February 28, 2005

CLIENT: MMFX Steel Corporation of America (FASTEEL)
1832 South Lewis Street
Anaheim, CA 92805
Attn.: Daniel L. Brick

Subject: Tensile Test - Coupled Reinforcing Steel Bars (w/ Stress vs. Strain Graphs)
Test Method: ASTM A 370
Specification: None
Source: Submitted to Laboratory by Client.

**Report of Tests**

At your request, tensile tests were performed on coupled MMFX rebar. Strain values are calculated from deflection as measured between the ends (gage length) of the coupler at two bar diameter from the ends: *Results are summarized in Table 1 below.*

### TABLE 1 - Tensile Test Results

#### MMFX Rebar and Coupler

<table>
<thead>
<tr>
<th>Sample I.D.</th>
<th>#4-1</th>
<th>#4-2</th>
<th>#4-3</th>
<th>#4-4</th>
<th>#4-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Diameter, in.:</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Nominal Area, Sq. In.:</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
<td>0.20</td>
</tr>
<tr>
<td>Maximum Load, Lbs.:</td>
<td>32,744</td>
<td>33,200</td>
<td>32,980</td>
<td>32,910</td>
<td>33,100</td>
</tr>
<tr>
<td>Tensile Strength, PSI:</td>
<td>163,720</td>
<td>166,000</td>
<td>164,900</td>
<td>164,550</td>
<td>165,600</td>
</tr>
<tr>
<td>% Elongation (@ 4&quot; G.L.):</td>
<td>12%</td>
<td>12%</td>
<td>13%</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>% Area Reduction =</td>
<td>36.40%</td>
<td>38.00%</td>
<td>34.20%</td>
<td>37.20%</td>
<td>36.00%</td>
</tr>
<tr>
<td>Failure Mode:</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample I.D.</th>
<th>#8-1</th>
<th>#8-2</th>
<th>#8-3</th>
<th>#8-4</th>
<th>#8-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Diameter, in.:</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Nominal Area, Sq. In.:</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
<td>0.79</td>
</tr>
<tr>
<td>Maximum Load, Lbs.:</td>
<td>139,932</td>
<td>139,930</td>
<td>138,441</td>
<td>139,542</td>
<td>139,542</td>
</tr>
<tr>
<td>Tensile Strength, PSI:</td>
<td>177,129</td>
<td>177,127</td>
<td>175,242</td>
<td>176,635</td>
<td>176,635</td>
</tr>
<tr>
<td>% Elongation (@ 4&quot; G.L.):</td>
<td>18%</td>
<td>16%</td>
<td>18%</td>
<td>18%</td>
<td>18%</td>
</tr>
<tr>
<td>% Area Reduction =</td>
<td>34.20%</td>
<td>31.20%</td>
<td>33.30%</td>
<td>31.80%</td>
<td>31.80%</td>
</tr>
<tr>
<td>Failure Mode:</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample I.D.</th>
<th>#9-1</th>
<th>#9-2</th>
<th>#9-3</th>
<th>#9-4</th>
<th>#9-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Diameter, in.:</td>
<td>1.128</td>
<td>1.128</td>
<td>1.128</td>
<td>1.128</td>
<td>1.128</td>
</tr>
<tr>
<td>Nominal Area, Sq. In.:</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Maximum Load, Lbs.:</td>
<td>177,860</td>
<td>177,376</td>
<td>177,154</td>
<td>177,994</td>
<td>177,994</td>
</tr>
<tr>
<td>Tensile Strength, PSI:</td>
<td>177,860</td>
<td>177,376</td>
<td>177,154</td>
<td>177,994</td>
<td>177,994</td>
</tr>
<tr>
<td>% Elongation (@ 4&quot; G.L.):</td>
<td>17%</td>
<td>18%</td>
<td>15%</td>
<td>16%</td>
<td>16%</td>
</tr>
<tr>
<td>% Area Reduction =</td>
<td>30.14%</td>
<td>27.66%</td>
<td>24.11%</td>
<td>23.64%</td>
<td>23.64%</td>
</tr>
<tr>
<td>Failure Mode:</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
</tr>
</tbody>
</table>
### MMFX Coupled Rebar

<table>
<thead>
<tr>
<th>Sample I.D.</th>
<th>#10-1</th>
<th>#10-2</th>
<th>#10-3</th>
<th>#10-4</th>
<th>#10-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Diameter, in.</td>
<td>1.27</td>
<td>1.27</td>
<td>1.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal Area, Sq. In.</td>
<td>1.27</td>
<td>1.27</td>
<td>1.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Load, Lbs.</td>
<td>210,180</td>
<td>210,670</td>
<td>209,309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength, PSI</td>
<td>165,496</td>
<td>165,882</td>
<td>164,810</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Elongation (@ 4&quot; G.L.)</td>
<td>15%</td>
<td>18%</td>
<td>12%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Area Reduction =</td>
<td>28.82%</td>
<td>25.04%</td>
<td>24.25%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure Mode:</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample I.D.</th>
<th>#11-1</th>
<th>#11-2</th>
<th>#11-3</th>
<th>#11-4</th>
<th>#11-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal Diameter, in.</td>
<td>1.41</td>
<td>1.41</td>
<td>1.41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal Area, Sq. In.</td>
<td>1.56</td>
<td>1.56</td>
<td>1.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Load, Lbs.</td>
<td>276,000</td>
<td>275,620</td>
<td>274,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tensile Strength, PSI</td>
<td>176,923</td>
<td>176,679</td>
<td>175,962</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Elongation (@ 4&quot; G.L.)</td>
<td>20%</td>
<td>20%</td>
<td>5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Area Reduction =</td>
<td>28.82%</td>
<td>25.04%</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Failure Mode:</td>
<td>Rebar Broke</td>
<td>Rebar Broke</td>
<td>Coupler Brk</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General Notes:** For observation only, an elongation using a 2" gage length would somewhat increase the 4" elongation value at approximately 80%.

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Respectfully Submitted,

SMITH EMERY LABORATORIES

V. Andrew Tan  
Registered Civil Engineer No.: C 64265  
Registration Expires: 6-30-07

☐ Materials Tested Did Not Comply With Specifications.  
☐ No Established Criteria for Acceptable Limits.  
☐ For Information Only
MMFX Coupled Rebar (2-22-05) Size #4 Test #1

Coupled System
Maximum Load = 32,740 lbs.
Max Tensile Strength = 163,918 psi
%Elongation @ 4" G.L.=14%
Failure: Rebar Broke
% Area Reduction : 36.40%
Coupled System
Maximum Load = 32,980 lbs.
Max Tensile Strength = 164,905 psi
%Elongation @ 4" G.L.=13%
Failure: Rebar Broke
% Area Reduction : 34.20%

MMFX Coupled Rebar (2-22-05) Size #4 Test #3
MMFX Coupled Rebar (2-22-05) Size #4 Test #4

Coupled System
Maximum Load = 32,910 lbs.
Max Tensile Strength = 164,565 psi
%Elongation @ 4" G.L.=12%
Failure: Rebar Broke
% Area Reduction : 37.20%
MMFX Coupled Rebar (2-22-05) Size #4 Test #5

Coupled System
Maximum Load = 33,100 lbs.
Max Tensile Strength = 165,510 psi
%Elongation @ 4" G.L.=13%
Failure: Rebar Broke
% Area Reduction : 36.00%
Coupled System
Maximum Load = 139,932 lbs.
Max Tensile Strength = 177,130 psi
%Elongation @ 4" G.L. = 18%
Failure: Rebar Broke
Area Reduction: 34.20%
Coupled System
Maximum Load = 139,930 lbs.
Max Tensile Strength = 177,130 psi
%Elongation @ 4" G.L. = 16%
Failure: Rebar Broke
Area Reduction: 31.20%
Coupled System
Maximum Load = 138,440 lbs.
Max Tensile Strength = 175,240 psi
%Elongation @ 4" G.L.=18%
Failure : Rebar Broke
Area Reduction: 33.30%
MMFX Coupled Rebar (2-24-05) Size #9 Test #2

Coupled System
Maximum Load = 178,376 lbs.
Max Tensile Strength = 178,380 psi
%Elongation @ 4" G.L.=18%
Failure : Rebar Broke
Area Reduction: 27.66%
MMFX Coupled Rebar (2-24-05) Size #9 Test #3

Coupled System
Maximum Load = 177,154 lbs.
Max Tensile Strength = 177,150 psi
%Elongation @ 4" G.L.=15%
Failure: Rebar Broke
Area Reduction: 24.11%
MMFX Coupled Rebar (2-24-05) Size #10 Test #3

Coupled System
Maximum Load = 210,309 lbs.
Max Tensile Strength = 164,810 psi
%Elongation @ 4" G.L.=12%
Failure: Rebar Broke
% Area Reduction = 24.25%
Coupled System
Maximum Load = 276,920 lbs.
Max Tensile Strength = 176,920 psi
%Elongation @ 4" G.L.=20%
Failure = Rebar Broke
% Area Reduction = 29.65 %
Coupled System
Maximum Load = 274,500 lbs.
No Rebar Break
%Elongation @ 4" G.L.=5%
Failure: Coupler Broke
% Area Reduction = None
MMFX #4 Bars with Barsplice Couplers with Failure in Bars Outside Couplers

Close-up of MMFX #4 Bars with Barsplice Couplers with Failure in Bars Outside Couplers
MMFX #8 Bars with Barsplice Couplers with Failure in Bars Outside Couplers

Close-up of MMFX #8 Bars with Barsplice Couplers with Failure in Bars Outside Couplers
MMFX #9 Bars with Barsplice Couplers with Failure in Bars Outside Couplers

Close-up of MMFX #9 Bars with Barsplice Couplers with Failure in Bars Outside Couplers
MMFX #10 Bars with Barsplice Couplers with Failure in Bars Outside Couplers

Close-up of MMFX #10 Bars with Barsplice Couplers with Failure in Bars Outside Couplers
MMFX #11 Bars with Barsplice Couplers with Failure in Bars Outside Couplers

Close-up of MMFX #11 Bars with Barsplice Couplers with Failure in Bars Outside Couplers
Ductile Failure of #11 MMFX Bars outside Coupler

Close-up of #11 Barssplice Coupler Detail
Close-up of Ductile Failure of #9 MMFX Bars