



The Enclosed Technical Proposal Is Submitted Exclusively
For

MEGGITT AIRCRAFT BRAKING SYSTEMS

**ONE (1) SECO/WARWICK CONTROLLED ATMOSPHERE
ELEVATOR FURNACE**

SECO/WARWICK PROPOSAL No. 84754-1-2-19-US1-THE

June 28, 2019

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SECO/WARWICK INTRODUCTION

SECO/WARWICK is a full service manufacturer of custom engineered heat processing furnace systems, including vacuum and atmosphere furnaces of all types for ferrous, non-ferrous and specialty metals, along with aluminum melting furnaces. Our USA facility is located in Meadville, PA USA. SECO/WARWICK serves a worldwide market, with emphasis in the North America, Europe and the Pacific Rim, and is ISO 9001-2000 certified in the USA and Poland.

This proposal and all detailed information contained herein are the property of SECO/WARWICK Corporation. They are confidential and are given for a limited purpose and must be returned upon request. Neither the proposal, nor any information concerning it may be copied, exhibited, or furnished to others without the prior written consent of SECO/WARWICK.



In general, this proposal provides that SECO/WARWICK Corporation, located in Meadville, Pennsylvania, USA (hereinafter referred to as SECO/WARWICK) proposes to furnish the following:

- One (1) SECO/WARWICK Controlled Atmosphere Elevator Furnace
- Optional car/hearth that can move in and out.

This furnace equipment shall be shipped in completed sections for assembly and installation within the United Kingdom plant of Meggitt Aircraft Braking Systems (hereinafter referred to as the PURCHASER).

SECO/WARWICK Corporation is focused on developing long-term value added relationships with our business partners and appreciates the opportunity to partner on this project. This focus has contributed greatly to our many years of servicing our customers.



SUMMARY

The furnace will be of similar construction/function to the elevator furnace already provided by Seco/Warwick to the purchaser. The serial number for the original furnace is 416-03G. The furnace will operate under a positive 0.10 to 2.0 inches w.c. pressure inside the retort. A Baratron pressure transducer will be used to monitor pressure. A 0-1000 schf flowmeter will be used on the Nitrogen inlet.

A number of variations will be employed with this new furnace iteration. 1) Control logic for heating will be “proportional control” to allow for smoother heat up and control using SCR type control for the heating power. 2) The diffuser will be modified for better convective gas recirculation, which in combination with the better heating control will further add to the better uniformity, 3) The furnace will be designed, as requested, to CE standards, and 4) The movable car will allow elimination of the pit for loading.

SPECIFICATIONS ELECTRICALLY HEATED PIT FURNACE

SIZE

Dimensions will be the same as the prior Seco/Warwick furnaces being used. The load size will be 48” x 48” x 48”. The hearth can support a 2,000 pound load.

MAXIMUM OPERATING TEMPERATURE (inside retort)

1562°F (850°C)

ELECTRICAL RATING

415 V, 3 PH, 50 HZ – all motors will be TEFC. Full load amps for the furnace will be 195 amps.



HEATING ELEMENTS

The heating equipment for the furnace will be panel style. The heating element input rating will be 132 KW.

SHELL

The shell is fabricated from ¼” steel plate rolled and welded.

INSULATION

The furnace walls and roof will be insulated with ceramic fiber blanket modules, 10.5” thick (not exposed to the furnace atmosphere due to retort being used). The base will be exposed to the furnace atmosphere. The base will be composite insulation construction, with the cold face being a lighter weight insulating castable, and the hot face being a denser castable that is resistant to the phosphoric and acetic acids that will be in the atmosphere. Base insulation will be 12.125” thick.

ALLOY RETORT

The alloy retort is designed for the operating temperature and atmosphere used in the furnace. It is constructed of 3/16” thick 330 SS alloy. The retort seals the internal atmosphere, so that the corrosive atmosphere is not exposed to the elements and roof/sidewall insulation. The base of the furnace comes up to the retort to make the seal. The same drain collection system will be used for draining off the acids through the base as the existing furnace.

TEMPERATURE

1. Furnace will control at +5/-10°C at 93°C
2. Furnace will control at +/-10°C at 93°C set point from 500°C to 850°C
3. Temperature uniformity will be -10/+25°C within heat zone.
4. Oven ramp rate with a 2,000 pound load of aircraft carbon brakes is 125°C/hour from 25°C to 260°C and 100°C/hour from 260°C to 850°C.



5. Programmable control will hold at least ten recipes each containing up to ten ramp/soak events.
6. Cool down of a 2,000 pound load of aircraft carbon brake disks from 800°C to 50°C will be in 24 hours.

FORCED AIR COOLING SYSTEM

The cooling blower/ductwork system will be a duplicate of the existing elevator furnaces. The blower and duct sizes will remain the same. The blower will be rated at 163,000 SCFH @ 16" W.C. with a 10HP motor.

CONTROL PANEL

SECO/WARWICK will provide an enclosed, pre-wired Control Panel that contains all of the necessary control instruments. Seco/Warwick will provide and mount the following instruments:

- *Allen Bradley CompactLogix series PLC (customer prefers Siemens)*
- *Allen Bradley Operator interface (Panelview)(or Siemens)*
- *Honeywell DR45AT Temperature recorder (single point)*
- *Honeywell UDC 2000 excess temperature control*
- *Pushbuttons/selector switches will be Allen Bradley 800T with 24V lamps*

OTHER CONTROL FEATURES:

1. The control Panel and all junction boxes will be NEMA 12 and conform to CE.
2. All sensors will be 12-30 VDC.
3. Heater power will be interlocked to nitrogen flow and vessel closure.
4. Furnace will have separate thermocouples for control, recording and high limit.
Thermocouples will be certified at 265°C and 800°C.
5. Prox sensors will be included for elevator locking pins (MABS will provide the spec).



6. Amp meter to show heater amperage.

GENERAL SPECIFICATIONS FOR ALL EQUIPMENT

PAINTING

All of the proposed equipment will be given one coat of shop paint and one coat of finish paint prior to shipment. Paint color will match existing furnace.

PIPING AND WIRING

The equipment outlined and described in this proposal will be completely factory assembled, piped and wired prior to shipment. It will only be necessary to make the interconnections between the sections and components furnished by SECO/WARWICK. All field interconnecting wiring and piping is to be provided and installed by the PURCHASER.

FOUNDATION AND PITS

PURCHASER will furnish complete foundation, pit, anchor bolts, grating, reinforcing, grouting, etc., for equipment.

INSURANCE REQUIREMENTS

SECO/WARWICK will build the proposed equipment according to current NFPA, ANSI, NEC, NESC, NEMA, IEEE, UL and OSHA requirements. Any additional equipment or services required to meet insurance or local codes not specifically detailed herein are to be furnished by the PURCHASER or, where feasible, will be furnished by SECO/WARWICK on an adjusted price basis only.



FACTORY BUILT

Insofar as possible, SECO/WARWICK plans on shipping the equipment as completed components including the installation of refractory, piping and shop wiring, etc., completed in SECO/WARWICK's places of construction prior to shipment to the PURCHASER..

Items removed for shipment are to be remounted at the installation site by the PURCHASER.

DRAWINGS AND MANUALS

- Drawings** - SECO/WARWICK will provide complete drawings needed for installation, maintenance, and equipment operation. Typical drawings include piping schematics, wiring schematics, interconnecting diagrams, foundation outlines, and equipment outlines. Drawings will be provided in AutoCad format.

- Manuals** - SECO/WARWICK will provide an operating manual in English. The manual will be submitted as one (1) in electronic format.



SUMMARY OF ITEMS FURNISHED BY SECO/WARWICK

One (1) SECO/WARWICK Pit Furnace System consisting of the following:

- One (1) SECO/WARWICK Electrically Heated Elevator Furnace
- One (1) SECO/WARWICK Control/Power free-Standing Panel
- Drawings, Manuals and Spare Parts List

Included Option:

- Moveable car that can go in/out from the furnace.



SUMMARY OF ITEMS PROVIDED BY PURCHASER

1. Shipping costs, unloading, proper storage, at customer factory.
2. Any additional safety or control equipment made necessary by shop conditions or requirements of the law and installation of the same.
3. All necessary labor as required for installation of the equipment in PURCHASER's plant.
4. All necessary field wiring and piping as required including bringing in utilities and connecting to points on the furnace.
5. Any necessary hoods, stacks, ducts, vents, eductor blower, etc. as necessary and required and installation of the same.
6. All additional maintenance access ladders and pit grating as required.
7. Power as required for operation of the installation.
8. Protective atmosphere and water piping and flow control components including labor and materials from supply to connection points.
9. Foundation as required in accordance with plans to be supplied by SECO/WARWICK, if necessary.
10. All load and lifting fixtures as required.