© 2004 Cannon Design
All rights reserved. No part of this document may be reproduced or utilized in any form, without prior written authorization by The Cannon Corporation.
eanders
8/17/2004 6:22:41 PM
p:\02414.01\cooling tower\hvac\ctr-m002.dwg
..\base\ctr-tblk.dwg

9 SEQUENCE OF OPERATION

1.1 CHILLER OPERATION

A. GENERAL

1. THIS SYSTEM INCLUDES THREE CHILLERS, CH-1, CH-2, AND CH-3. EACH CHILLER HAS A DEDICATED PRIMARY CHILLED WATER PUMP, CHWP-1, CHWP-2, AND CHWP-3 RESPECTIVELY.
2. REFER TO THE SPECIFICATIONS FOR A LIST OF ADDITIONAL MONITORING AND CONTROL POINTS.

B. SYSTEM STARTUP

1. THE SYSTEM SHALL BE ENABLED FROM THE OPERATOR'S WORKSTATION.
2. WHENEVER THE OUTDOOR AIR TEMPERATURE IS ABOVE 60 DEG F AND THE TEMPERATURE OF THE SUPPLY CHILLED WATER TO THE BUILDING IS ABOVE 50 DEG F (ADJUSTABLE) THE SYSTEM SHALL BE ALARMED. THIS SHALL PROMPT THE SYSTEM OPERATOR TO ENABLE ANOTHER CHILLER.
3. WHENEVER THE A CHILLER IS ENABLED, THROUGH THE WORKSTATION, THE FOLLOWING SHALL OCCUR:
   a. OPEN ISOLATION VALVES (CHWR V-1*) ASSOCIATED WITH THE PARTICULAR CHILLER BEING ENABLED.
   b. AFTER END SWITCHES, ASSOCIATED WITH THE ISOLATION VALVES, CONFIRMED THAT THE VALVES ARE OPEN, THE BAS SHALL START THE ASSOCIATED PRIMARY CHILLED WATER PUMP.
   c. AFTER THE DIFFERENTIAL PRESSURE SWITCH, ASSOCIATED WITH THE PRIMARY CHILLED WATER PUMP, PROOFS CHILLED WATER FLOW, CONDENSING WATER PUMP (CWP-1, CWP-2, OR CWP-3) SHALL START AND AT A PREDETERMINED TIME DELAY OPEN THE CHILLER'S V-2* (CWS VALVE). TIME DELAY SHALL BE DETERMINED DURING STARTUP.
   d. AFTER THE DIFFERENTIAL PRESSURE SWITCH, ASSOCIATED WITH THE CONDENSING WATER PUMP, PROOFS CONDENSING WATER FLOW, THEN THE CHILLER SHALL BE ENABLED TO START.
   e. AFTER THE BAS HAS COMMANDED THE CHILLER TO THE START, THE CHILLER INTERNAL CONTROLS WILL ENERGIZE THE CHILLER.
   f. IF ANY OF THE END SWITCHES OR DIFFERENTIAL PRESSURE SWITCHES FAIL TO CONFIRM WATER FLOW, AN ALARM SIGNAL SHALL BE DISPLAYED AT THE WORKSTATION.
   g. WHENEVER A CHILLER IS ALREADY OPERATING AND A SECOND CHILLER IS COMMANDED BY THE WORKSTATION TO START, THE SAME SEQUENCES SHALL BE FOLLOWED FOR THE ADDITIONAL CHILLER.

C. CHILLER STOP

1. WHENEVER THE TEMPERATURE DIFFERENTIAL BETWEEN CHILLED WATER SUPPLY AND CHILLED WATER RETURN IS 5 DEG F (ADJUSTABLE) OR LESS, THE BAS SHALL PROMPT THE OPERATOR TO STOP ONE CHILLER. THE OPERATOR, THROUGH THE WORKSTATION, SHALL COMMAND THE BAS TO STOP A CHILLER. ONCE THE CHILLER HAS BEEN COMMANDED TO STOP THE FOLLOWING SHALL OCCUR:
   a. THE BAS SHALL COMMAND THE CHILLER TO STOP. THE CHILLER CONTROL PANEL SHALL STOP THE CHILLER. AFTER THE CHILLER STATUS SIGNAL INDICATES THAT THE CHILLER HAS STOPPED, THE BAS WILL WAIT FOR 2 MINUTES (ADJUSTABLE) BEFORE STOPPING THE CHILLED WATER PUMP.
   b. AFTER THE CHILLED WATER PUMP HAS STOPPED, THE BAS SHALL WAIT FOR 2 MINUTES (ADJUSTABLE) BEFORE STOPPING THE CONDENSING WATER PUMP AND CLOSING VALVE V-2*. VALVE V-2* SHALL CLOSE AT A PREDETERMINED TIME DELAY. TIME DELAY SHALL BE DETERMINED DURING STARTUP.
   c. AFTER THE DIFFERENTIAL PRESSURE SWITCHES HAVE DETERMINED THAT THE CHILLED WATER PUMP AND CONDENSING WATER PUMP HAVE STOPPED, THE ISOLATION VALVE ASSOCIATED WITH THE CHILLER SHALL CLOSED.

1.2 PLATE AND FRAME HEAT EXCHANGER - FREE COOLING

A. GENERAL

1. THIS SYSTEM INCLUDES A PLATE AND FRAME TYPE HEAT EXCHANGER (HX-1) FOR WINTER OPERATION TO PROVIDE WATER SIDE ECONOMIZER. THE CONDENSING WATER SYSTEM SHALL OPERATE IN THE WINTER MODE.

B. STARTUP

1. THE SYSTEM SHALL BE COMMANDED TO START FROM THE OPERATOR'S WORKSTATION
2. WHENEVER THE OUTDOOR AIR TEMPERATURE IS BELOW 50 DEG F (ADJUSTABLE) THE SYSTEM SHALL BE ENABLED. WHENEVER THE OUTDOOR AIR TEMPERATURE IS ABOVE 53 DEG F, THE SYSTEM SHALL BE DISABLED.
3. WHENEVER THE SYSTEM IS COMMANDED TO START THE FOLLOWING SHALL OCCUR:
   a. OPEN ISOLATION VALVE CHWR V-14 AND CWR V-24.
   b. AFTER END SWITCHES, ASSOCIATED WITH THE ISOLATION VALVES, CONFIRMED THAT THE VALVES ARE OPEN, THE BAS SHALL START THE ASSOCIATED PRIMARY CHILLED WATER PUMP CHWP-4.
   c. AFTER THE DIFFERENTIAL SWITCH, ASSOCIATED WITH PUMP CHWP-4, PROOFS FLOW, THEN LEAD CONDENSING WATER PUMP (CWP-1, CWP-2 OR CWP-3) SHALL START.
   d. IF ANY OF THE END SWITCHES OR DIFFERENTIAL PRESSURE SWITCHES FAIL TO CONFIRM WATER FLOW AN ALARM SIGNAL SHALL BE DISPLAYED AT THE WORKSTATION.

C. HEAT EXCHANGER (FREE COOLING) STOP

1. THE WORKSTATION SHALL COMMAND THE BAS TO STOP THE OPERATION OF HX-1. ONCE HX-1 HAS BEEN COMMANDED TO STOP THE FOLLOWING SHALL OCCUR:
   a. STOP PUMP CHWP-4 AND THE CONDENSING WATER PUMP ASSOCIATED WITH THE WINTER MODE.
   b. AFTER THE DIFFERENTIAL PRESSURE SWITCHES ASSOCIATED WITH THE OPERATION OF PUMP CHWP-4 AND THE CONDENSING WATER SYSTEM DETERMINE THAT THERE IS NO FLOW IN THE CHILLED WATER SIDE AND THE CONDENSING WATER SIDE OF HX-1, THE ISOLATION VALVES V-14 AND V-24 SHALL CLOSED.

1.3 SECONDARY CHILLED WATER PUMP OPERATION

A. GENERAL

1. THIS SYSTEM INCLUDES THREE CHILLED WATER PUMPS AND BY-PASS VALVE (V-1)

B. SYSTEM STARTUP

1. THE SYSTEM SHALL BE COMMANDED TO START FROM THE OPERATOR'S WORKSTATION.
2. WHENEVER THE SYSTEM IS COMMANDED TO START THE FOLLOWING SHALL OCCUR:
   a. START THE LEAD SECONDARY CHILLED WATER PUMP. LEAD PUMP SHALL START WITH THE ASSOCIATED VARIABLE FREQUENCY DRIVE AT ITS LOWEST SPEED SETTING. AFTER 2 MINUTES (ADJUSTABLE) THE VARIABLE FREQUENCY DRIVE WILL START TO INCREASE THE SPEED OF THE PUMP AT A MAXIMUM RATE OF 2% PER SECOND (SET AT THE VFD). THE BAS WILL COMMAND THE VARIABLE FREQUENCY DRIVE TO CHANGE THE SPEED OF THE PUMP AS REQUIRED TO MAINTAIN THE LOWEST DIFFERENTIAL PRESSURE IN THE SYSTEM AS DETERMINED BY THE TWO DIFFERENTIAL PRESSURE TRANSMITTERS DPT-1 AND DPT-2. SETPOINT SHALL BE 20 PSI (ADJUSTABLE).
   b. WHENEVER THE SPEED OF THE LEAD SECONDARY PUMP IS AT 95 % OF ITS MAXIMUM SPEED FOR MORE THAN 15 MINUTES (ADJUSTABLE), THE BAS SHALL ENERGIZE THE LAG SECONDARY CHILLED WATER PUMP. WHENEVER THE TWO PUMPS ARE OPERATING, THE TWO PUMPS SHALL VARY THEIR SPEED SIMULTANEOUSLY TO MAINTAIN THE SET POINT.
   c. WHENEVER THE SPEED OF BOTH PUMPS DROPS BELOW 45% FOR MORE THAN 15 MINUTES (ADJUSTABLE), THE LEAD PUMP SHALL BE DE-ENERGIZED. AT THIS TIME THE LAG PUMP BECOMES THE LEAD PUMP.

C. BY-PASS OPERATION

1. WHENEVER THE DIFFERENTIAL PRESSURE AS DETERMINED BY DPT-1 OR DPT-2 IS 10 PSI (ADJUSTABLE) ABOVE THE SET POINT, BY-PASS VALVE V-1 SHALL MODULATE OPEN TO MAINTAIN THE DIFFERENTIAL PRESSURE IN THE SYSTEM. OTHERWISE, IT SHALL REMAIN CLOSED.

1.4 COOLING TOWER OPERATION

A. GENERAL

1. THIS SYSTEM INCLUDES A 5 CELL COOLING TOWER AND 3 CONDENSING WATER PUMPS. COOLING TOWER CT-5 IS TO OPERATE DURING THE WINTER MODE.
2. THIS SYSTEM INCLUDES THREE MODES OF OPERATION: WARMUP, SUMMER, AND WINTER. WARMUP SHALL BE ACTIVE WHENEVER THE CHILLED WATER PLANT IS FIRST ENERGIZED. SUMMER MODE SHALL BE ACTIVE WHENEVER THE OUTDOOR AIR TEMPERATURE IS ABOVE 50 DEG F (ADJUSTABLE). WINTER MODE SHALL BE ACTIVE WHENEVER THE OUTDOOR AIR TEMPERATURE IS 50 DEG F (ADJUSTABLE) OR BELOW.

B. WARMUP MODE

1. THIS MODE OF OPERATION IS ONLY TO BE ACTIVE WHENEVER CHILLER #1 IS OPERATING. DURING THIS MODE ISOLATION VALVES V-3, V-4, AND V-5 SHALL REMAIN CLOSED. ISOLATION VALVES, V-31, V-32, V-33, AND V-34, ASSOCIATED WITH THE COOLING TOWERS SHALL REMAIN CLOSED
2. THE BAS SHALL COMMAND THIS SYSTEM TO START. WHENEVER THIS SYSTEM IS COMMANDED TO START, THE LEAD CONDENSING WATER PUMP SHALL BE ENERGIZED. DIFFERENTIAL PRESSURE SWITCH SHALL PROVIDE THE BAS WITH A PROOF OF FLOW. BAS SHALL SET THE SPEED OF THE CONDENSING WATER PUMP TO DELIVER 2000 GPM.
3. VALVE V-35 SHALL OPEN THE BY-PASS PORT AND DIRECT WATER FLOW TO THE SUMP OF THE COOLING TOWER. VALVE V-35 SHALL MODULATE THE BY-PASS PORT CLOSED AS THE CONDENSING WATER TEMPERATURE REACHES THE SET POINT OF 70 DEG F (ADJUSTABLE).
4. WHENEVER THE TEMPERATURE OF THE CONDENSING WATER EXCEEDS 75 DEG F (ADJUSTABLE) THE BAS SHALL ENERGIZED THE FAN ASSOCIATED WITH CT-5 AT ITS LOWEST SPEED. BAS SHALL INCREASE THE SPEED OF THE FAN AS REQUIRED TO MAINTAIN THE SET POINT.

C. SUMMER MODE

1. THIS MODE OF OPERATION IS TO BE ACTIVE AFTER THE WARM UP MODE HAS BEEN OPERATING AND AN ADDITIONAL CHILLER IS TO BE ENERGIZED.
2. THE BAS SHALL COMMAND THIS SYSTEM TO START AN ADDITIONAL CONDENSING WATER PUMP. WHENEVER THIS SYSTEM IS COMMANDED TO ADD ANOTHER PUMP, THE FOLLOWING SHALL OCCUR:
   a. OPEN ISOLATION VALVES FOR THE TWO LAG COOLING TOWERS (V-3*). OPEN ISOLATION VALVES V-3, V-4, AND V-5. ISOLATION VALVES ASSOCIATED WITH THE OTHER TOWERS SHALL REMAIN CLOSED.
   b. AFTER END SWITCHES HAVE CONFIRMED THAT THESE VALVES ARE OPEN. BAS SHALL ENERGIZE THE LAG CONDENSING WATER PUMP AND AT A PREDETERMINED TIME DELAY OPEN THE CHILLER'S V-2* VALVE. WHENEVER MULTIPLE CONDENSING PUMPS ARE OPERATING, THE VARIABLE FREQUENCY DRIVES OF EACH PUMP NEEDS TO BE SET TO MEET THE TOTAL CONDENSING WATER FLOW:

EQUIPMENT OPERATING	TOTAL LWS (GPM)	EACH CWS PUMP (HZ)
CH-1	2000	
CH-2 OR CH-3	5400	
CH-1 AND CH-2	7400	
CH-1 AND CH-3	7400	
CH-2 AND CH-3	10800	
HX-1	2700	

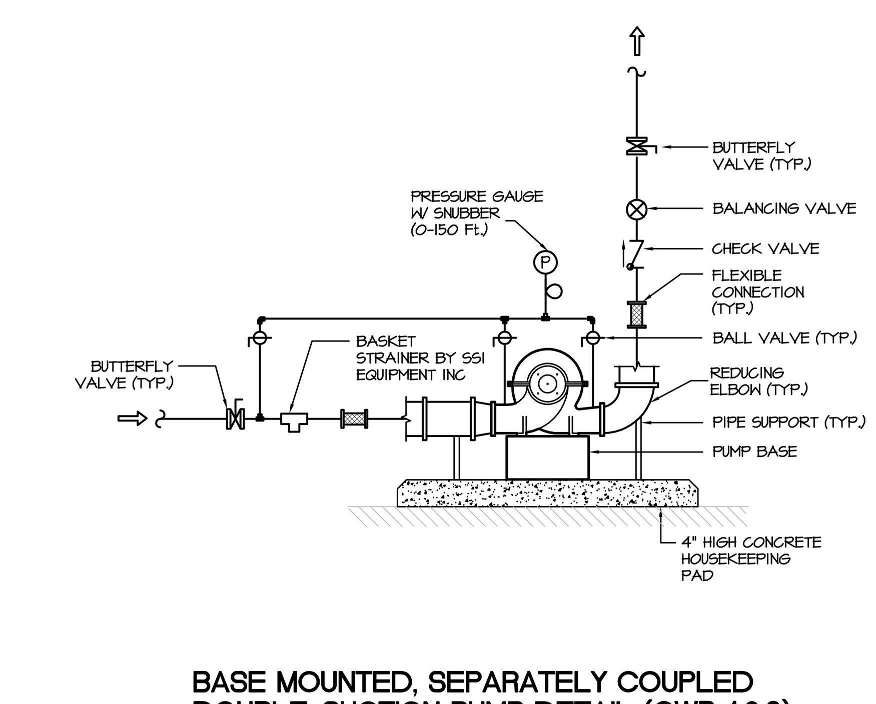
   c. WHENEVER THE TEMPERATURE OF THE CONDENSING WATER EXCEEDS 75 DEG F (ADJUSTABLE) THE BAS SHALL ENERGIZED THE FAN OF THE FIRST LAG COOLING TOWER AT ITS LOWEST SPEED. BAS SHALL INCREASE THE SPEED OF THE FAN AS REQUIRED TO MAINTAIN THE SET POINT. WHENEVER THE SPEED OF THE FIRST LAG TOWER IS AT 95%, THE FAN OF THE SECOND LAG TOWER SHALL BE ENERGIZED. WHENEVER THE TWO FANS ARE OPERATING, THEY SHOULD VARY THEIR SPEED SIMULTANEOUSLY.
   d. ON A DROP ON WATER TEMPERATURE BELOW SET POINT THE FANS SHALL SLOW DOWN. WHENEVER THE FAN SPEED IS BELOW 45% THE FIRST LAG FAN SHALL STOP. ON A FURTHER DROP OF WATER TEMPERATURE BELOW SET POINT THE SECOND LAG FAN SHALL STOP.

D. WINTER MODE

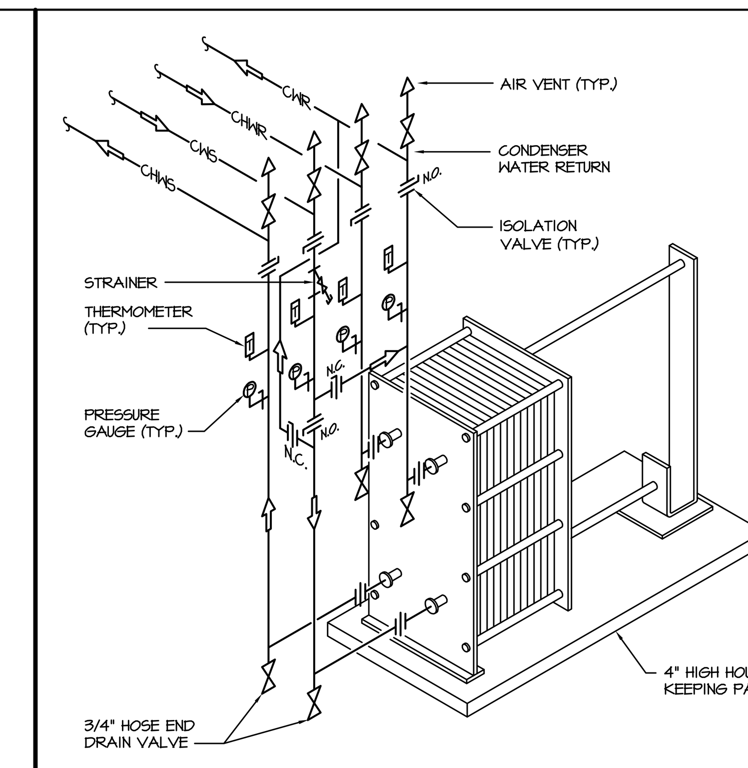
1. THIS MODE OF OPERATION IS ONLY TO BE ACTIVE WHENEVER HEAT EXCHANGER HX-1 IS OPERATING. DURING THIS MODE ISOLATION VALVES V-3, V-4, AND V-5 SHALL REMAIN CLOSED. ISOLATION VALVES, V-31, V-32, V-33, AND V-34, ASSOCIATED WITH THE COOLING TOWERS SHALL REMAIN CLOSED
2. THE BAS SHALL COMMAND THIS SYSTEM TO START. WHENEVER THIS SYSTEM IS COMMANDED TO START, THE LEAD CONDENSING WATER PUMP SHALL BE ENERGIZED. DIFFERENTIAL PRESSURE SWITCH SHALL PROVIDE THE BAS WITH A PROOF OF FLOW. BAS SHALL SET THE SPEED OF THE CONDENSING WATER PUMP TO DELIVER 2700 GPM.
3. VALVE V-35 SHALL OPEN THE BY-PASS PORT AND DIRECT WATER FLOW TO THE SUMP OF THE COOLING TOWER. VALVE V-35 SHALL MODULATE CLOSE THE BY-PASS PORT AS THE CONDENSING WATER TEMPERATURE REACHES THE SET POINT OF 47 DEG F (ADJUSTABLE).
4. WHENEVER THE TEMPERATURE OF THE CONDENSING WATER EXCEEDS 47 DEG F (ADJUSTABLE) THE BAS SHALL ENERGIZED THE FAN ASSOCIATED WITH CT-5 AT ITS LOWEST SPEED. BAS SHALL INCREASE THE SPEED OF THE FAN AS REQUIRED TO MAINTAIN THE SET POINT.

E. MISCELLANEOUS

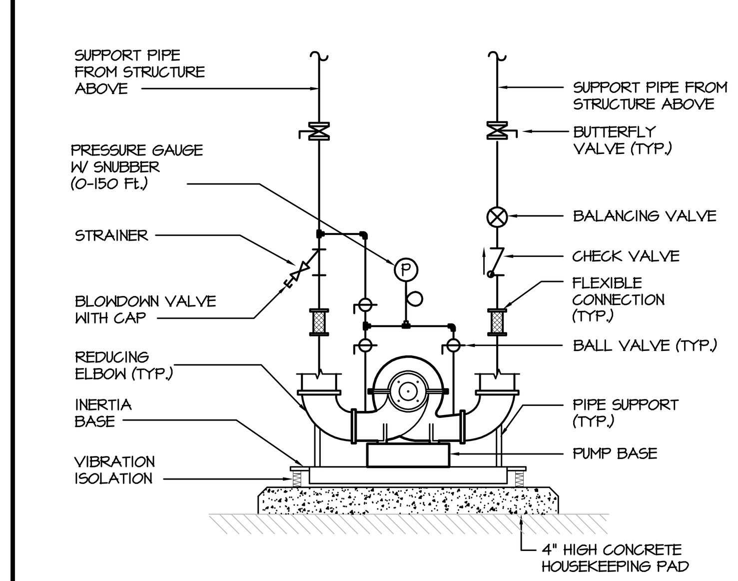
1. COOLING TOWERS SHALL STOP THE ASSOCIATED FAN WHENEVER THE VIBRATION ISOLATION SWITCH IS ACTIVATED. THE BAS SHALL DISPLAYED AN ALARM AT THE WORKSTATION.
2. BASIN HEATERS SHALL BE ENABLED BY THE BAS WHENEVER THE OUTDOOR AIR TEMPERATURE IS BELOW 45 DEG F (ADJUSTABLE) BASIN HEATERS SHALL MODULATE TO MAINTAIN A WATER TEMPERATURE IN THE SUMP AT 40 DEG F (ADJUSTABLE). BAS SHALL DISPLAY AN ALARM WHENEVER THE WATER TEMPERATURE FROM ANY TOWER IS BELOW 40 DEG F (ADJUSTABLE).
3. WATER LEVEL SENSOR SHALL MONITOR THE WATER LEVEL IN THE COOLING TOWERS. BAS SHALL OPEN THE SOLENOID VALVE ASSOCIATED WITH THE MAKE UP WATER FOR THE CONDENSING WATER SYSTEM LOCATED IN THE CENTRAL PLANT. THE BAS SHALL DISPLAY AN ALARM WHENEVER THE WATER LEVEL DROPS BELOW LOW LEVEL SET POINT. SIGNAL FROM THE WATER LEVEL SENSOR ASSOCIATED WITH THE COOLING TOWERS, WHICH ARE NOT OPERATING SHALL NOT CONTROL THE MAKE-UP SYSTEM DURING NON-OPERATING PERIODS.



8 BASE MOUNTED, SEPARATELY COUPLED DOUBLE-SUCTION PUMP DETAIL (CWP-1,2,3)



7 SINGLE PASS PLATE AND FRAME HEAT EXCHANGER



6 BASE MOUNTED, SEPARATELY COUPLED DOUBLE-SUCTION PUMP DETAIL (CHWP-1,2,3,4 AND SCHWP-1,2,3)

5 FAN SCHEDULE

UNIT NO.	SERVICE	LOCATION	AIR CAPACITY (CFM)	TYPE	TOTAL STATIC PRESSURE (IN. WG)	VOLUME CONTROL	MOTOR HP	MOTOR V/PH/Hz	BASIS OF DESIGN	REMARKS
EF-1	EXHAUST	PUMP ROOM	6000	SIDEWALL PROPELLER	0.25	CONSTANT VOLUME	3/4	460/3/60	GREENHECK MODEL SB-3L24-7	1 2
EF-2	EXHAUST	PUMP ROOM	6000	SIDEWALL PROPELLER	0.25	CONSTANT VOLUME	3/4	460/3/60	GREENHECK MODEL SB-3L24-7	1 2

NOTES:
1. PROVIDE WALL MOUNTED THERMOSTAT AND MOTOR GUARD.
2. DISCONNECT SWITCH BY DIVISION 16.

4 PIPING HEAT TRACING SCHEDULE

NO.	PIPING TYPE	ELECTRIC DATA WATT/ VOLT/ PHASE/ HERTZ	REMARKS
1	CONDENSER WATER SUPPLY	3000/ 208/ 1/ 60	1
2	CONDENSER WATER RETURN	3000/ 208/ 1/ 60	1
3	EQUALIZING PIPING	1000/ 120/ 1/ 60	1
4	DRAIN & OVERFLOW	1000/ 120/ 1/ 60	1

NOTES: 1. HEATER ON EMERGENCY POWER

3 PLATE AND FRAME HEAT EXCHANGER SCHEDULE

UNIT NO.	SERVICE	LOCATION	CAPACITY (MBH)	CHILLED WATER (HOT) GPM	EWT (°F)	LWT (°F)	MAX. PD (FT/H_2O)	CONDENSER WATER (COLD) GPM	EWT (°F)	LWT (°F)	MAX. PD (FT/H_2O)	WET BULB TEMP (°F)	SIZE (L x W x H)	BASIS OF DESIGN	REMARKS
HX-1	CHILLED WATER SYSTEM	SECOND BASEMENT - CENTRAL PLANT	6714	1250	60	50	10	2700	47	52	15	36	7' x 2'8" x 6'	ITT MODEL P43-282-TMTL-72	WINTER FREE COOLING

NOTES: 1. HEAT EXCHANGER SHALL BE SIZED FOR USE WITH WATER AND FOULING FACTOR OF 0.0005.

2 PUMP SCHEDULE

UNIT NO.	SYSTEM	TYPE	CAPACITY (GPM)	TOTAL HEAD (FT)	NPSHR (FT)	PUMP SIZE SUCTION (IN.)	PUMP SIZE DISCHARGE (IN.)	MOTOR HP	RPM	VFD	V/PH/HZ	ISOLATION TYPE	DEFLECTION (INCHES)	BASIS OF DESIGN	REMARKS
CHWP-1	CHILLED WATER CHILLER #1	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	1250	50	11	10	8	25	1750	NO	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 6X8X13	2
CHWP-2	CHILLED WATER CHILLER #2	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	3100	60	24	12	10	60	1750	NO	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 10x12x12M	2
CHWP-3	CHILLED WATER CHILLER #3	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	3100	60	24	12	10	60	1750	NO	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 10x12x12M	2
CHWP-4	CHILLED WATER HX-1	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	1250	50	11	10	8	25	1750	NO	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 6X8X13	2
SCHWP-1	SECONDARY CHILLED WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	3100	100	15	12	10	100	1780	YES	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 10x12x12M	1
SCHWP-2	SECONDARY CHILLED WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	3100	100	15	12	10	100	1780	YES	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 10x12x12M	1
SCHWP-3	SECONDARY CHILLED WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	3100	100	15	12	10	100	1780	YES	460/3/60	INERTIA	1"	BELL & GOSSETT SERIES HSC 10x12x12M	1 STANDBY PUMP
CWP-1	CONDENSER WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	5400	100	12	12	10	200	1185	YES	460/3/60	-	-	BELL & GOSSETT SERIES HSC 14X16X17	1
CWP-2	CONDENSER WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	5400	100	12	12	10	200	1185	YES	460/3/60	-	-	BELL & GOSSETT SERIES HSC 14X16X17	1
CWP-3	CONDENSER WATER	BASE MTD., SEPARATELY COUPLED DOUBLE SUCTION	5400	100	12	12	10	200	1185	YES	460/3/60	-	-	BELL & GOSSETT SERIES HSC 14X16X17	1

NOTES:
1. PROVIDE VFD W/ BYPASS. LOCAL DISCONNECT SWITCH BY DIV 16.
2. LOCAL DISCONNECT BY DIVISION 16.

1 FACTORY-ASSEMBLED COOLING TOWER SCHEDULE

UNIT NO.	TYPE	CAPACITY (GPM)	WATER TEMP. (°F) IN	WATER TEMP. (°F) OUT	AMBIENT WET BULB TEMP. (°F)	FAN MOTOR HP	RPM	V/PH/HZ	VFD	OUTLET SIZE (IN)	INLET QTY	INLET SIZE EACH (IN)	EQUALIZER SIZE (IN)	OVERFLOW SIZE (IN)	DRAIN SIZE (IN)	OPERATING WEIGHT (LBS)	BASIS OF DESIGN	REMARKS
CT-1	INDUCED DRAFT	2700	95	85	78	60	1750	460/3/60	YES	12	2	8	12	3	2	38000	MARLEY NC 8311H1	1 2
CT-2	INDUCED DRAFT	2700	95	85	78	60	1750	460/3/60	YES	12	2	8	12	3	2	38000	MARLEY NC 8311H1	1 2
CT-3	INDUCED DRAFT	2700	95	85	78	60	1750	460/3/60	YES	12	2	8	12	3	2	38000	MARLEY NC 8311H1	1 2
CT-4	INDUCED DRAFT	2700	95	85	78	60	1750	460/3/60	YES	12	2	8	12	3	2	38000	MARLEY NC 8311H1	1 2
CT-5	INDUCED DRAFT	2700	95	85	78	60	1750	460/3/60	YES	12	2	8	12	3	2	38000	MARLEY NC 8311H1	1 2 3 4 5

NOTES:
1. PROVIDE VFD W/ BYPASS FOR OUTDOOR INSTALLATION. LOCAL DISCONECT BY DIV 16.
2. PROVIDE VIBRATION CUT-OFF SWITCH.
3. PROVIDE ELECTRIC BASIN HEATER. 2 ELEMENTS EACH AT 14KW/ 460 VOLTS/ 3 PHASE/ 60 HZ.
4. PROVIDE BASIN HEATERS ON EMERGENCY POWER
5. PROVIDE 12-IN BYPASS CONNECTION AT BASIN.

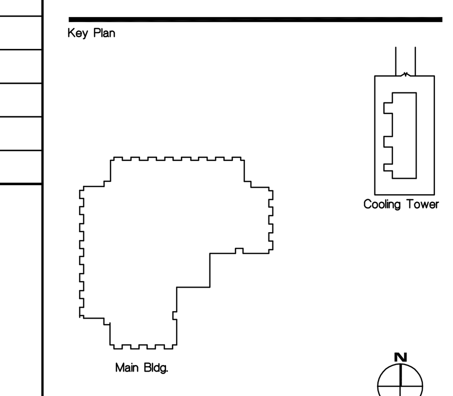
Andrew W. Breidenbach Environmental Research Center

CANNONDESIGN
1100 Wilson Blvd., Suite 2900, Arlington, Virginia 22209 703.907.2300
Baltimore • Boston • Buffalo • Chicago • Jacksonville • Los Angeles • New York
St. Louis • Vancouver • Washington DC

COOLING TOWER REPLACEMENT

Final Submission
August 16, 2004

Key Plan



No.	Revisions	Date

Drawing Title:
MECHANICAL SCHEDULES, DETAILS AND SEQUENCE OF OPERATION

Issue Date: -
Drawn by: E.R.A. Checked by: T.R.
Project No.: 02414.01 Scale: NONE
Drawing No.:

M002

© 2004 Cannon Design