

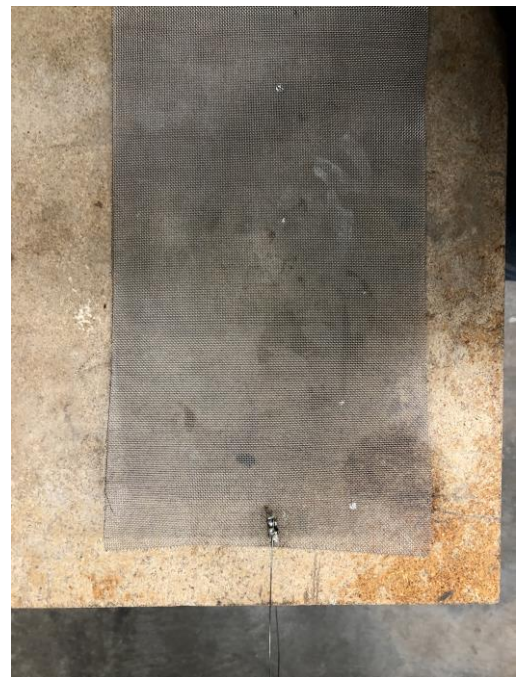
Accelerated Corrosion Procedure: Specimen Preparation

Procedure title	Accelerated corrosion for Reinforcing Bars	
Author	Victor Alejandro Calderon	
Date of creation / revision	Date Created: 05/06/2021	Date last revised: 05/06/2021
Principal Investigator	Mervyn J Kowalsky	
Location	Building and room number	
1.	This standard operating procedure (SOP) is for	
<input type="checkbox"/> Specific laboratory procedure or experiment <p>This document outlines the procedure to perform the generation of the passive layer in reinforcing steel bars. This documents assumes that the specimen is already inside the container where the specimens will develop the passive layer. The passive layer is generated by using a saturated pore solution of calcium hydroxide. The solution concentrations were obtained from the study by Ghods et al. [1]</p> <p>[1] P. Ghods, O. B. Isgor, G. McRae, and T. Miller, "The effect of concrete pore solution composition on the quality of passive oxide films on black steel reinforcement," <i>Cem. Concr. Compos.</i>, 2009.</p>		
2.	Process or experiment description	
<p>The reinforcing steel bars are placed in an airtight container and are submerged in a calcium chloride saturated solution.</p> <p>The required chemicals are listed below:</p> <ul style="list-style-type: none"> • Sodium hydroxide • Potassium hydroxide • Calcium sulfate dehydrate • Calcium hydroxide • Distilled water <p>Other equipment:</p> <ul style="list-style-type: none"> • Beaker 500 ml • Glass mixing rod • Disposable 1 gal bucket or equivalent glass container • Measuring scale • Spoon for handling of chemicals • Paper sheets for spills • Funnel 		

3.	Hazard and risk assessment.	
<p>Physical hazard: The user must be careful of puncturing edges and tools. For example, the edges of the stainless steel mesh can cut through skin, therefore, the user should wear puncture resistant gloves for the handling of metals. The user must be careful with the use of tools such as saws.</p> <p>The user should be careful to not breathe PVC dust and residues.</p>		
4.	Safety equipment <i>Specify all equipment needed to perform procedure safely and to respond to emergencies.</i>	
4.a.	Engineering / ventilation controls N/A	
4.b.	Personal protective equipment <ul style="list-style-type: none">Safety glasses/gogglesPuncture resistant glovesLab coatN95 mask	
4.c.	Location of nearest emergency safety equipment	
Item		Location
Eyewash / safety shower		See laboratory map
First aid kit		Safety box
Chemical spill kit		Contact lab manager
Fire extinguisher		See laboratory map
Fire alarm manual pull station		See laboratory map
Telephone		(919) 515-3000
Other		
5.	Step-by-step methodology <i>The methodology explained below is made for 1L of saturated solution. If required multiply the concentrations below by the desired volume.</i>	
Step 1: Cut PVC to the desired length in this examples the PVC is cut to 50 inches		
Step 2: Cut rebars to specimen length		
Step 3: Cut stainless steel mesh with sufficient length and width to fit inside the PVC pipes		



Step 4: Weld or mechanically attach stainless steel wires to the reinforcing steel bar and the stainless steel mesh



Step 5: Mark dimension of grip areas

Step 6: Place 2-part epoxy on the grip areas of the reinforcing steel bars. Wait for the epoxy to cure (see product manual for curing times)



Step 7: Place electroplater tape in the grip areas

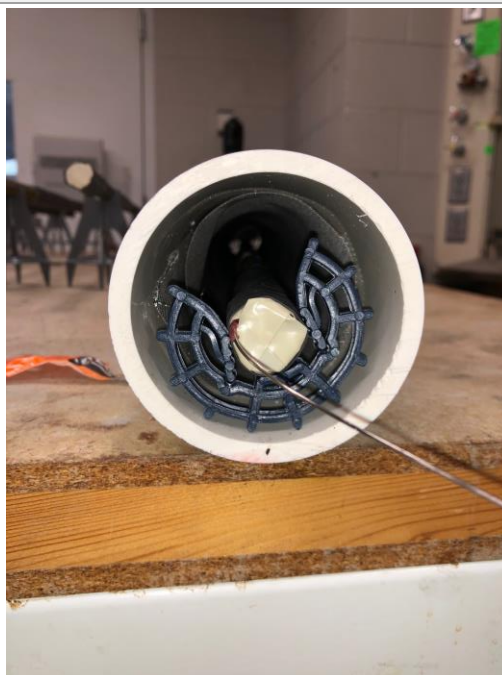


Step 8: Place shrink tube around grip areas. Use the heat gun to shrink the tube closer to the surface of the reinforcing steel bars



Step 9: Place stainless steel mesh inside the PVC pipe

Step 10: Place reinforcing steel bars inside the PVC pipe with the plastic wheel chairs as shown below



Step 11: Prepare the connection to the 90-degree elbow. Using primer and the cement glue the PVC elbows on both sides of the PVC pipes.



Step 12: Start procedure to generate passive layer

6. **Designated area**

Room temperature area.

7. **Special handling procedures, transport, and storage requirements**

Describe special handling and storage requirements for hazardous chemicals used in this procedure, especially those that are highly reactive/ unstable, flammable toxic and corrosive. Describe secondary containment requirements for transport between laboratory rooms.

8 **Waste disposal**

Identify and list all hazardous waste to be generated and appropriate disposal procedures. Include liquid and solid waste.

9. Emergency procedures

Life-threatening emergencies (for example, medical event, fire, explosion, large-scale spill or release, toxic or flammable gas leak, valve failure)

- Call 911. Provide dispatch the following information: your name and call back number, location of incident, material released, if known, if there are any injured person and their location.
- Pull the nearest fire alarm.
- Exit the building using the nearest stairway.
- Proceed to designated assembly area.
- Provide information to emergency responders as able.

Chemical spills

1. Determine if it is a “major” or “minor” spill. Minor spills are well contained, able to be cleaned using the spill kit at hand and clean-up would not require special PPE such as a respirator.
2. Assist anyone who may have been contaminated or injured during the spill.
3. Clean up minor spills using appropriate spill control equipment.
4. Call 911, NCSU Police ((919) 515-3000) and EHS ((919) 515-7915) for all major spills.
5. Contain major spill with appropriate absorbent only if trained to do so and your safety is not compromised.
6. Post “DO NOT ENTER” on entrance door and evacuate the area.

Do not re-enter until Emergency Responders have cleaned up the spill and declare the area safe for reentry.

If personnel exposed to chemicals

1. Call 911 to seek emergency medical help.
2. Assist exposed person away from incident or source of exposure, to the emergency shower or eyewash. Do this only if able and personal safety is not compromised. Exposed person decontaminates using the nearest emergency shower or eyewash.
 - 2.1. Pull the safety shower lever to start the water flowing (or push the eyewash lever to start the water flowing).
 - 2.2 To wash off chemicals from your eyes, hold your eyes open to get the water under your eyelids.
 - 2.3 Remove all contaminated clothing and shoes to effectively wash chemicals off your body.
 - 2.4 Stay under the water for at least 15 minutes to wash all the chemicals off.
3. Report incident
4. Seek follow-up medical treatment.

Building maintenance emergencies (for example, power outages, plumbing leaks, fume hood malfunction)

Call (919) 515-2991 to report facility emergency.

10. Training requirements

List the general and laboratory-specific training required for authorized users of this SOP

- ☐ EHS Chemical and Lab Safety Training
- ☐ EHS Hazardous Waste Training
- ☐ CFL Safety Training

