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# MADWELL PRODUCTS CORPORATION TECHNICAL BULLETIN:

## VACUUM TESTING REHABILITATED STRUCTURES

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## SECTION 1: INTRODUCTION

Vacuum testing can be a method to tell that a sound and watertight liner has been installed. The vacuum testing should be in accordance with ASTM C1244. Although this test method is not for existing manholes, it remains the standard most commonly used for vacuum testing rehabilitated structures.

## SECTION 2: TESTING PROCEDURE

To vacuum test structures, you will need the following;

- Pneumatic plugs of appropriate sizes for pipe penetrations
- Braces for plugs (Usually made of 2"x4" lumber cut to fit)
- Test Head (Either Pancake or Doughnut)
- Vacuum Pump or vacuum generator and compressor

Once all plugs have been set and braced, air up all plugs to manufacturers recommended test pressure. Next, set the vacuum test head. The test head will either sit on the top of the casting or below the casting. If below the casting, air doughnut bag up to manufacturers recommended test pressure. Once the test head is set, you will then start the pump or vacuum generator to develop a vacuum inside the structure to 10 inches HG (-5 psig). Once the gauge reaches 10 inches Hg (mercury), the vacuum valve is closed, and the test begins. Per ASTM C1244, during the specified time of test, the gauge cannot fall below 9 inches HG without resulting in a failed test.

\*The Manhole is accepted if the measured time meets or exceeds the values presented in Table 1 of ASTM C1244. If the manhole fails the initial test, it may be repaired by an approved method until a satisfactory test is obtained.

TABLE 1 Minimum Test Times for Various Manhole Diameters (30 - 120 in.) in Seconds

Depth (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
	Time, in seconds								
<4	6	7	7	9	10	12	13	15	16
6	9	10	11	13	15	18	20	22	25
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

TABLE 1 Minimum Test Times for Various Manhole Diameters (30 - 120 in.) in Seconds (continued)

Depth (ft)	Diameter, in.							
	78	84	90	96	102	108	114	120
	Time, in seconds							
<4	18	19	21	23	24	25	27	29
6	26	29	31	34	36	38	41	43
8	35	38	41	45	48	51	54	57
10	44	48	52	56	60	63	67	71
12	53	57	62	67	71	76	81	85
14	62	67	72	78	83	89	94	100
16	70	76	83	89	95	101	108	114
18	79	86	93	100	107	114	121	128
20	88	95	103	111	119	126	135	142
22	97	105	114	122	131	139	148	156
24	106	114	124	133	143	152	161	170
26	114	124	134	144	155	164	175	185
28	123	133	145	155	167	177	188	199
30	132	143	155	166	178	189	202	213

Upon completion of a test, slowly release the vacuum from the structure. *Do not* remove test head until all of the vacuum has been released.

**Example:** Per ASTM C1244-11

*4' diameter 10' deep manhole should hold -10Hg for 25 seconds.*

**Note:** The latest edition of ASTM C1244 shall be used for proper testing procedures and criteria.

If you find you are failing the test, following are some common areas to check for leaks;

- Pipe Penetrations
- Steps
- Inverts

\*Leaks can also be detected by spraying a soapy water solution all over the interior of a structure and testing it. Release the vacuum and remove the head. Bubbles will have formed where it is leaking.

The following photos are examples of Vacuum equipment sold by the Cherne® company.

*Photo 3: High Speed Vacuum Generator (requires compressed air)*



Bladder style vacuum testers can seal on the frame or at the top of the cone (images courtesy Cherne® Company).

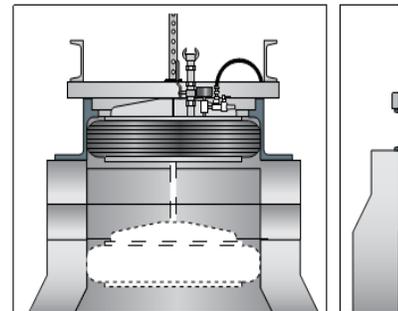
*Photo 1: Plate Style Vacuum Tester*



*Photo 2: Bladder Style Vacuum Tester*



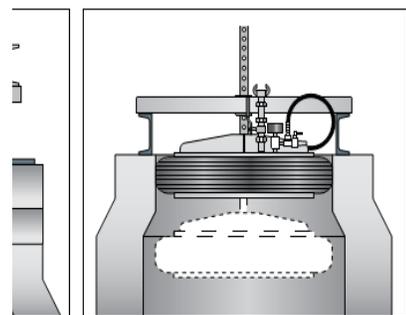
*Figure 1*



**Seals on frame**

**Seal**

*Figure 2*



**Seals at top of cone**