adequate fall on drain lines and as needed for refrigeration drainage.

3.2.2 Bell holes shall be dug to allow soil pipe to lie fully supported.

3.2.3 Rock shall be excavated 3 inches below the laying depth, and the trench shall be backfilled with sand 3 inches deep.

3.2.4 Over-excavation shall be added in 12 inch lifts (max) and mechanically compacted. Flooding or puddling not permitted.

3.2.5 All piping which will be under walks, planters, arcades, parking lots, concrete or asphalt shall be mechanically compacted in 12 inch lifts (max).

3.3. Interface with Site Utilities:

3.3.1 Coordinate with other work. Connect to site supplies and storm drain at 5'-0" demising line.

3.3.2 Provide waste connection to site sewer at 5'-0" demising line. Provide grease-bearing waste connection to grease trap and from grease trap to waste line located as shown on the Drawings or otherwise indicated.

3.4. Pipe Installation:

3.4.1 Install horizontal sanitary and drain piping, to a uniform grade of not less than 1/8" per foot, unless otherwise noted.

3.4.2 Openings in pipes, drains, fitting, apparatus and equipment shall be kept covered or plugged to prevent accumulating obstructions in the piping.

3.4.3 Run piping free of traps, sags, bends or other defects. grade and valve for complete drainage and control of the system

3.4.4 All waste, vent and water lines shall be concealed, and all water lines shall be overhead.

3.4.5 Maintain headroom and keep passageways clean. offset to maintain the required clearance and conform with architectural and structural features of building. Run parallel and straight with adjacent walls or ceilings to present a uniform appearance. Group long runs together. Run concealed in finished rooms.

3.4.6 All rough-ins shall be set exactly to measurements furnished by manufacturer. Batteries of fixtures shall have rough outlets set in straight lines at equal spacing.

3.4.7 Flush out all lines to insure that they are clear of obstructions prior to the setting of refrigerated cases. If lines are not clear and a case is set, the Plumbing Contractor shall be responsible for the removal and re-set cost.

3.4.8 Water piping shall not be embedded in concrete nor concealed within the floor slab within the building. unless shown on drawings). Isolate copper piping from concrete with tar paper or PVC sleeve.

3.4.9 All piping shall be installed to prevent unusual noise from the flow of water under normal conditions. Install pipe isolators at ring hangers consisting of a metal sheath with end flanges assuring positive retention in the ring hangers. Separate cold lines from hot lines by 6".

3.4.10 Provide dirt pockets on low point of vertical gas piping. install full pipe size drip pockets at low point in change of grade.

3.4.11 For refrigeration case drains, stub up a 3" line 1" above floor; no hub required.

3.5. Pipe, joints, fittings, and connection-installation

3.5.1 Cast Iron Soil Pipe: Pack tight with first quality oakum to within 1 inch of end hub. Fill remaining space with one pouring of molten lead and caulk tight; or make-up with neoprene gaskets.

3.5.2 Screwed Piping: Make up with pipe dope, applied only to male thread. Remake leaky joints with new material without use of thread cement or caulking. Paint exposed threads of all pipe with asphaltic paint.

3.5.3 Copper Tubing:

3.5.3.1 Solder with 95-5 (no-lead solder) and a noncorrosive flux. Thoroughly clean inside and outside surfaces with sandpaper or wire brush before assembly. Defective joints shall be dismantled, cleaned, and resoldered. Do not use acid Solder.

3.5.3.2 Press Connections: Copper press fittings shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure that the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

3.5.4 Copper, brass pipe and chromed, polished or painted connections from fixtures shall show no tool marks.

3.5.5 PVC Joints: Clean socket and pipe ends with cleaner recommended by cement manufacturer. Liberally apply solvent cement to both socket and pipe ends. Make up joint firmly.

3.5.6 Gas Piping:

3.5.6.1 Black iron schedule 40, welded except at equipment connections. Certified welding is required.

3.5.6.2 At each piece of equipment, provide shut-off valve, union, drip leg minimum 4 times pipe diameter, capped) and flexible pipe connection.

3.5.7 Springing, bending or forcing of pipe will not be allowed. Use fittings for all offsets or changes in alignment of piping. Center hubs so cast iron will lay straight without pinched joints.

3.5.8 Street elbows, bushings, and long screw fittings will not be allowed on metal pipe

3.5.9 Cleanly cut pipe and tubing and remove burrs to full diameter of pipe. Excessive reaming will not be permitted. Remove metal particles from ends of pipe and clear each section of foreign material before assembling.

3.5.10 Cut pipe threads to full depth of die and screw up tight to fully engage thread in fitting. Threads to comply with ASA No B 2.1, and be cut with clean sharp dies.

3.5.11 Clean outs: Clean outs shall be placed as shown on Drawings, or max. 50' o.c., at bases of stacks, at major changes in direction, and at the ends of all lines that have 2 or more openings going into that line, or as required by code. Clean outs shall be as indicated on Drawings. If PVC is used include hub adapter.

3.5.12 Provide shut-off valves in access panels to allow shut down of area of fixtures where indicated on Drawings.

3.5.13 Provide shock absorbers with isolating gate or ball valves as indicated on the Drawings. Mount in the vertical position as recommended by the manufacturer.

3.5.14 The inside of all pipes shall be clean, reamed smooth with no burrs, fins or other obstructions. All drains including trap under utility sinks shall be copper with soldered joints. No pipe shall be run exposed, unless approved by Publix Representative.

3.6. Polypropylene Piping System:

3.6.1 Install listed pipe materials and joining methods below in the following applications:

3.6.1.1 Underground: Service entrance piping shall be Type K copper with the transition to Polypropylene (PP-R) no less than 1 ft. A.F.F.

3.6.1.2 Aboveground: Polypropylene (PP-R) piping in SDR 6, 7.5 or 11 based on the required minimum pressure rating and use temperature.

3.6.2 Fusion Welding of Joints:

3.6.2.1 Install fittings and joints using socket-fusion, electro fusion or butt-fusion as applicable of the fitting type. All fusion-weld joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.

3.6.2.2 Fusion-weld tooting, welding machines and electro fusion devices shall be as specified by the pipe and fittings manufacturer.

3.6.2.3 Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and the manufacturer's specifications

3.6.2.4 Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

3.7. Pipe Insulation

3.7.1 Sealed at all joints and seams with adhesive in accordance with insulation manufacturer's recommendations. Pipe supports shall be on the outside of the insulation with 6" minimum length saddles of galvanized sheet metal.

3.7.2 Fiberglass seams shall be sealed with factory furnished self sealing lap and butt joints in accordance with manufacturer's recommendation.

3.7.3 Polyolefin seams shall be sealed with factory-furnished, self-adhering, pressure sensitive seams. Butt joints shall also be glued with factory-furnished adhesive.

3.8. Fixture Installation

3.8.1 Stub out to the exact location of the fixtures. All stubs shall [illegible] symmetrically with fixture.

3.8.2 Install fixtures and trim supplied by Publix or others, [illegible] to plumbing as required. Finish out and trim fixtures [illegible] for complete installation.

3.8.3 [illegible] all plumbing fixtures shall be [illegible] and caulk[illegible] joint at walls, [illegible] intersecting surfaces with [illegible] caulking compound, counter tops and [illegible] shall be caulked with "[illegible] putty".

3.8.4 Backing shall be 2 x 6 pressure treated wood flush with stud [illegible] and extending [illegible] beyond fixture on each side. Secure as required.

3.9. Inspection

3.9.1 [illegible] Work shall be [illegible] under the [illegible] and with the approval of Publix' Authorized Representative.

3.9.2 Notify the Publix' Representative two days in advance of backfilling, enclosing, or covering [illegible] lines so that he may inspect installation.

3.9.3 Do not [illegible] plumbing until inspection is made and installation is acceptable. [illegible] deficiencies in installation as directed by Publix' Representative.

3.10. Tests and Adjustments

3.10.1 All soil, waste, and vent piping shall be filled with water to the highest point in each system with all air removed. The lines shall be flushed by removing the test plug. Piping may be tested in sections providing that all portions to be concealed shall be subjected to not less than a 10 ft. head for 24 hours with no leaks. Standpipe installed for head test shall be 2 in. minimum diameter.

3.10.2 Sewer piping shall be filled with water to it's highest point.

3.10.3 Verify that all drain lines have been flushed and are clear of debris prior to completion of Work.

3.10.4 Water piping shall be flushed out, tested at 100 psi and shall be left under pressure of supply main for the balance of the construction period.

3.10.5 Plumbing fixtures shall be filled with water and checked for leaks or retarded flow.

3.10.6 All flush valves, loose key stops, valves and similar equipment shall be adjusted and balanced to provide for the proper operation of the various systems.

3.10.7 Each piece of plumbing equipment and the entire plumbing system shall be adjusted and readjusted as required to insure proper functioning and shall be left in first class operating condition.

3.10.8 Gas piping, shall be tested at 15 psi air pressure for 24 hours, in excess of the requirements of NFPA 54.

3.11. Disinfection:

3.11.1 Purge system of all deleterious material before proceeding with disinfection.

3.11.2 Comply with local health department regulations.

3.11.3 Flush with clean, potable water until water runs clear.

3.11.4 Fill system with with chlorine solution containing at least 50 ppm of chlorine. Allow to stand for at least 24 hours.

3.11.5 Purge system of chlorine solution before putting into service.

3.12. Inspection

3.12.1 Notify inspector as required by local authority when all work is completely installed and tested leak-tight.

3.12.2 Do not conceal piping or fixtures until approval has been obtained from inspector.

3.13. Cleaning Equipment and Premises:

3.13.1 Thoroughly clean all parts of fixtures and equipment. exposed parts which are to be painted shall be thoroughly cleaned of foreign matter with grease, oil, soldering flux, etc. removed.

3.13.2 Exposed metal work shall be carefully brushed down with steel brushes to remove rust and other spots and touched up with primer.

End of Section 22 40 00

Section 23 05 93

Testing, Adjusting and Balancing of Mechanical Systems

V10092017

1. General

1.1. Summary

1.1.1 All work done under this section shall adhere to the concept of total system balance defined in ASHRAE. This concept states that one source shall be responsible for the complete testing, adjusting and balancing of all applicable HVAC systems, such that repeatable results are obtained, and the design intent of the engineer and the functional requirements of the owner are met.

1.1.2 The independent testing and balancing agency shall, to the extent made possible by the installation and performance constraints of the project specific HVAC systems, systematically test the performance of all HVAC equipment under field conditions to verify conformance to project specifications, drawings and documents. The testing, adjusting and balancing process shall include: (1) the testing & balancing of all HVAC air and water distribution systems; (2) the adjustment of total systems to attempt and provide specified design quantities; (3) electrical measurement; (4) establishing the quantitative performance of all HVAC equipment; (5) verifying that HVAC system automatic controls are functional.

1.1.3 For purposes of consistency and clarification for all parties involved with HVAC testing, adjusting and balancing, the following designations and abbreviations will be used throughout these specifications.

1.1.3.0.1 AABC = Associated Air Balance Council

1.1.3.0.2 ASHRAE = American Society of Heating, Refrigerating, and Air Conditioning Engineers

1.1.3.0.3 BAS = Building Automation Systems

1.1.3.0.4 CM = Construction Manager, general contractor or prime contractor

1.1.3.0.5 DALT = Duct Air Leakage Tests

1.1.3.0.6 DP = Design Professional

1.1.3.0.7 EC = Electrical Contractor

1.1.3.0.8 ES = Equipment Supplier

1.1.3.0.9 MC - Mechanical Contractor

1.1.3.0.10 Owner = Owner or owner's designated representative

1.1.3.0.11 SMACNA = Sheet Metal and Air Conditioning Contractors' National Association

1.1.3.0.12 TAB = Testing and Balancing, or independent testing and balancing agency

1.1.3.0.13 TBE = AABC certified Test and Balance Engineer

1.2. General Requirements

1.2.1 The TAB contract shall be procured and administered directly by the owner with Test and Balance Contractor.

1.2.2 The owner or his designated representative shall be copied directly on all TAB agency generated deficiency lists and HVAC equipment/system test results. No statements or verbiage found elsewhere in the Division 23 mechanical specifications, or in the project general conditions, shall be construed as preventing the owner from receiving a direct copy of any TAB agency generated deficiency list or test result

1.2.3 The HVAC System Testing, Adjusting and Balancing section of the Division 23 mechanical specifications, Section 23 05 93, has been provided to other contractors primarily for information, reference and coordination. Other contractors are to take note of their responsibilities summarized in Section 23 05 93, and to be prepared to comply with the applicable requirements noted therein.

1.2.4 Responsibilities of other contractors which are delineated herein include, but are not necessarily limited to the following.

1.2.4.1 Responding in a timely manner to submitted TAB agency deficiency lists.

1.2.4.2 Changing applicable fan/motor sheaves and belts per TAB agency recommendations.

1.2.4.3 Identifying manual volume damper (MVD) locations, maintaining access and verifying proper vapor barrier tight insulation to all MVD quadrant handles.

1.2.4.4 Ensuring that all applicable control interlocks are in place and functional.

1.2.5 Total System Balance shall be preformed by a TAB agency certified by the Associated Air Balance Council (AABC) and approved by the owner. All work preformed by this shall be done by qualified technicians under the direct supervision of an AABC certified TBE, and under the project supervision of a registered professional engineer, permanently employed and registered in the state work is preformed by the TAB agency. All manpower will be permanently employed by the TAB firm and NO subcontractors to [illegible] agency will be allowed.

1.3. Scopes

1.3.1 Work and services to be provided by the TAB agency shall [illegible] furnishing all technical support personnel and all ma[illegible] test equipment[illegible]-access equipment[illegible] field labor required to comp[illegible] test, adjust and [illegible]nce all air, flui[illegible], [illegible]ical, electrical and BAS contr[illegible] local controls instruments [illegible]ssociated with [illegible] heating, v[illegible], air condi[illegible] and building proce[illegible]ust systems.

1.3.2 [illegible] following spe[illegible] services are includ[illegible] in the W[illegible] Services described [illegible]aph 1.3.1 a[illegible]

1.3.2.1 [illegible] Air System B[illegible]

1.3.2.1.1 Outs[illegible] Systems

1.3.2.1.2 Supply [illegible]stems

1.3.2.1.3 Return Air [illegible]ms

1.3.2.1.4 Exhaust Air Systems

1.3.2.2 Hydronic System Balance (where applicable)

1.3.2.2.1 Chilled Water Systems

1.3.2.2.2 Condenser Water Systems

1.3.2.2.3 Heating Hot Water Systems

1.3.2.2.4 Glycol-Water Systems

1.3.2.3 Control Systems Verification

1.3.2.4 Special Systems

1.3.2.4.1 Kitchen Hood Testing

1.3.2.5 System Performance Verification

1.3.2.6 Renovation Projects - Preconstruction airflow and water flow measurements and appropriate testing of existing HVAC systems where indicated in the design documents.

1.4. References

1.4.1 AABC

1.4.1.1 2016 NATIONAL STANDARDS FOR TESTING AND BALANCING HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS, 7th edition.

1.4.1.2 AABC TEST AND BALANCE PROCEDURES

1.4.2 2015 ASHRAE HANDBOOK, HVAC APPLICATIONS, Testing, Adjusting and Balancing

1.4.3 SMACNA, HVAC AIR DUCT LEAKAGE TEST MANUAL, 2012, 2nd edition

1.5. Quality Assurance

1.5.1 Regulatory Requirements

1.5.1.1 Workmanship, materials and installation shall comply with all state and local codes including, but not limited to the following:

1.5.1.1.1 Applicable State Building Code

1.5.1.1.2 ASHRAE Standard 62.1 - Latest Edition: Ventilation for Acceptable Indoor Air Quality

1.5.1.1.3 ANSI/ASHRAE 111- Latest Edition Testing, Adjusting, and Balancing of Building HVAC Systems.

1.5.1.1.4 National Electrical Code - Latest Edition

1.5.1.1.5 National Fire Codes (NFPA) - Latest Edition

1.5.1.1.6 OSHA General Industry Standards

1.5.1.2 Nothing in the contract documents shall be construed to permit work not conforming to these codes or ordinances. Should conflicts arise between standards, the more stringent standard shall apply.

1.5.2 All testing, adjusting and balancing procedures shall be in strict accordance with the following reference standards:

1.5.3 AABC

1.5.3.1 2016 NATIONAL STANDARDS FOR TESTING AND BALANCING HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS, 7th edition.

1.5.3.2 AABC TEST AND BALANCE PROCEDURES

1.6 Tab Agency Qualifications

1.6.1 The TAB agency shall be an AABC member in good standing.

1.6.2 All work shall be performed in accordance with the AABC procedures and standards itemized in paragraph 1.05B, and under the project supervision of a registered professional engineer permanently employed by the TAB agency. An AABC certified TBE shall be responsible for all field supervision and certification of the total work of this section.

1.7. Contract Documents

1.7.1 The owner or owner's designated representative shall furnish the TAB agency with plans, specifications and submittals as soon after the project contract award date as possible. These documents will be reviewed by the TAB agency for discrepancies or irregularities that would hinder TAB services or jeopardize optimum system performance.

1.7.2 The owner or his designated representative shall execute a test and balance agreement as soon as possible after the construction contract has been awarded to allow the TAB agency ample time to schedule this work in cooperation with other trades involved and to comply with the contract completion date.

1.8. Notification And Scheduling

1.8.1 The schedule for testing and balancing the HVAC systems shall be established by the Owner, or his designated representative, in coordination with the TAB agency on a critical path network.

1.8.2 The TAB agency is responsible for initiating this continuing coordination to determine schedule for final TAB services.

1.8.3 It will be necessary for the TAB agency to perform its services in close coordination with the CM, MC, EC, and BAS contractor, with all scheduling and deficiencies reported through the Owner, or his designated representative.

1.8.4 Before testing and balancing commences, the TAB agency shall receive notification in writing from the refrigeration coordinator that the systems are operational, complete and ready for balancing. Included with this notification shall be completed and signed HVAC equipment start-up check lists.

1.8.5 A completed system means more than just the physical installation. The CM, MC, EC, and BAS contractor shall certify that all prime movers, fans, pumps, dampers, refrigeration machines, boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested.

1.8.6 The shall certify to the refrigeration coordinator in writing that all equipment has been checked, started and adjusted by the manufacturer and operated for the specified period of time.

1.9. Coordination With Other Trades

1.9.1 As a minimum to bring the HVAC systems into a state of readiness for testing, adjusting and balancing, the Mechanical Contractor (MC) shall perform the following:

1.9.1.1 Air Distribution Systems

1.9.1.1.1 All required DALT procedures on all applicable duct systems have been performed, all duct work sealed as required and applicable retesting completed.

1.9.1.1.2 Ensure that all splitters (only to be used for Gross distribution of flow, not balancing), volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief and exhaust air shall provide tight closure and full opening, with a smooth and free operation.

1.9.1.1.3 Verify that all supply, return, exhaust and transfer grilles, registers, diffusers and high pressure terminal units are installed and operational.

1.9.1.1.4 All manual volume dampers (MVDs) are in the open position and readily accessible.

1.9.1.1.5 The MVD handles must be supplied with a stand-off bracket and locking quadrant.

1.9.1.1.6 Ensure that air handling systems, units and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc. are blanked-off and/or sealed to eliminate excessive bypass or leakage of air

1.9.1.1.7 Ensure that all fans (supply, return, relief and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.

1.9.1.1.8 Make any necessary changes to the sheaves, belts and dampers, as required by the TAB agency, at no additional cost to Owner.

1.9.1.1.9 Install clean filters prior to testing.

1.9.1.2 Water Circulating Systems (where applicable)

1.9.1.2.1 Check all pumps to verify pump alignment and rotation.

1.9.1.2.2 Ensure that systems are clean with the proper strainer screens installed for [illegible] operation.

1.9.1.2.3 Check all pump motors for current and voltage to ensure that motors do not exceed nameplate rating.

1.9.1.2.4 Provide overload protection of [illegible] size and rating.

1.9.1.2.5 Ensure that all water circulating systems shall be clean, full of water and free of air; that expansion tanks are set to proper water level, and that all air vents are installed at high points of systems and are operating.

1.9.1.2.6 Check and set operating temperatures of heat exchangers to design requirements.

1.9.2 The BAS contractor shall perform the following minimum pre-TAB items:

1.9.2.1 Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets and fire and freeze stat resets.

1.9.2.2 Verify that all controlling instruments are calibrated and set for design operating conditions.

1.9.2.3 [illegible]rate room thermostats after installation and before the thermostat control verification tests are performed.

1.9.2.4 The BAS contractor shall allow sufficient time in the project to provide assistance and instruction to the TAB agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.

1.9.2.5 The TAB agency will then verify by-pass operation and field set all boxes by comparing actual tested airflow and correcting the minimum and maximum settings.

1.9.3 The Owner, or his designated representative, the CM, the MC, the BAS contractor and the equipment suppliers of the HVAC equipment shall all cooperate with the TAB agency to provide all necessary data on the design and proper application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies and shall be on site during the Test and Balance process.

2. Products

2.1. General

2.1.1 The TAB agency shall be responsible for providing all instrumentation, ductwork test ports and plugs, testing equipment and all other accessories and man access equipment necessary for accomplishing total system balance of all systems.

2.1.2 Service tools or special devices required to manipulate HVAC system control devices or control modes shall be loaned to the TAB agency by the BAS contractor until testing of all HVAC controls has been completed.

2.1.3 The accurate calibration of all field instrumentation to be used by the TAB agency is extremely important. Instrumentation shall be of first quality and accurately calibrated within (12 months prior to start of total system balance).

2.1.4 Whenever possible, the same instrument should be used for the entire job. If more than one instrument is used, a check shall be made to verify that the variation in instrument readings does not exceed +/- 0.5%.

3. Execution

3.1. Procedures

3.1.1 Please note that the TAB Agency is contracted to perform a once through test and balance (TAB) (i.e. in a single mobilization). If deficiencies are identified that prohibit the TAB Agency from completing TAB, then the deficiencies will be noted within the final report and submitted to the owner. It will be the financial responsibility of the offending contractor to resolve any outstanding deficiencies and the cost of any TAB retesting will be back charged by Publix to the General Contractor. It is the intent of Publix to resolve all outstanding deficiencies prior to releasing final payment. Please note that a deficiency which impacts the operation of the HVAC equipment or overall store comfort will require a retest. Non-impacting deficiencies may be resolved via photo and/or written documentation.

3.1.2 Preconstruction Design Documents Check & Review

3.1.2.1 Review the project documents and contractor submittals for their effect on the test and balance process and overall performance of the HVAC systems.

3.1.2.2 Review building pressurization to verify that make-up air and exhaust air quantities balance out in conformance with specified design facility pressurization requirements.

3.1.2.3 Review location and type of manual volume dampers (MVD) in the air distribution system, and verify that all MVDs are accessible.

3.1.2.4 Review inlet conditions to air terminals, air valves and HVAC equipment.

3.1.2.5 Review location of pressure sensors in the air and water distribution systems.

3.1.2.6 Review automatic control systems as they affect the test and balance procedure.

3.1.3 Air System Test & Balance Procedures

3.1.3.1 FAN SPEEDS - test and adjust fan RPM to achieve design CFM requirements. 0% to +10%

3.1.3.2 CURRENT & VOLTAGE - measure and record motor current and voltage.

3.1.3.3 PITOT TUBE TRAVERSE - perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.

3.1.3.4 OUTSIDE AIR - test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.

3.1.3.5 STATIC PRESSURE - test and record system static pressures, including suction and discharge static pressure profile of each fan.

3.1.3.6 AIR TEMPERATURE - take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil.

3.1.3.7 At least one zone balancing damper shall be completely open.

3.1.3.8 MAIN DUCTS - adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

3.1.3.9 BRANCH DUCTS - adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.

3.1.3.10 TOLERANCE - test and balance each diffuser, grille and register to within +/- 15% of design requirement on ceilings above 15 feet and +/- 10% for ceilings below 15ft

3.1.3.11 IDENTIFICATION - identify the location and area of each grille, diffuser, register and terminal box. This information shall be recorded on air outlet data sheets.

3.1.3.12 DESCRIPTION - record the size and type of each diffuser, grille and register on air outlet data sheets.

3.1.3.13 VARIABLE AIR VOLUME SYSTEMS - shall be field set and balanced according to the specific type of VAV system supplied and method of controlling air flow. The following requirements shall be met:

3.1.3.13.1 Verify that inlet ducts have sufficient straight runs as indicated in the details before VAV boxes or that straighteners have been provided and the VAV box manufacturer's control system is compatible with the building control system.

3.1.3.13.2 Determine the maximum and minimum CFM for the boxes used and verify that the operating conditions fall within the design operating range.

3.1.3.13.3 Check static pressures and volume flows and adjust to proper values as necessary. Test and report total airflow under maximum and minimum settings.

3.1.3.13.4 Set outlets to design flow with VAV box on maximum setting and then set minimum set point

3.1.3.14 TERMINAL BOXES - field set volume regulators on all terminal boxes to meet design maximum and minimum CFM requirements. All associated temperature controls shall be checked for proper operation and calibration.

3.1.3.15 MINIMIZING DRAFTS - adjust all diffusers, grilles and registers to minimize drafts in all areas.

3.1.3.16 EXHAUST FANS - measure exhaust fan static pressure, total CFM, make-up air and fan RPM. Measure motor operating voltage and amperage.

3.1.3.16.1 Verify exhaust fan static pressures, total CFM, make-up air and fan RPM. Verify exhaust fan total air flow via Pitot tube traverse wherever possible.

3.1.3.16.2 Measure motor operating voltage and amperage.

3.1.3.16.3 Balance of kitchen hoods. The airflow shall be set to deliver design average velocity x hood area. After flows are set, measure hood face velocities with a Shortridge Velgrid per manufactures recommendations.

3.1.3.16.4 Record the specified against the [illegible] supplied horsepower and electrical characteristics [illegible].

3.1.4 Hydronic System Test and Balance Procedures (where applicable)

3.1.4.1 WATER TREATMENT - ex[illegible] water in the system to determine if the water has been tr[illegible] cleaned. If it has not, request that the mechanical contractor [illegible] treat the water.

3.1.4.2 AIR VENTS - check all air vents at the high points of the water system and determine if they are installed and [illegible].

3.1.4.3 VALVES - set all balancing valves and automatic [illegible] control valves to the full open position for balancing. Three-[illegible]; the [illegible] pressure drop shall first be adjusted with the three-[illegible] so [illegible] water flows through the coil. The bypass shall then be adjusted to equal the drop of each coil until equal pressure drop be[illegible] and return connections is obtained, with the three-way valve set [illegible] the coil.

3.1.4.4 PUMPS - adjust [illegible]ter, hot water and condenser water pump to meet design GPM requirements. Check pumps for proper operation. Pumps shall be free of vibration and cavitations. Measure and record operating current and voltage. Plot shut-off head and operating head on [illegible] generated pump performance curve.

3.1.4.5 CENTRAL PLANT - adjust water flow from the central plant if applicable.

3.1.4.6 TOLERANCES - proceed to balance all chilled water and hot water coils to within +/- 5% of design GPM requirements.

3.1.4.7 MARKING - mark all settings and record all data after completing the flow readings and coil adjustments.

3.1.4.8 PRIMARY/SECONDARY PUMPING SYSTEM - if a primary-secondary pumping system is employed, the TAB agency shall ensure that a proper balance is obtained between primary and secondary loops and that sufficient flow is maintained in the secondary loop at all times.

3.1.5 Control Systems Verification

3.1.5.1 Verify that all control devices are properly connected.

3.1.5.2 Verify that all dampers, valves and other controlled devices are operated by the intended controller.

3.1.5.3 Verify that all dampers and valves are in the position indicated by the controller (open, closed, or modulating).

3.1.5.4 Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions.

3.1.5.5 Check that all valves are properly installed in the piping system in relation to direction of flow and location.

3.1.5.6 Check the calibration of all controllers.

3.1.5.7 Verify the proper application of all normally open and normally closed valves.

3.1.5.8 Check the location of all thermostats and humidistat for potential erratic operation from outside influences such as sunlight, drafts or cold walls.

3.1.5.9 Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control contractor will relocate as deemed necessary by the TAB agency.

3.1.5.10 Check the sequence of operation that any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs. Observe that heating cannot take place until the cooling zone of valve is completely closed.

3.1.5.11 Verify that all controller set points meet the design intent.

3.1.5.12 Check all dampers for free travel.

3.1.5.13 Verify the operation of all interlock systems.

3.1.5.14 Perform all system verification to assure the safety of the system and its components.

3.1.6 System Performance Verification

3.1.6.1 Publix' Commissioning Authority will verify the repeatability of the TAB report. If random tests indicate a measured flow deviation of 10% or more from that recorded in the Certified TAB Report listings at 10% or more of the selected recheck stations, the report will be rejected. All systems shall then be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to Owner.

3.2. Record & Report Data

3.2.1 The TAB report shall be complete with logs, data and records as required herein. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the TAB agency's certified TBE, and signed by the TAB agency's registered professional engineer.

3.2.2 One (1) hardcopy and one (1) electronic .PDF version of the TAB report are required and shall be submitted to the Owner or the Owner's designated representative.

3.2.3 The report shall contain the following general data in a format selected by the TAB agency.

3.2.3.1 Project number

3.2.3.2 Contract Number

3.2.3.3 Project title

3.2.3.4 Project location

3.2.3.5 Project architect

3.2.3.6 Project mechanical engineer

3.2.3.7 Test and balance agency

3.2.3.8 Test and Balance Engineer

3.2.3.9 General Contractor

3.2.3.10 Mechanical subcontractor

3.2.3.11 Date tests were performed

3.2.3.12 Certification

3.2.4 The TAB report shall be recorded on report forms conforming to the recommended forms in AABC National Standards. At a minimum, the report shall include:

3.2.4.1 Preface: any abnormalities and problems encountered, and any remaining outstanding deficiencies.

3.2.4.2 Instrumentation List: the list of instruments including type, model, manufacturer, serial number.

3.2.4.3 List of formulas used on test form

3.2.4.4 System Identification: in each report, the VAV boxes, zones, supply, return, and exhaust openings, and traverse points shall be numbered and/or lettered to correspond to the numbers and letters used on the report data sheets.

3.2.4.5 Store pressurization summary sheet indicating design versus final CFMs

3.2.4.6 Measured supply air summary sheet indicating total CFMs of each AHU and AC, equate and document total tested tonnage of installed HVAC equipment

3.2.4.7 Air Handling Equipment

3.2.4.7.1 Manufacturer, model number and serial number.

3.2.4.7.2 All design data.

3.2.4.7.3 Total actual CFM by traverse if practical, if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC

3.2.4.7.4 Complete Static Pressure Profile across all filter and coils

3.2.4.7.5 Return air, bypass air, and outside air minimum and maximum specified CFM

3.2.4.7.6 Actual operating current, voltage and brake horsepower of each fan motor.

3.2.4.7.7 Final RPM of each fan (High Speed & Low Speed).

3.2.4.7.8 Fan and motor sheave manufacturer, model, size, number of grooves and center distance.

3.2.4.7.9 Belt size and quantity

3.2.4.7.10 Static pressure controls' final operating set points.

3.2.4.7.11 Entering air temperature (EAT) / Leaving air temperature (LAT) (DB & WB) °F

3.2.4.7.12 Cooling coil temperature test

3.2.4.7.13 Heating coil temperature test for gas heat / amp& volt for electric heat

3.2.4.7.14 Heat reclaim coil test (where applicable) GPM, EWT, LWT

3.2.4.7.15 Actual Ambient Data at the time of testing

3.2.4.7.16 Room DB/WB (°F)

3.2.4.7.17 Entering and leaving enthalpy (BTU/#)

3.2.4.7.18 Total enthalpy (BTU/#)

3.2.4.7.19 Total BTUH

3.2.4.7.20 Duct traverse sheet

3.2.4.8 Supply / Return / Exhaust Air Distribution for each [illegible]

3.2.4.8.1 Area served

3.2.4.8.2 Specified grille (i.e. neck size, run-out, Ak)

3.2.4.8.3 Specified design (Velocity and CFM)

3.2.4.8.4 Preliminary [illegible] test (Velocity and CFM)

3.2.4.8.5 Final field test (Velocity and CFM)

3.2.4.8.6 % of design

3.2.4.9 [illegible] Air Conditioning Systems

3.2.4.9.1 Manufacturer, model number and serial number.

3.2.4.9.2 [illegible] data.

3.2.4.9.3 [illegible]

3.2.4.9.4 [illegible]

3.2.4.9.5 Cooling and Heating [illegible] performance data

3.2.4.10 [illegible]

3.2.4.10.1 [illegible]facturer, model number and serial number.

3.2.4.10.2 All design data.

3.2.4.10.3 Area and equipment served

3.2.4.10.4 Exhaust

i Filter size

ii Average velocity (FPM)

iii Conversion factor

iv Calculated CFM

v Total Airflow & calculated % of design

3.2.4.10.5 Supply

i Test face velocities and balance accordingly

ii Total airflow & calculated % of design

3.2.4.10.6 Verify and mark the outside air damper actuator's maximum setting & performance verify the minimum settings for AC unit(s) dampers that are associated with the hood system.

3.2.4.11 Exhaust and Make-up Air fans

3.2.4.11.1 Manufacturer, model number and serial number.

3.2.4.11.2 All design data

3.2.4.11.3 Area and equipment served

3.2.4.11.4 Static Pressure (Design and tested)

3.2.4.11.5 Fan RPM (Design and tested)

3.2.4.11.6 Tested amperage

3.2.4.11.7 Tested Voltage

3.2.4.11.8 Heater size, rating, setting

3.2.4.11.9 Fan and motor sheave manufacturer, model, size, number of grooves and center distance.

3.2.4.11.10 Belt size and quantity.

3.2.4.11.11 Final tested CFM

3.2.4.11.12 Maximum & minimum VFD frequency, if applicable

3.2.4.12 VAVs

3.2.4.12.1 Manufacturer, model number.

3.2.4.12.2 All design data.

3.2.4.12.3 Area and equipment served

3.2.4.12.4 Field test minimum CFM

3.2.4.12.5 Field test maximum CFM

3.2.4.13 ERVs (Supply and Exhaust)

3.2.4.13.1 Manufacturer, model number and serial number.

3.2.4.13.2 All design data.

3.2.4.13.3 Area and equipment served

3.2.4.13.4 Test amperage

3.2.4.13.5 Test voltage and phase

3.2.4.13.6 Heater data, size, rating, setting

3.2.4.13.7 Static Pressure entering the wheel (in wg)

3.2.4.13.8 Fan Suction (in wg)

3.2.4.13.9 Pressure drop across the filter and the wheel (in wg)

End of Section 25 05 93

Section 23 70 00

Central HVAC Equipment

V10092017

1. General

1.1. Summary

1.1.1 Provide all materials and equipment and perform all labor required to install HVAC systems complete as indicated, as required by code, and as specified herein. All sizes, etc. are Publix minimum and if local code requirements are higher, the work shall be bid and installed accordingly.

1.1.1.1 Obtain and pay for all permits, bonds, inspection.

1.1.1.2 Provide roof top and split HVAC systems or install systems provided by Publix as described below.

1.1.1.3 All A/C curbs shall be set for drying-in by Roofer.

1.1.1.4 All roof mounted fans will be furnished by Publix and installed by HVAC Contractor. Curbs will be furnished by Publix for installation by Roofer.

1.1.1.5 Provide hurricane brackets and other supports required to secure units to structure for wind and seismic conditions.

Seismic: Seismic hazard level as designated by Authority Having Jurisdiction.

Hurricane: FM 1-90 or higher if designated by Authority Having Jurisdiction.

1.1.1.6 Provide sheet metal duct systems as indicated on Drawings and described in Specifications.

1.1.1.7 Provide exhaust ducts between the cooking hoods and the roof mounted exhaust fans.

1.1.1.8 Provide double-wall metal gas vents.

1.1.1.9 Provide all other materials and services required for installation described in Contract Documents.

1.1.2 HVAC Equipment:

1.1.2.1 Publix will provide equipment delivered to the site of Construction. Coordinate delivery schedule with construction progress. Provide all labor, equipment, materials, and services required for installation and satisfactory completion of HVAC work.

1.1.2.2 In addition to above, provide equipment, delivery, required staging and storage, and all other services required to complete the Work.

1.1.3 Coordinate work with work of others. Notify concerned parties before proceeding with work that will affect them.

1.2. Definitions: Explanation and precedence of Documents:

1.2.1 For purposes of clarity and legibility, HVAC drawings are essentially diagrammatic and, although size and location of equipment are drawn to scale wherever possible, Contractor shall make use of all Contract Documents.

1.2.2 Although the locations of the equipment and ductwork may be shown on the Drawings in certain positions, the Contractor shall be guided by the architectural details and conditions existing at the job, correlating this work with that of others.

1.2.3 The Drawings indicate size, connection points and routes of ducts and equipment. it is not intended, however, that all offsets, rises and drops are shown. Install all items as required to fit structure, avoid obstructions, and retain clearance, headroom, openings and passageways.

1.2.4 Remodels: Carefully examine all existing conditions, existing work in place and premises and compare the Drawings with the existing conditions. Submittal of bid indicates that the Contractor has examined the Site and Drawings and has included all required work in his bid. No allowances will be made for error resulting from Contractor's failure to visit job sites and to review Drawings.

1.2.5 Conflicts, discrepancies, interferences and omissions in Documents shall be brought to the attention of the Publix Engineer for clarification prior to commencement of work.

1.3. Submittals:

1.3.1 Submit LOIs in accordance with Section 01 33 00 Submittal Procedures.

1.3.2 Within 30 days of Contract Commencement (Authorization to Proceed), submit the following shop drawings and cut sheets for Publix Engineer's approval:

Cooling Equipment

Air Handling Equipment

Heating Equipment

Air Distribution

Valves, Gauges, Specialties, [illegible]meters, Misc.

Insulation

Round and Oval Duct - submittals [illegible] shop drawings

All [illegible] shall have rough-in dimensions, connection [illegible] any special [illegible] requirements, [illegible] performance data [illegible] horsepower, voltage [illegible] for all equipment.

Equipment, fixtures and [illegible] with cuts including rough-in dimensions

Other items required to [illegible] the work

1.3.3 Submit [illegible] (2) identical bound copies [illegible] all items. Arrange categories in order listed [illegible].

1.3.4 Literature [illegible] above shall have [illegible]-in dimensions, connection sizes, and special in[illegible] requirements.

1.3.5 Project Record Drawings: Comply with Section 01 78 39.

1.3.6 Do not order ma[illegible] or proceed with work until all submittals have been reviewed, and approved.

1.3.7 Co[illegible] electrical and other requirements with other contractors.

1.4. Quali[illegible]

1.4.1 Subcontractor:

1.4.1.1 The HVAC Subcontractor shall be a reputable firm regularly engaged in this type of work, employing skilled workmen, and with proper equipment.

1.4.1.2 Upon request Subcontractor shall show evidence of at least two similar jobs, of comparable size and character, installed and operating within the previous two years prior to Bid Opening.

1.4.1.3 Publix reserves the right to refuse any Subcontractor with or without cause.

1.4.2 Personnel:

1.4.2.1 Employ an experienced Superintendent to oversee all operation.

1.4.2.2 Work shall not proceed without adequate supervision present at all times

1.4.2.3 Work shall be accomplished by workers certified in their trade as masters, journeymen, and apprentices in accordance with regulations of the governing authority or customary practice. Utilize workers with skills in proportion to complexity of tasks required.

1.4.2.4 Publix reserves the right to reject personnel with or without cause.

1.4.3 Quality standards: Work will be judged in comparison to work of similar types. Substandard construction as judged by Publix Representative will not be accepted.

1.4.4 Regulations. Comply with applicable provisions of the following codes (latest version adopted by governing agencies):

Local Building Code

ASME Code for Unfired Pressure Vessels

International Mechanical & Energy Codes

Florida State Mechanical & Energy Codes

Georgia State Mechanical & Energy Codes

North Carolina State Mechanical & Energy Codes

OSHA - for construction

1.4.5 Coordination. Work shall be accomplished along with the work of other trades. Corporate with others to benefit the job as a whole.

1.4.6 Participate in the pre-construction conference.

1.5. Sequencing:

1.5.1 Notify General Contractor, or any others, of all chases, sleeves and openings required so that the work can be accomplished without delay. Provide necessary sleeves, etc., to be installed. Otherwise, HVAC Sub-Contractor shall pay for appropriate trades to perform cutting and patching.

1.5.2 Joists, girders, beams, columns or reinforcing steel shall not be cut.

1.5.3 Where construction necessitates the routing of ducts or piping through structural members, or framing, permission to make such installation shall first be obtained from the Publix Field Representative

1.6. Temporary Operation: The Owner may require operation of part or all of the installation prior to Final Acceptance.

1.7. After acceptance of the Work, the Owner reserves the right to make emergency repairs as required to keep equipment in operation without voiding the Contractor's guarantee nor relieving the Contractor of his responsibilities during the guarantee period.

1.8. Operating Instructions and Service Manual:

1.8.1 Provide two (2) neatly bound copies of maintenance and instructions book, parts lists pertaining to all equipment furnished.

1.8.2 Each section shall be indexed and include parts lists, instruction books, suppliers' phone numbers and addresses, and individual equipment guarantees all in separate sections.

1.8.3 Representatives of the Owner shall be instructed by the Contractor as to complete care and operation of the HVAC system. Inform the Architect in writing as to the persons who received the instructions and the date that this was done.

1.9. Warranty:

1.9.1 Units shall have a manufacturer's standard one-year warranty against all defects.

1.9.2 Provide industry standard five-year compressor replacement warranty.

2. Products

2.1. General: All equipment and materials shall be furnished in strict accordance with the equipment schedule and specifications requirements. See Section 01 11 00 - Summary of Work to determine responsabilities regarding supplying and installing of equipment.

2.2. Nameplates

2.2.1 Nameplates shall not be painted.

2.2.2 All switches, starters, and major pieces of equipment shall be identified with black plastic nameplates with engraved white letters.

2.3. Packaged Rooftop Air Conditioners: Self-contained, factory assembled and wired unit. Consists of cabinet compressor(s), evaporator fan, evaporator coil(s), air filters, air cooled condenser, fully charged with refrigerant and oil, and controls.

2.4. Power Ventilators: Direct or belt-drive centrifugal fans consisting of housing, wheel, fan, shaft, bearings, motor and disconnect switch drive assembly, curb base and accessories.

2.5. Controls:

2.5.1 An Environmental Control Panel will be furnished and installed by Publix to control all AC units. Conduit, line voltage circuits, interlocks, etc., shall be furnished and installed by the Contractor, as shown on drawings.

2.6. Filter Media: Full two inch thick dual density polyester material.

2.7. Air Distribution

2.7.1 General:

2.7.1.1 All air distribution shall be supplied by manufacturers whose testing procedures are in accordance with ASHRAE Standard 70.

2.7.1.2 Furnish and install, unless otherwise noted, all grilles, registers, and outlets at the location and of the type and size shown on the Drawings. Install foam rubber gaskets behind flanges of all grilles and registers to prevent leakage and streaking. Adjust air volumes and set deflection in accordance with Drawings.

2.7.1.3 Approved manufacturers:

Airguide

Anemostat

Bailey and Tuttle

Lindab

Krueger

Metal Industries

Nailor Industries

Price

Titus

Other manufacturer as approved by Publix Engineer.

2.7.2 Return Air Grilles and Registers:

2.7.2.1 Return air grilles, outlets, registers and door grilles shall be of etched aluminum with acrylic finish and as indicated.

2.7.2.2 All grilles shall be suitable for smooth surface mounting, Coordinate installation door grilles with door installation.

2.7.2.3 Where indicated, provide opposed blade dampers.

2.7.3 Supply Registers and Diffusers:

2.7.3.1 All supply outlets shall be aluminum (or aluminized steel where required when part of rated roof-ceiling assembly) and products of a single manufacturer.

2.7.3.2 Provide steel grilles and fire dampers, radiation dampers as indicated on the Drawings and in accordance with U.L. roof-ceiling assembly design where indicated.

2.7.3.3 Where indicated, provide opposed blade dampers.

2.7.4 Louvers: Aluminum, drainable with bird screen, AMCA certified.

Greenheck ESD-403

Ruskin #ELF[illegible]

Louvers and Dampers [illegible] Series

[illegible]

2.8. Bypass Terminal Units: [illegible] gauge galvanized [illegible] construction, 1/2" thick 1.5 lb/ft³ densit[illegible] coated fibrous glass insulation, complies with NFPA 90A and UL-181. Steel damper and actuator [illegible] with self-lubricating bearings. Field adjusted minimum [illegible] volume stop and [illegible]AC actuator.

2.8.1 Approved Manufacturers:

[illegible] Metal Industries

[illegible]

T[illegible]

2.9. Sheet Metal Ductwork:

2.9.1 Galvanized Ductwork: All duct and fittings shall be manufactured from galvanized steel of lock forming quality per ASTM A653. The zinc coating shall be minimum G90 (1.25 oz. 1 sq. ft.) per ASTM A924. Seams on fittings shall be welded or tacked & sealed. Individual fittings are required, manifolding is not permitted. Comply with SMACNA requirements for duct construction for ventilation and air conditioning systems.

2.9.2 Stainless steel ductwork: ASTM A480, Type 316 sheet-form with #4 finish for surfaces exposed to view; Type 304sheet-form, with #1 finish for concealed ducts.

2.9.3 Rectangular Duct Work:

2.9.3.1 Panels shall be cross broken. (Beaded duct not acceptable)

2.9.3.2 Longitudinal standing seams may be used

2.9.3.3 Corner closures are not required

2.9.3.4 Hangers shall be galvanized steel strapping and galvanized rods.

2.9.3.5 Elbows shall be as drawn.

2.9.3.6 Where indicated vaned elbows shall be double vaned.

2.9.3.7 Connections shall be either 90 degree straight with Titus Model AG-45 control grid or radius tap-in.

2.9.3.8 Inspection plates and test holes are not required.

2.9.3.9 Fresh air intake shall be square or rectangular standard.

2.9.3.10 Access doors shall be insulated and removable

2.9.3.11 Sealer on all joints: Sealants shall have a Flamespread Rating of 25 or less, Smoke Developed Rating of less than 50 to comply with NFPA 90A

Hardcast Iron Grip Water-Based Duct Sealant 601

United McGill, United Duct Sealer.

Precision Adhesives PA-2084A Duct Sealant.

Fosters 32-19

2.9.4 Round and Flat Oval Duct:

2.9.4.1 All exposed ductwork shall be spiral lockseam construction standard SMACNA gauges tested to + 10WG. Longitudinal seam duct is prohibited. Comply fully with SMACNA recommendations.

2.9.4.2 Where ductwork is exposed to view, provide G90 galvanized metal suitable for painting.

2.9.4.3 Field Joints in Exposed Ductwork: Lindab Inc. SPIRO safe duct system, or Ductmate industries Spiralmate Round Duct Connector and "Ovalmate Flat Oval Duct Connector" or approved equals.

2.9.4.4 Substitution of sizes by cross section area or equivalent round formula must have written prior approval.

2.9.4.5 Ductwork assemblies shall be the type tested to 10" WG (min.) by UL 181.

2.9.4.6 Approved Duct Manufacturers:

Eastern Sheet Metal

Lindab, Inc

Semco

United McGill Corp.

Crown Products Company

Hamlin Sheet metal

2.9.4.7 Gauges (Single Wall Ductwork):

Round Duct

Diameter	Spiral	Fitting
3" - 18"	26 Ga.	26 Ga.
19" - 24"	26 Ga.	24 Ga.
25" - 42"	24 Ga.	22 Ga.
43" - 60"	22 Ga.	20 Ga.
61" – 66"	22 Ga.	18 Ga.
67" – 84"	20 Ga.	18 Ga.

Oval Duct

Major Axis	Spiral	Fitting
3" - 24"	24 Ga.	24 Ga.
25" - 26"	22 Ga.	24 Ga.
27" - 42"	22 Ga.	22 Ga.
43" - 48"	22 Ga.	20 Ga.
49" – 60"	20 Ga.	20 Ga.
61" – 70"	20 Ga.	18 Ga.
71" – 84"	18 Ga.	18 Ga.

2.9.4.8 Doublewall Ductwork

2.9.4.8.1 Double wall duct and fittings shall consist of a perforated inner liner, a 1 inch, 1.50 lb./ft³ (unless otherwise specified) layer of fiber glass insulation and a solid outer pressure shell. A retaining fabric shall be wrapped between the perforated inner duct and the fiber glass insulation.

2.9.4.8.2 All fitting ends from 5" to 24" O.D. shall have rolled edges for added strength and rigidity during installation and shipping.

2.9.4.8.3 Double wall to single wall transitions shall be provided where insulated duct connects to non-insulated, single wall duct. Transitions also act as insulation ends reducing the double wall outer shell diameter to the inner shell diameter.

2.9.4.8.4 Gauges (Double Wall Ductwork):

Round Duct

Diameter	Spiral	Fitting
3" - 18"	26 Ga.	26 Ga.
19" - 24"	26 Ga.	24 Ga.
25" - 42"	24 Ga.	22 Ga.
43" - 60"	22 Ga.	20 Ga.
61" – 66"	22 Ga.	18 Ga.
67" – 84"	20 Ga.	18 Ga.

Oval Duct

Diameter	Spiral	Fitting
3" - 22"	24 Ga.	20 Ga.
23" - 34"	22 Ga.	20 Ga.
35" - 46"	22 Ga.	18 Ga.
47" - 58"	20 Ga.	18 Ga.
59" – 60"	20 Ga.	16 Ga.
61" - 68"	20 Ga.	16 Ga.
69" – 84"	18 Ga.	16 Ga.

2.9.4.9 Duct Hangers - 8' 0" C/C max distance.

2.10. Flexible Duct:

2.10.1 Factory insulated on aluminum liner, UL listed Class 1 Air Duct, STD. 181 and NFPA Bulletin 90A, with F/S kraft metallized mylar vapor barrier jacket. Flamespread rating less than 25, and smoke developed 50 or less.

Publix SUPER MARKETS

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LAKELAND, FL 33811-3311

PUBLIX FACILITIES DESIGN DEPARTMENT

DAVID TAULBEE, [illegible]
ARCHITECT FL REG. [illegible]18

DAVID RUBIN
ARCHITECT [illegible]EG. [illegible]2557
[illegible] 11881
SC [illegible] 7477
AL REG. 6234
TN REG. 103497
NC REG. 12432
VA REG. 0401017097

JOHN W. KITCHENS, PE
CIVIL/STRUCTURAL FL REG. 45277
GA REG. 020251
SC REG. 16340
AL REG. 20382
TN REG. 101507

PAUL C. HARMAN, PE
STRUCTURAL FL REG. 51959
GA REG. 27740
SC REG. 21754
AL REG. 24905
TN REG. 107882
NC REG. 39673
VA REG. 0402055022

JOHN J. CARAMALIS, PE
MECHANICAL FL REG. 43889
GA REG. 021246
SC REG. 16521
AL REG. 20581
TN REG. 108507
VA REG. 0402055478

ANTHONY CLEMENTI, PE
MECHANICAL FL REG. 54781
GA REG. 31882
SC REG. 25591
AL REG. 28469
TN REG. 111382
NC REG. 039664
VA REG. 0402056137

RAYMOND J. SIRIANNI, PE
ELECTRICAL FL REG. 54085
GA REG. 025636
SC REG. 19743
AL REG. 23065
TN REG. 108038
NC REG. 039963
VA REG. 0402055379

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THE DESIGN INDICATED IN THESE CONSTRUCTION DOCUMENTS DOES; TO THE BEST OF MY KNOWLEDGE, INFORMATION, AND BELIEF; COMPLY WITH THE APPLICABLE MINIMUM BUILDING CODES

PLOT DATE:
August, 21 2018

No.	Description	Date

STORE NUMBER
1687
Tattersall Park

US 280 & Highway 19
Hoover
Shelby Co., AL

48.10
V0514-2018
SIENNA LITE
~~PROJECT MANUAL~~
V07262018

PM-8

of 9

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