



## ULTRAPURE & INDUSTRIAL SERVICES GROUP, DALLAS

### Passivation of Stainless Steel Piping

The purpose of this paperwork is to describe the standard operating procedure for cleaning and passivation of stainless steel piping used in the UPW, pharmaceutical, and food and beverage industries. The following areas will be detailed:

- I. Swab Passivation of Weld Areas
- II. Passivation of 316 Stainless Steel Piping
- III. Neutralization of Passivation Solution
- IV. Rinse Down Specifications
- V. MSDS and Other Safety Issues
- VI. EPA / Chemical Handling and Rinse Down / Release to Drain
- VII. \*Addendum 1.1 – Dip Passivation

**NOTE\*** Where the terminology for RO / DI water is detailed Hot Purified Water and / or Hot WFI water can be substituted per customer SOP requirements.

#### I. Swab Passivation of Weld Areas:

This procedure is used to clean and passivate areas where a new tie in, fitting, or pipe connection has been welded on to existing piping.

1. Using a clean-room type cloth with a wire tied to it, stuff the cloth in the pipe passed the weld area so the wire is available for removing the cloth.
2. With a 10% Citric Acid or 10% Phosphoric Acid solution, swab the weld area inside the open pipe several times. Allow the area to dry and repeat.
3. When fully dry swab the area with RO (Reverse Osmosis) or DI grade (UPW) water several times. Allow to dry and repeat. Remove clean-room cloth.
4. If possible all pipe weld areas should be rinsed for at least 1 hour when all piping has been put together and system is complete. Rinse water should be analyzed for conductivity via an on line or portable monitor. Rinse water should read less than 2 micro-siemens of conductivity.

## **II. Passivation of 316 Stainless Steel Piping:**

- 1. Using storage / rinse water vessel, distribution pump, and a return manifold, construct a recirculating loop.**
- 2. Storage / Loop should be fed with Reverse Osmosis or DI water for the purpose of passivation on any stainless steel piping.**
- 3. Using the diameter of all pipe to be passivated, and the appropriate computations, determine the hold up volume of all piping and any return loop piping including manifold.**
- 4. Add to that volume enough volume to bring the amount of water in the storage tank and loop to such that adding enough acid and neutralization solution there will still be some room in the holding vessel. This is a varying amount and care should be given to accurately determine these volumes.**
- 5. Before adding acid, circulate water through the loop and holding vessel for 30 minutes to allow for a good flush of the system.**
- 6. Using the distribution pump, close the backside valves on the return portion of the loop and pressure up the loop to \_\_\_\_psi as a hydrostatic test to determine if there are any leaks in the system.**
- 7. Once the system passes this test open the return valves and allow loop to circulate.**
- 8. Begin adding acid (Citric or Phosphoric) taking regular samples to measure the specific gravity of the solution in the loop. Specific Gravity Charts are available upon request. You should also be using an on line pH monitor and / or pH test strips to determine the pH range of the solution in the loop. It must stabilize at the proper specific gravity for the percent of solution you need and the pH should be at or below 1.**
- 9. Once the proper pH and specific gravity has been achieved the solution must circulate at ambient temperature for 2 hours. Higher temperatures require less recirculation time but can be more dangerous and can result in leaks at gaskets and / or joint areas. All care should be given and constant checking of loop and pipe joint should be done.**

## **III. Neutralization of Passivation Solutions**

- 1. After 2 hours of recirculation time, begin adding sodium hydroxide to bring the pH up to EPA acceptable levels. (Between 5 – 10 pH) Caustic should be added slowly and there will be a definite temperature spike. All care should be given and constant checking of loop and pipe joint should be done.**
- 2. Once the pH has stabilized at between 5 – 10 pH for a give period of 10 – 30 minutes, the solution is safe to send to any floor or city drain. Please note that sending less than 5 pH solutions to any drain run the risk of high fines should the EPA become involved for any reason. Sending solution of less than 3 pH to any drain that is not CPVC or stainless steel can cause severe damage to in or above ground piping. Over time this drain piping will simply dissipate and any solution sent to drain will migrate into the ground water. This is not only disastrous to any city water supply but will result in governmental action of the highest magnitude.**

#### **IV. Rinse Down Specifications**

- 1. When all solution is being drained from the system, continue adding clean feed water to the storage / holding vessel and continue recirculating this solution. Monitor at all time. When the circulating solution stabilizes at or below 2 microsiemens of conductivity the system is considered safe for release to make most products.**
- 2. Consistent logs should be taken for the purpose of verifying the release water spec.**

#### **V. MSDS and Other Safety Issues**

- 1. There must be an MSDS (Material Safety Data Sheet) on site delivered with all chemicals to be used for these processes. The information in these documents includes HAZ-MAT status, chemical composition, and safety information relating to emergency health and chemical spill issues.**
- 2. All sites should have an emergency response handbook detailing what to do in case of any emergency... especially chemical related emergencies.**
- 3. A safety meeting of all operators and / or technicians must be held prior to beginning each day's work. It is recommended that periodic safety meetings be held during on going jobs to talk about potential problems and possible ways to avoid injuries.**
- 4. PPE (Personal Protection Equipment) is required in some form for all chemical handling. This will be clearly detailed on MSDS paperwork, but should also be a part of any and all safety meetings / requirements for any production location.**

#### **VI. EPA / Chemical Handling and Rinse Down / Release to Drain**

- 1. EPA guidelines for the handling of and disposal of any and all HAZ-MAT related material should be followed to the letter and documented clearly. This paperwork must be available for any audit / inspection and should be kept for a minimum of 2 years in immediate files, 7 years total.**
- 2. Chemicals must be handled according to governmental guidelines and specifications. There should be one supervisor / technician assigned to have that information available or at the very least know how to access that data.**
- 3. Release criteria for water that can be sent in to the municipal water sewer has also been set by EPA standards. This criteria in general terms is – between 5 – 10 pH for release water. Logs of all released water, either reject streams or neutralized waste water must be clear, detailed as to when where why and how, and must be available for any audit. (Both internal or by outside agency)**

## **Addendum 1.1**

### **VII. \*Dip Passivation of Parts**

**When performing on site or in house dip passivation of solutions these steps should be followed:**

- 1. Determine the amount of total volume to be in the dip area.**
- 2. Using the proper formula as follows – to determine percent of concentration to be used:**

**$[(\text{Acid Volume} \times \% \text{ of Acid Purchased (i.e. 50\% - 75\% \text{ etc.})) / \text{Total Volume of Acid and Water}] \times 100$**

- 3. Add Water to proper level. (Parts must be submerged)**
- 4. Add Citric Acid to a 10% concentration.**
- 5. Carefully place parts in passivation solution.**
- 6. Log time, concentration level, and temperature.**
- 7. Allow 2-hour static soak time. Agitation of solution can be helpful but is not required.**
- 8. Remove parts from dip tank and allow to dry.**
- 9. Rinse parts with reverse osmosis or DI grade water. (Always wear gloves and PPE when using acids of any kind)**
- 10. Add water to dip tank as you drain the tank to insure proper dilution of solution. Volume should equal or be slightly less than drain rate for 10 – 15 minutes. Turn off dilution water. When tank is fully drained, run clean water to drain for 10 – 15 minutes to assure proper dilution of follow water.**

**Data put together by:  
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