Project

HYDROGEN READY POWER PLANT

Customer

GREENFIELD SOUTH POWER INC.

Applique

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1. DESCRIPTION

The purpose of this document is to define the installation procedure for the 7FA/B Exhaust Diffuser Duct, MLI A042

2. INSTALLATION EQUIPMENT CHECKLIST

The installer shall have the following equipment (as a minimum) to install the 7FA/B Exhaust Diffuser Duct, MLI A042

2.1 Hand Tools

Set of end wrenches
Torque Wrenches
Hammers, sledgehammers, spikes
Stainless Steel wire brushes
M20 and M12 Thread Restoration Tool (Die)

2.2 Lifting and Handling

Winch
Jacks
Hydraulic Jacks
Slings & Shackles
Scaffolding
Crane
Wooden Support Blocking, 12” x 12” x 53.65” [304.8 x 304.8 x 1362.71 mm] and 12” x 12” x 42.62” [304.8 x 304.8 x 1082.55 mm]

2.3 Adjustment

Thickness Wedges

2.4 Other

Welding Equipment
Anti-Seize
Walkie-talkie or other multi-person communication device
Painting Equipment

3. SITE INSTALLATION

Working electrical boxes
Storage and assembly area. An assembly area of 33 x 66 feet [10 x 20 meters] is recommended to assemble the duct and for the positioning of the cranes.

4. REFERENCE DOCUMENTS

317T1518– 7FA Exhaust Diffuser Duct Erection Procedure
123E1039 – Exhaust Support Structure Assembly
124T0430– Top Forward Half Duct General Arrangement
123E1044 – 7FA Diffuser Top Aft Half Arrangement
123E1045 – 7FA Diffuser Bottom Aft Half Arrangement

124T0410 – General Assembly
124T0443 – Bottom Forward Half Duct General Arrangement
146E1033 – Top Aft Duct Shipping Frame
146E1184 – Top Forward Duct Shipping Frame
124T0914 – Field Installed Parts
146E1251– Bottom Forward Half Duct Shipping Frame
146E2868– Bottom Aft Duct Shipping Frame
146E2870 – Alignment Tool
GEK116662 – Operation and Maintenance Recommendations for Gas Turbine Exhaust Diffuser Ducts

5. INSTALLATION SEQUENCE

Prior to installation, the Plant Designer/Plant Installer shall verify that all elevations and anchor bolts have been set in accordance with the GE EG23 drawing for the Exhaust Diffuser Duct, MLI A042.

Critical

Plant Designer/Plant installer to refer to the actual weight on each component prior to lifting.

To avoid damage to the system components when rigging and lifting, multiple lift points shall be used. Multiple lift points, lugs, are provided on each duct section to facilitate lifting. These lugs are designed for lifting single duct sections using multiple lift points. The use of multiple lift point "slings" is required to safely handle each component. Caution shall be exercised to ensure that multiple sections are not lifted into place as a single unit unless multiple lift points per duct component are used to distribute the combined load properly. Failure to follow this precaution may result in damage to the duct components and possible injury to installation personnel. A minimum four (4) lifting points for each component is recommended.

Do not remove the shipping bracing prior to installation. Failure to follow this precaution may result in
damage to the duct components.

The minimum lifting sling angle is 60 degrees for all duct components. Soft material shall be used between the slings and the exterior duct surface to protect the duct paint.
All structural connections shall be fully tightened in accordance with AISC – American Institute of Steel

Construction (latest version). All structural steel bolts shall be fully tensioned using the "Turn-of-the-Nut" method as outlined in Research Council on Structural Connections Publication Specification for Structural Joints using ASTM A325 or A490 Bolt, section 8.2.1.

The Exhaust Diffuse Duct can be installed in 2 different ways: 1. Exhaust Diffuser, MLI 0706, in place or 2. Exhaust Diffuser, MLI 0706, not in place.

5.1 Exhaust Diffuser, MLI 0706, in place.

This procedure is to be followed to allow the Bottom Forward section of the Diffuser Duct to be positioned without interfering with the forward lower section of the support structure.

1. Install the Aft Diffuser Duct support columns, 123E1039, on the foundation. Do not install the Brackets.

2. Remove from the Bottom Forward Half Duct section the protective masking on the PTFE support pads, two (2) locations, as shown on 317T1518.

3. Unbolt the Cribbing on the Bottom Forward Half Duct section, 146E1251.

4. Lower into place the Bottom Forward Half Duct section, 124T0443. Support this section with the Wooden Support Blocking as shown on 124T0410 sheet 8, Step 1.

5. Remove from the Lower Support Structure, 123E1039, the protective masking on the PTFE support pads, four (4) locations, as shown on 317T1518.

6. Install the Forward Diffuser Duct support columns, 123E1039, on the foundation. Do not install the Brackets.

7. Install the remainder of the Lower Support Structure, excluding the brackets.

8. Continue with the installation starting at section 5.2, item 6.

5.2 Exhaust Diffuser, MLI 0706, not in place.

1. Install the Lower Support Structure, 123E1039, with the exception of the Brackets. Do not install the
   Brackets at this time.

2. Remove from the Lower Support Structure the protective masking on the PTFE support pads, four (4)
   locations, as shown on 317T1518.

3. Remove from the Bottom Forward Half Duct section the protective masking on the PTFE support pads, two (2) locations, as shown on 317T1518.

4. Unbolt the Cribbing on the Bottom Forward Half Duct section, 146E1251.

5. Lower into place the Bottom Forward Half Duct section, 124T0443. Support this section with the Wooden Support Blocking in addition to the Support Structure.

6. Remove from the Bottom Aft Half Duct section the protective masking on the PTFE support pads, two
(2) locations, as shown on 317T1518.

7. Unbolt the Cribbing on the Bottom Aft Half Duct section, 146E2868.
8. Lower into place the 7FA Diffuser Bottom Aft Half section, 123E1045, as shown on 124T0410 sheet 8, Step 2.
9. Align and bolt together the Diffuser Bottom Forward Lower Section and Bottom Aft Lower section as
shown on 124T0410 sheets 3 and 8.

10. Remove the Wooden Support Blocking from underneath the Forward Lower Duct section.

11. Unbolt the Cribbing on the Top Aft Duct section, 146E1033.

12. Lower the Top Aft Duct, 123E1044, into place on the Bottom Aft Duct as shown on 124T0410 sheet 8, Step 3. Caution, do not allow the lift sling to apply pressure to the Pressure Probe Ports on the downstream side of the duct section. This may cause damage to the duct section.

13. Align and bolt together the Top Aft Duct section to the Bottom Aft Duct section as shown on 124T0410 sheets 3 and 8.

14. Unbolt the Cribbing on the Top Forward Duct section, 146E1184.

15. Lower the Top Forward Duct, 124T0430, into place on the Bottom Forward Duct as shown on 124T0410 sheet 8, Step 4.

16. Align and bolt together the Top Forward Duct section to the Bottom Forward Duct section and the Top Aft Duct section as shown on 124T0410 sheets 3 and 8.

17. Align the Diffuser Duct axis to the Exhaust Diffuser, MLI 0706, using the Alignment Tool, 146E2870, to obtain the required Flex Seal preset deflection and the correct concentricity between the Diffuser and Duct. The alignment shall be checked at a minimum of 6 places equally spaced around the Diffuser Duct as shown on 124T0410 sheet 11.

18. Having established the correct positioning of the Diffuser Duct to the Exhaust Diffuser, install the Forward Shear Key, 124T0914P003, onto the Support Structure cross member under the Forward Lower Diffuser Duct section and weld in place as shown on 124T0410 sheet 4.

19. Install the Forward Shear Key Capture Plate, 124T0914P001, against the Shear Key and weld to the

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Diffuser Duct as shown on 124T0410 sheet 4.

20. Install the Aft Shear Key, 124T0914P002, onto the Support Structure cross member under the Aft Lower Diffuser Duct section and weld in place as shown on 124T0410 sheet 4.

21. Weld the horizontal and vertical mating flanges of the four (4) Duct sections as shown on 124T0410
sheet 3.

22. Install the Support Structure Brackets at all 4 locations.

23. Remove the internal shipping/lifting braces from each Duct section (2 braces per Duct section). Cut/Grind back the Brace installation tabs to be flush with the inside surface of the Duct outer shell. Do not gouge the shell.

24. Remove the Nylon Nuts retaining the clamp bars, clamp angles, and washers at the field joints. Retain
all clamp bars, clamp angles, and washers as they shall be reused. Do not remove the plastic protective coating over the insulation in the field joint areas.

25. Field installed insulation material shall be free of moisture. If the insulation material is or has been wet, it shall be properly disposed of and replaced with clean dry material. Install the field insulation along the horizontal and circumferential field joints as shown on 124T0410 sheet 3. Splices in the insulation material shall be staggered as shown in 124T0410 sheet 3 to reduce the potential for hot spots on the exterior of the Duct during operation. If insulation material needs to be cut to fit for length/width, it shall be cut 0.5 inches [12.7 mm] longer/wider than the gap the material is to fill for gaps 12 inches [304.8 mm] or less and 1.0 inches [25.4 mm] longer/wider than the gap the material is to fill for gaps larger than 12 inches [304.8 mm]. No gaps or voids are allowed in the insulation. Proper Personnel Protection Equipment (PPE) shall be worn while handling insulation material.

26. Install the field liner sheets from the aft end of the Diffuser Duct up to the aft end of the trough section of the Duct per 124T0410 sheet 3 and 4. Use caution when placing the liner sheets over the Duct studs to avoid damaging the stud threads. Replace the previously removed (step 17) clamp bars,
clamp angles, and washers as shown on 124T0410 sheet 3.

27. Visually inspect all threads for damage. Chase all damaged threads with the appropriate size thread
restoration tool (Die). Apply Anti Seize to the field joint studs and the steel nuts, specified on 124T0410 to be used in place of the removed Nylon Nuts). Do not reuse the Nylon Nuts. Hand tighten the nut onto the stud until all liner plates have been installed.

28. Install the field trough insulation and trough liners, clamp bars, and rope clamps at the two longitudinal splices as shown on 124T0410 sheet 6.

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29. Visually inspect all threads for damage. Chase all damaged threads with the appropriate size thread
restoration tool (Die). Apply Anti Seize to the field joint studs stud and the steel nuts, specified on 124T0410 (to be used in place of the removed Nylon Nuts). Do not reuse the Nylon Nuts. Hand tighten the nut onto the stud until all liner plates have been installed.

30. Tighten all M20 field installed nuts to a range of 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench. Loosen the nut, then retighten to 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench.
Mark the position of the nut, then loosen the nut by one half (1/2) turn. All parts must be in tight contact, no gaps allowed. Tack weld the nut to the stud as shown on 124T0410 sheet 4 "Welding Detail –Studs & Nuts". If the nut is retaining a Round Washer, tack weld the nut to the washer as shown on 124T0410 sheet 4 "Welding Detail –Studs & Nuts".

31. Install the Flex Seal clamps as shown on 124T0410 sheet 7. Torque the first of the two nuts to a range of 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench. Loosen the nuts and retighten to 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench. Then using a wrench to hold the first (inner) nut in place (no additional movement) install the second (outer) nut and tighten it to 35 ft-lbs [47.5 N-M].

32. Install the Flex Seals and Flex Seal Bolting hardware onto the Exhaust Diffuser (MLI 0706) end flange
as shown on 124T0410 sheets 9 and 10. The Diffuser Duct flex seal clamp bars shall not be loosened
to install the flex seals. The flex seals shall be inserted into the gap between the Duct clamp bars working from outside the forward section of the Diffuser Duct with the hole side of the seals then being pushed forward to meet the forward face of MLI 0706. The arrangement of the flex seals is critical to the function of the seals and care shall be given to ensure the correct orientation of each flex seal layer. Apply anti seize to the stud and hand tighten the nuts retaining the flex seals to MLI 0706.

33. Having established the correct positioning of the Flex Seals, tighten the nuts attaching the Flex Seals to MLI 0706 to 75-80 ft-lbs [102-108 N-M] using a calibrated torque wrench. After 3 to 5 Gas Turbine
starts, re-torque the nuts to 75-85 ft-lbs [102-115 N-M] and tack weld the nuts to the studs. The stud
must be lubricated with anti seize compound before torquing.

34. Install the tadpole gasket and associated hardware as shown on 124T0410 sheet 7. If necessary, use a 1 in [25.4 mm] pin to spread the gasket material apart so it fits over/around the studs. Torque the first nut on each stud to a range of 30-35 ft-lbs [41-47 N-M] using a calibrated Torque Wrench. Loosen the nuts and retighten to 30-35 ft-lbs [41-47 N-M] using a calibrated Torque Wrench. Then using a wrench to hold the first nut (per stud) in place (no additional movement) install the second (per stud) nut and tighten it to 35 ft-lbs [47.5 N-M].

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35. Align and bolt together the Duct Bottom Aft Expansion Joint Flange to the mating flange on the downstream interface. Bolting hardware is to be provided with the mating equipment.

36. Align and bolt together the Duct Top Aft Expansion Joint Flange to the mating flange on the downstream interface.

37. Weld the Expansion joint mating flanges to the downstream interface flanges as shown on 124T0410
sheet 5.

38. Splice together the top and bottom Expansion Joint Halves (in 2 locations) as detailed on 124T0410 sheet 5.

39. Field installed insulation material shall be free of moisture. If the insulation material is or has been wet, it shall be properly disposed of and replaced with clean dry material. Install the field insulation circumferentially along the interior of the Expansion Joint. Splices in the insulation material shall be
staggered as shown in 124T0410 sheet 3 to reduce the potential for hot spots on the exterior of the
Duct during operation. If insulation material needs to be cut to fit for width, it shall be cut 0.5 inches [12.7 mm] wider than the gap the material is to fill. No gaps or voids are allowed in the insulation. Proper Personnel Protection Equipment (PPE) shall be worn while handling insulation material.

40. Install the liner sheets, clamp bars, washers, and nuts as shown on 124T0410 sheets 3 and 4.

41. Remove the shipping braces, REP 7 on 146E1033 and 146E2868, from the exterior of the Expansion
Joint. Retain the double nuts used to secure each shipping brace and reinstall them after the brace is
removed. Torque the first of the two nuts (per stud) to a range of 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench. Loosen the nuts and retighten to 50-55 ft-lbs [68-75 N-M] using a calibrated Torque Wrench. Then using a wrench to hold the first (inner) nut in place (no additional movement), install the second (outer) nut and tighten it to 35 ft-lbs [47.5 N-M].

42. If provided, install the Upper Support Structure, 123E1039, onto the Lower Support Structure.

43. Install MLI0909 Compressor Bleed Piping to A042 bleed penetrations. Reference 0909 drawings for
welding details.

44. Install MLI0976 Exhaust Drain Piping to MLI A042 drain connection. Reference 0976 drawings for welding details.

45. After 3 to 5 Gas Turbine Starts, re-torque the nuts attaching the Flex Seals to MLI 0706 to 75-85 ft-lbs [102-115 N-M] using a calibrated torque wrench, then weld the nut to the stud and the nut to the washer as shown on 124T0410 sheet 9.

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6. PAINT INSPECTION

1. Inspect the Diffuser Duct for any damage to the paint system. Stainless steel components are not to be painted.

2. Repair any damaged paint/galvanized/coated areas as per GEK 116662, Section IV, paragraph A.

3. All external surfaces of the exhaust system shall be painted with high temperature silicon aluminum paint immediately after final installation per GE specification P6C-AG31. Paint is to be supplied by Plant Designer/Installer. The A042 support steel is not required to be painted high temperature silicon aluminum paint.

7. CLEANLINESS / FINAL INSPECTION

Prior to the operation of the Gas Turbine, the Exhaust Diffuser Duct shall be checked to ensure that it is free of debris, tools, equipment, and all other foreign objects. All sections of the duct shall be completely installed. All seals shall be completely installed. All instrument access points shall be completely sealed.

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