



**WESTERN MICHIGAN UNIVERSITY**

Bronco Construction  
Research Center

## Estimate

| Item Code   | Description  | Quantity | \$ Each        |  | Amount |
|---|--|----------|----------------|--|--------|
| <b>Staff Compensation</b>                           |  |          |                |  |        |
| Center Director                                     | Director   | 1        | \$72.84/hour   |  |        |
| Labor- Research Associate                           | R3 Research Associate  | 1        | \$58.65/hour   |  |        |
| Labor- Carpenter                                    | Carpenter/General Labor  | 1        | \$30.00/hour   |  |        |
| Labor- Mechanical Engineer                          | \$30/hour  | 1        | \$30.00/hour   |  |        |
| Student Worker                                      | \$20/hour  | 1        | \$20.00/hour   |  |        |
| <b>Load Frame (Force Displacement)</b>              |  |          |                |  |        |
| Load or Displacement Control                        | 22kip servo-hydraulic, 7.42" area  | 1        | \$923.07/test* |  |        |
| Load or Displacement Control                        | 110kip servo-hydraulic, 38.48" area  | 1        | \$923.07/test* |  |        |
| 110kip servo-hydraulic configuration fee (flat fee) | Mechanical adjustments necessary to utilize equipment (Flat Fee)   | 1        | \$500.00/Fee   |  |        |
| Finite Elemental Analysis                           | Staff @ \$88.23/hour + Operating Expenses \$80.29/day  | 1        | TBD            |  |        |
| <b>Tension &amp; Compression</b>                    |  |          |                |  |        |
| Tensile Testing 22kip, 15gpm                        | ASTM E8 metallic materials   | EA       | \$64.00/each*  |  |        |
| Tensile   | ASTM B557 wrought and cast aluminum/magnesium alloy products   | EA       | \$64.00/each*  |  |        |
| Wire Tensile  | ASTM B557 wrought and cast aluminum/magnesium alloy products   | EA       | \$80.00/each*  |  |        |
| Weld Tensile  | CSA W47.1 fusion welding of steel, CSA W47.2 fusion welding of aluminum, ASME IX QW-150 welding general requirements – | EA       | \$60.00/each*  |  |        |

|   |   |    |                |  |  |
|---|---|----|----------------|--|--|
|   | tension tests, ASME IX QB-150 welding general requirements – tension tests  |    |                |  |  |
| <b>Bending and Ductility</b>                            |   |    |                |  |  |
| Weld Bend   | CSA W47.1 fusion welding of steel, CSA W47.2 fusion welding of aluminum, ASME IX QW-160 welding general requirements – tension tests, ASME IX QB-160 welding general requirements – tension tests | EA | \$60.00/each*  |  |  |
| Filet-Weld Bend   | CSA W47.1 fusion welding of steel, CSA W47.2 fusion welding of aluminum, ASME IX QW-180 welding general requirements – fillet weld tests  | EA | \$64.00/each*  |  |  |
| <b>Impact</b>   |   |    |                |  |  |
| Charpy Notched bar impact testing of metallic materials | ASTM E23 Notched bar impact testing of metallic materials   | EA | \$40.00/each*  |  |  |
| Impact testing of welding procedures                    | ASME VIII UCS-67 rules for construction of pressure vessels division – impact testing of welding procedures   | EA | \$40.00/each*  |  |  |
| Fusion Welding of Steel                                 | CSA W47.1 fusion welding of steel   | EA | \$80.00/each*  |  |  |
| Steel Products  | ASTM A370 steel products  | EA | \$104.00/each* |  |  |
| Optional Vee-notch                                      |   | EA | \$8.00/each*   |  |  |
|   |   |    |                |  |  |
|   |   |    |                |  |  |
|   |   |    |                |  |  |
| <b>Hardness</b>   |   |    |                |  |  |
| Rockwell Hardness                                       | ASTM E18 – hardness of metallic materials   | EA | \$48.00/each*  |  |  |
| Brinell Hardness  | ASTM E10 Hardness of metallic materials by portable hardness testers  | EA | \$120.00/each* |  |  |
| Vickers – Hardness                                      | ASTM E384 micro indentation hardness of materials   | EA | \$120.00/each* |  |  |
| Profile Harness   | ASTM E384 micro indentation hardness of materials   | EA | \$160.00/each* |  |  |
| Case Depth  | ASTM E384 – up to 10 hits per component   | EA | \$160.00/each* |  |  |

|  |   |    |                |  |  |
|--|---|----|----------------|--|--|
| <b>Dynamic Wind Uplift</b>                 |   |    |                |  |  |
| 12'x24' wind uplift test                   | Sequence A through E (19-hour average test)   | EA | \$12,500/each* |  |  |
| 1-day specimen assembly required           | Hourly rates (charged under Staff Compensation)   |    |                |  |  |
| 1-day specimen disassembly required        | Hourly rates (charged under Staff Compensation)   |    |                |  |  |
| 1-day test                                 | Hourly rates (charged under Staff Compensation) + daily operating expenses                                    |    |                |  |  |
| <b>Monotonic Wind Uplift</b>               |   |    |                |  |  |
| 8'x8' monotonic wind uplift                | Static pressure (defined during project scope) held for "x" hours (defined during project scope) during scope | EA | \$5,000/each*  |  |  |
| ½ day specimen assembly                    | Hourly rates (charged under Staff Compensation)   |    |                |  |  |
| ½ day specimen disassembly                 | Hourly rates (charged under Staff Compensation)   |    |                |  |  |
| 1-day test                                 | Hourly rates (charged under Staff Compensation) + daily operating expenses                                    |    |                |  |  |
| <b>Facility Operating Expenses (Daily)</b> |   |    |                |  |  |
| Facility Operating Expenses                | Daily Rate  | 1  | \$112.71/day   |  |  |
| <b>Equipment Costs</b>                     |   |    |                |  |  |
| Equipment Costs (10-year depreciation)     | Daily Rate  | 1  | \$232.53/day   |  |  |
| <b>TOTAL</b>                               |   |    |                |  |  |

Above tests entail producing a data set and graphs, no analysis. Tests requiring machining, sample preparation, fixturing, or significant setup time will be charged by the hour at applicable rates plus materials costs. An estimate will be given upon receipt of samples

\*specimen preparation and fixturing is additional via Staff Compensation + Facility Operating Expenses