MANATEE COUNTY
FLORIDA

FACSIMILE

February 17, 2009

TO: All Interested Bidders

SUBJECT: Invitation for Bid #09-0250DC
North Regional Water Reclamation Facility Influent Structure
ADDENDUM #3

Bidders are hereby notified that this Addendum shall be acknowledged on the Bid Form and made a part of the above named bidding and contract documents.

The following items are issued to add to, modify, and clarify the bid and contract documents. These items shall have the same force and effect as the original bidding and contract documents, and cost involved shall be included in the bid prices. Bids to be submitted on the specified bid date, shall conform to the additions and revisions listed herein.

1. Bid Opening Date is changed to: **February 26, 2009 at 3:00 P.M.**, same location.

2. See attached information as prepared by URS Corporation, Project Engineer.

If you have submitted a bid prior to receiving this addendum you may request in writing that your original, sealed bid be returned to your firm. All sealed bids received will be opened on the date stated.

Bids will be received at Manatee County Purchasing, 1112 Manatee Avenue West, Suite 803, Bradenton, Florida 34205 until **February 26, 2009 at 3:00 P.M.**

Sincerely,

R.C. "Rob" Cuthbert, C.P.M.
Purchasing Division Manager

/dcr
Attachments

Financial Management Department - Purchasing Division
1112 Manatee Avenue West, Suite 803, Bradenton, FL 34205
PHONE: 941.749.3074 * FAX: 941.749.3034
www.mymanatee.org

URS

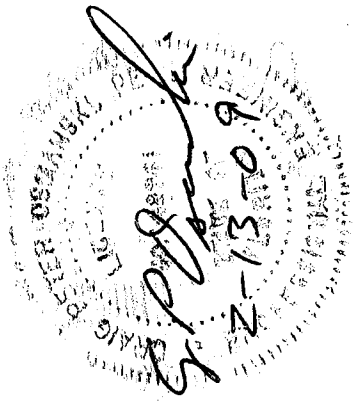
Memorandum

Date: February 13, 2009

To: Deborah Carey-Reed, Manatee County Purchasing Department

Cc: Chuck Froman, Manatee County Project Management

From: Craig Osmanski, P.E.



Subject: **Text for Addendum No. 3**
IFB 09-0250DC, NWRF Influent Structure (6011281)

Clarifications

Detail 6 on Sheet M-8 applies to all stop, slide and weir gates.

On the Drawings

Sheets M-2, M-3, M-4, M-5, M-6 and M-7
All references to Odor Control Collection Piping shall be changed as follows.
On the piping callouts, delete "Odor – PVC/PO" and replace with "Odor – FRP".

Sheet M-3, Notes
Under Notes, add new Note 4 as follows.

4. RAS Influent Box and Effluent Box shall be covered with stainless steel covers. See Detail on Sheet S-1.

Sheet M-6, Detail 2
Delete the top Callout, "2-4" FLG 45° Bends"
And replace with, "2-6" FLG 45° Bends"

Delete the bottom left fitting callout, "4" FLG 90° Bend"
And replace with, "6" FLG 90° Bend"

Add Note as follows:
"1. Grit pump suction piping is 6-inch diameter and pump discharge is 4-inch diameter."

Sheet M-8, Detail 10
Change "Alum Checkered Cover Plate" to read "316 SST Cover Plate".
Delete "PVC Union" callouts.
Change "PVC" to read "FRP".

Sheet M-11, Odor Control Collection Piping

All collection piping callouts that read "(pipe dia.)" Odor – PVC/PO" shall be changed to read "(pipe dia.)" Odor – FRP".

URS Corporation
7650 West Courtney
Campbell Causeway
Tampa, FL 33607-1462
Tel: 813.286.1711
Fax:813.286.6587
www.urscorp.com

Add Notes as follows.

1. All odor control collection pipe and fittings shall be FRP, see attached specification Section 15891, attached.
2. Slope odor control piping to drain towards 12-inch flanged outlet.
3. Provide expansion and contraction flexible connectors as recommended by the FRP manufacturer.

Sheet S-12, Notes

Under Note 3, A; change "Schlage D80PD RHO Lever – US32D" to read "Schlage D80PD RHO Lever – US26D".

Change "PR Hager BB1168" to read "Hager ECBB1101 NRP".

Sheet E-9, Conduit Schedule

Under Conduit Schedule Notes, add new Note 15 as follows.

"15. Conduit shall be RGS".

In the Conduit Schedule, in WW and XX rows, under the Notes column, add Note "15".

In the Specifications

Delete the "Table of Contents" and replace with new "Table of Contents", attached.

Section 11295, Coplastix, Slide, Stop and Weir Gates

Paragraph 1.01, A; Delete "Plasti-Fab, Tualatin, Oregon".

Paragraph 1.01, A; at the end of the last line, add "Ham Baker Flow Control".

Paragraph 2.01, B; page 5, line 6, following "... support members only.", delete:
"Or, the exterior material shall be a monolithic structure of fiberglass reinforced copolymer at least ¼-inch thick leaving no joints and entirely watertight."

Delete Paragraph 2.04, Motor Operators in its entirety and replace with:

"2.04 Floor Stands and Operators

A. Floor stands shall be furnished for all gate operators not supported on the gate yoke. Floor stands shall be cast-iron or cast steel construction. The pedestal height shall be such that the crank shaft will be approximately 36-in above the operating floor. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be furnished in cast iron or welded steel construction, designed to withstand all normal operating loads. Where shown on the Drawings floor stands shall be offset type mounted on the floor surface, and offset to align with the gate stem. The floor stand shall be mounted on a heavily ribbed reinforced cast iron bracket anchored to the concrete with Type 304 stainless steel anchors. The bracket and anchor bolts shall be sized to transfer the upward or downward thrust required to ultimately fail the stainless steel stem. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and acceptable to the Engineer. The bracket, anchors, backplate and accessories shall be supplied as part of the gate assembly by the gate manufacturer.
B. Manual operators shall be furnished where shown and shall consist of a handwheel mounted on the gate yoke or on a floor stand.
    1. Handwheel operators shall have a minimum 18-in diameter handwheel and shall operate the gate under the specified operating head with not greater than 40 lbs of force on the handwheel. The

operator shall be fully enclosed, equipped with roller bearings above and below the operating nut and mechanical seals. Alternatively, polyethylene bearing pads may be used.

Section 11314, Recessed Impeller Pumps

Paragraph 2.05, C.
Delete "Wemco Model C" and replace with "Wemco Model CE".

Section 14551, Shaftless Screw Conveyors and Appurtenances

Paragraph 1.03, A, 9; delete paragraph :A, 9" in its entirety.

Paragraph 1.05, B; after "... Wilmington, DE" add "Vulcan Industries, Inc., Missouri Valley, IA".

Paragraph 2.02, J; in the first line, change "3/16-in" to read "1/8-inch minimum".

Paragraph 2.02, J; in the eighth line, change "3/8-in" to read "1/4-inch minimum".

Questions

Jerry Hames, Peter A. Basile & Sons, 1/26/09

Question 1: There are no sizes listed in the plans or specifications for the auto control valves (pressure sustaining, check or surge anticipating valves). What are the sizes of these valves?

Response 1: Specification Section 02640, Valves and Appurtenances, is a Standard County specification. Size and type of valve shall be as shown on the drawings.

Ken Harrell, Wharton-Smith, Inc., 1/21/09

Question 1: Is the Existing 36" WW-PCCP line abandoned as indicated (worded) on sheet C-4, or will it be abandoned upon installation of the bulkheads?

Response 1: The existing 36-inch WW-PCCP is currently abandoned, however, static head pressure from the aeration basins keep the pipe full of water. The line can be isolated using the existing sluice gates.

Ramsey Frangie, Ramate Construction Inc., 1/16/09

Question 1: I would like to propose a substitution for the auger-cast or driven concrete piles for this project. The proposed substitution would be to use micro-piles; helical screw piles that can be installed with minimal or no vibration, limited access and more quickly than the proposed piles. The same or greater load capacities can be achieved.

Response 1: Piles shall be in accordance with the contract documents.

John Opperman, Tampa Armature Works (TAW), 1/19/09

Question 1: Is there any specification on the Fiber Optic cable that goes from the new PLC to the existing PLC.

Response 1: Fiber optic cable shall be as follows.

General: The quantity of fibers shall be as specified on the Drawings. Fiber optic cable shall be tight-buffered distribution type, OFNR riser rated, fungus resistant, UV resistant, and water-blocked, suitable for indoor/outdoor use, with a central filler, aramid strength member, super-absorbent-polymer coated yarn that swells upon exposure to water, ripcord, and PVC outer jacket.

Fibers: Fibers shall be multi-mode graded index type, with 62.5 um diameter core and 125 um diameter cladding, acrylate coating and color-coded 900um diameter tight-buffer. Attenuation shall not exceed 3.0 and 1.0 dB/km at 850 and 1300 nm wavelengths, respectively. Bandwidth shall be 200 and 500 MHz-km at 850 and 1300 nm wavelengths, respectively, for LED sources, and 385 and 500 MHz-km at 850 and 1300 nm wavelengths, respectively, for laser sources.

Connectors: Connectors shall be ST type, ANSI/TIA/EIA-568A compliant, listed by the manufacturer as suitable for terminating specified fiber type, requiring no epoxy and/or polishing, and complying with the following criteria:

Insertion Loss: 0.3 dB average.
Durability: $\leq$ 0.2 dB change, 1000 rematings.
Tensile Strength: $\leq$ 0.2 dB change, 10 lb.
Temperature Cycling: $\leq$ 0.3 dB change.
Materials:
Ferrule: Composite or Ceramic.
Housing: Composite.

Frank Rexford, Vogel Brothers, 1/5/09

Question 1: The Structural drawings call for stainless steel odor control cover plates, the mechanical show aluminum. Please clarify.
Response 1: Refer to Addendum No. 2.

Question 2: Please provide a specification for the electrical room door.
Response 2: Refer to Addendum No. 2.

Question 3: The instrumentation spec refers to a 36" flow meter. A 24" is shown on the drawings. The flow meter calls out two vendors with specific model numbers. The written spec defines mixed characteristics which apply top both, however, vendor cannot meet all criteria. Please clarify.
Response 3: Refer to Addendum No. 2.

Question 4: Dwg M-3, Section A shows a "bold print" 36" RMJ 90 bend on an existing anoxic basin line. This does not match a plan view of this are on Dwg C-3. Please clarify.
Response 4: See Sheet C-4. The new 30-inch WW line increases to 36-inch just before the 36-inch tie-in with a 36-inch 90 degree bend.

Question 5: Dwg M-1 shows 6" grit pump suction. Dwg M-6 shows 4". Please clarify.
Response 5: The grit pump suction piping is 6-inch diameter and the discharge piping is 4-inch diameter.

Frank Rexford, Vogel Brothers, 1/6/09

Question 1: Please clarify the piping specification to be used for this system.
Response 1: Odor control collection piping is FRP. See specification Section 15891, attached.

Question 2: Please clarify the valves/dampers to be used for this system.
Response 2: See specification Section 15891, attached.

Question 3: Please note Dwg M-8, Detail 10 is noted as the as the detail required at the air connections. However, the plan view descriptions do not reflect the same material identified by the detail. Please clarify.

Response 3: Refer to Addendum No. 2.

Question 4: Please confirm the collection risers on Dwg M-4 Section C are 6" rising from a 12" tee in one instance and from an 8" line on the other.

Response 4: Vertical risers for odor control piping is 6-inch diameter. See Sheet M-11.

Question 5: Please confirm the 4" collection lines should be piped by reducing the 6" line, the piping drops by providing 4" tees, 90's, and valves.

Response 5: See Sheet M-11.

Question 7: Dwg M-1. Please provide a PVC specification for potable, sanitary, and reclaim water piping.

Response 7: See Specification Section 02622.

Question 8: Dwg M-1. Please provide a specification for the eye wash and shower.

Response 8: Emergency eyewash and shower shall be Guardian, Model G1909HFC or equal.

Dallas Lamberson, TLC Diversified, 2/9/09

Question 1: The Schlage D80PD is not made in a 32D. It is available in 26D. Also, the Hager BB1168 is not available in 32D but the ECBB1101 NRP is.)Made for Hager in China) How should I quote it?

Response 1: The Shlage D80PD shall be US 26D. Hager BB1168 shall be changed to ECBB1101 NRP.

Mark Kelly, Encore Construction Co., 2/2/09

Question 1: Is PVC duct an acceptable material for the odor control duct shown on M-10? If no, please provide specifications for the pipe, fittings and valves.

Response 1: Odor control collection piping shall FRP. Se attached specification Section 15891.

William, Cyber Electric of Central Florida, 2/12/09

Question 1: sec. 16130 3.02 B item # 22 and 40. Will the PVC coated RMC conduit be required for the entire length of the conduit stub up? The section currently calls for it to be installed to a point of 18" above grade. But section 40 explains to extend conductors to equipment with RMC. Which type of conduit will we be required to use indoors and out?

Response 1: Spec. Sect. 16130 Para. 3.02 A. identifies where each type of conduit is to be applied (except where otherwise noted elsewhere in the specification or on the Contract Drawings). This paragraph does not differentiate between indoor and outdoor installations, and thus the requirements shall be applied universally.

Spec. Sect. 16130 Para. 3.02 B. 22. applies where rigid non-metallic conduits (RNC) (e.g. PVC Sch. 40 or 80) used underground are to be turned up vertically, thus becoming a riser, and are not terminated into the bottom of free-standing equipment. Note also that this paragraph does not differentiate between indoor and outdoor installations, and thus the requirements shall be applied universally. In this case, the RNC shall be transitioned to PVC coated RMC at the elbow and shall continue as PVC coated RMC up to at least 18 inches above finished grade or floor slab.

Spec. Sect. 16130 Para. 3.02 B. 40. applies where conduit is stubbed up for termination into the bottom of free-standing equipment. Again, note that this paragraph does not differentiate

between indoor and outdoor installations, and thus the requirements shall be applied universally.

Question 2: sec. 16010-7 sec.1.08 line item D calls for all equipment to be provided by one manufacturer for a single source responsibility. But section 16416-2 sec.2.02 A Calls for Siemens exclusivly. Will a Sq. D surge equivilant be acceptable in keeping with the previously mentioned spec section?

Response 2: Spec. Sect. 16010 Para. 1.08 D. does not list, and therefore does not apply to, TVSS units. The TVSS unit required by Spec. Sect. 16416 is an established Manatee County Standard.

MANATEE COUNTY
INFLUENT STRUCTURE AT THE
NORTH WATER RECLAMATION FACILITY

MANATEE COUNTY
INFLUENT STRUCTURE AT THE
NORTH WATER RECLAMATION FACILITY

MANATEE COUNTY
INFLUENT STRUCTURE AT THE
NORTH WATER RECLAMATION FACILITY

MANATEE COUNTY
INFLUENT STRUCTURE AT THE
NORTH WATER RECLAMATION FACILITY

SECTION 15891

FIBERGLASS DUCTWORK AND ACCESSORIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish, fabricate and install all fiberglass reinforced plastic (FRP) ductwork including fittings, accessories, dampers, hangers and any incidental work or components required and provide ductwork systems as shown on the Drawings and as specified herein.

B. In general, ductwork shall consist of any passageway made of FRP substantially air-tight, used for the conveying of air or gas. Included are fittings, transitions, bracing, fasteners, sealers, supports, accessories and manual air balancing dampers. All ductwork shall be of size and material as specified herein and as shown on the Drawings. All duct sizes indicated on the Drawings are clear, inside dimensions.

C. Any change in duct sizes, offsets, transitions and fittings required to accommodate job conditions shall be submitted to Engineer for approval.

1.02 SUBMITTALS

A. Submit to the Engineer, in accordance with Section 01340, the following drawings and data. Ductwork shop drawings shall include typical details of transitions, elbows, fittings, accessory items, volume control and dampers, hangers, joining methods, bracing and material gauges. Drawings of general layouts of individual systems shall be submitted.

B. The following additional data shall be submitted.

1. Manufacturer's qualification and experience data, specifications and installation instructions, factory and field quality control procedures catalog data, brochures, descriptive matter, illustrations, diagrams and color charts of ductwork to be selected.

2. Specific handling and storage requirements for ductwork, joint kits and resin systems.

3. Resin system data, including chemical environment service test data, case history data of similar installations (with contact addresses), resin pot life and time versus temperature data required for complete resin cure for laminate thicknesses actually proposed.

4. Submit a letter certifying that the laminates fabricated with the proposed resin system will give satisfactory performance under the specified service conditions and stating the service conditions for which certification is provided and indicating compliance with specified pressure and vacuum design criteria.

5. Submit construction details for flexible connectors, expansion joints, elbows, transitions, junctions and flanged fittings including dimensioned laminate cross sections and flange fabrication and assembly details.

6. Submit results of factory readings taken with "Barcol Hardness Impressor" and provide procedure to field check for complete cure of resin.

7. Certified service tables for the resins being used and the expected contaminants showing satisfactory services for the required design conditions.

8. Detailed instructions for field joining of the ductwork to include quality control procedures.

9. Submit shop test reports for fiberglass reinforced plastic dampers.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C581 - Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass-Fiber-Reinforced Structures Intended for Liquid Service.

B. National Fire Protection Association (NFPA)

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilation Systems.

2. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Materials.

3. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies.

C. Underwriters Laboratories (UL)

1. UL 555 - UL Standard for Safety Fire Dampers.

D. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)

E. American National Standards Institute (ANSI)

1. ANSI RTP-1 - Reinforced Thermoset Plastic Corrosion Resistant Equipment.

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 QUALITY ASSURANCE

A. All FRP duct and fittings shall be from a single manufacturer.

B. All materials shall be supplied by a manufacturer experienced in the fabrication of materials similar to those specified. Design and engineering shall be performed by personnel regularly employed by the manufacturer who are experienced in the design of FRP systems similar to those specified.

C. The manufacturer shall provide factory trained personnel for training of installers and for supervision and inspection of the installation. The use of local sales representatives for this service is not acceptable.

D. Corrosion resistance data shall be based on ASTM C581.

1.05 DELIVERY, STORAGE AND HANDLING

A. Equipment, material and spare parts are to be shipped complete except where partial disassembly is required by transportation regulations or for protection of components. No ductwork or components shall be shipped prior to complete resin cure.

B. Inspection of the duct and components will be made by the Engineer or other representative of the Owner after delivery. Materials shall be subject to rejection at any time on account of failure to meet any of the specified requirements. Material rejected after delivery shall be marked for identification and shall be immediately removed from the job site.

1.06 STANDARDS OF CONSTRUCTION AND INSTALLATION

A. All ductwork construction and installation details shown on the Drawings and specified herein are based on acceptable methods of construction and installation and are intended to define the quality of construction and installation to be furnished. Alternate details may be submitted for approval.

PART 2 PRODUCTS

2.01 MATERIAL

A. Design Conditions

1. Temperature: 10 to 125 degrees F

2. Pressure: 10-in H_2O w.g. positive; 10-in H_2O w.g. negative

3. Flow medium and velocity: air at 2500 fpm

4. Wall thickness (minimum):

a. Up to 20-in diameter - 0.125-in

B. The following materials are expected to be in the air stream or surrounding area. The resins used shall be suitable for all of the following:

1. Hydrogen Sulfide gas.

2.02 FIBERGLASS REINFORCED PLASTIC (FRP) DUCTWORK

A. FRP ductwork shall be of contact molded or filament wound construction, or a combination of these methods, to meet design criteria.

B. FRP ductwork shall have a flame spread rating of 25 or less inside and outside and a smoke developed rating of not more than 50 in accordance with NFPA 91.

C. Laminates shall consist of a 20 mil (finished thickness) minimum chemical resistant interior liner with an apertured synthetic surface veil embedded in a resin rich surface. The corrosion barrier shall be a minimum of 100 mils thick and include not less than two layers of 1-1/2 oz mat with

25 percent glass and 75 percent resin content. The structural layer shall be of sufficient thickness to meet the minimum thickness requirements specified. The exterior surface layer shall be resin rich "C" - glass or apertured nexus veil not less than 20 mils thick. Outside finish shall be a pigmented, parrafinated gel coat with an ultra violet inhibitor. The inner surface shall be free of cracks and crazing with a smooth finish and with an average of not over two pits per square foot, providing the pits are less than 1/8-in in diameter and not over 1/32-in deep and are covered with sufficient resin to avoid exposure of inner surface fabric. Some waviness is permissible as long as the surface is smooth and free of pits.

D. Resins used in the laminate shall be premium corrosion resistant and fire retardant vinylester resins.

E. Fittings and Joints: All fittings such as elbows, laterals, tees and reducers shall be of the same resin as and equal or superior in strength to the adjacent duct section and shall have the same internal dimensions as the adjacent duct. Non-flanged duct joints shall be butt wrapped or bell and spigot joints. Bell and spigot joints shall be sealed with a standard butt joint overlay as per PS 15-69. The interior opening between the bell and spigot shall be sealed with a resin paste so that no glass fibers are exposed and all voids are filled. Field cut duct ends and exposed glass fibers shall be resin coated prior to joint assembly to maintain a continuous interior corrosion barrier. Coat all exterior surfaces of joints with a paraffinated resin-rich gel coat with UV inhibitors.

F. Total width of overlay for butt-wrap joints shall be not less than 6-in for diameters from 6-in up to and including 30-in.

G. Round Standard Elbows

1. Standard elbow centerline radius shall be equal to one times the diameter.

2. Standard elbows up to 24-in diameter shall be smooth radius molded elbows.

3. 0 to 44 degree elbows shall contain one mitered joint and two sections. 45 to 80 degree elbows shall have a minimum of two mitered joints and three sections. Elbows greater than 80 degrees shall have a minimum of four mitered joints and five section

H. Tolerances

1. Out-of-roundness of duct shall be limited to plus or minus 1/8-in or plus or minus 1 percent of duct inside diameter, whichever is greater for duct sizes 6-in diameter and greater.

2. All unflanged duct shall be square on the ends in relation to the pipe axis and plus or minus 1/8-in up to and including 24-in diameter.

3. Fittings

   a. The tolerance on angles of all fittings shall be plus or minus 1 degree, up to and including 24-in diameter.

4. Flanges

   a. Flange faces shall be perpendicular to the axis of the duct within 1/2 degree.

b. Flange faces shall be flat to within plus or minus 1/32-in, up to and including 18-in diameter.

c. Provide custom filler pieces as required to mate flanges squarely.

I. All connections to expansion joints, butterfly dampers, or other equipment shall be flanged. Gaskets shall be chlorobutyl. Flanges shall be hand laid up to thickness specified in PS 15-69 except that minimum thickness shall be 3/4-in. Each flange face shall be ground flat. The flange shall be anchored to a waxed table to ensure the flatness tolerance outlined above. The face shall be textured for use with full face chlorobutyl gaskets, 1/8-in minimum thickness. Flange drilling shall be as per PS 15-69. All bolt holes shall be back spot faced for a washer seat. All flange bolts shall be torqued to values as recommended by manufacturer.

J. Fasteners: Furnish all bolts, nuts, washers and other fasteners required. Material of metallic fasteners shall be Type 316 stainless steel.

K. There shall be not less than a 1/4-in buildup of FRP over the duct at each support and as shown on the Drawings.

L. Provide 1-in minimum PVC pipe and PVC ball valve duct drains in the bottom of all main, branch and riser ducts to allow removal of condensate.

2.03 TOOLS, SPARE PARTS AND MAINTENANCE MATERIALS

A. The duct system shall be furnished with the following:

1. One set of special tools required to maintain and repair the system.

2. All materials in kit form to make or repair joints. Additional kits shall be supplied sufficient to repair 10 percent of the joints. Materials shall be packaged for long term storage.

3. Names and addresses of all manufacturers of: Fiberglass reinforcements, resins, hardeners and components used to repair and maintain the FRP duct system.

B. Spare parts shall be packed in sturdy containers with clear indelible identification markings and shall be stored in a dry, warm location, until transferred to the Owner at the conclusion of the project.

C. Material safety data sheets for all components must be furnished.

2.04 FIBERGLASS REINFORCED PLASTIC DAMPERS

A. Furnish and install where indicated on the Drawings manually operated butterfly or parallel blade dampers, with handle for manual operation and positive locking quadrant for balancing purposes. Dampers shall be flanged connection and fabricated from materials similar to those specified in Paragraph 2.03 above.

B. Locking quadrants shall have a positive method of holding the damper in its selected position such as a bolt through both the quadrant and the lever arm. Systems using springs or other devices that can vibrate loose are not acceptable.

C. Rating Conditions

1. Velocity Through Damper: 4000 fpm.

2. Pressure Rating: 20-in water column.

3. Allowable Leakage: With a differential pressure of 12-in wg.

Size (in Dia.)	Maximum Allowable Leakage (cfm)
24	25
18	20

4. One damper of each size shall be shop tested at 12-in wg differential and shall meet the above leakage. Submit damper test report to the Engineer. Damper shall not be shipped until approved by the Engineer.

D. Materials

1. Bearings, Teflon.

2. Blade: FRP, angle reinforced.

3. Frame: FRP.

4. Axles: FRP rods, full length of damper size as shown on the Drawings.

5. Finish: FRP.

6. Handle: Type 316 stainless steel, or FRP.

7. Pins: Type 316 stainless steel.

8. Blade Stops: FRP angles with elastomer seals suitable for use at the design conditions.

9. Bushings: Teflon.

10. Hardware: Type 316 stainless steel.

11. Angles: FRP.

E. Dimensions: As detailed on the Drawings.

F. Manufacturer: Provide products of one of the following:

1. Ershigs Incorporated.

2. Bionomic Industries, Interchem Systems Division.

3. Heil Process Equipment, Xerxes Corporation.

4. Swartwout, Phillips Industries.

5. Calgon Corporation.

6. Or equal.

2.05 FRP TRANSITION PIECES

A. Provide transition pieces as shown on Drawings and specified herein.

B. Construction:

1. Thickness of transition pieces shall be designed using a safety factory of 10 to 1 for pressure and 5 to 1 for vacuum service with the pressure classification listed below.

2. Custom flanges shall be designed as required to connect to dampers and duct work.

C. Pressure Classification: Manufacturer shall design transition pieces so that they shall be free from buckling, pulsing, warpage and sagging at design pressures.

2.06 FLEXIBLE CONNECTORS

A. Expansion or contraction flexible connections shall be designed to allow 1-in movement. Working length or "live" length shall be as designed by the manufacturer to allow up to 1-in of movement. Ends shall be flanged, with flanges matching duct connection flanges. Corners on rectangular expansion joints shall be molded and free of patches or splices. The flexible connections shall be suitable for outdoor service and temperature ranges from minus 10 up to 125 degrees F, and pressure to 5 psig. Specially fabricated split Type 316 stainless steel retaining back-up bars shall be supplied to prevent damage to the EPDM rubber flanges when Type 316 stainless steel bolts are tightened.

B. Ductwork spacing and alignment for flexible connections shall be aligned to the tolerances of the flexible connection manufacturer, or plus/minus 1/4-in whichever is less. Bolts shall be torqued to the manufacturer's recommendations. Do not over tighten.

C. Where flexible connections are used as expansion joints, the manufacturer's precompression recommendations must be followed. When the temperature at installation differs from the temperature in the precompression recommendation, a correction shall be made.

D. Manufacturer:

1. Holz Rubber Company.

2. Mercer Rubber Company.

3. Proco Products, Incorporated.

4. Or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Hangers shall be installed plumb and securely suspended from supplementary steel or inserts in concrete slabs. Lower ends of hanger rods shall be sufficiently threaded to allow for adequate vertical adjustment. Building siding and metal decking shall not be used to hang ductwork.

B. Wherever ducts are divided, the cross-sectional area shall be maintained. All such changes must be approved and installed as directed by the Engineer or as approved on shop or erection drawings.

C. During installation the open ends of ducts shall be closed to prevent debris and dirt from entering. Work shall be installed in accordance with the overall approved progress schedule and in cooperation with all other trades so there will be no delay to other trades.

D. The Drawings of the air ducts and air risers indicate the general location for installation of the ducts and risers. Should additional offsets or changes in direction be made, these changes must be considered in the original bid and shall be installed at no additional cost to the Owner.

E. All necessary allowances and provisions shall be made in the installation of the ducts for the structural conditions of the building. Ducts shall be transformed or divided as may be required. Wherever this is necessary, the cross-sectional area shall be maintained. All of these changes, however, must be approved and ducts installed as directed by the Engineer or as approved on shop or erection drawings.

F. Do not remove or alter factory installed duct reinforcing ribs except as required to accommodate duct alterations due to unexpected field conditions. Notify the Owners representative prior to starting any field modifications involving ductwork structural reinforcing members.

G. No ductwork or components shall be shipped prior to complete resin cure.

3.02 CLEANING OF DUCTWORK

A. All ductwork, outlets and other parts of the ductwork systems shall be maintained in a clean condition during installation.

B. Complete ductwork systems shall be cleaned prior to testing. Cheese cloth shall be secured over all openings of the ductwork system for entrapment of dirt during the cleaning operation.

3.03 PAINTING

A. Painting shall be performed under this Section and shall be white.

END OF SECTION