SECTION 23 05 00 – COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: SUBMIT VALVES AND GAGES.

PART 2 PRODUCTS

2.1 PIPING

A. REFRIGERANT PIPING: COPPER TUBING, TYPE ACR HARD DRAWN, SILVER BRAZED.

2.2 PIPE HANGERS

A. ALL SERVICES: CLEVIS TYPE CONFORMING TO MSS TYPE 1.

B. UPPER ATTACHMENTS: COMPATIBLE WITH TYPE OF STRUCTURE BEING USED. [AT STEEL JOIST LOCATIONS ATTACH HANGERS TO TOP CHORD OF JOISTS.]

PART 3 EXECUTION

3.1 INSTALLATION

A. PROVIDE DIELECTRIC CONNECTIONS WHEREVER JOINTING DISSIMILAR METALS.

B. REAM PIPE AND TUBE ENDS. REMOVE BURRS. BEVEL PLAIN END FERROUS PIPE.

C. INSTALL GLOBE VALVES FOR SHUT OFF APPLICATIONS IN REFRIGERANT PIPING SYSTEMS.

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUBMITTALS

A. FINAL REPORT: REQUIRED

1.2 REPORT FORMS: AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE FORMS.

1.3 AIR HANDLING SYSTEMS: ADJUST FANS AND AIR DISTRIBUTION OUTLETS AND INLETS AIRFLOWS TO WITHIN PLUS OR MINUS 5 PERCENT OF DESIGN.

SECTION 23 07 00 - HVAC INSULATION

PART 1 GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: REQUIRED

B. SAMPLES: NOT REQUIRED

PART 2 PRODUCTS

2.1 PIPE INSULATION

A. GLASS FIBER: RIGID MOLDED, NONCOMBUSTIBLE WITH VAPOR BARRIER JACKET.

B. CELLULAR FOAM: FLEXIBLE, CELLULAR ELASTOMERIC, MOLDED OR SHEET.

C. PIPE INSULATION RATED FOR 0-1000 DEGREES F. WITH A "K" FACTOR OF 0.27 AT A MEAN TEMPERATURE OF 150 DEGREES F. REFER TO SCHEDULE FOR INSULATION REQUIRED THICKNESS.

D. INSULATION SHALL NOT CONTAIN ANY PBDE (POLYBROMINATED DIPHENL ETHERS) FLAME RETARDANTS.

E. JACKETS
1. PVC PLASTIC: ONE PIECE MOLDED TYPE FITTING COVERS AND SHEET MATERIAL, OFF-WHITE COLOR.
2. ALUMINUM JACKET: SHEET, [SMOOTH] [EMBOSSED] FINISH.

2.2 DUCTWORK INSULATION

A. FLEXIBLE GLASS FIBER: FLEXIBLE, NONCOMBUSTIBLE BLANKET WITH VAPOR BARRIER JACKET.

B. RIGID GLASS FIBER: RIGID, NONCOMBUSTIBLE BLANKET WITH VAPOR BARRIER JACKET.

C. JACKETS
1. ALUMINUM JACKET: SHEET, SMOOTH, OR EMBOSSED FINISH.

D. DUCT INSULATION "R" VALUES SHALL BE EQUAL TO OR GREATER THAN REQUIRED BY CODE.

E. INSULATION SHALL NOT CONTAIN ANY PBDE (POLYBROMINATED DIPHENL ETHERS) FLAME RETARDANTS.

PART 3 EXECUTION

3.1 INSTALLATION

A. PIPING INSULATION
1. PROVIDE COLD PIPES WITH VAPOR BARRIER JACKETS.
2. INSULATE COMPLETE SYSTEM.
3. FOR EXTERIOR APPLICATIONS, PROVIDE OUTDOOR, ALUMINUM, JACKET.

3.2 SCHEDULES

INSULATION

A. PIPING INSULATION	PIPE SIZE INCH	THICKNESS INCH
1. CONDENSATE PIPING FROM COOLING	ALL SIZES	0.5
2. REFRIGERANT SUCTION	ALL SIZES	0.5
3. REFRIGERANT HOT GAS	ALL SIZES	0.5

B. DUCTWORK INSULATION	INSULATION THICKNESS INCH
1. FLEXIBLE GLASS FIBER	
SUPPLY DUCTS	1.5
RETURN DUCTS	1.5
2. RIGID GLASS FIBER	
OUTSIDE AIR INTAKE DUCTS	1.5

SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 GENERAL

1.1 SYSTEM DESCRIPTION

A. DESIGN REQUIREMENTS: ELECTRIC SYSTEM INCLUDING CONTROL DEVICES, ACTUATORS, AND ELECTRIC ACCESSORIES.

1.2 SUBMITTALS

A. PRODUCT DATA: REQUIRED.

B. SHOP DRAWINGS: REQUIRED.

PART 2 PRODUCTS

2.1 CONTROL COMPONENTS

A. FURNISH MATERIALS AND EQUIPMENT OF STANDARD COMPONENTS, MANUFACTURED FOR USE IN CONTROL SYSTEMS AND NOT CUSTOM DESIGNED ESPECIALLY FOR THIS PROJECT. FURNISH COMPONENTS TESTED AND PROVEN IN ACTUAL USE.

B. FURNISH PRODUCTS TO ACCOMPLISH SEQUENCES OF OPERATION DESCRIBED IN PART 3.

C. CONTROL WIRING: WIRING IN ACCORDANCE WITH REQUIREMENTS OF DIVISION 26. MINIMUM WIRE SIZE TO BE 14 GAUGE.

PART 3 EXECUTION

3.1 INSTALLATION

A. AFTER COMPLETION OF INSTALLATION, TEST AND ADJUST CONTROL EQUIPMENT.

B. PROVIDE GUARDS ON THERMOSTATS IN ENTRANCES AND OTHER PUBLIC AREAS.

C. PROVIDE CONDUIT AND ELECTRICAL WIRING IN ACCORDANCE WITH APPROPRIATE REQUIREMENTS OF DIVISION 26.

3.2 SEQUENCES OF OPERATION

A. ROOFOTP PACKAGED UNIT (RTU-1)
1. WARM-UP CYCLE:
A. THE SUPPLY FAN IS, THROUGH THE DDC CONTROLLER AT THE OPTIMAL TIME AND RUN CONTINUOUSLY
B. THE OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED. THE RETURN AIR DAMPER IS FULLY OPEN
C. THE ELECTRIC HEATING SYSTEM IS OPERATIONAL AND HEATING BASED ON ZONE HEATING REQUIREMENTS
D. THE UNIT REFRIGERATION SYSTEM IS LOCKED OUT
E. WHEN OCCUPIED SPACE TEMPERATURE IS REACHED, UNIT IS INDEXED TO THE OCCUPIED CYCLE
2. COOL DOWN CYCLE
A. THE SUPPLY FAN IS, THROUGH THE DDC CONTROLLER, STARTED AT THE OPTIMAL TIME AND RUN CONTINUOUSLY
B. THE OUTSIDE AIR AND RELIEF AIR DAMPERS ARE CLOSED THE RETURN AIR DAMPER IS FULLY OPEN
C. THE UNIT REFRIGERATION SYSTEM IS ALLOWED TO OPERATE.
D. THE ELECTRIC HEATING SYSTEM IS OFF.
E. WHEN OCCUPIED SPACE TEMPERATURE IS REACHED, UNIT IS INDEXED TO THE OCCUPIED CYCLE.
3. OCCUPIED CYCLE
A. THE SUPPLY AIR FAN RUN CONTINUOUSLY
B. THE OUTSIDE AIR DAMPER IS OPEN TO ITS MINIMUM POSITION.
C. PROOF OF STATUS (FLOW) FOR EACH FAN IS PROVIDED BY MENS OF AN AIR DIFFERENTIAL PRESSURE SWITCH. PROVIDE AN ALARM MESSAGE, THROUGH THE DDC CONTORLLER, WHEN A MALFUNCTION OCCURS.
D. HEATING – UPON A CALL FOR HEATING FROM SPACE TEMPERATURE, AN ELECTRONIC SPACE TEMPERATURE, THROUGH THE DDC CONTROLLER, THE FIRST STAGE OF ELECTRIC HEAT SHALL BE ENERGIZED. THE UNIT REFRIGERATINO SYSTEM IS LOCKED OUT. ON A FURTHER DECREASE IN SPACE TEMPERATURE, THE SECOND STAGE OF HEATING SHALL BE INITIATED.
E. COOLING – UPON A CALL FOR COOLING FROM SAPCE TEMPERATURE, AN ELECTRONIC SPACE TEMPERATURE SENSOR, THROUGH THE DDC CONTROLLER, THE FIRST STAGE OF COOLING SHALL BE ENERGIZED, THE UNIT ELECTRIC HEATING SYSTEM IS LOCKED OUT. ON A FURTHER INCREASE IN SPACE TEMPERATURE, THE SECOND STAGE OF COOLING SHALL BE INITIATED.
4. UNOCCUPIED HEATING CYCLE:
A. THE SUPPLY FAN IS, THROUGH THE DDC CONTROLLER, STOPPED AT THE OPTIMAL TIME AND CYCLE TO MAINTAIN REDUCED SPACE TEMPERATURE
B. THE FIRST STAGE OF THE ELECTRIC HEAT IS INITIATED. THE SECOND STAGE OF HEATING SHALL AUTOMATICALLY BE INITIATEDD IF THE ROOMS TEMPERATURE SETTING IS NOT MET
C. THE UNIT REFRIGERATION SYSTEM IS OFF
D. OUTSIDE AIR AND RELIEF AIR DAMPERS ARE FULLY CLOSED. RETURN AIR DAMPERS ARE FULLY OPEN
5. UNOCCUPIED COOLING CYCLE
A. THE SUPPLY FAN, THROUGH THE DDC CONTORLLER, IS STOPPED AT THE OPTIMAL TIME AND CYCLE TO MAINTAIN REDUCED SAPCE TEMPERATURE
B. THE HEATING SYSTEM IS OFF.
C. THE UNIT REFRIGERATION SYSTEM IS ALLOWED TO OPERATE UPON FAN CYCLING
D. OUTSIDE AIR AND RELIEF AIR DAMPERS ARE FULLY CLOSED. RETURN AIR DAMPERS ARE FULLY OPEN.
6. OVERRIDE:
A. PROVIDE A MANUAL OVERRIDE SWTICH TO PERMIT RESTORATION OF THE OCCUPIED CYCLE FOR AA THREE HOUR TIME PERIOD (ADJUSTABLE) IN ORDER TFOR THE OVERRIDE SWITCH TO BE RESET FOR A SUCESSIVE TIME PERIOD. IT MUST FIRST TIME OUT FROM THE PREVIOUS PERIOD

B. SPLIT SYSTEM HEATING AND COOLING (AHU-1/CU-1, AHU-2/CU-2)
1. UNTI SHALL BE PROVIDED WITH 24V PROGRAMMABLE WALL THERMOSTAT, TO ENERGIZE THE FAN AND COMPRESSOR UPON A CALL FOR COOLING

PART 1 SECTION 23 09 00 – INSTRUMENTATION AND CONTROL FOR HVAC

PART 2 GENERAL

2.1 SUBMITTALS

A. PRODUCT DATA: REQUIRED.

B. SHOP DRAWINGS: NOT REQUIRED.

PART 3 PRODUCTS

3.1 DUCTWORK

A. MATERIALS
1. STEEL DUCTS: GALVANIZED STEEL SHEET, LOCK-FORMING QUALITY.
2. FLEXIBLE DUCTS: FABRIC SUPPORTED BY HELICALLY WOUND SPRING STEEL WIRE OR FLAT STEEL BANDS.

B. METAL DUCTWORK
1. FABRICATE AND SUPPORT IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
2. CONSTRUCT T'S, BENDS, AND ELBOWS WITH RADIUS OF 1-1/2 TIMES WIDTH OF DUCT ON CENTER LINE OR PROVIDE TURNING VANES.
3. INCREASE DUCT SIZES GRADUALLY, NOT EXCEEDING 30 DEGREES DIVERGENCE AND 45 DEGREES CONVERGENCE.

C. MANUFACTURED DUCTWORK AND FITTINGS
1. MANUFACTURE IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE. FURNISH DUCT MATERIAL, GAGES, REINFORCING, AND SEALING FOR OPERATING PRESSURES AS INDICATED ON DRAWINGS.

3.2 DUCT ACCESSORIES

A. VOLUME CONTROL DAMPERS
1. FABRICATION: SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
2. SINGLE BLADE DAMPERS: FABRICATE FOR DUCT SIZES TO 12 X 30 INCH.
3. QUADRANTS: PROVIDE LOCKING, INDICATING REGULATORS ON DAMPERS.

B. BACKDRAFT DAMPERS: FABRICATE MULTI-BLADE, PARALLEL-ACTION GRAVITY BALANCED BACKDRAFT DAMPERS OF GALVANIZED STEEL OR EXTRUDED ALUMINUM, WITH CENTER PIVOTED BLADES LINKED TOGETHER.

C. FLEXIBLE DUCT CONNECTIONS: UL LISTED FIRE-RETARDANT NEOPRENE COATED WOVEN GLASS FIBER FABRIC TO NFPA 90A, APPROXIMATELY 3 INCHES WIDE, CRIMPED INTO METAL EDGING STRIP.

D. DUCT ACCESS DOORS
1. FABRICATE IN ACCORDANCE WITH SMACNA HVAC DUCT CONSTRUCTION STANDARDS - METAL AND FLEXIBLE.
2. ACCESS DOORS WITH SHEET METAL SCREW FASTENERS ARE NOT ACCEPTABLE.

3.3 GRILLES, REGISTERS, AND DIFFUSERS

A. MANUFACTURER: PRICE OR SIMILAR BY ANEMOSTAT, TITUS, OR NAILOR-HART.

B. GENERAL: GRILLE, REGISTER, AND DIFFUSER INFORMATION MARK, MODEL NUMBER, TYPE, SIZE, FINISH, AND ACCESSORY ITEMS ARE INDICATED IN SCHEDULE. LOCATIONS, TYPE, CFM, AND DIRECTIONS OF THROW (WHERE APPLICABLE) ARE INDICATED ON DRAWINGS.

C. DEFINITIONS: TERMS USED FOR GRILLES, REGISTERS, AND DIFFUSERS ARE AS FOLLOWS:
1. GRILLES: SAME STYLE AS REGISTERS BUT WITHOUT DAMPER.
2. REGISTERS: ITEMS LABELED AS REGISTERS ARE TO BE FURNISHED WITH OPPOSED BLADE DAMPERS.

D. FINISH: FURNISH GRILLES, REGISTERS AND DIFFUSERS WITH FACTORY APPLIED OFF-WHITE FINISH UNLESS NOTED OTHERWISE.

3.4 CENTRIFUGAL CEILING FANS

A. CENTRIFUGAL FAN UNIT: DIRECT DRIVE WITH GALVANIZED STEEL HOUSING LINED WITH 1/2 INCH ACOUSTIC INSULATION], TOTALLY ENCLOSED FAN COOLED TYPE MOTOR WITH LUBRICATED SEALED BEARINGS, MOTOR MOUNTED ON RUBBER-IN-SHEAR ISOLATORS, OUTLET DUCT COLLAR, GRAVITY BACKDRAFT DAMPER IN DISCHARGE.

B. DISCONNECT SWITCH.

C. MANUFACTURER: LOREN COOK OR SIMILAR BY GREENHECK, ACME, OR TWIN CITY FAN.

PART 4 EXECUTION

4.1 INSTALLATION

A. INSTALL BACKDRAFT DAMPERS ON DISCHARGE OF EXHAUST FANS.

B. CONNECT DIFFUSERS OR TROFFER BOOTS TO LOW PRESSURE DUCTS WITH 5 FEET MAXIMUM LENGTH OF FLEXIBLE DUCT.

C. INSTALL FLEXIBLE CONNECTIONS IMMEDIATELY ADJACENT TO EQUIPMENT IN DUCTS ASSOCIATED WITH FANS AND MOTORIZED EQUIPMENT.

D. INSTALL DUCT ACCESS DOORS FOR INSPECTION AND CLEANING BEFORE AND AFTER FILTERS, COILS, FANS, AUTOMATIC DAMPERS, AND AT FIRE DAMPERS.

E. CHECK LOCATION OF AIR OUTLETS AND INLETS AND MAKE NECESSARY ADJUSTMENTS IN POSITION TO CONFORM WITH ARCHITECTURAL FEATURES, SYMMETRY, AND LIGHTING ARRANGEMENT.

F. PROVIDE BALANCING DAMPERS ON DUCT TAKE-OFF TO DIFFUSERS, AND GRILLES AND REGISTERS.

G. PAINT DUCTWORK VISIBLE BEHIND AIR OUTLETS AND INLETS MATTE BLACK.

SECTION 23 70 00 – HEATING, VENTILATING, AND AIR CONDITIONING EQUIPMENT

PART 1 GENERAL

1.1 SUBMITTALS

A. PRODUCT DATA: REQUIRED

B. SHOP DRAWINGS: REQUIRED

C. PROJECT RECORD DOCUMENTS: REQUIRED

PART 2 PRODUCTS

2.1 PACKAGED ROOFTOP AIR CONDITIONING UNITS

A. UNIT: SELF-CONTAINED, PACKAGED, FACTORY ASSEMBLED AND PREWIRED UNIT, CONSISTING OF CABINET AND FRAME, SUPPLY FAN, RETURN FAN, ELECTRIC HEATING ELEMENTS, CONTROLS, AIR FILTERS, REFRIGERANT COOLING COIL AND COMPRESSOR, CONDENSER COIL, AND CONDENSER FAN

B. CABINET ACCESS PANELS: QUICK FASTENERS, LOCKING DOOR HANDLE TYPE WITH PIANO HINGES.

C. AIR FILTERS: 2 INCH THICK GLASS FIBER DISPOSABLE MEDIA IN METAL FRAMES.

D. ROOF MOUNTING CURB: 14 INCHES HIGH GALVANIZED STEEL CHANNEL FRAME WITH GASKETS AND NAILER STRIPS.

E. ELECTRIC HEATING ELEMENTS: FINNED TUBE OR HELICAL NICKEL-CHROME RESISTANCE WIRE COIL WITH AUTOMATIC RESET THERMAL CUT-OUT, BUILT-IN CONTACTORS, CONTROL CIRCUIT TRANSFORMER AND FUSE, MANUAL RESET THERMAL CUT-OUT, AIRFLOW PROVING DEVICE, TOGGLE SWITCH, LOAD FUSES.

F. EVAPORATOR] [INDOOR] COIL: COPPER TUBE ALUMINUM FIN COIL ASSEMBLY WITH CAPILLARY TUBES OR THERMOSTATIC EXPANSION VALVES.

G. COMPRESSOR: HERMETIC OR SEMI-HERMETIC COMPRESSOR, 3600 RPM, RESILIENTLY MOUNTED WITH POSITIVE LUBRICATION, CRANKCASE HEATER, HIGH AND LOW PRESSURE SAFETY CONTROLS, MOTOR OVERLOAD PROTECTION, SUCTION AND DISCHARGE SERVICE VALVES AND GAGE PORTS.

H. CONDENSER OUTDOOR COIL: COPPER OR ALUMINUM TUBE ALUMINUM FIN COIL ASSEMBLY WITH COIL GUARD, DIRECT DRIVE PROPELLER FANS, FAN GUARD. PROVIDE OUTDOOR THERMOSTAT TO CYCLE FANS.

I. DAMPERS: PROVIDE OUTSIDE, RETURN, AND RELIEF DAMPERS WITH DAMPER OPERATOR AND CONTROL PACKAGE TO AUTOMATICALLY VARY OUTSIDE AIR QUANTITY. OUTSIDE AIR DAMPER FALLS TO CLOSED POSITION.

J. THERMOSTAT: ELECTRIC SOLID STATE MICROCOMPUTER BASED ROOM THERMOSTAT.

2.2 COMPUTER ROOM AIR CONDITIONING UNITS

A. UNITS: PACKAGED, AIR COOLED, FACTORY ASSEMBLED, PRE-WIRED AND PRE-PIPED UNIT, CONSISTING OF CABINET, FANS, FILTERS, CONTROLS, ASSEMBLED FOR DOWN-FLOW AIR DELIVERY, IN DRAW-THROUGH OR BLOW-THROUGH CONFIGURATION.

B. COMPRESSORS: TWO SEMI-HERMETIC WITH SUCTION GAS COOLED MOTORS, VIBRATION ISOLATORS, THERMAL OVERLOADS, OIL SIGHT GLASS, MANUAL RESET HIGH PRESSURE SWITCH, PUMP DOWN LOW PRESSURE SWITCH, SUCTION LINE STRAINER, REVERSIBLE OIL PUMPS, 1750 RPM.] [HERMETIC WITH RESILIENT SUSPENSION SYSTEM, OIL STRAINER, CRANKCASE SIGHT GLASS, INTERNAL MOTOR PROTECTION, LOW PRESSURE SWITCH, MANUAL RESET HIGH PRESSURE SWITCH.

C. EVAPORATOR COILS: [ALTERNATE ROW CIRCUITS, DIRECT EXPANSION COOLING COILS OF SEAMLESS COPPER TUBES EXPANDED INTO ALUMINUM FINS.

D. CONDENSERS
1. AIR COOLED: CORROSION RESISTANT CABINET, COPPER TUBE ALUMINUM FIN COILS ARRANGED FOR TWO CIRCUITS, MULTIPLE DIRECT DRIVE PROPELLER FANS WITH PERMANENTLY LUBRICATED BALL BEARING SINGLE PHASE MOTORS WITH INTERNAL OVERLOAD PROTECTION.

E. FILTERS: PLEATED, LOFTED, NON-WOVEN, REINFORCED COTTON FABRIC; SUPPORTED AND BONDED TO WELDED WIRE GRID; ENCLOSED IN CARDBOARD FRAME; 2 INCH NOMINAL THICKNESS, RATED 25-30 PERCENT DUST SPOT EFFICIENCY.

F. HEATING COILS: ENCLOSED FIN ELECTRICAL ELEMENTS ARRANGED FOR MINIMUM OF TWO] [THREE] STAGES, PRIMARY AND SECONDARY THERMAL CUTOUTS, DIFFERENTIAL AIR PRESSURE SWITCH, BRANCH CIRCUIT OVER CURRENT PROTECTION.

G. CONTROL CABINET: UL LISTED, WITH PIANO HINGED DOOR, GROUNDING LUG, COMBINATION MAGNETIC STARTERS WITH OVERLOAD RELAYS, CIRCUIT BREAKERS AND COVER INTERLOCK, AND FUSIBLE CONTROL CIRCUIT TRANSFORMER.

H. ELECTRONIC CONTROL SYSTEM: SOLID STATE WITH START BUTTON, STOP BUTTON, TEMPORARY LOSS OF POWER INDICATOR, MANUAL RESET CIRCUIT BREAKERS, TEMPERATURE CONTROL HUMIDITY CONTROL, AND MONITOR PANEL.

PART 3 EXECUTION

3.1 INSTALLATION

A. PROVIDE INITIAL START-UP AND SHUT-DOWN DURING FIRST YEAR OF OPERATION, INCLUDING ROUTINE SERVICING AND CHECK-OUT.

B. MOUNT ROOF MOUNTED UNITS ON FACTORY BUILT ROOF CURB.

C. PIPE DRAIN PAN CONDENSATE WITH "P" TRAP TO DISCHARGE TO SPLASH BLOCK.

D. COVER, SPLICE BOX, COIL, CASING, FACTORY MOUNTED DISCONNECT SWITCH, AND CONTROLS; EXPOSED HELICAL COIL OF NICKEL-CHROME RESISTANCE WIRE WITH REFRACTORY CERAMIC SUPPORT BUSHINGS.

E. CONTROL: REMOTELY MOUNTED SPACE THERMOSTAT.

tec inc. engineering & design
33851 Curtis Blvd., 216
Eastlake, OH 44095
t 440.953.8760
f 440.953.1289
www.tecinc1.com
cleveland | columbus

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DRAWN BY: DJH
CHECKED BY: JDM

LAKELAND TRANSFER STATION
LAKELAND COMMUNITY COLLEGE
7700 CLOCKTOWER DR., KIRTLAND, OH 44094

MECHANICAL SPECIFICATIONS

PROJECT NO.
18050002
DISCIPLINE
MECHANICAL
SHEET NAME
M-3
SHEET 48 OF 55