

SEVENTH EXAMINATION
for
RECOGNITION OF COMPETENT PERSONS
for
INSPECTION & CERTIFICATION OF BOILERS

Date of written examination: 20th OCTOBER 2024 (Sunday)



CENTRAL BOILERS BOARD

Department for Promotion of Industry and Internal Trade (DPIIT)
Ministry of Commerce and Industry
Government of India, New Delhi.



Dr. Ambedkar Institute of Productivity
National Productivity Council
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**Technical Adviser (Boiler) &
Secretary, Central Boilers Board
Ministry of Commerce and Industry
(Department for Promotion of
Industry and Internal Trade)
Government of India, New Delhi.**

Foreword

The Boilers Act was enacted in 1923 mainly to provide for safety of life and property from the danger of explosion of boilers and for achieving uniformity in registration and inspection during operation and maintenance of boilers throughout the country. Up to year 2007, there had been no major amendments to the Act. The legislation needed changes in consonance with the evolving developments and changes in the technology of manufacturing, operation, testing and inspection of boilers.

The Indian Boilers (amendment) Act, 2007, introduced improvements in the provisions of the law to enhance safety norms, to ensure uniformity in standards of inspection, expediting inspections and reducing delays by decentralization of inspection of boilers during their manufacture, erection and use, by allowing inspection and certification by the independent inspecting authorities.

Rules and regulations are in place for third party inspection; and inspection by third party inspecting authorities and competent persons is operational in the country. Thirteen third party inspecting authorities recognized by the Central Boilers Board are operating in the country employing competent persons to carry out inspection of boilers and boiler components during manufacture, erection and use, in addition to Chief Inspector/ Director of Boilers. Further, Competent Persons have also been authorized to work in individual capacity under section-8 of the Boilers Act, for in-service inspection of boilers

So far, six examinations have been conducted in years 2011, 2012, 2015, 2017, 2018 and 2020 for recognition of competent persons for undertaking inspections & certification of boilers and boiler components during manufacture, erection and use. Now, the seventh examination is scheduled on **20th October 2024**.

Central Boilers Board, Department for Promotion of Industry & Internal Trade Government of India has authorized Dr. Ambedkar Institute of Productivity (AIP), National Productivity Council (NPC) to conduct the examination.

I invite you to register for the seventh examination for recognition of competent persons and wish you all very best for your success in the examination.

**Sandeep Sadanand Kumbhar
Technical Advisor (Boilers) &
Chairman, CBB Examination Standing Committee**

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1.0 BACKGROUND:

As per the Boilers Act, 1923 and the Indian Boiler Regulations, 1950 framed therein, a provision has been made for inspection and certification of boilers and boiler components during manufacture, erection & use in India by Inspecting Authorities recognized by the Central Boilers Board and for this purpose the Inspecting Authority in India is required to engage Competent Persons recognized by the Central Boilers Board (CBB). However, Competent Persons can undertake inspection and certification of boilers during use, independently also without taking employment with the Inspecting Authority.

Central Boilers Board (CBB), Government of India has authorized National Productivity Council (NPC) to conduct the seventh examination for recognition of Competent Persons for inspection and certification of boilers.

2.0 PROCEDURE FOR RECOGNITION OF COMPETENT PERSONS FOR INSPECTION AND CERTIFICATION OF BOILERS:

(1) Introduction: -

(a) Regulation 4-J of the Indian Boiler Regulations, 1950 prescribes the procedure for recognition of Competent Persons.

(b) Competent persons are allowed to inspect and certify the boilers under the Boilers Act during manufacture, erection, operation and maintenance throughout India.

(2) Minimum qualifications and experience for candidates: -

(a) Must be a graduate in Mechanical or Production or Power plant or Metallurgical Engineering from a recognized institution; and

(b) Minimum five years post qualification experience singly or cumulatively in the following fields related to boilers -

- (i) Design;
- (ii) Manufacture;
- (iii) Commissioning;
- (iv) Operation and maintenance;
- (v) Inspection and certification during manufacture or operation and maintenance;
- (vi) High Pressure Welding-Inspection;

and

- (c) Level-II NDT Certified from ISNT/ASNT or any other professional body recognised by ISNT in Non-Destructive methods of testing in radiography and ultrasonic testing.

(3) Central Boilers Board Examination Process:

- (i) An examination shall be conducted by the Central Boilers Board Examination Standing Committee, or an agency, or Regional Examination Standing Committees authorised by it, as per the following examination methods namely: -

- (a) Written Examination consisting of such numbers of papers as the Central Boilers Board Examination Standing Committee may decide on design, manufacture, operation and maintenance of the boiler, Non-Destructive Testing Techniques, inspection and certification of boilers during manufacture and use as per Indian Boiler Regulations (70% weightage);
- (b) Candidate shall secure at least 45% marks in individual written examination papers and at least 60% marks in aggregate to qualify for viva-voce;
- (c) Viva-voce on the above (30 % weightage);
- (d) Candidate shall secure at least 60 % marks in aggregate (written exam with 70% weightage and viva-voce with 30% weightage) in order to pass the examination;
- (e) The Central Boilers Board shall issue a passing grade certificate to the candidate after passing the examination.

- (ii) Application for appearing in the Central Boiler Board Examination Process shall be made in the format as provided by the Central Boilers Board Examination Standing Committee at such place and time as decided by the Central Boilers Board Examination Standing Committee, or an agency, or Regional Examination Standing Committees authorised by it.

(4) Central Boilers Board Authorisation Process: -

- (i) The Competent Person shall perform the work without conflict of interest;
- (ii) An applicant for a Central Boiler Board Authorisation shall meet the following requirements, namely: -
 - (a) The applicant shall be in regular employment of, and exclusively engaged by a Central Boilers Board recognised Inspecting Authority:
Provided that for inspection and certification of boilers during use under section 8 of the Boilers Act, 1923, applicant can work independently also without taking employment with the Central Boilers Board recognised Inspecting Authority;
 - (b) The applicant shall meet the minimum qualification and experience requirements as referred at Sl. No. (2) above.
 - (c) The applicant shall have taken and passed the Central Boilers Board examination as referred at Sl. No. (3) above;
 - (d) The applicant shall apply for an authorisation not later than three years after passing the Central Boilers Board Examination and a person whose authorisation has not been issued within the three-year period shall be required to take the Central Boiler Board Examination and receive a passing grade; and
 - (e) The maximum age for the Competent Person shall be sixty-five years, provided the person is medically fit;
- (iii) (a) When the applicant has met the eligibility requirements as referred to in clause (ii) above and at the request of the applicant's employer; a Central Boilers Board authorisation card and a certificate shall be issued:

Provided that the request for authorisation card, only for undertaking inspection and certification of boilers during use under section 8 of the Boilers Act, 1923, can also be made by the applicant;
 - (b) The application for an authorisation shall be on forms obtained from the Central Boilers Board; and
 - (c) A Competent Person may possess only one valid authorisation card;
- (iv) (a) The validity of an authorisation certificate shall be three years from the date of issue or in co-terminus with the validity period of

recognition of employing Inspecting Authority (wherever applicable), whichever is earlier;

- (b) For undertaking inspection and certification of boilers during manufacture and erection, the Competent Person must be in regular employment of the Central Boiler Board recognised Inspecting Authority failing which the authorisation lapses;
- (c) Where the Competent Person leaves the employment, Central Boilers Board Authorisation Card shall be surrendered by the Inspecting Authority to the Secretary, Central Boilers Board within a period of seven days from the date of such leave;
- (d) the request for renewal shall be made by Competent Persons employer and the request shall certify that the Competent Person maintained inspection proficiency by performing or supervising inspection activity and that the individual has met the continuing updation requirement as laid down in clause (f):

Provided that request for renewal of authorisation, only for undertaking inspection and certification of boilers during use under section 8 of the Boilers Act, 1923, can also be made by the Competent Person, giving details of inspections undertaken in the last three years and confirming that he has met the continuing updating requirement as given in clause (f);

- (e) On change of employment, a request for authorisation card shall be made by the Competent Persons current employer on forms obtained from the Central Boilers Board;
- (f) Each Central Boilers Board authorised Competent Person, at least once every three years, shall either attend a Central Boilers Board seminar or receive other instruction related to inspections and the instruction may be in any format, e.g., classroom, home study, or web-based; the topics may include any subject of relevance to the inspection process, such as new methods, products, materials, technology or changes to construction or repair codes;
- (g) A person whose authorisation has not been renewed for five years or less may, on proper application, have the authorisation reinstated;
- (h) The employer or Competent Person, if working independently, as the case may be, shall provide verification of continuing updation as mentioned in clause (f) ; and

- (i) A person whose authorisation has not been renewed for more than five years shall be required to take the Central Boilers Board Examination and receive a passing grade;
- (v) (a) A Central Boilers Board authorisation may be revoked by the Secretary, Central Boilers Board for falsification of any statement contained in any application however the person may request reconsideration by the Secretary, Central Boilers Board;
- (b) When an evaluation reveals that a Central Boilers Board authorised Competent Person has been negligent in his duty or has made false statements on forms used for documentation of his duties, a Central Boilers Board Committee formed for the purpose may examine the evaluation and recommend to the Secretary, Central Boilers Board, a suitable action against such Competent Person. The Secretary, Central Boilers Board shall take the final decision;
- (c) If any person is aggrieved by a decision of the Secretary, Central Boilers Board, he may prefer an appeal against such decision within thirty days from the date of the decision, to the Central Boilers Board;
- (d) The decision of the Central Boilers Board shall be binding; and
- (e) Any person aggrieved by,-
 - (i) An order made or purported to be made by a Competent Person in the exercise of any power conferred by or under the Act; or
 - (ii) A refusal of a Competent Person to make any order or to issue any certificate which he is required or enabled by or under the Act to make or issue;May, within thirty days from the date on which such order or refusal is communicated to him, prefer an appeal against the order or refusal, to the Chief Inspector of Boilers of the State in which the boiler is located;
- (vi) Fee fixed by the Central Boiler Board Examination Standing Committee shall be paid for each authorisation issued, renewed or reinstated.

3.0 CONDUCT OF EXAMINATION FOR RECOGNITION OF COMPETENT PERSONS FOR INSPECTION AND CERTIFICATION OF BOILERS:

Central Boilers Board (CBB) has authorised Dr. Ambedkar Institute of Productivity (AIP), National Productivity Council (NPC) as the Agency to conduct the examination for recognition of competent persons.

The seventh examination for recognition of competent persons will be held on 20th October, 2024(Sunday). The written examination shall be consisting of two papers viz. paper 1 & 2 and viva-voce shall be held subsequently for those who qualify in the written examination.

4.0 ELIGIBILITY CRITERIA FOR APPEARING IN THE EXAMINATION FOR RECOGNITION OF COMPETENT PERSONS FOR INSPECTION AND CERTIFICATION OF BOILERS:

- (a) Must be a graduate in Mechanical (or) Production (or) Power Plant (or) Metallurgical Engineering from a recognized institution.
- (b) Minimum five years of post-qualification experience singly or cumulatively in the following fields related to boilers,-
 - (i) Design
 - (ii) Manufacture
 - (iii) Commissioning
 - (iv) Operation and Maintenance
 - (v) Inspection and certification during manufacture or operation and Maintenance
 - (vi) High Pressure Welding-Inspection
- (c) Must be Level-II NDT Certified (both during application cut-off date and during viva-voce) from ISNT/ASNT or any other professional body recognized by ISNT in Non-Destructive methods of testing in radiography and ultrasonic testing.

Note:

- (1) Applicants employed in Central Govt. / State Govt. / PSU's have to inform their employer in writing before applying and proof of the same to be submitted along with the application.
- (2) The maximum age for the applicants is **64** years as on 17th September, 2024, provided the person is medically fit.
- (3) Training period shall not be considered as experience.
- (4) Work experience until 17th September 2024 shall be taken to calculate the total work experience for those persons who are employed currently and the last date of their previous employment for those persons unemployed currently.

5.0 SYLLABUS/CURRICULUM FOR THE EXAMINATION FOR RECOGNITION OF COMPETENT PERSONS FOR INSPECTION AND CERTIFICATION OF BOILERS:

- a) The examination will consist of the following two papers:
 - (i) **Paper – I:** (150 marks), Open book, Multiple Choice Questions (MCQ) & descriptive examination on “Boilers Act,1923 and Indian Boiler Regulations,1950 and their compliance & Boiler Design Engineering” **[3 hours duration]**
 - (ii) **Paper - II:** (150 marks) Open book, Multiple Choice Questions (MCQ) & descriptive examination on “Boiler Design, Manufacturing, Materials, Erection, Commissioning, Operation & Maintenance, Inspection & Certification during manufacture or operations and High-Pressure Welding Inspection”. **[3 hours duration]**
- b) Viva-Voce 130 marks.
- c) The candidate shall secure at least 45% marks in individual written examination papers and at least 60% marks in aggregate to qualify for viva-voce.
- d) Candidate shall secure at least 60 % marks in aggregate (written exam with 70% weightage and viva-voce with 30% weightage) in order to pass the examination.
- e) The Central Boilers Board shall issue a passing grade certificate to the candidate after passing the examination.

6.0 REQUIREMENTS FOR PASSING THE EXAMINATION FOR RECOGNITION OF COMPETENT PERSONS FOR INSPECTION AND CERTIFICATION OF BOILERS:

A candidate should secure at least 45% marks in individual written examination papers and at least 60% marks in aggregate to qualify for viva-voce;.

Only candidates passing the written examination shall be allowed to appear for Viva-Voce.

Examination will contain the following papers:

Paper – I	Open Book, Multiple Choice Questions (MCQ) & descriptive examination on Boiler Act,1923 and Indian Boiler Regulations,1950 and their compliance & Boiler Design Engineering	3 Hours Duration	150 Marks
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Paper – II	Open Book, Multiple Choice Questions (MCQ) & descriptive examination on Boiler Design, Manufacturing, Materials, Erection, Commissioning, Operation & Maintenance(O&M), Inspection & Certification during manufacture or operations and High-Pressure Welding Inspection	3 Hours Duration	150 Marks
	Viva – Voce		130 Marks

7.0 SCHEDULE OF EXAMINATION:

Date/Day	Paper	Timings	Examination	Marks
20/10/2024 Sunday	Paper – I	Morning Session 09.30 a.m. to 12.30 p.m. (3 Hours)	Open book, Multiple Choice Question & descriptive examination on Boiler Act,1923 and Indian Boiler Regulations,1950 and their compliance & Boiler Design Engineering	150
20/10/2024 Sunday	Paper – II	Afternoon Session 02.00 p.m. to 05.00 p.m. (3 Hours)	Open book, Multiple Choice Question (MCQ) & descriptive examination on Boiler Design, Manufacturing, Materials, Erection, Commissioning, Operation & Maintenance(O&M), Inspection & Certification during manufacture or operations and High Pressure Welding	150
(Date will be decided & intimated later)			Viva-voce	130

8.0 EXAMINATION CENTRES:

The written examination centres are as follows: -

S. No.	Centre
1.	Chennai
2.	Hyderabad
3.	Kolkata
4.	Mumbai
5.	NCT of Delhi

The applicants will have to give three choices of examination centre in the order of their preference. If the number of applications for a particular centre is found to be less than the minimum required number, the examination centre for those applicants may be shifted to their next preferred centre at NPC's own discretion. NPC reserves the right to cancel any centre at its discretion.

9.0 EXAMINATION FEE:

Rs.4720/-(Rupees four thousand seven hundred twenty only) for General Category candidates and Rs.2360/- (Rupees two thousand three hundred sixty only) for SC/ST candidates. The above-mentioned fees are inclusive of 18% GST. However, GST rate will be applicable based on notification by GOI at the time of payment.

Presently, the GST rate is **18%**. However, Goods and Services Tax prevailing will be applicable based on notification by Government of India at the time of payment of fee.

Fee once paid will not be refundable under any circumstances.

The Examination fee shall be paid through online portal during the registration process.

10.0 REFERENCE BOOK FOR OPEN BOOK EXAMINATION

The candidates shall refer the book on Indian Boilers Regulations, 1950 for their open book examination. The candidates should bring their own current edition of IBR Book (the book should not have any notes/ scribbling/ marks) other than that any other book/photocopy of IBR is not allowed.

The necessary technical data sheets, if required shall be supplied to the candidates during the examination.

11.0 LAST DATE FOR ONLINE APPLICATION & REGISTRATION PROCESS

The online registration portal for the Examination shall be open **till 17th September 2024(till 5 p.m. only)**. The last date for the online application form along with the necessary enclosures and requisite fee is **17th September 2024 (till 5 p.m. only)**. Applications received after the deadline will not be considered.

Fees once paid will not be refunded under any circumstances.

On receipt of the online application form, the candidates would be provided with acknowledgement through email. The application and supporting documents will be scrutinized and if found eligible, hall ticket for the written examination will be generated online.

The hall ticket can be downloaded from the portal one/two weeks before the commencement of the written examination. The same will be intimated to the candidates via email/mobile.

Results of the written examination of all the candidates would be displayed on NPC's website. Communication would also be sent by email to the qualified candidates, requesting them to appear in Viva-voce.

12.0 ROLE OF NPC

The Central Boilers Board has authorized the National Productivity Council (NPC) to conduct the examination for Competent Persons and to declare the results. NPC will carry out the following activities: -

1. Dr. Ambedkar Institute of Productivity, NPC, Chennai will receive and process the online applications from the candidates and register them as per the laid down procedures.
2. NPC will send all necessary instructions in respect of the Examination and other details such as hall ticket, the venue of examination, timings, code of conduct for the candidates who are registered for the examination.
3. NPC will administer the written examination and viva-voce at designated centres subject to the availability of minimum number of candidates.

13.0 CONDITIONS AND INSTRUCTIONS TO THE CANDIDATES

1. Candidates are advised to go through the prospectus before filling in the online application form & all entries should be correctly filled.
2. Candidates should have valid proof of work experience certificate as per the eligibility criteria duly certified by the employer.
3. Candidates should have valid Degree certificate as per the eligibility criteria
4. Valid Level-II NDT Certificates from ISNT/ASNT or any other professional body recognized by ISNT in Non-Destructive methods of testing in radiography and ultrasonic testing.
5. Candidates should have recent passport size photograph and signature.
6. The Examination fee shall be paid through online portal during the registration process.

7. Candidates belonging to SC/ST category will be required to upload the necessary supporting documents (caste certificate) as mentioned in the prospectus and as per the **formats applicable for Govt. of India**. Other formats issued in local languages will not be accepted strictly.
8. Candidates should have a valid E-mail ID for any communication
9. The last date for the submission of online application form along with the necessary enclosures and requisite fee is 17th September 2024 (till 5 p.m. only). Applications received after the deadline will not be considered.

Note: All future correspondence related to the Examination should be made preferably through e-mail only.

10. The fees paid by a candidate shall not be refunded or adjusted under any circumstances on the basis of medical or any other grounds, including the rejected applications. Hence, candidates are required to ensure that they are eligible in all aspects before filling the online application.
11. The candidates will have the responsibility to cross-check the information on allotted examination centres, issue of hall tickets and other instructions issued from time to time, from the designated website.
12. Request for exemption from age limit or other qualifications will receive no attention. Requests for furnishing causes of failure in the written examination or for non-selection based on the results of the written examination will not be entertained.
13. Request for re-totaling /re-valuation shall be entertained only within one week of declaration of result of written examination on the NPC website on payments of requisite fee.
14. Central Boilers Board Examination Standing Committee reserves the right to change and cancel the examination dates / centres due to any unforeseen reasons and reasons beyond its control.
15. Applications received after the deadline, OR in any other format other than the prescribed one, OR incomplete will be summarily rejected. Applications received without relevant enclosures would be rejected without assigning any reason.
16. In all subsequent correspondence, make sure that invariably you quote the registration number, which you will receive in your acknowledgment by email.
17. For any clarification. Contact us at boilerexam@npcindia.gov.in
18. For Examination updates visit website: www.npcindia.gov.in
19. The decision of the Central Boiler Board Examination standing committee in all matters related to the above examination will be final and binding on the candidates and no enquiry/correspondence will be entertained in this regard.

14.0 LIST OF ENCLOSURES TO BE UPLOADED ON THE ONLINE PORTAL

1. Recent Passport Size Photograph in JPEG format with size up to 1MB.
2. Candidate Signature in JPEG format with size up to 100KB.
3. Proof of age in PDF format with size up to 1MB.
4. Proof of the requisite educational qualifications in PDF format with size up to 1MB
5. Proof of the requisite NDT certificates (UT&RT) in PDF format with size up to 1MB each.
6. Proof of the requisite work experience certificate/s duly certified by the employer/s, compiled in a single PDF format with size up to 1MB.
7. NOC/Proof of Intimation to Employer (Only if employed in Govt./PSUs) in PDF format with size up to 1MB.
8. Proof of Community certificate as per Govt. of India format, in case of claiming fee concession (only for SC/ST Category) should be in PDF format with size up to 1MB. **Certificates issued in local languages will not be accepted.**

Candidate who are qualified for viva-voce, must bring their original of the documents uploaded during the online application process viz. educational qualification certificate, NDT certificates, Age proof, Work Experience certificates for verification purpose during viva-voce.

15.0 SYLLABUS

**Paper: 1 - Boiler Act, Indian Boiler Regulations and their compliance and Boiler Design Engineering
(Three hours, Open Book (IBR, 1950 & the Boilers Act, 1923), Multiple Choice Question & Descriptive Examination)**

Boiler Act and Indian Boiler Regulations:

Salient Features of Boiler Act 1923 (as amended) and Indian Boiler Regulations, 1950 (as amended).

Water tube boilers: Classification of boilers- Natural circulation, Forced circulation, Fluidized Bed Combustor Boiler (FBC), Circulating Fluidized Bed Combustor Boiler (CFBC), Waste heat boiler, Chemical recovery boilers, Cycles for Steam Power Plants.

Once through boilers, Supercritical boiler and Ultra-supercritical boiler functions and differences, advantages and disadvantages.

Solar Boilers, unfired boilers including thermic fluid boilers

Water circuit and steam circuit.

Fire tube boiler: Shell type boilers – Horizontal and Vertical boiler, Various types of furnaces, Furnace heat release rates for solid fuel and Oil fired Boilers, Methods of various attachments in Shell and furnaces.

Boiler Design and Engineering :Design calculation methods – factors to be considered in designing a boiler, boiler layout, pressure part arrangement, pressure and temperature drops across the boiler - temperature control methods, High temperature properties (Hot yield, creep) of steel and design criteria for ascertaining permissible stress and maximum temperature for use of each grade of steel - Design calculation to ascertain maximum working pressure of parts, tubes exposed to hot gases connecting pipes, headers, pipes and drums, ligament efficiency, method of compensation for opening, method of attachment of tubes and branch pipes, Longitudinal Stress, bending moment etc., weld coefficient.

Elements of feed water heaters –Design and construction including tube expansion methods.

Design & working pressure calculations for shell type boilers, ligament efficiency, end plates / tube plates, tube design, furnace design, method of compensation for openings, stay rods, gussets, stiffeners, pressure circle calculations etc.

Various boiler mountings and auxiliaries like fusible plugs, safety valves, safety valve selection criteria and capacity calculation, electromatic safety valves, drum level indicators, selection of feed water pumps etc.

Boiler components, piping, fitting, steam receivers, valves, steam traps, new materials.

Criteria for adopting Pressure reducing and desuperheating stations (PRDS), Feed water control system, Tees, elbows, bends and fittings.

Metal temperature calculations for various sections of boiler.

Paper – 2 - Boiler Design, Manufacturing, Materials, Erection, Commissioning, Operation and Maintenance, Inspection & Certification during manufacture or operations and High Pressure Welding Inspection

(Three hours, Open Book (IBR, 1950 & the Boilers Act, 1923), Multiple Choice Question & Descriptive Examination)

Boiler Design

All aspects of boiler design included.

Materials

Classification of materials, Classification of steels, boiler materials, basic metallurgy, weldability of materials, plates, pipes, tubes, casting and forgings of boiler quality and welding electrodes, process of steel manufacturing, chemical composition, mechanical properties, tolerances, knowledge on equivalent international materials used in boiler manufacture, well known steel /forge/foundry/ pipe / tube maker etc requirements, procedures, inspection and testing to be done in the absence of well-known recognitions, new materials.

Construction and workmanship

Welding- Welding procedure, Welders Qualification, Initial Qualification & renewal for welders, Conditions under which requalification test is required, tests to be done on plate/Pipe & Tube for Initial and requalification, Essential variables.

Welding processes : SMAW, GTAW, SAW, FCAW, GMAW, Combination welding, Plasma, Flash butt welding, Induction Pressure welding, etc., welding consumables and their classification, welding engineering (joint design, fit-up, weld & welding symbols), reinforcement requirements, weld defects unique to each weld-fit-up process and their acceptance norms, methods & norms for weld repairs.

Welding Consumables - initial/periodic check tests on consumables as per IBR.

Preheating, Post heating and Post weld heat treatment, Criteria for application of PWHT for Shells, Drums, Headers, piping, Tubular products, method of loading, calibration of furnaces and measuring instruments, soaking temperature / time, Rate of heating / cooling .

Different process adopted in welding of tubes, pipes, Shells, Visual Inspection of welds, reinforcement requirements, acceptance norms for weld defects, norms & method for weld repairs.

Non-destructive Testing: Mandatory NDT requirements for various welds on tubes, pipes, headers and drums, Qualification of NDE personnel.

PT- Liquid Penetrant Testing

Principles of liquid penetrant process, Lighting for liquid penetrant testing Materials for liquid penetrant testing, Testing of materials, Interpretation/Evaluation, Factor affecting indications, Indications from discontinuities, Procedures, Codes/Standards/Specifications. Non relevant indications.

MT- Magnetic Particle Testing

Characteristics of magnetic fields and equipments, Technique/Calibrations, Selecting the proper

method of magnetization, Magnetic particle test indications and interpretations, Procedures, Codes/Standards/Specifications. Non relevant indications.

RT-Radiographic Testing

Principles Radiographic imaging, Sources for radiation, Techniques / Calibration, Imaging considerations, Image Quality Indicator (IQI), Density of material, Viewing of radiographs, Judging radiographic quality, Interpretation and Evaluation: Radiographic appearance of discontinuities, Non-relevant indications, Film artifacts, Film identification and correlation of the weld, Procedures, Codes/Standards/Specifications.

UT-Ultrasonic Testing

Principles, Equipment/Materials, Pulse/echo instrumentation, Calibration blocks, Techniques/Calibrations, Use of all types of probes, Calibration(electronic and functional), Interpretation and Evaluations: Evaluation of base metal, product forms, Evaluation of weldments, Variables affecting test results, Procedures, Codes/Standards/Specifications.

Radioscopy Test (Fluoroscopy).

Field installation and registration

Review of document of boiler parts as received and correlation to the corresponding part - Verifying the qualification of welders, NDE personnel etc, review and remedial action, Inspection during field installation w.r.t parts identification, Weld setups, Welding and non destructive examination. Evaluation of field welds by RT, UT, HT or PT or by combination.

Heat Treatment where applicable method for local HT and controls - Witnessing final Hydraulic test before thermal insulation, water quality and temperature, Safety Valve set / reset pressure, discharge capacity, Safety valve set pressure and discharge capacity for waste Heat Boiler with auxiliary firing, Water level indicator and use of remote Water level indicator, Steam pipe lines cold / hot condition flexibility and hanger settings, Verification of instruments to measure metal temperature, Steam temperature and pressure, Protection of boilers through burner management system (Fuel cut off systems, flame scanner and trips , interlocks etc.).

Documentation for registration of boilers.

Inspection & Certification:

Stages of Inspection during manufacture of Boiler/Boiler Components, erection and use of different IBR forms and their applicability, Memorandum of Inspection or registration Book (Form I) and its salient features.

Requirements for Registration of boilers.

Repair and Renewal of Certificate for use of Boilers:

Procedure for Inspection and repair of Installed Boilers & Steam pipes.

Boiler Operation and Maintenance

Chemical requirements of feed water, Boiler water, steam quality for low, medium pressure, high and super-critical Boilers, sampling methods, test method, Carryover, scale and sludge, scaling of fireside of heating surfaces, steam contamination and its control, prevention of

deposit formation in boiler units, corrosion of heating surfaces, Start & stop sequence, operation procedure, critical boiler parameters, alarms and annunciators, contingency action plan, safety precautions.

Boiler emergencies – How to handle

Boiler explosions – Reasons and Preventions

Boiler repairs – Methods and procedure, Failure analysis

Thick walled component repair at site – Precautions and limitations, Preheating and post heating, Post Weld Heat Treatment

Maintenance schedule – shutdown maintenance, procedure, safety precautions, work permit system, restarting procedure, acid cleaning, hydraulic test, light up of boiler, commissioning

Data acquisition and analysis – Broad idea, importance

Boiler inspection periodicity, methods, procedure

In service periodic inspection

Review mandatory requirements of operating boilers, Procedures for conducting periodic hydraulic test of operating boilers, Elements of mode of failures of metals, Assessment of condition of boilers: - Review past record of boilers w.r.t. failures, outages, repairs / replacements of pressure parts, Visual inspection of external & internal surfaces for visible damages, loss of metal by erosion/corrosion, condition of tube supports, spacers etc., fire side scaling, ash/slag fouling, Boilers with record of frequent failures may require detailed investigation by conducting NDE using Dye penetrant / magnetic particle test for detecting cracks or UT to determine thickness of tubes or cracks in dissimilar welds / fillet / butt weld cracking or RT insitu metallurgical examination, Conducting laboratory examination on tube samples for erosion / corrosion, creep damage, hydrogen embrittlement, Stress Corrosion Cracking, Oxygen pitting, Oxidation, fire side fouling, water side deposits and need for chemical cleaning etc., Authorization for repairs & replacement, Verifying the condition of safety valves, water level gauges and other mounting, instruments for measuring temperature and pressure and fire protection systems and interlocks, Isolation of steam and water circuits in battery of boilers and other safety measures.

Remnant Life Assessment (RLA) of boilers

Criteria for R L A – Tests required for various boiler components, Evaluation methods for remaining life.

Fuel – Air – Gas system

Basics knowledge in the areas like Primary fuels, principles of combustion, chemistry of combustion, pulverized coal fired furnaces, fuel oil and gas fired furnaces, controls and instrumentation and their effect on boiler functioning. Isolation of Fuel/Flue Gas during inspection.

Layout and Sketches

Layout and Sketches of boilers & boiler components, steam & feed water circuits and their parameters.

ABOUT NATIONAL PRODUCTIVITY COUNCIL

NPC is a national level organization to promote productivity culture in India. Established as a registered society by the Government of India, it is an autonomous tripartite, non-profit organization with equal representation from the government, employers and workers organizations apart from the technical and professional institutions on its governing council. NPC provides consultancy, training and undertakes research in the area of productivity, besides implementing the productivity promotion of the Tokyo based Asian Productivity Organization, an inter-governmental body of which the Government of India is a founder member.

SPECTRUM OF SERVICES

NPC has more than five decades of experience deploying the best practices, preferred methods & standards and advanced productivity software across a spectrum of industries and services. The organization specializes in a wide range of services to promote productivity, competitiveness and cost effectiveness through.

Awareness Generation: Propagating productivity quality and competitiveness through seminars, workshops, publications and other suitable methods.

Consultancy: Improving productivity for competitiveness through consultancy work of the private and public corporate sectors. SMEs, Governments and other client groups.

Training: Training of executive managers, workers, supervisors and others

Research: Conducting research studies and surveys on productivity and related matters.

ENTERPRISE LEVEL:

Process Management: Total Quality management, ISO 9000 certification, Business Process Re- engineering, KAIZEN, Benchmarking, Customer Relations Management (CRM).

Information Technology: Management Information System, E-governance, IT Infrastructure Planning.

Energy Management: Energy Audits, Co-operation, Demand side Management, Renewable and Green Energy Sources, Process Optimization and Energy Conservation.

Environment Management: Integrated Environment Planning, Environment Audit, Cleaner Production Techniques, Hazardous Waste Management, Waste Minimization and Utilization, Green Productivity, ISO 14000 & OSHAS 18000.

Economic Services: Policy Research and Consultancy, Productivity Audit.

Human Resources Development: Work Culture, Participative Group Activities, Work Load Assessment, Organization Redesign, Productivity Linked Reward/Wages Scheme, Training needs Assessment.

Technology Management: Condition Monitoring, Safety Audit, Assessment, Total Productivity Maintenance, Maintenance system evaluation study.

World Class Manufacturing: Flexible/Cellular Manufacturing, Cycle Time Reduction, Six Sigma.

Agribusiness: Food Processing, Soil and Water Conservation.

*“What we know is only a
handful, what we don’t know is
an ocean”*

- Avvaiyar, Tamil poet, 2 AD.

For any further details, please contact

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