NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.
This is the twenty-fifth in a series of monthly informal progress reports submitted in partial fulfillment of the contract. It constitutes the first monthly report on the second 1-year continuation of the original 2-year program. It was written by R. B. Setterlund who was supervised by A. Rubin.

I. OBJECTIVES

A. To study the stress corrosion characteristics of 18%-Nickel maraging steel with respect to compositional variation.

B. To study the effect of environmental temperature on the rate of stress corrosion cracking in three alloys: 18%-nickel maraging steel, a low alloy martensitic steel, and a hot-worked die steel.

C. To study the electro-potential changes occurring in 18%-nickel maraging steel during stress corrosion exposure, and the effect of applied potential.

D. To evaluate the effectiveness and applicability of surface protection on 18%-nickel maraging steel in preventing stress corrosion cracking.

II. WORK PROGRESS

A. COMPOSITIONAL VARIATION

Four heats of 18%-nickel maraging steel have been ordered. Delivery is expected in early September. The source of the material is listed below:
<table>
<thead>
<tr>
<th>Supplier</th>
<th>Trade Name</th>
<th>Anticipated Yield Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republic Steel</td>
<td>RSM 200</td>
<td>200 ksi</td>
</tr>
<tr>
<td>Vanadium Alloys Steel Co.</td>
<td>Vascomax 250</td>
<td>250 ksi</td>
</tr>
<tr>
<td>Latrobe Steel Co.</td>
<td>Marvac 18</td>
<td>260 ksi</td>
</tr>
<tr>
<td>Vanadium Alloys Steel Co.</td>
<td>Vascomax 300</td>
<td>300 ksi</td>
</tr>
</tbody>
</table>

Stress corrosion tests will be conducted on the above material using beam specimens stressed elastically to 75% of the yield strength, U-bend specimens to represent plastic deformation, and center-notched specimens to determine the tendency of stress corrosion cracks to propagate in the presence of an existing crack. Three (3) replicate tests will be conducted for each test condition. Tests will be conducted in distilled water, 3% NaCl solution, high humidity air and seacoast atmospheric exposure.

B. EFFECT OF ENVIRONMENTAL TEMPERATURE

We are presently installing immersion heaters controlled by mercury thermo-regulators to set up constant temperature baths for maintaining temperatures of 120 and 160 F. Specimens of the above four 18%-nickel maraging steel heats along with specimens of Vascojet 1000 and Ladish D6AC for comparison will be exposed to a distilled water environment at 70, 120 and 160 F to obtain data showing the temperature dependence of stress corrosion cracking susceptibility for these alloys.

C. ELECTROPOTENTIAL CHANGES

An experiment has been designed to measure the electropotential changes occurring during the stress corrosion process using the center-notch specimen employed in the third year program. The entire specimen surface with
the exception of the notch tip will be masked off, and the electrical connection made at that point. The potential of the crack surface compared to a standard calomel cell will be recorded continuously as the specimen is loaded and during the environmental exposure. This experiment is expected to yield data that will reveal the electrochemical nature of the stress-corrosion mechanism.

D. SURFACE PROTECTION

Two (2) protective coatings found to be most effective in preventing stress corrosion cracking of H-11 steel will be evaluated for applicability in protecting 16%-nickel maraging steel. The coatings selected, based on the previous years work are CAT-A-LAC 454-1-1, a chromate-inhibited epoxy, and Magna Laminar X-500, a polyurethane-type coating.

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