M.E. GROUP PRESENTATION

R. DORTWEGT

June 12, 2001

SUMMARY

- Linac water systems
    - Closed loop water stations
    - Other systems
    - Other work for Linac customers
- SR vacuum chamber water
- Process water quality
- PAR vacuum chambers
- Pressure Technology and Safety Committee (PTSC)
- Mechanical safety

LINAC WATER SYSTEMS

- Closed loop water stations provide temperature conditioning for:
    - Waveguides
    - Accelerating structures
    - SLED's
    - RF loads
    - RF windows
- Other systems installed to provide D.I. water for:
    - P.C. Gun
    - Laser
    - 75^{o}F water from primary loop for new power supplies for modulators
    - APS injection guns (future) – 2 separate loops for guns
- Assistance for Linac "customers"
    - Mostly in the form of assistance with flowmetering and instrumentation

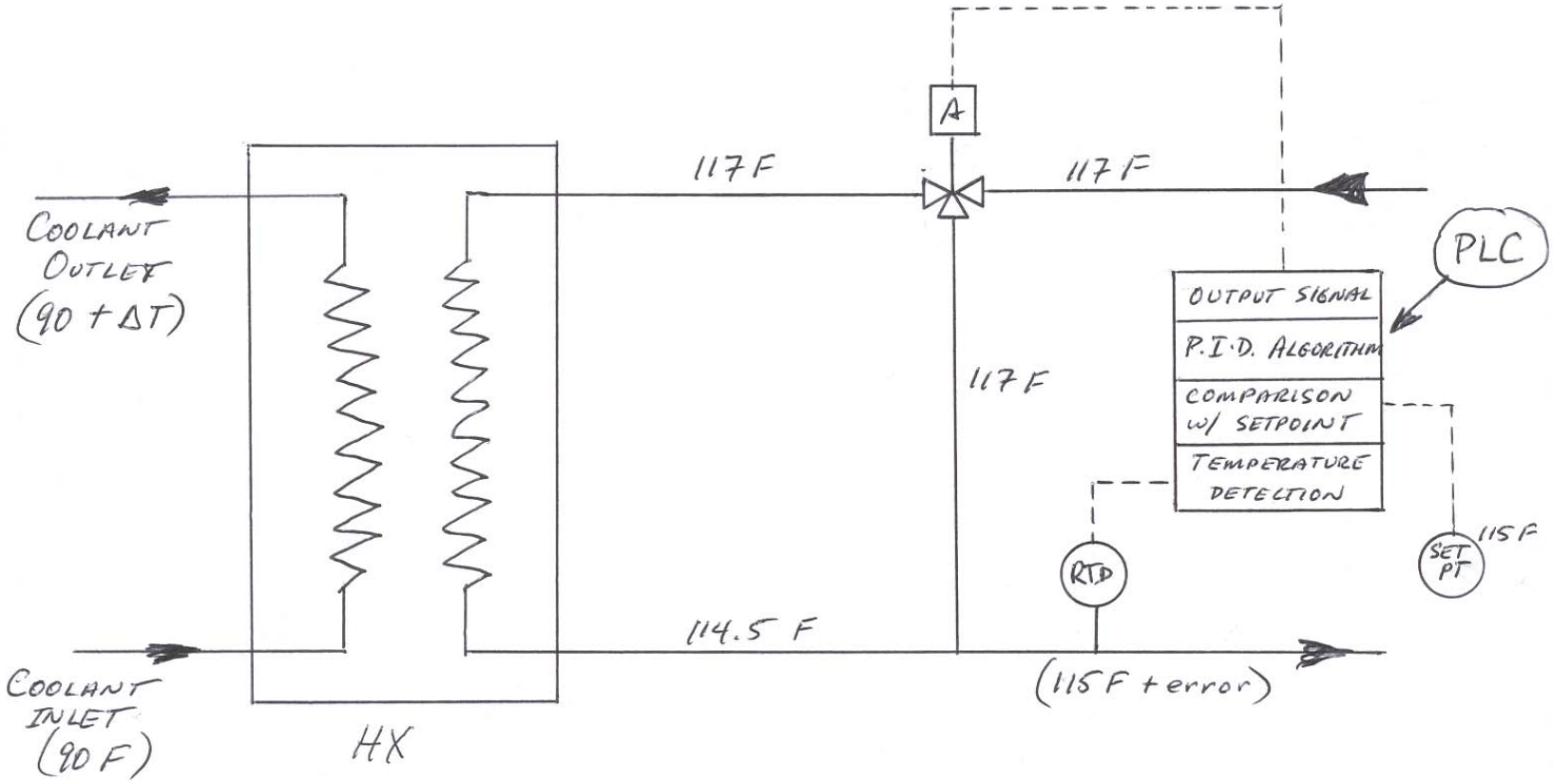
LINAC CLOSED LOOP SYSTEMS

- History
  - Built by original APS Linac Group
  - Temperature stability an issue at commissioning
  - Change to Johnson Controls
  - Big improvements early on were:
    - Direct immersion RTD's (improves response time)
    - Beginning of realization that loop tuning was important
  - Control valve tuning class (you can adjust only the errors you can detect)
  - Understanding the impact of signal resolution (i.e. detecting really small temperature changes)
  - Prototype fix (stand-alone controller from Honeywell)
  - Implementation of Allen-Bradley controls (Rick)
  - Communications with EPICS (Rick with help from ASD Controls Group)

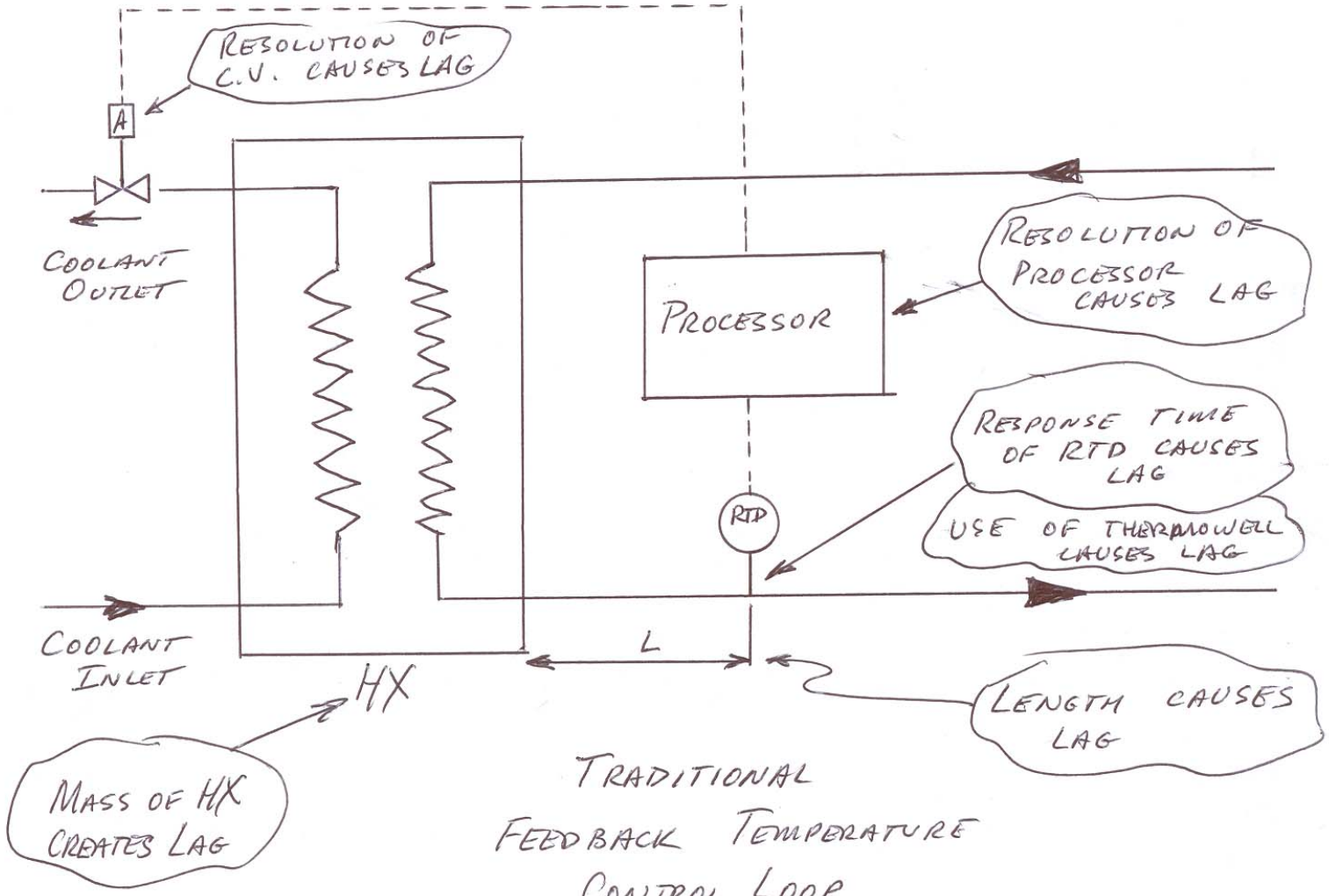
Linac Closed Loop Water Station

LINAC CLOSED LOOP SYSTEMS

- Important things to understand
  - Feedback loop principles
  - Reduce time lag of error signal processing
  - Direct immersion RTD vs. RTD in a thermowell
  - Resolution of temperature changes
- New requirements
  - New water station to be built in FY-02 for Linac Sector 6
    - Provide separate water loop for SLED (operate at different temperature)
    - Quieter
    - Smaller (??)
    - All PLC control
    - Location, location, location!!!!!
  - Improve flow metering on closed loop stations using V-cones and DPT's
    - Better reliability
    - Install DPT's in tunnel to avoid failure in tunnel



APS
FEEDBACK TEMPERATURE
CONTROL LOOP



TRADITIONAL FEEDBACK TEMPERATURE CONTROL LOOP

OTHER LINAC SYSTEMS

- GOAL: to get away from custom designed systems (a la P.C. Gun) for miscellaneous items such as guns, lasers, etc.

    - Less costly to obtain
    - Less lead time to implement
    - Standardized design
    - Repairs do not impact larger PW secondary system
    - ~K$10

    - First unit for gun testing work in Linac RF Test Room (delivery expected in August, ’01)

    - Vendor is Bay Voltex
    - Standard design modified to achieve 140^{o}F
    - Stability to /-0.1 ^{o}C (0.18F)
    - Flow monitoring and water treatment done in-house
    - Remote monitoring/control via EPICS

- Low pressure / cool water for Linac components from primary water (75F)

    - Pumps P-PRMOD-1/2 (75 psig)
    - Same pumps as SRVC cooling skids
    - Pressure and temperature not as severe as secondary system
    - All capacity taken by new modulator power supplies, RF loads and window

Call Toll FREE 1-877-285-8900

Tel: **925-606-6293** Fax: **925-606-6297**
174 Lawrence Drive, Suite J
Livermore, CA 94550 USA
sales@bayvoltex.com

Bay Voltex

Lasers

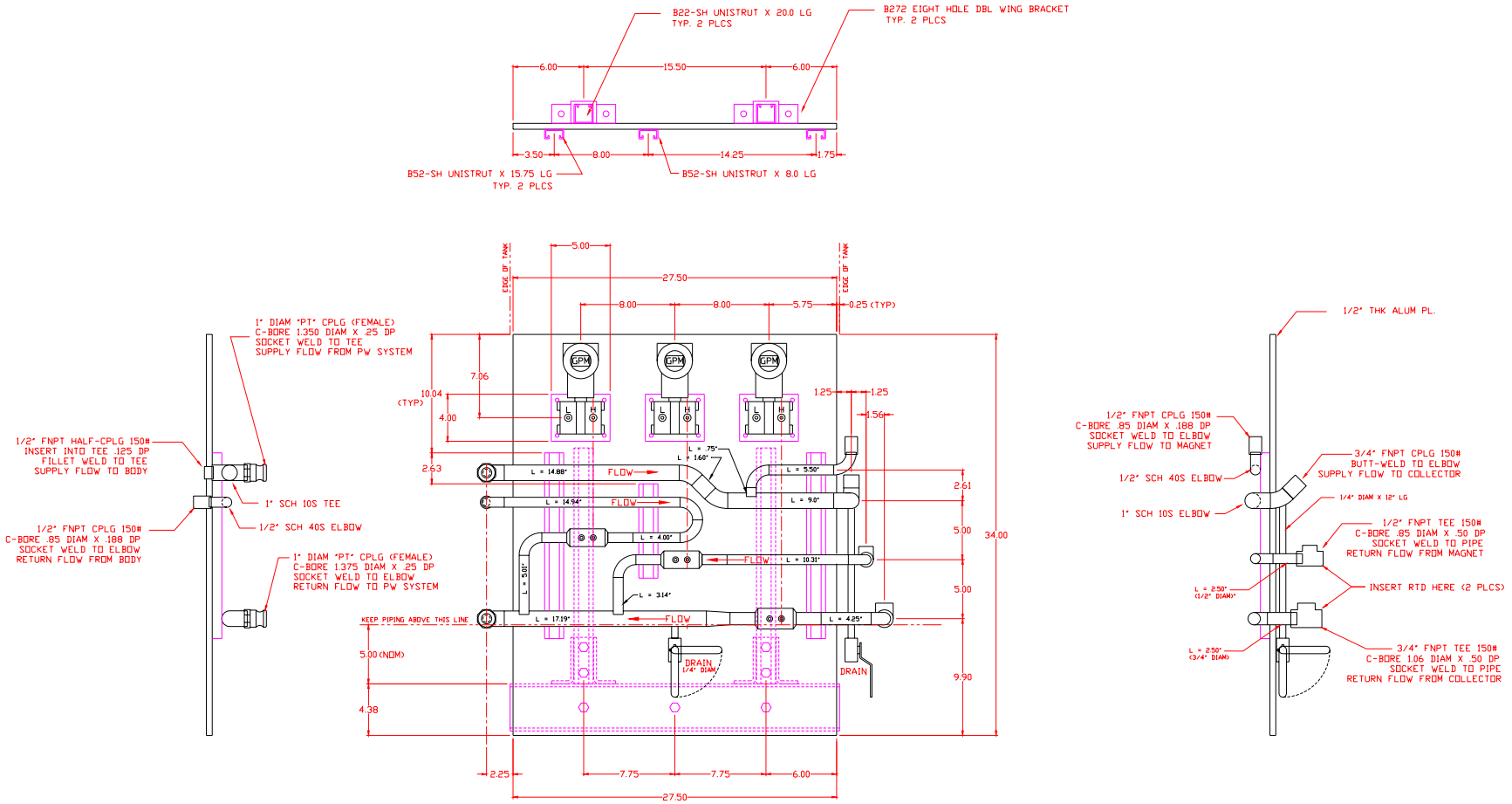
19" RACK MOUNT CHILLERS: 19" rack mountable systems have been developed with cooling capacities from 300 watts to 4kw. Systems for circulation of deionized water are available. A selection of pumps, remote signal and safety interlocks are available.	
TEMPRYTE FT SERIES: The FT series are a very simple, high reliability, low cost, refrigeration based, cooling systems for application where only a simple replacement of 20°C tap water cooling is required. A range of capacities and pumps are available. See Specification Sheet.	
TEMPRYTE RRS SERIES: A series of 0-40°C chillers which meet the general cooling requirement of numerous applications. Safety interlocks and full metering are standard. Cooling capacities from 300 watts to 40kw are available. Numerous options for remote control, deionized water compatible, etc., are available. See Specification Sheet.	
WATER to DI WATER HEAT EXCHANGERS: A patented circuit design allows these systems to provide lasers with a very tight temperature controlled source of deionized water. A wide range of cooling capacities, flow rates and customizing options are available.	

Call Toll FREE 1-877-285-8900
sales@bayvoltex.com

Typical Example of “Off-the-shelf” System planned for use with new APS Guns

ASSISTANCE FOR LINAC "CUSTOMERS"

- FLOW METERING PROJECTS
    - Modulator power supplies
    - Klystrons
- Use of V-cones and Yokagawa DP transmitters
    - Accuracy 1% or better
    - Reliability
    - 10:1 turndown
    - Standardization of components across ASD-ME and other groups
    - No moving parts in water stream
    - Built by our own technicians



Layout of Components for Klystron Flowmeter Upgrade in Linac

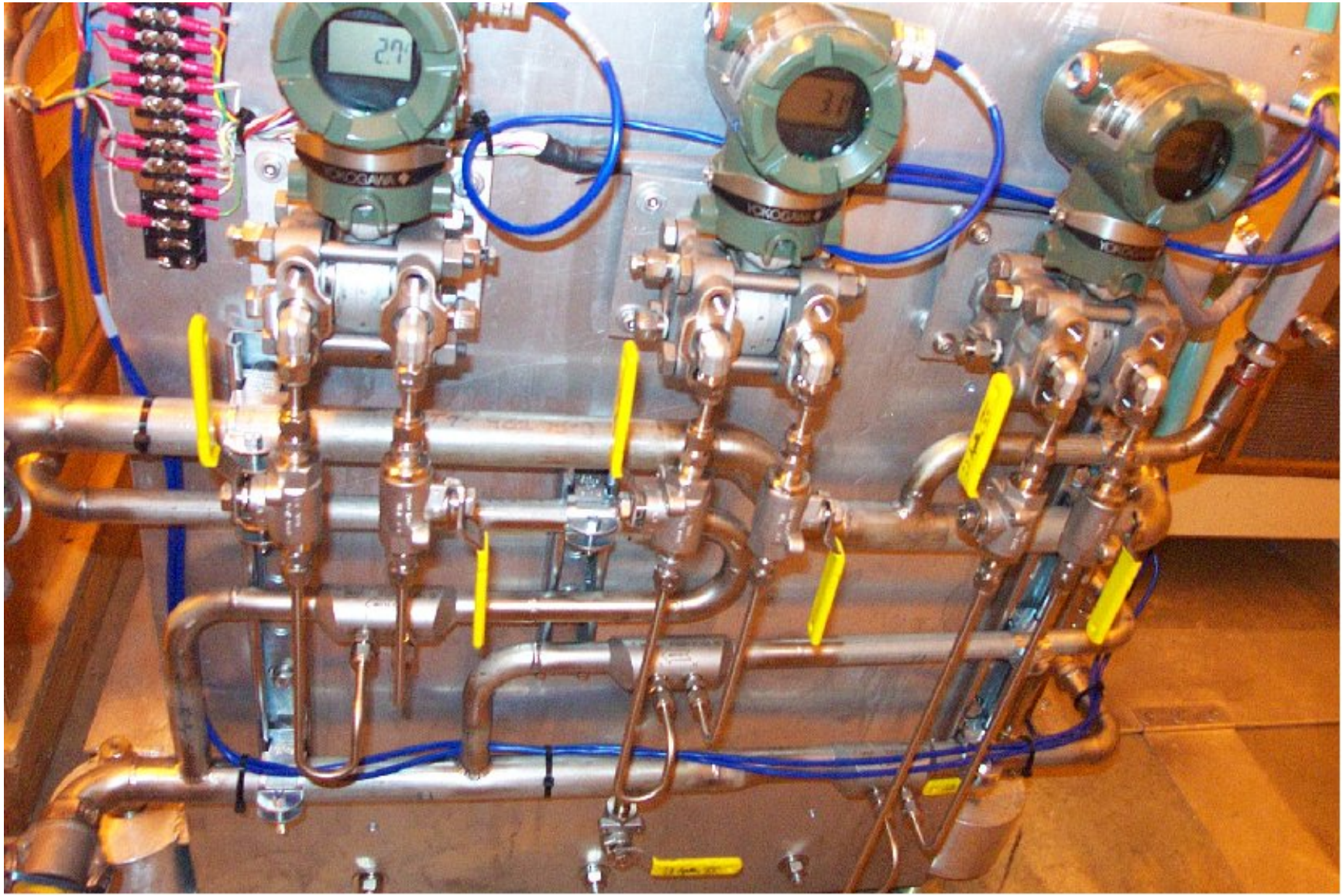


Photo of Components for Klystron Flowmeter Upgrade in Linac

SR VACUUM CHAMBER COOLING

- COOLING SKIDS
  - One skid for two SR sectors (20 skids)
  - Mechanical mezzanine
  - Separate water stations for aluminum vacuum chambers
  - 52 gpm @ 45 psig nominal operating point
  - Low maintenance
  - Will need to start replacing “sealed for life” bearings

- FUTURE IMPROVEMENTS TO COOLING SKIDS
  - “Clean-up” slipstream piping through resin tanks
  - Install permanent resin tank for till connection
  - Upgrade system monitoring
  - Allen-Bradley temperature controls (95% complete)
  - Disconnect switches for individual pumps

Cooling Skid for SR Vacuum Chambers

SR VACUUM CHAMBER BAKEOUT

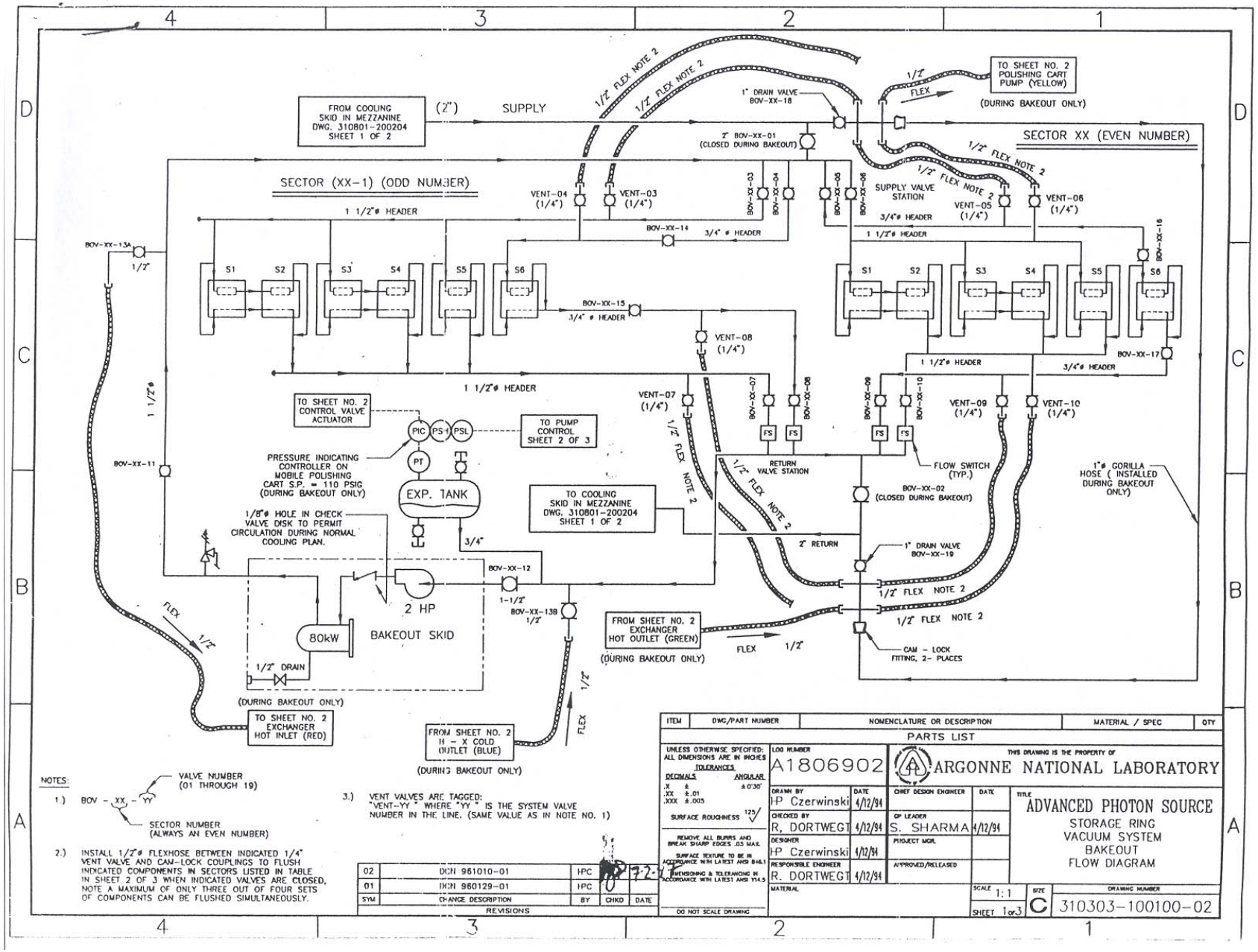
- BAKEOUT SKIDS
  - One skid for two SR sectors (20 skids)
  - SR Utility Aisle
  - Uses same distribution piping as cooling skids
  - ~25 gpm per sector at 110 psig and 135^{o}C (275 ^{o}F)
  - Originally designed for 150^{o}C (300 ^{o}F)
  - Vacuum group never uses temps that high
  - High pressure to keep water from boiling and dissolved air from flashing
  - Must be used with mobile cart for water purification

- FUTURE IMPROVEMENTS TO BAKEOUT SKIDS
  - Upgrade and automate monitoring
  - Install permanent wiring for beacon system
  - Install permanent signage for bakeout system

- MOBILE CART
  - Used only when bakeout is ongoing
  - HX for heat recovery
  - Pumps 3 gpm of “clean” water from cooling skid to bakeout system
  - Returns 3 gpm of “bakeout” water to cooling system to be purified

Bakeout Skid for SR Vacuum chambers

Mobile Cart for Maintaining Cleanliness of DI Water During SR Vacuum Chamber Bakeout



NOTES:

1.) BOV - XX - YY
- XX: SECTOR NUMBER (ALWAYS AN EVEN NUMBER)
- YY: VALVE NUMBER (01 THROUGH 19)

2.) INSTALL 1/2"ø FLEXHOSE BETWEEN INDICATED 1/4" VENT VALVE AND CAM-LOCK COUPLINGS TO FLUSH INDICATED COMPONENTS IN SECTORS LISTED IN TABLE IN SHEET 2 OF 3 WHEN INDICATED VALVES ARE CLOSED. NOTE A MAXIMUM OF ONLY THREE OUT OF FOUR SETS OF COMPONENTS CAN BE FLUSHED SIMULTANEOUSLY.

3.) VENT VALVES ARE TAGGED: "VENT-YY" WHERE "YY" IS THE SYSTEM VALVE NUMBER IN THE LINE. (SAME VALUE AS IN NOTE NO. 1)

SYM	CHANGE DESCRIPTION	BY	CHKD	DATE
02	DCN 961010-01	HPC		
01	DCN 960129-01	HPC		

REVISIONS

ITEM	DWG/PART NUMBER	NOMENCLATURE OR DESCRIPTION	MATERIAL / SPEC	QTY

PARTS LIST

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS: .X ±; .XX ±.01; .XXX ±.005
ANGULAR: ±0°30'
SURFACE ROUGHNESS 125
REMOVE ALL BURRS AND BREAK SHARP EDGES .03 MAX.
SURFACE TEXTURE TO BE IN ACCORDANCE WITH LATEST ANSI B46.1
DIMENSIONING & TOLERANCING IN ACCORDANCE WITH LATEST ANSI Y14.5
DO NOT SCALE DRAWING

LOG NUMBER A1806902

THIS DRAWING IS THE PROPERTY OF ARGONNE NATIONAL LABORATORY

DRAWN BY	HP Czerwinski	DATE	4/12/94
CHECKED BY	R, DORTWEGT	DATE	4/12/94
DESIGNER	HP Czerwinski	DATE	4/12/94
RESPONSIBLE ENGINEER	R. DORTWEGT	DATE	4/12/94
CHIEF DESIGN ENGINEER	S. SHARMA	DATE	4/12/94
GP LEADER			
PROJECT MGR.			
APPROVED/RELEASED			

MATERIAL

TITLE: ADVANCED PHOTON SOURCE
STORAGE RING
VACUUM SYSTEM
BAKEOUT
FLOW DIAGRAM

SCALE 1:1 SHEET 1 OF 3 SIZE C DRAWING NUMBER 310303-100100-02

WATER QUALITY AT APS

- Copper corrosion continues to be an issue at APS, but at manageable rates
- Manageable corrosion rates have been achieved through filtration and oxygen control
- Information on deaeration system at Building 450
  - ASD invested ~K$500 on improving this system
  - Tripled the throughput (now 450 gpm)
  - DO less than 5ppb coming out of degassifier
  - System DO normally between 5-10ppb
  - Transferred responsibility to PFS in February of this year
- Focal point for ordering filters and chemical analyses
  - Filters from US Filter-Filtration
  - Analyses from McCrone Lab (Westmont)
- What we have learned about pH of DI water and impact on corrosion rate
- DI water production
  - Change to RO production in 1998
  - System is leased from vendor with fixed monthly charges
  - Learned that we must do maintenance only during 1st week of shutdown

PAR VACUUM CHAMBERS

- Evaluation of spares inventory indicates a need for attention
    - Several chambers not complete
    - A few chambers not compatible with existing geometry
- Inconel 625 formed/machined plate still on hand from 1993 effort
- Bill Toter has all the E-B welding parameters on file
- Learning how to work on “hot’ chambers

ANL-E PRESSURE SAFETY COMMITTEE

- Committee was formed around 7-8 years ago
- Goal was to develop a Pressure Safety Manual (PSM) for ANL-E
  - Based on ASME
  - DOE order 440.1 (mandatory)
- First draft manual was complete ~2-3 years ago (done mostly by the Chair at the time)
- Committee and divisional revolt (no buy-in)
- New committee chair appointed (Bill Toter)
- Draft manual completed two months ago
  - Does not give rules on design and fabrication
  - Does give guidelines on what things need to be considered
  - Responsibility for pressure safety put on division Division director & line management

ANL-E PRESSURE SAFETY COMMITTEE (cont.)

- Every division to appoint a Pressure System Advisor (PSA)
- Pressure systems classified into 3 classes:
  - Category A: significant risk
  - Category B: relatively low or limited risk
  - Category C: low-risk systems
- Anticipate all (or most) of our systems to be Category B and C
- The biggest impact on ASD will be:
  - Documenting and testing current systems to ensure compliance
  - Implementing work rules that ensure compliance

ASD MECHANICAL SAFETY COMMITTEE

- R. Dortwegt participation upon request by Jim Lang
- Current effort includes noise reduction of pump motors in building 420 & 411
  - Building 420:
    - Current motors ~90-92dBA (noise from all 3 operating simultaneously)
    - New motors (68dBA individually) could reduce noise to 75-80dBA composite
    - Noise generated mostly from fan blades
    - Motors are larger, so either have to raise pump on baseplate or modify baseplate
    - Figure $2500 per motor
  - Building 411:
    - Current motors ~89dBA (noise from all 3 operating simultaneously)
    - New motors (79dBA individually) would not reduce noise much
    - Need another quote for quieter motor

MECHANICAL SUPPORT

- Lots of help received
  - Technician labor
  - From other staff
  - From Jodi
  - Thoughtfulness when needed
  - Cheerfulness
  - Chop-busting even when not needed

- **Many thanks**