SHOCK TUBE TEST OF A 36-INCH BLAST VALVE

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Ballistic Research Laboratories
Aberdeen Proving Ground, Maryland

August 1972
MEMORANDUM REPORT NO. 2213

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by

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ABERDEEN PROVING GROUND, MARYLAND
A 36" blast valve was positioned in a duct, branching from an 8 ft diameter shock tube, and subjected to blast in both the open and closed position.
<table>
<thead>
<tr>
<th>KEY WORDS</th>
<th>LINK A</th>
<th>LINK B</th>
<th>LINK C</th>
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</thead>
<tbody>
<tr>
<td>Blast Valve</td>
<td></td>
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<tr>
<td>Shock Tube Test</td>
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Terminal Ballistics Laboratory

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Work was supported by Corps of Engineers
on AMCNS No. 5910.22.61252

ABERDEEN PROVING GROUND, MARYLAND
I. INTRODUCTION

At the request of Corps of Engineers personnel of Ballistics Research Laboratories subjected a blast valve to a series of six shock tube generated tests during the period 22 February through 7 March 1972. The test subjected valve is a 36 inch butterfly-type designed for installation in air conditioning ducting of hardened underground sites to protect personnel in the event of an nuclear explosion.

II. OBJECTIVES

The test objectives were to determine the structural integrity of the valve body under shock loadings and to dynamically test the automatic valve closure trigger mechanism. Testing parameters as set forth by Corps of Engineers were to be shock levels of 2, 3, 10 and 25 psi overpressure with the valve tested in both open and closed mode. During a planning meeting held with representatives of Corps of Engineers, Aberthau Construction Co. and BRL, it was agreed that BRL would supply the blast environment required to meet Corps of Engineers testing criteria, but would not evaluate the valve's performance.

III. PROCEDURE AND RESULTS

Testing was accomplished utilizing the 8' diameter shock tube at the BRL Dual Shock Tube Facility. The valve was installed with standard flange mounting in a 36" diameter branch duct. Four data channels of shock wave histories were obtained using CEC type 4-316 unbonded strain pressure transducers and recorded on a CEC 12" oscillograph. Angle of valve vane rotation was recorded through use of a rotary potentiometer affixed to the vane shaft. Following each test the valve was operated manually to determine its continued ability to function.

The location of the data acquisition points, valve placement and test layout are shown in Figure 1. Figures 2 through 7 show the pressure time records acquired during the shot condition tested. Table 1 lists pertinent shock data.

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<table>
<thead>
<tr>
<th>Shot No.</th>
<th>Station P-2 $P_s$</th>
<th>Valve Position at shock arrival</th>
<th>Temp. $^\circ$C</th>
<th>$P_{amb}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-72-1</td>
<td>21.45*</td>
<td>Closed</td>
<td>1.0</td>
<td>30.27</td>
</tr>
<tr>
<td>8-72-2</td>
<td>2.10</td>
<td>Open</td>
<td>10.3</td>
<td>30.09</td>
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<tr>
<td>8-72-3</td>
<td>2.29</td>
<td>Open</td>
<td>12.46</td>
<td>29.95</td>
</tr>
<tr>
<td>8-72-4</td>
<td>26.74*</td>
<td>Closed</td>
<td>14.98</td>
<td>29.96</td>
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<tr>
<td>8-72-5</td>
<td>2.22</td>
<td>Open</td>
<td>2.90</td>
<td>29.71</td>
</tr>
<tr>
<td>8-72-6</td>
<td>11.49</td>
<td>Open</td>
<td>4.76</td>
<td>30.23</td>
</tr>
</tbody>
</table>

*Shock Reflection

$P_s$: Shock Overpressure

Valve Position: $5^\circ = \text{open}$  
$83^\circ 45' = \text{closed}$

$P_{amb}$: in. mercury

The valve endured the tests with no apparent damage.