



**SECTION 40_XX_XX
ELASTOMER DUCKBILL EFFLUENT DIFFUSER NOZZLE WITH INTEGRAL WIRE/FABRIC
REINFORCED FLANGED RUBBER ELBOW, FLANGED RUBBER RISER, OR FLANGED RUBBER ELBOW
AND RISER FOR MULTI-PORT OUTFALLS**

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Elastomer Duckbill Effluent Diffuser Nozzle With Wire/Fabric Reinforced Flanged Rubber Elbow, Flanged Rubber Riser, or Flanged Rubber Elbow and Riser For Multi-Port Outfalls

B. Related Sections:

1. (provided by the engineer)
2. (provided by the engineer)
3. (provided by the engineer)

1.02 REFERENCES

- A. ASTM D2000 Standard Classification System for Rubber Products
- B. ASTM D1418 Standard Practice for Rubber & Rubber Lattices-Nomenclature
- C. ASTM A240 Type 316 Stainless Steel

1.03 SUBMITTALS

The following documents must be submitted in their entirety within one complete package; submittal packages not including all these items will be deemed incomplete and rejected without review. The following is an itemized list of documents to be included within the submittal package:

- A. Product literature that includes information on the performance and operation of the valve, materials of construction, dimensions and weights, elastomer characteristics, and pressure ratings.
- B. Diffuser Dimensional Drawing – the drawing shall be a scaled version of the actual nozzle, generic drawings with listed dimensions will not be accepted.
- C. Hydraulic curves for each inlet nozzle showing headloss, jet velocity, and effective open area all versus flow rate. The hydraulic curves must accurately reflect the variable orifice characteristics inherent to duckbill valves. The backpressure rating of diffuser shall be indicated.

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- D. Verification of independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight (8) sizes of duckbill valves ranging from 2" through 48". The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.
 - E. Verification of Independent Laboratory Testing for Manufacturing Consistency - the nozzle manufacturer shall provide summary documentation of a report conducted by an Independent Laboratory for hydraulic testing where multiple nozzles (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability and consistency of the manufacturing process to produce the same hydraulic characteristics.
 - F. Verification of Finite Element Analysis (FEA) - the nozzle manufacturer shall provide summary documentation of Finite Element Analysis modeling on representative duckbill nozzle sizes to determine deflection, stress and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
 - G. Report of independent testing that studied the flow distribution characteristics of duckbill valves installed on multiport manifolds. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.
 - H. Report of independent testing that studied the initial dilution characteristics of duckbill valves. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.
 - I. Report of independent testing that studied the salt water purging characteristics of duckbill valves. The manufacturer must have been in the business of manufacturing duckbill valves at the time the report was published.
 - J. United States Manufacturer Certificate
 - K. Installation & Operation Manual
 - L. The following further defines the specific requirements for each submittal item:
 - a. Valve Dimensional Drawing – the drawing shall be a scaled version of the actual valve, generic drawings with listed dimensions will not be accepted. Dimensions required in the drawing include the following:
 - i. Overall length and/or height
 - ii. Flange size
 - iii. Flange drilling
 - iv. Overall height at the nozzle bill
 - v. Length of opening at the nozzle bill

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- vi. Orientation of the nozzle bill
 - vii. Location of lifting clevis if supplied
 - viii. Elastomer material used in construction
 - ix. Elastomer material used on exterior layer
- b. US Manufacturer's Certification Document - the valve manufacturer shall certify in a written document that they have a minimum of 15 years' experience in fabrication and installations "duckbill" style elastomeric valves and at least 10 years' experience with diffuser applications globally. The manufacturer shall supply valves of the same size as required within these specifications and certify that the valves provided for this project were, in their entirety, fabricated, vulcanized and packaged within the United States of America.
- c. Verification of Independent Laboratory Testing for Head Loss and Velocity – the valve manufacturer shall provide summary documentation of a report conducted by an Independent Laboratory for hydraulic testing to determine head loss and jet velocity characteristics on a representative set of duckbill valves. The testing must include multiple constructions (stiffness) within each size designated by backpressure rating and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.
- d. Verification of Independent Laboratory Testing for Backpressure Capacity - the valve manufacturer shall provide summary documentation of a report conducted by an Independent Laboratory for hydraulic testing to determine the backpressure capacity of the duckbill nozzles with respect to their construction designation (thickness and fabric reinforcing ratio).
- e. Verification of Independent Laboratory Testing for Manufacturing Consistency - the valve manufacturer shall provide summary documentation of a report conducted by an Independent Laboratory for hydraulic testing where multiple valves (at least 4) of the same size and construction (stiffness) were tested to validate the submitted head loss characteristics and to prove the repeatability and consistency of the manufacturing process to produce the same hydraulic characteristics.
- f. Verification of Finite Element Analysis (FEA) - the valve manufacturer shall provide summary documentation of Finite Element Analysis modeling on representative duckbill valve sizes to determine deflection, stress and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
- g. Hydraulic Curve – the hydraulic curve shall be developed from the testing conducted by the Independent Laboratory for head loss and backpressure characteristics. Each valve curve shall indicate the head loss versus flow, the backpressure capacity of the valve and operating point as defined within the required operating conditions defined within these specifications.

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1.04 WARRANTY

- A. Valves shall be warranted by the manufacturer for defects in materials and workmanship for a period of 2 years (24 months) from date of shipment.

PART 2 PRODUCTS

2.01 GENERAL

- A. (provided by the engineer)

2.02 Elastomer Duckbill Effluent Diffuser Nozzle (size) inch/mm with Integral Wire/Fabric Reinforced Rubber (*insert angle in degrees here*) Elbow, or with Integral (*insert riser diameter here*) Wire/Fabric Reinforced Slip-On Rubber Riser, or with Integral Wire Fabric Reinforced Rubber (*insert angle in degrees here*) Elbow and Integral (*insert riser diameter here*) Wire/Fabric Reinforced Slip-On Rubber Riser.

- A. Manufacturers: Tideflex® Series 35D or pre-approved equal
- B. The Diffuser Nozzles are to be all rubber and the flow operated check type with integral flanges connection. The port area shall contour down to a duckbill, which shall allow passage of flow in one direction while preventing reverse flow. The flange and flexible duckbill nozzle shall be one-piece rubber construction with nylon reinforcement.
- C. The integral (*insert angle in degrees here*) elbow, or integral (*insert riser diameter here*) riser, or integral (*insert angle in degrees here*) elbow and integral (*insert riser diameter here*) riser shall consist of an elastomer inner tube, a fabric reinforced body section with a helical wire reinforcement embedded in the body. The elbow shall be covered with a synthetic rubber cover stock for protection against abrasion and gouging.
- D. The Diffuser Nozzle With Integral Flanged Elbow is designed to attach to piping mating flanges by means of vendor furnished stainless back-up rings. The flange drilling shall conform to ANSI B16.1 Class 125/ANSI B16.5, Class 150 standards. The Series 35D shall be supplied with 316 stainless steel back-up ring.
- E. The Diffuser Nozzles shall be a variable orifice providing a non-linear jet velocity vs. flow characteristic, which maximizes jet velocity at low flow rates compared to fixed orifice nozzles, and a linear headloss vs. flow characteristic.
- F. The hydraulic characteristics of the diffuser nozzles shall be defined by "Hydraulic Code Number" or "Catalog Number".
- G. Manufacturer shall have conducted independent hydraulic testing to determine headloss and jet velocity characteristics on a minimum of eight (8) sizes of duckbill valves ranging

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from 2" through 48". The testing must include multiple constructions (stiffness) within each size and must have been conducted for free discharge (discharge to atmosphere) and submerged conditions.

- H. Manufacturer shall have conducted an independent hydraulic test where multiple nozzles (at least four) of the same size and construction (stiffness) were tested to validate the submitted headloss characteristics and to prove the repeatability of the manufacturing process to produce the same hydraulic characteristics.
- I. Manufacturer shall have conducted independent hydraulic testing to study the flow distribution characteristics of duckbill nozzles installed on multiport manifolds.
- J. Manufacturer to have conducted Finite Element Analysis (FEA) on various duckbill nozzles to determine deflection, stress, and strain characteristics under various load conditions. Modeling must have been done for flowing conditions (positive differential pressure) and reverse differential pressure.
- K. The inlet ports/nozzles shall discharge an elliptically shaped jet. The nozzle must have been modeled by an independent laboratory using Laser Induced Fluorescence (LIF).
- L. Manufacturer must have conducted in-house backpressure testing on duckbill valves ranging from $\frac{3}{4}$ " to 48".
- M. All nozzles shall be (*size*) inch/mm Series 35D, HYDRAULIC CODE NUMBER (*insert number*) as manufactured by the Red Valve Co., Inc. of Pittsburgh, PA 15220, USA.
- N. The pre-approved manufacturer of these duckbill nozzles is Red Valve Company, Inc., 750 Holiday Drive #400, Pittsburgh, PA 15220, USA (412)-279-0044. Alternate manufacturer's must be pre-approved by the Engineer, the Contractor shall submit to the Engineer at least twenty days prior to the bid date a reference submittal package as defined within the section entitled Submittal Documents showing that the alternate manufacturer can comply with the scope, performance and general intentions of this specification.
- O. Company name, plant location, valve size and serial number shall be bonded to outside of the diffuser valves. Valves shall be wholly manufactured in the USA.
- P. Design:
 - a. Valve
 - i. Nozzles with Elbows, Risers, or Elbows and Risers to be flow operated.
 - ii. Nozzles with Elbows, Risers, or Elbows and Risers shall be designed to connect to pipe mating flanges and attach by vendor furnished stainless steel back-up rings.
 - iii. The Nozzle port area shall contour down to a duckbill to allow passage of flow in one direction while preventing reverse flow.



- iv. The duckbill is concentric and is flared equidistant from centerline to form a duckbill shape.
- v. The manufacturer's name, location, model and serial number shall be bonded onto the exterior of the valve.

Q. Materials

- a. Nozzle with Integral Elbow, Integral Riser, or Integral Elbow and Riser
 - i. One-piece rubber construction with nylon reinforcement with integral wire/fabric reinforced rubber elbow, integral wire/fabric reinforced rubber riser, or integral wire/fabric reinforced rubber elbow and riser.
- b. Back-up Rings and Bolting Hardware
 - i. 316 Stainless Steel

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install nozzles as specified in section (filled in by the engineer) and the manufacturer's instructions.
- B. (verbiage by engineer instructing how effluent diffuser valves are to be oriented on piping header)

3.02 COMMISSIONING Field testing (verbiage by engineer)