

**TECHNICAL SPECIFICATION & GENERAL TECHNICAL CONDITIONS**  
**FOR REFURBISHING OF GE FRAME 9 GAS TURBINE PARTS.**  
**NOZZLE ASSEMBLIES**

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**1.0 BRIEF DESCRIPTION**

The technical specification and general technical conditions specified herein cover carrying out refurbishing of parts removed during the periodic scheduled and breakdown maintenance of GE Frame-9 Gas Turbines.

**2.0 TECHNICAL SPECIFICATION OF SCOPE OF WORK**

The scope of work specified hereunder cover but not limited to the following and the refurbishing work shall be carried out in accordance with standard engineering practices in general, and as per the instructions laid out by original equipment manufacturer. in particular.

**2.1 SCOPE OF WORK**

**2.1.0 1<sup>ST</sup> STAGE NOZZLE ASSY. FRAME-9**

**HEAVY REPAIR:**

1. Collect and transport to contractor's works.
2. Perform receiving inspection and dimensional checks.
3. Dis-assemble Nozzle complete.
4. Remove core plugs from segments.
5. Perform air blast clean.
6. Perform visual/NDT inspection of all components/hardware, prepare and submit report to FEWA.
7. Inform FEWA for pre-repair inspection to decide category of repair (Light, Medium or Heavy), or need for Detailed Metallurgical examination and obtain approval.
8. If visual dye penetrant inspection reveals extensive damage, carryout detailed metallurgical examination, if required to determine refurbishability of nozzle segments, after obtaining approval from FEWA.
9. Perform solution anneal heat treatment of segments in vacuum furnace as per OEM processes.
10. Perform liquid dye penetrant test to detect cracks.
11. Grind to remove all crack indications.
12. Weld and blend repair heavy cracks, heavy F.O.D. and heavy worn areas by TIG welding.
13. Weld build all trailing edge coupons.
14. Correct bowing on partitions and trailing edges.
15. Reestablish all cooling holes.
16. Grind, blend and polish segments to re-establish contours and trailing edges thickness.
17. Perform post weld heat treatment of nozzle segments in vacuum furnace, as per OEM procedures and processes.
18. Perform liquid penetrant inspection of retaining ring, L seals and flat seals and repair or replacement of seals all weld repair all crack indications and worn areas.

19. Repair or replace core plugs as required and install in segments.
20. Correct retaining ring out of roundness.
21. Re-assemble nozzle segments to retaining ring, replacing defective bolts, dowels and helicoils.
22. Dimensional checks for roundness, gas path diameters and inter segment gaps.
23. Correct all out of tolerance dimensions.
24. Take throat openings and pitch dimensions.
25. Perform area check and harmonic analysis using OEM procedures and processes.
26. Final clean and Quality Acceptance inspection report.
27. Inform FEWA for pre-despatch final inspection and obtain approval for despatch
28. Preserve and pack for shipment
29. Submit two copies of all Inspection Reports to FEWA head office and pack one copy in box and put identification Tag with Part Name, Part No. Sl. No., Contract No. & contractor's name etc. in the box.
30. Despatch to FEWA.

**Note:**

If the Nozzle segments are originally coated, stripping the coating and recoating is to be carried out, as applicable. Charges for such coating to be separately indicated.

**LIGHT REPAIR:**

All above listed work SL.No. 1 to 30, except following:

For Sl.No.12, Read: Weld and blend repair light cracks, light F.O.D. and light worn areas by TIG welding.

Delete Sl.No. 13 & 14 above & Sl. No. 19, Read: Repair core plugs as required and install in segments.

**MEDIUM REPAIR:**

All above work listed Sl.No. 1 to 30, except following:

For SL. No. 12 Read: Weld and blend repair medium cracks, medium F.O.D. and medium worn areas by TIG welding.

For Sl.No.13, Read: Weld build trailing edge coupons up to 50%.

For Sl.No.14, Read: Correct bowing on partitions and trailing edges unto 50%.

For Sl.No.19, Read: Replace Core plugs up to 30%.

### 3.0 GENERAL TECHNICAL CONDITIONS FOR REFURBISHING-GT PARTS.

- 3.1 Tenderer should carry out preliminary visual inspection of refurbishable items at FEWA Central Store/Maintenance Workshop, Sharjah before submitting his offer. Tenderer should also study the technical specification, scope of work and general technical conditions and submit signed and stamped copy along with offer indicating acceptance of these conditions. Tenderer may submit his own scope of work if it differs from what is indicated in this enquiry.
- 3.2 Tenderer should submit copies of documents to prove his competency and submit details of previous experience in carrying out similar work, list of customers, equipments and testing facilities available for such work etc.
- 3.3 The contractor, at his own cost, should arrange to and fro transportation of parts between the FEWA Sharjah stores and contractors works. FEWA shall arrange packing of materials for transportation.
- 3.4 **Prices:** - Following break up of prices indicated should be submitted for each item along with the offer as per enclosed schedule of prices and completion period.
- i) Transportation and NDT inspection.
  - ii) Detailed Metallurgical examination.
  - iii) Light Repair,
  - iv) Medium Repair,
  - v) Heavy Repair.
  - vi) Stripping the coating and recoating, wherever applicable.
- Payment will be made as per actual work carried out and as approved by FEWA Engineer.
- 3.5 Proper identification, such as Part Number, Serial Numbers, Name of Power Station, etc. shall be tagged to each part when collected from site and these identification tags should be retained, while returning the parts after refurbishing.
- 3.6 In case of assemblies to be refurbished, contractor should ensure that all loose parts belonging to the assembly is collected and list of such parts is made and a copy of this list submitted to FEWA. Such parts duly refurbished/replaced should be supplied along with the refurbished assemblies and packing list enclosed. Contractor should also supply missing loose items along with the refurbished assembly.
- 3.7 If any item is uneconomical to repair, the contractor should provide technical justification and obtain FEWA approval for scrapping. In case further metallurgical tests are required, prior approval should be obtained from FEWA. Charges for transportation and inspection is admissible in case the item is scrapped, provided such items are returned to FEWA stores. If the item is sent abroad, the scrapped items should be returned only by sea shipment and return shipment charges by sea is only admissible. Metallurgical test charges will be paid, as applicable.

#### 3.8.1 Pre-Repair Inspection.

After in receipt inspection and before proceeding with refurbishing, pre-repair inspection of the items will be carried out by FEWA Engineers at the contractor's work, if required. Contractor should send to FEWA copies of in receipt detailed inspection report indicating category of repair, replacement parts needed etc. FEWA Engineers written approval should

be obtained before proceeding with the work, especially for the category of repair and for major parts replacement.

**3.8.2 Pre-despatch Inspection**

Items after completion of refurbishing should be dispatched only after FEWA engineers have accepted them. The performance test and final QA test should be carried out in the presence of FEWA engineers in the contractor's works. In case the inspection is to be carried out outside the country, Contractor should intimate at least 3 weeks in advances the proposed date of such inspection to enable FEWA Engineers to witness test in time. The expenses for FEWA Engineers travel, boarding & lodging to witness such inspection will be met by FEWA.

**3.8.2 Inspection Reports.**

Three copies of following reports should be prepared for each item separately in appropriate forms as recommended by OEM. One copy of these reports should be packed with the item and 2 copies sent to Director of Generation, FEWA.

- i) Pre-Repair inspection and detailed inspection report of each major part.
- ii) Details of work carried out,
- iii) Performance test and final Q.A. test report

**3.8.3 Packing & Tagging:** Part numbers and serial nos. marked in individual part should be renumbered, if the same is erased during refurbishing. Each item should be tagged with details like Name, Part No. Sl. No. Contract No. And Name of Contractor. One copy of inspection reports should be packed with the item.

**3.11 Contractual period and completion time.**

As some of the items will be released for refurbishing as and when available, completion time indicated should be from date of collecting the item from our Main Stores, Sharjah. The prices quoted and completion time indicated should be valid for a period of one year from date of signing of the contract. Completion time for one set, two sets and 3 sets if sent together should be indicated.

**3.12 Guarantee.**

All the parts refurbished should be guaranteed for a minimum of 8,000 operating hours or two years from date of acceptance whichever occurs earlier.

## **A. Refurbishment of Fr-9 1<sup>st</sup> Stage Buckets.**

Scope of work: -

1. Collect and transport to contractors' works.
2. Perform incoming inspection and individually identify all buckets.
3. Perform solvent cleaning of bucket dovetails and clean airfoils.
4. Non Destructive Inspection
  - a) Visual and fluorescent Penetrant inspection.
  - b) Dimensional check, evaluation and report condition of each bucket
  - c) Metallurgical examination and analyses of sample buckets to determine condition of the buckets.
5. Destructive Test and Analyses

Carryout, if required, destructive test (creep rupture test) of one sample of bucket to determine metallurgical condition and balance life of the bucket.
6. Submit Report to FEWA including metallurgical analyses, balance life, category of repair of each bucket, No. of scrap buckets to be replaced and obtain approval for repair category and replacement buckets.
7. Chemically strip to remove coating.
8. Determine airfoil wall thickness and record.
9. Solution heat treat in vacuum furnace.
10. Perform fluorescent dye Penetrant test and X-ray heavy FOD and map all defects.
11. Separate buckets according to repair category.
12. Weld repair all cracks, build up bucket tips, air seals and EDM squealer tip etc.
13. Grind, blend and polish airfoils to re-establish contours, bucket height and air seals as per specifications.
14. NDT inspection including fluorescent dye Penetrant inspection.
15. Degrease and grit blast.
16. Transient phase restoration, as required and solution heat treatment.
17. Blend repaired areas
18. Visual inspection and NDT

19. Perform RE-coating of airfoils with approved coating.
20. Final heat treatment.
21. Perform shot peening of bucket dovetails.
22. Plasma spray locking pad (if required)
23. Perform moment/static weight of each bucket.
24. Perform computer charting of buckets, as per OEM procedures and processes, and produce wheel position chart.
25. Final clean and QA inspect.
26. Pack with one copy of all inspection reports and tag as indicated.
27. Despatch to FEWA