HVAC DESIGN CRITERIA
INDOOR TEMPERATURE: 75 DEG F COOLING; 73 HEATING
HUMIDITY CONTROL: THIS PROJECT HAS NO DIRECT CONTROL OF HUMIDITY

OUTDOOR DESIGN CONDITIONS (HOUSTON, TEXAS) PER ASHRAE 90.1–2007 TABLE 5.1.4): 96 DEG. F DB, 80 DEG. WB SUMMER; 28 DEG. DB WINTER. 1371 DEGREE DAYS HEATING; 7357 DEGREE DAYS COOLING; CLIMATE ZONE 2A

CODE INFORMATION:
APPLICABLE CODES INCLUDE BUT ARE NOT LIMITED TO:
CITY OF HOUSTON BLDG CODE: 2006 IBC, AMENDED
CITY OF HOUSTON MECHANICAL CODE: 2006 UMC, AMENDED
CITY OF HOUSTON ENERGY CODE: ASHRAE 90.1–2007 (WITH NO ASHRAE AMENDMENTS) PLUS CITY OF HOUSTON AMENDMENTS

OUTSIDE AIR REQUIREMENTS PER CITY HOUSTON MECH CODE TABLE 4–1

EXAM ROOM:	.08 CFM /SQ FT x 1366 sq.ft. =	109
CONFERENCE:	.20 CFM /SQ FT x 3201 sq.ft. =	640
BREAK ROOM:	.20 CFM /SQ FT x 841 sq.ft. =	188
CORRIDOR:	.05 CFM /SQ FT x 7340 sq.ft. =	367
OFFICES:	.08 CFM /SQ FT x 12831 sq.ft. =	1027
	TOTAL	= 2331

THE EXISTING 4800 CFM OF OUTSIDE AIR DELIVERED TO THE AREA IS SUFFICIENT.

ENERGY CODE PER ASHRAE / IES 90.1–2007– MANDATORY PROVISIONS
6.4 .1 ALL EQUIPMENT EFFICIENCIES SHALL MEET OR EXCEED THAT SHOWN IN TABLE 6.8.1 A THRU G
6.4.2 ENGINEER HAS PERFORMED HVAC LOAD CALCULATIONS FOR THIS PROJECT USING ELITE OR TRACE
6.4.3 CONTROLS
6.4.3.1 A DEAD BAND OF AT LEAST 5 DEGREE SHALL BE SET, WITHIN WHICH ENERGY IS REDUCED TO A MINIMUM.
6.4.3.2 HEAT SETPOINT CANNOT EXCEED COOLING SET POINT
6.4.3.3 AUTOMATIC SHUT DOWN AND SETBACK CONTROLS ARE PROVIDED. OPTIMUM START IS PROVIDED FOR SYSTEMS > 10000 CFM ZONE ISOLATION CONTROLS ARE PROVIDED.
6.4.3.4 ELEVATOR VENT SHAFT SHALL HAVE MOTORIZED DAMPER OUTSIDE AIR AND EXHAUST HOODS AND VENT SHALL HAVE MOTORIZED DAMPER, OUTSIDE AND EXH SYSTEM SHALL SHUT WHEN NOT IN USE. DAMPERS SHALL MEET STIPULATED LEAKAGE RATES. FAN GREATER THAN .75 HP SHALL HAVE AUTOMATIC CONTROLS
6.4.4 INSULATION
6.4.4.1 PIPE AND DUCT INSULATION SHALL MEET TABLE 6.4.4.1.1
6.4.4.2 DUCT AND PLENUM LEAKAGE
6.4.4.2.1 DUCTS SHALL BE SEALED
6.4.4.2.2 DUCT LEAKAGE TESTS SHALL BE SPECIFIED WHEN APPLICABLE

ENERGY CODE PER ASHRAE / IES 90.1–2007– PRESCRIPTIVE METHOD PROVISIONS
6.5.1.1 AIR SIDE ECONOMIZERS ARE NOT REQUIRED IN HOUSTON. WHEN SPECIFIED ECONOMIZERS AND CONTROLS SHALL MEET SECTION 6.5.1.1
6.5.1.1 WATER SIDE ECONOMIZERS ARE NOT USED ON THIS PROJECT.
6.5.2 SIMULTANEOUS HEATING AND COOLING IS NOT USED ON THIS PROJECT, WITH THESE EXCEPTIONS:
6.5.2.3 DEHUMIDIFICATION: IN HOUSTON, REHEAT IS ALLOWED FOR PURPOSES OF HUMIDITY CONTROL

HVAC SPECIFICATIONS

23 05 00 BASIC MECHANICAL REQUIREMENTS
Demolition: Remove ducts/pipe to above ceiling or below floor. Resupport any remaining duct/pipe that was supported by demolition walls. Damage to existing materials/equipment will be repaired at no additional cost. Give demolished equipment to Owner, dispose of if Owner does not want. Refrigerants become the property of the Contractor and shall be removed per EPA regulations and ARI Std 770.
Warranty: Guarantee labor and materials for 1 year. Warranties begin upon Owner's acceptance of substantial completion of the installation.
Shop drawings: Submit complete information on all equipment, air devices, valves, duct accessories and controls. Submit complete ductwork and piping shop drawings, based on approved equipment and field observation of building conditions. Submit detailed layout of mechanical rooms and yards. Incomplete submittals will be returned to the contractor unreviewed. No time extensions or cost increases will be allowed for delays caused by return of incomplete submittals.
Operations and maintenance instructions: Provide 3 copies of operation and maintenance manuals to Owner. Provide within 90 days after the date of system acceptance. These manuals shall be in accordance with industry–accepted standard such as ASHRAE Guideline 1 and shall include, at a minimum, the following: (a) Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance. (b) Operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified. (c) Names and addresses of at least one service agency. (d) HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field–determined setpoints shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments. (e) A complete narrative of how each system is intended to operate, including suggested setpoints. Provide instruction on system operation to Owner's representatives.
Record drawings: Within 90 days after the date of system acceptance, provide record drawings in AutoCAD 2004 or higher, plus full size hard copy. Electronic backgrounds may be available from Engineer for a fee. Record drawings shall include as a minimum the installed location and performance data on each piece of equipment, air devices, control sensors, control panels, general configuration of duct and pipe distribution system including sizes, and the terminal air or water design flow rates.
Coordination: Provide Electrical Contractor with electrical requirements of approved equipment in sufficient time to order panel boards, disconnects, etc.
Access doors: Provide Milcor or equal as required for access to all valves, filters, controls, dampers or other devices requiring attention. Doors shall match wall or ceiling rating. Architect must approve location and appearance of all access doors. Access panels for fire or smoke dampers shall be openable without the use of tools.
Sleeves: Provide metal sleeves where pipes or control wiring penetrate walls
Overflow drain pans: Provide under all furred in units. Pans to be minimum 24 gauge galvanized sheet steel; minimum 1–1/2" deep and not less than 3" larger than unit or coil dimensions. Provide separate 3/4" drain from pan to conspicuous location; provide escutcheon plates at ceiling penetrations. When allowed by local authority, may provide float switch in overflow pan instead of discharge piping; float switch shall shut unit off if water is detected. Pans equipped with float switch shall have screw cap nipple on bottom or side of pan to allow water to be drained from pan.

23 05 29 HANGERS AND SUPPORTS FOR HVAC DUCTWORK, PIPING & EQUIPMENT
Pipe, duct and equipment hangers and supports shall be per the local code. Support piping at a minimum every 10' or less for 1" and larger pipe, every 6' on 3/4" or smaller. With copper pipe use copper hangers or tape at contact point.

Support flex ducts per manufacturer's installation instructions (provide instructions for inspector review). Alternate acceptable flex duct support (in City of Houston) is 26 gage, 1.5 inch wide galvanized iron straps on 4 ft maximum spacing.

23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC
Balance shall be by an employee of the balance contractor that is qualified to perform the task.

Balance according with NEBB Procedural Standards –1999 Procedural Standards for Building Systems, or AABC 2002 Associated Air Balance Council Test and Balance Procedures.

Adjust system to achieve air quantities shown, then adjust volumes to provide constant temperature (±2 deg F) throughout the zone. Adjust fan sheaves. Calibrate all thermostats. Mark setpoints on all dampers and valves. Return to project at 1 and 3 month intervals after completion to make balance adjustments in response to Owner's perceived comfort.

Re–balance will be required for the unit serving the project area.

Existing AHU–2 (PH–1) was originally balanced for a total of 14,000 CFM. This unit must be capable of delivering this amount of air flow. The project area will require the following total CFM to serve the revised project area.

A comfort balance will be required for all spaces served to achieve constant temperature (±2 deg F).

Submit report (NEBB or AABC format). Include:
General data: Nameplate data on all equipment. Outside air temp; cfm each supply, exhaust and return grille and actual room temperatures and humidities vs. setpoints
Fans: Volume and static pressure; fan rpm and amps

Ductwork designed to operate at static pressures in excess of 3 in. w.c. shall be leak tested according to SMACNA Duct Leakage Test Procedures– 1985 <<803.3.6 of the IECC>> Representative sections totaling no less than 25% of the total installed duct area for the designated pressure class shall be tested. The maximum permitted duct leakage shall be no more than 1% of the total airflow in the section tested.

Air systems shall be balanced in a manner to first minimize throttling losses. Then, for fans with fan system power greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

HVAC control systems shall be tested to ensure that control elements are calibrated, adjusted, and in proper working condition. Submit test documentation. (All existing controls shall be utilized as is and only used for controlling the units during re–balancing.)

No adjustment to existing air handlers and fans serving the area are allowed without Owner's express knowledge and consent.

23 07 03 DUCTWORK INSULATION
Flame spread less than 25, smoke developed less than 50 as per ASTM E84, NFPA 255, UL273.
Minimum required installed R values for non–residential projects (excluding film resistance) are:
1. On roof or elsewhere on bldg exterior: Supply R8; Return R8; Exhaust or relief–none req'd; Conditioned outside air R8
2. Within the conditioned space: Supply R5.6; Return –none req'd; Exhaust or relief: none req'd; Conditioned outside air R5.6
3. In return air plenums (but inside bldg insulation envelope): Supply R5.6; Return –none req'd; Exhaust or relief: none req'd; Conditioned outside air R5.6
4. In shafts, plenums or furrdowns not used for return air (but inside bldg insulation envelope): Supply R5.6; Return –R5.6; Exhaust or relief: R5.6; Conditioned outside air R5.6

External duct wrap: foil face rigid or flexible fiberglass with vapor retarder. R value stenciled on outside. ASTM A96 Water Vapor Permeance: 0.5 perms maximum. Mold Growth per ASTM C1338– No Growth. GREENGUARD Environmental Institute Certified. Vapor Retarder Jacket conforming to ASTM C 1136 Type II: Foil Scrim Kraft (FSK), or White polypropylene – scrim –kraft (PSK). 2" Staple flange on longitudinal seam. Adhere to duct with vapor barrier type adhesive. Overlap all joints. Cover all joints or breaks with glass fab imbedded in vapor barrier mastic.

23 09 23 DIRECT DIGITAL CONTROLS FOR HVAC
The building currently has a direct digital building automation system that controls the basic building HVAC control functions. Contractor shall provide and install all required control devices to allow the new equipment to be integrated into operational sequences.

To accommodate the addition of the VAV dampers into the current constant volume systems, a new Variable frequency drive will be added to two large constant volume units that were installed as part of the original Phase I building. The new VFD will allow the unit fans to be ramped up or down to maintain a designated pressure in the supply ductwork. The VFD's will be sized as follows:
AHU–1 (PH–I) 10 HP
AHU–2 (PH–1) 15 HP
The original unit thermostat will be relocated to a new area to continue to sense the general temperature within the revised project area. The contractor shall coordinate the placement of the unit thermostat with the owner.

The new VAV dampers will be installed in the designated areas to serve the requirements of the revised project areas. Each damper will have its own dedicated controller and a wireless zone thermostat to control the damper position based on current space temperature. During the balance operation, the zone will be balanced to a comfort condition. When the main unit is in the cooling mode, if zone temperature is too cold, a rise in the space temperature will reduce the air flow to meet space setpoint. When the main unit is in the heating mode, if zone temperature is too hot, the air flow will reduce to meet space setpoint.

The current zone thermostats for the existing air handling units shall be relocated by the contractor as directed by owner.

23 09 93 SEQUENCES OF OPERATION
ALL SYSTEMS
a. For systems > 2200 cfm, Division 28 smoke detector in supply or return air shuts unit down upon presence of product of combustion. Detectors located in return must be located prior to dilution by outside air.
b. Dead Bands: Where used to control both heating and cooling, automatic changeover zone thermostatic controls shall be capable of providing a temperature range or dead band of at least 5F within which the supply of heating and cooling energy to the zone is shut off or reduced to a minimum. Exceptions: Special applications where wide temperature ranges are not acceptable (retirement homes, data processing, museums, some areas of hospitals) and are approved by the authority having jurisdiction.
c. Automatic Shutdown. Each HVAC system shall have controls that can start and stop the system under different time schedules for seven different daytypes per week, are capable of retaining programming and time setting during loss of power for a period of at least 10 hours, and include an accessible manual override, or equivalent function, that allows temporary operation of the system for up to two hours.
d. Setback Controls. Heating systems have the capability to automatically restart and temporarily operate the system to maintain zone temperatures above a heating setpoint adjustable down to 55F or lower. Cooling systems shall have the capability to automatically restart and temporarily operate the system as required to maintain zone temperatures below a cooling setpoint adjustable up to 85F or higher or to prevent high space humidity levels.
e. Optimum Start Controls. Individual heating and cooling air distribution systems with a total design supply air capacity exceeding 10,000 cfm, served by one or more supply fans, shall have optimum start controls. The control algorithm shall, as a minimum, be a function of the difference between space temperature and occupied setpoint and the amount of time prior to scheduled occupancy.

2. SINGLE ZONE CONSTANT VOLUME A/C PACKAGED OR SPLIT SYSTEM:
a. Programmable thermostat controls system off/on cycles; multiple cycles per day. When system is on, fan runs continuously.
b. Zone thermostat cycles compressor(s), then stages heater to maintain zone thermostat set point.

3. VAV AIR HANDLER
a. These units consist of a fan section and cooling coil to serve the variable volume box and terminal units. A duct static pressure sensor shall control the fan speed. Static pressure set point shall be reset to the lowest datum that satisfies all boxes. At each decision interval (e.g., 5 min), the following logic can be applied:
1. Check the controller outputs for all VAV boxes and determine time–averaged values over the last decision interval.
2. If any of the controller outputs are greater than a threshold value (e.g., 95%), then increase the static pressure set point by a fixed value(e.g., 5% of the design range) and go to step 4. Otherwise, go to Step 3.
3. If all of the controller outputs are greater than a threshold value (e.g., 85%), then decrease the static pressure set point by a fixed value (e.g., 5% of the design range) and go to step 4. Otherwise, do not change the setpoint.
4. Limit the set point between upper and lower limits based on upper and lower flow limits and the duct design.
b. The duct temperature sensor mounted in the unit discharge shall maintain 55° F discharge air temperature (adjustable) in the cooling mode. When outside temperature drops below 60F, unit shall switch to heating mode and the heaters shall be energized.
c. Outside air damper is full open when unit is active; closed when unit is inactive. Damper and operator shall be capable of full modulation (to allow future addition of demand control ventilation)

4. VAV BOXES (Heating and Cooling): Each of these units shall be controlled by a factory–mounted unitary controller. Room temperature sensor shall modulate the variable volume damper based on whether the AHU is in heating or cooling mode. As the space temperature approaches setpoint, the volume shall proportionately reduced to a minimum cfm (operator adjustable) through the action of the digital controller. (Minimum set points have been set at approximately 50% of the maximum airflow to insure that there is adequate air flow in the conditioned space to meet occupancy requirements.)

23 31 00 HVAC DUCTS
Do not fabricate duct from these drawings, confirm all dimensions and available space in field. Dimensions given on drawings are inside free area, sheet metal is larger on lined duct. Branch takeoffs to have 45 degree entry fitting with volume damper. Elbows to be radius type with minimum centerline radius 1.5 times width or mitered elbows with single thickness turning vanes.

Sheet metal: Use galvanized sheetmetal, conforming to current SMACNA for construction, reinforcing, support and other aspects.
PRESSURE CLASS:
Supply from single zone units: +1"
Supply upstream of VAV boxes: + 2".
Supply downstream of VAV boxes: +1".
Exhaust: –1" upstream of fan, 1" downstream

DUCT SEALING:
Definitions (per ASHRAE 2008 TABLE 18–1) :
Seal Level A: All transverse joints and longitudinal seams, and all duct wall penetrations
Seal Level B: All transverse joints and longitudinal seams
Round or flat oval spiral seams need not be sealed
Transverse joints include connections (including but not limited to spin–ins, taps, branches, access door frames, duct connections to equipment)
Duct wall penetrations include but are not limited to screws, pipe, tubes, rods, wires & non self–sealing fasteners

Supply and outside air ducts, all locations: Seal Level A.
Return or exhaust ducts, outdoors: Seal Level A; all other locations: Seal Level B
Seal all metal ducts using Hardcast or equal mastic plus fiberglas scrim). Do not use oil or solvent base sealants inside bldgs. Tape sealants are not allowed

Externally insulated ducts shall be sealed before being insulated. Sealants of exterior ducts shall form a water and air–tight seal, bond to the metal involved, remain flexible with metal movement and have a service temperature range of –30 to 175 F. If exposed to direct sunlight, sealant shall be UV and ozone resistant.

DUCT LINER / INSULATION SCHEDULE:
Rectangular supply: Unlined, externally insulated, except that 25 ft closest to fan or air units shall be internally lined
Round supply: Unlined, externally insulated
Exhaust– No liner, no insulation; except that exhaust ducts in non–conditioned attics shall be externally insulated
Outside air– Unlined, externally insulated, except that 15 ft closest to a fan shall be internally lined

Liner (when specified in duct description above): Schuller Permacote Linacoustic; Certainteed Tough Gard or equal, 1.5 pcf density, coated fiberglas conforming to ASTM C1071; coating to be cleanable and shall prevent microbial growth per ASTM C21, C22. Attached with adhesive (90% coverage) and stick clips. Meet minimum noise reduction std of ASTMC1071. Leading edges and transverse joints to be sealed.

Liner R values shall meet duct insulation values spec'd in section 15290. In addition to meeting R values, the following minimum thicknesses shall be maintained for acoustic reasons: Supply duct: 1". Return ducts: 1/2" except that within 15 feet of fan or air unit use 1". Return air sound traps: 1"

Flex duct
Shall not exceed 8 ft in length nor to be bent more than 90 deg. Flex duct to be externally insulated, UL listed, class 1. Flex duct is same size as diffuser neck.

23 33 00 DUCTWORK ACCESSORIES
Provide manual balancing dampers in all supply and exhaust branches. Provide manual balancing dampers in outside air and return ducts to each air unit. Provide manual balancing damper at each location motorized duct damper location.

VOLUME CONTROL DAMPERS: per SMACNA HVAC Duct Construction Standards – Metal and Flexible. Single blade dampers for duct sizes up to 6 x 30 inch. Multi–Blade Damper: opposed blade pattern. Assemble center and edge crimped blades in prime coated or galvanized frame channel with suitable hardware. Except in round ductwork 12 inches and smaller, furnish end bearings. Furnish closed end bearings on ducts having pressure classification over 2 inches wg.

Outdoor air, supply and exhaust air dampers shall have a maximum leakage rate of 0.3 cfm per square foot.

Splitter Dampers: Material: Same gage as duct to 24 inches size in both dimensions, and two gages heavier for sizes over 24 inches. Blade: sheet metal streamline shape, secured with continuous hinge or rod. Operator: Min. 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

Furnish locking, indicating quadrant regulators on single and multi–blade dampers. On insulated ducts mount quadrant regulators on standoff mounting brackets, bases, or adapters to allow full insulation thickness. Where rod lengths exceed 30 inches furnish regulator at both ends.

All balance damper operators shall be accessible via access panel, lay–in ceiling or remote cable operator. All motorized damper operators shall be accessible and shall not block the air stream.

BACKDRAFT DAMPERS: Parallel–action, gravity–balanced, galv. 16 gage thick steel or extruded aluminum blades with felt or flexible vinyl sealed edges. Blades linked together in rattle–free manner with 90–degree stop, steel ball bearings, and plated steel pivot pin. Adjustment device to permit setting for varying differential static pressure.

DUCT ACCESS DOORS: per SMACNA, rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish same insulating value as adjacent duct, plus sheet metal cover. Less than 12 inches sq., secure with sash locks. Up to 18 inches sq.: two hinges and two sash locks. Up to 24 x 48 inches: Three hinges and two compression latches. Access panels with sheet metal screw fasteners or requiring use of tools are not acceptable. Stencil or label fire and smoke damper access doors per local requirements

FLEXIBLE DUCT CONNECTIONS: per SMACNA. Fabric crimped into 24 gage galvanized metal edging strip. Fabric: Approx. 3 inches wide. UL listed fire–retardant neoprene coated woven glass fiber fabric conforming to NFPA 90A.

DUCT TEST HOLES: air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

23 36 00 AIR TERMINAL UNITS –VAV BOXES)
A. Carrier, Kreuger, Price, Tempmaster, Titus, Trane or York.
B. Ceiling mounted variable air volume or fan powered as noted.
C. Identification label and airflow indicator. Include unit nominal airflow, maximum factory set airflow, min factory set airflow, coil data.
D. Casings: Minimum 24 gage galvanize steel. Maximum unit depth is 14" for VAV boxes; 16" for fan powered boxes up through size 14; 18" for size 14 fan powered box
E. Lining: neoprene or vinyl coated fibrous glass insulation, 1.5 lb/cu ft density, meeting NFPA 90A and UL 181. Coat raw edges. Line attenuator sections with 2–inch thick insulation.
F. S and drive connections for inlet and outlet duct attachment.
G. Access panels for all devices requiring adjustment or maintenance
H. Max Casing Leakage: 2 percent of design air flow at 3" inlet static pressure.
I. VOLUME DAMPER –Factory calibrated damper and shaft extension for connection to externally mounted control actuator (normally closed damper). Damper leakage shall not exceed 1% of maximum cfm at 3" static pressure
J. CONTROLS– DDC damper operator, maximum volume controller; pressure independent proportional variable air volume control, compensating for varying inlet static pressure, with minimum and maximum limits set at reset device, mounted in control box.

AIR COOLED CONDENSING UNITS: UL or CSA listed and ARI certified. Copper tube, aluminium fin coils. Crankcase heaters and overload protection, time delay relay, filter drier, sight glass, antishort cycle, dual compressors for units > 10 tons.

VARIABLE FREQUENCY DRIVES (provided by Mechanical contractor)
ABB ACH550, DANFOSS VLT6000, YASKAWA, TOSHIBA Q7
FLOWSAVER. Variable Frequency Drive mounted in a NEMA 1 enclosure with all of the below feature mounted and wired. LCD display keypad control, min. 3% input line reactor or 3% dc link reactor (harmonics meeting IEEE 519–1993), RFI/EMI Filters, adjustable acceleration and deceleration, auto restart with speed search, .95 true harmonic power factor correction, compatible with 4–20 ma or 0–10 vdc signal, electronic motor overload with phase to phase short circuit protection, ground fault protection, LCD display and keypad to include manual speed control with HOA operation, contact closure for remote alarm indication and run indication. Controls interface shall be BACnet, MODBUS, LON as dictated by control contractor
By–pass is not required.

REFRIGERANT PIPING CLEANING REQUIREMENTS (provided by Mechanical contractor)
The contractor shall be required to thoroughly clean the existing refrigerant piping run across the ceiling and the existing DX coils located in existing AHU–2 prior to the new condensing unit, which will be charged with R–410A refrigerant. Summit Refrigerants, a Houston area refrigerant reclaim company, has looked at the project and has been determined acceptable to complete the cleaning process. The contact information for Summit is:
Summit Refrigerant
3537 FM–1960 East, Suite A
Humble, TX 77338
Contact: Jeff Carver
281–540–COLD (2653) / 866–971–COLD
Fax # 281–540–0385
An allowance of $3,000 shall be included in the contractors bid to cover the cost of the cleaning sub–contractors work.
If contractors wishes to use a different cleaning company, they must be approved by the owner before the cleaning process can begin.
To prepare for the cleaning operation, the contractor must provide and install new 3/4" fittings and ball valves in the existing refrigerant lines and remove the cores from the existing expansion valves to provide a connection point for the cleaning contractor.

#	REVISION DESCRIPTION	DATE
1	ISSUE FOR CONSTRUCTION	12-14-2011

CONDENSER REPLACEMENT
SOUTHEAST COMMUNITY SERVICE CENTER
5801 LONG DRIVE, HOUSTON, TEXAS 77087

REDDING LINDEN BURR
CONSULTING ENGINEERS
801 TRAVIS, SUITE 2000
HOUSTON, TEXAS 77002
PH: 713.237.9800
FAX: 713.237.9801
TEXAS REGISTERED ENGINEERING FIRM F- 3113

STATE OF TEXAS
STEPHEN M. REDDING
39171
REGISTERED
PROFESSIONAL ENGINEER
12/14/11

PROJECT NUMBER
11398.00
DRAWN BY
RCR
CHECKED BY
SMR
SHEET DATE
12-14-2011
MECH SPECIFICATIONS
M-8.0

File Name: M:\MHMRA\11398.00 Long Rd. Condenser Replacement\Mech\LONG RD CONDENSER REPLAC–M8.0– SPEC–FINAL.DWG
User: rogers
Date/Time: Dec 14, 2011 – 12:58pm Xref File(s):