

GENERAL INSTRUMENTS OR FUNCTIONS
(SEE NOTES 8 & 11)

SIGNALS AND LINES

- CONNECTION TO PROCESS OR INSTRUMENT AIR SUPPLY
- PNEUMATIC SIGNAL
- ELECTRIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED) NOTE 11
- ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED) NOTE 11
- INTERNAL SYSTEM LINK (SOFTWARE OR DATALINK)
- UNDEFINED SIGNAL

PRESSURE DEVICES
() - SUCCEEDING LETTERS

- FIELD MOUNTED INSTRUMENT**
- INSTRUMENT FOR TWO MEASURED VARIABLE, OR INSTRUMENT FOR SINGLE MEASURED VARIABLES AND PERFORMING TWO FUNCTIONS**
- INSTRUMENT FOR ASME TEST ONLY**
- INSTRUMENT FOR ASME TEST PLUS NORMAL USE**
- FRONT-OF-PANEL MOUNTED INSTRUMENT**
- INSTRUMENT MOUNTED BEHIND OR INTERNAL TO A PANEL**
- AUXILIARY PANEL FRONT MOUNTED INSTRUMENT**
- AUXILIARY PANEL INTERIOR MOUNTED INSTRUMENT**
- SHARED CONTROL, SHARED DISPLAY FUNCTION, NORMALLY ACCESSIBLE TO THE OPERATOR AT PRIMARY PANEL**
- SHARED CONTROL, SHARED DISPLAY FUNCTION, FIELD MOUNTED**
- DESIGNATES INSTRUMENT SUPPLIED WITH ASSOCIATED EQUIPMENT PACKAGE**
- PROGRAMMABLE LOGIC FUNCTION, NORMALLY ACCESSIBLE TO THE OPERATOR AT PRIMARY PANEL**
- CONTROL SYSTEMS INTERLOCKS (SEE NOTE 12)**
- FIELD MOUNTED COMPUTER FUNCTION**
- PANEL MOUNTED PILOT LIGHT**

FIELD MOUNTED INSTRUMENT

INSTRUMENT FOR TWO MEASURED VARIABLE, OR INSTRUMENT FOR SINGLE MEASURED VARIABLES AND PERFORMING TWO FUNCTIONS

INSTRUMENT FOR ASME TEST ONLY

INSTRUMENT FOR ASME TEST PLUS NORMAL USE

FRONT-OF-PANEL MOUNTED INSTRUMENT

INSTRUMENT MOUNTED BEHIND OR INTERNAL TO A PANEL

AUXILIARY PANEL FRONT MOUNTED INSTRUMENT

AUXILIARY PANEL INTERIOR MOUNTED INSTRUMENT

SHARED CONTROL, SHARED DISPLAY FUNCTION, NORMALLY ACCESSIBLE TO THE OPERATOR AT PRIMARY PANEL

SHARED CONTROL, SHARED DISPLAY FUNCTION, FIELD MOUNTED

DESIGNATES INSTRUMENT SUPPLIED WITH ASSOCIATED EQUIPMENT PACKAGE

PROGRAMMABLE LOGIC FUNCTION, NORMALLY ACCESSIBLE TO THE OPERATOR AT PRIMARY PANEL

CONTROL SYSTEMS INTERLOCKS (SEE NOTE 12)

FIELD MOUNTED COMPUTER FUNCTION

PANEL MOUNTED PILOT LIGHT

FLOW DEVICES
() - SUCCEEDING LETTERS

- FE - ORIFICE PLATE**
- FO - RESTRICTION ORIFICE**
- ORIFICE PLATE IN QUICK-CHANGE FITTING**
- FLOW NOZZLE FLOW TUBE**
- VENTURI TUBE**
- PITOT OR PITOT-VENTURI TUBE**
- FORWARD-REVERSE PITOT TUBE**
- AVERAGING PITOT TUBE**
- FLUME**
- WEIR**
- TURBINE OR PROPELLER**
- POSITIVE DISPLACEMENT**
- VARIABLE AREA**
- VORTEX**
- TARGET**
- MAGNETIC**
- SONIC**
- V-CONE METER**
- ANNULAR ORIFICE METER**
- CORIOLIS FLOWMETER**
- FLOW STRAIGHTENING VANES**
- GENERAL SYMBOL FOR IN-LINE INSTRUMENT**
- REGULATOR**

TEMPERATURE DEVICES
() - SUCCEEDING LETTERS

- TI - BIMETALLIC THERMOMETER**
- TW - THERMOWELL**
- TE - TEMPERATURE ELEMENT (THERMOCOUPLE, RTD, ETC.)**
- RTD (IF APPLICABLE)**
- DUAL OR DUPLEX TEMPERATURE ELEMENTS IN ONE WELL WHEN BOTH ELEMENTS ARE CONNECTED TO INSTRUMENTS**
- FILLED SYSTEM**
- LEVEL DEVICES**
() - SUCCEEDING LETTERS
- GAUGE GLASS OR FLOAT OR DISPLACEMENT TYPE LEVEL INSTRUMENT**
- DIFFERENTIAL-PRESSURE TYPE**
- FLANGE-MOUNTED DIFFERENTIAL-PRESSURE TYPE (ATMOSPHERIC TANK)**
- INTERNAL BALL-FLOAT TYPE**
- GAUGE BOARD TYPE**
- ELECTROMAGNETIC OR SONIC TYPE (NOT GUIDED), NOTE 11**
- ELECTROMAGNETIC OR SONIC TYPE (GUIDED WAVE RADAR) NOTE 11**
- COMBINATION GAUGE**
- CAPACITANCE OR DIELECTRIC TYPE**
- PADDLE OR LEVER**
- HAND- OR OPERATOR-ACTUATED DEVICES**
- HAND - OR OPERATOR-ACTUATED AUTOMATIC VALVE IN PROCESS LINE (NOTE 6)**
- ANALYSIS DEVICES**
() - SUCCEEDING LETTERS
- FLOW THROUGH TYPE**
- INSERTION TYPE**

SELF-ACTUATED DEVICES-PRESSURE

- PRESSURE REDUCING REGULATOR, SELF-CONTAINED**
- PRESSURE REDUCING REGULATOR, WITH EXTERNAL PRESSURE TAP**
- DIFFERENTIAL PRESSURE REDUCING REGULATOR WITH INTERNAL AND EXTERNAL PRESSURE TAP**
- BACKPRESSURE REGULATOR SELF-CONTAINED**
- BACKPRESSURE REGULATOR WITH EXTERNAL PRESSURE TAP**
- PRESSURE RELIEF OR SAFETY VALVE, STRAIGHT THROUGH PATTERN, SPRING OR WEIGHT LOADED, OR WITH INTEGRAL PILOT**
- PRESSURE RELIEF OR SAFETY VALVE, ANGLE PATTERN SPRING OR WEIGHT LOADED, OR WITH INTEGRAL PILOT**
- VACUUM RELIEF VALVE, ANGLE PATTERN, SPRING OR WEIGHT LOADED, OR WITH INTEGRAL PILOT**
- PRESSURE RELIEF OR SAFETY VALVE, ANGLE PATTERN, TRIPPED BY INTEGRAL SOLENOID**
- RUPTURE DISK OR SAFETY HEAD FOR PRESSURE RELIEF**
- RUPTURE DISK OR SAFETY HEAD FOR VACUUM RELIEF**
- TEMPERATURE REGULATOR, FILLED-SYSTEM TYPE**
- TEMPERATURE REGULATOR, FILLED-SYSTEM TYPE**
- TEMPERATURE REGULATOR, FILLED-SYSTEM TYPE**
- TEMPERATURE REGULATOR, FILLED-SYSTEM TYPE**
- TEMPERATURE REGULATOR, FILLED-SYSTEM TYPE**

SELF-ACTUATED DEVICES - TEMP

SELF-ACTUATED DEVICES - FLOW

- FLOW REGULATOR**

SELF-ACTUATED DEVICES - LEVEL

- LEVEL REGULATOR, WITH MECHANICAL LINKAGE**

VALVE ACTUATORS

- DIAPHRAGM, SPRING OPPOSED WITH POSITIONER**
- DIAPHRAGM, PRESSURE BALANCED**
- ROTARY MOTOR (SHOWN TYPICALLY WITH ELECTRIC SIGNAL)**
- SPRING-OPPOSED PNEUMATIC CYLINDER SINGLE-ACTING**
- PNEUMATIC CYLINDER, DOUBLE-ACTING**
- SINGLE-ACTING CYLINDER ASSEMBLED WITH ACTUATING PILOT VALVE**
- PNEUMATIC CYLINDER, DOUBLE-ACTING, WITH PILOT VALVE**
- SINGLE SOLENOID WITH OPTIONAL MANUAL RESET**
- ELECTRO-HYDRAULIC**
- HAND ACTUATOR OR HANDWHEEL ON PNEUMATIC VALVE**
- UNCLASSIFIED (TYPE OF ACTUATOR TO BE WRITTEN ADJACENT TO THE SYMBOL)**

MISCELLANEOUS INSTRUMENTS OR FUNCTIONS

FUNCTION BLOCKS (NOTE 5)

SYMBOLS FUNCTION

- NON-LINEAR OR UNSPECIFIED FUNCTION**
- PROPORTIONAL**
- SQUARE ROOT EXTRACTOR**
- HIGH SELECTING**
- LOW SELECTING**
- CURRENT-TO-PNEUMATIC CONVERTER**
- SUMMING**
- MULTIPLYING**
- DIVIDING**
- INTERLOCKS**
- HARDWARE INTERLOCK**
- DCS**
- PLC**
- PURGE OR FLUSHING DEVICE**
- PURGE DEVICE (MEANS OF REGULATING PURGE MAY BE SHOWN IN PLACE OF THE SYMBOL)**
- POWER SUPPLIES**
- NS - NITROGEN SUPPLY**
- SS - STEAM SUPPLY**
- WS - WATER SUPPLY**
- AS - AIR SUPPLY**
- GS - GAS SUPPLY**
- HS - HYDRAULIC FLUID SUPPLY**

INSTRUMENT FUNCTIONAL IDENTIFICATION

FIRST LETTERS ()	MEASURED OR INITIATING VARIABLE	MODIFIER	READOUT OR PASSIVE FUNCTION	SUCCEEDING LETTERS ()	
				OUTPUT FUNCTION	MODIFIER
A	ANALYSIS (NOTE 4)		ALARM (NOTE 10)	USER'S CHOICE	USER'S CHOICE
B	BURNER COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE
C	CONDUCTIVITY				
D	DENSITY	DIFFERENTIAL			
E	VOLTAGE		SENSOR/PRIMARY ELEMENT		
F	FLOW RATE	RATIO (FRACTION)			
G	GAGING (DIMENSIONAL)		GLASS, VIEWING DEVICE		
H	HAND (NOTE 6)				HIGH
I	CURRENT		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE			CONTROL STATION
L	LEVEL		LIGHT		LOW
M	MOISTURE	MOMENTARY			
N	USER'S CHOICE (NOTE 2)				
O	USER'S CHOICE (NOTE 2)		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED OR FREQUENCY	SAFETY			SWITCH (NOTE 10)
T	TEMPERATURE				TRANSMIT
U	MULTIVARIABLE		MULTIFUNCTION		MULTIFUNCTION
V	VIBRATION, VISCOSITY				VALVE, DAMPER, LOUVER
W	WEIGHT, FORCE	WELL			
X	UNCLASSIFIED (NOTE 3)	X AXIS	UNCLASSIFIED		UNCLASSIFIED
Y	EVENT, STATE, VIBRATION OR PRESSURE	Y AXIS			RELAY, COMPUTE, CONVERT
Z	POSITION, DIMENSION (NOTE 9)	Z AXIS			DRIVER, ACTUATOR UNCLASSIFIED FINAL CONTROL ELEMENT

NOTES:

- THE INSTRUMENT SYMBOLS AND LEGENDS ARE BASED ON ISA STANDARD 55.1-1992. FOR FURTHER DETAILS AND CLARIFICATION, REFER TO ISA STANDARD.
- THE USER'S CHOICE LETTERS "N" AND "O" ARE FOR UNLISTED MEANINGS THAT WILL BE USED REPETITIVELY ON A PARTICULAR PROJECT. THE MEANINGS WILL BE DEFINED ONLY ONCE FOR THAT PROJECT AND HAVE ONE AND ONLY ONE MEANING AS THE FIRST LETTER AND ANOTHER SINGLE MEANING AS THE SUCCEEDING LETTER.
- THE UNCLASSIFIED LETTER "X" IS FOR UNLISTED MEANINGS THAT WILL BE USED ONLY ONCE OR TO A LIMITED EXTENT. IT MAY HAVE ANY NUMBER OF MEANINGS AS A FIRST LETTER AND ANY NUMBER OF MEANINGS AS A SUCCEEDING LETTER EXCEPT FOR ITS USE WITH DISTINCTIVE SYMBOLS. THE MEANINGS WILL BE DEFINED OUTSIDE THE INSTRUMENT CIRCLE.
- THE LETTER "H" IS USED FOR ALL ANALYSIS VARIABLES. THE FOLLOWING TERMS MAY BE PLACED OUTSIDE THE INSTRUMENT CIRCLE TO DENOTE THE SPECIFIC VARIABLES:

CL2 - CHLORINE	N2 - NITROGEN	O2 - DISSOLVED OXYGEN	SiO2 - SILICA
CO - CARBON MONOXIDE	NA - SODIUM	O2 - GASEOUS OXYGEN	SO - SULPHUR OXIDES
CO2 - CARBON DIOXIDE	NH3 - AMMONIA	OP - OPAACITY	SO2 - SULPHUR DIOXIDE
COMB - COMBUSTIBLE	N2H4 - HYDRAZINE	PH - HYDROGEN ION CONCENTRATION	SMOKE - SMOKE DENSITY
H - DISSOLVED HYDROGEN	HCL - HYDROGEN CHLORIDE	TURB - TURBIDITY	TURB - TURBIDITY
H2 - GASEOUS HYDROGEN	NOX - NITROGEN OXIDES	S - SULPHUR	MEA - MONOETHANOL AMINE
			H2S - HYDROGEN SULFIDE
- THE DESCRIPTION DENOTING THE FUNCTION OF THE RELAY, CONVERTER OR COMPUTER "Y" MAY BE SHOWN ON THE P&ID OUTSIDE THE INSTRUMENT BUBBLE WHEN FURTHER DEFINITION IS CONSIDERED NECESSARY.
- IN THIS CONTEXT, "HV" IS A HAND- OR OPERATOR-ACTUATED VALVE.
- THE SPECIFIC BOARD OR OTHER LOCATION AT WHICH AN INSTRUMENT IS LOCATED MAY BE REFERENCED OUTSIDE THE INSTRUMENT SYMBOL, FOR LOCAL PANELS, THE PANEL REFERENCE IS TO BE PRECEDED BY THE LETTERS "JCL" UNLESS THE PANEL REFERENCE ITSELF IS INDICATIVE.
- HIGH-HIGH, LOW-LOW, AND HIGH-LOW ALARMS OR SWITCHES WILL BE DESIGNATED BY THE MODIFYING LETTERS "HH", "LL", AND "HL" RESPECTIVELY.
- PARALLEL STREAM VALVE POSITION SWITCH CONVENTION IS AS FOLLOWS:

VALVE A	ZSD	A	OPEN POSITION	VALVE B	ZSD	B	OPEN POSITION
	ZSC	A	CLOSED POSITION		ZSC	B	CLOSED POSITION
- TEXT LOCATION AROUND INSTRUMENT SYMBOL SHOULD BE STANDARDIZED AS FOLLOWS:

d	- FUNCTION IDENTIFICATION	d, e	a, f, g, h, j
b	- LOOP NUMBER AND SUFFIX		
c	- PANEL NUMBER (NOTE 7)		
d	- ASME TEST SYMBOL		c, j
e	- PACKAGE SUPPLIED INSTRUMENT (+)		
f	- FUNCTION BLOCK AND DESIGNATIONS		
g	- MODIFYING LETTERS H, HH, HL, L, LL FOR ALARMS AND SWITCHES		
h	- SPECIFIC ANALYSIS VARIABLE		
i	- FUNCTION DEFINITION FOR FIRST-LETTER "X" AND SUCCEEDING LETTER "Y" (NOTES 3 & 5)		
j	- SYSTEM IDENTIFICATION IF REQUIRED FOR CLARITY OR SAFETY. EXAMPLES: BMS, EBO		
k	- FIELD BUS INSTRUMENT DENOTED BY "FB"		
- ELECTROMAGNETIC PHENOMENA INCLUDE HEAT, RADIO WAVES, NUCLEAR RADIATION, AND LIGHT.
- INSERT THE FOLLOWING DEPENDING UPON THE REQUIRED INTERLOCK:

PLC	- PROGRAMMABLE LOGIC CONTROLLER	CTG	- COMBUSTION TURBINE CONTROL SYSTEM
DCS	- DISTRIBUTED CONTROL SYSTEM	BMS	- BURNER MANAGEMENT CONTROL SYSTEM
STG	- STEAM TURBINE CONTROL SYSTEM		
- DO NOT SHOW A SEPARATE BUBBLE FOR THE TW UNLESS THE TW LOOP NUMBER DOES NOT MATCH THAT OF THE TE OR TI. A NOTE SHALL BE INCLUDED IF NO TW IS PROVIDED.

MISCELLANEOUS INSTRUMENTS OR FUNCTIONS (CONT.)

SPECIAL USE DESUPERHEATER

PRESSURE REDUCING DESUPERHEATER VALVE

STRAIGHT THRU DESUPERHEATER

BECHTEL CONFIDENTIAL

BECHTEL POWER CORPORATION
FREDERICK, MARYLAND

CO2 KARSTO PROJECT

PIPING & INSTRUMENT DIAGRAM SYMBOLS AND LEGENDS

NO.	DATE	ISSUED FOR USE	BY	CHK	MECH SUPV	CS SUPV	PROJ ENGR
13	04/08						
SCALE	DESIGNED	DRAWN	PM				

GASSNOVA

OWNER DOCUMENT NUMBER: **10112936-PB-P-PID-0004**

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REV: **0**