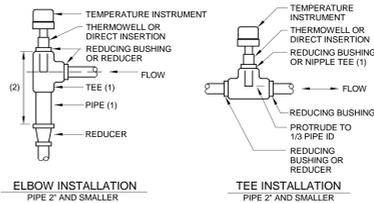
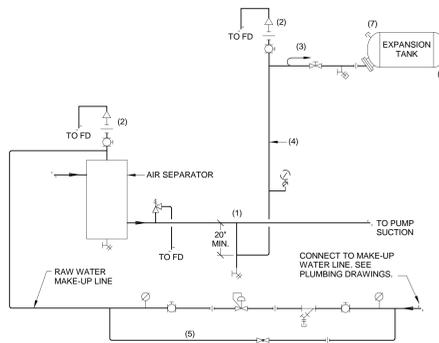


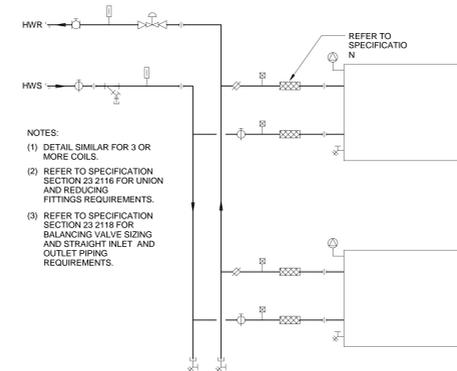
NOTE:  
(1) REFER TO SPECIFICATION SECTION 23 2118 FOR BALANCING VALVE SIZING AND STRAIGHT INLET AND OUTLET PIPING REQUIREMENTS.



NOTE:  
(1) USE TEE APPROPRIATELY SIZED TO MAINTAIN NET AREA NOT LESS THAN CROSS SECTIONAL AREA OF CONNECTED PIPE.  
(2) UN-REDUCED RUN SHALL EXCEED THERMOWELL OR DIRECT INSERTION LENGTH PLUS 2 INCHES.



NOTES:  
(1) CONNECT TO SIDE OF MAIN. AVOID TOP OR BOTTOM CONNECTION.  
(2) AUTOMATIC AIR VENT. USE HIGH CAPACITY TYPE AT AIR SEPARATOR. SEE SPECIFICATION SECTION 23 2120.  
(3) PITCH NOT LESS THAN 1" IN 5 FEET.  
(4) UNLESS OTHERWISE INDICATED, MINIMUM PIPE SIZE FROM TANK TO SYSTEM TO BE 1-1/4" FOR SYSTEM HAVING HEAT GENERATOR OUTPUT CAPACITY LESS THAN 10 MBH, 1-1/2" FOR CAPACITY BETWEEN 10 AND 16 MBH, AND 2" FOR CAPACITY OVER 16 MBH.  
(5) UNLESS OTHERWISE INDICATED, BYPASS LINE SHALL BE THE SAME SIZE AS THE MAKE-UP WATER LINE.  
(6) DRAIN PLUG.  
(7) AIR CHARGING VALVE PLUG.



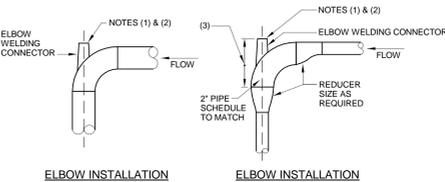
NOTES:  
(1) DETAIL SIMILAR FOR 3 OR MORE COILS.  
(2) REFER TO SPECIFICATION SECTION 23 2116 FOR UNION AND REDUCING FITTINGS REQUIREMENTS.  
(3) REFER TO SPECIFICATION SECTION 23 2118 FOR BALANCING VALVE SIZING AND STRAIGHT INLET AND OUTLET PIPING REQUIREMENTS.

**10 IN-LINE PUMP (WITH STRAINER)**  
NTS

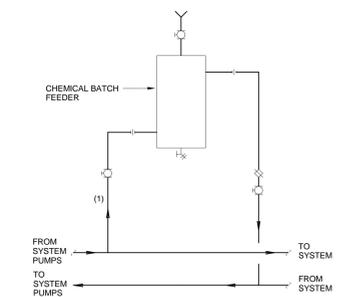
**7 TEMPERATURE INSTRUMENTS (THREADED PIPE)**  
NTS

**4 BLADDER TYPE EXPANSION TANK PIPING (SUSPENDED TANK)**  
NTS

**1 HOT WATER HEATING COIL PIPING (MULTIPLE COILS 2-WAY CV)**  
NTS



NOTE:  
(1) USE THREADED CONNECTOR FOR THREADED WELLS. USE SOCKET OR BUTT WELD CONNECTOR AND FLANGE FOR FLANGED WELLS.  
(2) FOR DIRECT INSERTION TEMPERATURE INSTRUMENTS, PROVIDE 1/2" WELD-O-LET.  
(3) UN-REDUCED RUN MUST EXCEED THERMOWELL LENGTH PLUS 2 INCHES.



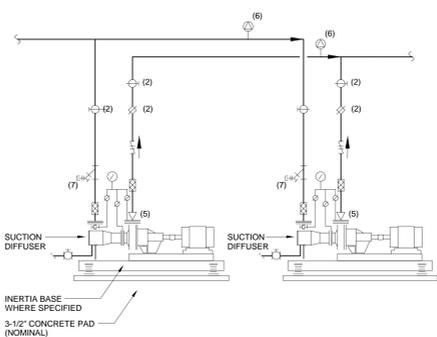
NOTE:  
(1) PIPE TO BE 3/4" UNLESS OTHERWISE SHOWN ON PLANS.

**11 CHEMICAL BATCH FEEDER PIPING**  
NTS

**8 TEMPERATURE INSTRUMENTS (WELDED PIPE)**  
NTS

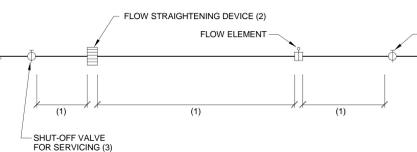
**5 WATER FILTER PIPING**  
NTS

**2 CHILLED WATER COOLING COIL PIPING (MULTIPLE COILS 2-WAY CV)**  
NTS



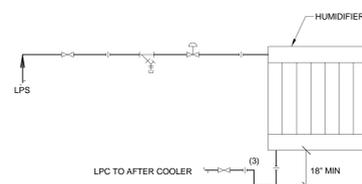
NOTE:  
(1) INERTIA BASE IF SPECIFIED, SHALL EXTEND UNDER SUCTION DIFFUSER.  
(2) MOUNT VALVES AS LOW AS PRACTICAL.  
(3) REFER TO SPECIFICATION FOR GROUTING REQUIREMENT.  
(4) REFER TO SPECIFICATION SECTION 23 2118 FOR BALANCING VALVE SIZING AND STRAIGHT INLET AND OUTLET PIPING REQUIREMENTS.  
(5) REFER TO SPECIFICATION FOR REDUCER REQUIREMENT.  
(6) PROVIDE AUTOMATIC VENTS AT HIGH POINTS.  
(7) PROVIDE DRAIN AT LOW POINT.

**9 END-SUCTION PUMP CONNECTION (2-PUMPS WITH SUCTION DIFFUSER)**  
NTS



NOTE:  
(1) INSTALL FLOW ELEMENT IN ACCORDANCE WITH MANUFACTURER'S INSTALLATION INSTRUCTIONS WITH RECOMMENDED UPSTREAM AND DOWNSTREAM STRAIGHT PIPE.  
(2) INSTALL FLOW STRAIGHTENING DEVICE IF FURNISHED WITH FLOW ELEMENT.  
(3) SHUT-OFF VALVES ARE NOT REQUIRED IF FLOW ELEMENT HAS HOT TAP FEATURE.

**6 FLOW ELEMENT (MEASURING STATION)**  
NTS



NOTE:  
(1) PROVIDE NECESSARY SUPPORTS FOR HUMIDIFIER.  
(2) REFER TO SECTION 23 0902 FOR VALVE REQUIREMENT.  
(3) PIPE SIZE AS RECOMMENDED BY UNIT MANUFACTURER BUT NOT LESS THAN 1"

**3 STEAM HUMIDIFIER PIPING**  
NTS

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SEALS AND SIGNATURES



ISSUED FOR CONSTRUCTION 07/01/12

REV. NO. DESCRIPTION BY APVD DATE



FMS  
Facilities Management Services

PROJECT TITLE ADVANCED PROTEIN  
CRYSTALLIZATION FACILITY,  
ARGONNE NATIONAL LABORATORY  
PROJECT NO. 08541-00

DRAWING TITLE  
**MECHANICAL DETAILS**

DESIGNED	AE CAD FILE	FACILITY
SPF	M6.4.0	(NOI)
DRAWN	AE DWG. NO.	
LW	M6.4.0	
CHECKED	CAD NO.	
SPF		
PROJECT MANAGER	DWG STATE	
ANL - JESSE ADAMS	BND ORDER	
DATE - 08/18/11		
FACILITY DOCUMENT NUMBER		REV. NO.
<b>J446-101-W-</b>		<b>M6.4.0</b>