PROCESS AND INSTRUMENTATION DIAGRAM SYMBOLS

- BUTTERFLY VALVE MANUAL
- BUTTERFLY CONTROL VALVE
- BUTTERFLY DAMPER
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- SHUTOFF VALVE (BUTTERFLY VALVE FOR 2-1/2" AND LARGER. BALL VALVE FOR 2" AND SMALLER)
- BALANCING VALVE
- SPRING CHECK VALVE
- SWING CHECK VALVE
- 2-WAY CONTROL VALVE
- 3-WAY MIXING VALVE
- 2-WAY SOLENOID VALVE
- 3-WAY SOLENOID VALVE MIXING ARROW INDICATING FAIL POSITION
- DRAIN VALVE
- DRAIN VALVE WITH CAP
- GAS SHUTOFF VALVE
- REDUCED PRESSURE BACKFLOW PREVENTER (RPBP)
- PRESSURE SAFETY RELIEF VALVE
- LOCKSHIELD VALVE
- GENERAL PIPELINE STRAINER WITHOUT DRAIN
- GENERAL PIPELINE STRAINER WITH DRAIN
- WATER SYSTEM PIPELINE STRAINER
- SUCTION DIFFUSER
- VACUUM BREAKER
- FLANGE
- UNION
- FLEXIBLE CONNECTION
- AUTOMATIC AIR VENT
- MANUAL AIR VENT
- TEST PLUG (PRESSURE/TEMP.)
- CONCENTRIC REDUCER
- ECCENTRIC REDUCER
- OR — FLOW DIRECTION
- RUPTURE DISK PRESSURE RELIEF
- PRESSURE REDUCING VALVE–PRV
- AIR FILTER
- PLATE & FRAME HEAT EXCHANGER
- FAN
- EXPANSION TANK
- AIR SEPARATOR
- PUMP (BASE MOUNTED)
- DRAIN
- THERMOWELL
- SURFACE-MOUNT ULTRASONIC FLOW METER
- HEAT EXCHANGER
- AIR TERMINAL BOX

DAMPERS

- OPPOSED BLADE TYPE
- PARALLEL BLADE TYPE

ACTUATORS

- MANUAL
- ON/OFF SPRING OPPOSED
- ELECTRIC MOTOR DRIVEN
- MODULATING W/O POSITIONER
- MODULATING WITH POSITIONER
- SOLENOID

FAIL POSITION OR NORMAL POSITION.
FC = FAIL CLOSED
FO = FAIL OPEN
NC = NORMALLY CLOSED
NO = NORMALLY OPEN

INSTRUMENT LINE SYMBOLS

- CONNECTION TO PROCESS OR INSTRUMENT SUPPLY
- PNEUMATIC SIGNAL, AIR OR ANY GAS USED AS THE SIGNAL MEDIUM
- CAPILLARY TUBE
- ELECTRIC SIGNAL OR SOFTWARE LINK (SERIAL OR DATA)
- HARDWARE LINK
- PACKAGED EQUIPMENT LINE
- MAIN AIR SUPPLY

ETHERNET TERMINATION PER ANSI/TIA/EIA 568-B STANDARD

STRAIGHT		CROSS-OVER
PIN 1	ORG/WHT	PIN 1
PIN 2	ORG	PIN 2
PIN 3	GRN/WHT	PIN 3
PIN 4	BLU	PIN 4
PIN 5	BLU/WHT	PIN 5
PIN 6	GRN	PIN 6
PIN 7	BRN/WHT	PIN 7
PIN 8	BRN	PIN 8

12345678 — SOCKET END VIEW

87654321 — PLUG END VIEW

GENERAL INSTRUMENT OR FUNCTION SYMBOLS

FIELD MOUNTED | PANEL MOUNT ACCESSIBLE

- DISCRETE INSTRUMENTS (ie: SENSORS, CONTROLLERS, RECORDERS ETC.)
- INDICATING LIGHTS, ALARMS, HORNS
- XXX — LOOP IDENTIFIER (REFER TO ABBREVIATION MATRIX)
  - XXX = CLARIFIER
- YYYY / XXXX — YYYY = PROCESS MEDIA; REFER TO DRAWING XXXX FOR CONTINUATION OF PROCESS
- I — INTERLOCK
- AI XXX — DDC ANALOG INPUT
- AO XXX — DDC ANALOG OUTPUT
- DI XXX — DDC DISCRETE INPUT
- DO XXX — DDC DISCRETE OUTPUT
- FI XXX — DDC FREQUENCY INPUT

GENERAL SHEET SYMBOLS

- X — PLAN NOTE REFERENCE SYMBOL
- X — REVISION SYMBOL REFERENCE NUMBER
- XXXX — CHANGE BULLETIN SYMBOL REFERENCE NUMBER
- REFER / XX — PLAN CONTINUATION SYMBOL: BOTTOM = SHEET REFERENCE FOR CONTINUATION
- X / XX — DETAIL REFERENCE SYMBOL: TOP = DETAIL NUMBER; BOTTOM = SHEET REFERENCE ON WHICH DETAIL APPEARS
- EQUIPMENT TAG

INSTRUMENTATION SYMBOLS

CONTROLLERS							READOUT DEVICES		SWITCHES and ALARM DEVICES			TRANSMITTERS			SOLENOIDS, RELAYS, & COMPUTING DEVICES	PRIMARY ELEMENT	TEST POINT	WELL or PROBE	VIEWING DEVICE GLASS	SAFETY DEVICE	FINAL CONTROL ELEMENT
FIRST LETTERS	INITIATING OR MEASURED VARIABLE	RECORDING	INDICATING	BLIND	SELF-ACTUATED CONTROL VALVES	SELF-ACTUATED CONTROL DAMPERS	RECORDING	INDICATING	HIGH	LOW	COMB.	RECORDING	INDICATING	BLIND							
A	ANALYSIS	ARC	AIC	AC	ACV	ACD	AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW	AG		AV
B	BURNER/COMBUSTION	BRC	BIC	BC	BCV	BCD	BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE	BP	BW	BG		BZ
C	CONDUCTIVITY	CRC	CIC	CC	CCV	CCD	CR	CI	CSH	CSL	CSHL	CRT	CIT	CT	CY	CE	CP	CW	CG		CV
CR	CONTROL RELAY														CR						
D	DENSITY/VISCOSITY	DRC	DIC	DC	DCV	DCD	DR	DI	DSH	DSL	DSHL	DRT	DIT	DT	DY	DE	DP	DW	DG		DV
E	VOLTAGE	ERC	EIC	EC	ECV	ECD	ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE	EP	EW	EG		EZ
F	FLOW RATE	FRC	FIC	FC	FCV	FCD	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP	FW	FG		FV
FQ	FLOW QUANTITY	FQRC	FQIC	FQC	FQCV	FQCD	FQR	FQI	FQSH	FQSL	FQSHL	FQRT	FQIT	FQT	FQY	FQE	FQP	FQW	FQG		FQV
FF	FLOW RATIO	FFRC	FFIC	FFC	FFCV	FFCD	FFR	FFI	FFSH	FFSL	FFSHL	FFRT	FFIT	FFT	FFY	FFE	FFP	FFW	FFG		
H	HAND	HRC	HIC	HC	HCV	HCD	HR	HI	HSH	HSL	HSHL	HRT	HIT	HT	HY	HE	HP	HW	HG		HZ
I	CURRENT	IRC	IIC	IC	ICV	ICD	IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE	IP	IW	IG		IZ
J	POWER	JRC	JIC	JC	JCV	JCD	JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE	JP	JW	JG		JV
K	TIME	KRC	KIC	KC	KCV	KCD	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE	KP	KW	KG		KV
L	LEVEL	LRC	LIC	LC	LCV	LCD	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE	LP	LW	LG		LV
M	MOISTURE	MRC	MIC	MC	MCV	MCD	MR	MI	MSH	MSL	MSHL	MRT	MIT	MT	MY	ME	MP	MW	MG		MV
N	FREQUENCY	NRC	NIC	NC	NCV	NCD	NR	NI	NSH	NSL	NSHL	NRT	NIT	NT	NY	NE	NP	NW	NG		
P	PRESS./VACUUM	PRC	PIC	PC	PCV	PCD	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP	PW	PG	PSV/PSE	PV
PD	PRESS./DIFF.	PDRC	PDIC	PDC	PDCV	PDCD	PDR	PDI	PDSH	PDSL	PDSHL	PDRT	PDIT	PDT	PDY	PDE	PDP	PDW	PDG		PDV
Q	QUANTITY	QRC	QIC	QC	QCV	QCD	QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE	QP	QW	QG		QZ
R	RADIATION	RRC	RIC	RC	RCV	RCD	RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE	RP	RW	RG		RZ
S	SPEED	SRC	SIC	SC	SCV	SCD	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE	SP	SW	SG		SV
T	TEMPERATURE	TRC	TIC	TC	TCV	TCD	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW	TG	TSE	TV
TD	TEMPERATURE/DIFF.	TDRC	TDIC	TDC	TDCV	TDCD	TDR	TDI	TDSH	TDSL	TDSHL	TDRT	TDIT	TDT	TDY	TDE	TDP	TDW	TDG		TDV
U	MULTIVARIABLE	URC	UIC	UC	UCV	UCD	UR	UI	USH	USL	USHL	URT	UIT	UT	UY	UE	UP	UW	UG		UV
V	VIBRATION/MACHINERY ANALYSIS	VRC	VIC	VC	VCV	VCD	VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE	VP	VW	VG		VZ
W	WEIGHT/FORCE	WRC	WIC	WC	WCV	WCD	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE	WP	WW	WG		WZ
X	ON/OFF	XRC	XIC	XC	XCV	XCD	XR	XI	XSH	XSL	XSHL	XRT	XIT	XT	XY	XE	XP	XW	XG		XV
Y	EVENT STATE/PRESENCE	YRC	YIC	YC	YCV	YCD	YR	YI	YSH	YSL	YSHL	YRT	YIT	YT	YY	YE	YP	YW	YG		YZ
Z	POS./DIMEN.	ZRC	ZIC	ZC	ZCV	ZCD	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE	ZP	ZW	ZG		ZV

NOTE: THIS TABLE IS NOT ALL INCLUSIVE

*A, ALARM. THE ANNUNCIATING DEVICE, MAY BE USED IN THE SAME FASHION AS S, SWITCH, THE ACTUATING DEVICE.

† THE LETTERS H AND L MAY BE OMITTED IN THE UNDEFINED CASE

OTHER POSSIBLE COMBINATIONS

TJR	(SCANNING RECORDER)	FO	(RESTRICTION ORIFICE)	PFR	(RATIO)	HMS	(HAND MOMENTARY SWITCH)
LLH	(PILOT LIGHT)	FRK,HIK	(CONTROL STATIONS)	KQI	(RUNNING TIME INDICATOR)	XY	(PILOT SOLENOID VALVE)
XC	(MOTOR STARTER)	FX	(ACCESSORIES)	WKIC	(RATE-OF-WEIGHT LOSS CONTROLLER)	XS	(MOTOR AUXILIARY)
PRV	(PRESSURE REGULATING VALVE)			ZSC	(POSITION SWITCH CLOSED)		
				ZSO	(POSITION SWITCH OPEN)		

EQUIPMENT ABBREVIATIONS

ACB	- ACTIVE CHILLED BEAM
ACC	- AIR COOLED CONDENSER
AHU	- AIR HANDLING UNIT
AFM	- AIR FLOW MONITOR
AS	- AIR SEPARATOR
AT	- AIR TERMINAL DEVICE
B	- BOILER
CC	- COOLING COIL
CH	- CHILLIER
CHR	- CHILLED WATER RETURN
CHS	- CHILLED WATER SUPPLY
CWP	- CHILLED WATER PUMP
CWR	- CONDENSER WATER RETURN
CWS	- CONDENSER WATER SUPPLY
CT	- COOLING TOWER
CUH	- CABINET UNIT HEATER
D	- DAMPER
DCW	- DOMESTIC COLD WATER
DHW	- DOMESTIC HOT WATER
EA	- EXHAUST AIR
EF	- EXHAUST FAN
ET	- EXPANSION TANK
F	- FILTER
FCU	- FAN COIL UNIT
FD	- FIRE DAMPER
FF	- FINAL FILTER
FR	- FIN TUBE RADIATION
FT	- FLASH TANK
HC	- HEATING COIL
HRR	- HEAT RECOVERY WATER RETURN
HRS	- HEAT RECOVERY WATER SUPPLY
HRW	- HEAT RECOVERY WHEEL
HOA	- HAND OFF AUTO
HWP	- HEATING HOT WATER PUMP
HWR	- HEATING HOT WATER RETURN
HWS	- HEATING HOT WATER SUPPLY
HX	- HEAT EXCHANGER
LPC	- LOW PRESSURE CONDENSATE
LPS	- LOW PRESSURE STEAM
LTWS	- LOW TEMPERATURE WATER SUPPLY
LTWR	- LOW TEMPERATURE WATER RETURN
NG	- NATURAL GAS
NPCW	- NONPOTABLE COLD WATER
NPHW	- NONPOTABLE HOT WATER
NPSW	- NONPOTABLE SOFT WATER
NPW	- NONPOTABLE WATER
OA	- OUTSIDE AIR
OFCI	- OWNER FURNISHED CONTRACTOR INSTALLED
OFOI	- OWNER FURNISHED OWNER INSTALLED
P	- PUMP
PF	- PRE-FILTER
PWS	- PROCESS WATER SUPPLY
PWR	- PROCESS WATER RETURN
RC	- REHEAT COIL
RA	- RETURN AIR
RF	- RETURN FAN
SAD	- SOUND ATTENUATING DEVICE
SA	- SUPPLY AIR
SF	- SUPPLY FAN
SS	- STORM SEWER
ST	- STORAGE TANK
T	- TANK
TCV	- TEMPERATURE CONTROL VALVE
UH	- UNIT HEATER
V	- VALVE
VFD	- VARIABLE FREQUENCY DRIVE
VTR	- VENT THRU ROOF
WF	- WATER FILTER
WFM	- WATER FLOW METER

SMITHGROUP
architecture engineering interiors planning
SMITHGROUP, INC
35 EAST WACKER
SUITE 2200
CHICAGO, IL 60601
T 312.641.0770
F 312.641.6728
www.smithgroup.com

JJR
landscape architecture planning urban design civil engineering environmental science
JJR, LLC
35 EAST WACKER DRIVE
SUITE 2200
CHICAGO, ILLINOIS 60601
312.641.0510 T
312.641.0668 F
www.jjr-us.com

AEI Affiliated Engineers
Affiliated Engineers, Inc.
5802 Research Park Boulevard
Madison, Wisconsin 53719
Tel 608.238.2616 Fax 608.238.2614

Thornton Tomasetti
Thornton Tomasetti, Inc.
330 N. Wabash Avenue, Suite 1500
Chicago IL 60611-7622
T 312.596.2000 F 312.596.2001

TERRA ENGINEERING LTD.
225 West Ohio Street, 4th Floor
Chicago, Illinois 60654
T:(312)467-0123 F:(312) 467-0220

SEALS AND SIGNATURES

SCOTT P. FOSTER
062-059117
LICENSED PROFESSIONAL ENGINEER OF ILLINOIS
STATE OF ILLINOIS
EXPIRES 30 13

REV. NO.	DESCRIPTION	BY	APVD	DATE
	ISSUED FOR CONSTRUCTION			07/03/12

Argonne NATIONAL LABORATORY

FMS
Facilities Management Services

PROJECT TITLE: ADVANCED PROTEIN CRYSTALLIZATION FACILITY, ARGONNE NATIONAL LABORATORY

PROJECT NO: 08541-00

DRAWING TITLE

INSTRUMENTATION AND CONTROL SYMBOLS AND ABBREVIATIONS

DESIGNED: AEI	A/E CADD FILE: MI5.1.0	FACILITY NO(S)
DRAWN: AEI	A/E DWG. NO.: MI5.1.0	
CHECKED: AEI	CAD NO:	
PROJECT MANAGER: ANL - JESSE ADAMS; DATE - 05/06/11	DWG STATE	
	BIND ORDER	

FACILITY DOCUMENT NUMBER: J446-101-W- MI5.1.0 — REV. NO. 0

Plot Date: 5/2/2011 11:23:15 AM