

Board of Examination (for Boiler Engineers)

Syllabus Steam Boilers / Engineering

1. Boilers & Auxiliaries:-

Evolution and development, classifications, high pressure boilers, critical / super critical boilers. Waste Heat Boilers

Mountings, fittings & accessories: Super-heaters, re-heaters, economizers, air preheaters, de-super-heaters, attemperators, soot blowers, feed water pump, draft fans, pulverizers, fuel handling and fire systems, ash handling systems, feed water tanks, de-aerator, pressure release tank, pressure reducing and regulating valves, feed water regulators, water walls, chimneys, blow-down systems, refractory etc.

2. Boiler Operation & Maintenance:-

Startup / shutdown, boiling out, drying out, safety precautions, interlocking & control systems, slagging, fouling, fly ash and problems, de-slagging etc. scale formation, corrosion, oxidation, priming, foaming, draft types, merit & de-merit, FD & ID fans, formulas, etc

Maintenance: tubes fitting, removal, caulking, beading, flaring, methods of tubing, preparation for inspection, chemical cleaning, mechanical cleaning, repairs, hydrostatic testing etc, boiler room size, foundations, supports, erection procedures, , shop and field assembly, , ducts, chimney, draft measuring instruments, damper and controls, re-circulation. Refractory types etc

3. Fuels, types, burning methods, availability, problems, Combustion principles, chemistry of combustion, burner management:-

Combustion chemistry, air-fuel ratio, excess air, solid fuel combustion, liquid & gases fuels combustions, advantages & disadvantages, properties of good fuel, analysis of fuel, calorific value, LHV, HHV etc, ash type, problem and its handling.

Burning Systems:- Oil and gas burners, pulverized coal firing, FBC, stoker firing, burners, designing, characteristic, working demerits. Gas, oil & solid fuel burning / pipelines, layout, drawings, fitting, auxiliaries, preheating, filtration, grading, fuel handling, storage, furnace types & designs etc.

4. Environment Emissions & Control Technologies:-

Definitions, solid particles / particulates, NO_x & SO_x and their control, waste treatment, cooling-tower water treatment, causes of pollution, equipments and methods of removal, ESP, Scrubbers, Fabric Filters, Dust Collector etc.

5. Thermodynamics, Steam Fundamentals, Steam Cycles & Characteristics:-

Thermodynamic cycles, Rankin, Carnot, topping cycle, super charged boilers, binary vapor cycles, steam and its generation, kinds of steam, heat and its types, enthalpy, measurements of steam and heat-energy, transfer of heat, boiler circulation. Evaporation rate, factor of evaporate,

equivalent evaporation, boiler horsepower, rating terms, boiler load, steam flow, measurements, steam purification, steam washing methods, steam pollutants, separation, washing, scrubbing, drum internals, steam polishing etc, steam condensate recovery etc.

6. Water treatment:-

Water chemistry, impurities and removals, methods, process, diagrams, problems, benefits, limitation, zeolite process, demineralization, reverse osmosis, sketches, chemical equations and limitations, water analysis etc. Chemical cleaning of water side, limits, importance, benefits, disadvantages, chemicals and their functions etc.

7. Boiler Design ... Principles & Factors:-

Principles, considerations, factors, site selection for power plant, factors to be considered to select a suitable boiler, materials, stress relieving, manufacturing of boilers, assembly.

Pipelines.....materials, symbols, identifications, fittings, methods of connecting pipes, codes, leak test, support, expansion joints and allowances, insulation, layout etc. steam traps,

8. Thermo Oil Boilers / Heaters:-

Thermo Oil boilers, thermo oil properties, advantages & dis-advantages, pumping requirements, operating hazards, containment problems, equipment design, materials for construction, tests and inspections, comparison with water & steam boilers / heaters, industrial applications.

9. Terminologies:-

Force, pressure, power, friction, moment of inertia, torque, Newton laws, speed, velocity, acceleration, kinetic energy, potential energy, momentum, wear, abrasion, erosion, corrosion, rusting, pitting, fatigue, creep, calorie meter, BTU, CHV, Caloric, joule, flue-gas analyzers, boiler trims, critical temperature & pressure of steam, critical & sub-critical boilers.

10. Balance of plant:-

Introduction, efficiency of boiler, rating, how to increase efficiency, limits, MCR, ECR, efficiency tests, heat losses and calculations, steam test etc.

11. New Trends:-

Critical, subcritical & supercritical boilers, Steam Generation from nuclear energy, Introduction, Fundamentals, Operation, Problems etc.

12. Pressure Vessels:-

Introduction, types, materials, testing, design parameters, inspection mechanism, durations of inspections, common defects, remedies, standards and codes.