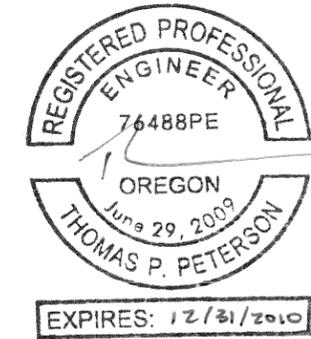


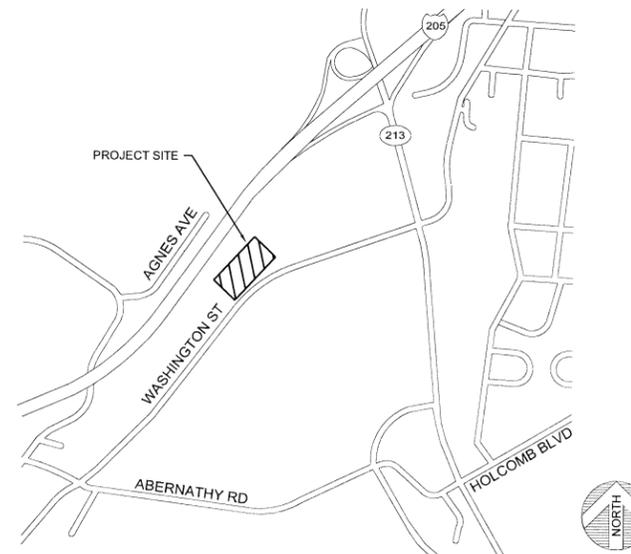
METRO SOUTH STATION

2001 Washington Street
Oregon City, OR 97045

HOUSEHOLD HAZARDOUS WASTE HVAC UPGRADE



DRAWING NAME	DESCRIPTION	REV	DATE
G-001	GENERAL TITLE SHEET & DRAWING INDEX	0	03/01/10
M-001	MECHANICAL LEGEND, ABBREVIATIONS & GENERAL NOTES	0	03/01/10
M-002	MECHANICAL SPECIFICATIONS	0	03/01/10
M-101	MECHANICAL FIRST FLOOR DEMOLITION PLAN	0	03/01/10
M-102	MECHANICAL ROOF DEMOLITION PLAN	0	03/01/10
M-103	MECHANICAL FIRST FLOOR PLAN	0	03/01/10
M-104	MECHANICAL ROOF PLAN	0	03/01/10
M-501	MECHANICAL DETAILS	0	03/01/10
M-601	MECHANICAL AIRFLOW SCHEMATIC	0	03/01/10
M-602	MECHANICAL SCHEDULES	0	03/01/10
E-001	ELECTRICAL LEGEND, ABBREVIATIONS & GENERAL NOTES	0	03/01/10
E-002	ELECTRICAL SPECIFICATIONS	0	03/01/10
E-003	ELECTRICAL SPECIFICATIONS	0	03/01/10
E-101	ELECTRICAL ROOF DEMOLITION PLAN	0	03/01/10
E-102	ELECTRICAL FIRST FLOOR PLAN	0	03/01/10
E-103	ELECTRICAL ROOF PLAN	0	03/01/10
E-501	ELECTRICAL CONTROL DIAGRAMS	0	03/01/10
E-502	ELECTRICAL DETAILS TERMINAL INSTALL	0	03/01/10
E-503	ELECTRICAL DETAILS EXHAUST ALARM PANEL	1	03/01/10
E-504	ELECTRICAL PANEL FIELD WIRING	1	03/01/10
E-505	ELECTRICAL DETAILS TERMINAL DEMO	1	03/01/10
E-601	ELECTRICAL PANEL SCHEDULES	0	03/01/10



PROJECT TITLE:
METRO SOUTH HHW HVAC UPGRADE

CLIENT:
METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

PROJECT TITLE:
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REV	DESCRIPTION	DATE	APPR
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Drawn By: B. YOSHIMORI

Sheet Title:
GENERAL
TITLE SHEET
AND DRAWING
INDEX

Sheet Number:
G-001

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ABBREVIATIONS

ABV	ABOVE
AC	ACTIVATED CARBON FILTER OR ALTERNATING CURRENT
ACC	AIR COOLED CHILLER
ACFM	ACTUAL CUBIC FEET/MINUTE
ACU	AIR CONDITIONING UNIT
AD	ACCESS DOOR
AFD	ADJUSTABLE FREQUENCY DRIVE
AFF	ABOVE FINISHED FLOOR
AH	AIR HANDLER, GENERAL
AHU	AIR HANDLING UNIT
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
AMP	AMPERE (AMP,AMPS)
ARF	ABOVE RAISED FLOOR
BDD	BACK DRAFT DAMPER
BF	BUTTERFLY VALVE
BHP	BRAKE HORSEPOWER
BLO	BLOWER
BLR	BOILER
BOD	BOTTOM OF DUCT
BOP	BOTTOM OF PIPE
BOT	BOTTOM OF TRAY
BOTT	BOTTOM
BOM	BILL OF MATERIAL
BTU	BRITISH THERMAL UNIT
C	CENTIGRADE OR COMPRESSOR
CA	COMPRESSED AIR
CC	COOLING COIL
CD	CEILING DIFFUSER
CFM	CUBIC FEET PER MINUTE
CH	CHILLER
CKT	CIRCUIT
CLP	COIL PUMP
CO	CLEANOUT
CONN	CONNECTION
CPLG	COUPLING
CRU	CONDENSATE RETURN UNIT
CSST	CORRUGATED STAINLESS STEEL TUBING
CT	COOLING TOWER
CTG	CLEANOUT TO GRADE
CU	CONDENSATE UNIT
CV	CONSTANT VOLUME TERMINAL UNIT
CVR	CONSTANT VOLUME REHEAT TERMINAL UNIT
dB	DECIBEL
DB	DRY BULB
DBT	DRY BULB TEMPERATURE
DC	DIRECT CURRENT
DDC	DIRECT DIGITAL CONTROL
DEWS	DE WATER SUPPLY
DN	DOWN
DEH	DEHUMIDIFIER
DER	DEAERATOR
DF	DRINKING FOUNTAIN
DIA	DIAMETER
(E)	EXISTING
EA	EACH
EA	EXHAUST AIR
EF	EXHAUST FAN
EFF	EFFICIENCY
ELEV	ELEVATION
EPO	EMERGENCY POWER OFF
ET	EXPANSION TANK
EWC	ELECTRIC WATER COOLER
EXH	EXHAUST, GENERAL
(F)	FUTURE
F	FAHRENHEIT
FC	FAN COIL UNIT
FCO	FLOOR CLEANOUT
FD	FLOOR DRAIN
FF	FINISHED FLOOR
FFE	FINISHED FLOOR ELEV
FL	CARTRIDGE OR BAG FILTER
FLT	FILTER
FN	FAN
FP	FAN POWERED TERMINAL UNIT
FFM	FEET PER MINUTE
FPS	FEET PER SECOND
FT	FOOT OR FEET
GA	GAGE OR GAUGE, OR GENERAL AIR
GAL	GALLONS
GCO	GRADE CLEANOUT
GCR	GLYCOL RETURN
GCS	GLYCOL SUPPLY
GEN	GENERATOR
GD	GROUND DIFFUSER
GPH	GALLONS PER HOUR
GPM	GALLONS PER MINUTE
HC	HEATING COIL
HD	HEAD
HE	HEAT EXHAUST
HG	MERCURY
HOR	HORIZONTAL
HP	HORSEPOWER
HR	HOUR(S)
HU	HUMIDIFIER
HX	HEAT EXCHANGER
HYD	HYDRAULIC
HZ	HERTZ (FREQUENCY)
ICW	INDUSTRIAL COLD WATER
ID	INSIDE DIAMETER
IE	INVERT ELEVATION
IHW	INDUSTRIAL HOT WATER
KW	KILOWATT
KWH	KILOWATT HOUR
KVA	KILOVOLT-AMPERE
LAV	LAVATORY
LBS	POUNDS
LD	LEAK DETECTION
LPD	LOW POINT DRAIN
(M)	MECHANICAL
MAH	MAKEUP AIR HANDLER
MAX	MAXIMUM
MCC	MOTOR CONTROL CENTER
MIN	MINIMUM
MISC	MISCELLANEOUS
MM	MULTI-MEDIA FILTER
MOT	MOTOR
MP	METERING PUMP
MUA	MAKEUP AIR
(N)	NEW
N/A	NOT APPLICABLE
NC	NOISE CRITERIA OR NORMALLY CLOSED
NG	NATURAL GAS
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NTS	NOT TO SCALE
OA	OUTSIDE AIR
OD	OUTSIDE DIAMETER
OL	OVERLOAD RELAY
OSA	OUTSIDE SUPPLY AIR
OZ	OUNCE
PD	PRESSURE DROP
PH	PHASE
PV	POST INDICATOR VALVE
PL	PLUG VALVE
POC	POINT OF CONNECTION
PPM	PARTS PER MILLION
PSI	POUNDS PER SQUARE INCH
PSIA	PSI, ABSOLUTE
PSIG	PSI, GAUGE
QT	QUART
QTY	QUANTITY
(R)	RELOCATE
RA	RETURN AIR
RAH	RECIRC. AIR HANDLER
REQ	REQUIRED
REV	REVISION
RG	RETURN GRILLE
RH	RELATIVE HUMIDITY
RM	ROOM
RPM	REVOLUTIONS PER MINUTE
RTU	ROOF TOP UNIT
SA	SUPPLY AIR
SC	SCRUBBER
SCFM	STANDARD CUBIC FEET/MINUTE
SD	SUPPLY DIFFUSER
SEC	SECOND
SG	SUPPLY GRILLE
SLM	STANDARD LITERS/MINUTE
SM	SHEET METAL
SP	STATIC PRESSURE
SPEC	SPECIFICATION
SS	STAINLESS STEEL
STD	STANDARD
TB	THRUST BLOCK
TD	TEMPERATURE DIFFERENCE
TEMP	TEMPERATURE
TF	TRANSFER FAN
TK	TANK
T.O.	TOP OF
TOP	TOP OF DUCT
TOP	TOP OF PIPE
TOS	TOP OF STEEL (SUPPORT)
TSTAT	THERMOSTAT
TU	TERMINAL UNIT
TYP	TYPICAL
UF	ULTRA FILTRATION UNIT
UH	UNIT HEATER
UNO	UNLESS NOTED OTHERWISE
UR	URINAL
V	VOLT
VAC	VACUUM
VAR	VARIABLE
VAV	VARIABLE AIR VOLUME
VD	VOLUME DAMPER
VEL	VELOCITY
VERT	VERTICAL
VP	VACUUM PUMP
VV	VARIABLE VOLUME TERMINAL UNIT
VVR	VARIABLE VOLUME REHEAT TERMINAL UNIT
W/	WITH
W	WATT
WB	WET-BULB
WBT	WET-BULB TEMPERATURE
WC	WATER CLOSET
W.C.	WATER COLUMN
WP	WEATHERPROOF
WS	WATER SOFTENER
WTR	WATER TEMPERATURE RISE
WTD	WATER TEMPERATURE DROP
WW	WASTE WATER
WX	WET EXHAUST
XFMR	TRANSFORMER
YD	YARD
YR	YEAR
Z	ZONE

PIPE DESIGNATIONS

	HWS	PREFERRED METHOD
	2"HWS	ACCEPTABLE METHOD
	3"HWS	MULTI-LINE DESIGNATION
	3"HWR	ACCEPTABLE METHOD
	2"CHWS	PIPING IDENTIFIED FROM LEFT TO RIGHT
	2"CHWR	PIPING IDENTIFIED FROM LEFT TO RIGHT

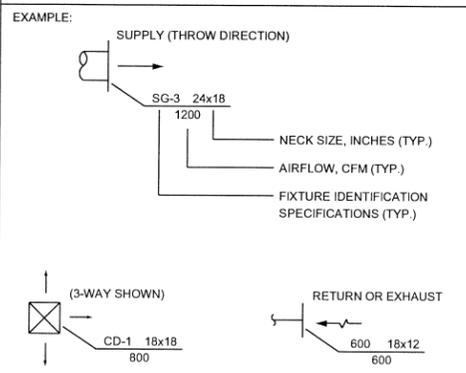
GENERAL SYMBOLS

SYMBOL	DESCRIPTION
	CONNECT TO EXISTING
(E)	EXISTING TO REMAIN
(F)	FUTURE
(N)	NEW
(D)	EXISTING TO BE REMOVED
	SHUT DOWN
	DIFFERENTIAL PRESSURE SENSOR
	STATIC PRESSURE SENSOR

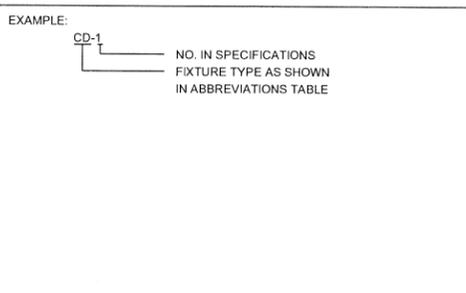
ANNOTATION SYMBOLS

	KEYED NOTE
	RECTANGLE
	REVISION TRIANGLE
	DETAIL NUMBER
	DETAIL SYMBOL
	DRAWING NUMBER WHERE DETAIL APPEARS
	ELEVATION LETTER
	ELEVATION SYMBOL
	DRAWING NUMBER WHERE ELEVATION APPEARS
	SECTION LETTER
	ELEVATION SYMBOL
	SECTION LETTER
	SECTION CUT SYMBOL
	DRAWING NUMBER WHERE SECTION APPEARS
	SECTION LETTER
	SECTION CUT SYMBOL
	DRAWING NUMBER WHERE SECTION APPEARS
	NORTH ARROW
	POINT OF NEW CONNECTION
	FLOW ARROWS

AIR OUTLET/INLET DESIGNATION



FIXTURE IDENTIFICATION



EQUIPMENT SYMBOLS

SYMBOL	DESCRIPTION
	CENTRIFUGAL PUMP
	SUBMERSIBLE PUMP
	MULTISTAGE CENTRIFUGAL PUMP
	VACUUM PUMP
	SUMP PUMP
	EXHAUST FAN
	LIQUID RING PUMP

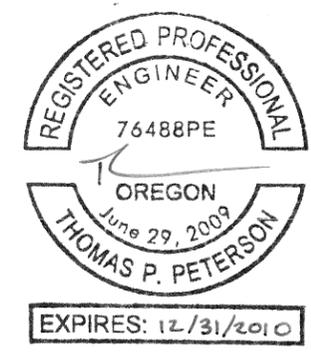
XX EQUALS
 AFD ADJUSTABLE FREQUENCY DRIVE
 CS-1 CONSTANT SPEED-SINGLE SPEED MOTOR
 CS-2 CONSTANT SPEED-TWO SPEED MOTOR

DUCTWORK SYMBOLS

SINGLE LINE	DOUBLE LINE	DESCRIPTION
		RECTANGULAR DUCT, WIDTH x DEPTH (INCHES) = INTERNALLY LINED
		ROUND DUCT (INCHES) = INTERNALLY LINED
		OVAL DUCT (INCHES)
		FLEXIBLE DUCT
		DUCT DOWN
		DUCT UP
		FLEXIBLE CONNECTION
		SUPPLY DUCT
		EXHAUST OR RETURN DUCT
		STANDARD RADIUS ELBOW
		LONG RADIUS ELBOW
		SQUARE ELBOW W/TURNING VANES
		RADIUS ELBOW W/TURNING VANE
		CEILING DIFFUSERS (ARROWS DENOTE THROW PATTERN) ASSUME 4-WAY THROW UNLESS OTHERWISE INDICATED
		CEILING EXHAUST REGISTER OR RETURN AIR GRILLE
		SIDEWALL SUPPLY REGISTER
		SIDEWALL EXHAUST REGISTER OR RETURN AIR GRILLE/REGISTER
		ROOM THERMOSTAT, PNEUMATIC OR ELECTRONIC (UNIT CONTROLLED)
		ROOM THERMOSTAT, PENDENT MOUNT. (UNIT CONTROLLED)
		ROOM HUMIDISTAT
		PHOTOHELIX
		ACTUATED DAMPER
		HAND/VOLUME DAMPER
		BLAST GATE DAMPER
		FIRE DAMPER
		SMOKE DAMPER
		FIRE/SMOKE DAMPER
		BACK DRAFT DAMPER
		SMOKE DETECTOR

GENERAL NOTES

A THIS IS A GENERAL LEGEND PAGE, NOT ALL ITEMS ON THIS SHEET WILL BE USED.



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PROJECT TITLE: METRO SOUTH HHW HVAC UPGRADE
 CLIENT: METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

PROJECT TITLE:
 CLIENT:

REV	DESCRIPTION	DATE	APPR
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Drawn By: B. YOSHIMORI
 Sheet Title: MECHANICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES
 Sheet Number: M-001
 Proj No: CC09065

LINWEIGHT LEGEND

	EXISTING WALLS & EQUIPMENT
	NEW EQUIPMENT
	EXISTING EQUIPMENT TO BE DEMOLISHED
	EQUIPMENT TO BE RELOCATED

MECHANICAL SPECIFICATIONS

15050 GENERAL CONDITIONS.

- I. GENERAL
- THE CONTRACTOR SHALL FURNISH ALL LABOR, MATERIAL, AND EQUIPMENT NECESSARY TO PROVIDE OWNER WITH COMPLETE AND FULLY OPERATIONAL SYSTEMS. ANY WORK NOT SPECIFICALLY INDICATED BUT REASONABLY IMPLIED SHALL BE INCLUDED.
 - ALL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE LOCAL AND STATE CODES AND REGULATIONS AND OWNER STANDARDS.
 - ALL MATERIALS SHALL BE NEW UNLESS SPECIFIED OTHERWISE.
 - THE CONTRACTOR SHALL OBTAIN ALL REQUIRED PERMITS AND INSPECTIONS AND PAY ALL ASSOCIATED FEES.
 - DRAWINGS ARE DIAGRAMMATIC IN NATURE. DRAWINGS ARE NOT INTENDED TO BE ABSOLUTELY PRECISE AND DO NOT SHOW EVERY OFFSET, FITTING, AND COMPONENT. THE PURPOSE OF THE DRAWINGS IS TO INDICATE A SYSTEM CONCEPT. THE MAIN COMPONENTS OF THE SYSTEMS, AND THE APPROXIMATE GEOMETRICAL RELATIONSHIPS. THE CONTRACTOR SHALL PROVIDE ALL OTHER COMPONENTS AND MATERIALS NECESSARY TO MAKE THE SYSTEM FULLY COMPLETE AND OPERATIONAL. CONTRACTOR SHALL ROUTE PIPING AND CONDUIT TO AVOID INTERFERENCES WITH STRUCTURAL ELEMENTS AND EXISTING BUILDING SYSTEMS, ETC.
 - ALL SIZES, DIMENSIONS, EQUIPMENT MOUNTING HEIGHTS, ETC. SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO INSTALLATION. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER AT THE TIME OF DISCOVERY.
 - ALL CONSTRUCTION SHALL BE DONE IN A NEAT AND WORKMANLIKE MANNER. THE CONTRACTOR SHALL MAINTAIN THE SITE IN AN ORDERLY AND BROOM-CLEAN CONDITION AT ALL TIMES. CLEAN-UP AND DEBRIS REMOVAL SHALL BE DONE AT THE END OF EACH WORKDAY.
 - THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS, SAMPLES AND / OR CATALOG CUT SHEETS AS INDICATED FOR REVIEW. SUBMIT THREE COPIES OF EACH SUBMITTAL. DO NOT PROCEED WITH INSTALLATION UNTIL SUBMITTAL HAS RECEIVED FINAL APPROVAL. CONTRACTOR TO SUBMIT THE FOLLOWING ITEMS:
- | | DRAWINGS / REPORTS / QUALIFICATIONS | CATALOG CUT SHEETS |
|---------------------------------------|-------------------------------------|--------------------|
| AIR HANDLING EQUIPMENT | | X |
| CENTRIFUGAL EXHAUST FANS | | X |
| AIR FILTER HOUSINGS AND CARTRIDGES | | X |
| HVAC DUCTWORK | | X |
| TEST AND BALANCE AGENCY QUALIFICATION | X | |
| TEST AND BALANCE REPORT | X | |
- CONTRACTOR SHALL PROVIDE REDLINE DRAWINGS NOTING AS-BUILT CONDITIONS OF THE PROJECT. THESE DRAWINGS SHALL BE SUBMITTED TO THE OWNER WITHIN TWO WEEKS AFTER FINAL PUNCH LIST IS ISSUED.
 - ALL WALLS, ROOFS, AND FLOORS THAT HAVE BEEN DAMAGED DUE TO DEMOLITION AND/OR CONSTRUCTION ACTIVITIES SHALL BE PATCHED TO MATCH ORIGINAL CONDITION.
 - THE CONTRACTOR SHALL ENSURE THAT EACH NEW PENETRATION OF EXISTING WEATHER SUSCEPTIBLE SURFACES AND MATERIALS SHALL MAINTAIN A WEATHER TIGHT SEAL.

II. COMPLETION

- PRIOR TO SUBSTANTIAL COMPLETION THE CONTRACTOR SHALL SUBMIT WRITTEN CERTIFICATION THAT:
 - CONTRACTOR HAS INSPECTED PROJECT FOR COMPLIANCE WITH CONTRACT DOCUMENTS AND THAT WORK HAS BEEN COMPLETED.
 - EQUIPMENT AND SYSTEMS HAVE BEEN TESTED AND ARE OPERATIONAL. PROJECT IS COMPLETED AND READY FOR INSPECTION.
- OWNER/ENGINEER WILL MAKE INSPECTION AS SOON AS POSSIBLE AFTER RECEIPT OF CERTIFICATION.
- CONTRACTOR SHALL BE PRESENT AT INSPECTION TO ASSIST OWNER/ENGINEER AND DEMONSTRATE OPERATION OF EQUIPMENT AND ANSWER QUESTIONS.
- SHOULD OWNER/ENGINEER CONSIDER THAT WORK IS NOT FINALLY COMPLETE:
 - THE CONTRACTOR WILL BE NOTIFIED STATING REASONS.
 - CONTRACTOR SHALL TAKE IMMEDIATE STEPS TO REMEDY DEFICIENCIES AND SEND SECOND WRITTEN NOTICE TO OWNER/ENGINEER STATING THAT WORK IS COMPLETE.
- SHOULD OWNER/ENGINEER CONSIDER THAT WORK IS FINALLY COMPLETE IN ACCORDANCE WITH CONTRACT DOCUMENTS, CONTRACTOR SHALL MAKE CONTRACT CLOSEOUT SUBMITTALS.

15810 METAL HVAC DUCTWORK AND SPECIALTIES

- I. GENERAL
- THIS SECTION COVERS MATERIALS AND REQUIREMENTS FOR METAL HVAC DUCTWORK AND SPECIALTIES.
 - CONSTRUCTION CRITERIA
 - ALL PRODUCTS SHALL CONFORM TO NFPA SECTION 90A, POSSESSING FLAME SPREAD RATING OF NOT OVER 25 AND SMOKE DEVELOPED RATING NO HIGHER THAN 50.
 - USE MATERIAL, WEIGHT, THICKNESS, GAUGE, CONSTRUCTION AND INSTALLATION METHODS AS OUTLINED IN THE FOLLOWING SMACNA PUBLICATIONS, EXCEPT AS MODIFIED IN THIS SECTION OF SPECIFICATIONS:
 - HVAC DUCT CONSTRUCTION STANDARDS, METAL AND FLEXIBLE, 3RD EDITION, 2005, FOR RECTANGULAR AND ROUND DUCTWORK UP TO POSITIVE 10" WG AND NEGATIVE 10" WG AND FLAT OVAL DUCTWORK UP TO POSITIVE 10" WG.
INTERNAL TIE RODS ARE NOT ALLOWED EXCEPT FOR DUCT 85" AND OVER. TIE RODS SHALL BE 1/2" OR 3/4" GALVANIZED STEEL CONDUITS WITH BOLT ASSEMBLY CONSISTING OF RUBBER WASHER AND FRICTION ANCHORED THREADED INSERT SIMILAR TO DUCTMATE EASYROD.
 - MIDPANEL TIE RODS DESCRIBED IN SMACNA ARE NOT ALLOWED.
 - ROUND INDUSTRIAL DUCT CONSTRUCTION STANDARDS, 2ND PRINTING 1980.
 - ACCEPTED INDUSTRY PRACTICE FOR INDUSTRIAL DUCT CONSTRUCTION, 1ST EDITION, 4TH PRINTING 1988 FOR ROUND DUCTWORK NEGATIVE 10" TO 20" WG (TABLE 1-A) AND FOR RECTANGULAR DUCTWORK NEGATIVE 6" TO 20" WG (TABLE 2-A).
- II. PRODUCTS
- GALVANIZED STEEL SHEET
 - GALVANIZED CARBON SHEET STEEL CONFORMING TO ASTM A525 OR ASTM A527. STRUCTURAL SHAPES SHALL BE CARBON STEEL CONFORMING TO ASTM A36. GALVANIZED COATING SHALL BE G90, MINIMUM 22 GAUGE THICKNESS FOR DUCTWORK WITHIN BUILDING, MINIMUM 18 GAUGE THICKNESS FOR EXHAUST STACKS.
 - FLEXIBLE DUCT FABRIC
 - MANUFACTURERS: VENTFABRICS, INC., DURO DYNE, OR APPROVED EQUAL. MATERIAL TO BE GLASS FABRIC, FIRE RETARDANT, WATERPROOF, AIR TIGHT AND COMPLY WITH UL STANDARD 214 AND NFPA 90A.
 - MATERIAL FOR OUTDOOR USE TO BE COMBINATION OF INNER LAYER OF VENTGLAS AND OUTER LAYER OF 26 OUNCE PER YARD, DOUBLE COATED WITH HYPALON, UV RESISTANT, SUITABLE FOR -10° F UP TO 275° F, EQUAL TO VENTLON.
 - FILTER HOUSINGS
 - HOUSINGS SHALL HAVE FLEXIBLE PVC SEAL ABOUT THE ENTIRE PERIMETER OF EACH FILTER FOR NO MORE THAN 0.5% LEAKAGE AT 125% AIRFLOW. FILTRATION GROUP INNER SEAL HOUSINGS OR EQUAL.
 - HOUSINGS SHALL HAVE WEATHER COVER FOR OUTDOOR INSTALLATION.
 - HOUSINGS SHALL HAVE FACTORY INSTALLED MAGNAHELIC GAUGES AT INLET AND OUTLET.

III. EXECUTION

- GENERAL
 - INSTALL COMPONENTS AS INDICATED AND IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.
 - INSTALL DUCTWORK PARALLEL TO BUILDING WALLS AND CEILINGS AND AT SUCH HEIGHTS NOT TO OBSTRUCT ANY PORTION OF WINDOW, DOORWAY, STAIRWAY OR PASSAGEWAY.

- DUCTWORK EXPOSED TO VIEW SHALL BE FREE OF KINKS AND DENTS.
 - PROVIDE TRANSITIONS WHERE DIFFERENT SIZE OR DIFFERENT SHAPE DUCTWORK SEGMENTS ARE CONNECTED. UNLESS OTHERWISE INDICATED, MAKE DIVERGING TRANSITIONS WITH MAXIMUM ANGLE OF 15 DEGREES PER SIDE, AND CONVERGING TRANSITIONS WITH A MAXIMUM ANGLE OF 25 DEGREES PER SIDE.
 - METAL DUCTS SHALL BE INSTALLED AND SUPPORTED IN ACCORDANCE WITH THE CURRENT EDITION OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE, SECTION IV.
- B. EXHAUST DUCTWORK
- FABRICATE AND INSTALL THE DUCT IN ACCORDANCE WITH THE CURRENT EDITION OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE. NEGATIVE TEN INCH STATIC PRESSURE CLASS, SEAL CLASS A, RIGID GALVANIZED SHEET METAL DUCT.
 - ROUND DUCT AND FITTINGS: ROUND DUCT AND FITTINGS SHALL BE FABRICATED IN ACCORDANCE WITH DESIGN DRAWING DETAILS AND THE CURRENT EDITION OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE AS FOLLOWS:
 - STRAIGHT DUCT GAUGE SHALL BE IN ACCORDANCE WITH TABLE 3-5 THROUGH 3-13.
 - TRANSVERSE JOINTS SHALL BE TYPE RT-1 (BEADED SLEEVE) FOR DUCT DIAMETERS 36 INCHES AND SMALLER AND TYPE RT-2 (VAN STONE FLANGE) FOR DUCT DIAMETERS 37 INCHES AND LARGER IN ACCORDANCE WITH FIGURE 3-2. LONGITUDINAL SEAMS SHALL BE TYPE RL-1 (SPIRAL SEAM) IN ACCORDANCE WITH FIGURE 3-2.
 - RADIUS ELBOWS SHALL BE IN ACCORDANCE WITH TABLE 3-1 EXCEPT ALL ELBOWS SHALL HAVE A CENTERLINE RADIUS OF 1-1/2 TIMES THE DIAMETER AND SHALL BE STAMPED OR SEGMENTED TYPE IN ACCORDANCE WITH FIGURE 3-4.
 - TEE, TAP, AND WYE FITTINGS SHALL BE IN ACCORDANCE WITH FIGURES 3-5 AND 3-6.
 - ALL FOUR INCH STATIC PRESSURE CLASS SEAMS AND JOINTS IN THE FITTINGS AND ELBOWS SHALL BE CONTINUOUSLY WELDED.
 - ALL ONE INCH STATIC PRESSURE CLASS SEAMS AND JOINTS IN THE FITTINGS AND ELBOWS SHALL BE SPOT WELDED AND SEALED.
 - JOINT SEALING: JOINTS AND SEAMS SHALL BE SEALED IN ACCORDANCE WITH THE CURRENT EDITION OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE TABLE 1-1, SEAL CLASS AS SPECIFIED AND AS FOLLOWS:
 - ROUND DUCTS SHALL BE SEALED USING ONE OF THE FOLLOWING METHODS:
 - SEALANT: APPLY AS SPECIFIED BY SEALANT MANUFACTURER.
 - TAPE SEALING SYSTEM: APPLY AS SPECIFIED BY SEALANT MANUFACTURER.
 - METAL DUCTS SHALL BE INSTALLED AND SUPPORTED IN ACCORDANCE WITH CONTRACT DRAWINGS AND THE CURRENT EDITION OF SMACNA HVAC DUCT CONSTRUCTION STANDARDS METAL AND FLEXIBLE.
 - ALL WELDING SHALL BE IN ACCORDANCE WITH AWS D1.1 OR AWS D1.3. ALL GALVANIZED AREAS DAMAGED BY WELDING SHALL BE COATED WITH A COLD GALVANIZING COMPOUND.
 - FLEXIBLE CONNECTION SECTIONS OF DUCTWORK SHALL BE USED AT ALL DUCTWORK CONNECTIONS TO EQUIPMENT SUCH AS AIR HANDLERS AND FANS.
 - SYSTEM LEAKS:
 - ALL DUCTED AIR SYSTEMS SHALL NOT HAVE NOTICEABLE AIR LEAKS.
 - LEAKAGE CONCENTRATED AT A SINGLE POINT MAY RESULT IN OBJECTIONABLE NOISE. THIS NOISE SOURCE SHALL BE CORRECTED TO THE SATISFACTION OF ENGINEER AND OWNER'S AUTHORIZED REPRESENTATIVE.
- C. TESTING
- TEST ALL DUCTWORK IN ACCORDANCE WITH SECTION 15952 - AIR SYSTEMS TESTING, ADJUSTING AND BALANCING
- D. DUCT FLEXIBLE CONNECTIONS
- INSTALL DUCT FLEXIBLE CONNECTIONS FOR ALL CONNECTIONS TO ANY DUCTWORK OR EQUIPMENT CASING CONTAINING ROTATING DEVICES INCLUDING AIR HANDLING UNITS AND FANS. INSTALLED WIDTH SHALL BE SUITABLE FOR THE APPLICATION BUT SHALL NOT BE LESS THAN 4". INSTALL FLEXIBLE CONNECTIONS IN ACCORDANCE WITH SMACNA STANDARDS WITH DOUBLE LOCK OR "GRIP LOC" CONNECTION.
- E. MANUAL BALANCING DAMPERS
- INSTALL MANUAL BALANCING DAMPERS IN ALL BRANCH DUCTS OF SUPPLY, RETURN AND EXHAUST DUCTWORK, AS INDICATED ON PLANS AND AS REQUIRED TO REGULATE AIR FLOW TO MEET AIR BALANCE REQUIREMENTS.
 - INSTALL BALANCING DAMPERS SO AS NOT TO FLUTTER OR VIBRATE AND AS FAR AS POSSIBLE UPSTREAM FROM THE AIR OUTLET.

15817 HVAC DUCT SUPPORTS

- I. GENERAL
- PROVIDE SUPPORT AND LATERAL BRACING FOR ALL DUCTWORK AND EQUIPMENT IN ACCORDANCE WITH SMACNA AND BUILDING CODES.
 - FABRICATE AND INSTALL DUCTWORK SUPPORTING SYSTEMS. DESIGN AND INSTALL SUPPORTING SYSTEMS IN ACCORDANCE WITH CHAPTER 5 OF THE SMACNA "HVAC DUCT CONSTRUCTION STANDARDS", WITH THE FOLLOWING EXCEPTIONS:
 - DO NOT DRILL, CUT, OR WELD BUILDING STRUCTURAL STEEL.
 - DO NOT CONNECT HANGERS DIRECTLY TO METAL ROOF DECKS.
- II. PRODUCTS
- METAL FRAMING SUPPORT SYSTEM (STRUT SYSTEM)
 - MANUFACTURERS: UNISTRUT, B-LINE STRUT SYSTEMS, POWER-STRUT, SUPERSTRUT, KINDORF, HYDRA-ZORB OR APPROVED EQUAL.
 - CHANNELS TO HAVE EPOXY PAINT OR ELECTRO-GALVANIZED FINISH.
 - CHANNELS SHALL NOT BE LIGHTER THAN 12-GAUGE.
 - FASTENERS
 - CADMIUM PLATED OR GALVANIZED STEEL SCREWS OR 3/16 INCH DIAMETER STEEL POP RIVETS OR FLAT HEAD, TINNED IRON RIVETS.
- III. EXECUTION
- GENERAL
 - INSTALL EXHAUST AIR HANGERS AND SUPPORTS AT 4 FEET ON CENTER SPACING.
 - INSTALL ROOF PENETRATION PROTECTION AT POINTS WHERE ITEMS ARE PENETRATING ROOF. INSTALL AS SHOWN AND ACCORDING TO MANUFACTURER'S INSTALLATION INSTRUCTIONS.
 - DUCTS ARE TO BE INDEPENDENTLY SUPPORTED FROM BUILDING STRUCTURE ONLY, AND NOT FROM EQUIPMENT OR OTHER EQUIPMENT SUPPORTS.
 - ATTACHMENTS TO STRUCTURAL STEEL JOISTS OR TRUSSES:
 - SUPPORT LOADS FROM PANEL POINTS.
 - WHERE NECESSARY, INSTALL SUPPLEMENTARY STEEL REQUIRED TO BRIDGE TWO PANEL POINTS OR TWO JOISTS FOR TRANSMISSION OF LOAD TO PANEL POINTS.
 - EQUIPMENT CURB RAILS
 - INSTALL AS INDICATED ON PLANS, AND IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS AND RECOMMENDATIONS.

SECTION 15952 AIR SYSTEMS TESTING ADJUSTING AND BALANCING

- I. GENERAL
- SUBMITTALS
 - ALL REPORTS SHALL BE ASSEMBLED USING 3 RING HARD COVER BINDER WITH PROJECT NAME AND LOCATION ON COVER AND SIDE PANEL. ALL INFORMATION SHEETS SHALL BE 8-1/2" X 11" WHITE BOND PAPER. USE PRE-PRINTED FORMS OF NEBB OR AABC WHEREVER POSSIBLE. ASSEMBLE THE REPORT IN THE FOLLOWING ORDER.

- TRANSMITTAL LETTER
 - COVER SHEET WITH PROJECT TITLE, LOCATION, SUBMITTAL DATE, AND NAME AND ADDRESSES OF OWNER, MECHANICAL CONTRACTOR, TAB SUBCONTRACTOR, ARCHITECT, AND ENGINEER.
 - INDEX OF NUMBERED TABS LISTING MAJOR SYSTEMS.
 - DATA ORGANIZED BY SYSTEM IN THE FOLLOWING ORDER:
 - EQUIPMENT DATA AND MEASUREMENT SUMMARY
 - EQUIPMENT MEASUREMENT DATA
 - BRANCH MAIN MEASUREMENT DATA
 - TERMINAL DEVICE MEASUREMENT DATA
- B. FINAL REPORT
- WITHIN 10 DAYS AFTER FIELD WORK IS COMPLETED, SUBMIT FINAL REPORT AS DETAILED IN PART III OF THIS SECTION TO ASSURE DESIGN OBJECTIVES ARE MET AND TO ASSIST OWNER IN FUTURE MAINTENANCE.
- C. REFERENCE STANDARDS
- REFER TO THE LATEST PUBLICATIONS OF NEBB, AABC AND AMERICAN SOCIETY OF HEATING, REFRIGERATING, AND AIR CONDITIONING ENGINEERS (ASHRAE) FOR ESTABLISHING REQUIRED PROCEDURES.
- D. DESCRIPTION
- TAB WORK SHALL BE PERFORMED BY PERSONS TRAINED IN TAB WORK AND CERTIFIED BY ASSOCIATED AIR BALANCE COUNCIL (AABC) OR NATIONAL ENVIRONMENTAL BALANCING BUREAU (NEBB). ALL PROCEDURES SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF AABC OR NEBB STANDARDS AND AS PER DETAILED HEREIN.
 - TAB CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING COMPLETE TESTING, ADJUSTING AND BALANCING (TAB) WORK OF ALL SYSTEMS INCLUDED IN THIS PROJECT.
 - WORK REQUIRED SHALL CONSIST OF SETTING VOLUME FLOW RATES AND ADJUSTING SPEED CONTROLS, RECORDING DATA, MAKING TESTS, AND PREPARING REPORTS, ALL AS SPECIFIED HEREIN.
 - SCOPE OF WORK INCLUDES NEW WORK SPECIFIED HEREIN AND INCLUDES ALL EQUIPMENT, DISTRIBUTION SYSTEMS, AND TERMINAL UNITS CONNECTED.
 - UPON DIRECTION OF ENGINEER OR TAB SUBCONTRACTOR, MECHANICAL CONTRACTOR SHALL PROVIDE AT NO ADDITIONAL COST TO OWNER, ANY ADDITIONAL WORK AND/OR DEVICES NECESSARY TO PROPERLY BALANCE SYSTEM, INCLUDING CALIBRATED BALANCING VALVES, GAUGE TAPPINGS, FLOW SENSORS, AND THERMOMETER WELLS.

II. PRODUCTS

- INSTRUMENTATION
 - PROVIDE ALL REQUIRED INSTRUMENTATION TO OBTAIN PROPER MEASUREMENTS. APPLICATION OF INSTRUMENTS AND ACCURACY OF INSTRUMENTS AND MEASUREMENTS SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF NEBB OR AABC STANDARDS AND INSTRUMENT MANUFACTURER'S SPECIFICATIONS.
 - INSTRUMENTS USED FOR MEASUREMENTS SHALL BE ACCURATE, AND CALIBRATION HISTORIES FOR EACH INSTRUMENT TO BE AVAILABLE FOR EXAMINATION BY ENGINEER UPON REQUEST. CALIBRATION AND MAINTENANCE OF ALL INSTRUMENTS TO BE IN ACCORDANCE WITH REQUIREMENTS OF NEBB OR AABC STANDARDS.

III. EXECUTION

- GENERAL
 - FOLLOW PROCEDURES OUTLINED HEREIN AND AS DESCRIBED IN PLANNING PHASE NARRATIVES.
- PLANNING PHASE
 - OBTAIN THE LATEST CONTRACT DOCUMENTS INCLUDING ADDENDA, APPLICABLE CONSTRUCTION BULLETINS AND CHANGE ORDERS. OBTAIN SHOP DRAWINGS AND PERFORMANCE CURVES FROM MECHANICAL CONTRACTOR FOR ALL EQUIPMENT.
 - IDENTIFY FLOW MEASURING DEVICES TO BE USED AT EACH TEST POINT.
 - PREBALANCE CHECKLIST, TO INCLUDE, BUT NOT LIMITED TO:
 - CHECK FOR COMPLETENESS OF WORK
 - SYSTEM CLEANING
 - PLACE SYSTEM INTO OPERATION
 - BEARINGS, ALIGNMENT, STARTERS, VIBRATION ISOLATORS, ROTATION.
 - SETTING DAMPERS TO PROPER POSITION.
 - MEASURING INSTRUMENT LIST: LIST WHAT MEASURING INSTRUMENTS WILL BE USED FOR EACH PROCEDURE. INDICATE RANGES REQUIRED FOR EACH PROCEDURE. PROVIDE DATA ON EACH MEASURING INSTRUMENT TO BE USED. THIS DATA SHALL INCLUDE:
 - MANUFACTURER NAME AND MODEL NUMBER
 - MEASUREMENT RANGE
 - PRESSURE/TEMPERATURE LIMITS
 - DATE PUT INTO SERVICE
 - DATE OF LAST CALIBRATION
 - INCLUDE CERTIFICATE FROM CALIBRATION FIRM
 - ENGINEER AND OWNER'S AUTHORIZED REPRESENTATIVE RESERVE THE RIGHT TO REQUEST ADJUSTMENTS IN ANY PROCEDURE AND/OR ASK FOR RECALIBRATION OF ANY MEASURING INSTRUMENT, WHICH HAS NOT BEEN RECALIBRATED WITHIN PAST YEAR.
- BALANCING
 - PERFORM ALL PROCEDURES AS PER PLANNING PHASE NARRATIVE. CORRECT ALL DEFICIENCIES AND REDO PROCEDURES AS REQUIRED BEFORE SUBMITTING FINAL REPORT.
 - SUBMIT FINAL REPORT TO ENGINEER, OWNER'S AUTHORIZED REPRESENTATIVE AND TO MECHANICAL CONTRACTOR INDICATING ALL DATA AND MEASUREMENTS AS PER REQUIREMENTS HEREIN AND PER PLANNING PHASE NARRATIVE. DO NOT SUBMIT PARTIAL OR INCOMPLETE REPORTS.
 - ENGINEER RESERVES THE RIGHT TO CHECK ANY MEASUREMENT MADE AND TO REJECT ANY PORTION OF WORK NOT WITHIN DESIGN TOLERANCE OF +/- 10% OF DESIGN FLOW. CONTRACTOR SHALL RESUBMIT ALL OR PORTIONS OF FINAL REPORT AS DIRECTED BY ENGINEER.



CORBIN CONSULTING ENGINEERS, INC.
1945 N.W. 14th Place Suite 121
Beverly Hills, CA 90210
Tel: (310) 445-6176 Fax: (310) 445-6153

Metro People places open spaces

METRO SOUTH HHW HVAC UPGRADE

METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

PROJECT TITLE: METRO SOUTH HHW HVAC UPGRADE
CLIENT: METRO SOUTH STATION

REV	DESCRIPTION	DATE	APPR	TPP
0	ISSUED FOR CONSTRUCTION	03/01/10		

Drawn By: b. YOSHIMORI
Sheet Title: MECHANICAL SPECIFICATIONS
Sheet Number: M-002
Proj No: CC09065

GENERAL NOTES

A SEE SHEET M-001 AND M-002 FOR LEGEND, ABBREVIATIONS, GENERAL NOTES AND SPECIFICATIONS.

KEYED NOTES

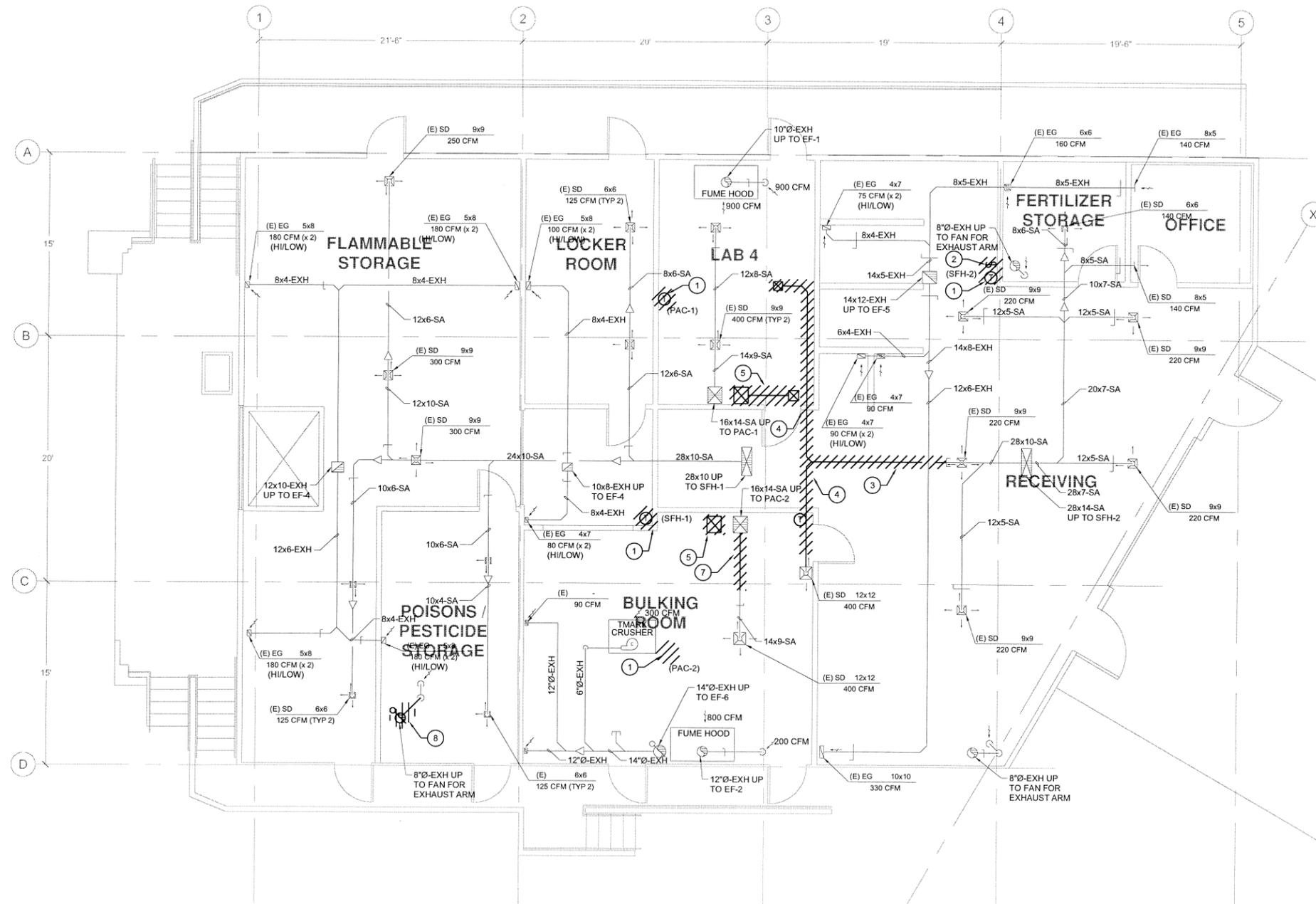
- DEMOLISH THERMOSTAT. REUSE CONDUIT AND WIRES AS POSSIBLE FOR REPLACEMENT THERMOSTATS SHOWN ON SHEET M-103.
- DEMOLISH WASTE OIL BURNER / ELECTRIC HEAT SELECTOR SWITCH, CONDUIT AND CONDUCTORS BACK TO SOURCE.
- DEMOLISH DUCTWORK AND DIFFUSER IN LAB 4. DIFFUSER IN BULKING ROOM IS TO BE REUSED. INSTALL SHEETMETAL CAP AT OPEN END OF DUCTWORK AND SEAL IN ACCORDANCE WITH MECHANICAL SPECIFICATIONS.
- SEAL WALL OPENINGS LEFT FROM DEMOLISHED DUCTWORK TO 2HR RATING WITH APPROVED UI SYSTEM.
- DEMOLISH RETURN DUCTWORK TO CEILING AND SEAL WITH SHEETMETAL. NEW MAKE-UP AIR UNITS DO NOT HAVE RETURN AIR OPENINGS.
- DEMOLISH VERTICAL SECTION OF EXHAUST DUCTWORK. COORDINATE EXTENT OF DEMOLITION WITH PLAN DRAWING M-103.
- DEMOLISH 14x9-SA DUCTWORK TO APPROXIMATE LOCATION SHOWN. COORDINATE EXTENT OF DEMOLITION WITH PLAN DRAWING M-103.
- DEMOLISH GALVANIZED DUCTWORK FROM EXHAUST ARM TO CEILING.

PROJECT TITLE:
METRO SOUTH HHV HVAC UPGRADE
 CLIENT:
METRO SOUTH STATION
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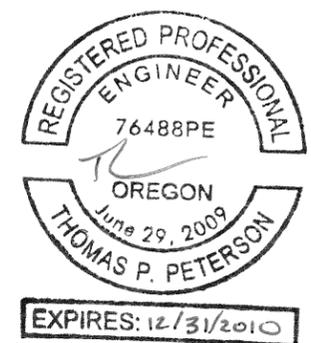
PROJECT TITLE:
 CLIENT:

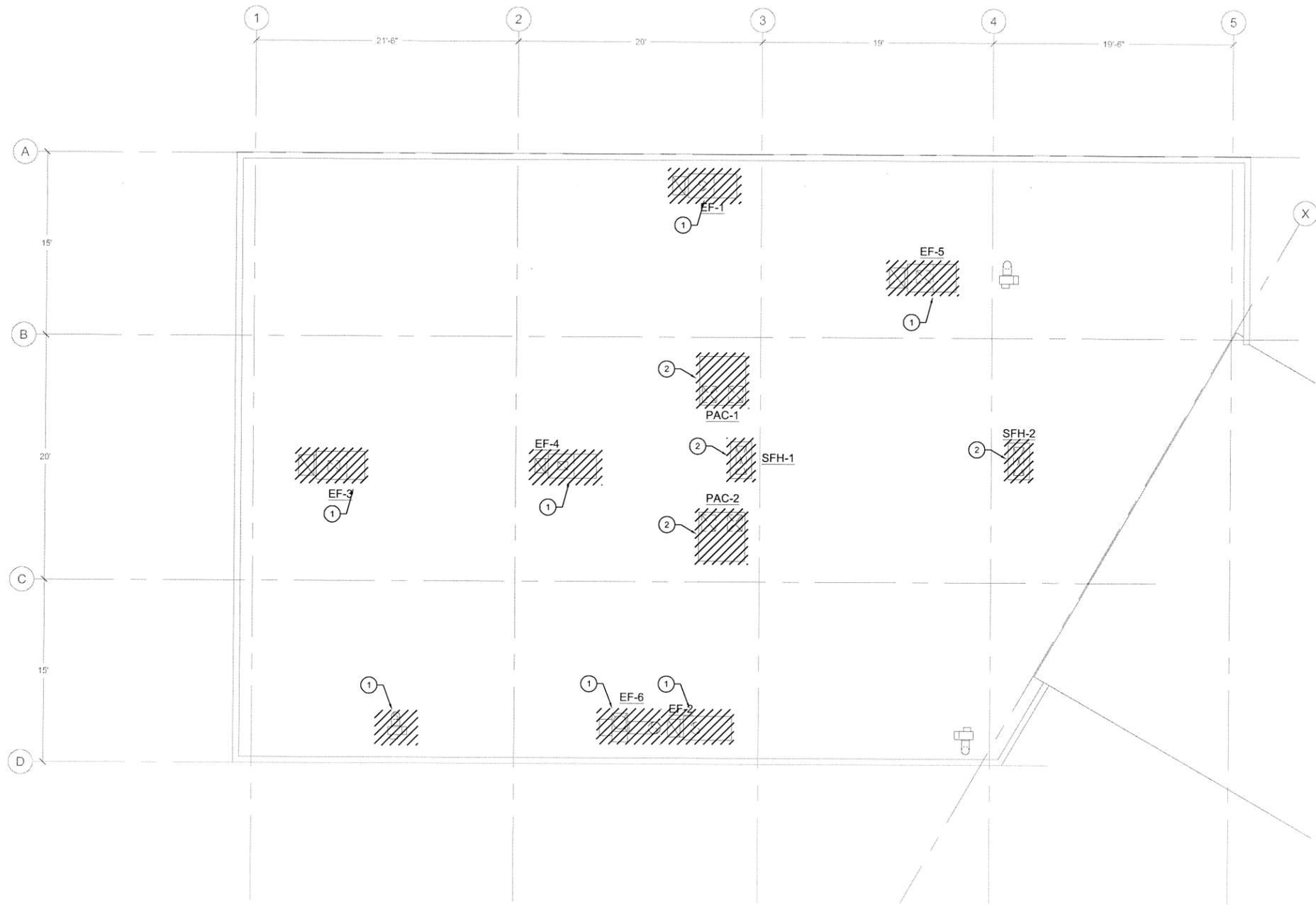
REV	DESCRIPTION	DATE	APPR	TPP
0	ISSUED FOR CONSTRUCTION	03/01/10		

Drawn By: b. YOSHIMORI
 Sheet Title:
MECHANICAL FIRST FLOOR DEMOLITION PLAN
 Sheet Number:
M-101
 Proj No: CC09065



1
M-101
FIRST FLOOR DEMOLITION PLAN





1
M-102 ROOF DEMOLITION PLAN

GENERAL NOTES

- A SEE SHEET M-001 AND M-002 FOR LEGEND, ABBREVIATIONS, GENERAL NOTES AND SPECIFICATIONS.
- B COORDINATE ALL DEMOLITION WORK WITH ELECTRICAL CONTRACTOR.
- C THE EXTENT OF DEMOLITION OF EQUIPMENT SUPPORT CURBS IS AT THE DESECRATION OF THE CONTRACTOR. CURBS MAY BE LEFT IF A MANUFACTURERS CURB ADAPTOR IS AVAILABLE FOR NEW EQUIPMENT.

KEYED NOTES

- 1 DEMOLISH EXHAUST FAN AND CURB. DUCTWORK BELOW ROOF LEVEL AND ELECTRICAL ARE TO REMAIN AND BE RECONNECTED TO REPLACEMENT FAN SHOWN ON DRAWING M-103.
- 2 DEMOLISH AIR HANDLER AND SUPPORT CURB. SUPPLY DUCTWORK BELOW ROOF LEVEL IS TO REMAIN AND BE RECONNECTED TO REPLACEMENT EQUIPMENT SHOWN ON DRAWING M-103. RETURN DUCTWORK TO BE DEMOLISHED.

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CLIENT:

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Drawn By: B. YOSHIMORI

Sheet Title:
MECHANICAL
ROOF
DEMOLITION
PLAN

Sheet Number:

M-102

Proj No: CC09065



EXPIRES: 12/31/2010



GENERAL NOTES

A SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.

KEYED NOTES

- 1 INSTALL NEW THERMOSTAT FOR AIR HANDLERS AND SUPPLY FANS. REUSE EXISTING CONDUIT AND CONDUCTORS FROM DEMOLITION AS POSSIBLE. SEE MECHANICAL SCHEDULES FOR DETAILS ABOUT THERMOSTAT TYPE.
- 2 INSTALL 16x14-SA FROM EXISTING 16x14-SA VERTICAL DUCT AND REDUCE TO CONNECT TO EXISTING DIFFUSER.
- 3 CONNECT TO EXISTING DIFFUSER.
- 4 RE-ROUTE 8"Ø-EXH DUCT FROM EXHAUST ARM TO CEILING.
- 5 INSTALL LOCKABLE BLAST GATE DAMPER FOR BALANCING PER DETAIL.

METRO SOUTH HHV HVAC UPGRADE

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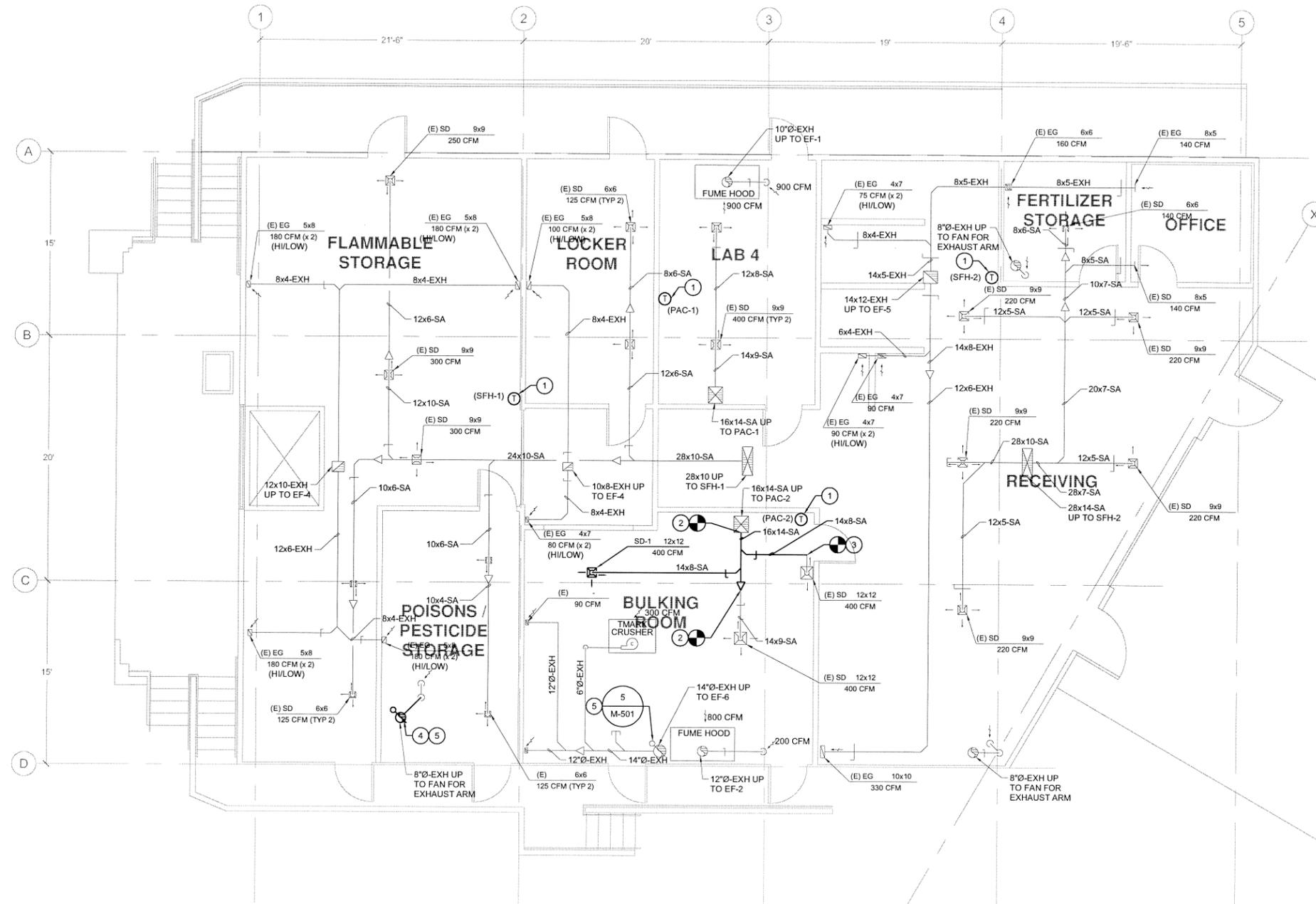
Drawn By: B. YOSHIMORI

Sheet Title:
 MECHANICAL
 FIRST FLOOR
 PLAN

Sheet Number:

M-103

Proj No: CC09065



1 FIRST FLOOR PLAN
M-103

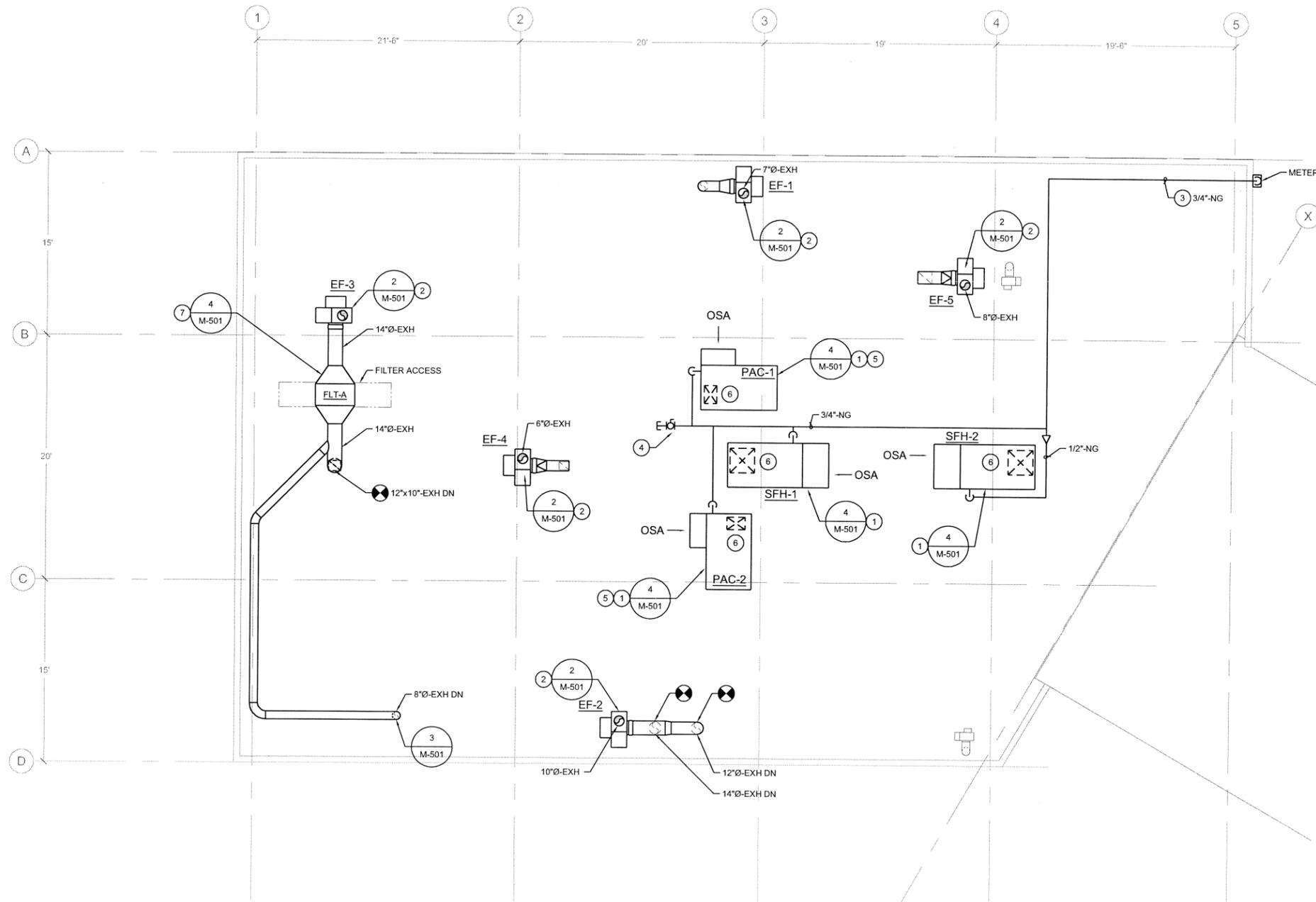


GENERAL NOTES

- A SEE SHEET M-001 FOR LEGEND, ABBREVIATIONS AND GENERAL NOTES.
- B EQUIPMENT SCHEDULE:
 FLT-A
 FILTRATION GROUP, INNER SEAL 21 TRACK HOUSING
 MODEL: IS21-1.5x1
 PREFILTER: FILTRATION GROUP PLEATED FILTER SERIES
 400HC, QTY. (1) 24x24x2, (1) 12x24x2
 POST FILTER: FILTRATION GROUP FP-95 FILTER - MERV 14
 QTY. (1) 24x24x12, (1) 12x24x12
- C ROOF HAS PARAPET OR RAILING 42" TALL MIN. AROUND ENTIRE PERIMETER.

KEYED NOTES

- 1 SET NEW MECHANICAL EQUIPMENT CURB TO LINE UP WITH EXISTING ROOF PENETRATIONS AND DUCTWORK.
- 2 INSTALL NEW FAN AT LOCATION OF EXISTING DUCTWORK AND ELECTRICAL BOX. COORDINATE INSTALLATION WITH ELECTRICAL. RECONNECT 1/4" PRESSURE SENSING TUBE AND SEAL WEATHER TIGHT.
- 3 CONNECT TO NATURAL GAS METER AT GROUND LEVEL AND ROUTE GAS PIPING TO ROOFTOP EQUIPMENT. METER IS TO BE INSTALLED BY NW NATURAL. SEE NATURAL GAS RISER DIAGRAM ON SHEET M-501 FOR DETAILS.
- 4 INSTALL 3/4" VALVE AND CAP FOR FUTURE EXTENSION.
- 5 CONTRACTOR TO SEAL RETURN AIR OPENING WITH SHEET METAL BLANK.
- 6 TRANSITION FROM NEW SUPPLY DUCT SIZE TO EXISTING SUPPLY DUCT BELOW.
- 7 PLACE A SINGLE ROOF SUPPORT CURB BELOW CENTER OF FILTER HOUSING.



1 ROOF PLAN
M-104

METRO SOUTH HHV HVAC UPGRADE
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PROJECT TITLE:
 CLIENT:

REV	DESCRIPTION	DATE	APPR
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Drawn By: B. YOSHIMORI

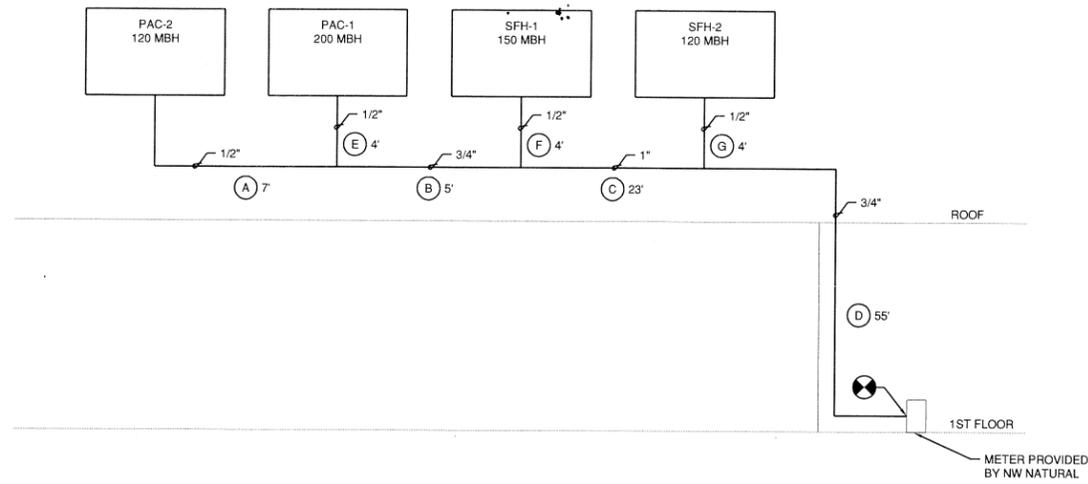
Sheet Title:
 MECHANICAL
 ROOF PLAN

Sheet Number:

M-104

Proj No: CC09065





1 NATURAL GAS RISER DIAGRAM
M-501

Natural Gas Supply Sizing Worksheet

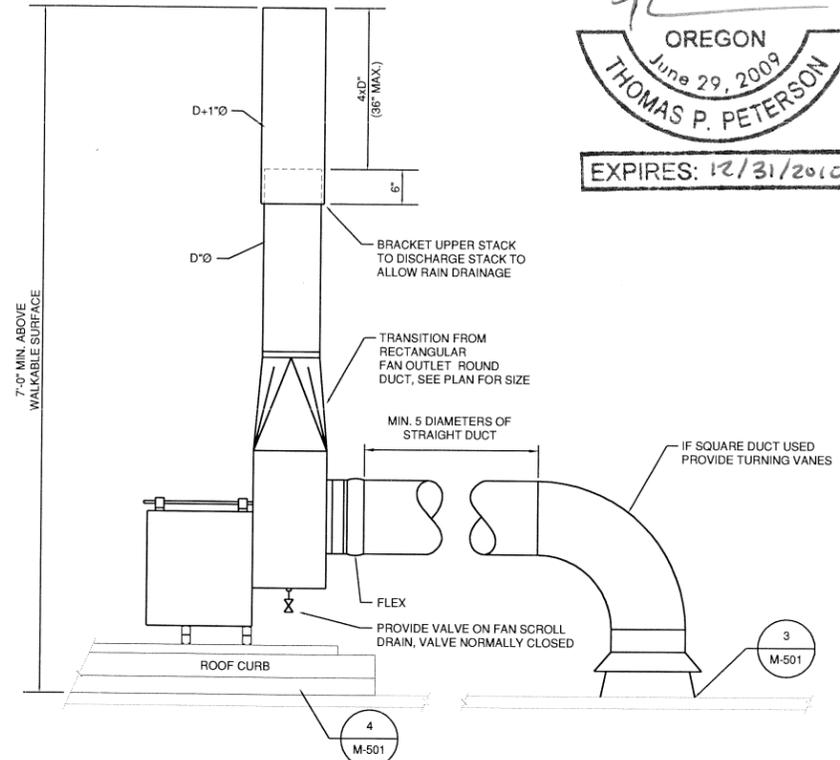
Given Data:
 Developed length from new gas meter to most remote load: (PAC-2) 75 ft.
 Pressure downstream of regulator/meter: <2 psi (0.5 psig for CSST)
 Minimum pressure required at appliance: 1.0 psi
 Gas heating value: 1000 Btu/cu.ft.

Natural Gas Demands for New Service:

PAC-1	115	MBH
PAC-2	115	MBH
SFH-1	150	MBH
SFH-2	108	MBH
Total:	488	MBH
Convert to SCFH (divide by heating value):	1000	Btu/cu.ft.
SCFH:	488	SCFH

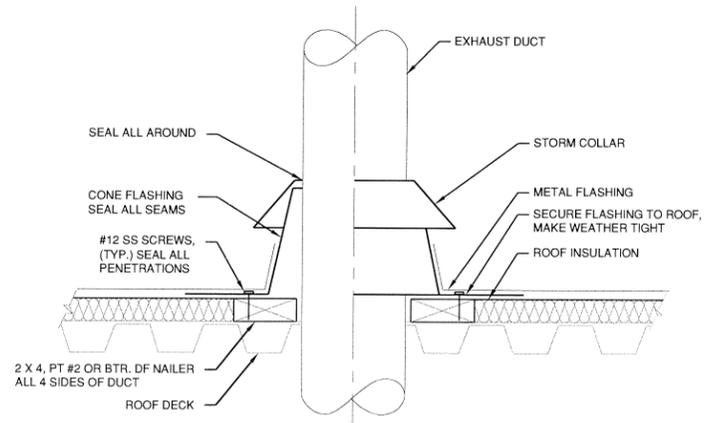
Sch 40 Metallic Pipe Sizes from 2007 OMSC table C402.4(3):

Section	Total Run Length (ft)	Tbl. Row (feet)	Demand (SCFH)	Min. Size (in)	Selected Size (in)
A	90	90	115	0.5	0.5
B	83	90	230	0.5	0.75
C	78	80	380	0.5	0.75
D	55	60	488	0.5	0.75
E	88	90	115	0.5	0.5
F	82	90	150	0.5	0.5
G	59	60	108	0.5	0.5

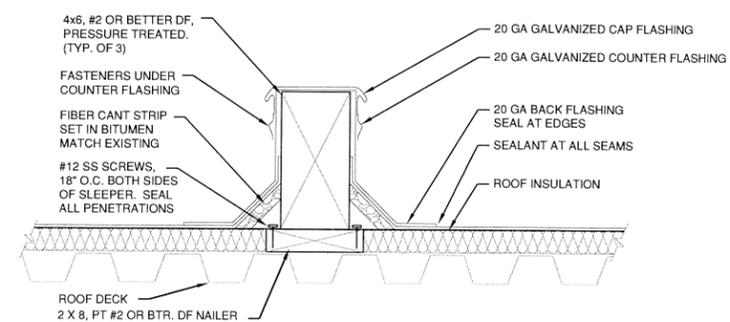


NOTE: 1. SEE PLANS FOR DUCT SIZES.
 2. PER SHEET SPECIFICATIONS ON DRAWING M-102, EXHAUST STACK IS TO BE CONSTRUCTED OF 18 GA. MIN MATERIAL.

2 ROOF EXHAUST STACK DETAIL
M-501 NTS

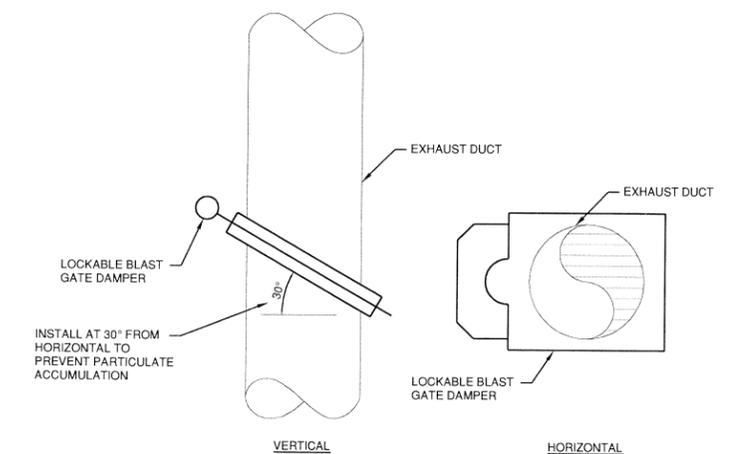


3 DUCT ROOF PENETRATION DETAIL
M-501 NTS



NOTES:
 1 TRIM AND LEVEL CURBS WITHIN 1/4".
 2 EQUAL FACTORY EQUIPMENT RAILS ARE ACCEPTABLE WITH PRIOR ENGINEER APPROVAL.
 3 OMIT 2x8 BASE NAILER AND DO NOT CUT AWAY INSULATION FOR DUCTWORK SUPPORT CURBS.
 4 SUPPORT CURBS FOR EQUIPMENT MUST SPAN (2) ROOF TRUSSES MINIMUM.

4 SUPPORT CURB DETAIL
M-501 NTS



5 BLAST GATE DAMPER DETAIL
M-501 NTS



PROJECT TITLE:
METRO SOUTH HHV HVAC UPGRADE
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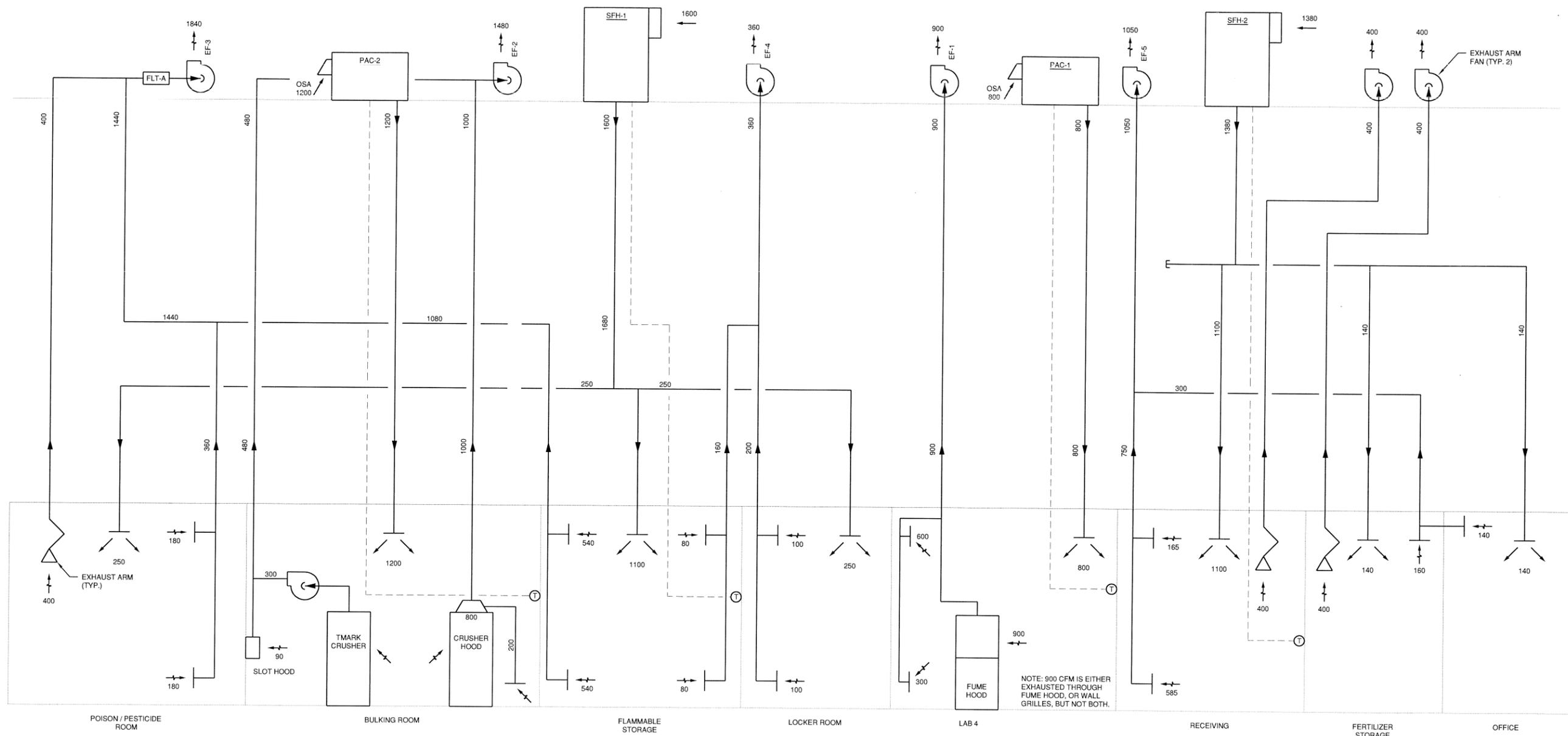
Drawn By: B. YOSHIMORI

Sheet Title:
MECHANICAL DETAILS

Sheet Number:

M-501

Proj No: CC09065



NOTE: 900 CFM IS EITHER EXHAUSTED THROUGH FUME HOOD, OR WALL GRILLES, BUT NOT BOTH.

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REV	DESCRIPTION	DATE	APPR
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Drawn By: B. YOSHIMORI
 Sheet Title:
MECHANICAL AIRFLOW SCHEMATIC
 Sheet Number:
M-601
 Proj No: CC09065

1 BUILDING AIRFLOW SCHEMATIC
M-601



MAKE UP AIR UNIT SCHEDULE

TAG	LOCATION	SERVICE	UNIT TYPE	MANUF	MODEL	FAN		OUTSIDE AIR (CFM)	BHP (HP)	COOLING		HEATING		ELECTRICAL			FILTER SIZE (INCHES)	WEIGHT (LBS)	REMARKS	
						AIRFLOW (CFM)	ESP (INCH)			CAPACITY (BTU/HR)	EFF SEER/EER	INPUT (MBTU/HR)	OUTPUT (MBTU/HR)	AFUE (%)	MCA	MOC				VOLTS / PH
PAC-1	ROOF	LAB-4	GAS/ELEC	CARRIER	48TCRA04	800	0.75	800	0.7	34,250	- / 12	115	93	81%	21.3	30	208/1	2"	600	SEE NOTES 1 - 5
PAC-2	ROOF	BULKING ROOM	GAS/ELEC	CARRIER	48TCRA04	1,200	0.75	1,200	0.7	36,800	- / 12	115	93	81%	21.3	30	208/1	2"	600	SEE NOTES 1 - 5
SFH-1	ROOF	FLAMM. STORAGE	GAS/ELEC	GREENHECK	IG-109-H10	1,600	1.25	1,600	1	-	-	100	83	80%	3.8	15	460/3	2"	800	SEE NOTES 1 - 5
SFH-2	ROOF	RECEIVING	GAS/ELEC	GREENHECK	IG-109-H10	1,380	1.25	1,380	0.75	-	-	86	72	80%	3.2	15	460/3	2"	800	SEE NOTES 1 - 5

- NOTES:
- 1 PROVIDE 7 INDIVIDUAL DAYS + HOLIDAY PROGRAMMABLE THERMOSTAT WITH NIGHT SET BACK AND DEAD BAND FROM BAS. PROGRAM FAN TO BE ON DURING OCCUPIED HOURS OR PER OWNER'S SCHEDULE.
 - 2 PROVIDE NON-FUSED DISCONNECT AND GFI OUTLET.
 - 3 PROVIDE STAINLESS STEEL HEAT EXCHANGER.
 - 4 ORDER UNITS WITH FACTORY WIRED 120V CONVENIENCE RECEPTACLE.
 - 5 CONTRACTOR HAS THE OPTION OF PROVIDING A FIELD FABRICATED, INSULATED ROOF CURB, OR A VENDOR PROVIDED, INSULATED ADAPTOR CURB TO EXISTING CURB. (SEE PLANS)

EXHAUST FAN SCHEDULE

TAG NUMBER	AREA SERVED	TYPE	SERVICE	DRIVE	CFM	SP (IN)	MOTOR		RPM	EST. WEIGHT (LBS)	MODEL NO.	REMARKS
							HP	V/PH				
EF-1	LAB 4	CENTRIFUGAL ROOF	EXHAUST	BELT	900	1.75	.5	460/3PH	1,839	200	GREENHECK 12-BISW-21	SEE NOTES 1,2,3
EF-2	BULKING ROOM	CENTRIFUGAL ROOF	EXHAUST	BELT	1,480	2.50	1.5	460/3PH	2,402	225	GREENHECK 12-BISW-21	SEE NOTES 1,2,3
EF-3	FLAMM. STORAGE	CENTRIFUGAL ROOF	EXHAUST	BELT	1,840	4.00	2	460/3PH	2,587	225	GREENHECK 13-BISW-21	SEE NOTES 1,2,3
EF-4	LOCKER ROOM	CENTRIFUGAL ROOF	EXHAUST	BELT	360	1.75	.25	460/3PH	2,113	175	GREENHECK 9-BISW-21	SEE NOTES 1,2,3
EF-5	RECEIVING	CENTRIFUGAL ROOF	EXHAUST	BELT	1,050	2.00	.75	460/3PH	1,997	200	GREENHECK 12-BISW-21	SEE NOTES 1,2,3

- Notes:
- 1 FAN IS TO BY TYPE-A SPARK RESISTANT CONSTRUCTION.
 - 2 PROJECT PERFORMANCE REQUIREMENT IS SHOWN. BALANCING CONTRACTOR TO MAKE FAN DRIVE CHANGE AS NEEDED TO ACHIEVE FLOW RATE WITHOUT DAMPERING.
 - 3 PROVIDE WEATHER HOOD, SCROLL DRAIN WITH VALVE, ACCESS DOORS, SPRING ISOLATORS AND CORROSION RESISTANT FINISH

DIFFUSER, REGISTER AND GRILLE SCHEDULE

TAG NUMBER	NECK SIZE (INCHES)	MANUFACTURER	MODEL	TYPE	FACE	FRAME	DAMPER	FINISH	BLOW PATTERN	REMARKS
SD-1	12x12	TITUS	250	SQUARE	BLADE	SURFACE	ORDER W/OBD	WHITE	TWO WAY	

METRO SOUTH HHW HVAC UPGRADE
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Drawn By: B. YOSHIMORI
 Sheet Title:
 MECHANICAL SCHEDULES
 Sheet Number:
M-602
 Proj No: CC09065



ABBREVIATIONS

ELECTRICAL LEGEND

GENERAL NOTES

A, AMP	AMMETER, AMPERE	M	MAG CONTACTOR, COIL OR CONTACT
AB	ABSOLUTE	MAX	MAXIMUM
AC	ALTERNATING CURRENT	MBS	MAINTENANCE BYPASS SWITCH
ACB	AIR CIRCUIT BREAKER	MCB	MAIN CIRCUIT BREAKER
AF	AMPERE FRAME	MCC	MOTOR CONTROL CENTER
AFD	ADJUSTABLE FREQUENCY DRIVE	MCCB	MOLDED CASE CIRCUIT BREAKER
AFF	ABOVE FINISHED FLOOR	MCP	MOTOR CIRCUIT PROTECTOR
AIC	AMPS INTERRUPTING CURRENT	MDC	MOTORIZED DAMPER CONTROL
ANN	ANNUNCIATOR	MFR	MANUFACTURER
ARF	ABOVE RAISED FLOOR	MH	MANHOLE
AS	AMMETER SWITCH	MIN	MINIMUM
AT	AMP TRIP	MLO	MAIN LUGS ONLY
ATS	AUTOMATIC TRANSFER SWITCH	MMP	MECHANICAL MOUNTING PANEL
ATX	AUTO TRANSFORMER	MO	MOTOR OPERATOR
AWG	AMERICAN WIRE GAUGE	MS	MOTOR STARTER
		MSP	MOTOR STARTER PANEL
		MT, MTD	MOUNT, MOUNTED
B	BELL	(N)	NEW
BC	BARE COPPER	N	NEUTRAL
BFF	BELOW FINISHED FLOOR	NA	NON-AUTOMATIC
BG	BULK GAS	N.C.	NORMALLY CLOSED
BKR	BREAKER	N.E.	NORTH EAST
BLDG	BUILDING	NEC	NATIONAL ELECTRICAL CODE
BMS	BUILDING MANAGEMENT SYSTEM	NEMA	NATIONAL ELECTRIC MANUFACTURERS ASSOCIATION
BOC	BOTTOM OF CONDUIT	NIC	NOT IN CONTRACT
BOD	BOTTOM OF DUCT	NL	NIGHT LIGHT
BOP	BOTTOM OF PIPE	N.O.	NORMALLY OPEN
BOT	BOTTOM OF TRAY	NP	NAMEPLATE
BRN	BUS REFERENCE NO. (ENGINEERING STUDY USE)	NTS	NOT TO SCALE
BT	BASIC TRANSPOUNDER	N.W.	NORTH WEST
C	CONDUIT, COIL	OCB	115KV OIL CIRCUIT BREAKER
CAP	CAPACITOR	OFCl	OWNER FURNISHED, CONTRACTOR INSTALLED
CAT. #	CATALOG NUMBER	OFOI	OWNER FURNISHED, OWNER INSTALLED
CB	CIRCUIT BREAKER	OL	OVERLOAD RELAY
CC	CONTROL CABLE	OO	ON-OFF
CCTV	CLOSED CIRCUIT TELEVISION	OOA	ON-OFF-AUTO
CCT, CKT	CIRCUIT	OOR	ON-OFF-REMOTE
CLK	CLOCK	OPD	OPEN POLE DETECTOR
CO	CONDUIT ONLY	P	POWER
CONT	CONTINUED	PF	POWER FACTOR
CPT	CONTROL POWER TRANSFORMER	PL	PILOT LIGHT
CR	CONTROL RELAY	PLS	PLUSH/LOW TON SWITCH
CRE	CORROSION RESISTANT	PC	PHOTOCELL
CRS	COATED RIGID STEEL CONDUIT	PCP	PLANT CONTROL PANEL
CRMP	CLEAR ROOM WALL PANEL	PIN	PERSONAL ID NUMBER
CSFD	COMBINATION SMOKE, FIRE DAMPER	PIV	POST INDICATOR VALVE
CT	CURRENT TRANSFORMER	PNL	PANEL
D	DUCT	PQ	POWER QUALITY
DB	DUCT BANK	Ø, PH	PHASE
DC	DIRECT CURRENT	PVC	POLYVINYL CHLORIDE
DDC	DIRECT DIGITAL CONTROL	QTY	QUANTITY
DIA	DIAMETER	R	RATE OF RISE, RIGHT
DIV	DIVISION	(R)	RELOCATE
DWG	DRAWING	RCPT	RECEPTACLE
Δ	DELTA CONNECTED	RCY	RACWAY
E	EMPTY	(RD)	REDUNDANT
(E)EX	EXISTING	RF	RADIO FREQUENCY
ECS	EMERGENCY COMMAND STATION	RGS	RIGID GALVANIZED STEEL
EDF	ELECTRIC DRINKING FOUNTAIN	RM	ROOM
EEW	ENERGIZED ELECTRICAL WORK	RMS	ROOM MEAN SQUARE
EG	ENGINE GENERATOR	RGD	REQUIRED
EL	ELEVATION	RTM	RUNNING TIME METER
ELEC	ELECTRICAL	RVNR	REDUCED VOLTAGE NON-REVERSING
EMEMER	EMERGENCY	RVR	REDUCED VOLTAGE REVERSING
EMH	ELECTRICAL MANHOLE	S	SPEAKER
EPO	EMERGENCY POWER OFF	S.C.	SHORT CIRCUIT
EMT	ELEC METALLIC TUBING	SCP	SECURITY CONTROL PANEL
ENT	ELEC NON-METALLIC TUBING	S.E.	SOUTH EAST
EOL	END-OF-LINE DEVICE	SEC	SECONDS
ERT	EMERGENCY RESPONSE TEAM	SES	SERVICE ENTRANCE SUBSTATION
ESD	ELECTROSTATIC DISCHARGE	SFEP	SMOKE/FUME EXHAUST PANEL
ESER	EMER SERVICE ENTRANCE SUBSTATION	SO	SWITCH OPERATOR
ET	EXPANDED TRANSPOUNDER	SOL	SLOW SPEED OL RELAY
ETM	ELAPSED TIME METER	SP	SPARE
EWC	ELECTRIC WATER COOLER	SS	STAINLESS STEEL
F	FLUSH	ST	SHUNT TRIP
(F)	FUTURE	STC	SOURCE TRANSFER CONTROL
FA	FIRE ALARM	STD	STANDARD
FACP	FIRE ALARM CONTROL PANEL	SUPP	SUPPRESSOR
FBO	FURNISHED BY OTHERS	SUR	SURFACE
FCS	FACILITY CONTROL SYSTEM	SW	SWITCH
FDR	FEDDER	S.W.	SOUTH WEST
FLR	FLOOR	SWBD	SWITCHBOARD
FOL	FAST ACTING OL RELAY	SWGR	SWITCHGEAR
FU	FUSE	SYM	SYMMETRICAL
FWS	FIRE WATER STORAGE	SYNC	SYNCHRONIZER
FVNR	FULL VOLTAGE NON-REVERSING	2S1W	TWO SPEED, ONE WINDING
FVR	FULL VOLTAGE REVERSING	2S2W	TWO SPEED, TWO WINDING
GND	GROUND	T	TEMPORARY
GEN	GENERAL	TSTAT	THERMOSTAT
GFCI	GROUND FAULT CIRCUIT INTERRUPTER	TB	TERMINAL BLOCK
GFR	GROUND FAULT RELAY	TBD	TO BE DETERMINED
GSM	GAS SAFETY MONITOR	TC	TIME CLOCK
H	HORN	TDR	TIME DELAY RELAY
HH	HANDHOLE	TJB	TERMINAL JUNCTION BOX
HID	HIGH INTENSITY DISCHARGE	TS	TAMPER SWITCH
HOA	HAND-OFF-AUTOMATIC	TSP	TWISTED SHIELDED PAIR
HVAC	HEATING, VENTILATING & AIR CONDITIONING	TYP	TYPICAL
HB	HORIZONTAL BEND	U	UNDERGROUND
HP	HORSEPOWER	UPS	UNINTERRUPTIBLE POWER SUPPLY, EXPLOSION PROOF - TYPE, CLASS AND GROUP AS NOTED
ICCB	INSULATED CASE CIRCUIT BREAKER	V	VOLTMETER, VOLT
I.D.	IDENTIFICATION	VA	VOLT-AMPERE
IER	INTEGRATED EQUIPMENT RATING	VESDA	VERY EARLY SMOKE DETECTION APPARATUS
IBC	INSTRUMENTATION AND CONTROL	VFD	VARIABLE FREQUENCY DRIVE
IMC	INTERMEDIATE METALLIC CONDUIT	VIB	VERTICAL INSIDE BEND
I/O	INPUT/OUTPUT	VLF	VERTICAL LAMINAR FLOW UNIT
IS	CURRENT SWITCH	VOB	VERTICAL OUTSIDE BEND
J, JB	JUNCTION BOX	VP	VAPORPROOF
K	KEY INTERLOCK	VS	VOLTMETER SWITCH
KCMIL	1000 CIRCULAR MIL	VT	VOLTAGE TRANSFORMER
KV	KILOVOLT	W	WATT, WIRE
KVA	KILOVOLT-AMPERE	WHD	WATTHOUR DEMAND METER
KVAR	KILOVAR	WP	WEATHERPROOF
KW	KILOWATT	X, (X)	REMOVE
KWH	KILOWATT HOUR	XFMR	TRANSFORMER
L	LEFT	Y	WYE-CONECTED
LAN	LOCAL AREA NETWORK	Z	IMPEDANCE
LC	LIGHTING CONTACTOR	ZSD	UNBALANCED IMPEDANCE DETECTOR
LTG	LIGHTING		
LV	LOW VOLTAGE		
LVR	LOW VOLTAGE RELAY		

SYMBOL	DESCRIPTION
OUTLETS	
	DUPLEX RECEPTACLE (120V)
	DEDICATED DUPLEX RECEPTACLE (120V)
	WEATHERPROOF RECEPTACLE
	GROUND FAULT RECEPTACLE
	ISOLATED GROUND RECEPTACLE
	RECEPTACLE ABOVE COUNTER
	HALF SWITCHED RECEPTACLE
	DOUBLE DUPLEX RECEPTACLE
	FLUSH FLOOR RECEPTACLE, DUPLEX
	SPECIAL EQUIPMENT RECEPTACLE
	LOCKING RECEPTACLE
	TELEPOWER POLE (T-TELEPHONE, P-POWER, C-COMPUTER)
	JUNCTION BOX
	WALL JUNCTION BOX
	PULL (JUNCTION) BOX
	UNDER FLOOR WALL JUNCTION BOX
	UNDER FLOOR BOX WITH DOUBLE DUPLEX AND TELEDATA
SWITCHES	
	SINGLE-POLE SWITCH
	SINGLE-POLE SWITCH WITH SWITCH LEG
	DOUBLE-POLE SWITCH
	THREE-WAY SWITCH
	FOUR-WAY SWITCH
	SWITCH WITH PILOT LIGHT
	COMBINATION SWITCH/DUPLEX RECEPTACLE
	LOW-VOLTAGE SWITCH, NUMBER AS SHOWN
	LOCKING SWITCH
	SINGLE-POLE DIMMER SWITCH
	SINGLE-POLE FLUORESCENT DIMMER SWITCH
	KEY SWITCH
	WEATHERPROOF SWITCH
	TIME SWITCH
	OCCUPANCY SENSOR
	WALL MOUNTED OCCUPANCY SENSOR
	PHOTOELECTRIC LIGHT SENSOR
MECHANICAL	
	MOTOR AND CONNECTION, HP SHOWN
	CEILING EXHAUST FAN
	WALL TYPE EXHAUST FAN, HP SHOWN
	PIPE HEAT TRACE
	ELECTRIC UNIT HEATER
	ELECTRIC BASEBOARD HEATER
	ELECTRIC TOEKICK HEATER
	WATER HEATER
TELE/ATA	
	TELEPHONE JACK, 4SQ BOX WITH SINGLE GANG MUD RING MOUNT @ +18" AFF (1-CAT5e) UNO
	TELE/ATA JACK, 4SQ BOX WITH SINGLE GANG MUD RING MOUNT @ +18" AFF UNO (2-CAT5e) UNO
	DATA JACK, 4SQ BOX WITH SINGLE GANG MUD RING MOUNT @ +18" AFF UNO (2-CAT5e) UNO
FIXTURES	
	SURFACE FLUORESCENT FIXTURE WITH BOX
	FLUORESCENT STRIP FIXTURE, NORMAL
	FLUORESCENT STRIP FIXTURE, EMERGENCY
	NIGHT LIGHT ON EMERGENCY
	2' x 2' PARABOLIC LIGHT FIXTURE ON EMERGENCY
	2' x 2' PARABOLIC LIGHT FIXTURE ON NORMAL
	PRISMATIC LIGHT FIXTURE
	DOWNLIGHT OR GENERAL FIXTURE
	DOWNLIGHT ON EMERGENCY
	EXIT SIGN WITH FOOT INDICATES WALL MOUNTED
	DARKENED SEGMENT INDICATES NUMBER OF AND DIRECTION OF EXIT FACE(S)
	DOORWAY OR WALL MOUNTED LIGHT
	SINGLE FACE, WALL MOUNTED (E1)
	SINGLE FACE, CEILING STEM MOUNTED WITH SINGLE DIRECTION (E1)

SYMBOL	DESCRIPTION
FIXTURES CONTINUED	
	DOUBLE FACE, CEILING STEM MOUNTED (E2)
	DOUBLE FACE, WALL MOUNTED ON EDGE WITH BOTH SIDES DIRECTION MARKED (E2)
	POLE MOUNTED FIXTURE
	WALLPACK FIXTURE
	EMERGENCY EGRESS LIGHT (NUMBER OF HEADS SHOWN)
	SITE BOLLARD FIXTURE
CIRCUITRY AND RACEWAYS	
	CONDUIT DOWN
	CONDUIT UP
	CONDUIT, CAP AND STAKE
	HOME RUN (WITH CIRCUIT NUMBERS)
	END OF CONDUIT RUN
	"RUN CONTINUES" INDICATION
	WIREMOLD #500 UNLESS NOTED
	PLUGMOLD #V20GB612 UNLESS NOTED
	#12 GROUND
	#12 GROUND, ISOLATED
	#12 AWG HOT
	#12 AWG NEUTRAL
	#3/10 AWG CONDUCTORS (1 NEUTRAL, 1 HOT, 1 GROUND)
	SWITCHED CONDUCTOR
SERVICE AND EQUIPMENT	
	TRANSFORMER (KVA SHOWN)
	NONFUSED DISCONNECT SWITCH, AMPERAGE INDICATED, SEE NOTE F.
	FUSED DISCONNECT SWITCH, AMPERAGE INDICATED, SEE NOTE F.
	ENCLOSED CONTACTOR, MAGNETIC, AMPERAGE INDICATED. SEE NOTES F AND G.
	ENCLOSED STARTER, MAGNETIC, NEMA SIZE INDICATED. SEE NOTES F AND G.
	ENCLOSED STARTER, COMBINATION MAGNETIC, NEMA SIZE INDICATED SEE NOTES F AND G.
	PANELBOARD, FLUSH MOUNTED
	PANELBOARD, SURFACE MOUNTED
	UTILITY METER, AS REQUIRED
	CURRENT TRANSFORMERS (WITH POTENTIAL TRANSFORMERS WHERE REQUIRED)
	GROUND
	CIRCUIT BREAKER, THERMAL MAGNETIC OR SOLID
	TELEPHONE TERMINAL BOARD
	VARIABLE FREQUENCY DRIVE
CONTROL	
	THERMOSTAT
	HUMIDISTAT
	PHOTOCELL
	TIME CLOCK
	PUSHBUTTON STATION
FIRE ALARM	
	SMOKE DETECTOR
	SMOKE DETECTOR, 120V
	HEAT DETECTOR, RATE OF RISE
	DUCT DETECTOR
	HORN
	STROBE ONLY
	EVACUATION STROBE
	FIRE ALARM CONTROL PANEL
	ANNUNCIATOR PANEL
	MAGNETIC DOOR HOLDER
	FIREFIGHTER COMMUNICATION JACK
	FIRE ALARM PULL STATION
	FLOW SWITCH
	TAMPER SWITCH
	EVACUATION PULL STATION
	BREAK GLASS MANUAL SHUT-OFF SWITCH.
	FIRE SMOKE DAMPER
	CEILING MOUNTED SPEAKER/STROBE, CANDELLA AS NOTED
	EVACUATION SPEAKER/STROBE CANDELLA AS NOTED

GENERAL NOTES

- THIS IS A STANDARD LEGEND SHEET. SOME SYMBOLS OR ABBREVIATIONS MAY APPEAR ON THIS SHEET AND NOT ON THE PROJECT DRAWINGS.
- CONDUIT RUNS MARKED WITH CROSSHATCHES INDICATE NUMBER OF #12 AWG CONDUCTORS. CROSSHATCH WITH DOT INDICATES GROUND WIRE. SIZE CONDUIT ACCORDING TO SPECIFICATIONS AND APPLICABLE CODES UNLESS OTHERWISE NOTED.
- TAG NUMBER DENOTES DEVICE ADDRESS.
- CONDUCTORS AND CONDUIT ARE SIZED ON BASIS OF COPPER, THHN/THWN. CIRCUITS THROUGH 100A SIZED ON BASIS OF 60°C. CIRCUITS GREATER THAN 100A SIZED ON BASIS OF 75°C, UNLESS NOTED OTHERWISE.
- MOUNTING PER MANUFACTURER'S SPECIFICATIONS UNLESS INDICATED OTHERWISE. REFER TO PLAN DRAWINGS AND SECTIONS FOR MOUNTING HEIGHTS.
- NEMA 1 UNLESS INDICATED OTHERWISE:
 3R=NEMA 3R, X=EXPLOSIONPROOF
 4X=NEMA 4X, WP=WEATHERPROOF
- SEE CONTROL DIAGRAMS FOR OPERATIONAL SCHEMATIC.
- LUMINAIRE SYMBOLS SHOWN ARE GENERIC GRAPHIC REPRESENTATIONS. REFER TO LUMINAIRE SCHEDULE FOR SPECIFIC SOURCE, TYPE & MOUNTING.
- ELECTRICAL CONTRACTOR SHALL PROVIDE (FURNISH AND INSTALL) ALL ELECTRICAL COMPONENTS, SUPPORT AND TERMINATIONS UNLESS NOTED OTHERWISE.
- ELECTRICAL CONTRACTOR SHALL MAINTAIN UPDATED PANEL SCHEDULES DURING PROJECT AND PROVIDE FINAL TYPE WRITTEN SCHEDULES AT END OF PROJECT ENGINEER AND PLACE COPY IN POWER PANEL.
- CONTRACTOR SHALL WALK PROJECT AREA PRIOR TO BID. TIME AND MATERIALS REQUIRED DUE TO DIFFICULTY OF ROUTING AND IMPACTS TO BUILDING CONSTRUCTION THAT ARE VISIBLE AT TIME OF WALK SHALL BE INCLUDED IN FINAL BID SUBMISSION. AREAS THAT CAN NOT BE VIEWED AT TIME OF BID SHALL BE SPECIFICALLY NOTED AND EXCLUDED IN BID FOR CONSTRUCTION IN AWARD PROCESS.
- COORDINATE EQUIPMENT/DEVICE LOCATIONS WITH ARCHITECTURAL DRAWINGS.
- DEMOLITION SHALL INCLUDE REMOVAL OF CONDUIT, WIRE, BOXES AND HANGER SUPPORT BACK TO SOURCE.
- COORDINATE INSTALLATION WITH OTHER TRADES.

SPECIAL NOTES

- INTEGRATED EQUIPMENT RATING (IER) REFERS TO THE SHORT CIRCUIT RATING OF THE ELECTRICAL COMPONENT THAT HAS THE LOWEST SHORT CIRCUIT RATING.

PROJECT TITLE:
METRO SOUTH HHW HVAC UPGRADE

CLIENT:
METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

REV	DESCRIPTION	DATE	APPR	DAS
0	ISSUED FOR CONSTRUCTION	03/01/10		



Drawn By: B. YOSHIMORI

Sheet Title:
ELECTRICAL LEGEND ABBREVIATIONS AND GENERAL NOTES

Sheet Number:
E-001

Proj No: CC09065

CONDUCTOR COLOR CODES

CONDUCTOR	208/120V, 240/120V	480/277V	ABOVE 600V
PHASE A	BLACK	BROWN	RED
PHASE B	RED	ORANGE	BLUE
PHASE C	BLUE	YELLOW	BLACK
NEUTRAL	WHITE	GRAY	-
GROUND	GREEN	GREEN	-
ISO GROUND	GN/YL	GN/YL	-

ELECTRICAL SPECIFICATIONS

16050 BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

WORK INCLUDED

PROVIDE ALL ITEMS, ARTICLES, MATERIALS, EQUIPMENT, OPERATIONS AND/OR METHODS LISTED, MENTIONED, SHOWN AND/OR SCHEDULED IN THESE SPECIFICATIONS, INCLUDING ALL LABOR, SERVICES, PERMITS, FEES, UTILITY CHARGES AND INCIDENTALS NECESSARY TO PERFORM AND COMPLETE THE ELECTRICAL WORK DESCRIBED IN THIS DIVISION.

SEE THE CONTRACT CONDITIONS (GENERAL AND SUPPLEMENTARY) AND DIVISION 1 FOR REQUIREMENTS CONCERNING THIS DIVISION INCLUDING, BUT NOT LIMITED TO, SUBMITTALS, SUBSTITUTION REQUESTS, CHANGE ORDERS, MAINTENANCE MANUALS, COORDINATION, RECORD DRAWINGS, RECORD DOCUMENTS, PERMITS AND GUARANTEES.

RELATED WORK SPECIFIED ELSEWHERE

MECHANICAL EQUIPMENT MOTORS TO BE FURNISHED UNDER DIVISION 15 BUT CONNECTED UNDER THIS DIVISION. STARTERS TO BE MOUNTED AND CONNECTED BY THIS DIVISION, BUT FURNISHED BY DIVISION 15 UNLESS OTHERWISE NOTED ON THE ELECTRICAL DRAWINGS.

CONTROL WIRING FOR MECHANICAL EQUIPMENT BEYOND PROVISIONS SHOWN ON THE ELECTRICAL DRAWINGS SHALL BE PERFORMED UNDER DIVISION 15.

QUALITY ASSURANCE

DO ALL WORK IN ACCORDANCE WITH REGULATIONS OF THE SERVING ELECTRIC UTILITY, NATIONAL ELECTRICAL CODE, NATIONAL FIRE CODES, THE STATE AND LOCAL CODES AND ALL OTHER APPLICABLE CODES.

PROJECT CONDITIONS

CONTRACTOR SHALL INSPECT THE JOB SITE PRIOR TO BIDDING AND FAMILIARIZE HIMSELF WITH EXISTING CONDITIONS WHICH WILL AFFECT HIS WORK.

COORDINATE ALL ASPECTS OF PROJECT WITH THE OWNER'S REPRESENTATIVE. ALL WORK TO BE COORDINATED WITH OWNER PRIOR TO START OF WORK.

CONTRACTOR SHALL VERIFY WITH THE OWNER A LOCATION FOR STORAGE OF MATERIALS, SUPPLIES, TOOLS, RUBBISH, ETC. PRIOR TO START OF WORK.

ELECTRICAL CONTRACT DOCUMENTS INDICATE APPROXIMATE LOCATION OF OUTLETS, LIGHTING FIXTURES, ELECTRICAL EQUIPMENT, ETC. CONSULT THE OTHER TRADES TO AVOID CONFLICTS WITH EQUIPMENT, STRUCTURAL MEMBERS, ETC. MAKE ALL DEVIATIONS AS REQUIRED TO MAKE THE WORK CONFORM TO THE BUILDING AS CONSTRUCTED AND TO RELATED WORK OF OTHERS. MINOR RELOCATIONS ORDERED PRIOR TO INSTALLATION MAY BE MADE WITHOUT ADDED COST TO OWNER.

CALL TO THE ATTENTION OF THE ENGINEER ANY ERROR, OMISSION, CONFLICT OR DISCREPANCY IN SPECIFICATIONS. DO NOT PROCEED WITH ANY QUESTIONABLE ITEMS OF WORK UNTIL CLARIFICATION OF SAME HAS BEEN MADE.

UNDER NO CONDITIONS ARE BEAMS, GIRDERS, FOOTINGS OR COLUMNS TO BE CUT FOR ELECTRICAL ITEMS UNLESS SO NOTED IN SPECIFICATIONS OR WRITTEN APPROVAL OBTAINED FROM THE PROJECT MANAGER.

VERIFY THE PHYSICAL DIMENSIONS OF EACH ITEM OF ELECTRICAL EQUIPMENT TO FIT THE AVAILABLE SPACE AND PROMPTLY NOTIFY THE PROJECT MANAGER TO THE AVAILABLE SPACE AND TO THE ACCESS ROUTES THROUGH THE CONSTRUCTION.

PART 2 - PRODUCTS

MATERIALS

ALL MATERIALS SHALL BE NEW AND BEAR MANUFACTURER'S NAME, MODEL NUMBER, ELECTRICAL CHARACTERISTICS AND OTHER IDENTIFICATION. ALL EQUIPMENT TO BE U.L. APPROVED IF APPLICABLE.

MATERIAL AND EQUIPMENT SHALL BE STANDARD PRODUCT OF MANUFACTURER REGULARLY ENGAGED IN PRODUCTION OF SIMILAR MATERIAL FOR AT LEAST FIVE YEARS (UNLESS SPECIFICALLY EXEMPTED) AND SHALL BE MANUFACTURER'S LATEST DESIGN.

DISCONNECTS

SAFETY AND DISCONNECT SWITCHES TO BE HEAVY DUTY QUICK-MAKE, QUICK-BREAK, DUAL RATED AND OF SUCH ELECTRICAL CHARACTERISTICS AS REQUIRED FOR THE LOAD SERVED. SWITCHES TO HAVE DEFEATABLE COVER INTERLOCK.

FUSE CLIPS SHALL ACCEPT CLASS R OR CLASS I FUSES IF REQUIRED. MOTOR RATED TOGGLE SWITCHES EQUAL TO HUBBELL #1221 MAY BE USED AS MOTOR DISCONNECTS IN DRY LOCATIONS.

DISCONNECT SWITCHES REQUIRED BY CODE SHALL BE INSTALLED WHETHER OR NOT SPECIFICALLY NOTED IN SPECIFICATIONS. DISCONNECT SWITCHES FOR REFRIGERATION EQUIPMENT AND MULTIPLE MOTOR HVAC EQUIPMENT SHALL BE FUSIBLE TYPE.

FUSES

PROVIDE FUSES AS INDICATED ON THE DRAWINGS, SIZED FOR NEC, OR AS REQUIRED BY THE EQUIPMENT MANUFACTURER, WHICHEVER PROVIDES MAXIMUM PROTECTIONS, FOR A FULLY OPERATIONAL SYSTEM.

ALL FUSES FURNISHED SHALL BE OF THE SAME MANUFACTURER.

ALL FUSES SHALL BE INSTALLED BY THE ELECTRICAL CONTRACTOR AT JOBSITE AND ONLY WHEN EQUIPMENT IS TO BE ENERGIZED. FUSES SHALL NOT BE INSTALLED DURING SHIPMENT.

ALL FUSES TO BE 200,000 AIC, CURRENT-LIMITING, U.L., TIME DELAY, DUAL-ELEMENT TYPE AS FOLLOWS:

FOR FEEDERS 601 AMPS AND ABOVE:
CLASS L, KRP-C, KLPC

FOR FEEDERS 600 AMPS AND LESS:
CLASS RK-1 FOR 600 VOLT; LPS-RK, LLS-RK
CLASS RK-1 FOR 250 VOLT LPN-RK, LLN-RK
CLASS J, JHC, JTD

FOR MOTOR CIRCUITS BEYOND THE MAIN AND SUB-DISTRIBUTED BOARDS, 600 VOLT AND BELOW:
CLASS RK-5 FOR 600 VOLT; FRS-R, FLS-R
CLASS RK-5 FOR 250 VOLT; FRN-R, FLN-R

PROVIDE NOT LESS THAN THREE (3) SPARE FUSES OF ANY ONE SIZE AND TYPE

IF THE ELECTRICAL CONTRACTOR WISHES TO FURNISH MATERIALS OTHER THAN THOSE SPECIFIED, A WRITTEN REQUEST, ALONG WITH A COMPLETE SHORT CIRCUIT AND SELECTIVE COORDINATION STUDY, SHALL BE SUBMITTED TO THE ENGINEER FOR EVALUATION AT LEAST 14 DAYS PRIOR TO THE BID DATE. IF THE ENGINEER'S EVALUATION INDICATES ACCEPTANCE, A WRITTEN ADDENDUM WILL BE ISSUED LISTING THE OTHER ACCEPTABLE MANUFACTURER.

BOXES

OUTLET AND JUNCTION BOXES SHALL BE SIZED IN ACCORDANCE WITH CODE REQUIREMENTS. MINIMUM 20 CUBIC INCHES.

UNLESS OTHERWISE SPECIFIED OR SHOWN ON THE DRAWINGS, ALL OUTLET BOXES FOR NEW WORK SHALL BE GALVANIZED STEEL KNOCKOUT, OUTLET BOXES. GANGABLE BOXES ARE NOT ACCEPTABLE. OUTLET BOXES SHALL NOT BE SMALLER THAN 4 INCHES SQUARE AND 1-1/2 INCHES IN DEPTH, UNLESS OTHERWISE NOTED. ALL OUTLET BOX COVERS, RINGS, OR OTHER FITTINGS SHALL BE GALVANIZED. BOXES WHICH ARE EXPOSED TO THE WEATHER SHALL BE CAST METAL AND WEATHERPROOF.

OUTLET BOXES SHALL BE DESIGNED FOR THE INTENDED USE, AND SHALL BE INSTALLED FLUSH WITH FINISH SURFACE LINES OR NOT MORE THAN 1/8 INCH BACK AND SHALL BE LEVEL AND PLUMB. LONG SCREWS WITH SPACES OR SHIMS FOR MOUNTING DEVICES ARE NOT ACCEPTABLE. NO COMBUSTIBLE MATERIALS SHALL BE INSTALLED TO PROVIDE PROTECTION FROM PHYSICAL DAMAGE.

OUTLET BOXES ON OPPOSITE SIDES OF FIRE RATED PARTITIONS SHALL HAVE A MINIMUM HORIZONTAL SEPARATION OF 24 INCHES. BACK-TO-BACK BOXES ARE NOT PERMITTED IN ANY WALLS.

PART 3 - EXECUTION

GENERAL INSTALLATION METHODS

CUTTING OR NOTCHING SHALL BE KEPT TO AN ABSOLUTE MINIMUM AND DONE ONLY AS AUTHORIZED BY THE PROJECT MANAGER. PATCH AND MATCH FINISHED SURFACES DAMAGED BY ELECTRICAL WORK.

PANELS, CABINETS AND EQUIPMENT SHALL BE LEVEL AND PLUMB AND INSTALLED PARALLEL WITH STRUCTURAL BUILDING LINES. ALL EQUIPMENT AND ENCLOSURES SHALL FIT NEATLY WITHOUT GAPS, OPENINGS, OR DISTORTIONS. PROVIDE APPROVED DEVICES FOR CLOSING ALL UNUSED OPENINGS.

ARRANGE CIRCUIT WIRING AS SHOWN ON THE DRAWINGS AND DO NOT ALTER OR COMBINE RUNS OR HOME RUNS WITHOUT THE SPECIFIC APPROVAL OF THE ENGINEER. FEEDER RUNS SHALL NOT BE RECOMBINED OR ALTERED.

CONTRACTORS, TRANSFORMERS, STARTERS AND SIMILAR NOISE-PRODUCING DEVICES SHALL NOT BE PLACED ON WALLS COMMON TO OCCUPIED SPACE.

BALLASTS, CONTACTORS, STARTERS, TRANSFORMERS AND LIKE EQUIPMENT WHICH ARE FOUND TO BE NOTICEABLY NOISIER THAN OTHER SIMILAR EQUIPMENT ON THE PROJECT WILL BE CONSIDERED DEFECTIVE AND SHALL BE REPLACED.

IN GENERAL, THE MOUNTING HEIGHTS SHALL BE AS LISTED BELOW. WHERE NO HEIGHTS ARE INDICATED, REQUEST CLARIFICATION FROM THE ENGINEER. ALL DIMENSIONS ARE TO THE CENTER OF THE DEVICE UNLESS OTHERWISE NOTED. LIGHTING DIMENSIONS ARE TO THE BOTTOM OF SUSPENDED FIXTURES AND CENTER OF WALL-MOUNTED FIXTURES UNLESS OTHERWISE NOTED.

LIGHT SWITCHES 48 INCHES
CONVENIENCE RECEPTACLES 18 INCHES
PANEL BOARD TOP 72 INCHES

ALL ELECTRICAL WALL PLATES, THERMOSTATS, OR OTHER SIMILAR WALL-MOUNTED DEVICES, IF MEASURED WITHIN 18 INCHES HORIZONTALLY FROM EACH OTHER, SHALL BE VERTICALLY STACKED AND ALIGNED UNLESS OTHERWISE INDICATED.

WHERE RACEWAYS PENETRATE FLOORS, CEILINGS AND FIRE WALLS, PROVIDE FIRE STOPPING TO MAINTAIN INTEGRITY OF THE FIRE ASSEMBLY. FIRE STOPPING METHOD SHALL BE APPROVED BY THE CODE AUTHORITY HAVING JURISDICTION.

ALL MATERIALS AND EQUIPMENT SHALL BE PROPERLY AND ADEQUATELY SUPPORTED FROM THE BUILDING STRUCTURE EXCEPT WHERE CEILING CONSTRUCTION OR OTHER PROVISIONS ARE SPECIFICALLY DESIGNED TO SUPPORT THEM. SUPPORT SYSTEMS SHALL PROVIDE A SAFETY FACTOR OF FOUR. THIS SHALL APPLY TO CHAINS, HANGERS, ANCHORS, CLAMPS, SCREWS, STRUCTURAL IRON AND ALL OTHER HARDWARE AND APPURTENANCES ASSOCIATED WITH THE SUPPORT SYSTEM. PROVIDE LOAD CALCULATIONS AND DETAILS OF SUPPORT WHERE REQUIRED BY LOCAL REVIEW AGENCY.

NO CONDUIT SHALL BE INSTALLED ON OUTSIDE OF EXTERIOR WALLS WITHOUT PRIOR WRITTEN APPROVAL OF THE OWNER.

LABELING

CLEARLY AND PROPERLY LABEL THE NEW ELECTRICAL EQUIPMENT TO INDICATE THE LOADS SERVED OR THE FUNCTION OF EACH ITEM OF EQUIPMENT PROVIDED UNDER THIS WORK.

NAMEPLATES SHALL BE 1/16 INCH THICK, LAMINATED THREE-PLY PLASTIC, CENTER-PLY WHITE, OUTER-PLY BLACK "LAMICOID" OR EQUAL. LETTERS SHALL BE FORMED BY ENGRAVING OUTER PLY, EXPOSING WHITE CENTER-PLY. NAMEPLATES SHALL BE SECURED WITH SCREWS.

PROVIDE A MASTER NAMEPLATE AT THE MAIN DISTRIBUTION TO IDENTIFY THE PROJECT, THE CONTRACTOR AND THE DATE. CLEARLY LABEL SWITCHBOARDS WITH ENGRAVED NAMEPLATES TO IDENTIFY EACH LOAD SERVED.

CLEARLY LABEL WITH ENGRAVED NAMEPLATES TO IDENTIFY EACH NEW LOAD SERVED AT MAIN DISTRIBUTION PANEL AND PANEL BOARDS.

LABEL ALL ELECTRICAL CONTACTORS, RELAYS, TIME SWITCHES, TRANSFORMERS, ETC. WITH AN ENGRAVED NAMEPLATE CORRESPONDING TO THE LABELING IN THE MAIN, OR BRANCH PANEL SERVING THE DEVICE OR APPARATUS.

PROVIDE REMOVABLE TYPEWRITTEN BRANCH PANEL SCHEDULES WITH PROTECTIVE CLEAR, TRANSPARENT COVERS ACCOUNTING FOR EVERY BREAKER INSTALLED. USE ACTUAL ROOM DESIGNATIONS ASSIGNED BY NAME OR NUMBER NEAR COMPLETION OF THE WORK.

IDENTIFY BRANCH PANELS WITH ENGRAVED NAMEPLATE CORRESPONDING WITH DISTRIBUTION PANEL LABELING. MOUNT LABELS INSIDE DOOR FOR FLUSH PANELS AND ON THE FACE OF THE DOOR FOR SURFACE PANELS. NO BRAND LABELS OR OTHER MARKING SHALL BE ON THE OUTSIDE OF THE PANELS. WHERE CHANGES ARE MADE IN EXISTING PANELS, DISTRIBUTION BOARDS, ETC. PROVIDE NEW LABELING AND SCHEDULES TO ACCURATELY REFLECT THE CHANGES.

PROVIDE COVER PLATE LABELS FOR EACH NEW RECEPTACLE AND SWITCH INDICATING PANEL AND CIRCUIT FED FROM, EXCEPT AS OTHERWISE PERMITTED. PROVIDE LAMICOID TYPE LABELS INDICATING PANEL AND CIRCUIT FED FROM FOR ALL OTHER LOADS SERVED. LETTERS SHALL BE 3/16 INCHES HIGH.

SAFETY

THE ENGINEER HAS NOT BEEN RETAINED TO PROVIDE DESIGN AND CONSTRUCTION REVIEW SERVICES RELATING TO THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, SEQUENCES OR PROCEDURES REQUIRED FOR THE CONTRACTOR TO PERFORM THE WORK.

GROUNDING

GROUND ALL ELECTRIC EQUIPMENT, RACEWAYS AND ENCLOSURES IN ACCORDANCE WITH CODE RULES AND ESTABLISHED SAFETY PRACTICES. PROVIDE A SINGLE GROUND BUS WHERE GROUNDING CONDUCTORS FROM THE AC GROUNDING SYSTEM GROUND RODS, GROUND GRIDS, WATER PIPES, MAIN SWITCHGEAR, ETC. MAY BE TERMINATED.

GROUNDING SHALL BE MADE AS DETAILED AND NOTED ON THE DRAWINGS. GROUNDS SHALL BE INSTALLED WHERE ACCESSIBLE FOR FUTURE INSPECTION AND SERVICING. WHERE GROUND CONNECTIONS ARE MADE IN INACCESSIBLE LOCATIONS, AN EXOTHERMIC WELD PROCESS, CADWELD OR EQUAL SHALL BE USED.

GROUND CONDUITS AND CABINETS FOR SIGNAL BY BONDING OR CONDUIT INTERCONNECTION WITH THE ELECTRICAL SYSTEM OR AS OTHERWISE SPECIFICALLY INDICATED ON THE DRAWINGS.

NO. 12 GROUNDING CONDUCTORS SHALL HAVE GREEN INSULATION.

BARE GROUNDING CONDUCTORS ARE UNACCEPTABLE, UNLESS NOTED ON DRAWINGS.

GROUNDING ELECTRODE AND MASTER GROUND BAR GROUNDING CONDUCTORS, WHERE ROUTED IN CONDUIT, SHALL BE ROUTED IN PVC SCHEDULE 40.

ISOLATED GROUND CONDUCTORS SHALL BE GREEN WITH YELLOW STRIPES.

ISOLATED GROUND BUSES SHALL BE USED ONLY FOR CONDUCTORS FROM ISOLATED GROUND RECEPTACLES. DO NOT BOND CONDUIT OR ENCLOSURES TO ISOLATED GROUND BUSES. ALL ISOLATED GROUND FEEDERS SHALL BE RUN BACK TO THE MAIN SERVICE GROUND BUS AND SHALL NOT TERMINATE IN INTERMEDIATE PANELS.

SEISMIC BRACING

ALL FREESTANDING SWITCHGEAR AND OTHER EQUIPMENT WEIGHING OVER 300 POUNDS SHALL BE FIRMLY BRACED TO BUILDING STRUCTURE. THE BRACING SHALL BE CAPABLE OF WITHSTANDING APPLICABLE SEISMIC ZONE FORCES.

ALL OVERHEAD FEEDER RUNS SHALL BE BRACED TO STRUCTURE AT INTERVALS NOT EXCEEDING 400 POUNDS OF FEEDER WEIGHT. BRACING SHALL BE CAPABLE OF MEETING APPLICABLE SEISMIC ZONE REQUIREMENTS.

EQUIPMENT CONNECTIONS

THE LOCATION AND METHOD FOR CONNECTING TO EACH ITEM OF EQUIPMENT SHALL BE VERIFIED PRIOR TO ROUGHING IN. THE VOLTAGE AND PHASE OF EACH ITEM OF EQUIPMENT SHALL BE CHECKED BEFORE CONNECTING. MOTOR ROTATIONS SHALL BE MADE IN THE PROPER DIRECTION. PUMP MOTORS ARE NOT TO BE TEST RUN UNTIL LIQUID IS IN THE SYSTEM AND PROPER LUBRICATION TO ALL BEARINGS IN UNIT IS CHECKED.

CONDUIT, WIRE AND CIRCUIT BREAKER SIZES FOR MECHANICAL AND SIMILAR EQUIPMENT ARE BASED ON THE EQUIPMENT RATINGS OF ONE MANUFACTURER. THE EQUIPMENT ACTUALLY FURNISHED MAY HAVE ENTIRELY DIFFERENT ELECTRICAL CHARACTERISTICS. CONDUIT, WIRE AND CIRCUIT BREAKERS SHALL NOT BE ORDERED OR INSTALLED UNTIL EXACT ELECTRICAL REQUIREMENTS ARE OBTAINED. RESPONSIBILITY FOR THIS COORDINATION RESTS WITH THE CONTRACTOR.

CHANGE ORDERS

AS PART OF THE CHANGE ORDER PROCESS, THE CONTRACTOR SHALL SUBMIT WITH HIS COST QUOTE FOR EACH CHANGE ORDER REQUEST A COMPLETE ITEMIZED BREAKDOWN COST OF MATERIALS, QUANTITY REQUIRED, LABOR UNITS FOR EACH ITEM, MISCELLANEOUS COSTS (ITEMIZED), OVERHEAD AND PROFITS, ETC., FOR REVIEW.

AT THE ENGINEER'S REQUEST, CONTRACTOR'S ESTIMATING SHEETS FOR THE SUPPLEMENTAL COST PROPOSALS SHALL BE MADE AVAILABLE TO THE ENGINEER. LABOR MUST BE SEPARATED FOR EACH ITEM OF WORK.

PROJECT RECORD DOCUMENTS

MAINTENANCE OF DOCUMENTS:

MAINTAIN AT JOBSITE, ONE RECORD COPY OF: CONTRACT DRAWINGS, SPECIFICATIONS, ADDENDA, REVIEWED SHOP DRAWINGS, CHANGE ORDERS, OTHER MODIFICATIONS TO CONTRACT AND FIELD TEST RECORDS.

RECORDING:

KEEP RECORD DOCUMENTS CURRENT. DO NOT PERMANENTLY CONCEAL ANY WORK UNTIL REQUIRED INFORMATION HAS BEEN RECORDED.

CONTRACT DRAWINGS, LEGIBLY MARK TO RECORD ACTUAL CONSTRUCTION; INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

DEPTHS OF VARIOUS ELEMENTS; LOCATIONS OF UNDERGROUND ITEMS, WITH DIMENSIONS TO BUILDING WALLS AND CORNERS; CHANGES OF DIMENSIONS AND DETAILS; CHANGES MADE BY ADDENDUM, FIELD ORDERS OR CHANGE ORDER.

SPECIFICATIONS AND ADDENDA; LEGIBLY MARK EACH SECTION TO RECORD CHANGES MADE BY ADDENDUM, FIELD ORDER OR CHANGE ORDER.

SUBMITTALS:

AT COMPLETION OF PROJECT, TRANSFER CHANGES TO CLEAN NEW PRINTS AND SPECIFICATIONS WHICH WILL BE SUPPLIED BY THE ENGINEER AND DELIVERED TO THE ENGINEER AS "AS-REPORTED AS-BUILTS".

COMPLETION

COMPLETE EACH SYSTEM AS SPECIFIED HEREIN AND PLACE IN OPERATION EXCEPT WHERE ONLY ROUGHING IN OR PARTIAL SYSTEMS ARE CALLED FOR. EACH SYSTEM SHALL BE TESTED AND LEFT IN PROPER OPERATION FREE OF FAULTS, SHORTS OR UNINTENTIONAL GROUNDS. DEMONSTRATE SYSTEM IN THE PRESENCE OF THE ENGINEER, THE OWNER OR THEIR REPRESENTATIVE WHEN REQUESTED.

SUBSTANTIAL COMPLETION INSPECTION

PRIOR TO SUBSTANTIAL COMPLETION, THE CONTRACTOR SHALL SUBMIT WRITTEN CERTIFICATION THAT:

CONTRACTOR HAS INSPECTED PROJECT FOR COMPLIANCE WITH CONTRACT DOCUMENTS AND THAT THE WORK HAS BEEN COMPLETED.

EQUIPMENT AND SYSTEMS HAVE BEEN TESTED AND ARE OPERATIONAL. PROJECT IS COMPLETED AND READY FOR INSPECTION.

ENGINEER/OWNER WILL MAKE INSPECTION AS SOON AS POSSIBLE AFTER RECEIPT OF CERTIFICATION.

THE ELECTRICIAN SHALL BE PRESENT AT INSPECTION TO REMOVE COVERS FOR PANELS, SWITCHBOARDS, DISCONNECT SWITCHES AND OTHER COVERS, AND IN GENERAL DEMONSTRATE OPERATION OF THE EQUIPMENT AND ANSWER QUESTIONS.

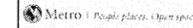
SHOULD ENGINEER CONSIDER THAT WORK IS FINALLY COMPLETE IN ACCORDANCE WITH CONTRACT DOCUMENT REQUIREMENTS, CONTRACTOR SHALL MAKE CONTRACT CLOSEOUT SUBMITTALS.

SHOULD OWNER/ENGINEER CONSIDER THAT WORK IS NOT FINALLY COMPLETE:

HE WILL SO NOTIFY CONTRACTOR/OWNER STATING REASONS.

CONTRACTOR SHALL TAKE IMMEDIATE STEPS TO REMEDY DEFICIENCIES, AND SEND SECOND WRITTEN NOTICE TO ENGINEER CERTIFYING THAT WORK IS COMPLETE.

END OF SECTION 16050



METRO SOUTH HHW HVAC UPGRADE

METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

PROJECT TITLE:
CLIENT:

REV	DESCRIPTION	DATE	APP	TPP					
0	ISSUED FOR CONSTRUCTION	03/01/10							

Drawn By: B. YOSHIMORI

Sheet Title:
ELECTRICAL SPECIFICATIONS

Sheet Number:

E-002

Proj No: CC09065

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

WORK INCLUDED

PROVIDE ALL RACEWAYS, WIREWAYS AND ASSOCIATED FITTINGS AS HEREIN SPECIFIED.

APPLICATION

EMT, RIGID GALVANIZED AND INTERMEDIATE METAL CONDUIT.

GALVANIZED RIGID CONDUIT (GRC) SHALL BE USED IN LOCATIONS SUBJECT TO MECHANICAL INJURY AND FOR SERVICE CONDUIT UNDER BUILDINGS OR CONCRETE SLABS AND IN EXTERIOR BUILDING LOCATIONS.

ELECTRIC METALLIC TUBING MAY BY USED ONLY IN DRY AND PROTECTED LOCATIONS.

FLEXIBLE METAL CONDUIT WILL BE PERMITTED ONLY WHERE FLEXIBILITY IS NECESSARY. EXCEPTIONS ARE CONNECTIONS TO RECESSED LIGHT FIXTURES AND WORK FISHED INTO EXISTING CONCEALED DRY LOCATIONS. FLEXIBLE METAL CONDUIT SHALL BE USED FOR CONNECTION TO ALL EQUIPMENT SUBJECT TO MOVEMENT OR VIBRATION SUCH AS MOTORS.

DRAWING NOTES REQUIRING A SPECIFIC TYPE OF RACEWAY SHALL TAKE PRECEDENCE OVER THE SPECIFICATIONS.

WHERE THE NATURE OF CONSTRUCTION (E.G., CONCRETE WALLS) DOES NOT ALLOW CONCEALING CONDUIT, SURFACE METAL RACEWAYS EQUAL TO WIREMOLD MAY BE USED IF SPECIFICALLY CALLED FOR ON THE DRAWINGS. SUCH INSTALLATION SHALL BE DIRECTED BY ENGINEER.

ELECTRICAL WIRING SHALL BE U.L. APPROVED RACEWAYS AND ENCLOSURES THROUGHOUT.

PART 2 - PRODUCTS

FITTINGS

RIGID AND INTERMEDIATE METAL CONDUIT SHALL BE COUPLED AND TERMINATED WITH THREADED FITTINGS. ENDS SHALL BE BUSHED WITH INSULATING BUSHINGS EQUAL TO T&B 200 SERIES.

CONNECTORS AND COUPLINGS FOR EMT SHALL BE CONCRETE TIGHT WITH INSULATED THROATS ON CONNECTORS. ALL FITTINGS SHALL BE STEEL. CONNECTORS LARGER THAN 1-1/4 INCHES SHALL BE T&B 200 SERIES WITH INSULATING BUSHING.

PART 3 - EXECUTION

INSTALLATION

PROVIDE PULL BOXES WHERE REQUIRED TO LIMIT THE NUMBER OF BENDS IN ANY RUN TO NOT MORE THAN THREE 90-DEGREE BENDS. USE CODE GAUGE GALVANIZED SHEET STEEL BOXES OF CODE REQUIRED SIZE WITH REMOVABLE COVERS, INSTALLED SO THAT COVERS WILL BE ACCESSIBLE AFTER WORK IS COMPLETED. VERIFY WITH THE ENGINEER ANY LOCATIONS IN FINISHED AREAS.

CONCEAL ALL WIRING IN FINISHED SPACES. ALL RACEWAYS (CONCEALED OR EXPOSED) SHALL BE PARALLEL TO STRUCTURAL LINES.

SUPPORT SUSPENDED FEEDER CONDUITS BY METAL RING OR TRAPEZE HANGERS WITH THREADED STEEL RODS. IF A LARGE NUMBER OF SUSPENDED FEEDERS ARE GROUPED TOGETHER, THE CONTRACTOR SHALL REVIEW THE LAYOUT WITH THE STRUCTURAL ENGINEER AND OBTAIN APPROVAL FOR THE PROPOSED LAYOUT.

EXPANSION JOINTS:

ALL CONDUITS 3 INCHES AND LARGER WHERE NOT CAST IN CONCRETE SHALL BE RIGIDLY SECURED TO THE BUILDING STRUCTURE ON OPPOSITE SIDES OF A BUILDING EXPANSION JOINT WITH AN EXPANSION-DEFLECTION FITTING ACROSS THE JOINT, EQUIVALENT TO OZGEDNEY AXDX, INSTALLED PER MANUFACTURER'S RECOMMENDATIONS.

ALL CONDUITS LESS THAN 3 INCHES WHERE NOT CAST IN CONCRETE SHALL BE PROVIDED WITH JUNCTION BOXES SECURELY FASTENED ON BOTH SIDES OF THE EXPANSION JOINT, CONNECTED TOGETHER WITH 15 INCHES OF SLACK (A MINIMUM OF 15 INCHES LONGER THAN THE STRAIGHT LINE LENGTH) FLEXIBLE CONDUIT WITH COPPER GREEN GROUND BONDING JUMPER. IN LIEU OF THIS FLEXIBLE CONDUIT, AN EXPANSION-DEFLECTION FITTING, AS INDICATED FOR CONDUITS 3 INCHES AND LARGER, MAY BE INSTALLED

SEISMIC JOINTS:

ALL CONDUITS SHALL BE PROVIDED WITH JUNCTION BOXES SECURELY FASTENED ON BOTH SIDES OF THE EXPANSION JOINT, CONNECTED TOGETHER WITH 15 INCHES OF SLACK (A MINIMUM OF 15 INCHES LONGER THAN THE STRAIGHT LINES LENGTH) FLEXIBLE CONDUIT WITH COPPER GREEN GROUND BONDING JUMPER. PRIOR TO INSTALLATION, VERIFY WITH ARCHITECT THAT THE 15 INCHES IS ADEQUATE FOR THE DESIGNED MOVEMENT, AND IF NOT, INCREASE THIS LENGTH AS REQUIRED.

PVC CONDUIT SHALL NOT BE INSTALLED LESS THAN 30 INCHES UNDER ROADWAYS OR AREAS SUBJECT TO HEAVY TRAFFIC. 90-DEGREE ELBOWS LARGER THAN 1 INCH SHALL BE GALVANIZED RIGID CONDUIT. PROVIDE A GROUND WIRE SIZED PER CODE IN ALL PVC CONDUITS. CONDUCTOR QUANTITIES INDICATED IN CONDUITS DO NOT INCLUDE GROUND WIRES UNLESS OTHERWISE NOTED.

CONDUITS PIERCING A BUILDING WATERPROOF MEMBRANE SHALL BE PROVIDED WITH FLANGES, USING TWO NEOPRENE WASHERS, ONE WASHER ON EACH SIDE OF MEMBRANE, BETWEEN EACH FLANGE AND MEMBRANE. WHERE ARCHITECTURAL DRAWINGS INDICATE A DIFFERENT METHOD, THIS METHOD SHALL TAKE PRECEDENCE.

RACEWAYS SHALL BE LEFT CLEAN AND FREE OF DEBRIS.

PROVIDE A PULL STRING IN ALL EMPTY CONDUITS.

END OF SECTION 16110

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

WORK INCLUDED

PROVIDE ALL WIRES AND CABLES AS HEREIN SPECIFIED AND SHOWN ON THE ASSOCIATED DRAWINGS.

QUALITY ASSURANCE

ALL WIRE AND CABLE SHALL CONFORM TO CODE AND SHALL MEET ALL ASTM SPECIFICATIONS.

PART 2 - PRODUCTS

MATERIALS

NO 10 AND 12 AWG CONDUCTORS SHALL BE TYPE "THHN" INSULATED, STRANDED OR SOFT DRAWN SOLID COPPER. NO. 8 AWG AND LARGER CONDUCTORS SHALL BE TYPE "XHHN" INSULATED, SOFT DRAWN, CLASS B STRANDED COPPER. MINIMUM CONDUCTOR SIZE SHALL BE NO. 12 AWG UNLESS OTHERWISE NOTED.

WHERE ADVERSE CONDUCTOR EXPOSURE EXISTS, CODE APPROVED INSULATION SUITABLE FOR THE CONDITIONS ENCOUNTERED SHALL BE USED UNLESS OTHERWISE NOTED.

WIRE AND CABLE SHALL BE NEW, SHALL HAVE GRADE OF INSULATION, VOLTAGE AND MANUFACTURER'S NAME PERMANENTLY MARKED ON OUTER COVERING AT REGULAR INTERVALS AND SHALL BE DELIVERED IN COMPLETE COILS OR REELS WITH IDENTIFYING SIZE AND INSULATION TAGS.

PART 3 - EXECUTION

SPLICES AND TERMINATIONS

SPLICES ARE TO BE MADE UP COMPLETE PROMPTLY AFTER WIRE INSTALLATION. SINGLE WIRE PIGTAILS SHALL BE PROVIDED FOR FIXTURE AND DEVICE CONNECTIONS. WIRENUTS MAY BE USED FOR FIXTURE WIRE CONNECTIONS TO SINGLE WIRE CIRCUIT CONDUCTOR PIGTAILS.

SPLICES SHALL UTILIZE SCOTCH "HYFLEX" OR "IDEAL" WING NUT CONNECTOR INSTALLED PROPERLY. SPLICES AND TERMINATIONS FOR NO. 8 AND LARGER WIRES MAY BE MADE WITH APPROVED PRESSURE-TYPE CONNECTORS EQUAL TO T&B SERIES 54000. ALL TAPED JOINTS SHALL BE WITH "SCOTCH 33" OR EQUAL, APPLIED IN HALF-LAP LAYERS WITH STRETCHING TO DEFORM

INSULATION SHALL BE REMOVED WITH A STRIPPING TOOL DESIGNED SPECIFICALLY FOR THAT PURPOSE. ALL CONDUCTORS SHALL BE LEFT NICK-FREE.

EMERGENCY SYSTEM FEEDERS OR CIRCUITS SHALL NOT BE SPLICED.

END OF SECTION 16120

SECTION 16140 - SWITCHES AND RECEPTACLES

PART 1 - GENERAL

WORK INCLUDED

PROVIDE ALL SWITCHES, RECEPTACLES AND OTHER DEVICES AS HEREIN SPECIFIED AND SHOWN ON THE ASSOCIATED DRAWINGS.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS

BRYANT, ARROW-HART, EAGLE, LAGRANDE, GENERAL ELECTRIC, LEVITON, HUBBELL AND P&S ARE ACCEPTABLE.

MATERIALS

THE FOLLOWING LIST OF WIRING DEVICES COVERS THE MOST COMMONLY SPECIFIED ITEMS AND ESTABLISHES THE GRADE OF DEVICE. SHOULD THE DRAWINGS INDICATE A DEVICE OTHER THAN THOSE LISTED HEREIN WITHOUT REFERENCE TO CATALOG NUMBER, SUCH DEVICE SHALL BE OF THE SAME GRADE AND MANUFACTURER AS LIKE DEVICES.

SINGLE POLE SWITCHES HUBBELL #1221
 DUPLEX RECEPTACLES HUBBELL #5362
 DUPLEX RECEPTACLES-ISOLATED GROUND HUBBELL #5362-IG

ALL WIRING DEVICES AND PLATES TO BE SPECIFICATION GRADE. RECEPTACLES SHALL BE MOUNTED VERTICALLY UNLESS OTHERWISE NOTED.

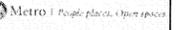
PART 3 - EXECUTION

LABELING

WHERE SWITCHES CONTROL REMOTE LIGHTING OR POWER OUTLETS, OR WHERE SWITCHES IN THE SAME OUTLET (TWO OR MORE) SERVE DIFFERENT PURPOSES, SUCH AS LIGHT, POWER, INTERCOM, ETC. OR DIFFERENT AREAS, SUCH AS CORRIDOR AND OUTSIDE, FURNISH ENGRAVED PLATES WITH 1/8 INCH BLACK LETTERS INDICATING FUNCTION OF EACH SWITCH OR OUTLET.

SEE SECTION 16050 FOR FURTHER REQUIREMENTS.

END OF SECTION 16140



PROJECT TITLE:
METRO SOUTH HHW HVAC UPGRADE
METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

CLIENT:
 METRO SOUTH STATION

REV	DESCRIPTION	DATE	APPR
0	ISSUED FOR CONSTRUCTION	03/01/10	DAS



Drawn By: B. YOSHIMORI

Sheet Title:
ELECTRICAL SPECIFICATIONS

Sheet Number:
E-003

Proj No: CC09065

GENERAL NOTES

A SEE SHEET E-001 FOR ELECTRICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES.

KEYED NOTES

1 DEMOLISH CONDUIT, CONDUCTORS AND SWITCH FOR EXHAUST SNORKEL BACK TO SOURCE.

METRO SOUTH HHV HVAC UPGRADE

METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

PROJECT TITLE:

CLIENT:

REV	DESCRIPTION	DATE	APPR	DAS
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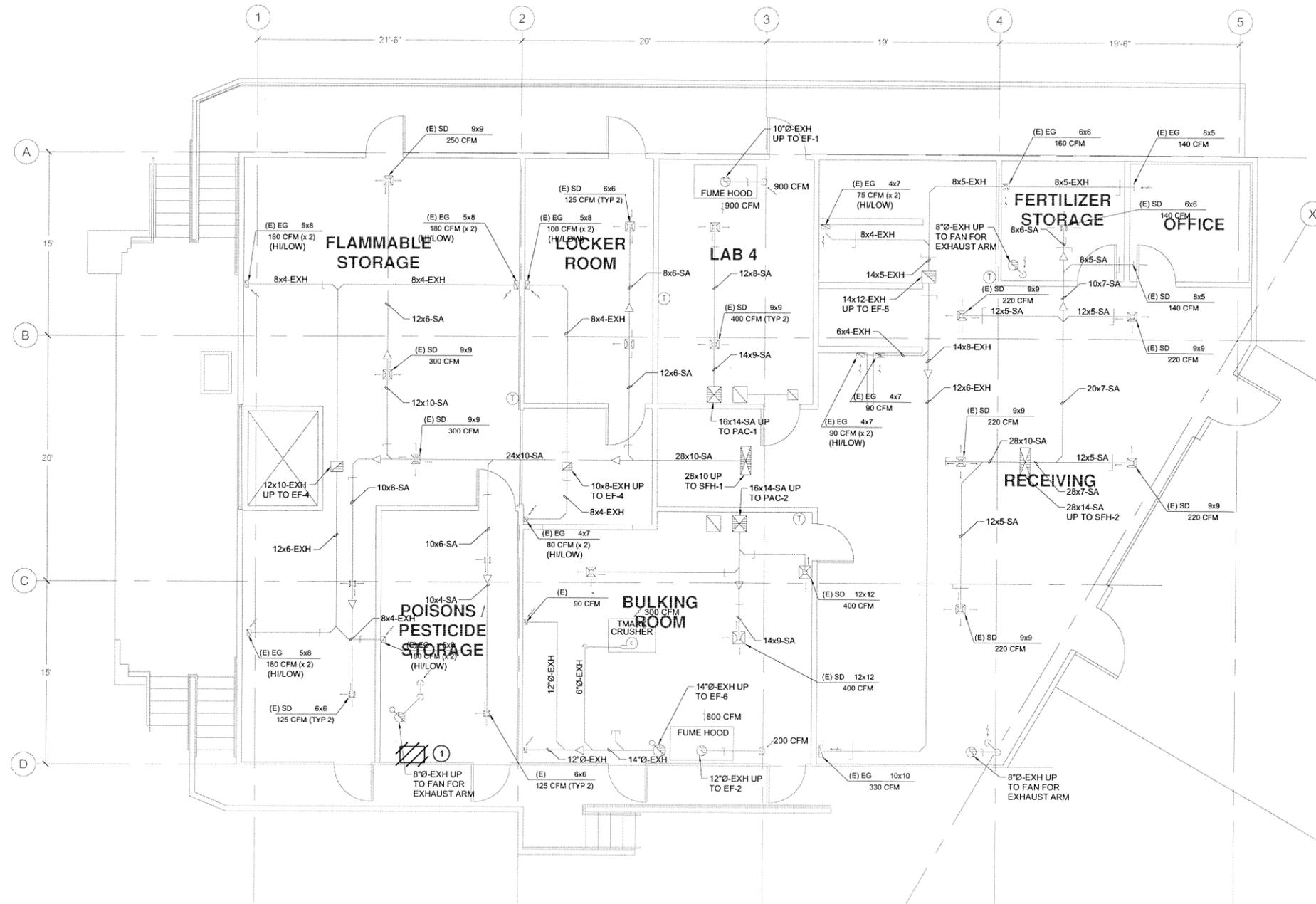
Drawn By: B. YOSHIMORI

Sheet Title:
ELECTRICAL
FIRST FLOOR
PLAN

Sheet Number:

E-101

Proj No: CC09065



1 FIRST FLOOR PLAN
E-101



EXPIRES: 6/30/2010

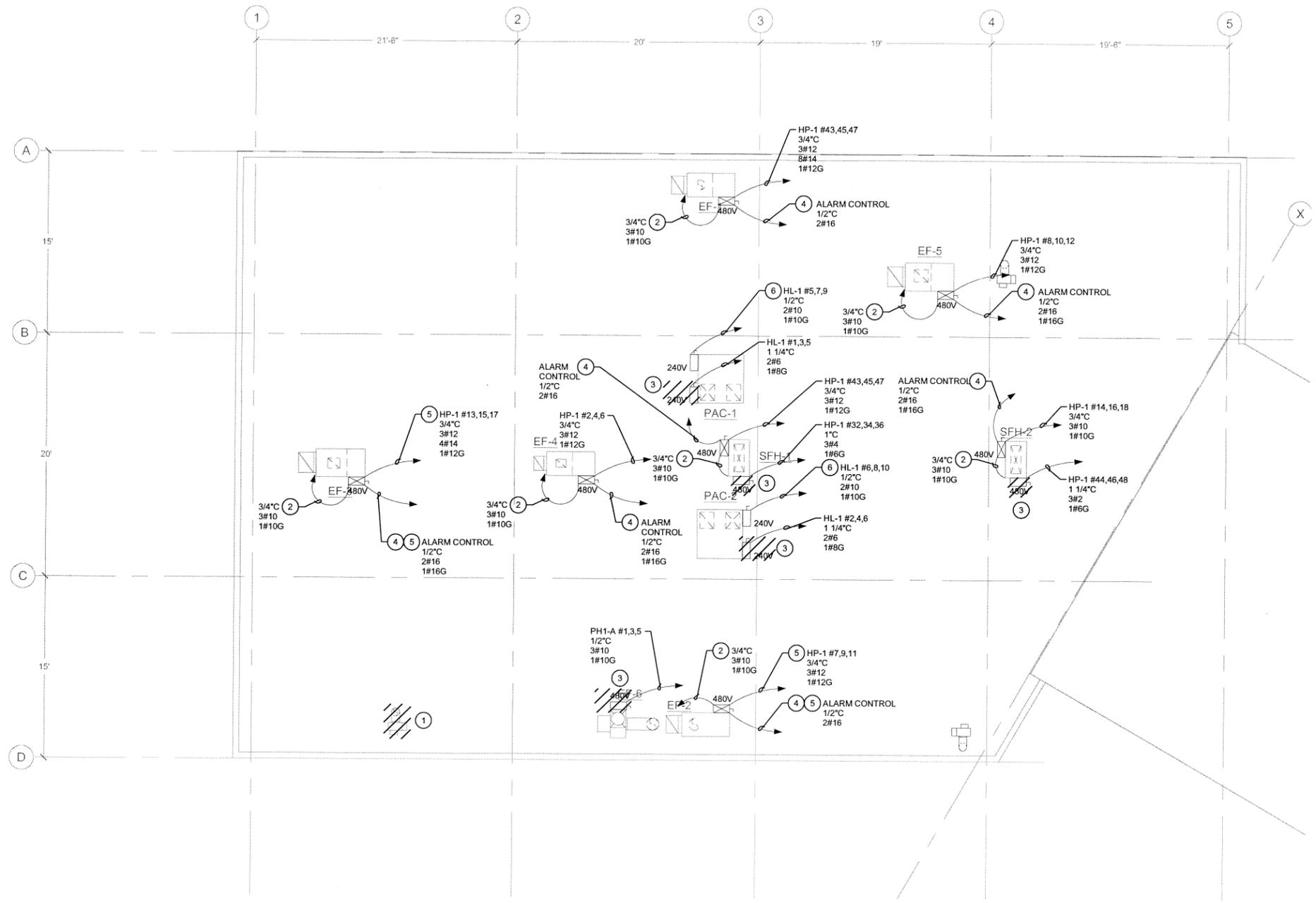


GENERAL NOTES

- A SEE SHEET E-001 FOR ELECTRICAL LEGEND, ABBREVIATIONS AND GENERAL NOTES.
- B CONTRACTOR TO DE-MOUNT EXISTING COMBINATION MOTOR STARTERS AND DISCONNECTS FROM FAN HOUSING ASSEMBLY FOR REMOUNTING AFTER FAN HOUSING IS REPLACED. DOCUMENT EXISTING WIRING AND TERMINATION.
- C CONTRACTOR TO FIELD VERIFY AND LABEL ALL PANEL DIRECTORIES PRIOR TO START OF DEMOLITION. NOTIFY ENGINEER AND OWNER OF ANY DISCREPANCIES.
- D CONTRACTOR TO SALVAGE SERVICEABLE CONTROL DEVICES. CONSULT WITH OWNER REGARDING DISPOSAL.

KEYED NOTES

- 1 DEMOLISH FAN, CONDUIT AND CONDUCTORS BACK TO SOURCE.
- 2 REUSE FLEXIBLE CONDUIT AND WIRING TO NEW FAN MOTORS AS NECESSARY. SEE E-103 FOR REINSTALLATION.
- 3 DEMOLISH EXISTING DISCONNECT AND ASSOCIATED CONDUIT AND WIRING BACK TO SOURCE OF SUPPLY.
- 4 SEE CONTROL DIAGRAM AS NECESSARY.
- 5 EF-2 AND EF-3 REPLACEMENT FANS TO BE INSTALLED IN A NEW LOCATION. CONTRACTOR TO PROVIDE WP J-BOXES OR CONDULET ON EXISTING CONDUITS (2 EACH) FOR FUTURE EXTENSION.
- 6 REPLACE EXISTING 2P20 AMP CIRCUIT BREAKER WITH 2P30 AMP HACR RATED. SEE PANEL SCHEDULE ON E-601.



1 ROOF DEMOLITION PLAN
E-102

PROJECT TITLE:
 METRO SOUTH HHV HVAC UPGRADE
CLIENT:
 METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

PROJECT TITLE:
 METRO SOUTH HHV HVAC UPGRADE
CLIENT:
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 2001 Washington Street
 Oregon City, OR 97045

REV	DESCRIPTION	DATE	APPR
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Drawn By: B. YOSHIMORI

Sheet Title:
 ELECTRICAL
 ROOF
 DEMOLITION
 PLAN

Sheet Number:

E-102

Proj No: CC09065

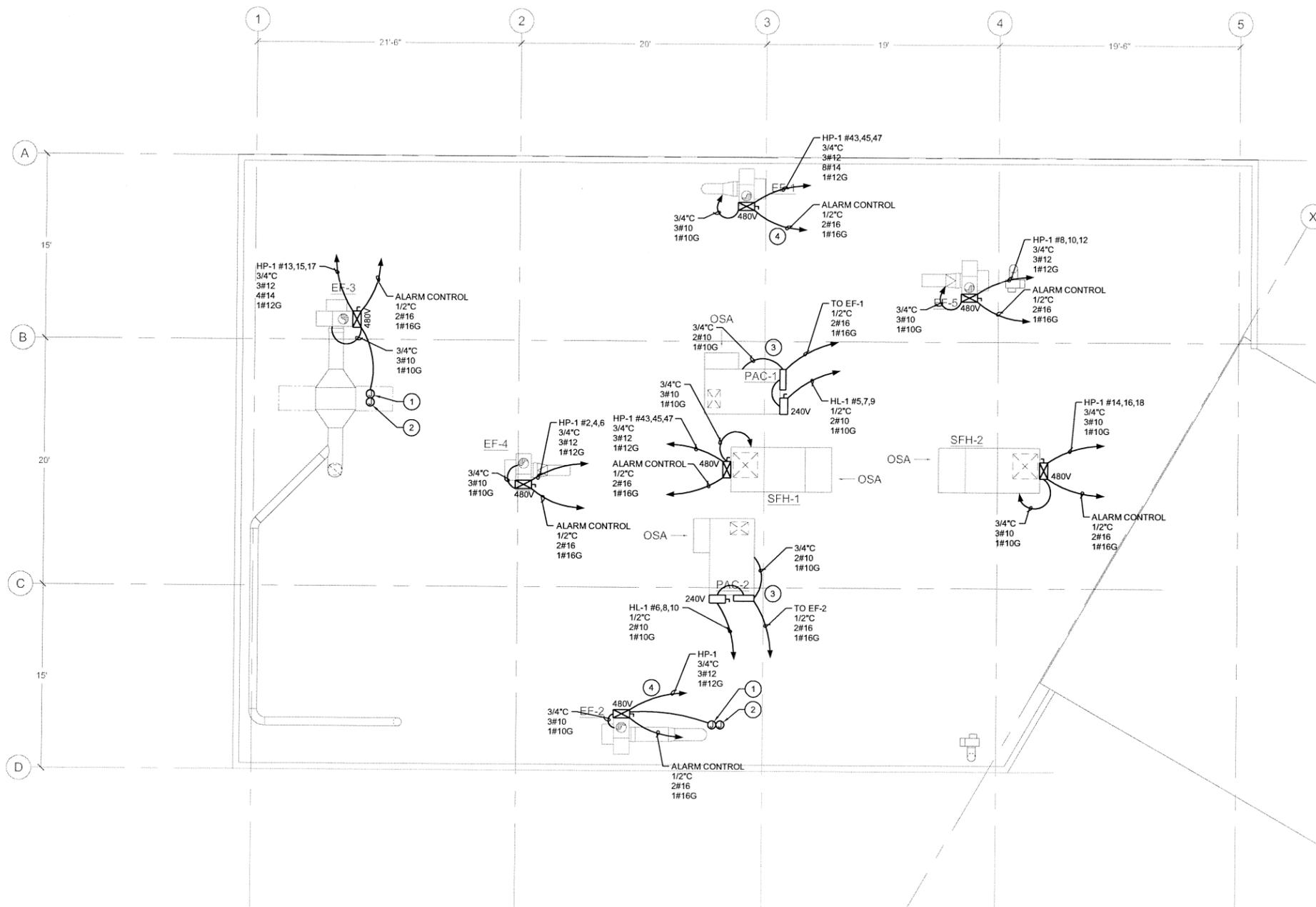


GENERAL NOTES

- A REMOUNT EXISTING COMBINATION MOTOR STARTERS AFTER FAN HOUSINGS ARE REPLACED.
- B PROVIDE NEW CONDUIT AND WIRING AS REQUIRED TO ACCOMMODATE THE REMOVAL AND RE-INSTALLATION OF FANS.
- C RECONNECT CONTROL TERMINATIONS.
- D START AND TEST MOTORS AND CONTROLS.
- E VERIFY MOTOR STARTER OVERLOADS ARE APPROPRIATE FOR ACTUAL MOTOR INSTALLED. REPLACE OVERLOADS AS NECESSARY.

KEYED NOTES

- 1 RECONNECT EXHAUST FAN CONTROLS TO WP J-BOX / CONDULET.
- 2 RECONNECT EXHAUST FAN POWER TO WP J-BOX / CONDULET.
- 3 PROVIDE NEMA 3R 30A, 240V, 1Ø MOTOR RATED CONTACTOR WITH 120VAC TRANSFORMER, FUSING AND HOA OPERATOR SWITCH. PROVIDE EMERGENCY SHUT DOWN INTERLOCK BETWEEN EXHAUST FAN CONTROLS INDICATED AND PAC INDICATED. SEE DRAWING E-501 FOR SCOPE OF WORK.
- 4 PROVIDE AUXILIARY CONTACTS IN EXISTING COMBINATION MOTOR STARTER. SEE DRAWING E-501 FOR SCOPE OF WORK.



1 ROOF PLAN
E-103

METRO SOUTH HHV HVAC UPGRADE
METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

PROJECT TITLE:
 CLIENT:

REV	DESCRIPTION	DATE	APPR	DAS
0	ISSUED FOR CONSTRUCTION	03/01/10		

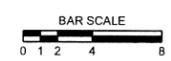
Drawn By: B. YOSHIMORI

Sheet Title:
ELECTRICAL ROOF PLAN

Sheet Number:

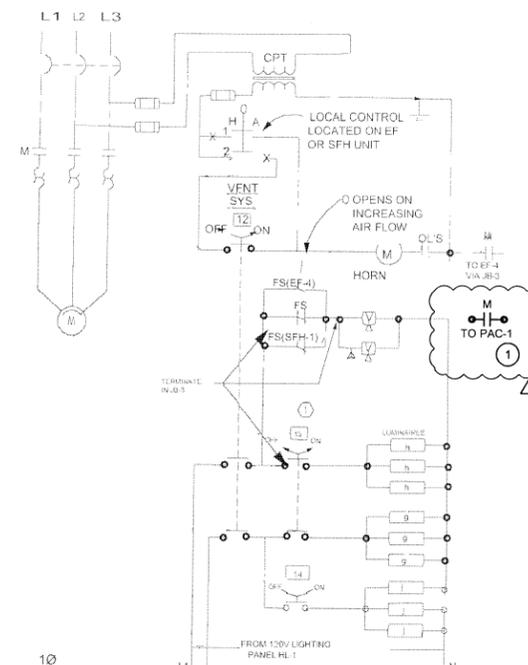
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Proj No: CC09065

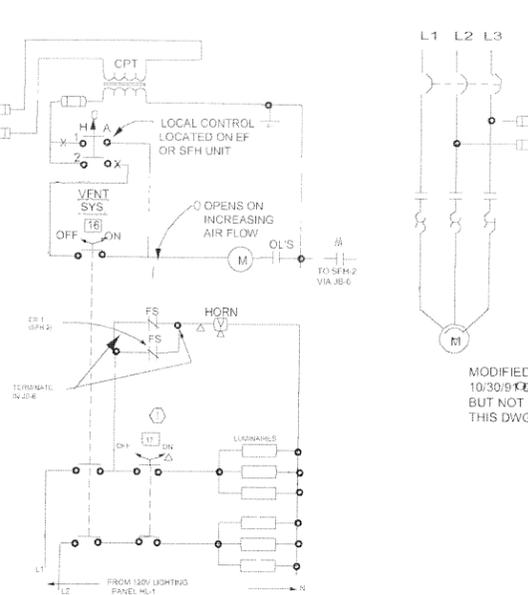
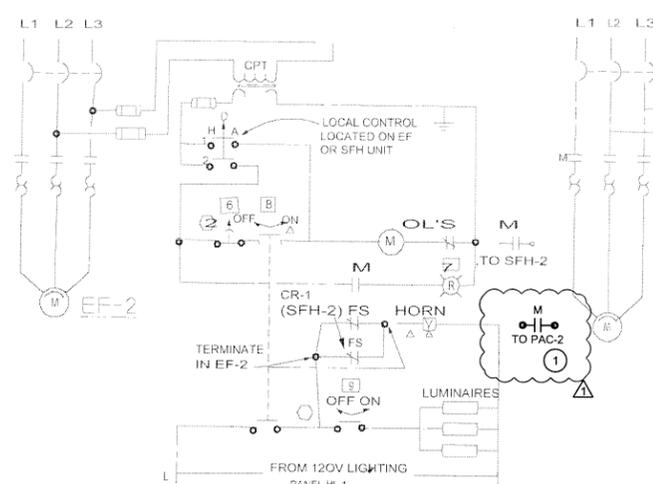


KEYED NOTES

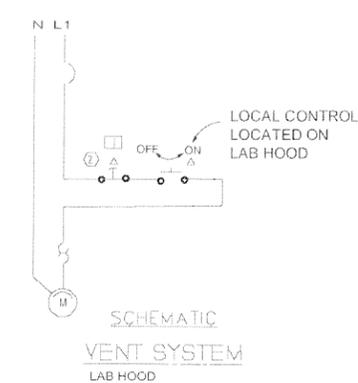
1 PROVIDE AUXILIARY CONTACTS IN EXISTING MOTOR STARTER. INTERCONNECT TO NEW PAC EMERGENCY SHUTDOWN NEMA 3R CONTACTOR. SEE DRAWING E-103.



SCHEMATIC VENT SYSTEM
PAINT BULKING ROOM AND HOOD



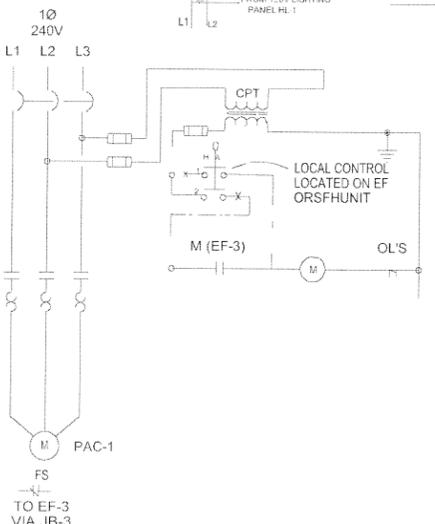
SCHEMATIC VENT SYSTEM
LAB ROOM



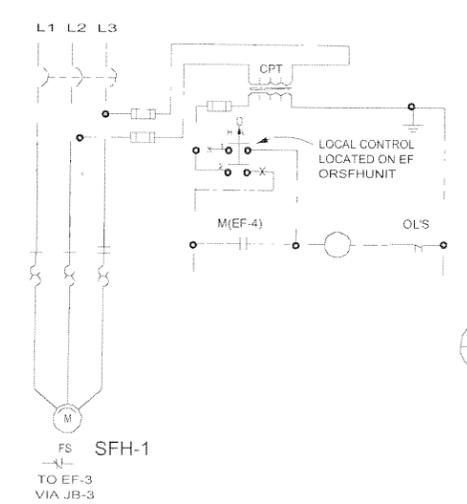
SCHEMATIC VENT SYSTEM
LAB HOOD

NOTES

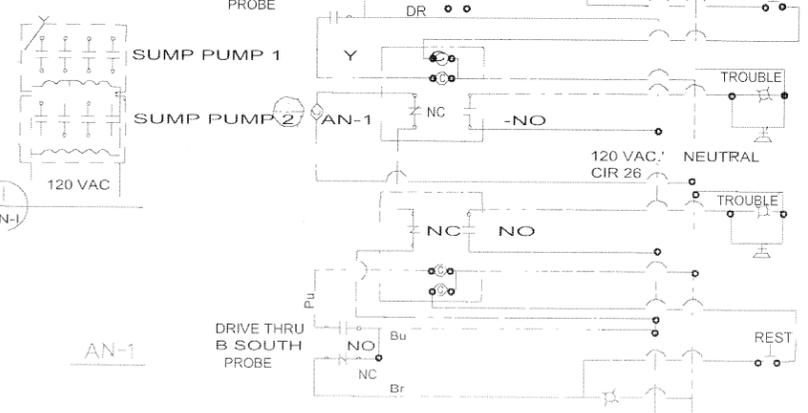
- ① SEE DWG. E-5 FOR MULTI-SWITCH CONTROL STATION ARRANGEMENT
- ② BREAK GLASS PUSHBUTTON, VENTILATION SYSTEM EMERGENCY SHUTOFF. MAINTAINED CONTACTS.
- ③ NUMERAL CORRESPONDS TO NAMEPLATE SHOWN ON DWG. E-5.
- ④ DEVICE LOCATED NEAR MAIN ENTRANCE TO ROOM OR AREA.



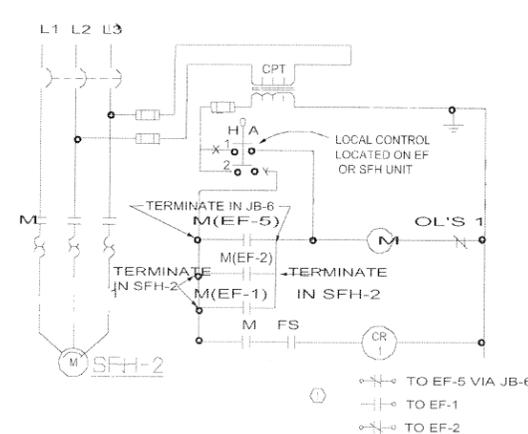
SCHEMATIC VENT SYSTEM
ALL DRU~ST~BA~E-S



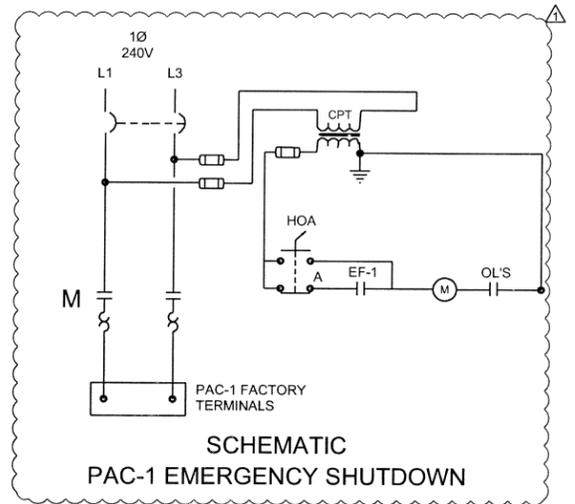
SCHEMATIC VENT SYSTEM
SFH-1



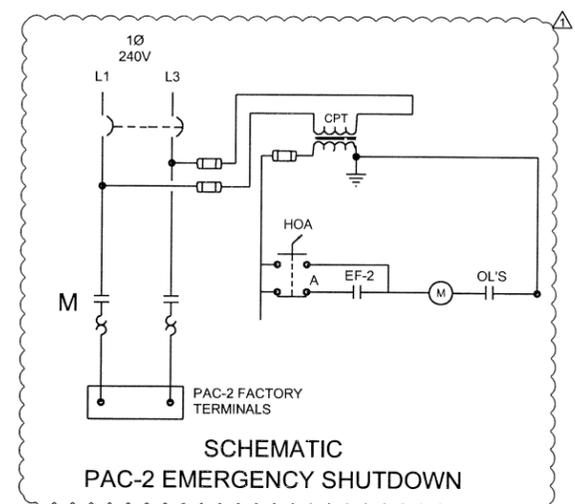
SCHEMATIC
AN-1



SCHEMATIC VENT SYSTEM
RECEIVING AREA, SATELLITE ACCUMULATION LOCKER, STORAGE



SCHEMATIC PAC-1 EMERGENCY SHUTDOWN



SCHEMATIC PAC-2 EMERGENCY SHUTDOWN



EXPIRES: 10/30/2010

PROJECT TITLE:
METRO SOUTH HHV HVAC UPGRADE

CLIENT:
METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

DATE: 09/29/05
 DATE: 03/01/10

REV	DESCRIPTION	DATE	APPR	DAS	DAS
0	ISSUED FOR CONSTRUCTION	09/29/05			
1	ISSUED FOR HVAC UPGRADES	03/01/10			

Drawn By: B. YOSHIMORI

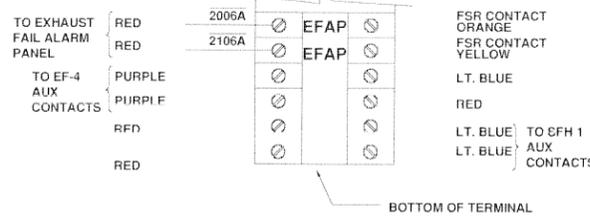
Sheet Title:
ELECTRICAL CONTROL DIAGRAMS

Sheet Number:

E-501

Proj No: CC09065

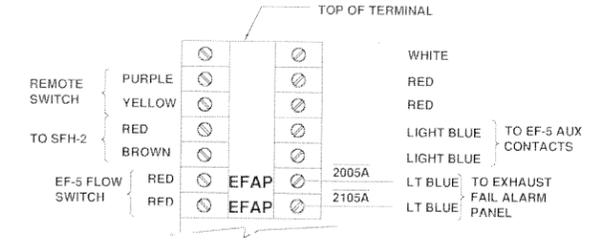
- GENERAL NOTES**
- A SEE SHEET E-001 FOR LEGEND AND GENERAL NOTES.
 - B SCOPE OF WORK INCLUDES CONTRACTOR TO DISCONNECT AND RECONNECT ALL EXISTING POWER AND CONTROL WIRING AS REQUIRED TO ACCOMMODATE THE REPLACEMENT OF FAN HOUSINGS.
 - C PROVIDE WIRE LABEL NUMBERS ON CONDUCTOR SLEEVES AND TERMINAL STRIPS. LABEL BOTH ENDS OF CONDUCTORS.
 - D STARTERS CONTAIN MULTIPLE POWER SOURCES. CHECK IF VOLTAGE PRESENT BEFORE STARTING WORK.
- KEYED NOTES**
- 1 PROVIDE NEW #14 AWG COPPER THWN CONDUCTORS. PROVIDE SLEEVE LABELS.
 - 2 UPDATE TERMINAL BLOCK LABEL FOR NOTED TERMINALS.
 - 3 PROVIDE COMBINATION STARTER, NEW INTERLOCK, AUXILIARY CONTACTS AND ASSOCIATED WIRING.



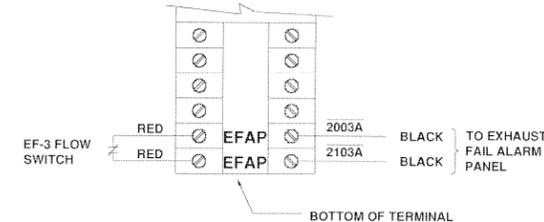
SFH-1 COMBINATION STARTER TERMINAL



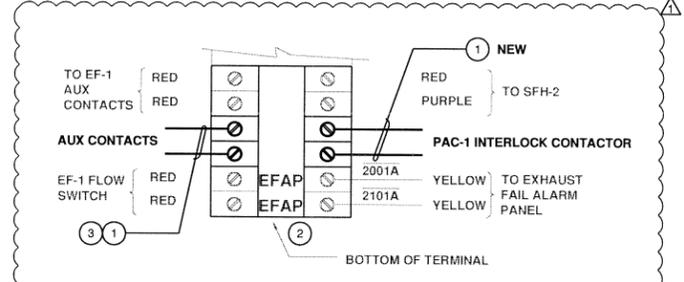
SFH-2 COMBINATION STARTER TERMINAL



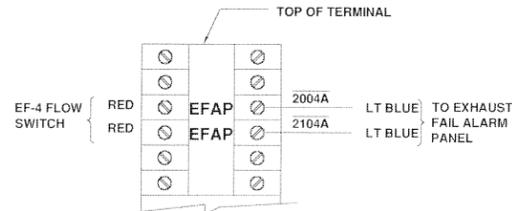
EF-5 COMBINATION STARTER TERMINAL



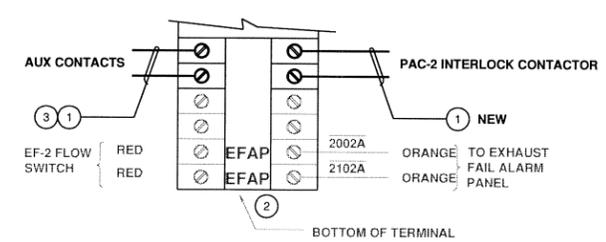
EF-3 COMBINATION STARTER TERMINAL



EF-1 COMBINATION STARTER TERMINAL



EF-4 COMBINATION STARTER TERMINAL



EF-2 COMBINATION STARTER TERMINAL

LEGEND
 XXXX = WIRE LABEL
 EFAP = EXHAUST FAIL ALARM PANEL

PROJECT TITLE:
 METRO SOUTH HHV HVAC UPGRADE

CLIENT:
 METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

DATE: 09/29/05
DATE: 03/01/10

REV	DESCRIPTION	DATE	APPR
0	ISSUED FOR CONSTRUCTION	09/29/05	DAS
1	ISSUED FOR HVAC UPGRADES	03/01/10	DAS

Drawn By: B. YOSHIMORI

Sheet Title:
 ELECTRICAL
 DETAILS
 TERMINAL
 INSTALL

Sheet Number:
E-502

Proj No: CC09065

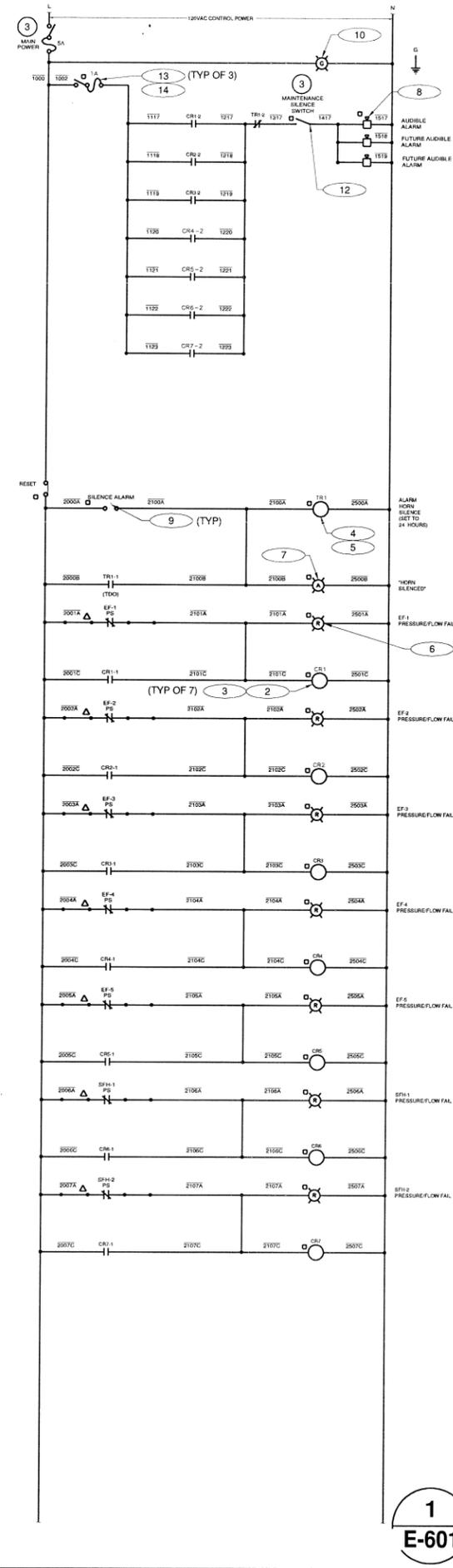


EXPIRES: 6/30/2010

DATE	APPR	DAS	DAS
09/29/05			
03/01/10			

REV	DESCRIPTION	ISSUED FOR CONSTRUCTION	ISSUED FOR HVAC UPGRADES
0			
1			

- GENERAL NOTES**
- SEE SHEET E-001 FOR LEGEND AND GENERAL NOTES.
 - ALARM PANEL SHALL BE CONSTRUCTED BY UL508 APPROVED PANEL SHOP.
 - PROVIDE WIRE LABEL NUMBERS ON CONDUCTOR SLEEVES AND TERMINAL STRIPS. LABEL BOTH ENDS OF CONDUCTORS.
- KEYED NOTES**
- PROVIDE PERMANENT LAMICOID LABELS. 1/4" TEXT, BLACK LETTERING ON WHITE BACKGROUND.
 - LOCATE HORN ON BOTTOM OF PANEL, FACING DOWN.
 - CLEARLY LABEL.



SEQUENCE OF OPERATION:

NORMAL CONDITION:
 THE FANS ARE RUNNING, THE PRESSURE SWITCH CONTACTS ARE OPEN.
 IF FAN SHUTS DOWN, PRESSURE SWITCH RETURNS TO SHELF STATE, THEREBY CONTACT CLOSURES.

ALARM CONDITION:
FAN PRESSURE BELOW SET POINT:
 THE SWITCH CONTACTS CLOSE.

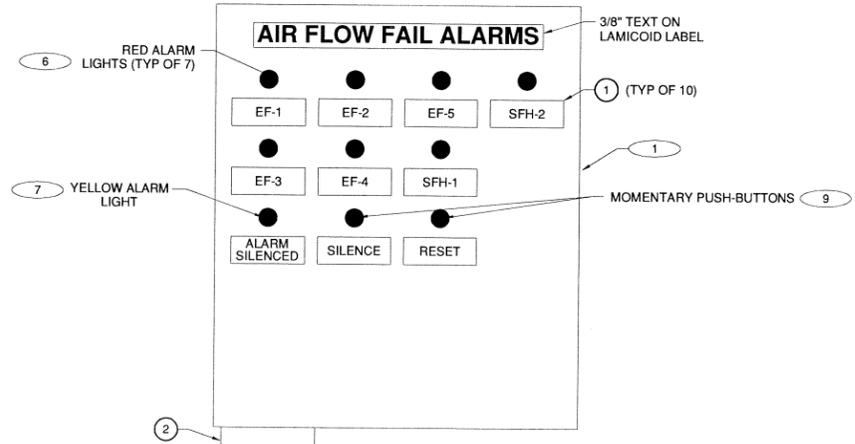
THE CONTROL RELAY FOR THE FAN ALARM (CRx) IS ACTIVATED.
 CONTACT (CRx-1) LATCHES THE RELAY ON, AND ACTIVATES THE CORRESPONDING FAN ALARM LIGHT IN THE RELAY PANEL.
 RELAY CONTACT (CRx-2) ACTIVATES THE AUDIBLE ALARM.

THE STAFF WILL PRESS THE "SILENCE" BUTTON IN THE SUPPORT AREA, ACTIVATING THE TIMER (TR1) AND SILENCING THE ALARM FOR 24 HOURS. THE ALARM LIGHT WILL REMAIN ILLUMINATED UNTIL THE PRESSURE SWITCH CONTACT IS OPEN, AND THE RESET BUTTON IS PRESSED.

AFTER FLOW IS RE-ESTABLISHED, PRESSURE SWITCH CONTACTS RETURN TO NORMALLY CLOSED STATE, THE OPERATOR MUST PRESS "RESET" TO CLEAR THE LIGHTS AND THE TIMER. IF RESET IS NOT PRESSED, THE TIMER (TR1) WILL TIME OUT, REACTIVATING THE ALARM HORN.

A MAINTENANCE SILENCE SWITCH IS LOCATED INSIDE THE CONTROL PANEL. THE SWITCH WILL DISCONNECT THE POWER TO THE HORN, SILENCING IT WHILE WORK IS PERFORMED ON THE FANS. POWER WILL REMAIN TO THE REMAINING COMPONENTS ALLOWING MAINTENANCE TO VERIFY WHEN FLOW SWITCH HAS CLEARED.

ADDITIONAL FAN AIR FLOW LOSS:
 IF ADDITIONAL FANS LOSE FLOW WHILE THE OPERATOR HAS SILENCED THE ALARM AND IS WORKING ON THE FIRST ALARM, THE ALARM LIGHT FOR THE ADDITIONAL FAILED FAN WILL BE ILLUMINATED. THE ALARM HORN WILL NOT ACTIVATE.
 IF THE OPERATOR DOES NOT ADDRESS THE SECOND FAN PRESSURE SWITCH, AND PRESSES RESET, THE ALARM LIGHT AND HORN WILL BE ACTIVATED AS IF THE SECOND FAN FAILURE WAS THE FIRST.



3 EXHAUST FAIL/AIR FLOW ALARM PANEL EXTERIOR VIEW
 SCALE: NONE

ITEM	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER	REMARKS
1	1	NEMA 12 ENCLOSURE, HINGED COVER, WITH BACK PANEL AND COIN LATCH, MAX WIDTH - 16"	HOFFMAN	--	OR ENGINEER APPROVED EQUIVALENT
2	7	3PDT 120VAC CONTROL RELAY WITH 120VAC, 10A RATED CONTACTS AND LED LIGHT, DIN RAIL MOUNTED	IDEC	RH3BUL-AC120V	OR ENGINEER APPROVED EQUIVALENT
3	7	3PDT CONTROL RELAY BASE, DIN RAIL MOUNTED	IDEC	SH3B-05	OR ENGINEER APPROVED EQUIVALENT
4	1	2PDT INTERVAL TIMER, ADJUSTABLE TIME, 36 MINUTES TO 60 HOURS, 120VAC COIL, 120V 5A RATED CONTACTS, INSTANTANEOUS CLOSE-DELAY OPEN, WITH 4 MODES OF OPERATION	IDEC	GT3A-3AD20	SET IN MODE B, OR ENGINEER APPROVED EQUIVALENT
5	1	2PDT TIMER RELAY BASE, DIN RAIL MOUNTED	IDEC	SR2P-05	OR ENGINEER APPROVED EQUIVALENT
6	7	30mm, RED, LED PILOT LIGHT, 120VAC	SQ, D	CLASS 9001 KP38LR31	OR ENGINEER APPROVED EQUIVALENT
7	1	30mm, YELLOW, LED PILOT LIGHT, 120VAC	SQ, D	CLASS 9001 KP38LY31	OR ENGINEER APPROVED EQUIVALENT
8	1	ALARM HORN, 120VAC, ADJUSTABLE 78 - 103dB	EDWARDS SIGNALING	870P-N5	OR ENGINEER APPROVED EQUIVALENT
9	2	30mm MOMENTARY BLACK PUSH BUTTON, CONTACT, 1N.O., 1N.C., 600Vac/dc, 20A rated	SQ, D	CLASS 9001 KR1BH13	OR ENGINEER APPROVED EQUIVALENT
10	1	30mm GREEN LED PILOT LIGHT, 120VAC	SQ, D	CLASS 9001 KP38LGG31	OR ENGINEER APPROVED EQUIVALENT
11		NOT USED			
12	1	120VAC, 10A, TOGGLE SWITCH (PROVIDE MOUNTING BRACKET)	HUBBELL	HBL11	OR ENGINEER APPROVED EQUIVALENT
13	3	FUSE HOLDER TERMINAL BLOCKS, INTEGRAL DISCONNECT, 120vac/dc 16A	ENTRELEC	ML 10/13.SF #199095.13	OR ENGINEER APPROVED EQUIVALENT
14	3	FUSES, (AMPERAGE TO MATCH SCHEMATIC)	-	-	
15		NOT USED			
16	A/R	FEED THRU TERMINAL BLOCKS, 600VAC/VDC, 20A	ENTRELEC	M 4/6 #115116.07	OR ENGINEER APPROVED EQUIVALENT
17	A/R	END SECTIONS	ENTRELEC	#118368.16	OR ENGINEER APPROVED EQUIVALENT
18	A/R	END STOPS	ENTRELEC	#103002.26	OR ENGINEER APPROVED EQUIVALENT
19	A/R	35mm MOUNTING RAIL	-	-	

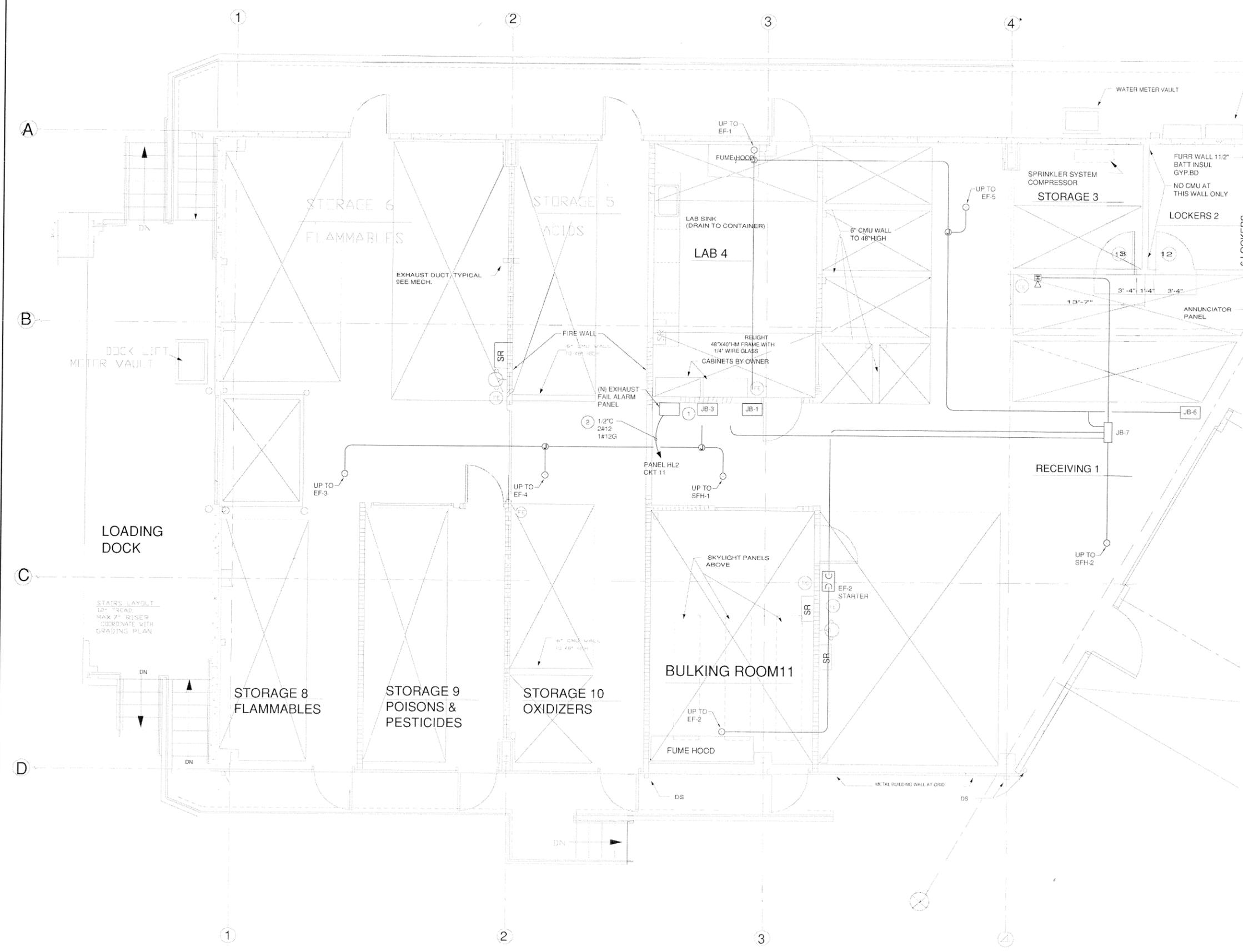
1 EXHAUST FAIL/AIR FLOW ALARM PANEL
 SCALE: NTS

2 BILL OF MATERIALS FOR REFERENCE ONLY
 SCALE: NONE

- LEGEND**
- = DEVICE IN RELAY ENCLOSURE (GROUND LEVEL)
 - = FIELD DEVICE IN STARTER PANEL (ROOF LEVEL)
 - △ = BOM ITEM #
 - X = WIRE LABEL
 - XXXX = KEYED NOTE
 - ⊗

GENERAL NOTES

- A SEE SHEET E-001 FOR LEGEND AND GENERAL NOTES.
- B ALL CONDUIT SHOWN IS EXISTING UNLESS NOTED OTHERWISE.
- C ELECTRICAL CONTRACTOR TO PROVIDE ALL NEW COMPONENTS NEEDED FOR COMPLETE INSTALLATION.
- D ALL NEW CONDUIT TO BE EMT WITH COMPRESSION FITTINGS UNLESS NOTED OTHERWISE.
- E CONDUIT IN BULKING ROOM AND LAB 4 TO BE INSTALLED TO MEET 2005 NEC ARTICLE 500, CLASS 1, GROUP D, DIV 1.



PROJECT TITLE:
METRO SOUTH HHV HVAC UPGRADE

CLIENT:
METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

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1	ISSUED FOR HVAC UPGRADES	03/01/10	DAS

Drawn By: B. YOSHIMORI

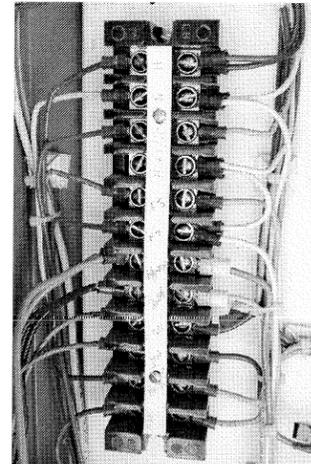
Sheet Title:
**ALARM PANEL
 FIELD WIRING
 DIAGRAM**

Sheet Number:
E-504

Proj No: CC09065

FOR REFERENCE ONLY

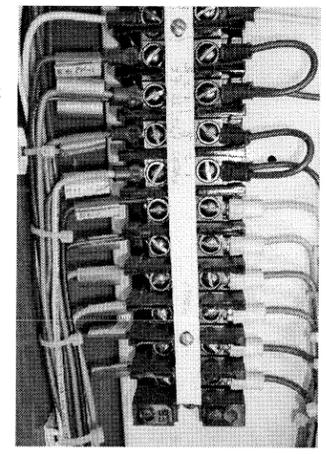
- RED
- WHITE
- BROWN
- SFH-1 FLOW SWITCH
LT. BLUE
- SFH-1 FLOW SWITCH
BROWN
- (MAY GOTO EF-4) ①
- (2) LT. BLUE
- (2) BLACK
- TO EF-4 AUX CONTACTS { PURPLE
- PURPLE
- RED
- RED



- RED
- WHITE
- LT. BLUE
- WHITE
- FSR COIL
LT. BLUE
- WHITE
- FSR CONTACT
ORANGE
- FSR CONTACT
YELLOW
- LT. BLUE
- RED
- LT. BLUE } TO SFH-1
LT. BLUE } AUX CONTACTS

SFH-1 COMBINATION STARTER TERMINAL

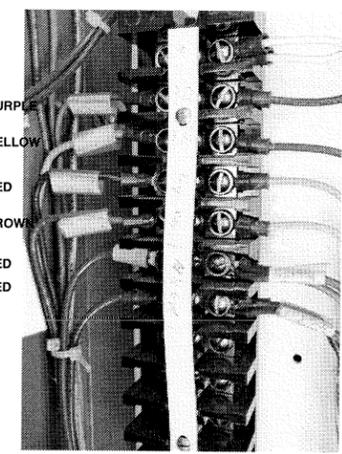
- WHITE
- FROM AUX CONTACTS { EF-1 RED
- EF-2 ORANGE
- EF-5 RED
- ④ EF-1 PURPLE
- ④ EF-2 YELLOW
- ④ EF-5 BLACK
- ④ EF-1 HORN BLACK
- ④ EF-1 HORN BLACK
- ④ EF-5 HORN LIGHT BLUE
- ④ EF-5 HORN LIGHT BLUE
- ④ EF-2 HORN RED
- ④ EF-2 HORN RED



- WHITE
- RED 120V
- RED
- TO SFH-2 MOTOR CONTACTOR
- YELLOW
- YELLOW
- BLUE
- BLUE
- RED
- RED
- FROM SFH-2 RELAY CONTACTS

SFH-2 COMBINATION STARTER TERMINAL

- REMOTE SWITCH { PURPLE
- YELLOW
- TO SFH-2 { RED
- BROWN
- EF-5 FLOW SWITCH { RED
- RED



- RED
- RED
- LIGHT BLUE } TO EF-5 AUX CONTACTS
- LIGHT BLUE
- TO SFH-2 BLUE ④ (HORNS?) ORANGE ①
- TO SFH-2 BLUE ④ (HORNS?) WHITE WITH BROWN TAPE ①

EF-5 COMBINATION STARTER TERMINAL

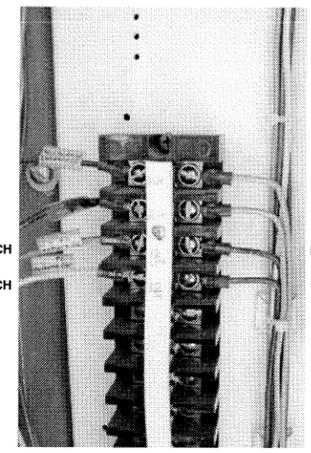
GENERAL NOTES

- A SEE SHEET E-001 FOR LEGEND AND GENERAL NOTES.
- B ALARM PANEL SHALL BE CONSTRUCTED BY UL508 APPROVED PANEL SHOP.
- C PROVIDE WIRE LABEL NUMBERS ON CONDUCTOR SLEEVES AND TERMINAL STRIPS. LABEL BOTH ENDS OF CONDUCTORS.
- D STARTERS CONTAIN MULTIPLE POWER SOURCES. CHECK IF VOLTAGE PRESENT BEFORE STARTING WORK.

KEYED NOTES

- 1 DISCONNECT WIRES FROM TERMINALS, CIRCUIT TRACE BACK TO TERMINAL BLOCK, POWER SOURCE, OR HORN AND DEMO.
- 2 DISCONNECT WIRES FROM EF-3 FLOW SWITCH, CIRCUIT TRACE AND DEMO BACK TO EF-4 TERMINAL BLOCK, POWER SOURCE, OR HORN.
- 3 DISCONNECT WIRES FROM SFH-1. CIRCUIT TRACE AND DEMO BACK TO EF-4 TERMINAL BLOCK, POWER SOURCE, OR HORN.
- 4 DISCONNECT AND DEMO CONDUCTOR BACK TO TERMINAL BLOCK.
- 5 REMOVE JUMPER WIRES.

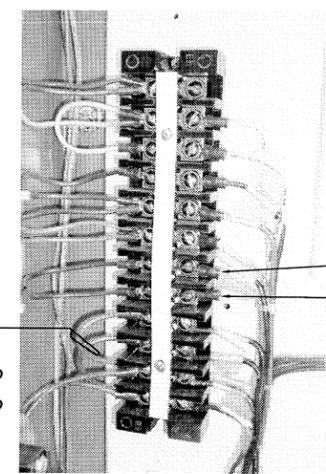
- TO EF-4 RED
- TO EF-4 RED
- REMOTE SWITCH
ORANGE
- REMOTE SWITCH
RED



- LIGHT BLUE } EF-3 AUX CONTACTS
- LIGHT BLUE
- RED
- RED

EF-3 COMBINATION STARTER TERMINAL

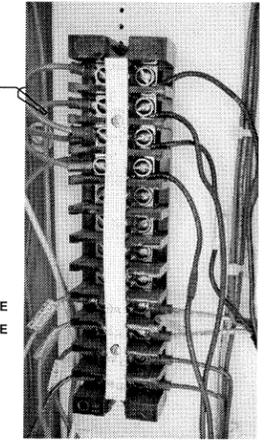
- TO EF-1 AUX CONTACTS { RED
- RED
- ⑤
- EF-1 FLOW SWITCH { RED
- RED



- SFH-2 RED
- SFH-2 PURPLE
- BLACK
- BLACK } TO SFH-2 RELAY CONTACT ④
- BLACK
- BLACK } LIGHTING/HORN ①

EF-1 COMBINATION STARTER TERMINAL

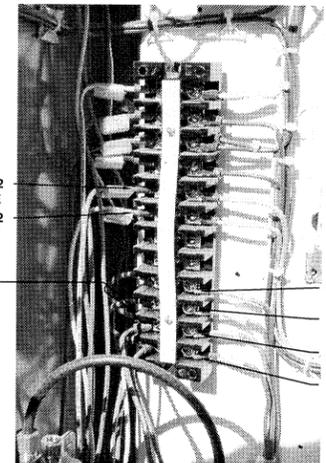
- EF-4 FLOW SWITCH { RED
- RED
- ⑤
- TO SFH-1 { PURPLE
- PURPLE
- EF-3 AUX CONTACTS { RED
- RED



- BLACK, RED TAPE
- BLACK
- BLACK, WHITE TAPE
- BLACK, GREEN TAPE
- TO EF-3 OR SFH-1 { ②
- ③
- LIGHT BLUE } EF-4 AUX CONTACTS
- LIGHT BLUE
- RED } EF-4 MOTOR CONTROL
- RED

EF-4 COMBINATION STARTER TERMINAL

- TO SFH-2 ORANGE
- TO SFH-2 YELLOW
- ⑤
- EF-2 FLOW SWITCH { RED
- RED



- LT BLUE } EF-2 AUX CONTACTS
- LT BLUE
- RED } TO SFH-2 RELAY CONTACT ④
- RED
- RED
- RED } LIGHTING/HORN ①

EF-2 COMBINATION STARTER TERMINAL

PROJECT TITLE: METRO SOUTH HHV HVAC UPGRADE
 CLIENT: METRO SOUTH STATION
 2001 Washington Street
 Oregon City, OR 97045

REV	DESCRIPTION	DATE	APPR
0	ISSUED FOR CONSTRUCTION	09/29/05	DAS
1	ISSUED FOR HVAC UPGRADES	03/01/10	DAS

Drawn By: B. YOSHIMORI
 Sheet Title: ELECTRICAL DETAILS TERMINAL DEMOLITION
 Sheet Number: E-505
 Proj No: CC09065

FOR REFERENCE ONLY

KEYED NOTES

- 1 REPLACE EXISTING 2P20A CIRCUIT BREAKER WITH 2P30A HACR RATED.

METRO SOUTH HHH HVAC UPGRADE
METRO SOUTH STATION
2001 Washington Street
Oregon City, OR 97045

PROJECT TITLE:
CLIENT:

APPR	DATE	DESCRIPTION
	03/01/10	DAS

REV	DESCRIPTION
0	ISSUED FOR CONSTRUCTION

Drawn By: B. YOSHIMORI
Sheet Title: ELECTRICAL PANEL SCHEDULES
Sheet Number: E-601
Proj No: CC09065



POWER PANEL SCHEDULE: HP-1
DATE: 2/11/2010
SERVICE: 3 Ph - 4 Wire
PANEL LOCATION: EAST WALL
PANEL DESCRIPTION: 480V
POWER TYPE: NORMAL
MAIN: 400A
SC RMS: xx,000 AIC
AVAILABLE FAULT: 0
FED FROM: PGE & Generator
FED THRU: Generator Transfer Sw

CKT#	LOAD DESCRIPTION	CB	POLES	VA	PH	CKT#	LOAD DESCRIPTION	CB	POLES	VA
1	EF-1	15	3		A	2	EF-4	15	3	
3	-	*	*		B	4	-	*	*	
5	-	*	*		C	6	-	*	*	
7	EF-2	15	3		A	8	EF-5	15	3	
9	-	*	*		B	10	-	*	*	
11	-	*	*		C	12	-	*	*	
13	EF-3	15	3		A	14	(SFH-2?) Fan Torrit Rcvng/Supply Exh/Bulk Rm	20	3	
15	-	*	*		B	16	-	*	*	
17	-	*	*		C	18	-	*	*	
19	Loading Dock LR	15	3		A	20	Loading Dock Door Operator	15	3	
21	-	*	*		B	22	-	*	*	
23	-	*	*		C	24	-	*	*	
25	Receiving Door Operator	15	3		A	26	Drum Storage Door Operator	15	3	
27	-	*	*		B	28	-	*	*	
29	-	*	*		C	30	-	*	*	
31	Spare (On)	20	1		A	32	SFH-1 Heater (DEMO)	70	3	
33	E-G coolant & Enclosure Heaters	20	2		B	34	-	*	*	
35	-	*	*		C	36	-	*	*	
37	Panel HL-1 via XFMR HL-1	150	3	0	A	38	Panel PH-1A (Formerly HP-1A)	100	3	0
39	-	*	*		B	40	-	*	*	
41	-	*	*		C	42	-	*	*	
43	(SFH-1?) Torrit Pesticide Rm/Can Crush/Bulking	20	3		A	44	(SFH-2?) Torrit Cleaner Room (DEMO)	100	3	
45	-	*	*		B	46	-	*	*	
47	-	*	*		C	48	-	*	*	
49	Panel HL-2 via XFMR HL-2	70	3	0	A	50	Breathing Air Supply	20	3	
51	-	*	*		B	52	-	*	*	
53	-	*	*		C	54	-	*	*	

PHASE A	PHASE B	PHASE C
0	0	0
0	0	0

KVA	AMPS
0	0

POWER PANEL SCHEDULE: HL-1
DATE: 2/11/2010
SERVICE: 3 Ph - 4 Wire
PANEL LOCATION: EAST WALL
PANEL DESCRIPTION: 208/120V
POWER TYPE: NORMAL
MAIN: 225A Breaker
SC RMS: XX,000 AIC
AVAILABLE FAULT: 0
FED FROM: PANEL HP-1
FED THRU: TRANSFORMER T1-HL-1

CKT#	LOAD DESCRIPTION	CB	POLES	VA	PH	CKT#	LOAD DESCRIPTION	CB	POLES	VA
1	Spare		2		A	2	Spare		2	
3	-	*	*		B	4	-	*	*	
5	PAC1 Fans	30	2		C	6	PAC 2 Fans	30	2	
7	-	*	*		A	8	-	*	*	
9	LIFT - (Tepper)	20	1		B	10	E-G Lights & Recpt	20	1	
11	Fire Alarm	20	1		C	12	E-G BA	20	1	
13	Lights	20	1		A	14	Lab Hood	20	1	
15	Plug Strips	20	1		B	16	Lights - Paint Bulking	20	1	
17	Lights - All Drums Storage Rooms	20	2		C	18	Lights - Receiving Accum/Lktr/St.	20	2	
19	Lights - All Drums Storage Rooms	*	*		A	20	Lights - Receiving Accum/Lktr/St.	*	*	
21	Lights - Lab	20	1		B	22	Drive Through	20	2	
23	Lights - Night/Exit/Evacuation Alarm	20	1		C	24	-	*	*	
25	Recpts - Lab Ckt (e)	20	1		A	26	Drive Through Sump Probes	20	1	
27	Recpts - Lab Ckt (e)	20	1		B	28	Loading Dock Sump Probes	20	1	
29	Recpts - Perimeter/Roof/GF/CKT (k)	20	1		C	30	Lights - Exterior Ckt R	20	1	
31	ERT Shed	20	1		A	32	Air Compressor	40	2	
33	Office Computer	20	1		B	34	-	*	*	
35	HVAC Control Circuit	20	1		C	36	Compressor Bleeder Valve	20	1	
37	Compressor	20	2		A	38	Portable Office	100	2	
39	-	*	*		B	40	-	*	*	
41	Plug Strips	20	1		C	42	Spare	20	1	

PHASE A	PHASE B	PHASE C
0	0	0
0	0	0

KVA	AMPS
0	0

POWER PANEL SCHEDULE: PH1-A (aka HP-1A)
DATE: 2/11/2010
SERVICE: 3 Ph - 4 Wire
PANEL LOCATION: EAST WALL
PANEL DESCRIPTION: 480V
POWER TYPE: NORMAL
MAIN: MLO
SC RMS: XX,000 AIC
AVAILABLE FAULT: 0
FED FROM: PANEL HP-1
FED THRU:

CKT#	LOAD DESCRIPTION	CB	POLES	VA	PH	CKT#	LOAD DESCRIPTION	CB	POLES	VA
1	Spare	15	3		A	2	COMPRESSOR "B"	30	3	
3	-	*	*		B	4	-	*	*	
5	-	*	*		C	6	-	*	*	
7	TEE-MARK 6-19-03 (Hyd. Can Crusher)	15	3		A	8	-	*	*	
9	-	*	*		B	10	-	*	*	
11	-	*	*		C	12	-	*	*	
13	TEE-MARK (Hyd. Can Crusher)	20	3		A	14	-	*	*	
15	-	*	*		B	16	-	*	*	
17	-	*	*		C	18	-	*	*	
19	-	*	*		A	20	-	*	*	
21	-	*	*		B	22	-	*	*	
23	-	*	*		C	24	-	*	*	
25	-	*	*		A	26	-	*	*	
27	-	*	*		B	28	-	*	*	
29	-	*	*		C	30	-	*	*	
31	-	*	*		A	32	-	*	*	
33	-	*	*		B	34	-	*	*	
35	-	*	*		C	36	-	*	*	
37	-	*	*		A	38	-	*	*	
39	-	*	*		B	40	-	*	*	
41	-	*	*		C	42	-	*	*	

PHASE A	PHASE B	PHASE C
0	0	0
0	0	0

KVA	AMPS
0	0

POWER PANEL SCHEDULE: HL-2
DATE: 2/11/2010
SERVICE: 3 Ph - 4 Wire
PANEL LOCATION: EAST WALL
PANEL DESCRIPTION: 208/120V
POWER TYPE: NORMAL
MAIN: 125A Breaker
SC RMS: xx,000 AIC
AVAILABLE FAULT: 0
FED FROM: PANEL HP-1
FED THRU: Transformer T2-HL-2

CKT#	LOAD DESCRIPTION	CB	POLES	VA	PH	CKT#	LOAD DESCRIPTION	CB	POLES	VA
1	Spare (Emerson Heater)	30	2		A	2	Spare (Boiler)	20	1	
3	Spare (Emerson Heater)	*	*		B	4	Spare (Boiler)	20	1	
5	Spare (Transfer Pump)	20	1		C	6	Lights & GF	20	1	
7	Spare (Transfer Pump)	20	1		A	8	Spare (Heat Trace)	20	1	
9	Overhead Door	20	1		B	10	Spare	20	1	
11	Air Flow Alarm Panel	20	1		C	12	Spare	20	1	
13	ERT Shed	20	1		A	14	Spare	20	1	
15	Spare	20	1		B	16	Spare	20	1	
17	Fans for Tee-Marks	20	2		C	18	Spare	20	1	
19	-	*	*		A	20	Spare	20	1	
21	-	*	*		B	22	Can Crusher Blower	20	2	
23	-	*	*		C	24	-	*	*	
25	-	*	*		A	26	-	*	*	
27	-	*	*		B	28	-	*	*	
29	-	*	*		C	30	-	*	*	
31	-	*	*		A	32	-	*	*	
33	-	*	*		B	34	-	*	*	
35	-	*	*		C	36	-	*	*	
37	-	*	*		A	38	-	*	*	
39	-	*	*		B	40	-	*	*	
41	-	*	*		C	42	-	*	*	

PHASE A	PHASE B	PHASE C
0	0	0
0	0	0

KVA	AMPS
0	0