



State of Ohio High Pressure Steam Engineering Course Contents

OHIO HP Chapter #	OHIO HP (Custom Series) Unit Title	Ohio HP (Custom Series) Chapter Title	Learning Outcomes	Ohio HP Body of Knowledge (Part#)	PETS Source Chapter (Essentials, Advanced)
(Book One) 1	Steam Theory	Introduction to Thermodynamics	Explain the principles of thermodynamics, including the laws of thermodynamics and the modes of heat transfer.	2	E.3.16
2	Steam Theory	Thermodynamics of Steam	Describe the principles of the thermodynamics of steam and the associated terms.	2	E.3.17
3	Steam Theory	Steam Properties and Calculations	Define properties of saturated and superheated steam and, using the steam tables, calculate the heat required to produce steam at various conditions; determine evaporation in steam boilers.	2	A.1.10
4	Boiler Designs & Heating Systems	Introduction to Boilers	Explain common terms relating to boilers.	1	E.10.46
5	Boiler Designs & Heating Systems	Firetube Boilers	Describe the design, characteristics and applications of HRT, locomotive, firebox, Scotch and packaged firetube boilers.	2	E.10.47
6	Boiler Designs & Heating Systems	Watertube Boilers	Describe various watertube boiler designs, including large generating units.	2	E.10.48
7	Boiler Designs & Heating Systems	Electric Boilers	Describe electric boilers with regard to their use and general design.	2	E.10.49
8	Boiler Designs & Heating Systems	Special Boiler Designs	Describe the designs, components, firing methods, and operating considerations for some special boilers used in industry.	2	A.3.2
9	Boiler Designs & Heating Systems	Steam Heating Equipment	Describe the operating principles of steam heating equipment and components.	2	E.20.95
10	Boiler Designs & Heating Systems	Steam Heating Systems	Describe the operating principles and maintenance procedures of steam heating systems and the components of these systems.	2	E.20.96
11	Boiler Construction, Operations & Maintenance	Boiler Construction	Explain Code requirements, in general terms, and describe construction and assembly methods for the major components of a large boiler.	2	A.3.3
12	Boiler Construction, Operations & Maintenance	Hot Water & Steam Heating Boiler Operations	Describe accessories, operation and troubleshooting of a hot water heating system	2	E.20.98
13	Boiler Construction, Operations & Maintenance	HP Boiler Preparation, Start-Up and Shutdown	Describe the basic preparation of a boiler for start-up, and the start-up and shutdown procedures.	7	E.12.59
14	Boiler Construction, Operations & Maintenance	High Pressure Boiler Operations	Describe the routine safe and efficient operation of a packaged boiler. Describe common procedures in the operation and maintenance of high pressure boilers.	7	E.12.60 A.3.9
15	Boiler Construction, Operations & Maintenance	Boiler Inspection, Maintenance and Cleaning	Describe the service and maintenance required for boilers. Discuss the procedure for preparing a boiler for inspection and cleaning, and describe mechanical and chemical boiler cleaning methods.	7	E.27.139 E.27.140
(Book Two) 16	Boiler Combustion & Flue Gases	Gas Burners for Heating Boilers	Describe the operation of the various types of gas burners used on heating boilers.	7	E.19.90
17	Boiler Combustion & Flue Gases	Fluidized Bed Combustion	Discuss the basic theory and design of a fluidized bed steam generator and describe the special operational and control aspects of fluidized bed combustion.	4	E.11.53
18	Boiler Combustion & Flue Gases	Burner Designs and Supply Systems	Describe the typical components of fuel supply systems and describe common burner/furnace designs for gas, oil, and coal-fired boilers.	4	A.3.6
19	Boiler Combustion & Flue Gases	Fuels, Combustion, Flue Gas Analysis	Explain the properties and combustion of common fuels and the analysis of combustion flue gas	4	A.2.3
20	Boiler Combustion & Flue Gases	Boiler Draft and Flue Gas Equipment	Discuss, sketch and describe the basic equipment used to supply combustion air to a boiler furnace. Explain boiler draft systems and fans and describe the equipment used to remove ash from flue gas.	5	E.11.51 A.3.7
21	Boiler Water Treatment	External Feedwater Treatment	Discuss the general principles, methods and equipment used in preparing raw feedwater for steam production in a boiler.	9	E.13.61



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22	Boiler Water Treatment	Boiler Water Pretreatment	Explain the purpose, principles, equipment, operation, and monitoring of boiler water pretreatment processes.	9	A.3.11
23	Boiler Water Treatment	Internal Feedwater Treatment and Testing Methods	Discuss the general principles, methods and equipment used in the internal treatment of raw feedwater for steam production in a boiler.	9	E.13.62
24	Boiler Water Treatment	Internal Water Treatment for Boilers	Discuss internal water treatment methods and systems for control of scale, corrosion, and carryover; explain testing & monitoring strategies..	9	A.3.10
25	Boiler Water Treatment	Heat Exchangers & Cooling Towers	Describe the operation and maintenance of cooling towers. Describe the design, operation, and applications of various types of industrial heat exchangers.	9	E.14.65 A.4.12
(Book Three) 26	Boiler Internals and Fittings	Low-Pressure Boiler Fittings	Name, describe the purpose of, and explain the operating principles of various boiler fittings found on hot water and low-pressure steam boilers, including pressure gages and safety valves.	6	E.19.91 E.19.92 E.19.93
27	Boiler Internals and Fittings	High Pressure Boiler Fittings	Describe the design and operation of common external and internal fittings attached to the pressure side of a high-pressure boiler.	6	A.3.5
28	Boiler Internals and Fittings	Sootblowers	Discuss sootblowers.	6	E.12.57
29	Boiler Internals and Fittings	Continuous and Intermittent Blowdown	Describe the purposes, equipment and operation of continuous and intermittent blowdown.	6	E.12.58
30	Piping, Pumps and Valves	Introduction to Piping and Pipe Fittings	Discuss the basic types of piping, pipe connections, supports, drainage devices and insulation.	8	E.9.43
31	Piping, Pumps and Valves	Valves and Actuators	Discuss the design, application, operation and maintenance of the most common types of valves used in power and process piping systems.	6	E.9.44 A.2.6
32	Piping, Pumps and Valves	Safety and Relief Valves	Discuss safety valves for power and heating boilers.	8	E.11.54
33	Piping, Pumps and Valves	Pump Designs and Operation	Describe designs, principles, components and operating procedures for common industrial pumps and discuss details pertaining to pump operation and various maintenance procedures performed on pumps.	8	E.15.68 E.15.69 A.3.12
34	Piping, Pumps and Valves	Pump Head Calculations	Define terms associated with pumping and perform pump head calculations.	8	A.3.13
(Book Four) 35	Boiler and Plant Control Systems	Basic Electricity	Describe the concepts of basic electricity and perform simple calculations using voltage, current, resistance and power.	6	E.17.73
36	Boiler and Plant Control Systems	Introduction to Instrumentation	Describe the overall purpose and function of plant instrumentation systems.	6	E.18.79
37	Boiler and Plant Control Systems	Introduction to Process Measurement	Describe the construction and operation of commonly used devices for measuring pressure, level, temperature, flow, and composition.	6	E.18.80
38	Boiler and Plant Control Systems	Basic Control Loop Components	Describe the basic types and functions of transmitters, recorders, controllers, and control valves.	6	E.18.81
39	Boiler and Plant Control Systems	Basic Boiler Instrumentation and Control Systems	Describe specific types of instrumentation and controls used on boilers.	6	E.18.82
40	Boiler and Plant Control Systems	Low-Water Fuel Cutoffs	Discuss the designs, operation and testing of low-water fuel cutoffs.	6	E.18.83
41	Boiler and Plant Control Systems	Boiler Programming Controls	Describe the operation of programming controls and discuss the proper testing and maintenance procedures.	6	E.18.84
42	Boiler and Plant Control Systems	Boiler Control Systems	Explain the components and operation of automatic control systems for boiler water level, combustion, steam temperature, and start-up.	6	A.3.8



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43	Steam Turbines, Heat Engines & Cogeneration	Heat Engines, Prime Movers, & Simple Steam Engines	Discuss the terms used in describing the conversion of heat into mechanical energy, and describe one such device for accomplishing this, the simple steam engine.	1	E.14.63
44	Steam Turbines, Heat Engines & Cogeneration	Steam Turbines I	Describe the construction and operation of steam turbines.	1	E.14.64

*The curriculum designed by Power Engineering Training Systems to address the Ohio Body of Knowledge requirements for the State of Ohio's Stationary Engineer, High Pressure, and Low Pressure Operator Examinations has been approved by the Division of Industrial Compliance, Ohio Department of Commerce as suitably addressing the applicable topics for the various Bodies of Knowledge. Learning materials are compiled from contents of the Essentials of Power Engineering Series, and the Advanced Concepts in Power Engineering Series, both published by Power Engineering Training Systems (www.powerengineering.net).

*These learning materials are contained in four volumes, per:

Chapters 1-15	Ohio HP Steam Eng. (Book 1): Boiler Design & Operation	ISBN 1-897251-15-7
Chapters 16-25	Ohio HP Steam Eng. (Book 2): Boiler Combustion & Water Treatment	ISBN 1-897251-16-5
Chapters 26-34	Ohio HP Steam Eng. (Book 3): Boiler Fittings, Valves & Pumps	ISBN 1-897251-17-3
Chapters 35-44	Ohio HP Steam Eng. (Book 4): Boiler Controls & Prime Movers	ISBN 1-897251-18-1

*When preparing for the High Pressure Boiler Operator license you may omit chapters 45 through 48 in Book 4 as they are not addressed in the Body of Knowledge for the High Pressure Boiler Operator license examination.

*Only the Body of Knowledge document found on the State of Ohio website at <http://www.com.state.oh.us/dic/documents/302.pdf> should be used as the fundamental reference for the knowledge requirements pertinent to the State of Ohio license examination.