

**EXAMINATION FOR COMPETENT PERSONS
FOR
INSPECTION & CERTIFICATION OF BOILERS**

24th April 2011 (Sunday)



CENTRAL BOILERS BOARD
Ministry of Commerce and Industry
(Department of Industrial Policy and Promotion)
Govt. of India, New Delhi.



Regional Professional Management Group
National Productivity Council

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**Secretary
Central Boilers Board
Ministry of Commerce and
Industry
(Department of Industrial Policy
and Promotion)
Government of India, New Delhi.**

Foreword

The Indian 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. Since then there had been no major amendments to the Act. The legislation required changes in consonance with the evolving developments and changes in the technology of fabrication, operation, testing and inspection of boilers.

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

Notification containing regulations for implementing many provisions of the amendment Act including for implementing the inspection by the third party inspecting authorities and competent persons has been published in the Gazette of India on 7th October, 2010.

As per regulations notified on 7th October, 2010, first examination is now being conducted for recognition of competent persons for undertaking inspections & certification of boilers during manufacture, erection and use by the third party inspecting authorities in India.

Central Boilers Board (CBB), Government of India has authorized National Productivity Council (NPC) to conduct the first examination for competent persons.

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

T.S.G. Narayannen

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1.0 BACKGROUND:

As per the amendments made in the Boilers Act, 1923 by the Indian Boilers (Amendment) Act, 2007 and in the Indian Boiler Regulations, 1950 vide Notification No. G.S.R. 821(E) dated 7th October, 2010, a provision has been made for inspection and certification of boilers and boiler components during manufacture, erection & use by “Competent Persons” recognized by the Central Boilers Board. As per these amendments, a third party “Inspecting Authority” in India is required to engage Competent Persons to undertake inspection and certification of boilers and boiler components during manufacture, erection & use. Central Boilers Board (CBB), Government of India has authorized National Productivity Council (NPC) to conduct the first examination for competent Persons.

2.0 PROCEDURE FOR RECOGNITION OF COMPETENT PERSONS

Regulation 4J of the Indian Boiler Regulations, 1950 prescribing procedure for recognition of Competent Person is as under:

2.1 4J. PROCEDURE FOR RECOGNITION OF COMPETENT PERSON

2.1.1 Introduction:-

(a) this regulation provides the requirements for the uniform qualification, examination, issuance and renewal of Central Boiler Board authorisation to act as a competent person;

(b) candidates meeting these requirements may be qualified to be issued a Central Boilers Board authorisation;

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

2.1.2 Minimum qualifications and experience:-

- (a) must be a graduate in Mechanical Engineering from a recognized institution;
- (b) minimum five years experience singly or cumulatively in the following fields related to boilers subject to the condition minimum of two years shall be in operation and maintenance of 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) Level-II NDT Certificates from ISNT or any other professional body recognised by ISNT in Non Destructive methods of testing in radiography and ultrasonic testing.

2.1.3 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 methods namely:-
 - (a) written Examination consisting of 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;
 - (b) viva-voce on the above(30 % weightage shall be given for viva-voce);
 - (c) the Central Boiler Board will issue a passing grade certificate to the candidate after passing the examination;
 - (d) candidate shall secure at least 60 % marks in written examination as well as viva-voce in order to pass 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.

2.1.4 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;
 - (b) the applicant shall meet the minimum qualification and experience requirements as referred in sub-regulation 2 of this regulation;
 - (c) the applicant shall have taken and passed the Central Boilers Board examination as referred to in sub-regulation 3 of this regulation;
 - (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 65 years provided the person is medically fit;
- (iii) (a) when the applicant has met the eligibility requirements as referred in clause (ii) of sub-regulation 4 and at the request of the applicant's employer, a Central Boilers Board authorisation card and a certificate shall be issued;
- (b) the application for an authorisation shall be on forms obtained from the Central Boilers Board;

- (c) a Competent Person may possess only the valid authorisation card listing one employer;
- (iv) (a) the validity of each 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 whichever is earlier;
- (b) the Competent Person must be in regular employment of the Central Boiler Board recognised Inspecting Authority failing which the authorisation lapses;
- (c) if 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;
- (d) the request for renewal shall be made by Competent Person's 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 given in clause (f) of this sub-regulation;
- (e) on change of employment, a request for authorisation card shall be made by the Competent Person's 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 from the employer, have the authorisation reinstated;
- (h) the employer shall provide verification of continuing updation as mentioned in clause (f) ;
- (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 the Competent Person. The Secretary, Central Boilers Board shall take the final decision;
- (c) if any individual is aggrieved by a decision of the Secretary, Central Boilers Board, the individual has the right to appeal to the Central Boilers Board, through the Secretary, Central Boilers Board and such appeal shall be within thirty days of the date of the decision;
- (d) the decision of the Central Boilers Board shall be binding;
- (e) any person aggrieved by,-
 - (i) an order made or purporting 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, appeal against the order or refusal to the Chief Inspector of Boilers of the state in which the boiler is located;
- (vi) a fee established by the Central Boiler Board Examination Standing Committee shall be paid for each authorisation issued, renewed or reinstated.

2.1.5 Use of Central Boilers Board Authorisation Number:- The Central Boilers Board authorisation number shall be recorded on all Indian Boiler Regulations forms used by him and on the items inspected and stamped as a proof of inspection and the authorisation number shall also be entered into the competent person's diary.

2.1.6 Competent Person's Diary:-

- (i) each Competent Person involved with new construction activities, in-service inspection and repairs and alterations under Indian Boiler Regulations must receive a separate diary from Central Boiler Board for each activity;
- (ii) the request for the diary shall be routed through his employer Inspecting Authority;
- (iii) the diary must be bound and the purpose of the diary is to provide a record of the Competent Person's activity and to support the continuity of inspections;
- (iv) the Competent Person's diary is the property of the employer Inspecting Authority and must be available at the location of the inspection.
- (v) the diary must be maintained for minimum of five years from the date of last entry and in due course diary may be maintained in digitised form with provision for online entries.

2.1.7 Duties and responsibilities of Competent Person.-

- (i) the Competent Person and owner shall inform the Chief Inspector of the concerned state at least thirty days in advance about the date of inspection fixed for a boiler;
- (ii) Memorandum of Inspection Book shall be obtained from the concerned boiler inspectorates through the Inspecting Authority for in-service boilers which shall be returned within a period of five days from the date of completion of final inspection;
- (iii) the Competent Person shall discharge the following duties at various stages, namely.-

2.1.8 Inspection during manufacture, erection and commissioning.-

- (a) work to the satisfaction of the Inspecting Authority for inspection during manufacture, erection and commissioning of boilers as per the provisions contained in the Indian Boiler Regulations ;
- (b) inspect during manufacture and erection as per the procedure given in Appendix -J of Indian Boiler Regulations ;

2.1.8.1 In-service inspections.-

- (a) verify whether the stamping or nameplate is legible and represents the item described on the inspection documentation;
- (b) perform external and internal inspections and witness any required pressure tests;
- (c) report the inspection results, including any nonconforming conditions, in the manner prescribed to the owner of the boilers;

2.1.8.2 Repairs and alterations under Indian Boiler Regulations.-

- (a) verify that the boiler owner has informed in writing to the chief inspector and the activity is permitted under the scope of the certificate or the structural alteration, addition or renewal is made under his supervision;
- (b) verify that the boiler repairer has the valid certificate under the Indian Boiler Regulations ;
- (c) monitor the quality control system and verify the system is being implemented to the requirements of the Indian Boiler Regulations;
- (d) verify that all material complies with the Indian Boiler Regulations;
- (e) verify that all welding procedure specifications, procedure qualification records, and welder and welding operation records conform to the Indian Boiler Regulations ;
- (f) verify that heat treatments as required under the Indian Boiler Regulations have been performed and properly documented;
- (g) verify that non-destructive examinations and tests as required under the Indian Boiler Regulations have been performed and properly documented;
- (h) witness pressure tests as required under the Indian Boiler Regulations ;
- (i) verify that information in the Indian Boiler Regulations report forms is correct and that the details have been properly punched;
- (j) verify that the stamping is correct.

2.1.8.3 Inspection Fee:-Competent Person may charge fee for the inspection subject to the condition that the fee shall not be less than the fee specified by the concerned State.

2.1.9 Inspection requirements:-

Inspection shall be carried out as per regulations 375 to 395G and the relevant certificate as per Indian Boiler Regulations shall be issued as follows, namely:-

2.1.9.1 For in-service Boilers inspection:

- (a) one copy shall be given to the owner of boiler on the day of inspection ;
- (b) one copy shall be given to Chief Inspector along with the Memorandum of Inspection Book (Form-I);
- (c) one copy shall remain in Book.

2.1.9.2 For inspection during manufacture:

- (a) one copy shall be given to the manufacturer;
- (b) one copy shall remain with Inspecting authority.

2.1.9.3 For inspection during erection:

- (a) one copy shall be given to the owner of boiler;
- (b) one copy shall be given to Chief Inspector;
- (c) one copy shall remain with Inspecting authority.”

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

Central Boilers Board (CBB) has nominated National Productivity Council (NPC) as the Agency to conduct the examination for competent person

The examination for competent persons will be held on 24th April 2011.

There will be three papers viz. paper 1, 2 & 3 and viva-voce would be held subsequently for those who qualify in the written examination.

4.0 ELIGIBILITY CRITERIA FOR APPEARING IN THE EXAMINATION FOR COMPETENT PERSONS:

- (a) Must be a graduate in Mechanical Engineering from a recognized institution.
- (b) Minimum five years experience singly or cumulatively in the following fields related to boilers subject to the condition that minimum two years shall be in operation & Maintenance of 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) Level-II NDT Certificates from ISNT or any other professional body recognized by ISNT in Non Destructive methods of testing in radiography and ultrasonic testing.

Note: (1) Age: Maximum age for the applicants is 65 years as on 31st March, 2011 provided the person is medically fit.

(2) Applicants employed in Central Govt./State Govt./PSUs have to inform their employer in writing before applying.

(3) Training period will not be considered as experience.

5.0 SYLLABUS/CURRICULUM FOR THE EXAMINATION FOR COMPETENT PERSONS:

- a) The examination will be consisting of the following three papers.
 - (i) **Paper-I** (Duration 2 Hours): It shall be an open book descriptive examination on boiler design engineering (100 marks)
 - (ii) **Paper-II**(Duration 1 hours): It shall be an open book, Multiple Choice Question (MCQ) type examination on Regulations, Welding, Heat Treatment and Safety (100 marks)

- (iii) **Paper-III** (Duration 3 Hours): It shall be a “No Book” descriptive examination on Operation & Maintenance (O&M), Commissioning, NDT, materials and erection (150 marks).
- (iv) **Viva-Voce on the above : 150 marks**

- b) Viva-Voce 150 marks. The candidate should obtain a minimum of 50% in each paper with aggregate of 60% in three papers in the written examination in order to be eligible for viva-voce. The pass marks for viva-voce examination is 60%
- c) The Central Boiler Board will issue a passing grade certificate to the Candidates after passing the examination

The syllabus for the examination for competent persons is given in **Annexure-1**

6.0 REQUIREMENTS FOR PASSING THE EXAMINATION FOR COMPETENT PERSONS:

- (i) A candidate shall secure at least 50% in each and 60% aggregate marks in written examination as well as viva-voce in order to pass the examination.

Examination will contain the following papers:

Paper - 1	Open book descriptive examination on boiler design engineering	2 Hours Duration	100 Marks
Paper - 2	Open book, Multiple Choice Question (MCQ) type examination on Regulations, Welding, Heat Treatment and Safety	1 Hour Duration	100 Marks
Paper - 3	No Book, descriptive examination on Operation & Maintenance (O & M) Commissioning, NDT, Materials and Erection	3 Hours Duration	150 Marks
	Viva – Voce		150 Marks

Schedule of Examination:

Date/Day	Paper	Timings	Examination	Marks	Overall Weightage
24/4/2011	Paper – 1	Morning Session 9.30 to 11.30 (2 Hours)	Open book descriptive examination on boiler design engineering	100	20%
24/4/2011	Paper – 2	Morning Session 11.30 to 12.30 (1 Hour)	Open book, Multiple Choice Question (MCQ) type examination on Regulations, Welding, Heat Treatment and safety	100	20%
24/4/2011	Paper – 3	Afternoon Session 2.00 to 5.00 (3 Hours)	Descriptive examination on Operation & Maintenance (O & M) Commissioning, NDT, Materials and Erection	150	30%
(As required)			Viva-Voce	150	30%
Total marks				500	100%

7.0 EXAMINATION CENTRES:

The examination centres are as follows:-

S. No.	Centre
1.	Chennai
2.	Mumbai
3.	Kolkatta
4.	New Delhi

The applicants will have to give two choices of examination centre in 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 can be shifted to their next preferred centre.

EXAMINATION FEE:

Rs.5800/- (Five thousand eight hundred only) for General Category candidates and Rs.4350/- (Rupees four thousand three hundred fifty only) for SC/ST candidates.

The fee shall be paid by Demand Draft favouring National Productivity Council, payable at Chennai

8.0 REFERENCE BOOKS FOR OPEN BOOK EXAMINATION

The candidates will refer the book on Indian Boilers Regulation for their open book examination. The candidates should bring their own current edition of IBR Book without any notes / marks. No other book is not allowed.

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

9.0 REGISTRATION PROCESS

Registration for the Examination will be done on receipt of the filled-in application form along with requisite fees from the candidates

The candidates have to download the application form and send the filled in forms with all necessary enclosures. Once application is received in physical form, the same will be scrutinized and if found eligible, a Registration No. will be allotted and acknowledgement would be sent by e-mail.

The Hall Tickets would be sent two weeks before the commencement of the examination.

The results of the written examination will be communicated to all the candidates and also displayed online at www.aipnpc.com & www.npcindia.org

10.0 ROLE OF NPC

The Central Boilers Board has authorised the National Productivity Council (NPC) to conduct the examination for Competent Persons and declare the results.

NPC will carry out the following activities: -

1. Regional Professional Management Group (RPMG), NPC, Chennai will receive and process the 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 examination in four centres subject to the availability of minimum number of candidates.

11.0 CONDITIONS AND INSTRUCTIONS TO THE CANDIDATES

1. Candidates are advised to go through the prospectus before filling the application form & all entries should be correctly filled.
2. Attach proof of work experience certificate as per the eligibility criteria.
3. Attach an attested Photostat copy of Degree certificate as per the eligibility criteria & Level II of NDT certificate.
4. Affix three recent passport size photographs (one self attested in the application form, one in the hall ticket and one in the Examination centre check form).
5. Enclose Demand Draft towards the fees in favour of **National Productivity Council, payable at Chennai.**

6. Candidates belonging to SC/ST category will be required to submit the attested copies of the necessary supporting documents 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.
7. Candidates should have an E-mail ID (If you don't have an email account please create one)
8. Filled-in application form along with requisite fee should reach the following address on or before 25th March 2011.

Head (RPMG)
Regional Professional Management Group
National Productivity Council
6, SIDCO Industrial Estate,
Ambattur, Chennai – 600 098
Tel. No. 044 – 26252467/26253144/9841401293
Fax No. 044 – 26253122
Email: npc.chn@gmail.com/rpmg.chennai@npcindia.org
Website: www.aipnpc.com

Note: All correspondence related with Examination should be made to the above address preferably on e-mail.

9. The fees paid by a candidate who has been admitted to the Examination, shall not be refunded or adjusted under any circumstances on the basis of medical or any other ground.
10. 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 mentioned website.
11. Any candidate, who does not receive or loses the admission ticket, shall report to the allotted examination centre with documentary evidence of having registered for Examination. Information about allotted examination centres may be seen at the web-site mentioned in the prospectus.
12. (a) If a candidate on declaration of the results of Examination is not satisfied with the marks given in any paper(s) and feels that there is possibility of either

omission in marking of any answer(s) or there is possibility of mistake in totalling of the marks in any paper(s), the candidate may seek verification of all or any paper on his submitting an application accompanied by a fee of Rs 200 for each paper, to be paid by DD drawn in favour of “**National Productivity Council**” payable at “**Chennai**”, within a weeks’ time from the announcement of the result. NPC would check for re-totalling and whether all the questions attempted by the candidates has been evaluated.

(b) The process of verification shall be completed with in a period of two weeks from the date of receipt of the application by NPC.

(c) The marks obtained by a candidate in individual questions of paper(s) shall not be supplied.

(d) Request for revaluation of evaluated Answer Books will not be entertained.

(e) Photocopies of evaluated Answer Books will not be made available to candidates.

13. Central Boilers Board Examination Standing Committee reserves the right to change the examination dates / centres due to some unforeseen reasons and reasons beyond its control.
14. Applications received after the last date OR in any other format other than the prescribed one OR incomplete will be summarily rejected. Delays in transit and applications without relevant enclosures would be rejected without assigning any reason.
15. In all subsequent correspondence make sure that invariably you quote the registration number, which you will receive in your acknowledgment by email.
16. For any clarification. Contact us at
npc.chn@gmail.com/rpmg.chennai@npcindia.org
17. For Examination updates visit websites www.aipnpc.com

12.0 LIST OF ENCLOSURES TO BE ATTACHED WITH THE APPLICATION

- 1 Proof for requisite educational qualification. (Certificate should be attested by a Gazetted Officer / Employer).
- 2 Proof for requisite experience in the prescribed format.
- 3 DD in favour of National Productivity Council payable at Chennai.
- 4 Three recent passport size photographs (one self attested in the application form, one in the hall ticket and one in the Examination centre check form).
5. Proof of SC/ST certificates as per Govt. of India format in case of claiming fee concession. **Certificates issued in local languages will not be accepted.**
6. Duly filled Hall Ticket & centre check form along with photograph
7. Proof of age.

SYLLABUS

Paper: 1

Boiler Design Engineering

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.

Supercritical boiler functions and differences, advantages and disadvantages.

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, Tube Plate Design, Gussets and Pressure circle calculations.

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 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, flue tube design, method of compensation for openings, stay rods, gussets, stiffeners etc.

Calculation for dished ends, headers, drums, method of attachment of tubes and branch pipes, Longitudinal stress, bending moment.

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.

Once through boilers, super critical and Ultra super critical boilers, boiler components, piping, fitting, steam receivers, valves, new materials.

Criteria for adopting Tees, elbows, bends and fittings.

Metal temperature calculations for various sections of boiler.

Boiler Act and Indian Boiler Regulations and their compliance

Boiler Act and Indian Boiler Regulations:

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

Materials

Materials used in boilers and their specification, methods of manufacture of materials, Review of material certificate, material traceability, Positive material identification, Acceptance of materials not fully identified, Tests done on plates / pipes, tubes, forgings, castings and welding consumables.

Construction and workmanship

Cold and hot forming of plates, tubes and pipes – heat treatment criteria after forming.

Welding- Welding procedure, Welders / operator Qualification: Initial Qualification & issue of certificate, Validity, Re-validation, age & experience for welders, Conditions under which requalification test is required, Tests to be done on plate/Pipe & Tube for Initial and Requalification – Essential variables, Maintenance of records.

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 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.

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

Mechanical testing of production test coupon.

Tensile Test: Tensile test, basic principle, types of tensile tests, significance of all-weld and transverse tensile tests, specimen extraction procedure, preparation & dimensional details of all-weld and transverse tensile specimens, testing procedure, calculation procedure for YS, UTS, % E, %RA, interpretation of test results as per IBR code.

Bend Test: Root bend, face bend, side bend tests, significance & application of each test, preparation & dimensional requirements of specimens, criteria for selection of mandrel diameter, angle of bend, Bend test procedure for plates, tubes & pipes, interpretation of test results as per code.

Impact test: Basic principle of impact test, types of impact test, location, preparation & dimensional requirements of specimens, selection of test temperature as per regulation, testing procedure, interpretation of test results as per regulations.

Macro examination: Specimen preparation procedure, macroscopic examination procedure, observable defects, interpretation as per regulation.

Micro Examination: Specimen preparation procedure, microscopic examination procedure, selection of magnification range, observable defects, interpretation as per regulation.

Procedure for open inspection of water tubes and Fire tubes boilers.

Hydraulic test:

Hydraulic test of boilers & various components like Drums, Headers, piping, tubular products at works.

Hydraulic test of boilers at site after erection and for renewal of certificate for use of boiler.

Venting, Test pressure, Number of calibrated gauges, Holding time, method of Inspection, Maker's stamp as stipulated in regulation.

Inspection & Certification:

Stages of Inspection during manufacture of Boiler/Boiler Components, different forms and their applicability.

Fees for approval of drawings/design, inspection during manufacture, erection, registration.

Calculation of heating surface area of boilers and its components

Exemptions as per Act

Boiler – Act, Regulation, Materials, erection, commissioning, operation and maintenance

Boiler Act and Compliance

Boiler Act and its provisions, Definition of terms like Accident, boiler, Pipelines, Manufacturer, Owner, Inspecting Authority, Competent Person, etc., Procedure for certification, registration and renewal of boiler, Role and responsibilities of competent person, Inspector, Chief Inspector, Inspecting Authority, Competent Authority.

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 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, I Q I, 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 tube repairs – Methods and procedure

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, instruments for measuring temperature and pressure and fire protection systems and interlocks.

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.

Layout and Sketches

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

ABOUT NATIONAL PRODUCTIVITY COUNCIL

The National Productivity Council is a national level organization, founded in 1958 by the Government of India. NPC is an autonomous, tri-partite, non-profit organization with equal representation from the government, employers and workers' organizations, apart from technical and professional institutions and other interests on its governing council. Besides its headquarters at New Delhi, NPC operates through 14 offices in India with 250 highly qualified and experienced specialists representing various disciplines.

Training Institute: [Dr. Ambedkar Institute of Productivity \(AIP\)](#) is a long-term training wing of the National Productivity Council of India. The Institute plays a wider role of running 2 years P.G Programmes and Short-term programmes in Managerial & Technical areas.

Mission: Development, Dissemination and Application of knowledge and experience in productivity, for promoting consciousness and improvement in productivity, with the objective of strengthening the performance and competitiveness of the national economy as well as of improving the working conditions and quality of working life.

Objectives: NPC is aiming to promote the cause of productivity in industry, agriculture, service, infrastructure and other sectors of the economy. It aims to help in achieving sustained all round development in India, leading to enhancement of quality of life of people in general. The concept of productivity as perceived by NPC encompasses not only a more efficient use of resources, but also of quality, environmental protection and integrated economic and social development. NPC aims at promoting these as a part of its objectives and activities. NPC possesses a well-equipped Librarycum-Documentation centre.

Services: Besides providing training, consultancy and undertaking research in the area of productivity, NPC also implements the productivity promotion plans and programmes of the Tokyo based Asian Productivity Organization (APO) an inter-governmental body of which the Government of India is a founder member.

Thrust Areas: NPC also conducts institutional training programmes for the development of consultants in Productivity and Management in the areas of Industrial Engineering, Energy Management & Energy Audit, Environment Management, Plant Engineering, HRD, TPM, TQM, Financial Management, Marketing Management and Agricultural Productivity.

NPC aims at propagating productivity as an evolving concept, which includes attention to special issues, and concerns relating to quality, environment, energy, integrated rural and community development, women workers etc. Nap's thrust is on providing modern and high quality productivity related services to sectors not adequately addressed by others, especially the small-scale industry and informal sector.

NPC has been active in the area of Energy Conservation & Management for over four decades and has undertaken numerous studies at macro, sectoral and unit levels through its team of committed professionals. It promotes rational use of energy through: Optimization of Methods Improvement, Technology Up gradation and Application of alternative energy sources.

“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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