READ THIS FIRST

This Project Spec Document may need additional modifications to suit your project. It is recommended that you proofread each section, paying attention to any “Notes” boxes such as this one--you should remove these “Notes” sections as you go. Also, do a search for all bracket characters “ [ ] “ as they are used to show you areas containing options or project specific details (you can use Microsoft Word’s Find feature {Ctrl-F} to jump to an open bracket “ [ “ character quickly). Again, these bracket characters should be removed.

It is important that every paragraph be numbered to allow for easy referencing. If you use the document’s built in styles and formatting your outline should be fine (turn on the formatting toolbar by going to View > Toolbars > Formatting). Most paragraphs will use the style “Numbered Material” and can be promoted (Shift) or demoted (Shift-Tab).

You should not have to manually enter extra spaces, carriage returns or outline characters such as A, B, C, or 1.01, 1.02; the formatting will do this for you. The entire document is 11 pt. Arial. If you paste items in, you may need to reapply the “Numbered Material” format.

1. GENERAL
   1. SUMMARY OF WORK
      1. The extent and location of the “Welding” Work is indicated in the Contract Documents. Terms
         1. The terms, “welding,” “weld,” “joining,” and other similar variations of these terms used in the context of this section generally refer to the joining of metals, using approved materials and procedures.
   2. GOVERNING CODES, STANDARDS, AND REFERENCES
      * 1. American Institute of Steel Construction (AISC)
           1. AISC 360, Specification for Structural Steel Buildings
           2. AISC 303, Code of Standard Practice for Steel Buildings and Bridges
           3. AISC 325, Steel Construction Manual
        2. American Welding Society (AWS)
           1. AWS A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination
           2. AWS A3.0, Standard Welding Terms and Definitions
           3. AWS D3.6, Underwater Welding
           4. AWS D1.1, Structural Welding Code – Steel
           5. AWS D1.3, Structural Welding Code – Sheet Steel
           6. AWS D1.4, Structural Welding Code – Reinforcing Steel
           7. AWS D14.4, Specification for Welding Joints for Machinery and Equipment
        3. American Society for Testing and Materials (ASTM)
           1. ASTM E165, Standard Practice for Liquid Penetrant Examination for General Industry
           2. ASTM E709, Standard Guide for Magnetic Particle Examination
        4. International Building Code (IBC)
           1. International Building Code as adopted and amended by the [City of Seattle as the Seattle Building Code] [Seattle-Tacoma International Airport Building Department] [Authority Having Jurisdiction] [other].
   3. SUBMITTALS
      1. Submit materials data in accordance with Section 01 33 00 - Submittals. Furnish manufacturers’ technical literature, standard details, product specifications, and installation instructions for all products.
      2. Submittals shall include the following:
         1. Shop Drawings
            1. Manufacturer shall submit shop drawings detailing the following information at a minimum in addition to shop drawing requirements:

Elements in shop drawings shall be shown with respect to grid or bent locations as shown on contract documents.

Show all shop and erection details, including cuts, copes, splices, weld preparations, cambers, holes, fasteners, and welds (etc.).

Show all welds, both shop and field, using AWS A2.4 standard notation.

* + - 1. Filler Material Specifications
         1. Material specifications shall be provided and presented as a direct comparison with the material requirements listed in this specification section.
         2. Each comparison shall be labeled with a ‘Pass’ or a ‘Fail.”
         3. Generic or incomplete manufacturer-supplied data may be rejected.
      2. Weld Qualifications
         1. Submit qualification documents (WPS, PQR, WPQ, WPQT) in accordance with:

AWS D1.1 for structural component thickness 1/8” and greater.

AWS D1.3 for structural component thickness of 1/8” and smaller.

AWS D1.3 for reinforcing steel.

AWS D14.4 for machinery.

* + - 1. Testing and Inspection Plan
         1. Locations of planned weld testing and inspection
         2. Schedule of planned weld testing and inspection, including inspection frequency
         3. Name(s) of testing and inspection agency or agencies
      2. Testing and Inspection Results
         1. Inspector name, company, date
         2. Project name
         3. Test location, using design drawings
         4. Welding Process
         5. Code Standard
         6. NDT Type
         7. Inspection Standard
         8. Acceptance Standard
         9. Pass/Fail
         10. Inspector remarks, photos, and measurements
      3. Qualifications of Welding Supervisor
         1. Name of welding supervisor(s)
      4. Installer Performance Qualifications
         1. Submit WABO performance qualifications for each welder, showing approval for each of the following at a minimum.

Name of welder

Weld positions

Welding processes

Plate thicknesses

Dates of qualification

* + - 1. Weld Inspection Work Schedules

1. MATERIALS

A. If only one product is acceptable (single or sole source product), obtain an approved Competition Waiver and submit to the CPO Construction, Contract Administrator. The language shall read as: “Manufacturer Name, Product # XXXXX, No Equal.” Refer to CPO-6 Competition Waiver Policy for more information.

B. If a Competition Waiver is not approved or more than one product is acceptable, this section must list a minimum of 2 products plus the language “Or Approved Equal,” along with salient characteristics. Refer to CPO Construction’s Salient Characteristics Guidelines for more information.

* 1. PROJECT INFORMATION
  2. PREPARATION FOR MATERIALS
  3. FABRICATION, PRODUCTION, AND SUPPLY OF MATERIALS
  4. MATERIAL REQUIREMENTS
     1. All Materials
        1. Unless noted or specified otherwise, all products shall be new, free from defects, and of the best quality for the intended use.
        2. Materials shall be within specification tolerances throughout the duration of the project, including at the time of installation.
        3. When proprietary systems are required, Contractor shall generally conform to manufacturers' specifications, for best performance in the use of each of their products.
           1. If manufacturer instructions are at variance with these specifications, report the discrepancy to the Port of Seattle before proceeding.
        4. All materials not specified but required for a complete and proper installation shall be selected by the Contractor but are subject to the approval of the Engineer.
     2. Filler Material
        1. Filler materials for underwater welding Work shall be in compliance with the standards stated or referenced in AWS D3.6.
        2. Only low hydrogen weld filler material shall be used.
        3. Weld filler metal shall meet the following minimum mechanical property requirements:

|  |  |
| --- | --- |
| PROPERTY | ACCEPTANCE REQUIREMENTS |
| Charpy V-Notch (CVN) | 20 ft-lb @ 40°F |
| Charpy V-Notch (CVN) | 40 ft-lb @ 70°F |
| Yield Strength | 58 ksi min. |
| Tensile Strength | 70 ksi min. |
| Elongation | 22%, minimum |

* + - 1. Filler materials for underwater welding Work shall be in compliance with the standards stated or referenced in AWS D3.6M, latest edition.
    1. Base Metals
       1. Weld filler metal shall comply with matching filler metal/base metal combinations of AWS D1.1/D1.4.
       2. Materials with welds in undesignated locations will not be accepted unless the welding is approved by the Engineer.
  1. MATERIAL HANDLING, DELIVERY, AND STORAGE
     1. Storage
        1. Welding electrodes shall be packaged, stored, and used in a manner consistent with AWS D1.1/D1.4, and electrode manufacturer specifications.
     2. Damage & Replacements
        1. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Port of Seattle in accordance with AWS D1.1/1.4.
  2. QUALITY ASSURANCE
     1. Inspection and Testing
        1. Any testing and inspection shall be in accordance with Section 01 45 23 - Independent Testing and Inspection Service.
        2. The Port of Seattle retains the right to inspect and test all materials at all phases of construction.

1. EXECUTION
   1. PROJECT NOTES
   2. PREPARATION FOR EXECUTION OF WORK
      1. Prequalified Welding Procedure Specifications (WPS)
         1. All welds shall be prequalified by AWS D1.1/1.4 unless otherwise approved by the Engineer.
         2. Use prequalified WPS’s in accordance with AWS D1.1/D1.4.
            1. Use prequalified base metal/ filler metal combinations.
            2. Use prequalified partial and complete joint penetration details.
            3. Use prequalified minimum preheat and interpass temperatures.
      2. Weld Qualifications
         1. All welds shall be qualified per AWS D1.1/D1.4.
         2. Previously qualified welds are allowable at the sole discretion of the approval of the Engineer.
         3. Welds with qualification tests are allowable at the sole discretion of the approval of the Engineer.
         4. Approval of any procedure does not relieve the Contractor of the sole responsibility for producing a finished structure meeting all specified strength and serviceability requirements.
      3. Base Metals
         1. Where weld is intended for application to steel with surface coatings such as paint or galvanizing, remove surface coatings within 1” clear of weld.
   3. EXECUTION OF WORK
      1. Fit-Up
         1. Fit-up tolerances, per AWS D1.1/D1.4, shall be measured and reported as a component of Periodic and Continuous Inspections.
         2. Root thickness tolerances shall be observed as described in AWS D1.1/D1.4.
         3. The Contractor shall not build-up out-of-tolerance roots using weld material unless approved by the Engineer.
            1. Approval of root build-up at one location shall not be considered to be tacit approval at other locations.
      2. Preheat and Interpass
         1. Use a maximum preheat and maximum interpass temperature of 550 deg. F, measured at a distance of 1 in. from the point of arc initiation.
            1. This maximum temperature may not be increased by the WPS, regardless of qualification testing.
      3. Minimum Welds
         1. Use minimum prequalified partial joint penetration (PJP) weld sizes in accordance the more stringent of the project specifications, drawings, and AWS D1.1/D1.4.
            1. Use PJP welds larger than the minimum allowable where shown on the plans.
         2. Where fillet weld size is not shown on the drawings, use minimum fillet weld sizes in accordance with the more stringent of the project specifications, drawings, and AWS D1.1/ D1.4.
      4. Welding
         1. Welding materials, procedures, and equipment shall comply with AWS D1.1/D1.4.
         2. Conform the design of welded connections to AISC 360 unless otherwise indicated or specified.
         3. Do not commence welding until welding procedures, inspectors, nondestructive testing personnel, welders, welding operators, and tackers have been qualified and the submittals approved by the Port.
         4. Metals shall be joined as indicated on drawings.
         5. Members in tubular structures shall be joined under the AWS D1.1 design requirements for cyclically loaded tubular structures.
      5. Field Welding
         1. Field welding shall comply with AWS D1.1/D1.4.
         2. Underwater welding Work shall be in compliance with the standards stated or referenced in AWS D3.6.
         3. Contactor shall shield welding operations from wind, rain, dirt, and other environmental weld detriments as directed by the Engineer.
         4. If light produced by welding arcs hinder the ongoing operations of tenants or the public, the Contractor shall make arrangements to move the weld location or screen the welding operations from view as directed.
      6. Finishing
         1. Where detailed, each weld shall be ground or otherwise mechanically finished to smooth condition without pits, edges, and sharp corners.
         2. Where coatings such as paint or galvanizing is to be applied, welds shall be prepared to compliance.
         3. All welds shall be completed to be smooth and free of burs, protrusions, edges, and other sharp discontinuities.
         4. Where applicable, weld must retain required throat thickness after finishing operations are completed.
         5. No weld shall be finished to allow for pits or cause pooling water when the finished structure is oriented as shown on plan.
         6. Weld contours shall be completed as required by AWS D1.1 reference.
         7. All finished welds shall remain within allowable sizes and tolerances throughout and after all finishing operations.
      7. Warping
         1. Fabricator shall use jigs, templates, strategic application of welds, and other means necessary to protect members from warping.
         2. Fabrications with excessive distortion due to welding may be rejected by the Engineer.
      8. Repair
         1. Repairs shall be performed in accordance with AWS requirements.
         2. Heat generated from weld may have a deleterious effect on surface conditioning, causing cracks, debonding, delamination, and other types of distress.
            1. Remove and repair surface coatings damaged by welding operations with like materials to the approval of the Engineer.
            2. Galvanizing shall be repaired by zinc solder or as approved by the Engineer.
   4. QUALITY ASSURANCE
      1. Testing and Inspection
         1. All Testing and Inspection
            1. All inspection procedures, techniques, methods, acceptance criteria, and inspector qualifications shall be completed in accordance with AWS D1.1/D1.4 and D3.6 as applicable.
            2. All Special Inspections shall be completed in compliance with the more stringent of IBC Chapter 17 or the adopted building code.
            3. Special Inspection or other Testing and Inspection of welding will be performed by the Special Inspector or agent of the Port in accordance with Section 01 45 23 - Independent Testing and Inspection Service, subject to the limitations of this section.
            4. Costs associated with the Independent Testing and Inspection Service inspecting replacement materials, products, welds, and other installations due to Contractor error shall be deducted from monies due to the Contractor.
            5. Testing and Inspection shall be completed at or near the Work site.
            6. The Port of Seattle and the Inspector shall be given the option to be present to view all fit-up and welding operations.
         2. Off-site Testing and Inspection

Use the following sections if the Authority Having Jurisdiction for the project is the City of Seattle (typical for Maritime or Economic Development projects). For Maritime or Economic Development projects outside of City of Seattle jurisdiction, modify to comply with applicable AHJ requirements.

* + - * 1. If the Contractor chooses to employ a fabricator who is not a City of Seattle approved fabricator in accordance with section 1704.2.2 of the Seattle Building Code, the Contractor shall pay for Special Inspection at the fabrication shop performed by the Special Inspector in accordance with the Seattle Building Code.
        2. In accordance with Section 01 45 29 – Independent Testing and Inspection Service, the Contractor shall provide and pay for off-site inspection and testing service required to confirm the quality of materials used.

Use the following sections if the Authority Having Jurisdiction for the project is the the Airport Building Department (typical for Aviation projects). For Aviation projects outside of ABD jurisdiction, modify to comply with applicable AHJ requirements.

* + - * 1. The Airport Building Department accepts Washington Association of Building Officials (WABO) registered steel fabrication facilities. Fabricators must provide WABO registration to the Airport Building Department for review and approval.
        2. It is not the Airport Building Department’s intent to prevent any fabricator who is not registered with WABO to manufacture structural steel components for building construction. Those fabricators, however, would be subject to special inspection at the fabrication facility by a WABO certified structural steel and welding special inspector.
        3. Upon completion of fabrication, the approved fabricator shall submit a certificate of compliance to the Airport Building Department stating that the work was performed in accordance with the approved construction documents.
        4. In accordance with Section 01 45 29 – Independent Testing and Inspection Service, the Contractor shall provide and pay for off-site inspection and testing service required to confirm the quality of materials used.
      1. Minimum Testing and Inspection Requirements
         1. Test Methods and Acceptance Criteria

Test methods and acceptance criteria shall be determined by location in accordance with AWS D1.1/D1.4 and adopted building codes for all Testing and Inspection requirements.

The extent of Testing and Inspection required shall be continuously determined by the Engineer.

* + - * 1. Visual Inspection

The Contractor shall sequence Work or otherwise schedule welding operations to accommodate the scheduling of 75% minimum required visual weld inspections to occur during normal business hours.

Visual Inspection shall be performed by the Inspector before, during, and after welding to the extent determined by the Port.

All root openings shall be inspected prior to welding.

Out-of-tolerance root openings must be approved by the Engineer prior to welding.

Inspector shall visually inspect 100% of installed welds after welding and prior to coating application.

* + - * 1. Nondestructive Testing (NDT)

The Contractor shall sequence Work or otherwise schedule welding operations to accommodate the scheduling of 100% minimum required nondestructive weld inspections to occur during normal business hours.

Magnetic Particle Testing

The following shall be tested by the magnetic particle method in accordance with AWS D1.1/D1.4. Locations to be determined by the Port.

30% of fillet welds

50% of all partial penetration welds

All complete penetration welds not tested by ultrasonic testing.

Ultrasonic Testing

The following shall be tested by the ultrasonic method in accordance with AWS D1.1/D1.4.

100% of complete penetration welds.

All complete penetration welds in which, in the opinion of the inspector, ultrasonic testing is more conclusive than magnetic particle testing.

* + - 1. Testing and Inspection Results
         1. Inspection results shall be made available to the Port and the Contractor within 2 business days of testing.
         2. Each weld designated for testing shall be inspected, located on design drawings, compared with acceptance standards, and assigned a “PASS” or “FAIL” grade.
    1. Qualifications
       1. Qualifications of Welding Supervisor(s)
          1. Provide at least one person who shall be present at all times during execution of this portion of the Work who shall be thoroughly trained and experienced in placing the types of welding specified and who shall direct all Work performed under this section.
       2. Installer Performance Qualifications
          1. All welders shall be currently certified by AWS or Washington Association of Building Officials (WABO) for structural welding.

If the welder has not been engaged in the welding process for three or more months, re-qualify the welder before permitting structural welding Work.

* + - * 1. All welders performing underwater welding Work shall be in compliance with the standards stated or referenced in AWS D3.6M, latest edition.
    1. Weld Inspection Work Schedules
       1. The Contractor shall notify the Port of Seattle and the Independent Testing Agency 14 days prior to beginning welding operations.
       2. The Contractor shall notify the Port of Seattle and the Independent Testing Agency 3 business days prior to fit-up and welding operations for all structural welds requiring Periodic or Continuous Inspection in accordance with adopted building codes.

1. MEASUREMENT AND PAYMENT
   1. GENERAL
      1. No separate measurement or payment will be made for the Work required by this section. The cost for this portion of the Work will be considered incidental to, and included in the payments made for the applicable bid items in the [Schedule of Unit Prices] [Lump Sum price bid for the Project].

End of Section

Revision History:

05/01/2014 Conversion to 2004 CSI Numbering System

10/15/2014 Added Sole Source and Salient Characteristics Note to Part 2

4/30/18 Added Submittal for Testing and Inspection Plan

10/14/19 Revised 3.04.A.2. Off-site Testing and Inspection