhaust gases across the radiator front
- (C) adjusting the radiator louvers
- (D) passing cooling water through the lube oil cooler

If choice C is selected set score to 1.

21. A dirty diesel engine oil filter element can best be detected by _____.

- (A) high lube oil sump temperature
- (B) the pressure drop across the filter
- (C) visual inspection of the elements
- (D) decrease in oil viscosity from the filter

If choice B is selected set score to 1.

22. Which of the fuel injection systems listed uses a spring loaded differential spray needle valve and an individual pump for each cylinder?

- (A) Common rail injection
- (B) Air injection
- (C) Jerk pump injection
- (D) Distributor injection

If choice C is selected set score to 1.

23. The component shown in the illustration, labeled "IV", is the _____. Illustration SE-0013

- (A) low-speed pinion
- (B) first reduction gear
- (C) high-speed pinion
- (D) bull gear

If choice D is selected set score to 1.

24. Which of the following statements is true concerning centrifugal pumps?

- (A) They are started with the discharge valve opened.
- (B) The flow of liquid is developed by imparting energy due to the rotation of an impeller.
- (C) They are particularly suited for pumping high viscosity fluids.
- (D) They are always mounted in a horizontal position.

If choice B is selected set score to 1.

25. Which of the listed substances can be satisfactorily removed from diesel fuel by centrifuging?

- (A) Sludge
- (B) Gasoline
- (C) Fuel oil
- (D) Lube oil

If choice A is selected set score to 1.

26. What is used to prevent contamination of a potable water system supplying a plumbing fixture such as a galley sink from a backup of sewage sanitary drains?

- (A) A "P" trap in the drain line draining sewage waste from the galley sink.
- (B) Check valves in the potable water supply lines delivering water to the galley sink.
- (C) Location of the potable water spigots below the rim of the galley sink.
- (D) Location of the potable water spigots above the rim of the galley sink.

If choice D is selected set score to 1.

27. When the compressed air reservoir is placed in line with an air compressor and is used as an aftercooler, what must be done with the reservoir?

- (A) It must be frequently drained of condensed water.
- (B) It must be fitted with a sight glass.
- (C) It must be fitted with a moisture trap at the inlet.
- (D) It must be fitted with a manhole.

If choice A is selected set score to 1.

28. Which of the valves listed should be closed before lighting off a boiler?

- (A) Superheater vent valve
- (B) Air cock valve
- (C) Economizer drain valve
- (D) Superheater drain valve

If choice C is selected set score to 1.

29. When a slow-speed diesel engine is used to directly drive a fixed-pitch propeller, upon execution of a stop order and cutting off fuel delivery, if there is way on the ship how is engine rotation stopped?

- (A) In all cases, the engine rotation is stopped by applying the shaft brake.
- (B) In some cases, a shaft brake is applied. In other cases, start air is admitted in the opposite direction until the engine stops rotating.
- (C) In all cases, the engine is allowed to rotate until it eventually stops.
- (D) In all cases, start air is admitted to the engine in the opposite direction of rotation until the engine stops rotating.

If choice B is selected set score to 1.

30. A naturally aspirated diesel engine at full throttle will have an intake manifold pressure _____.

- (A) slightly less than atmospheric pressure
- (B) approximately equal to exhaust manifold pressure at all times
- (C) that is widely fluctuating
- (D) constantly decreasing as engine load increases

If choice A is selected set score to 1.

31. Clean low-pressure steam drains are collected in the _____.

- (A) contaminated drain inspection tank
- (B) atmospheric drain tank
- (C) deaerating feedwater heater
- (D) main condenser hotwell

If choice B is selected set score to 1.

32. In order for microbiological growths to thrive in a fuel tank it is necessary for _____.

- (A) vanadium to be present
- (B) low temperatures to exist
- (C) moisture or water to be present
- (D) electrolysis to be occurring

If choice C is selected set score to 1.

33. In a diesel engine, a leaking exhaust valve can cause _____.

- (A) misfiring
- (B) pre-ignition
- (C) interrupted scavenging
- (D) reduced scavenging

If choice A is selected set score to 1.

34. Which of the tanks, shown in the illustration, supplies fuel to the emergency generator?
Illustration MO-0058

- (A) Diesel Oil Service Tank
- (B) Diesel Oil Settling Tank
- (C) Diesel Oil Boiler Tank
- (D) Diesel Oil Booster Tank

If choice A is selected set score to 1.

35. Which of the condensers listed is cooled by sea water?

- (A) Gland exhaust condenser
- (B) Main condenser
- (C) Vent condenser
- (D) Air ejector condenser

If choice B is selected set score to 1.

36. Which of the following statements about boilers is correct?

- (A) A hot boiler will continue to generate steam after the fires are secured.
- (B) The water level in a properly operated boiler will not shrink or swell.
- (C) No boiler will continue to generate steam after the fires are secured.
- (D) Loss of water will not harm a boiler if the water level can be restored.

If choice A is selected set score to 1.

37. When securing a steam reciprocating pump, which of the valves listed should remain open until the cylinder is drained?

- (A) Steam supply valve
- (B) Steam exhaust valve
- (C) Steam cylinder drain valve
- (D) Water cylinder drain valve

If choice C is selected set score to 1.

38. The component shown in the illustration, labeled "IV", is the _____. Illustration SE-0013

- (A) high-speed pinion
- (B) bull gear
- (C) first reduction gear
- (D) low-speed pinion

If choice B is selected set score to 1.

39. In the diagram illustrated, the direction of flow through item 3 is _____. Illustration GS-0125

- (A) in one direction only
- (B) dependent on the pump's discharge pressure
- (C) in either direction
- (D) dependent on the pump's suction pressure

If choice A is selected set score to 1.

40. According to the illustrated steam tables, what would be the superheater outlet temperature if saturated steam at 400 psia was elevated 192.83°F? Illustration SG-0004

- (A) 192.83°F
- (B) 247.31°F
- (C) 444.59°F
- (D) 637.42°F

If choice D is selected set score to 1.

41. Which of the following problems could develop due to the accumulation of oil vapors in the crankcase of a diesel engine?

- (A) Crankcase explosion
- (B) Reduced lubrication
- (C) Combustion knock
- (D) Poor fuel economy

If choice A is selected set score to 1.

42. The exhaust system for a turbocharged diesel engine functions to _____.

- (A) power the aftercoolers
- (B) power the turbocharger
- (C) reduce the cylinder scavenge effect
- (D) cool the turbocharger

If choice B is selected set score to 1.

43. Which of the following could be the cause of leaking valves in an air compressor?

- (A) excessive compressor speed
- (B) excessive discharge pressure
- (C) abrasion, dust, and dirt
- (D) irregular compression strokes

If choice C is selected set score to 1.

44. As shown on the illustrated sootblower diagram, how is the sootblower element rotated?
Illustration SG-0023

- (A) Manually operated with a handwheel.
- (B) Manually operated with an endless chain.
- (C) Manually operated with a hand-crank.
- (D) Air operated with a pneumatic motor.

If choice B is selected set score to 1.

45. One function of the air receiver in a compressed air system is to _____.

- (A) receive exhaust air from pneumatic accessories
- (B) dry the air discharged from the intercooler
- (C) minimize the system's line pulsations
- (D) remove all traces of oil from the air

If choice C is selected set score to 1.

46. The main advantage of unit injectors over other fuel injection systems is _____.

- (A) the lack of high-pressure fuel lines
- (B) their relatively low injection pressures
- (C) reduced wear of spray orifices
- (D) the lessened chance of fuel leaks into the engine sump

If choice A is selected set score to 1.

47. Auxiliary diesel engine electric starting motors use _____.

- (A) alternating current transformers
- (B) 400 cycle per second motor-generator power
- (C) low amperage, high voltage AC power
- (D) battery power direct current

If choice D is selected set score to 1.

48. As shown in the illustrated D type single furnace boiler, what does item "F" represent?
Illustration SG-0008

- (A) Superheater tubes
- (B) Generating tubes
- (C) Desuperheater tubes
- (D) Screening tubes

If choice B is selected set score to 1.

49. Diesel engine electric starting motors generally require heavier duty motors and operate at higher voltages than comparable starting motors for gasoline engines due to _____.

- (A) flywheel effect
- (B) higher speed required
- (C) higher compression pressures
- (D) lower starting temperatures

If choice C is selected set score to 1.

50. The pressure in the feedwater system must exceed boiler steam drum pressure in order to _____.

- (A) prevent air leakage into the feedwater system
- (B) remove the steam from the steam drum
- (C) prevent water hammer in the lines
- (D) force the feedwater into the boiler

If choice D is selected set score to 1.

51. In addition to achieving a speed reduction for efficient propeller operation, what statement represents other possible functional purposes for reduction gears?

- (A) Reduction gears can be used for propeller thrust reversal and reduction gears can be used for multiple prime mover inputs.
- (B) Reduction gears can be used for engine rotation reversal and reduction gears can be used for multiple prime mover inputs.
- (C) Reduction gears can be used for engine rotation reversal and reduction gears can be used for multiple propeller shaft outputs.
- (D) Reduction gears can be used for propeller thrust reversal and reduction gears can be used for multiple propeller shaft outputs.

If choice A is selected set score to 1.

52. In the system illustrated, what type of valves are downstream of point "A"? Illustration SG-0005

- (A) globe valves/ gate valves
- (B) gauge valves/ drain valves
- (C) swing check/ stop valves
- (D) stop-check/ stop valves

If choice D is selected set score to 1.

53. Which of the following modes of heat transfer does NOT require any physical contact between a warmer and a cooler substance?

- (A) Conduction
- (B) Lamination
- (C) Radiation
- (D) All of the above

If choice C is selected set score to 1.

54. The device shown in the illustration is a/an _____. Illustration GS-0116

- (A) mechanical shaft seal
- (B) oil scraper ring stuffing box for a crosshead engine
- (C) diesel engine motor mount
- (D) vane type steering gear

If choice D is selected set score to 1.

55. Of the many impurities commonly found in marine lubricating oil, which of the following CANNOT be removed by a centrifugal purifier at normal operating speeds and temperatures?

- (A) Carbon particles
- (B) Diesel fuel oil
- (C) Water
- (D) Metal particles

If choice B is selected set score to 1.

56. In the illustrated diesel engine, which label points to the piston? Illustration MO-0122

- (A) 3
- (B) 4
- (C) 6
- (D) 7

If choice B is selected set score to 1.

57. After the steam leaves the low-pressure turbine, it enters the _____.

- (A) main condenser
- (B) first-stage feedwater heater
- (C) feed and filter tank
- (D) turbine extraction valve manifold

If choice A is selected set score to 1.

58. Auxiliary boilers are divided into several classifications, one of which is _____.

- (A) water-tube supercritical circulation
- (B) water-tube forced circulation
- (C) fire-tube controlled circulation
- (D) fire-tube express circulation

If choice B is selected set score to 1.

59. The purpose of the main reduction gears is to _____.

- (A) reduce engine room noise levels during high-speed operations
- (B) provide a means of reversing the main engines in an emergency
- (C) transmit vibration and thrust to the ship's hull
- (D) reduce high turbine RPM to an efficient propeller RPM

If choice D is selected set score to 1.

60. What is a quick and effective way of determining whether or not a boiler water gauge glass is operating properly?

- (A) Quickly opening and then reclosing the gauge glass drain valve.
- (B) Quickly opening and then reclosing the gauge glass lower root valve.
- (C) Quickly opening and then reclosing the gauge glass upper root valve.
- (D) Watching for the level to fluctuate in the glass corresponding to ship movements such as pitching.

If choice A is selected set score to 1.

61. Which of the listed types of superchargers will NOT have a volumetric capacity proportional to engine speed?

- (A) Exhaust gas turbocharger
- (B) Roots blower
- (C) Piston type blower
- (D) Vane type blower

If choice A is selected set score to 1.

62. According to the illustrated lubricating oil system diagram, which of the labeled items is the lube oil storage tank? Illustration SE-0011

- (A) A
- (B) B
- (C) C
- (D) K

If choice B is selected set score to 1.

63. Condensate return lines from tank heating coils are led to the _____.

- (A) DC heater
- (B) atmospheric drain tank
- (C) contaminated drain system
- (D) main condenser

If choice C is selected set score to 1.

64. An excess pressure governor is a special type of control device. On what equipment would an excess pressure governor normally be found?

- (A) forced draft fan
- (B) turbine-driven feed pump
- (C) main circulator pump
- (D) low-pressure propulsion turbine

If choice B is selected set score to 1.

65. While underway, vacuum in the main condenser is primarily caused by the _____.

- (A) suction drawn by the condensate pump
- (B) condensing of the exhausting steam
- (C) main air ejector
- (D) aftercondenser loop seal

If choice B is selected set score to 1.

66. Which of the following conditions is indicated by oil flowing through a lube oil gravity tank overflow sight glass?

- (A) Sufficient oil flow is being supplied to the gravity tank.
- (B) Excessive oil is stored in the gravity tank.
- (C) Insufficient oil is being pumped to the gravity tank.
- (D) Turbine bearing failure has occurred.

If choice A is selected set score to 1.

67. If the water level in a steaming boiler is dropping rapidly and cannot be kept at the normal level by standard practices, you should _____.

- (A) speed up the feed pump to raise the water to normal
- (B) secure the fires and then secure the steam stop
- (C) blowdown the gauge glass to find the true water level
- (D) secure the steam stop and then secure the fires

If choice B is selected set score to 1.

68. The thermal energy produced by an internal combustion engine is transformed into _____.

- (A) combustion energy
- (B) internal energy
- (C) external energy
- (D) mechanical energy

If choice D is selected set score to 1.

69. Which of the following methods is normally used to lubricate bearings in a small high-speed diesel engine?

- (A) Mechanical lubricators
- (B) Splash lubrication
- (C) Pressure lubrication
- (D) Sight feed lubricators

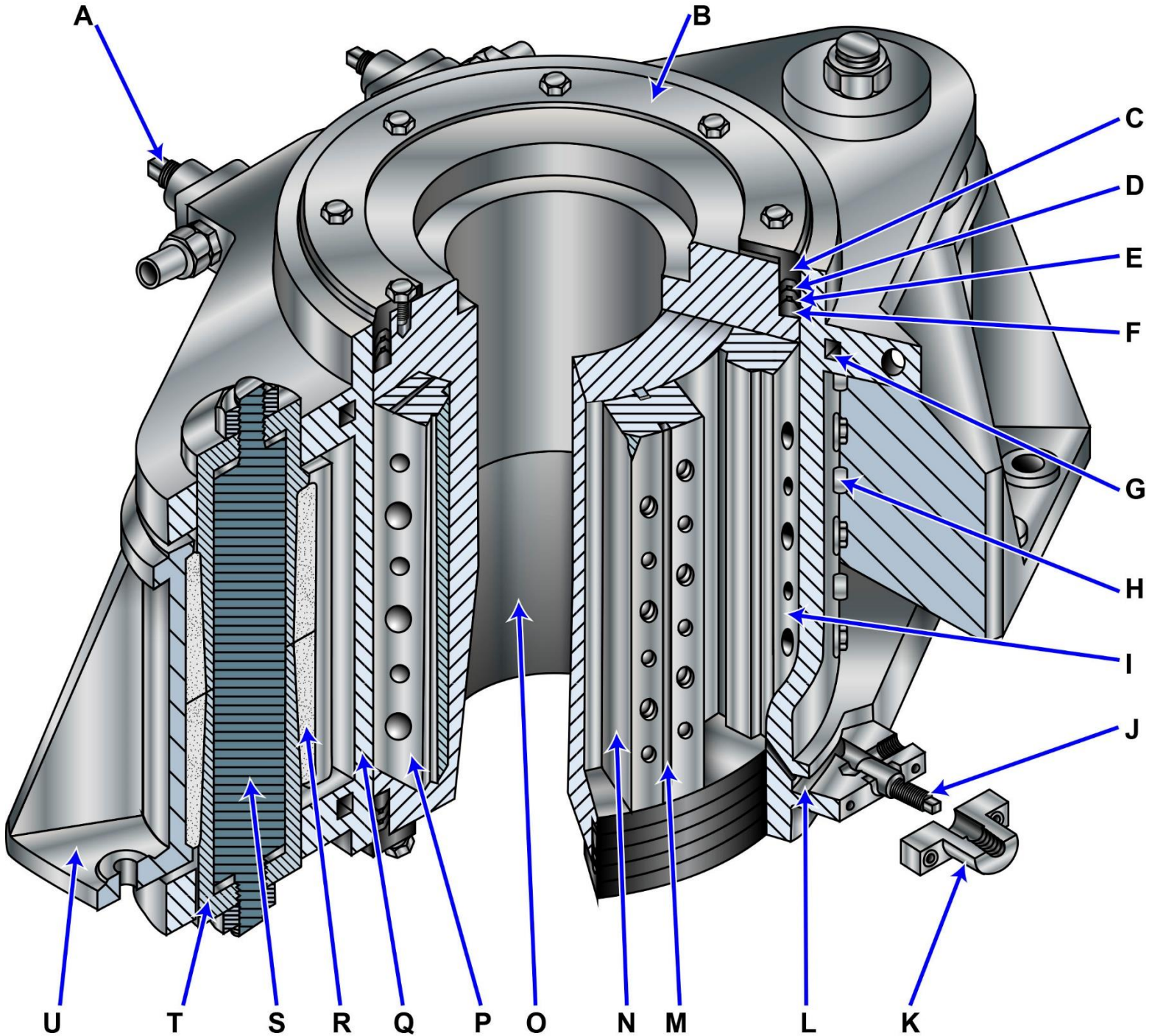
If choice C is selected set score to 1.

70. The expansion tank in a diesel engine closed fresh water cooling system is located at _____.

- (A) or near the tank top level
- (B) or near the floor plate level
- (C) the lowest point in the system
- (D) the highest point in the system

If choice D is selected set score to 1.

GS-0116

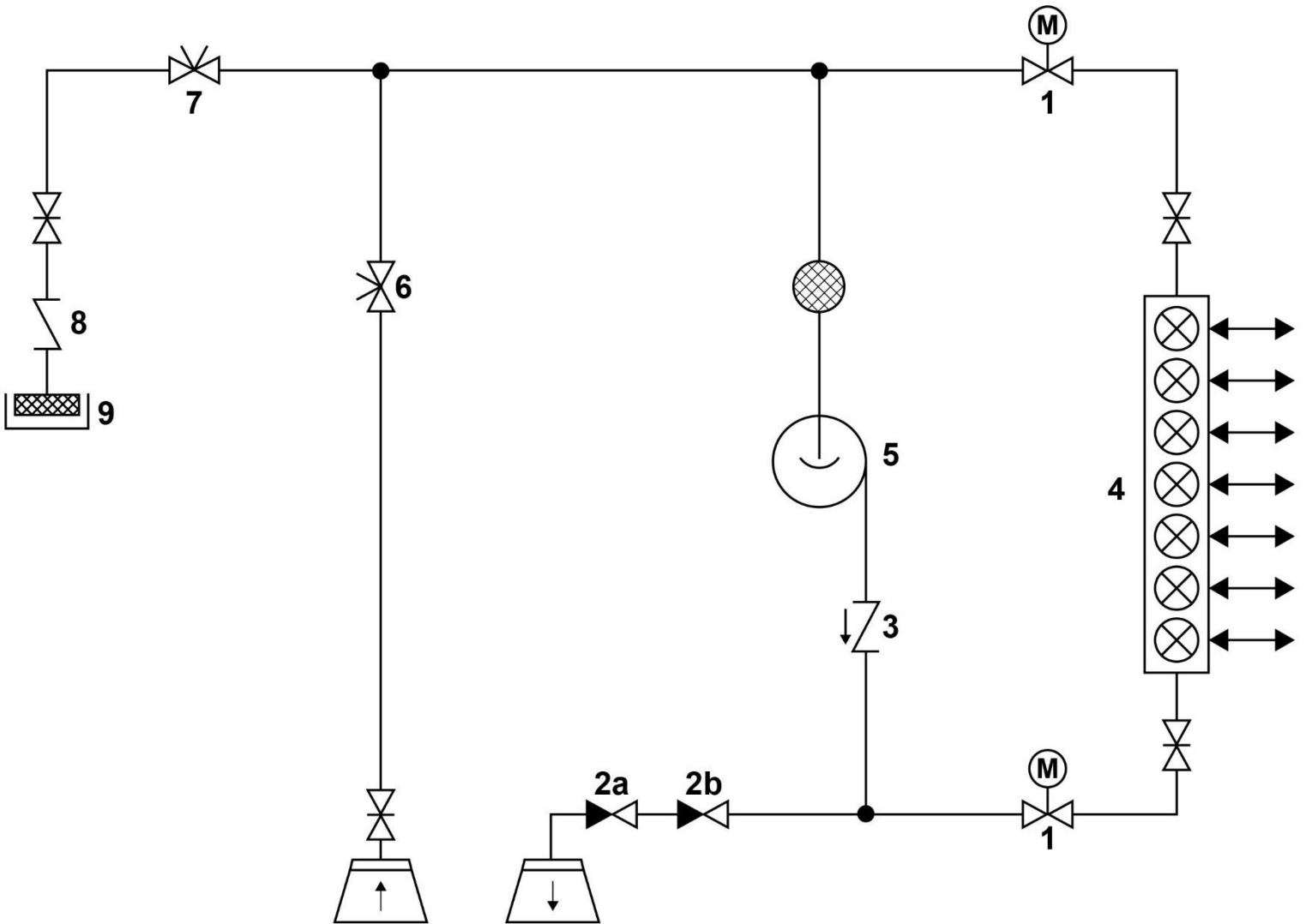


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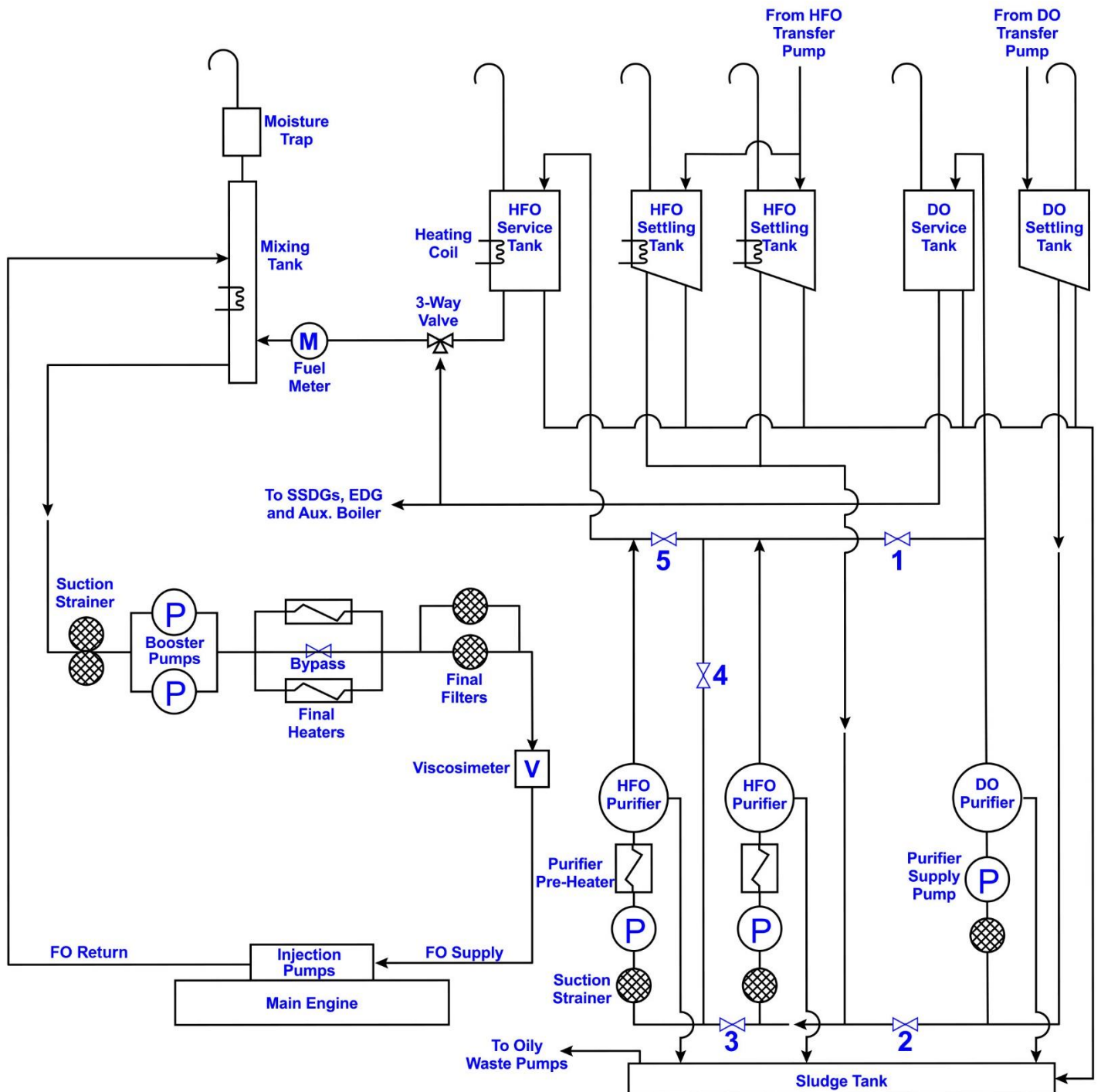
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GS-0125



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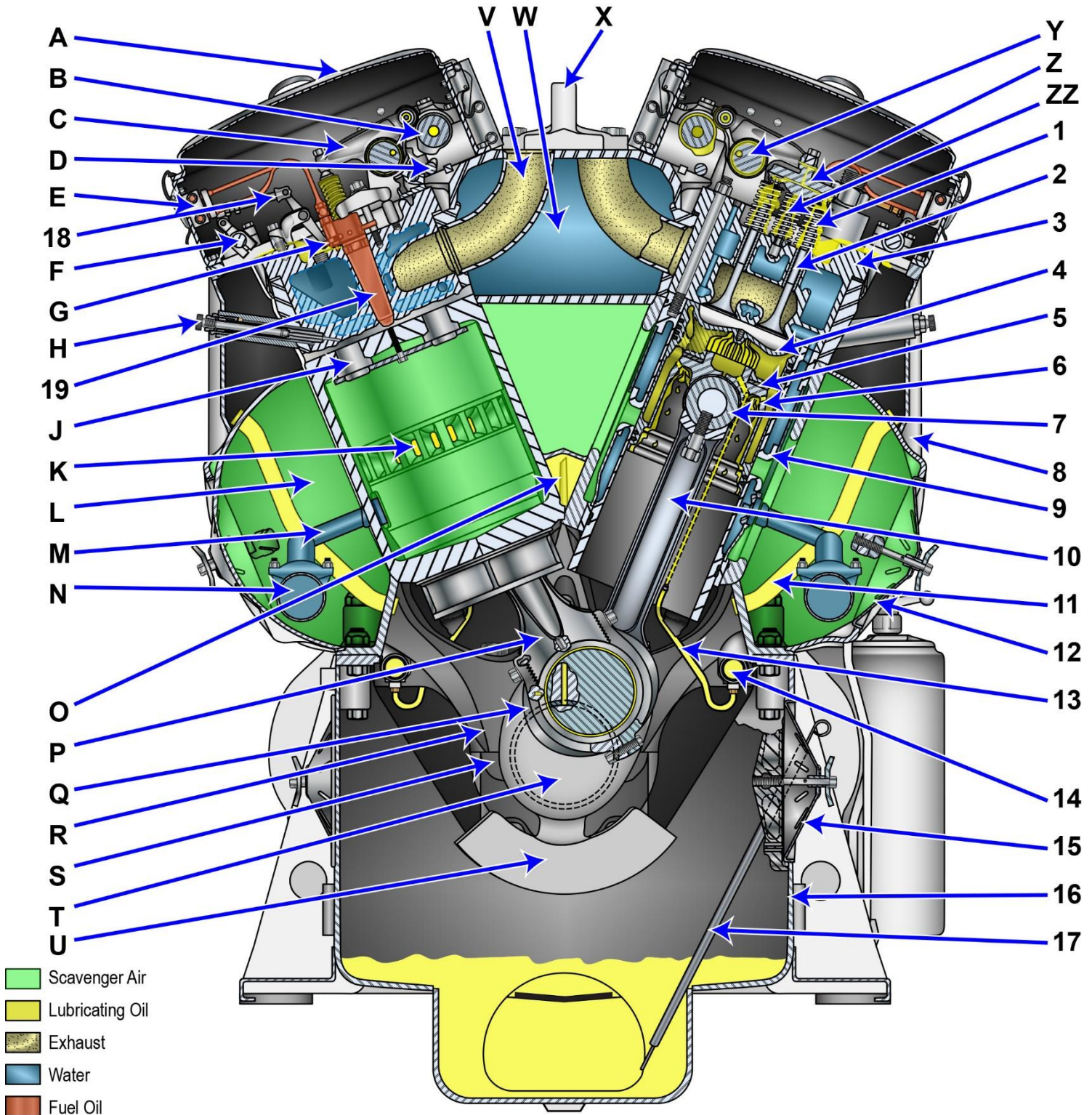


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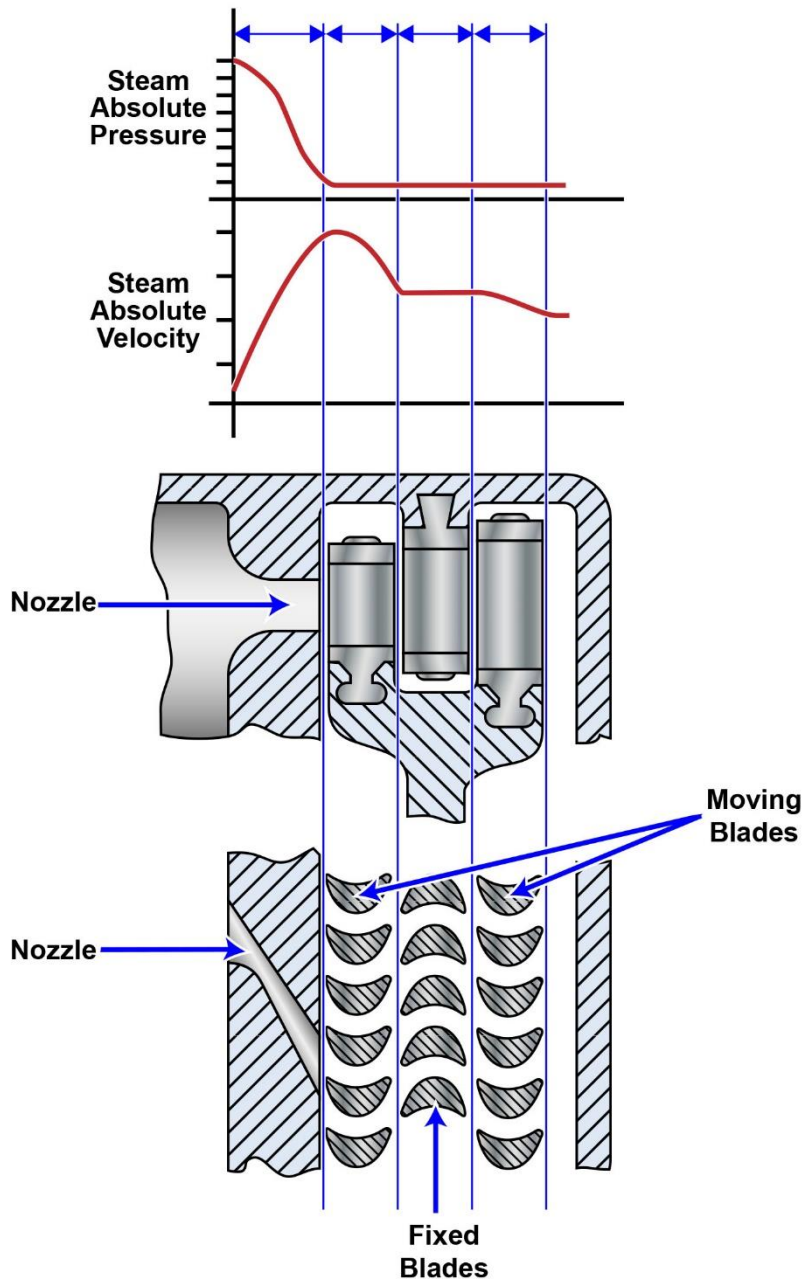


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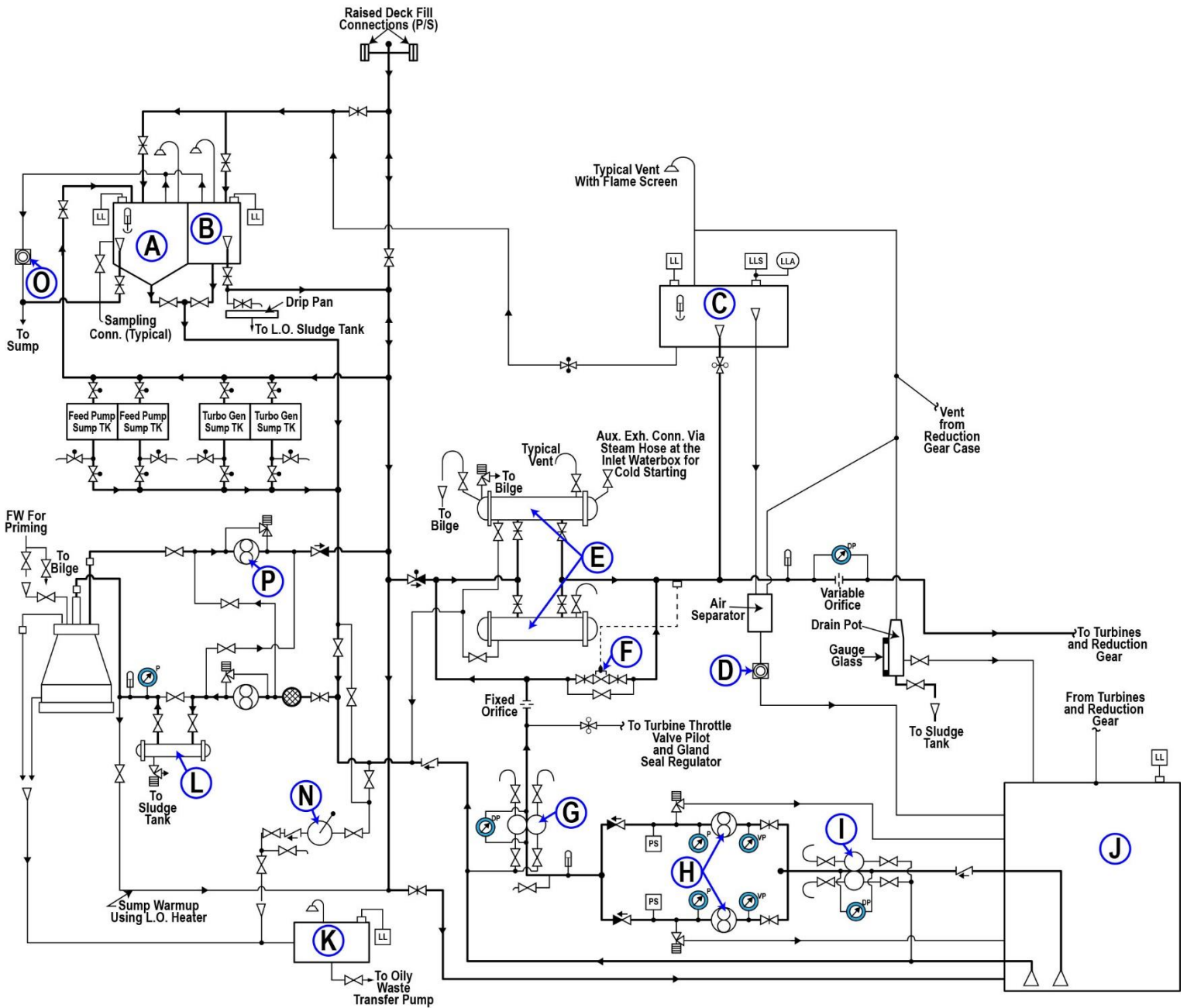


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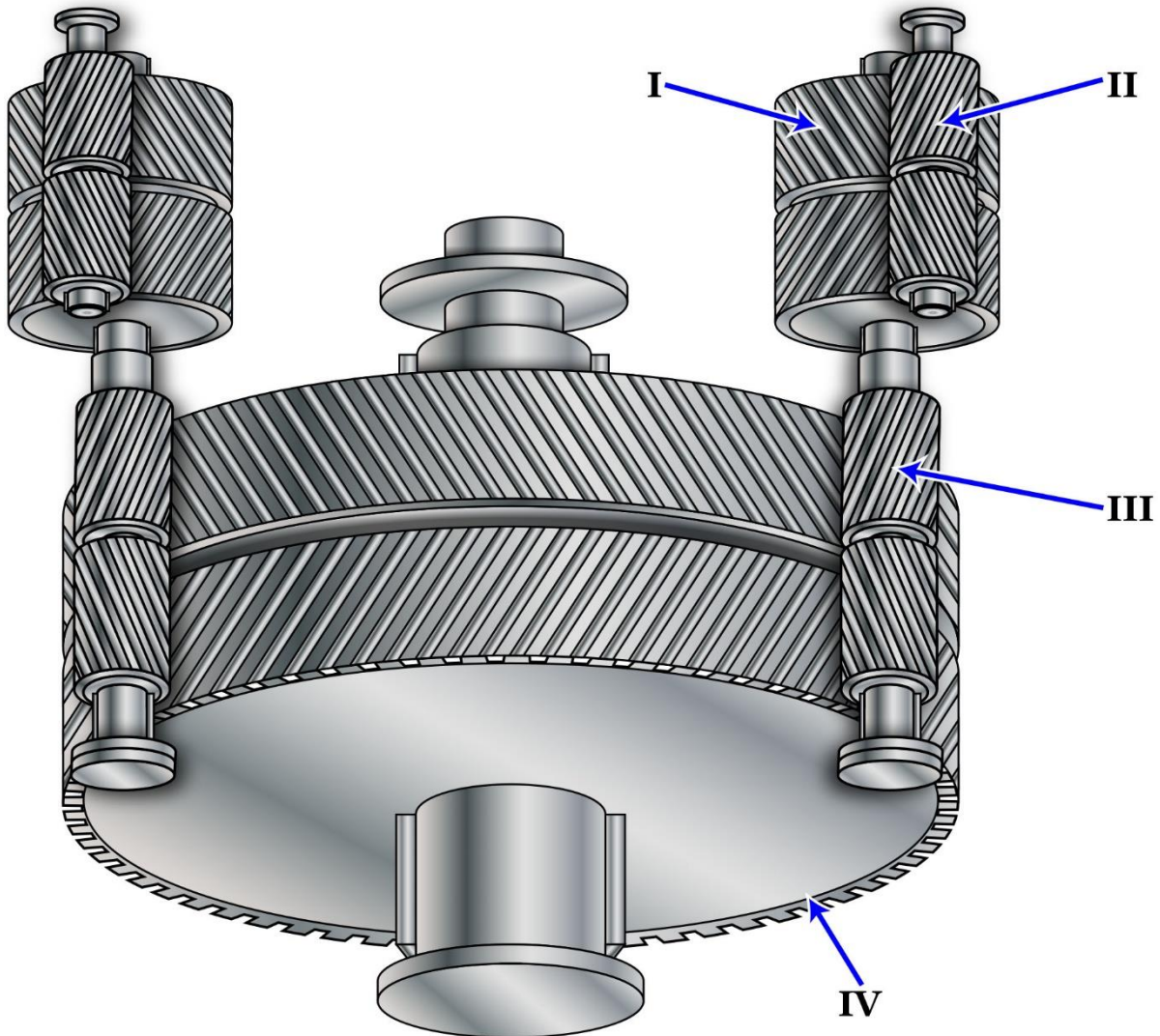
SE-0011

Steam Plant Lubricating-Oil System



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SE-0013



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SG-0004

Table 1
Thermodynamic Properties of Saturated Steam (Temperature)

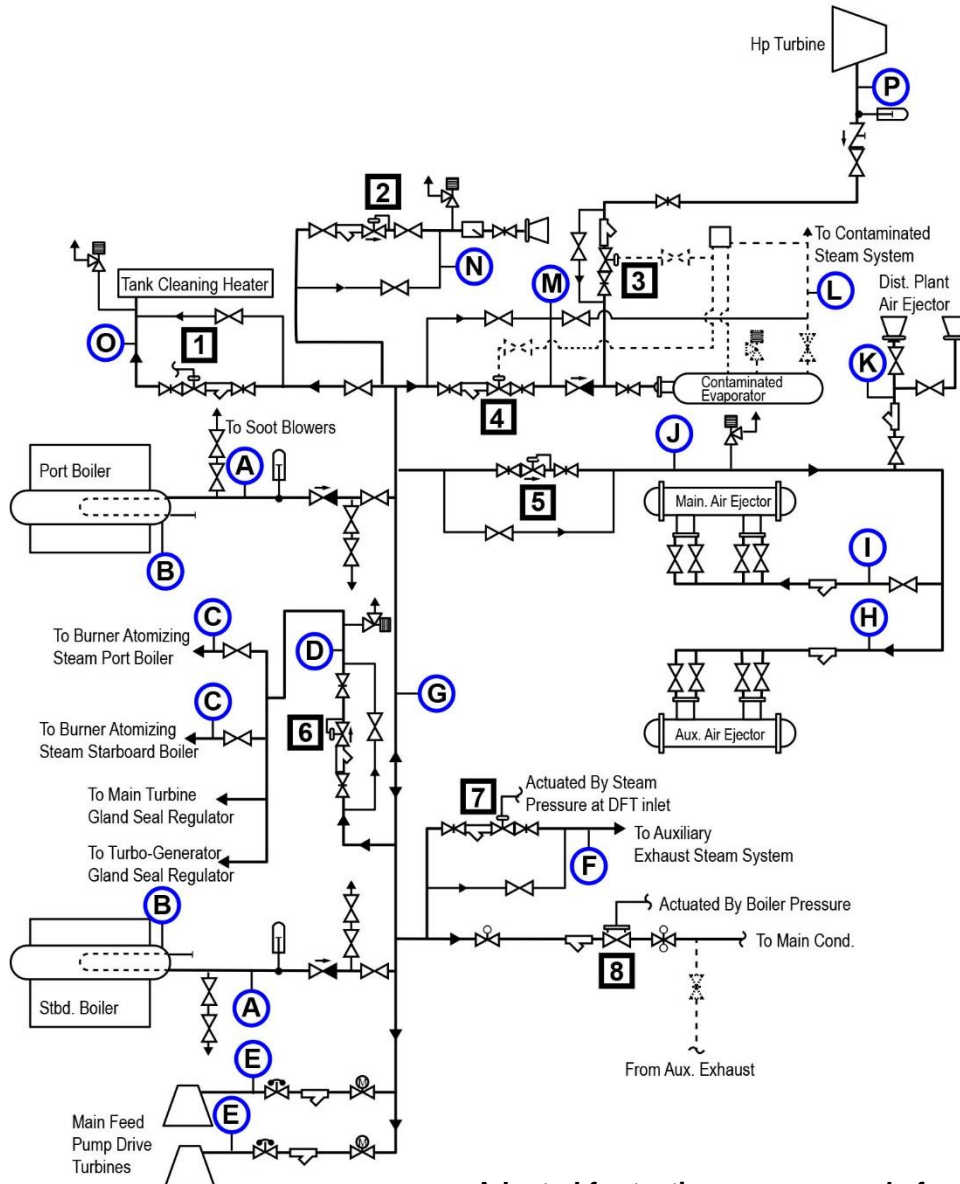
Temp, °F	Absolute Pressure, psi	Enthalpy (BTU/lb) of Liquid	Enthalpy (BTU/lb) of Evaporation	Enthalpy (BTU/lb) of vapor
32	0.08859	0.01	1075.5	1075.5
40	0.12170	8.05	1071.3	1079.3
50	0.17811	18.07	1065.6	1083.7
60	0.25630	28.06	1059.9	1088.0
70	0.36310	38.04	1054.3	1092.3
80	0.50690	43.02	1048.6	1096.6
90	0.69820	57.99	1042.9	1100.9
100	0.94920	67.97	1037.2	1105.2
110	1.27480	77.94	1031.6	1109.5
120	1.69240	87.92	1025.8	1113.7
130	2.22250	97.90	1020.0	1117.9
140	2.88860	107.90	1014.1	1122.0
150	3.71800	117.90	1008.2	1126.1
160	4.74100	127.90	1002.3	1130.2
170	5.99200	137.90	996.3	1134.2
180	7.51000	147.90	990.2	1138.1
190	9.33900	157.90	984.1	1142.0
200	11.52600	168.00	977.9	1145.9
212	14.69600	180.00	970.4	1150.4
220	17.18600	188.10	965.2	1153.4
240	24.96900	208.30	952.2	1160.5
280	49.20300	249.10	924.7	1173.8
300	67.01300	269.60	910.1	1179.7
340	118.01000	311.10	879.0	1190.1
380	195.77000	353.50	844.6	1198.1
400	247.31000	375.00	826.0	1201.0

Table 2
Thermodynamic Properties of Saturated Steam (Pressure)

Absolute Pressure, psi	Temp, °F	Enthalpy (BTU/lb) of Liquid	Enthalpy (BTU/lb) of Evaporation	Enthalpy (BTU/lb) of vapor
0.5	79.58	47.6	1048.8	1096.4
1.0	101.74	69.7	1036.3	1106.0
5.0	162.24	130.1	1001.0	1131.1
10.0	193.21	161.2	982.1	1143.3
14.7	212.00	180.0	970.4	1150.4
15.0	213.03	181.1	969.7	1150.8
20.0	227.96	196.2	960.1	1156.3
25.0	240.07	208.5	952.1	1160.6
30.0	250.33	218.8	945.3	1164.1
40.0	267.25	236.0	933.7	1169.7
50.0	281.01	250.1	924.0	1174.1
60.0	292.71	262.1	915.5	1177.6
70.0	302.92	272.6	907.9	1180.6
80.0	312.03	282.0	901.1	1183.1
90.0	320.27	290.6	894.7	1185.3
100.0	327.81	298.4	888.8	1187.2
110.0	334.77	305.7	883.2	1188.9
120.0	341.25	312.4	877.9	1190.4
130.0	347.32	318.8	872.9	1191.7
140.0	353.02	324.8	868.2	1193.0
150.0	358.42	330.5	863.6	1194.1
200.0	381.79	355.4	843.0	1198.4
250.0	400.95	376.0	825.1	1201.1
300.0	417.33	393.8	809.0	1202.8
350.0	431.72	409.7	794.2	1203.9
400.0	444.59	424.0	780.5	1204.5

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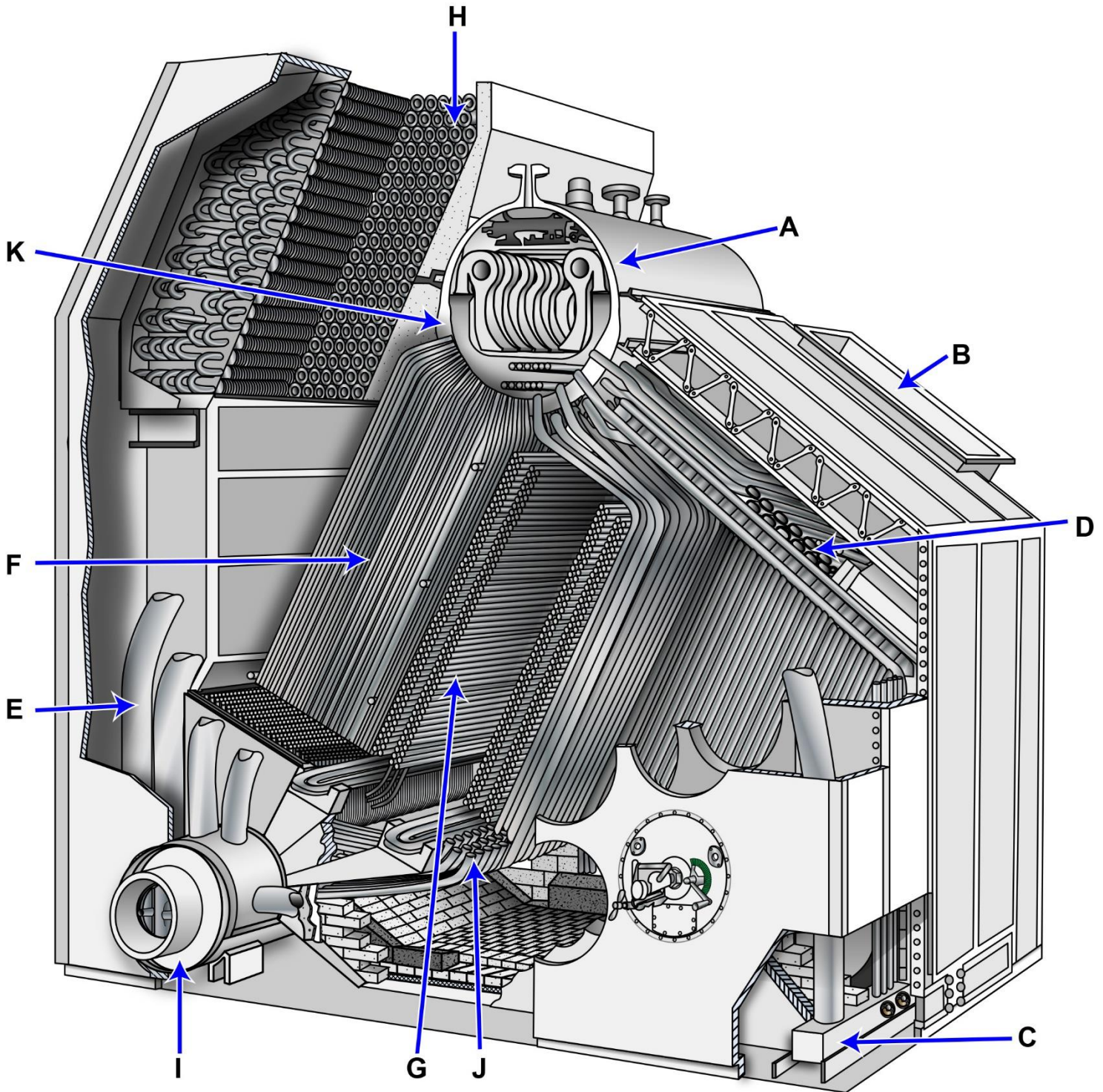


Nominal System Pressures	
Gauge	psig
A	850
B	860
C	143
4	350
D	143
E	850
F	32
G	850
H	143
I	143
J	143
K	143
L	130
M	350
N	140
O	130
P	205 (at full power)

Device Settings	
Valve	Psig
1	130
2	140
3	185
4	350
5	143
6	143
7	32
8	860

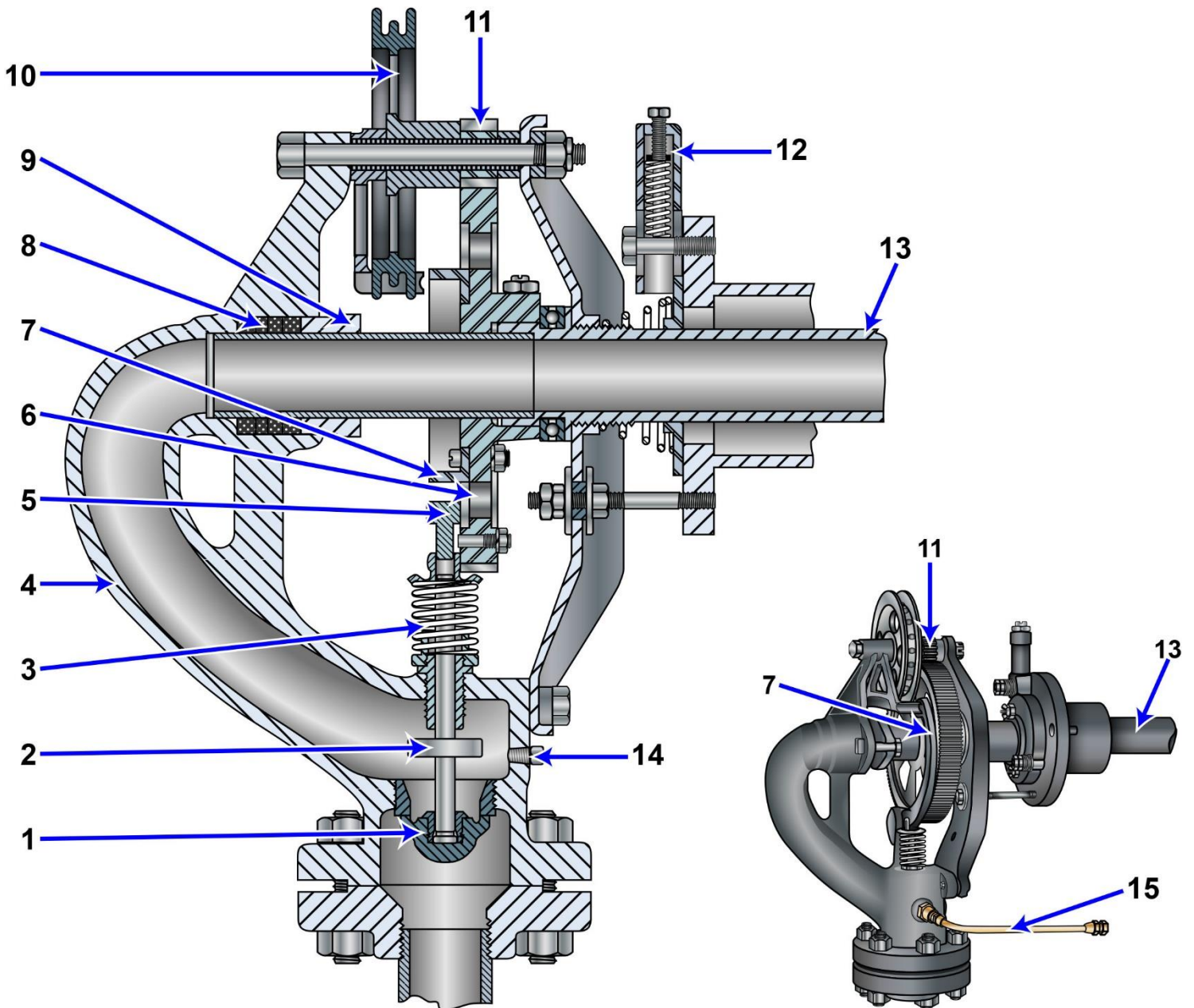
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