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. Description of Work
         1. The Work includes providing an energy dissipation and fendering system, as described within the requirements below.
         2. The Work includes providing all necessary and incidental labor, materials, equipment, and supporting documentation necessary to meet the minimum requirements described in specifications, drawings, and referenced supplements unless otherwise described within this section.
      2. Terms
         1. The terms “fender system,” “rubber fenders,” “fenders,” “energy dissipation units,” and other similar variations of these terms used in the context of this section generally refer to a complete structural system designed, installed, and commissioned to dissipate kinetic energy.
         2. The terms “fender system,” “fenders,” energy dissipation units,” and other similar variations of these terms generally refer to the Work outlined within this section.
   2. GOVERNING CODES, STANDARDS, AND REFERENCES
      1. Requirements Specified Elsewhere
         1. The provisions and intent of the Contract, including the General Conditions, Supplementary Conditions and General Requirements, apply to the Work as if specified in this section.
         2. Where publication dates are not directly specified, current publication at the time of Bid Opening shall govern.
      2. Governing Codes, Standards, and References
         1. American Institute of Steel Construction (AISC)
            1. AISC 360, Specification for Structural Steel Buildings
         2. American Society for Testing and Materials (ASTM)
            1. A240, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
            2. A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
            3. D395, Standard Test Methods for Rubber Property – Compression Set.
            4. D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
            5. D573, Standard Test Method for Rubber – Deterioration in an Air Oven.
            6. D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.
            7. D1171, Standard Test Method for Rubber Deterioration – Surface Ozone Cracking Outdoors or Chamber (Triangular Specimens).
            8. D2240, Standard Test Method for Rubber Property – Durometer Hardness.
            9. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
            10. F594, Standard Specification for Stainless Steel Nuts.
         3. British Standards International (BSI)
            1. B.S. 903.A.9 Method B, Physical testing of Rubber.
         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].
         5. International Organization for Standardization (ISO)
            1. ISO 4649, Rubber, vulcanized or thermoplastic – determination of abrasion resistance using a rotating cylindrical drum device.
         6. Research Council on Structural Connections (RCSC)
            1. Specification for Structural Joints Using High-Strength Bolts.
            2. Educational Bulletin No. 4, Recommended Erection and Field Inspection Procedures for High-Strength Bolts in Structural Steel Assemblies.
         7. The World Association for Waterborne Transport Infrastructure (PIANC)
            1. PIANC 2002, Guidelines for the Design of Fender Systems: 2002 Marcom Report of WG33.
   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. Manufacturer Qualifications Contact Information
         2. Fender Shop Drawings
         3. Performance Testing
         4. Fender Visual Inspection
         5. Material Schedules
         6. Installation Instructions
         7. Operations & Maintenance Manuals
2. MATERIALS

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
     1. Manufacturer Contact Information
        1. Submittal Requirements
           1. Manufacturer contact information
     2. Fender Shop Drawings
        1. Submittal Requirements
           1. Manufacturer shall submit shop drawings as detailed in Section 01 33 00 – Submittals.
           2. Shop drawings shall include the following:

Fender Type Designation

Fender Material Type

Fender Dimensions & Locations

Connector Material Types, Dimensions, and Locations

Installation Tolerances

* 1. FABRICATION, PRODUCTION, AND SUPPLY OF MATERIALS
     1. Source of Materials
        1. All materials shall be supplied and produced or certified for use by a single manufacturer.
        2. Identical components, shapes, or materials shall be fabricated or otherwise fashioned by a single fabricator.
  2. 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 as a minimum 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 Engineer before proceeding.
     2. Rubber Fenders
        1. Type
           1. The proposed fenders shall be a modern buckling type elastomeric fender capable of dissipating sufficient energy to prevent overloading of the fender and contact of the vessel with the mounting surface.
        2. Attachments
           1. Steel backing plates are allowable as anchorage supports for arch fenders. Plates shall be embedded firmly into the rubber body through the process of vulcanization and completely encapsulated so that no steel is exposed, except where female bolting nuts are present.
           2. Steel nuts, bolts, plates, and other attachments exposed to environmental moisture directly or via seepage shall be stainless steel, grade 316, unless otherwise noted.
        3. Rubber Material Requirements
           1. The rubber for the proposed fender shall be vulcanized natural or synthetic rubber or a mixture of them. Materials shall be homogeneous in quality and free of foreign materials, bubbles, injuries, splits, cracks, stretches, and harmful defects.
           2. The fenders shall be reinforced with carbon black and resistant to aging, seawater, abrasion, and UV rays.
           3. Rubber used in fender elements shall meet the following criteria:

| PROPERTY | | TEST METHOD | ACCEPTANCE REQUIREMENTS |
| --- | --- | --- | --- |
| BEFORE  AGING | HARDNESS | ASTM D2240 – SHORE A | 78°, max |
| TENSILE STRENGTH | ASTM D412 – DIE C | 2,320 psi |
| ULTIMATE ELONGATION | 300%, min |
| AFTER  AGING | CHANGE IN HARDNESS | ASTM D573 96 hrs @ 70°, C | +8°, max |
| CHANGE IN TENSILE STRENGTH | -20%, max |
| CHANGE IN ULTIMATE ELONGATION | -20%, max |
| COMPRESSION SET | | ASTM D395 Method B, 22 hours at 70°C | 30%, max |
| OZONE RESISTANCE | | ASTM D1171 Method A | No Visible Cracks |
| ABRASION RESISTANCE | | B.S. 903.A.9 Method B – 1000 rev | Volume Loss < 1500 mm3 |
| TEAR RESISTANCE | | ASTM D624 Die B | 4,800 lbs/ft, min |

* + - 1. Facing Materials
         1. Where designated on drawings, ultra high molecular weight polyethylene (UHMW) or other polymer may be required to be integrated with a rubber fender as a facing material. See applicable specification sections for more information.
      2. Steel Connections
         1. The design of the fender element attachments shall be completed by the fender element manufacturer.

Design loading conditions shall be provided by the fender element manufacturer for review by the Structural Engineer.

* + - * 1. Steel plates and washers shall be SS 316, in accordance with ASTM A240 and ASTM A666

Fy, min = 36 ksi.

* + - * 1. Steel bolts shall comply with ASTM F593, Group 2 (SS 316).
        2. Steel nuts shall comply with ASTM F594, Group 2 (SS 316).
      1. Performance
         1. Rubber fender elements shall be arch fenders as shown on drawings, fabricated to the lengths shown.
         2. Energy dissipation shall be 13 k-ft/meter.
         3. Maximum reaction shall be 38 k/meter.
         4. Deflection shall be 52.5% of the fender height.
      2. Submittal Requirements
         1. Type

Product catalog & data

Within catalog, clearly identify product(s) intended for use

* + - * 1. Attachments
        2. Rubber Material Requirements

Material properties

Comparison of manufacturer-supplied material property data with material requirements.

Unsupplied material data shall be considered fail.

* + - * 1. Facing Materials

Material properties as applicable

* + - * 1. Steel Connections

Material properties

* + - * 1. Performance

Design performance energy, reaction, and deflection

Maximum design reaction, normal & shear

* 1. MATERIAL HANDLING, DELIVERY, AND STORAGE
  2. DELIVERABLES
     1. Materials
        1. The Contractor shall furnish all materials, including materials incidental to the Work as described within drawings, specifications, and reference documents.
     2. Submittals
        1. The Contractor shall furnish all submittals required by drawings, specifications, and reference documents.
  3. QUALITY ASSURANCE
     1. Manufacturer Qualifications
        1. Manufacturer shall demonstrate a case history of fabricating and testing fenders of exact shape and size for 5 years minimum.
        2. Submittal Requirements
           1. Manufacturer case history of fabricating and testing fenders.
     2. Fender Unit Identification
        1. Each fender shall be labeled with a unique identification in the form of a temporary marking or tag.
        2. Identification shall be removed at the project site after installation and acceptance by the Port.
     3. Performance Testing
        1. The compression speed shall follow current PIANC fender performance testing guidelines and shall be recorded during testing.
        2. The fender is to be cycled for three times up to the designed deflection, left undisturbed for one hour, and applied with a fourth deflection cycle. The fourth deflection cycle is to be performed using constant or decreasing velocity compression, and will be used to determine the fender performance.
           1. The room temperature at the time of the tests shall be recorded.
           2. The fenders shall achieve a performance within 10% of the stated nominal design performance.
        3. Performance tests must be conducted on 10% of each size and type of supplied fenders.
           1. In the event that a fender element fails the performance test, additional tests on up to 100% of the supplied fenders shall be completed at the discretion of the Port and expense of the manufacturer.
        4. The performance of the fender is to be expressed by the value of the energy dissipated at the maximum value of the reaction load generated when the fender is compressed to the rating or maximum deflection.
        5. Submittal Requirements
           1. Manufacturer shall provide the following for each tested fender:

Test Procedure

Fender ID

Compression Speed

Number of Cycles

Dates and Times of Testing

Room Temperature Records

Design Energy & Reaction

Test Energy & Reaction Values

Photographs

* + 1. Fender Visual Inspections
       1. Each fender shall be inspected for the following criteria:
          1. Total length
          2. Location and type of connections
          3. Weight
          4. Defects and damage
       2. Submittal Requirements
          1. The material manufacturer shall provide visual inspection reports for each fender unit, referencing the fender’s unit identification mark.
    2. Material Schedules
       1. Submittal Requirements
          1. Schedules shall be submitted indicating the following milestones:

Dates of Fabrication

Dates of Material Performance Tests

Delivery of Materials

* + - 1. Schedules shall be maintained, updated, and submitted weekly.

1. EXECUTION
   1. PROJECT INFORMATION
   2. PREPARATION FOR EXECUTION OF WORK
      1. Fabrication
         1. Coordinate field and shop fabrication and installation plans prior to commencing fabrication.
      2. Interface Conditions
         1. Where steel, concrete, timber, or other material surfaces directly interface with energy dissipation unit, remove sharp edges, burrs, snags, or other discontinuities in interface materials that may damage the energy dissipation unit in the compressed or noncompressed state upon direction from the Engineer.
            1. Sharp discontinuities protruding up to ¼” shall be removed at no cost to the Port of Seattle at the discretion of the Engineer.
   3. EXECUTION OF WORK
      1. Design of Attached Elements
         1. When used in an assembly of parts acting as a fendering system assembly, cyclical loading and large deflections in a marine environment are anticipated.
         2. Contractor-selected materials and Work incidental to the fender system construction shall be detailed or specified to accommodate these conditions.
      2. Workmanship
         1. Rubber elements shall be cut to length by the manufacturer prior to shipment; cuts shall be smooth without snags or other discontinuities.
      3. Installation
         1. Install energy dissipation units in accordance with manufacturer recommendations.
      4. Connections
         1. Unless noted otherwise by manufacturer, nuts shall be installed snug-tight as defined by the RCSC.
         2. Contractor shall inspect bolts per RCSC Educational Bulletin 4.
      5. Plastic Wearable Surfaces
         1. Plastic wearable surfaces shall be permanently attached to rubber elements through a vulcanization processes.
   4. DELIVERABLES
      1. Assembly
         1. The Contractor shall install all materials and components necessary for a complete and functioning fender system in a way that meets the minimum requirements described within drawings, specifications, and reference documents.
      2. Submittals
         1. The Contractor shall furnish all submittals required by drawings, specifications, and reference documents.
   5. QUALITY ASSURANCE
      1. Cleaning of Fenders
         1. Upon completion of demobilization, the finished fenders shall be free of debris, dirt, dust, scrap parts, and other foreign objects.
      2. Installation Instructions
         1. Manufacturer shall submit special instructions for installation.
         2. Submittal Requirements
            1. Installation instructions
      3. Operations & Maintenance
         1. Required maintenance practices and intervals shall be identified.
         2. Conditions of operation shall be identified.
         3. Submittal Requirements
            1. O&M Manual
2. 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