SPECIFICATION FOR

CLEANING PROCEDURE

FOR

LIGO VACUUM EQUIPMENT

Hanford, Washington
and
Livingston, Louisiana

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AUG 0 9 1996

REV LTR.	BY-DATE	APPD. DATE	DESCRIPTION OF CHANGE
1	TMS 8-6-96	[illegible]	ADDED ACETONE PRECLEAN AND UPDATED PROCEDURE PER DEO 0240
0	TMS 4-30-96		GENERAL REVISION PER DEO # 0151

PROCESS SYSTEMS INTERNATIONAL, INC. | **SPECIFICATION**

INITIAL APPROVALS	PREPARED	DATE	APPROVED	DATE	Number A V049-2-015	Rev.
	T. Stan	4-30-96	RGS	5/1/96	LIGO-E960046-01-V	1

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1.0 PURPOSE

The purpose of this procedure is to define the necessary steps for the cleaning of the LIGO vacuum equipment components such that all vacuum exposed surfaces are compatible with ultra high vacuum service.

2.0 GENERAL

This procedure is applicable to any fabricated stainless or aluminum component that is exposed to UHV service. It applies to the cleaning of these components subsequent to completion of all machining and welding operations.

3.0 RESPONSIBILITY

3.1 PSI Engineering is responsible for identifying all components and portions of components that are subject to this procedure. All cleaning will be as specified on the drawings.

3.2 PSI manufacturing is responsible for the execution of this procedure in the PSI shop.

3.3 The installation contractor is responsible for maintaining this procedure at the sites.

3.4 Quality Assurance is responsible for monitoring compliance with this procedure in the PSI shop. Engineering will be responsible for compliance at the sites.

3.5 This procedure shall be maintained and modified as required by the cognizant engineer.

4.0 EQUIPMENT AND SYSTEMS

4.1 The cleaning equipment consists of the following:

4.1.1 Washing Cabinet
- Enclosure
- Spray header system
- Drain collection system and pump
- Vent system
- Controls

4.1.2 Cleaning Solution and Rinse System

Wash water storage tank
Rinse water storage tank
DI Water system and storrage tank
Waste water hold-up tank
Wash/Rinse water heater
DI Water heater
Pumps, filters, piping, valves

4.2 Clean Manufacturing Area

An isolated section of the PSI shop will be provided with an outside air purge to form a clean manufacturing space. Class 100 cleanrooms will be operated in this area. Because the air is recirculated through the cleanroom filters, it will also be cleaner than the shop atmosphere. It is expected that it may reach a level as low as Class 50,000 to 100,000. The components cleaned in the washing cabinet will be moved into the Class 100 cleanrooms for packaging (or closure of the vessel ports) without going back into the shop atmosphere.

4.3 Class 100 Cleanroom

4.3.1 Two Class 100 soft-wall portable cleanrooms are joined together to make a large working area. The cleanrooms circulate air through HEPA filters at the tops of the rooms downward. The air exits under the soft-walls (plastic curtains) at the bottom and recirculates through the room to the blower inlets at the top.

4.3.2 Cleanroom activities shall be performed in accordance with Cleanroom Procedure V049-2-118. Specific cleanroom training is required for anyone entering the cleanroom. This training, given by Manufacturing Engineering, covers principles, gowning and necessary behavior.

5.0 PROCEDURE

5.1 Starting Condition

a.. All welding completed to the degree possible.

b. Remove gross contamination from all interior and exterior surfaces (including flange faces) by steam cleaning with a portable steam system. Remove ink markings, such as material designations, with acetone.

5.2 Equipment Set-Up

a. Establish the proper level of DI water in the storage tank by running city water through the DI water system and into the tank

b. If any water remains in the waste water hold-up tank, drain it to the waste storage tank. (Note: If the waste water is to be drained to the town sanitary sewer, testing and treatment may be needed before discharge.)

c. Establish the proper water level in the rinse water tank, adding DI water as required.

d. Establish the proper level in the wash water tank, adding detergent and DI water as required. (The entire contents of this tank should be drained every 2 months or longer if the system is not used continuously.)

e. Activate the wash/rinse water heater and circulate the wash water in a closed loop to heat the contents of the tank to approximately 150 F as read on the thermometer at the pump inlet. Repeat for the rinse water. Repeat for the DI water using its dedicated pump and heater.

f. Confirm proper piping connections and valve lineup for the system.

g. Confirm proper operation of the vent fan.

h. Confirm proper operation of the cleanroom.

5.3 Cleaning Precautions

5.3.1 There shall be a minimum of two operators present (in the area) for all cleaning operations.

5.3.2 The operator doing the washing shall wear a lab coat, shoe covers and clean room gloves. (This applies to anyone handling the cleaned pieces.)

5.3.3 The operators should be familiar with the washing system and its components before operating the equipment.

5.3.4 Do not let any surface dry between start of washing and end of final rinse.

5.3.5 Handle each piece or component with appropriate care and clean gloves.

5.4 Cleaning

5.4.1 *General*

a. The heater controls should be set to provide approximately 150 F water.

b. When making DI water, periodically monitor the quality light at the DI system.

5.4.2 *Component Loading*

a. Mount the component to be cleaned on a cart, and position in the washing cabinet.

b. Assemble and position the spray headers as appropriate for the piece being washed.

c. Install the turning machine. Run the turning machine and visually confirm proper rotation of the component and positioning of the spray headers.

d. Close and secure the cabinet doors.

5.4.3 *Wash*

a. Start the cleaning cycle (the vent fan will automatically start during drying). Note: The cycle should not be interrupted between steps.

b. As the controller steps through the washing and rinsing steps of the cycle, periodically monitor the status of the pumps, valves, filters and tanks.

5.4.4 *Drying*

a. Drying will be accomplished by blowing clean air over the component before allowing it to cool.

b. Inspect and bag the component (or close up the vessel) as soon after drying as possible. Avoid contamination from unfiltered shop air through open doorways.

5.5 Inspection

a. Inspection shall be done (before removing the piece from the washing cabinet) using a black light on all interior surfaces or flange faces. No visible contaminant of any form shall be detected when viewed with the naked eye under both natural and ultraviolet light.

b. The presence of any hydrocarbon or fingerprints on any interior surface or flange face shall be cause for rejection. This will require CO_2 cleaning to rectify.

c. A visual inspection shall be made of exterior surfaces. Visible particulates or actual contamination shall be removed.

5.6 Bagging/Wrapping

a. Immediately after drying and inspection, double bag the component using clean, oil-free polyethylene bags or wrap and seal using the same material.

b. Remove the component to the clean area.

6.0 REQUIRED DOCUMENTATION

A component cleaning data sheet containing the following data shall be filled out on completion of cleaning. The data sheet will become part of the component QA package.

- Cleaning log describing parts cleaned and procedure used
- Comments and observations
- Record of flow rates, temperatures and durations used
- Record of inspection results

Attachment

LIGO COMPONENT CLEANING DATA SHEET

Project V59049

Component	Serial Number
_____	_____
_____	_____
_____	_____
_____	_____

Wash Cycle: _____

Flowrates: _____ Max. Temp.: _____ Duration: _____

Operator: _____ Date: _____

Comments: _____

_____

_____

Component(s) Inspected By: _____ Date: _____

Quality Assurance: _____ Date: _____

Comments: _____

_____

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Number

Rev.