



# Mueser Rutledge Consulting Engineers

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March 27, 2014

New York City Transit Authority  
2 Broadway  
New York, NY 10004

Attention: Mr. Roberto E Espinoza, PE  
Consultant Construction Manager  
Recovery & Resiliency Department

Re: Contract A-36929 - Flood Mitigation Project  
At Various Critical Locations, Borough of Manhattan  
(Removeable Ventilator Cover Prototypes)  
Certification of Completion of Water Test  
New York, NY  
MRCE File No. 11969

Dear Mr. Espinoza:

In accordance with contract requirements this letter is to certify that RSA Protective Technologies performed a successful water test of the "mock-up" ventilation cover at the manufacturer's facility in its assembled position to a head of 15 feet. The details of the test are included in the attached Leakage Test Report, prepared by Risto Salo Design & Engineering, dated March 26, 2014.

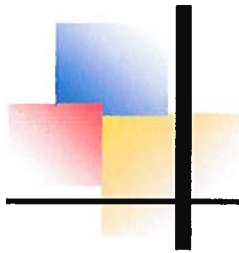
Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS



By: \_\_\_\_\_

Roderic A Ellman Jr., PE, Partner  
New York State Registration No. 063270



**Risto Salo  
Design & Engineering**

*Almost anything is possible.....*

**RSA Protective Technologies**

Removable Ventilation Flood Control Cover

NYCT Contract A-36929

Leakage Test

Prepared for:

RSA Protective Technologies

223 Independence Dr.

Claremont, CA 91711

PREPARED BY:

Risto Salo P.E.

3-26-14

## **Risto Salo Design & Engineering**

27492 Bridgewater Dr. Valencia CA 91354 Phone (661) 644-1209

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### Test Objectives

To measure the water leakage past the Removable Ventilation Flood Control Cover over the duration of 24 hours.

### Test Parameters

15 ft of Total Dynamic Head (TDH) above the cover.

There was no specific leakage rate given by the client for this test. A test of the similar invention in the Subway Cover for the same client was considered a success if the leakage was 3.5 gpm. The Subway cover is a much larger area and perimeter seal length. The Subway cover has 41 ft of seal where the Vent Cover has 17 ft of seal. As the majority of leakage is past the perimeter seals, it was assumed that the Vent cover would be successful if the leakage per foot was equal or less than the Subway cover.

Leakage goal= 3.5 gpm x 17 ft/41 ft=1.45 gpm

### Test Set-up

The testing was conducted at the Dimic Steel Tech facility located in Upland, CA on 3-25-14 and 3-26-14.

Prior to the leakage test, pressure testing was performed using the same fixture and installation procedure to verify a sound seal to the test fixture.

The Ventilation cover system was installed in the steel and concrete test fixture used to simulate the sidewalk surface surrounding the Vent Cover when erected on site. The system was installed per the standard installation procedure and using the production seals and hardware.

Photo for the test setup



Test tank with cover inside



Test tank with top removed exposing the top of the vent cover. Note the exposed concrete surface that the cover seals against.

A steel spacer frame and top cover were attached to the top of the test fixture suspended above the unit. Water was filled into the space between the cover and the top cover until full. Most of the air was allowed to vent.

Once full, water pressure was applied to 6.5 psig which is the equivalent of 15 ft of water head (TDH). This was the start time of the test.

The pressure was controlled with both a pressure regulator and manual valves to maintain the steady pressure plus/minus .5 psi (1 ft TDH) over the duration of the test. A clear plastic tube with a white plastic ball was setup vertically to visually determine the water head.

Tarps were suspended below the unit to completely collect all of the water and drain it into a large trough. Refer to Results below for collection methods.

The test was monitored continuously during the 24 hours by RSA and Dimic staff.

The equipment performed as expected for the duration of the test. Once 24 hours was reached, the water source was turned off and the pressure bled off. This was the end of the test.

### Test Results

The test was setup and run without interruption for 24 hours. All of the water which leaked past the cover was collected. To prevent the trough from overflowing, water was removed (extracted) from the collection trough periodically, measured and an accumulation tally was created.

Periodically "spot checks" were performed by collecting water for 1 minute and measuring the amount. All of the "spot check" water was returned to the trough for the final accumulation.

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## 1 Minute spot tests

Date	Time	Rate (gpm)	Notes
3/25/2014	7:25 PM	1.00	
	8:10 PM	1.00	
	9:00 PM	1.00	
	10:03 PM	1.00	
	11:13 PM	1.10	
3/26/2014	12:04 AM	1.20	
	1:00 AM	1.10	
	2:00 AM	1.00	
	3:00 AM	1.10	
	4:00 AM	1.10	
	5:00 AM	0.90	
	6:15 AM	0.90	
	7:35 AM	1.00	
	8:30 AM	1.00	
	9:30 AM	0.90	
	10:40 AM	1.20	
	11:40 AM	0.90	
	1:00 PM	0.90	
	1:50 PM	1.00	
	3:07 PM	0.85	
	4:15 PM	0.90	
5:12 PM	0.90		
5:50 PM	0.80		
6:44 PM	0.90		
7:15 PM	1.00		
Average		0.99	gpm

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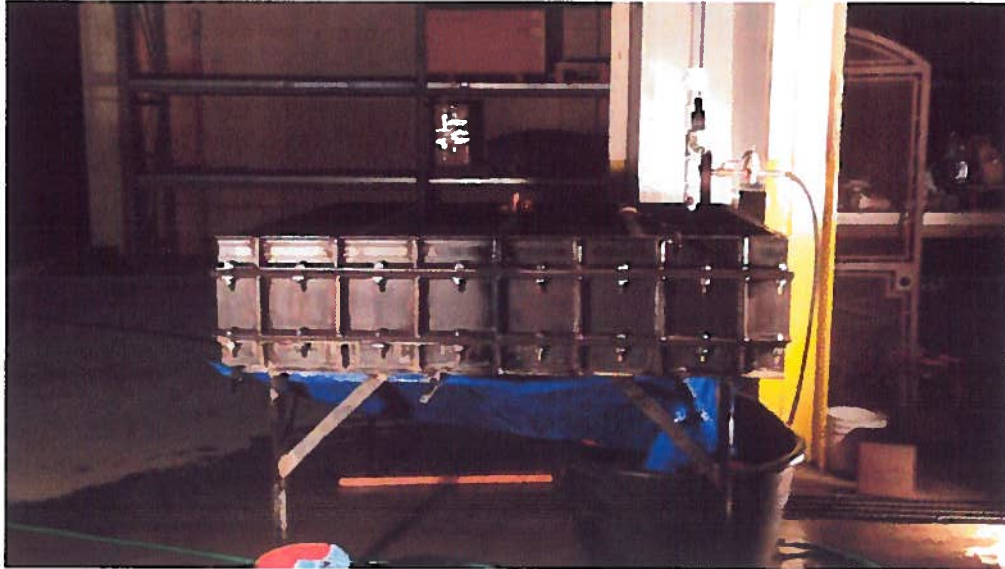
### Extraction of Seepage Accumulation

Date	Time	Gal	Notes
3/25/2014	7:15 PM		Test start
	8:40 PM	60	
	9:21 PM	60	
	10:25 PM	60	
	11:15 PM	60	
3/26/2014	12:06 AM	60	
	1:05 AM	60	
	2:05 AM	60	
	3:00 AM	60	
	4:00 AM	60	
	5:05 AM	60	
	6:20 AM	60	
	6:38 AM	28	
	7:37 AM	60	
	8:35 AM	60	
	9:32 AM	60	
	10:42 AM	60	
	11:43 AM	60	
	1:05 PM	60	
	1:52 PM	60	
	3:11 PM	60	
	4:18 PM	60	
	5:08 PM	60	
	5:50 PM	60	
6:40 PM	60		
7:15 PM	60		
	Remaining	8	Test end
	<b>Total</b>	<b>1476</b>	<b>gallons</b>
<b>Duration</b>	<b>24 hr=</b>	<b>1440</b>	<b>min</b>
		<b>1.025</b>	<b>avg</b>

Test Summary

The average leakage was 1.025 gallons per minute over the duration of the 24 hour test. Spot checks averaged .99 gpm and confirmed that the leakage rate was fairly consistent over the duration of the test.

Test Photos



Test setup with trap underneath and collection trough



Water regulator, clock, pressure gauge and vertical water gauge connection





Water shown draining into the collection trough



Collecting water for spot check



Siphoning water for accumulation tally

Summary

The equipment performed as designed and the test was successfully completed with a positive result.

The average leakage was 1 gpm which was below the goal of 1.45 gpm.