MECHANICAL LEGEND

PLUMBING

SYMBOL	DESCRIPTION
AAV	PNEUMATIC ACTUATOR
	AUTOMATIC AIR VENT
AV	AIR VENT (MANUAL)
BFP	BACK FLOW PREVENTER
	BALANCING FLOW CONTROL VALVE
	BALANCE VALVE / CIRCUIT SETTER VALVE
	BALANCE VALVE
	BALL VALVE
	BUTTERFLY VALVE
	CALIBRATED BALANCE VALVE
	CHECK VALVE
	FLOAT VALVE
	GATE VALVE
	GATE VALVE NORMALLY CLOSED
	GLOBE VALVE
P	PRESSURE GAUGE WITH COCK
	PRESSURE REDUCING VALVE
	PRESSURE REGULATING VALVE
	PRESSURE RELIEF VALVE
	PUMP SUCTION DIFFUSER
	STRAINER WITH DRAIN VALVE
	THREE WAY CONTROL VALVE
VTR	VENT THRU ROOF
WHA	WATER HAMMER ARRESTOR
	CAP OR PLUG
	CONCENTRIC REDUCER
	CONNECTION – DOWN
	CONNECTION – UP
	ECCENTRIC REDUCER
	ELBOW DOWN
	ELBOW IN PLAN
	ELBOW UP
	EXPOSED CLEAN OUT
	FLANGED JOINT
	FLEXIBLE CONNECTION
FCO	FLOOR CLEAN OUT
	FLOOR DRAIN
FD	FLOOR DRAIN
FS	FLOOR SINK
HB	HOSE BIBB
	HOSE CONNECTION
	INDIRECT WASTE
	PEET PLUG
	QUICK DISCONNECT

SYMBOL	DESCRIPTION
	PIPE ANCHOR
	PIPE EXPANSION JOINT
	PIPE SLEEVE OR GUIDE
	PIPE SUPPORT
	POINT OF CONNECTION
RD	ROOF DRAIN
RDO	ROOF DRAIN OVERFLOW
	SIGHT GLASS
	TEE DOWN
	TEE UP
	THEROMO WELL
	THERMOMETER WELL
	UNION
WCO	WALL CLEAN OUT
YCO	YARD CLEAN OUT
	FAN
	CENTRIFUGAL PUMP (FLOW SHEETS)
	WALL MOUNTED PUMP
	CENTRIFUGAL PUMP
	CENTRIFUGAL PUMP (DOUBLE SUCTION)
MH	MANHOLE
	EXPANSION BELLOWS.

LEGEND	DESCRIPTION
CHWR	CHILLED WATER RETURN (COOLING)
CHWS	CHILLED WATER SUPPLY (COOLING)
CA	COMPRESSED AIR OUTLET
CA	COMPRESSED AIR (PLAN AIR)
CD	CONDENSATE DRAIN
CD	CONDENSATION DRAIN (HVAC)
CNDR	CONDENSER WATER RETURN
CNDS	CONDENSER WATER SUPPLY
DIR	DEIONIZED WATER RETURN (HVAC)
DIS	DEIONIZED WATER SUPPLY (HVAC)
	DIRECTION OF FLOW
	DIRECTION OF SLOPE
D	DRAIN
FWD	FIRE WATER
	HEAT TRACE
HWR	HOT WATER RETURN (HEATING)
HWS	HOT WATER SUPPLY (HEATING)
NG	NATURAL GAS (FUEL GAS PIPING)
OFL	OVER FLOW (RAIN WATER) LEADER
SWHR	SANITARY (POTABLE) WATER HOT (RETURN)
SWHS	SANITARY (POTABLE) WATER HOT (SUPPLY)

LEGEND	DESCRIPTION
SWC	SANITARY (POTABLE) WATER COLD
POW	POLISHED WATER
PW	PROCESS WATER
PD	PROCESS DRAINAGE
RWL	RAIN WATER LEADER
RL	REFRIGERANT LIQUID
RS	REFRIGERANT SUCTION
SS	SANITARY SEWER LINE
	SOIL OR WASTE PIPE ABOVE GRADE
	SOIL OR WASTE PIPE BELOW GRADE
SD	STORM DRAIN
TWR	TOWER WATER RETURN (TECHNICAL EQ. COOLING)
TWS	TOWER WATER SUPPLY (TECHNICAL EQ. COOLING)
V	VENT

HVAC - CONTROLS

SYMBOL	DESCRIPTION
LI	LEVEL INDICATOR (BOILER WATER)
C	CONTROLLER
DA	PNEUMATIC DAMPER OPERATOR
DM	DAMPER MOTOR
DP	DIFFERENTIAL PRESSURE GAUGE
DPS	DIFFERENTIAL PRESSURE SENSOR
ES	END–SWITCH (POSITION DAMPER INDICATION)
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FM	FLOW METER
FT	FLOW TRANSMITTER
G	GEAR OPERATOR
HOA	HAND–OFF–AUTOMATIC SWITCH
MS	MANUAL SWITCH
M	MOTOR
O	ON–OFF STATUS SIGNAL
P	PRESSURE ELEMENT
PE	PNEUMATIC/ELECTRIC SWITCH
POS	POSITION SWITCH
PI	PRESSURE INDICATOR
RC	RECEIVER CONTROLLER
RH	RELATIVE HUMIDITY
RE	RESISTIVITY ELEMENT
RTD	RESISTANCE THERMAL DEVICE
SD	SMOKE DETECTOR
DSD	DUCT SMOKE DETECTOR
S	START/STOP INTERFACE

HVAC

SYMBOL	DESCRIPTION
S/S	START/STOP SWITCH
LL	LOW–LEVEL (FREEZE–PROTECTION)
T	IN–DUCT THERMOSTAT
T	ROOM THERMOSTAT
T	TEMPERATURE SENSING ELEMENT
TT	TEMPERATURE TRANSMITTER
VFD	VARIABLE FREQUENCY DRIVE
WS	WATER FLOW SWITCH
	POWER/INTERLOCK WIRING
	CONTROL SIGNAL CABLE
DS	DOOR SWITCH

HVAC - DUCTWORK & EQUIPMENT

SYMBOL	DESCRIPTION
	CEILING FAN
	DIFFUSER / GRILLE CALLOUT CFM (CFM FUTURE)
	THROW DIRECTION TYPE AS PER SCHEDULE NECK SIZE
200 816CD–2 4–WAY	CEILING (SUPPLY) DIFFUSER CAPACITY (200 CFM) NECK SIZE (8"ø) OUTLET SIZE (16"x16") TYPE AS PER SCHEDULE DIRECTION OF FLOW
400 12x12 CG–1	CEILING (EXHAUST) GRILLE CAPACITY (400 CFM) TYPE AS PER SCHEDULE OUTLET SIZE (12"x12")
500 24x24 CR–1	CEILING (RETURN) REGISTER CAPACITY (500 CFM) TYPE AS PER SCHEDULE OUTLET SIZE (24"x24")
000 00x00 RR–1	SIDEWALL (RETURN) REGISTER CAPACITY (CFM) OUTLET SIZE (00"Wx00"D) TYPE AS PER SCHEDULE
000 24"x12" SR–1	SIDEWALL (SUPPLY) REGISTER OUTLET SIZE (24"Wx12"D) TYPE AS PER SCHEDULE
FAC	COMBINATION FIRE APPARATUS CABINET
C	COOLING COIL
VD	DUCT BRANCH TAKE–OFF WITH REFERENCE TO AIR FLOW
	DUCT BRANCH WITH ADJUSTABLE EXTRACTOR
24x12	DUCT SIZE, (WIDTHxDEPTH)
RHC	RE–HEAT COIL (IN–DUCT)
	EXHAUST DUCT
F	FINAL FILTERS

SYMBOL	DESCRIPTION
	FAN POWERED VAV BOX W/H.W. REHEAT COIL
	FLEXIBLE DUCT CONNECTION
H C	HEATING COIL
DN	INCLINED DROP IN DUCT WITH REFERENCE
R	INCLINED DROP IN DUCT WITH REFERENCE
	LINEAR SLOT DIFFUSER
M	MOTORIZED CONTROL DAMPER
VD	OPPOSED BLADE DAMPER WITH LOCK QUADRANT
	RETURN DUCT
V C	VAV BOX W/H.W. REHEAT COIL
C	SPLITTER DAMPER
	SQUARE ELBOW WITH TURNING VANES
	SUPPLY DUCT
T 8	THERMOSTAT WITH REHEAT BOX IDENTIFICATION
	TRANSITION FROM RECTANGULAR TO ROUND
VD	VOLUME DAMPER (MANUAL)
	ACOUSTICAL OR INTERIOR DUCT LINING
	AIR DUCT RETURN OR EXHAUST, SECTION
	AIR DUCT SUPPLY, SECTION
FD	AUTOMATIC FIRE DAMPER
SFD	SMOKE/FIRE DAMPER
	UNIT HEATER (HORIZONTAL)
	UNIT HEATER (VERTICAL)
DS	DUCT SUPPORT
	"PITOT" STATIC TUBE TRAVERSE
SC PF T H T H T	FIRE SCREEN, PREFILTER, TEST SECTION, HEPA FILTER, TEST SECTION, HEPA FILTER, TEST SECTION.
	DENOTES SAFETY CLASS (SSC). SUBSTITUTIONS FOR SSC COMPONENTS MAY NOT BE MADE WITHOUT THE PROPER AUTHORITY.
	DENOTES SAFETY SIGNIFICANT COMPONENT (SSC). SUBSTITUTIONS FOR SSC COMPONENTS MAY NOT BE MADE WITHOUT THE PROPER AUTHORITY.
	HUMIDIFIER

GENERAL NOTES:

A. ALL WORK SHALL BE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL CODES AND ORDINANCES.

B. THE CONTRACTOR SHALL READ ALL OF THE GENERAL NOTES, SPECIFICATIONS AND PLANS AND SHALL BE SATISFIED TO THEIR TRUE MEANING AND INTENT AND SHALL BE RESPONSIBLE FOR COMPLYING WITH EACH. WHEREVER TWO OR MORE SPECIFICATIONS OR PLANS AND SPECIFICATIONS MAY CONFLICT, THE MORE STRINGENT SPECIFICATION SHALL TAKE PRECEDENCE.

C. IT IS INTENDED THAT THESE PLANS AND SPECIFICATIONS REQUIRE ALL LABOR AND MATERIAL NECESSARY AND PROPER FOR THE WORK CONTEMPLATED AND THAT THIS WORK BE COMPLETED IN ACCORDANCE WITH THEIR TRUE INTENT AND PURPOSE. THE CONTRACTOR SHALL NOTIFY THE CONSTRUCTION MANAGER IMMEDIATELY REGARDING ANY DISCREPANCIES OR AMBIGUITIES THAT MAY EXIST IN THE PLANS AND/OR SPECIFICATIONS PRIOR TO SUBMITTING BID. THE CONSTRUCTION MANAGER AND THE ENGINEER'S INTERPRETATION THEREOF SHALL BE CONCLUSIVE.

D. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR ANY FIELD CHANGES MADE WITHOUT PRIOR WRITTEN AUTHORIZATION FROM THE CONSTRUCTION MANAGER.

E. CONTRACTOR SHALL INSTALL ALL PIPING AND DUCTWORK SYSTEMS TO BEST SUIT FIELD CONDITIONS, AND COORDINATE WITH THE INSTALLATION WORK OF OTHER TRADES. THE DRAWINGS ARE DIAGRAMMATIC BUT MAY BE SCALED TO DETERMINE THE APPROXIMATE LOCATION OF PIPING AND DUCTWORK. NOTIFY THE CONSTRUCTION MANAGER OF ANY DEVIATIONS FROM THESE DRAWINGS PRIOR TO FABRICATION AND/OR INSTALLATION.

F. LOCATIONS AND DIMENSIONS OF EQUIPMENT, PIPING, AND THEIR SUPPORTS ARE SHOWN DIAGRAMMATICALLY BUT MAY BE SCALED TO DETERMINE THE APPROXIMATE LOCATION OF PIPING OR DUCTWORK. ACTUAL DIMENSIONS AND LOCATIONS ARE DEPENDENT ON MATERIAL SUPPLIED BY CONTRACTORS. CONTRACTORS SHALL PROVIDE OR DETERMINE DIMENSIONS AND PROVIDE LAYOUT DRAWINGS FOR COORDINATION WITH OTHER TRADES IN ACCORDANCE WITH THE SPECIFICATIONS.

G. DEAD LEGS OVER 6" LONG IN PIPING ARE PROHIBITED.

H. ACCESS AROUND CABLE TRAYS SHALL BE MAINTAINED AS FOLLOWS: 24" ON EITHER SIDE, 12" ABOVE. OTHER SYSTEMS SHALL NOT BE MOUNTED TO CHANNEL SUPPORT TRAPEZE FOR THE CABLE TRAY OR TO CABLE TRAY. SEE ELECTRICAL DRAWINGS FOR CABLE TRAY LOCATIONS.

I. CLEAN ALL DUCTWORK IN THE SHOP PRIOR TO SHIPPING. ALL DUCTWORK SHALL BE TRANSPORTED TO THE SITE IN COVERED VANS TO ELIMINATE CONTAMINATION OR SHALL BE SEALED PRIOR TO SHIPMENT AND SHALL BE PROTECTED FROM CONTAMINATION AT THE SITE. AFTER FABRICATION, AND DURING AND AFTER INSTALLATION, SEAL SECTIONS OF OPEN DUCTWORK WITH PLASTIC SHEETING TO PREVENT THE INTRUSION OF DIRT AND DEBRIS.

J. CONTRACTOR SHALL REMOVE RUBBISH WASTE MATERIALS ON DAILY BASIS AND PROTECT AREAS FROM DAMAGE WHICH MAY OCCUR DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE WHICH MAY OCCUR.

K. PROVIDE VALVED DRAIN SYSTEM AT THE LOW POINTS IN EACH LIQUID PIPING SYSTEM AND A MANUAL AIR VENT IN EACH PIPING SECTIONS THAT CAN TRAP AIR.

L. ALL VALVES AND OTHER PIPING SYSTEM SPECIALTIES SHALL BE LINE SIZE UNLESS OTHERWISE NOTED.

M. ALL PIPING IS TO BE FLUSHED AND TESTED IN ACCORDANCE WITH THE SPECIFICATIONS

N. UNIONS, BUSHINGS, TRANSITIONS AND/OR REDUCING INSERTS, ETC. NOT SHOWN ON DRAWINGS BUT REQUIRED FOR INSTALLATION, SHALL BE FURNISHED AND INSTALLED BY THE CONTRACTOR.

O. CONTRACTOR IS RESPONSIBLE FOR FIELD ROUTING DRAIN PIPING FROM EQUIPMENT, ETC. TO THE APPROPRIATE WASTE WATER SYSTEM.

P. WATER PIPE CONNECTIONS TO AIR HEATING AND COOLING COILS SHALL BE MADE SO THERE WILL BE COUNTER FLOW BETWEEN WATER AND AIR.

Q. REFER TO ARCHITECTURAL REFLECTED CEILING PLANS FOR EXACT LOCATION OF CEILING DIFFUSERS, REGISTERS, AND GRILLES.

R. ALL PIPES AND DUCTS PENETRATING FIRE SEPARATIONS SHALL HAVE AN FM APPROVED FIRE RATED ASSEMBLY.

S. ALL PIPES AND DUCTS PENETRATING FIRE SEPARATIONS SHALL HAVE UL APPROVED FIRE RATED ASSEMBLY.

T. ALL WORK SHOWN ANYWHERE ON THE DRAWINGS IS INCLUDED; SHOULD AN ITEM (SUCH AS A VALVE) BE SHOWN ON A DETAIL OR SCHEMATIC BUT NOT ON A PLAN VIEW OR VICE VERSA, IT MUST BE PROVIDED AS THOUGH IT WERE SHOWN IN ALL PLACES ON THE DRAWINGS.

U. THE CONTRACTOR SHALL PROVIDE REDLINE DRAWINGS IN FULL COMPLIANCE WITH SPECIFICATIONS.

V. PROVIDE ACCESS DOORS FOR ALL ITEMS CONCEALED WITHIN BUILDING STRUCTURE WHICH REQUIRE SERVICE, INCLUDING FIRE DAMPERS AND DUCT SMOKE DETECTORS.

W. KEEP DUCTS A MINIMUM OF 12" ABOVE CEILINGS EXCEPT FOR BRANCH DUCTS TO SERVE DIFFUSERS.

X. DELETED.

Y. ALL EQUIPMENT, PIPING AND DUCTWORK SHALL BE PERMANENTLY IDENTIFIED AND LABELED AS REQUIRED IN THE SPECIFICATIONS.

Z. COORDINATE ANY BELOW SLAB WORK OR PENETRATIONS THRU CONCRETE WITH STRUCTURAL MEMBERS.

AA. KEEP ALL PIPING BOP ELEVATIONS WHERE INDICATED AND OFFSET AS REQUIRED.

BB. WHERE MAIN PIPE SIZE IS NOT INDICATED BETWEEN BRANCH CONNECTIONS IN THE DRAWING, THE PIPE SIZE SHALL BE OF THE LARGER PRECEDING PIPE SIZE.

CC. ALL MECHANICAL UTILITY PIPING AND DUCTWORK SHALL BE INSTALLED TO 5'–0" BEYOND THE NORMAL ENVELOPE OF THE BUILDING OR AS SHOWN ON DRAWINGS.

DD. ALL UNDERGROUND MECHANICAL UTILITY PIPING AND DUCTWORK SHALL HAVE A MINIMUM OF 3'–0" OF COMPACTED EARTH COVER.

EE. ALL PROCESS WASTE PIPING FLOWING BY GRAVITY SHALL HAVE A MINIMUM SLOPE OF ONE PERCENT. AS NOTED ON DRAWINGS

FF. ALL MECHANICAL UTILITY SERVICES SHOWN ON THESE DRAWINGS ARE LABELED FROM LEFT TO RIGHT AND FROM TOP TO BOTTOM WHEN A GROUP OF PIPING OR DUCTWORK ARE IDENTIFIED.

GG. DELETED!!

HH. SITE UTILITIES DRAWINGS (UHU SERIES DRAWINGS) NORTH (N) AND EAST (E) COORDINATES REFERENCE THE SNS COORDINATE SYSTEM NAD 83 (88). THE SNS GRID ORIGIN POINT IS LOCATED AT X–10 GRID COORDINATES N–27,612.730950 AND E–38,196.144070 WITH THE SNS GRID BEING ROTATED 6 DEGREES CLOCKWISE FROM THE X–10 GRID AT THAT POINT. (88) REFERS TO THE YEAR MARTIN MARIETTA ENERGY SYSTEM (MMES) ESTABLISHED G.P.S. MONUMENTS ON THE OAK RIDGE RESERVATION USING VALUES PUBLISHED IN 1986 BY THE TN. DEPARTMENT OF TRANSPORTATION, WHICH TIED THE MMES G.P.S. MONUMENTS TO THE TN GEODETIC REFERENCE NETWORK SYSTEM.

II. FINAL DUCT TIE–INS TO EQUIPMENT SHALL BE ADJUSTED TO ACCOMMODATE ACTUAL CONNECTION SIZES.

JJ. UNLESS NOTED, ALL CONNECTIONS TO VAV INLETS WILL BE THE SAME SIZE AS THE TERMINAL BOX CONNECTION.

KK. MAXIMUM LENGTH OF FLEX DUCT RUNOUTS SHALL NOT EXCEED 7'–0".

LL. DELETED.

MM. ALL THERMOMETERS AND TEMPERATURE SENSORS SHOWN IN THE CONTROLS DIAGRAMS WILL BE PROVIDED BY THE CONTROLS CONTRACTOR . UNDER THIS CONTRACT FURNISH AND INSTALL A 3/4" THREAD–O–LET AT THE APPROXIMATE LOCATIONS INDICATED. THE THREAD–O–LETS WILL BE PLUGGED IN THE FIELD TO ALLOW FOR HYDROSTATIC PRESSURE TESTING. MATERIALS FOR THE THREAD–O–LETS SHALL MATCH THE PIPING IN WHICH THEY ARE BEING INSTALLED.

NN. ALL PRESSURE GAUGES AND PRESSURE SENSORS SHOWN IN THE CONTROLS DIAGRAMS WILL BE PROVIDED BY THE CONTROLS CONTRACTOR. UNDER THIS CONTRACT FURNISH AND INSTALL A 1/2" THREAD–O–LET AT THE APPROXIMATE LOCATIONS INDICATED. THE THREAD–O–LETS WILL BE PLUGGED IN THE FIELD TO ALLOW FOR HYDROSTATIC PRESSURE TESTING. MATERIALS FOR THE THREAD–O–LETS SHALL MATCH THE PIPING IN WHICH THEY ARE BEING INSTALLED.

OO. PROVIDE ACCESS DOORS FOR ALL FIRE DAMPERS AND AUTOMATIC DAMPERS IN ACCORDANCE WITH MECHANICAL DETAILS.

PP. BOP OR TOP SHALL MEAN, RESPECTIVELY, BOTTOM OR TOP OF PIPE IF UNINSULATED PIPING OR BOTTOM OR TOP OF INSULATION IF INSULATED PIPING IS USED.

1 DCN–CHMS–001

ORNL DRAWING NUMBER:

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NUMBER OF SECTION OR DETAIL
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN OR TAKEN
SECTION AND DETAIL KEY

THIS DOCUMENT CONTROLLED BY
CHANGE CONTROL SYSTEM _____
ENGINEERING PROCEDURE _____

REV	CHANGE TYPE	CHANGE CONTROL SYSTEM	CHANGE REQUEST NUMBER	DESCRIPTION	DSN	CHK	DEPT
0				CERTIFIED FOR CONSTRUCTION – 12/9/02	JG	BWJ	

REVISION OR ISSUE PURPOSE

DATE	PE	DATE	PJ	DATE	REQ	DATE	UTB	DATE	RPE	RPE NO	DATE
								BWJ	105869	12/9/02	

REVISION APPROVALS

ST	CV	EC	EE	EM	IE	M	PD	SE	AR
BZ	AW	BWJ	AK	IM	DM	–	BWJ	–	TW

SQUAD CHECK

REV.	DATE	DRAWING APPROVALS	
		DSN	
		DRW	
		CHK	
		DEPT	
		PE	CLG
		PJ	JS
		REQ	
		UTB	JRL

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UT-BATTELLE, LLC. ◆ Oak Ridge, Tennessee

PROJECT NAME:
CENTER FOR NANOPHASE MATERIALS SCIENCES
MECHANICAL SYMBOLS

1	48	49	50	PLANT	BLDG	FL	SH.	OF	TYPE	CLASS
3	H	X	X	8	8610		1	1	g	U
51		52		53	A/E DRAWING NUMBER:					REV
NC		NA			H0.00.01					0

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Date: 01/04/2002 Time: 09:09:11
Author: BWJ Date: 12/09/2002
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