

## **Section 13 in The Bureau of Energy Efficiency (Certification Procedures for Energy Managers) Regulations, 2010**

### **13. Constitution of Advisory Committees. -**

(1)The Bureau may, for the purpose of these regulations, National Examination for Energy Managers and for their certification and registration constitute an Examination Advisory Committee, a Technical Advisory Committee and a Certification and Registration Advisory Committee.(2)Each Advisory Committee shall consist of a Chairperson and not more than six other persons to be nominated by the Bureau from amongst members of the Advisory Committees constituted under regulation 3 of the Bureau of Energy Efficiency (Advisory Committees) Regulations, 2008.THE BUREAU OF ENERGY EFFICIENCY (CERTIFICATION PROCEDURES FOR ENERGY MANAGERS) REGULATIONS, 20101 SCHEDULE [ See regulation 5(3)] SUBJECTS FOR NATIONAL EXAMINATION 1: General Aspects of Energy Management and Energy Audit 1.1. Energy Scenario: Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, Indian energy scenario, Sectoral energy consumption (domestic, industrial and other sectors), energy needs of growing economy, energy intensity, long-term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future. 1.2 Energy Conservation Act, 2001 and related policies: Energy Conservation Act, 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act, 2003, Integrated Energy Policy, National Action Plan on Climate Change. 1.3 Basics of Energy and its various forms: Electricity basics-Direct Current and Alternative currents, electricity tariff, Thermal Basics-fuels, thermal energy contents of fuel, temperature and pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity and heat transfer, units and conversion, and Metric Ton Oil Equivalent (MTOE) conversions. 1.4 Energy Management and Audit: Definition, energy audit, need, types of energy audit, Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering, precautions to be taken in the sampling and measurements, thermography, smart metering. 1.5 Material and Energy Balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams. 1.6 Energy Action Planning: Key elements, force field analysis, Energy policy purpose, perspective, contents, formulation, ratification, Organizing - location of energy management, top management support, managerial function, roles and responsibilities of energy manager, accountability. Human resource development techniques, Information system-designing: barriers, strategies; Marketing and communicating- training and planning. 1.7 Financial Management: Investment-need, appraisal and criteria, financial analysis techniques-simple pay back period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts and role of Energy Service Companies (ESCOs). 1.8 Project Management: Definition and scope of project, technical design, financing, contracting, implementation and performance monitoring. Implementation plan for top management, Planning Budget, Procurement Procedures, Construction, Measurement and Verification. 1.9 Energy Monitoring and Targeting:

Defining monitoring & targetting, elements of monitoring and targetting, data and information-analysis, techniques-energy consumption, production, cumulative sum of differences (CUSUM). Energy Management Information Systems (EMIS). 1.10 Energy, Environment and Climate Change: Energy and environment, air pollution, climate change United Nations Framework Convention on Climate Change (UNFCCC), Sustainable Development, Kyoto Protocol, Conference of Parties (COP), Clean Development Mechanism (CDM), Sample Procedure case of COM-Bachat Lamp Yojna and industry; Prototype Carbon Fund (PCF). 1.11 New and Renewable Energy Sources (NRES): Concept of renewable energy, Solar energy, wind energy, biomass boilers and gasifiers, biogas, bio-fuels, hydro, fuel cells, energy from wastes, biomethanation, wave, tidal, and geothermal.

2: Energy Efficiency in Thermal Utilities 2.1 Fuels and Combustion: Introduction to fuels, properties of fuel oil, coal and gas, storage, handling and preparation of fuels, principles of combustion, combustion of oil, coal and gas. Agro-residue/biomass handling, preparation and combustion. 2.2 Boilers: Types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Boiler efficiency calculations for coal, oil and gas, evaporation ratio, Soot blowing and soot deposit reduction, reasons for boiler tube failures, start up, shut down and preservation, Thermic fluid heaters, and super critical boilers. 2.3 Steam System: Properties of steam, steam pipe insulation, assessment of steam distribution losses, steam leakages, steam trapping, condensate pumping, and flash steam recovery system, thermo-compressors, Steam utilization, steam dryers, Performance assessment of Steam system, and identifying opportunities for energy savings. 2.4 Furnaces: Classification, Forging furnace, Cupola, non-ferrous melting, Induction furnace, hot air generators, excess air, heat distribution, temperature control, draft control, waste heat recovery, heat balance and performance evaluation of a furnace, general fuel economy measures in furnaces. 2.5 Insulation and Refractories: Insulation-types and application, Cold insulation, economic thickness of insulation, heat savings and application criteria, Refractory- types, selection and application of refractories, and heat loss assessment. 2.6 Fluidized bed combustion (FBC) boilers: Introduction, mechanism of fluidized bed combustion, advantages, types of FBC boilers-Biomass-based fluidized bed combustion boilers, Atmospheric Fluidized bed combustion boilers, Circulating Fluidized bed combustion boilers, Pressurized Fluidized bed combustion boilers, application and operational features, retrofitting FBC system to conventional boilers, saving potential. 2.7 Cogeneration: Definition, need, application, advantages, classification, heat balance, steam turbine efficiency, tri-generation, micro turbines and saving potentials. 2.8 Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential. 2.9 Heat Exchangers: Types, networking, pinch analysis, multiple effect evaporators, condensers, and distillation column. 3: Energy Efficiency in Electrical Utilities 3.1 Electrical system: Electricity billing, electrical load management and maximum demand control, Maximum demand controllers, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, automatic power factor controllers, energy efficient transformers, Star labeled distribution transformers, Assessment of transmission, distribution and transformer losses. Demand side management, and losses due to harmonics and voltage unbalance. 3.2 Electric motors: Types, squirrel cage and slip ring induction motors and their characteristics, motor history sheet (new, 1st rewind, 2nd rewind), rewinding and motor replacement issues, Star operation, voltage unbalance, energy efficient motors, losses in induction motors, motor efficiency, Star labeled energy efficient motors, factors affecting motor performance, soft starters with energy saver option,

variable speed drives, and energy saving opportunities. 3.3 Compressed Air System: Types of air compressors, reciprocating vs screw, compressor efficiency, efficient compressor operation, Compressed air system components, Air Driers, capacity assessment, leakage test, factors affecting the performance and savings opportunities. 3.4 Heating Ventilation Air Conditioning (HVAC) and Refrigeration System: Introduction to Psychometrics, Vapor compression refrigeration cycle, refrigerants, co-efficient of performance, capacity, ice bank system, performance assessment of window and split room air conditioners, factors affecting Refrigeration and Air conditioning system performance and savings opportunities, ventilation system, cold storage refrigeration, humidification system, Vapor absorption refrigeration system: Working principle, types and comparison with vapor compression system and saving potential, heat pumps and their applications. 3.5 Fans and blowers: Types, pressure drop assessment, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. 3.6 Pumps and Pumping System: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Energy conservation opportunities in boiler feed water pumps, pumping systems for municipal drinking water, sewerage, and agriculture pump sets, star labelled pumps. 3.7 Cooling Tower: Types, fan-less cooling tower, natural draft cooling tower, performance evaluation, efficient system operation, cooling water treatment, flow control strategies and energy saving opportunities assessment of cooling towers. 3.8 Lighting System: Light source, Light Emitting Diodes (LEDs), metal halides, fluorescent tube lights, Compact fluorescent lamps (CFL), choice of lighting, luminance requirements, energy efficient street lighting, electronic ballast, occupancy sensors, energy efficient lighting controls, labeling scheme, and energy conservation avenues. 3.9 Diesel/Natural gas Power Generating systems: Factors affecting selection. Waste heat recovery, energy, performance assessment of diesel/natural gas power generating systems. 3.10 Energy conservation in Buildings and Energy Conservation Building Codes (ECBC): About Energy Conservation Building Codes (ECBC), building envelope, insulation, lighting, Heating, ventilation, air conditioning (HVAC), fenestrations, water pumping, inverter and energy storage/captive generation, elevators and escalators, star labelling for existing buildings, Energy Service Companies based case studies. ---- 1. Vide Notification No. 2/11(2)/07-BEE, dated 15th October, 2010, published in the Gazette of India, Extra., Pt. III, Sec. 4, dated 30th October, 2010.