

TVHS Murfreesboro - Replace Chiller and Cooling Tower
VA Project # 626A4-14-201
Addendum #1
05-26-2016

This Addendum, dated 5-26-2016, serves to clarify, revise, and supersede information in the Project Manual, Drawings, and previously issued Addenda. Portions of the Addendum affecting the Contract Documents will be incorporated into the Contract by enumeration of the Addendum in the Owner/Contractor Agreement.

The Bidder shall acknowledge receipt of this Addendum on the Bid Form.

This Addendum includes the following Specification Sections, issued in their entirety.

1. Specifications Section 23 25 00 HVAC Water Treatment

This Addendum includes the following drawings, issued in their entirety.

1. M101
2. M110
3. M500
4. M601
5. M800
6. M801

REVISIONS TO DRAWING SHEETS:

General

1. Schematic diagram takes precedence over details.

Sheet M101 – MECHANICAL FLOOR PLAN – GROUND LEVEL – BUILDING 107

1. Relocated Adams strainer includes relocating drains, controls identified on plans. Clarification of new air separator and piping made to 6/M101.

Sheet M110 – MECHANICAL FLOOR PLAN - GROUND LEVEL – BUILDING 109

1. Top of new cooling tower sumps must be equal to top of existing cooling tower sumps. See added note to document.
2. New reducer may be required depending on location of buried 18x12 reducer underground at towers. Contractor to field verify.
3. Modification of flexible metal shielded expansion devices will be used at towers. Change shown on drawing.
4. CWR and CWS pipe sizes switched. Piping shown as 14" CWR and 16" CWS on drawing.
5. Manual water make up shown on schematic (M601) added to drawing.

Sheet M500 – MECHANICAL DETAILS

1. Installation of equipment must be installed in accordance with manufacturer's requirements. Changes to details for compliance shown.
2. Refrigerant venting depends on chiller selected. R-123 chiller shall use Trane Rupture Guard safety valve. See detail 9/M500 for revised requirement.

3. Snubbers are not required at pressure gages as called out, utilize ½” ball valves as shown on details.

Sheet M601 – MECHANICAL SCHEMATICS

1. Air separator to include auto air vent isolated by manual ball valve, drain with blowdown valve.
2. Modifications to match changes made to plan and details.

Sheet M800 – MECHANICAL SCHEDULES

1. Modify cooling tower schedule as shown. Equipment TOTAL NOMINAL CAPACITY does not change, number of cells and flow per cell updated to match actual.

Sheet M801 – MECHANICAL SCHEDULES

1. Modify control point signal requirement as shown on drawing.

- END -

SECTION 23 25 00
HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies cleaning and treatment of circulating HVAC water systems, including the following.
1. Cleaning compounds.
 2. Chemical treatment for closed loop heat transfer systems.
 3. Chemical treatment for open loop systems.
 4. **Chemical treatment must be consistent with existing water treatment system. Any unused existing equipment in good condition must be turned over to the owner.**

1.2 RELATED WORK

- A. Test requirements and instructions on use of equipment/system: Section 01 00 00, GENERAL REQUIREMENTS.
- B. General mechanical requirements and items, which are common to more than one section of Division 23: Section 23 05 11, COMMON WORK RESULTS FOR.
- C. Piping and valves: Section 2321 13, HYDRONIC PIPING.
- D. Cooling Towers: Section 23 65 00, COOLING TOWERS.

1.3 QUALITY ASSURANCE

- A. Refer to paragraph, QUALITY ASSURANCE in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Technical Services: Provide the services of an experienced water treatment chemical engineer or technical representative to direct flushing, cleaning, pre-treatment, training, debugging, and acceptance testing operations; direct and perform chemical limit control during construction period and monitor systems for a period of 12 months after acceptance, including not less than 12 service calls and written status reports. Emergency calls are not included. During this period perform monthly tests of the cooling tower for Legionella pneumophila and submit reports stating Legionella bacteria count per millimeter. These tests shall be conducted in a certified laboratory and not by a technician in the field. Minimum service during construction/start-up shall be 12 hours.

- C. Field Quality Control and Certified Laboratory Reports: During the one year guarantee period, the water treatment laboratory shall provide not less than 12 reports based on on-site periodic visits, as stated in paragraph 1.3.B, sample taking and testing, and review with VA personnel, of water treatment control for the previous period. In addition to field tests, the water treatment laboratory shall provide certified laboratory test reports. These monitoring reports shall assess chemical treatment accuracy, scale formation, fouling and corrosion control, and shall contain instructions for the correction of any out-of-control condition.
- D. Log Forms: Provide one year supply of preprinted water treatment test log forms.
- E. Chemicals: Chemicals shall be non-toxic approved by local authorities and meeting applicable EPA requirements.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Manufacturer's Literature and Data including:
 - 1. Cleaning compounds and recommended procedures for their use.
 - 2. Chemical treatment for closed systems, including installation and operating instructions.
 - 3. Chemical treatment for open loop systems, including installation and operating instructions.
- C. Water analysis verification.
- D. Materials Safety Data Sheet for all proposed chemical compounds, based on U.S. Department of Labor Form No. L5B-005-4.
- E. Maintenance and operating instructions in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

1.5 APPLICABLE PUBLICATIONS

- A. The publication listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. National Fire Protection Association (NFPA):
70-2008.....National Electric Code (NEC)

C. American Society for Testing and Materials (ASTM):

F441/F441M-02 (2008)Standard Specification for Chlorinated Poly
(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules
40 and 80

PART 2 - PRODUCTS

2.1 CLEANING COMPOUNDS

- A. Alkaline phosphate or non-phosphate detergent/surfactant/specific to remove organic soil, hydrocarbons, flux, pipe mill varnish, pipe compounds, iron oxide, and like deleterious substances, with or without inhibitor, suitable for system wetted metals without deleterious effects.
- B. All chemicals to be acceptable for discharge to sanitary sewer.
- C. Refer to Section 23 21 13, HYDRONIC PIPING PART 3, for flushing and cleaning procedures.

2.2 CHEMICAL TREATMENT FOR CLOSED LOOP SYSTEMS

Water Chemistry must be consistent with existing program. Verify prior to bids or chemistry addition to system piping.

- A. Inhibitor: Provide sodium nitrite/borate, molybdate-based inhibitor or other approved compound suitable for make-up quality and make-up rate and which will cause or enhance bacteria/corrosion problems or mechanical seal failure due to excessive total dissolved solids. Shot feed manually. Maintain inhibitor residual as determined by water treatment laboratory, taking into consideration residual and temperature effect on pump mechanical seals.
- B. pH Control: Inhibitor formulation shall include adequate buffer to maintain pH range of 8.0 to 10.5.
- C. Performance: Protect various wetted, coupled, materials of construction including ferrous, and red and yellow metals. Maintain system essentially free of scale, corrosion, and fouling. Corrosion rate of following metals shall not exceed specified mills per year penetration; ferrous, 0-2; brass, 0-1; copper, 0-1. Inhibitor shall be stable at equipment skin surface temperatures and bulk water temperatures of not less than 121 degrees C (250 degrees F) and 52 degrees C (125 degrees Fahrenheit) respectively. Heat exchanger fouling and capacity reduction shall not exceed that allowed by fouling factor 0.0005.
- D. Pot Feeder: By-pass type, complete with necessary shut off valves, drain and air release valves, and system connections, for introducing

chemicals into system, cast iron or steel tank with funnel or large opening on top for easy chemical addition. Feeders shall be 18.9 L (five gallon) minimum capacity at 860 kPa (125 psig) minimum working pressure.

- E. Corrosion monitor rack:
 - 1. Materials: Corrosion resistant.
 - 2. Construction: ASME specifications.
 - 3. Number of coupons: four (4).
 - 4. Coupon holders: quick disconnect type.
- F. Provide chemicals and system monitoring for a minimum of 12 months.

2.3 CHEMICAL TREATMENT FOR OPEN LOOP SYSTEM(S)

- A. General: Provide the following:
 - 1. A fully assembled and tested, chemical feed/blow-down monitoring, controlling and alarming system, containing all except specified or indicated remote components,
 - 2. System shall be suitable for a broad spectrum make-up water supply and chemical treatment program. Components, except those specified or indicated otherwise, shall be housed in one or more joined or divided steel enclosures.
- B. System Functions:
 - 1. Automatically maintain a predetermined, selectable, total dissolved solids concentration through a continuously monitoring conductivity controller, maintain a predetermined, selectable, scale/corrosion inhibitor and dispersant residual, through a continuously make-up monitoring meter/counter/timer and inhibitor/dispersant ratio controller; achieve a predetermined, selectable, peak concentration of one or two microbiocides as needed on an alternating basis, through a programmable timer controller. De-energize controller or stagger feed chemicals that would degrade or could be incompatible if fed simultaneously.
 - 2. Automatically maintain a predetermined, selectable, pH level through a continuously monitoring pH controller. For systems with make up water alkalinity in excess of 125 PPM or hardness above 300 PPM, provide acid feed limit timer and audible/visual alarm actuated on low pH.
- C. Main control panel and accessories:

1. Housed in a NEMA Type 4X enclosure:
 - a. Hinged key lock door with viewing window.
 - b. Hard wire connected to power source.
 - c. Provide minimum of three (3) 115V, 1 Ph, 60 Hz receptacles located on enclosure for electrical connection and control of chemical pumps.
 - d. Prewired for ease of installation.
2. Provide an external combination mounted flow switch with transparent sight tube.
 - a. Disable control outputs upon loss of water flow to prevent chemical feeding.
 - b. Provide complete with 3/4 IN connections and combination conductivity and temperature electrode.
3. Keypad or remote control: Access all measurements and set points through chemical resistant key pad or remote.
 - a. Security code to prevent unauthorized access.
4. Utilize microprocessor technology.
5. Menu driver programs.
6. Liquid crystal display (LCD).
7. Provide temperature corrected measurements by reading water temperature and adjusting conductivity values according to known temperature curve.
 - a. Range: 0-100 degC (32-212 degF) with an adjustable high alarm.
8. Provide real-time clock.
9. Conductivity monitor:
 - a. Provide linear measurements of full range.
 - b. Provide two scales for selection of high and low in field to assure accurate measurements.
 - c. Provide increments of 1 microohm/cm with adjustable hysteresis.
 - d. Provide bleed-off control in following manner:
 - 1) Standard operation-controller actuates a bleed off solenoid valve when dissolved solids level is exceeded by trip point.
 - 2) Provide an adjustable bleed limit timer to prevent excessive bleed off.
 - 3) An alarm contact shall close when timer has timed out.
10. Biocide operation:

- a. Provide a programmable 28 day biocide timer for accurate addition of algaecide.
 - b. Provide a secondary bleed off timer to lower conductivity in system prior to biocide feed.
 - c. Lock out cooling water bleed-off during biocide feed period.
11. Chemical feed control: Provide three timers that are capable of operating in one of following field programmable modes.
- a. Counter-timer-chemical feed proportioned to make-up water rate.
 - 1) Controller shall send low voltage signal to a contacting head water meter.
 - 2) Low voltage signal will ensure long contact life.
 - 3) Water meter shall read in gallons.
12. Alarms:
- a. Provide alarm LEDs with silence button for high and low conductivity, 10-60 minute bleed-off, chemical feed limit timers, and chemical drum level. Provide remote output relay to indicate alarm condition to Building Control System specified under Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.
13. Controller operating data history:
- a. Retain in memory all operating data for following parameters:
 - 1) Standard memory shall allow acquisition and storage of all analog inputs for a one-week period.
 - 2) A three (3) hour minimum, maximum average of all conditions shall be stored for a one-week period.
 - 3) A minute-by-minute account of operating conditions shall be available for latest three-hour period.
14. Electrode: Combination temperature and conductivity type.
- a. Quick disconnect.
 - b. Supplied in flow switch assembly.
15. Ph monitor:
- a. Sensor for monitoring purposes only.
 - b. Acid shall not be used to control pH.
16. Remote communication: Provide open protocol BACnet/IP interface to perform the following functions:
- a. Access Real-time system values.
 - b. Change operating parameters.
 - c. Controller diagnostics.

- d. Obtain history files.
 - e. Alarm condition notification.
 - f. Operation of blow down valves.
- D. Impulse water meter:
- 1. General:
 - a. Measure in gallons.
 - b. Sized to meter peak make up rates.
 - c. Equipped with an electrical contacting register.
 - d. Totalize flow at main control panel.
 - 2. Provide at following locations:
 - a. Cooling tower make up line.
 - b. Cooling tower bleed off line.
- E. Provide stainless steel injection nozzles, ASTM F441 with corporation stop to inject chemical into main circulating water line.
- 1. Pressure rating: 700kPa (100 PSI)
 - 2. Size: DN20 (3/4 IN) NPT.
 - 3. Quantity: Three (3).
- F. Provide chemical feed pumps operated by a 115V, 60 cycle, single PH motor.
- 1. Provide separate stroke and stroke frequency setting capabilities.
 - 2. Positive displacement type pump
 - a. Provide with anti-siphon/pressure relief valve installed on pump head which provides anti-siphon protection and aids in priming under pressure.
 - b. Capacity: As determined by Water Treatment Vendor.
 - c. Complete with discharge check valves, foot valves, polyethylene suction and discharge tubing.
 - 3. Quantity: Provide one pump for each chemical provided.
- G. Bleed-off piping assembly:
- 1. Inlet shut-off valve.
 - 2. Wye strainer.
 - 3. Strainer blowdown valve.
 - 4. Throttling valve.
 - 5. Brass solenoid valve compatible with main control panel.
 - 6. Assembly shall be sized by Water Treatment Vendor.
- H. Secondary containment spill pallets for chemical drums:
- 1. Material: Polyethylene.

2. Capacity: 250 L (66 GAL) each.
 3. Dimensions each: DN135 (53 IN) length x DN74 (29 IN) wide X DN43 (17 IN) high.
 4. Provide each pallet with grating and drain plug.
 5. Provide one portable loading ramp.
 6. Quantity: Three
- I. Provide liquid level switch assemblies with a CPVC bung hole adapter, ASTM F441, to mount directly into 200 L (55 GAL) chemical drum bung hole.
1. Interface with main control panel.
 2. Quantity: Three (3).
- J. Corrosion monitor rack:
1. Materials: Corrosion resistant.
 2. Construction: ASME specifications.
 3. Number of coupons: four (4).
 4. Coupon holders: quick disconnect type.
- K. Provide test kits for monitoring inhibitor levels, total dissolved solids, chlorides, alkalinity and closed system inhibitors.
- L. Provide one (1) year's supply of chemical treatment including quantity of chemicals necessary to chemically treat system to control scale, corrosion and biological fouling. Provide water treatment products that perform the following:
1. Inhibitor to protect against corrosion and scale formation.
 2. Two liquid biocides for prevention of slime, bacteria and algae.
 3. Chromate based chemical are unacceptable.
 4. Water treatment chemicals to remain stable throughout operating temperature range.
 5. Are compatible with pump seals and other elements in the systems.
 6. Where analysis justifies addition of pH control, provide alteration of chemical formulation.
- M. Chemicals: provide sufficient chemicals for start-up and testing and twelve months operation from date of project acceptance.
1. Scale/corrosion inhibitor: Provide a concentrated liquid organic corrosion/scale/ fouling inhibiting formation without phosphates, chromates, zinc and other materials in excess of allowable, local, effluent limits. Feed automatically. Maintain residual as determined by water treatment laboratory.

2. Dispersant: Provide a concentrated liquid organic/polyelectrolyte formulation. Feed automatically. Maintain residual as determined by water treatment laboratory.
 3. pH Control: Depending upon local water conditions, ~~provide 60 or 66 degree Baume technical grade, concentrated sulfuric acid for acidic treatment or sodium hydroxide (NaOH) for basic treatment~~ **control** to maintain pH in the range of 7.0 to 8.0 automatically. ~~Provide one initial 47 L (12.5 gallon) carboy of acid or base and one spare carboy of acid or base, if required.~~
 4. Microbiocides: Provide two different, one oxidizing and one non-oxidizing, concentrated algaecide-biocide formations containing no heavy metals and which are effective at maximum encountered pH. Alternate solutions as needed to effectuate selective kill without build-up of immunity. Period treatment with a chlorine releasing agent is permissible within allowable, local, effluent limits. Feed automatically. Develop peak concentration and maintain for minimum period as determined by water treatment laboratory.
 5. All chemicals to be acceptable for discharge to sanitary sewer.
- N. Water Analysis: Confirm raw water analysis or provide analysis if none is furnished:

Description Year (Avg.)

Silica (SiO₂) _____

Iron & Aluminum _____

Calcium (Ca) _____

Magnesium (Mg) _____

Sodium (Na) & Potassium (K) _____

Carbonate (CO₃) _____

Bicarbonate (HCO₃) _____

Sulfate (SO₄) _____

Chloride (Cl) _____

Nitrate (NO₃) _____

Turbidity _____

pH _____

Residual Chlorine _____

Total Alkalinity _____

Non Carbonate Hardness _____

Total Hardness _____

Dissolved Solids _____

- O. Conduct performance test to prove capacity and performance of treatment system.
 1. Raw water total hardness, PPM
 2. Concentration cycles
 3. Raw water, pH
 4. System water, pH
 5. Chemical solution used
 6. Acid solution used
 7. Quantity of chemical solution injected into system per cycle
 8. Quantity of acid injected into system per cycle
 9. Make up water required
 10. Waste to drain requirement
- P. Centrifugal Solid Separator (sidestream):
 1. Material: The separator shall be fabricated of carbon steel with shell material and head material of 0.135 inch wall or heavier. Maximum operating pressure shall be 10.3 bar (150 psi), unless specified otherwise.
 2. Finish: Paint coating shall be acrylic urethane, spray-on, and royal blue.
 3. Performance: The removal of solids from a pumped/pressurized liquid system shall be accomplished with a centrifugal-action vortex separator. Solids removal efficiency is principally predicated on the difference in specific gravity between the solids and the liquid. Single pass test performance shall be less than 95% removal of solids 74 microns and larger. Pressure loss shall be between 0.3 - 0.8 Bar (5-12 psi).
 4. Purging: Evacuation of separated solids shall be accomplished automatically, employing a timer-activated motorized ball valve. Straight-through valve design, with bronze valve body and stainless steel ball in a Teflon seat. NEMA 4 housing for indoor and outdoor installation. Valve size: 50 mm (2").
 5. Provide a differential pressure sensor interface with DDC system.
 6. Provide all centrifugal solid separator components on a factory fabricated skid, including the centrifugal pump to accomplish sidestream flow, as scheduled.
- Q. Chemical Treatment System Piping and Valves

1. Stainless steel piping and fittings. Pipe size shall be 25 mm (1 inch) unless otherwise shown.
2. Ball Valves: stainless steel type.

2.4 EQUIPMENT AND MATERIALS IDENTIFICATION

Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

PART 3 - EXECUTION

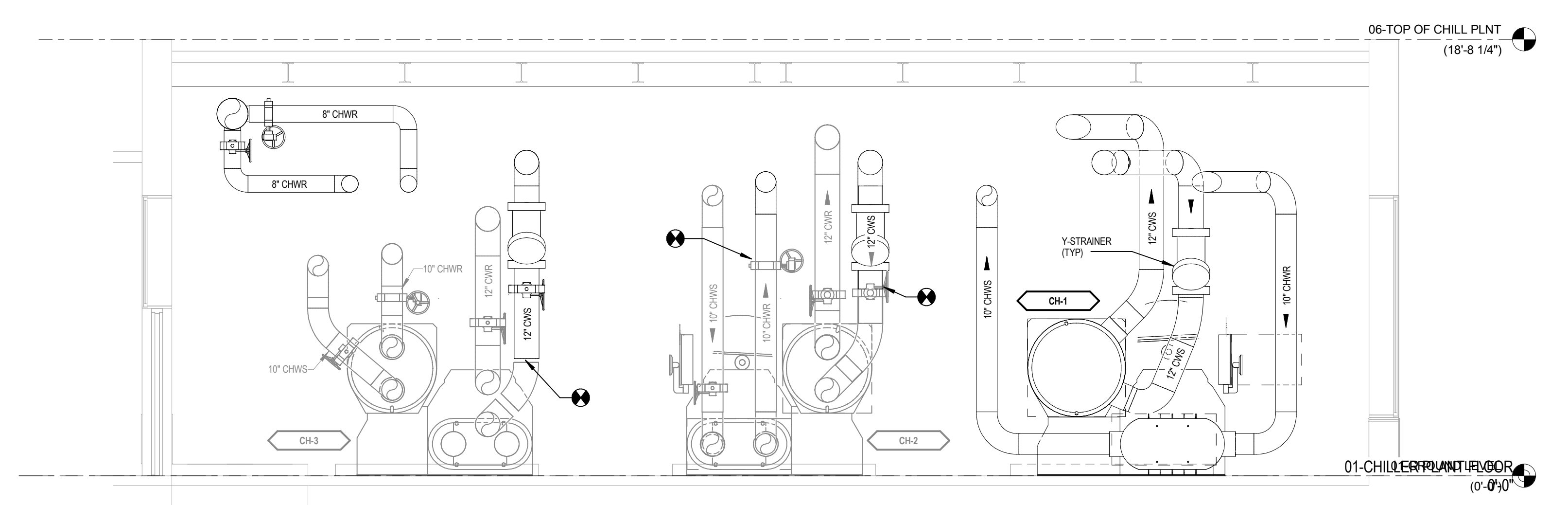
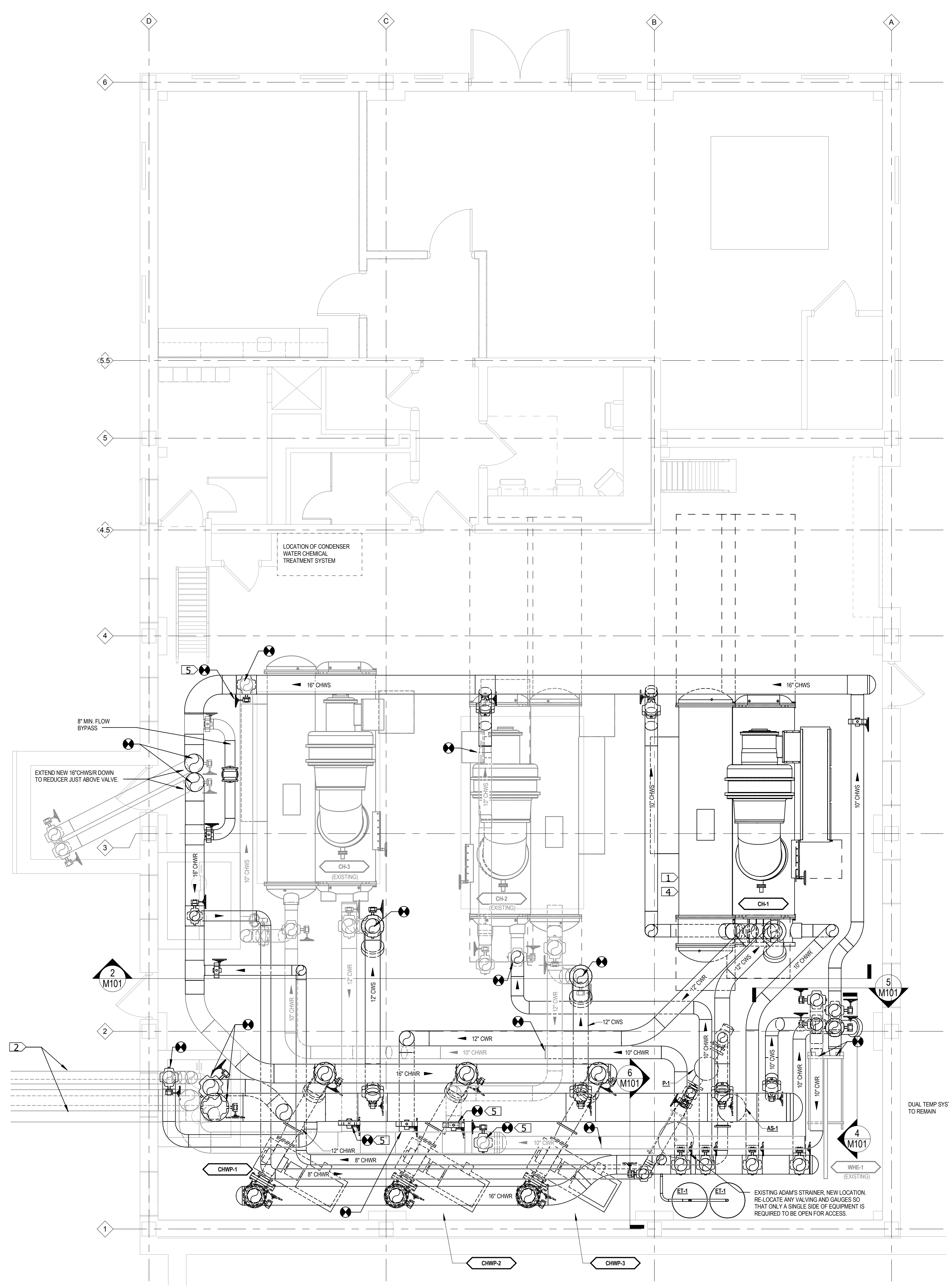
3.1 INSTALLATION

- A. Delivery and Storage: Deliver all chemicals in manufacturer's sealed shipping containers. Store in designated space and protect from deleterious exposure and hazardous spills.
- B. Install equipment furnished by the chemical treatment supplier and charge systems according to the manufacturer's instructions and as directed by the Technical Representative.
- C. Refer to Section 23 21 13 HYDRONIC PIPING for chemical treatment piping, installed as follows:
 1. Provide a by-pass line around water meters and bleed off piping assembly. Provide ball valves to allow for bypassing, isolation, and servicing of components.
 2. Bleed off water piping with bleed off piping assembly shall be piped from pressure side of circulating water piping to a convenient drain. Bleed off connection to main circulating water piping shall be upstream of chemical injection nozzles.
 3. Provide piping for the flow assembly piping to the main control panel and accessories.
 - a. The inlet piping shall connect to the discharge side of the circulating water pump.
 - b. The outlet piping shall connect to the water piping serving the cooling tower downstream of the heat source.
 - c. Provide inlet Y-strainer and ball valves to isolate and service main control panel and accessories.
 4. Install injection nozzles with corporation stops in the water piping serving the cooling tower downstream of the heat source.
 5. Provide piping for corrosion monitor rack per manufacturer's installation instructions. Provide ball valves to isolate and service rack.
 6. Provide installation supervision, start-up and operating instruction by manufacturer's technical representative.

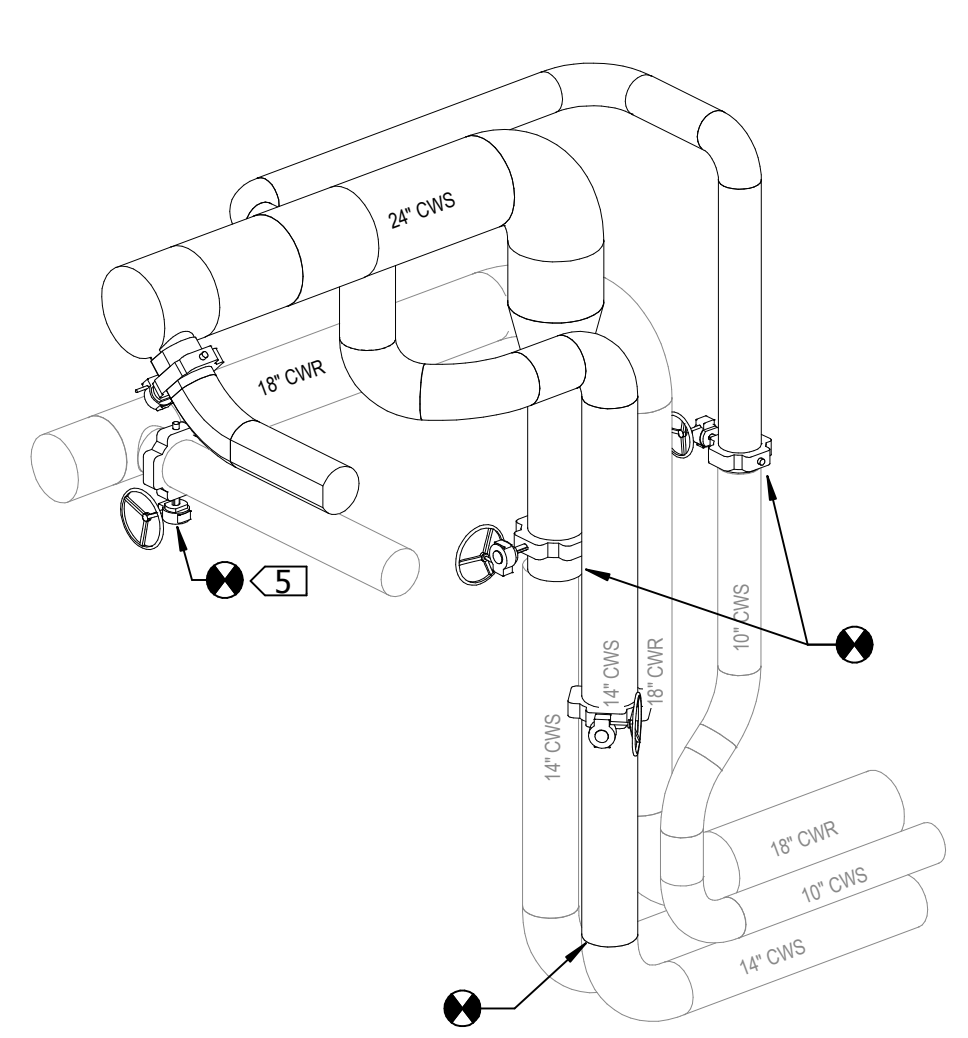
- D. Before adding cleaning chemical to the closed system, all air handling coils and fan coil units should be isolated by closing the inlet and outlet valves and opening the bypass valves. This is done to prevent dirt and solids from lodging the coils.
- E. Do not valve in or operate system pumps until after system has been cleaned. Review procedure with Owner if phasing considerations impact the thoroughness of this intent.
- F. After chemical cleaning is satisfactorily completed, open the inlet and outlet valves to each coil and close the by-pass valves. Also, clean all strainers.
- G. Perform tests and report results in accordance with Section 01 00 00, GENERAL REQUIREMENTS.
- H. After cleaning is complete, and water PH is acceptable to manufacturer of water treatment chemical, add manufacturer-recommended amount of chemicals to systems.
- I. Instruct VA personnel in system maintenance and operation in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

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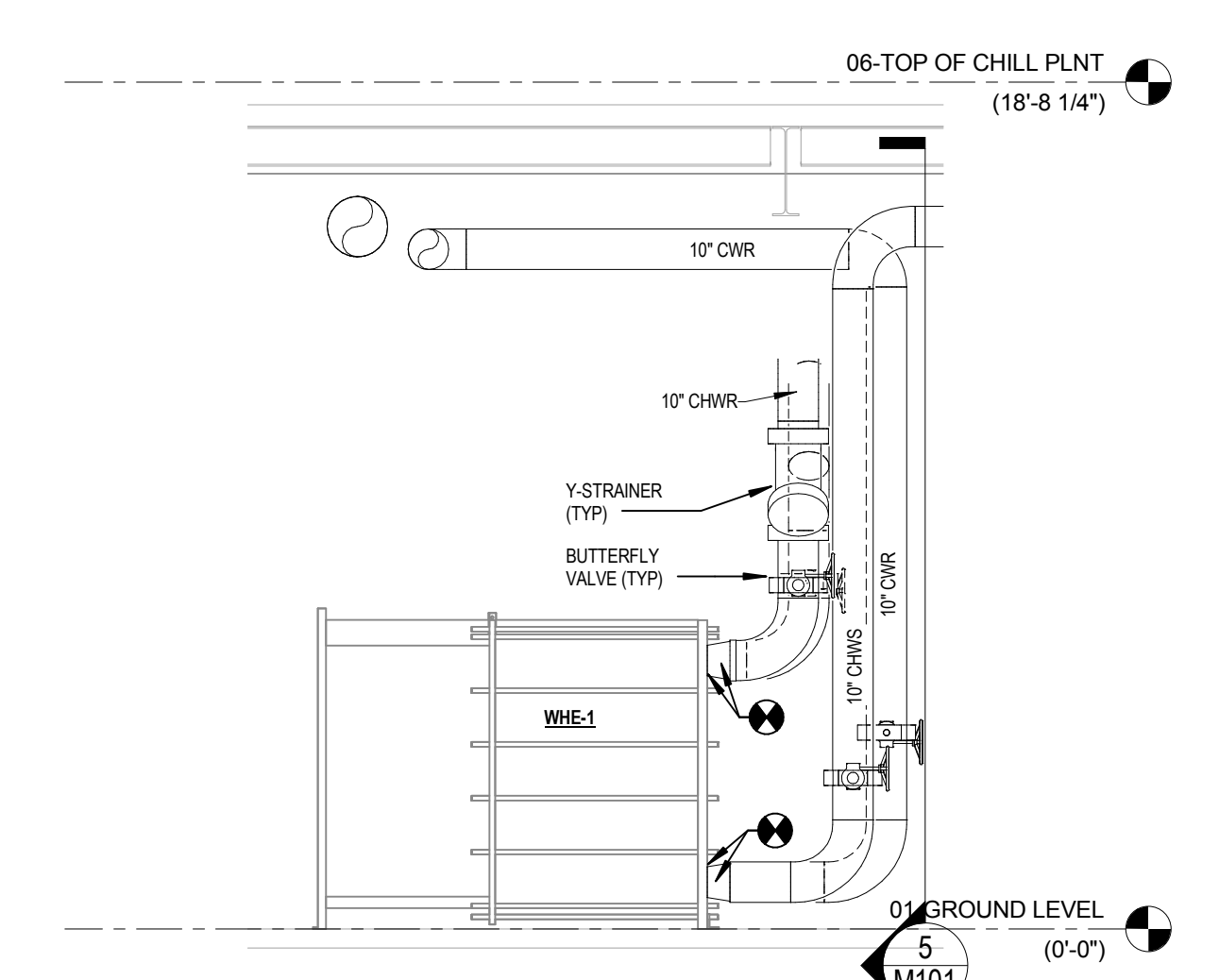
three inches = one foot
 one and one half inch = one foot
 one inch = one foot
 three quarters inch = one foot
 one half inch = one foot
 one quarter inch = one foot
 one eighth inch = one foot



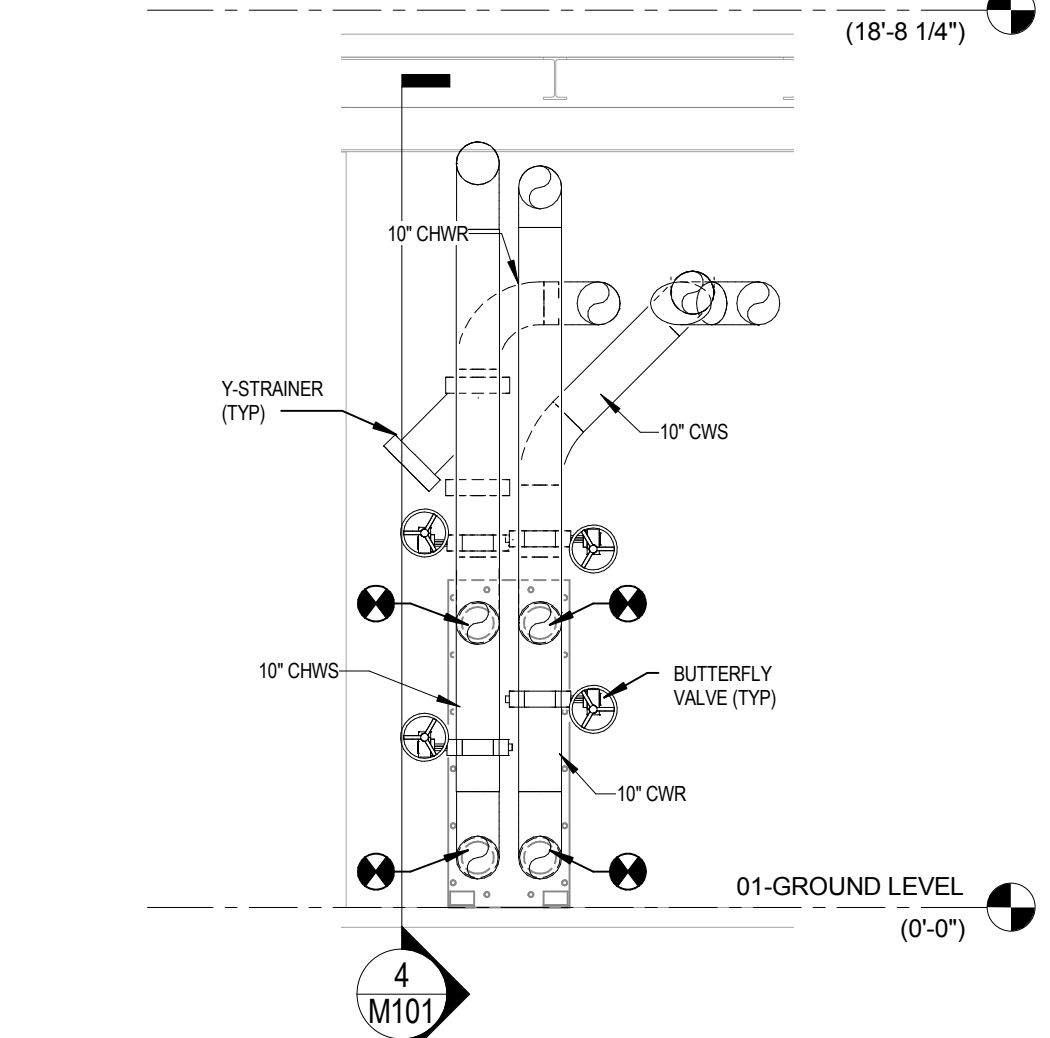
2 CHILLER PIPING CONNECTION DETAIL
 1/4" = 1'-0"



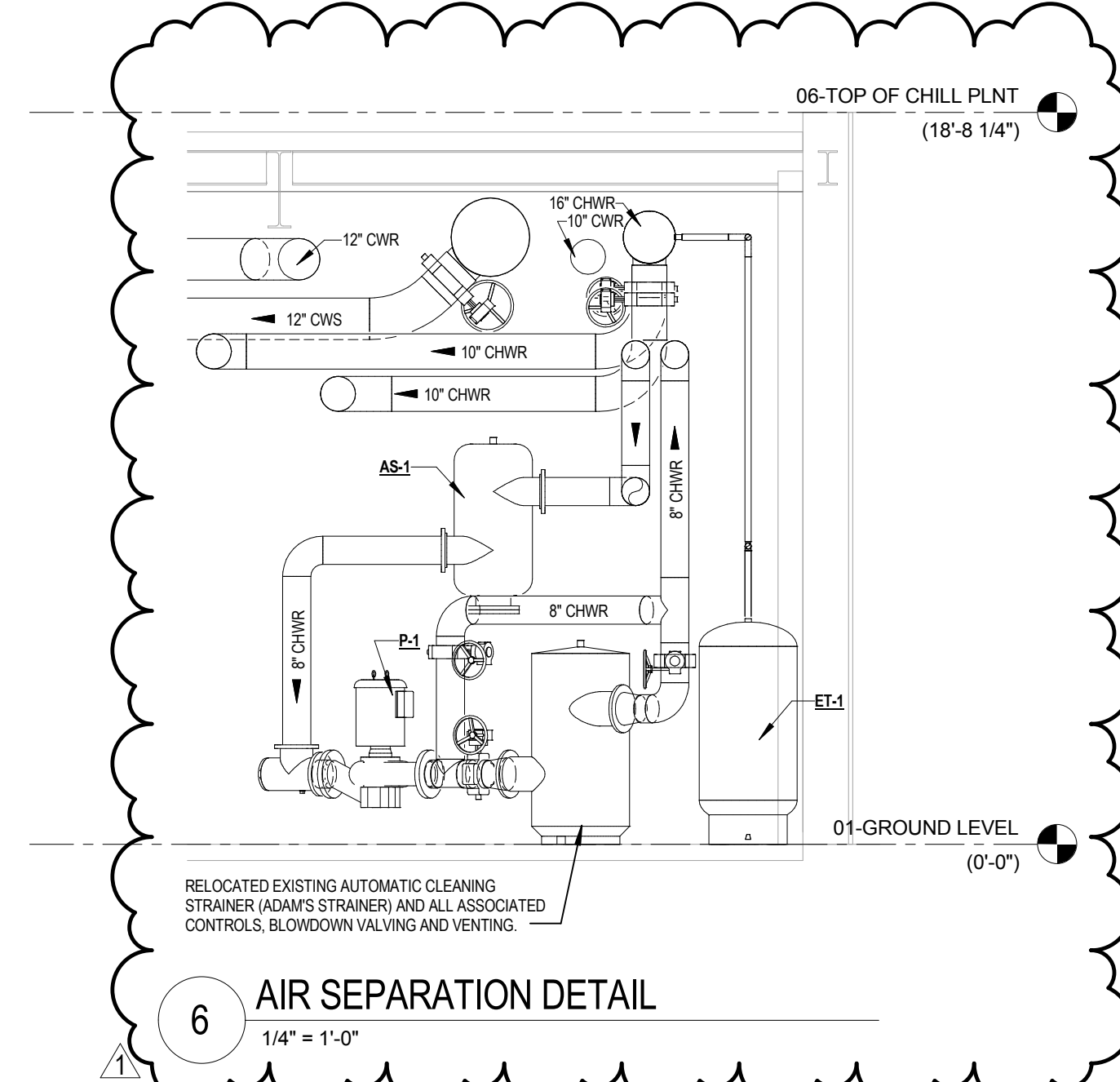
3 CONDENSER WATER PIPING ISOMETRIC



4 WHE-1 PIPING CONNECTION DETAIL (SIDE VIEW)
 1/4" = 1'-0"



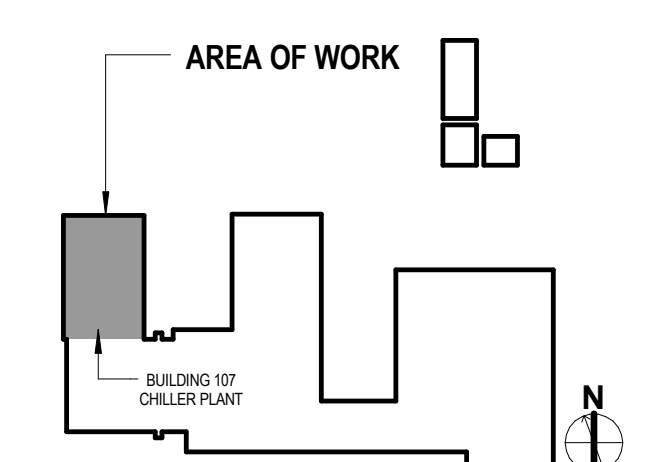
5 WHE-1 PIPING CONNECTION DETAIL
 1/4" = 1'-0"



6 AIR SEPARATION DETAIL
 1/4" = 1'-0"

1 NEW PLANT PIPING
 1/4" = 1'-0"

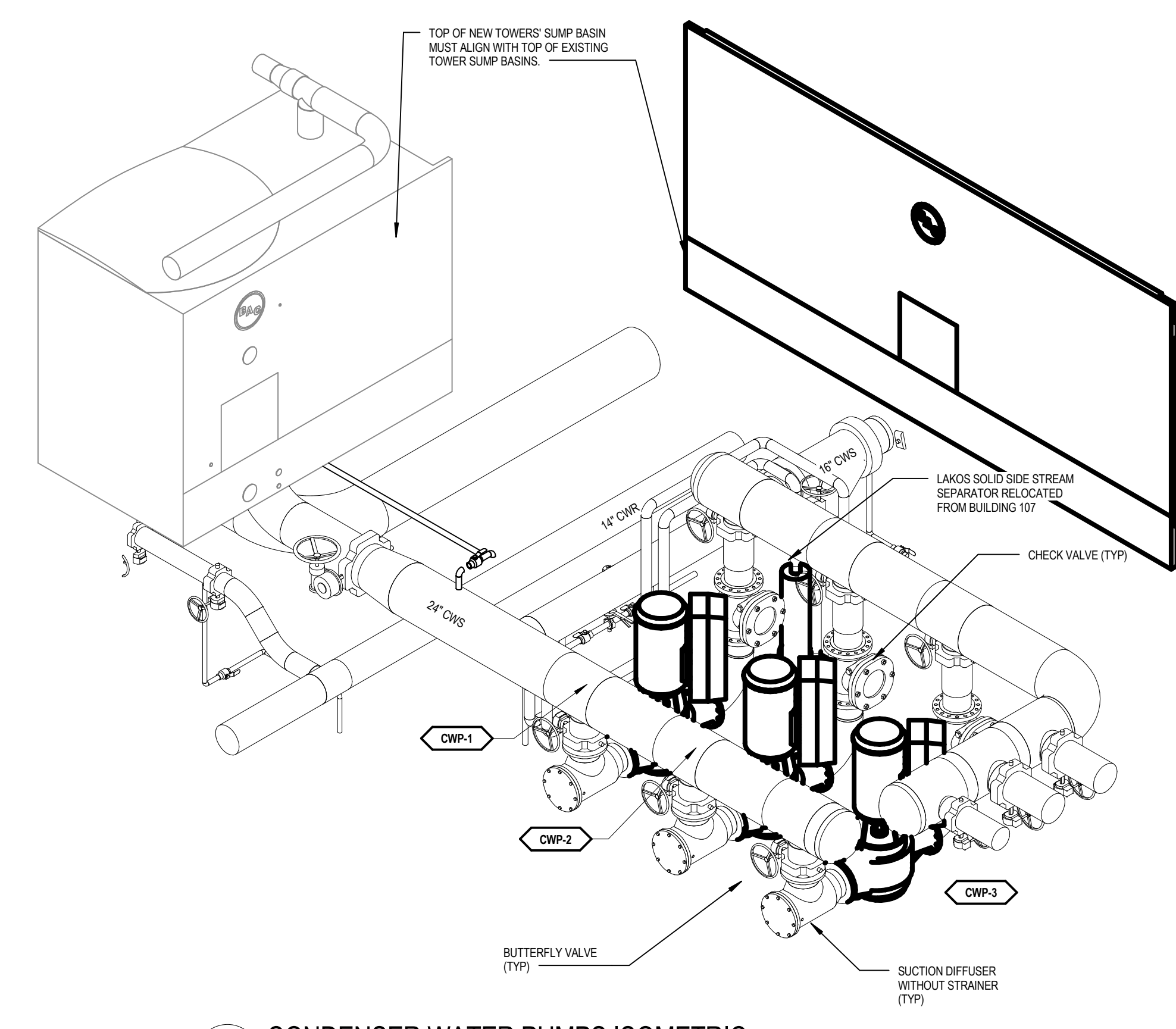
- KEYED NOTES:**
1. INSTALL NEW CHILLER ON 6" CONCRETE PAD. MAINTAIN MANUFACTURERS RECOMMENDED CLEARANCES.
 2. EXISTING BURIED CONDENSER WATER PIPING.
 3. CONTRACTOR SHALL INSPECT ALL PIPING INDICATED TO REMAIN FOR PERFORMANCE DEFICIENCIES. NOTIFY ENGINEER OF FINDINGS.
 4. PROVIDE CHILLER VENTING AS REQUIRED PER MANUFACTURER RECOMMENDATIONS AND VA STANDARDS. PROVIDE OPENING THROUGH ROOF AND PATCH AS REQUIRED.
 5. CONTRACTOR SHALL REPLACE ALL EXISTING CONTROL VALVES WITH MODULATING VALVES AS SPECIFIED.



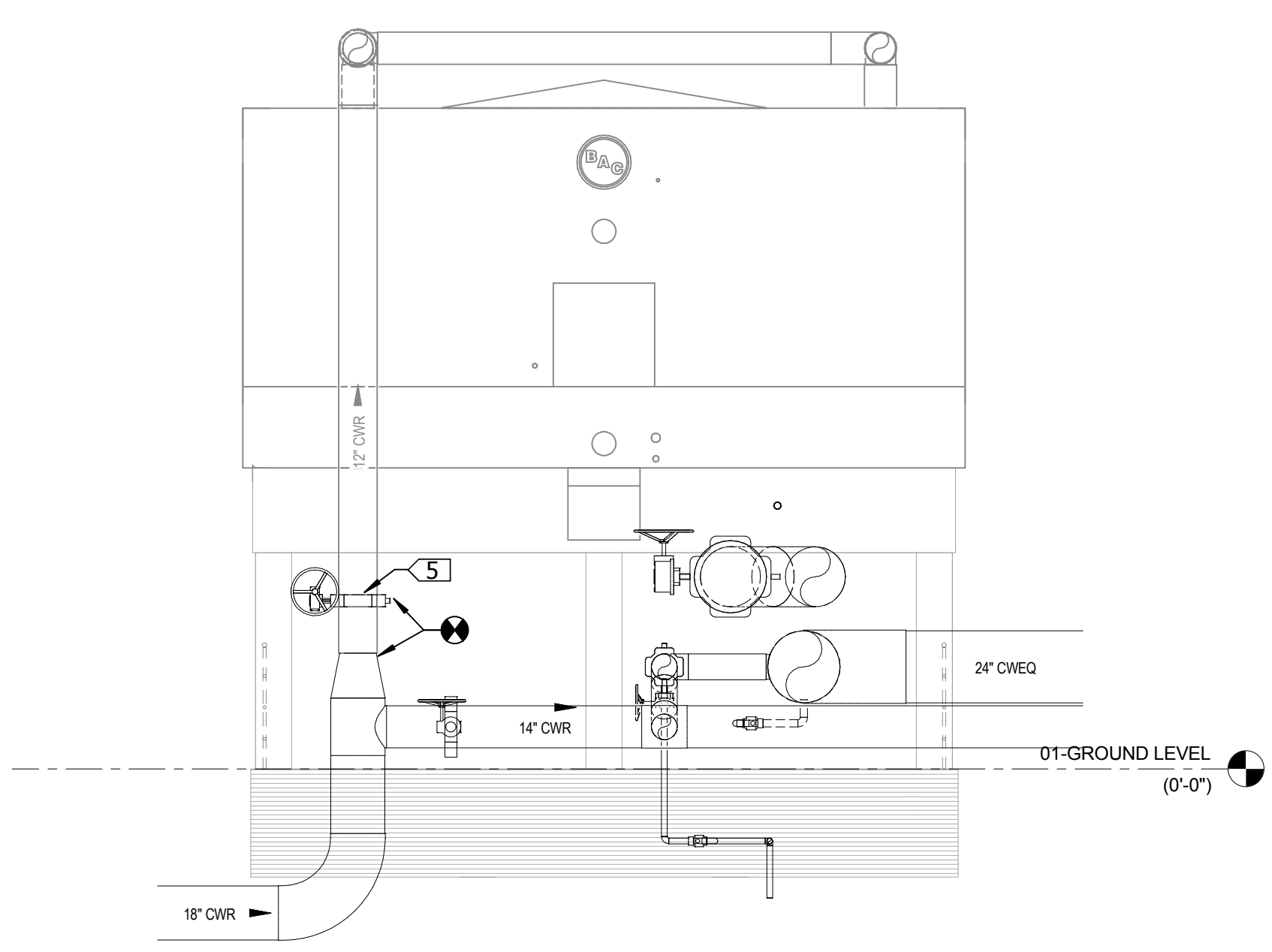
**PARTIALLY SPRINKLERED
 CONSTRUCTION DOCUMENTS**

Addendum 1 Revisions:	5-26-16 Date	CONSULTANTS: 420 5th Street North, Suite 100 Minneapolis, Minnesota 55401 Telephone 612.758.4000 HGA Project Number: 3359-003-00	SEAL 	ARCHITECTS/ENGINEERS: 6587 Hamilton Avenue Pittsburgh, Pennsylvania 15206 Ph: 412.287.7333 Fax: 412.287.7334 www.ae-works.com AE Works Project Number: 14023	Drawing Title MECHANICAL FLOOR PLAN - GROUND LEVEL - BUILDING 107	Project Title: REPLACE CHILLER AND COOLING TOWER	Project Number 626A4-14-201	Office of Construction and Facilities Management Department of Veterans Affairs
	Approved: Project Director	Location: TVHS YORK CAMPUS, MURFREESBORO, TN 37129	Building Number AS INDICATED	Date: 03/11/2016	Checked: JW	Drawing: GWS	Drawing Number M101	

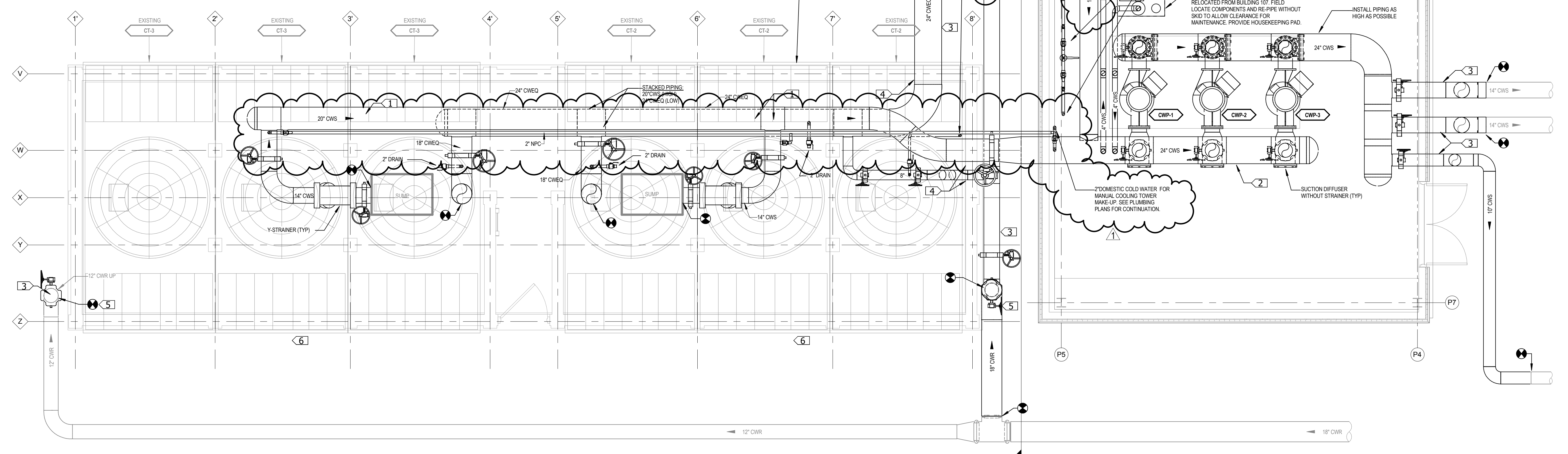
three inches = one foot
 one and one half inch = one foot
 one inch = one foot
 three quarters inch = one foot
 one half inch = one foot
 one quarter inch = one foot
 one eighth inch = one foot
 one sixteenth inch = one foot



1 CONDENSER WATER PUMPS ISOMETRIC

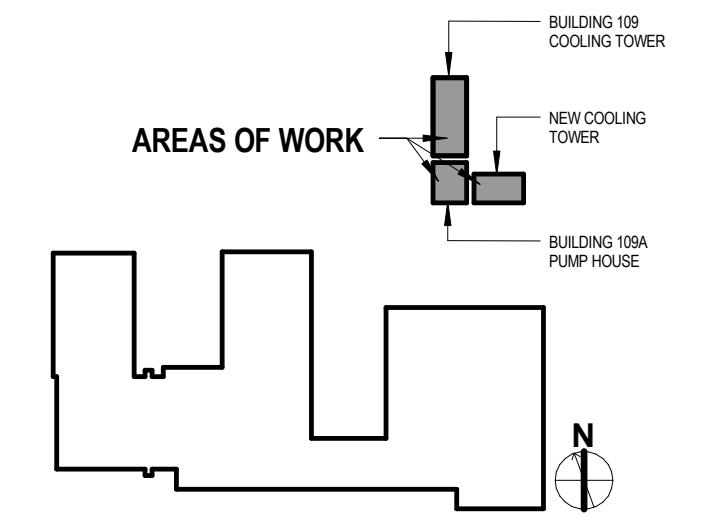


2 EXISTING COOLING TOWER CROSS-SECTION
 1/4" = 1'-0"



3 NEW COOLING TOWER PIPING
 1/4" = 1'-0"

- KEYED NOTES:**
1. PIPING SHALL BE SUPPORTED BY MEANS OF STEEL POSTS WITH PADS. SUPPORT SHALL ALLOW FOR PIPE MOVEMENT AS NEEDED. SEE STRUCTURAL DRAWINGS FOR ADDITIONAL INFORMATION.
 2. CWS PIPING TO PUMP SUCTION SHALL BE INSTALLED NO HIGHER THAN SUMP BASIN CONNECTION.
 3. ALL EXTERIOR EXPOSED STEEL PIPING (NEW AND EXISTING) SHALL BE PAINTED.
 4. PROVIDE LINK SEAL AT BUILDING PENETRATIONS.
 5. CONTRACTOR SHALL REPLACE ALL EXISTING CONTROL VALVES WITH MODULATING VALVES AS SPECIFIED.
 6. COOLING TOWER FOOTPRINT SHOWN FOR REFERENCE PURPOSES ONLY (TYPICAL). PIPING SHOWN IS UNDERNEATH TOWERS.



**PARTIALLY SPRINKLERED
 CONSTRUCTION DOCUMENTS**

<p>ADDENDUM 1 Revisions:</p>	<p>5-26-16 Date</p>
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CONSULTANTS:

420 5th Street North, Suite 100
 Minneapolis, Minnesota 55401
 Telephone 612.758.4000
 HGA Project Number: 3359-003-00

SEAL

ARCHITECTS/ENGINEERS:

6587 Hamilton Avenue
 Pittsburgh, Pennsylvania 15206
 Ph: 412.287.7333 Fax: 412.287.7334
 www.ae-works.com
 AE Works Project Number: 14023

Drawing Title:
 MECHANICAL FLOOR PLAN - GROUND LEVEL - BUILDING 109

Approved: Project Director

Project Title:
 REPLACE CHILLER AND COOLING TOWER

Location:
 TVHS YORK CAMPUS, MURFREESBORO, TN 37129

Date: 03/11/2016

Checked: JW

Drawn: GWS

Project Number: 626A4-14-201

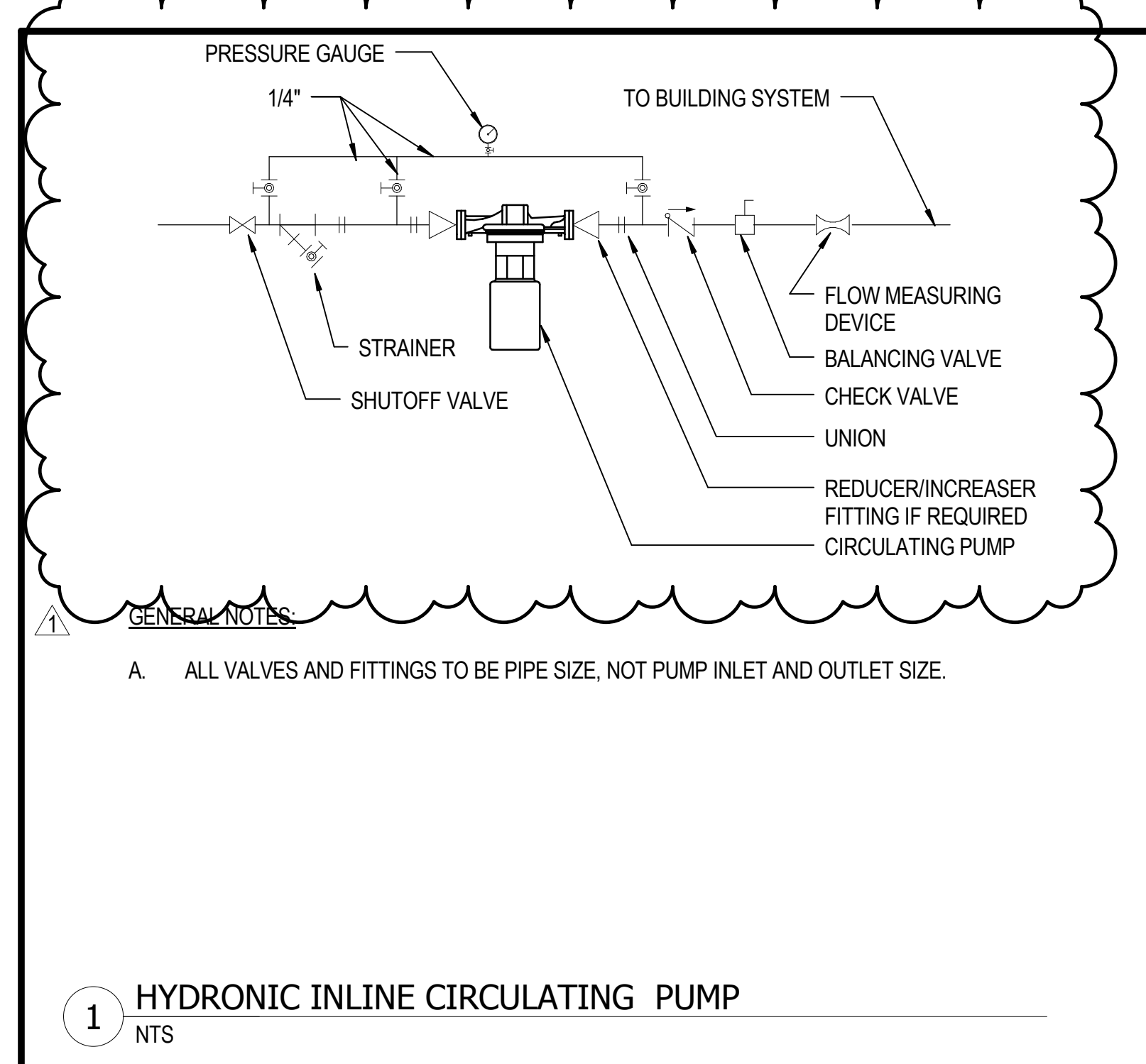
Building Number: AS INDICATED

Drawing Number: M110

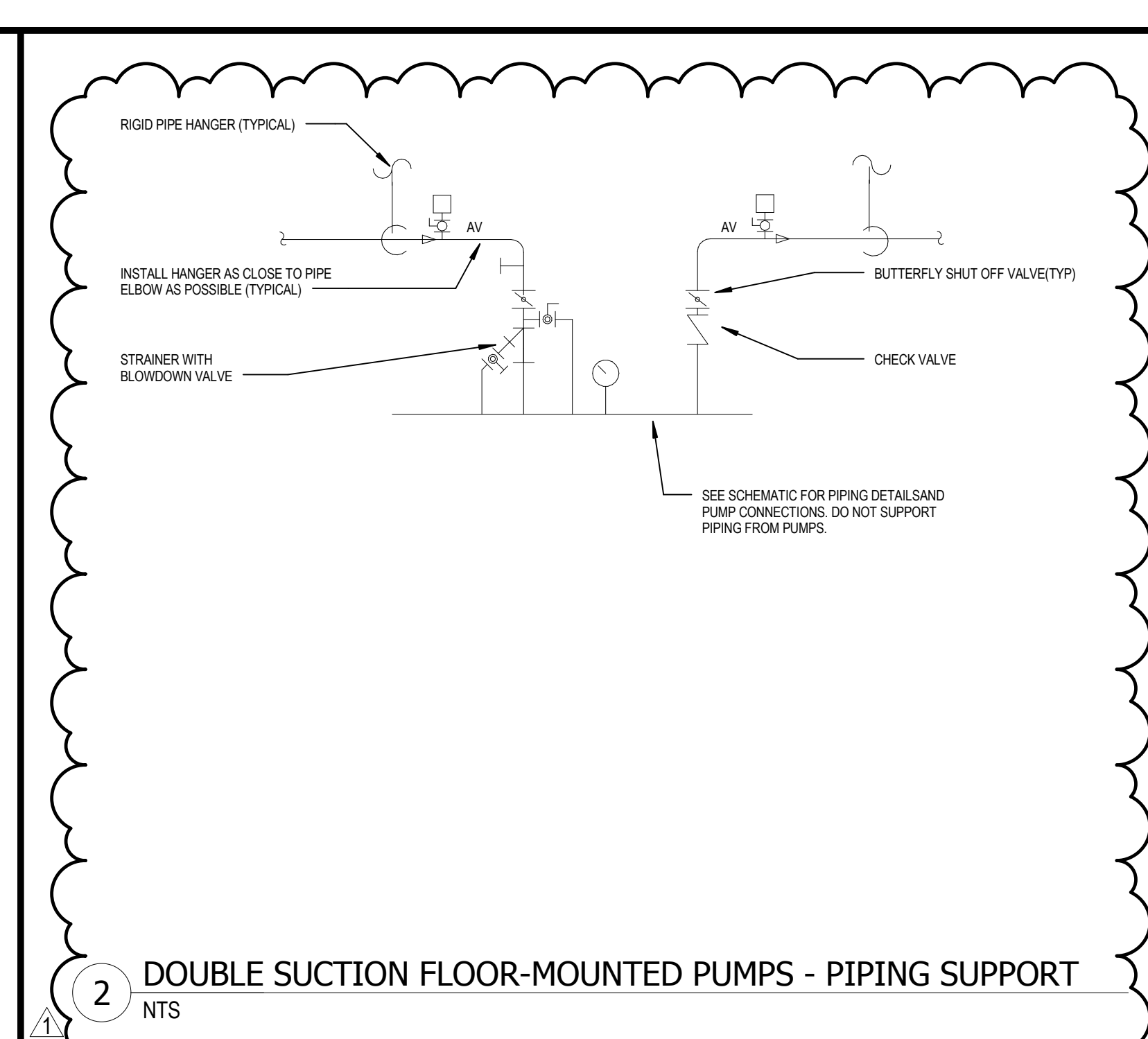
Office of Construction and Facilities Management

Department of Veterans Affairs

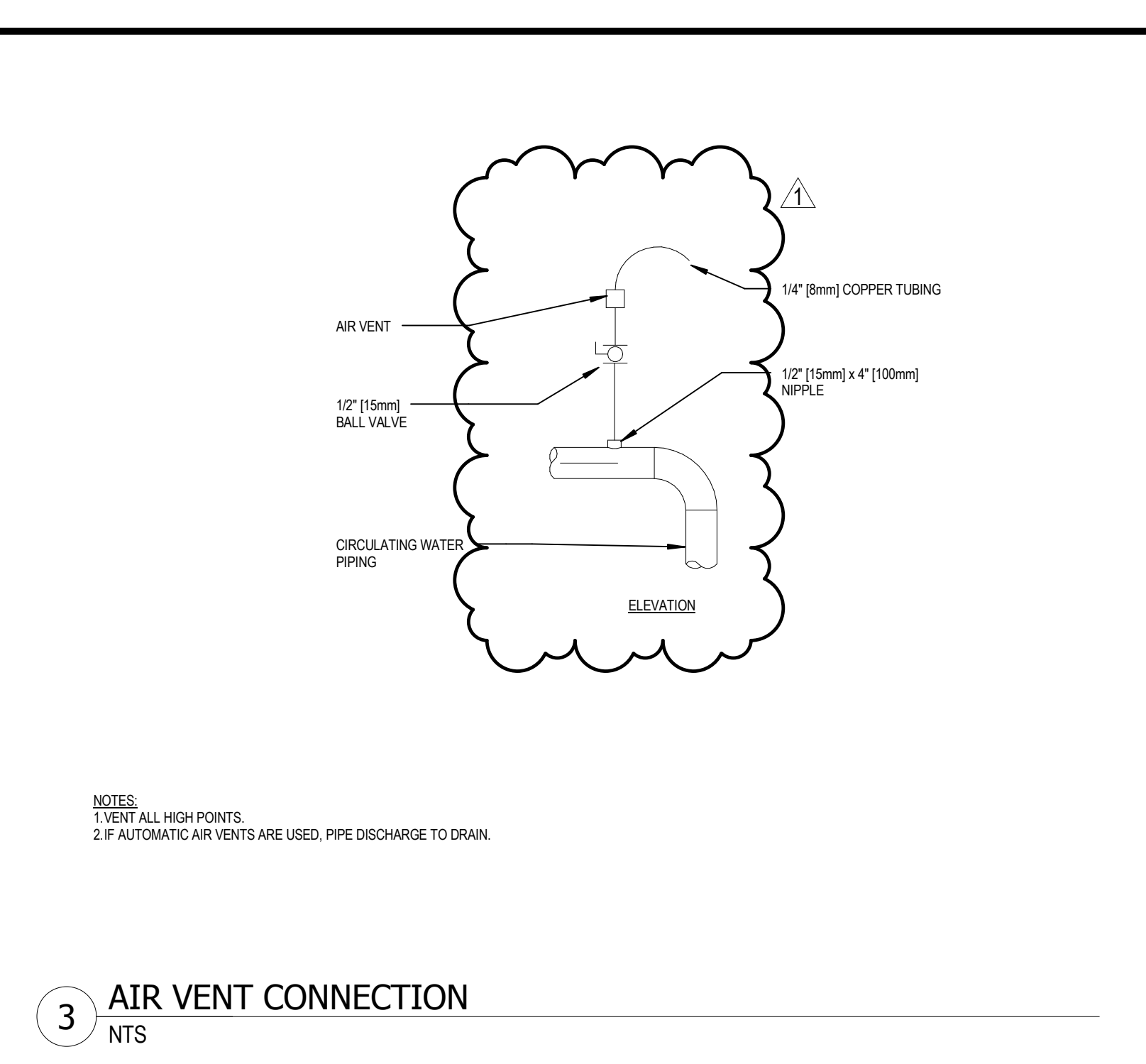
three inches = one foot
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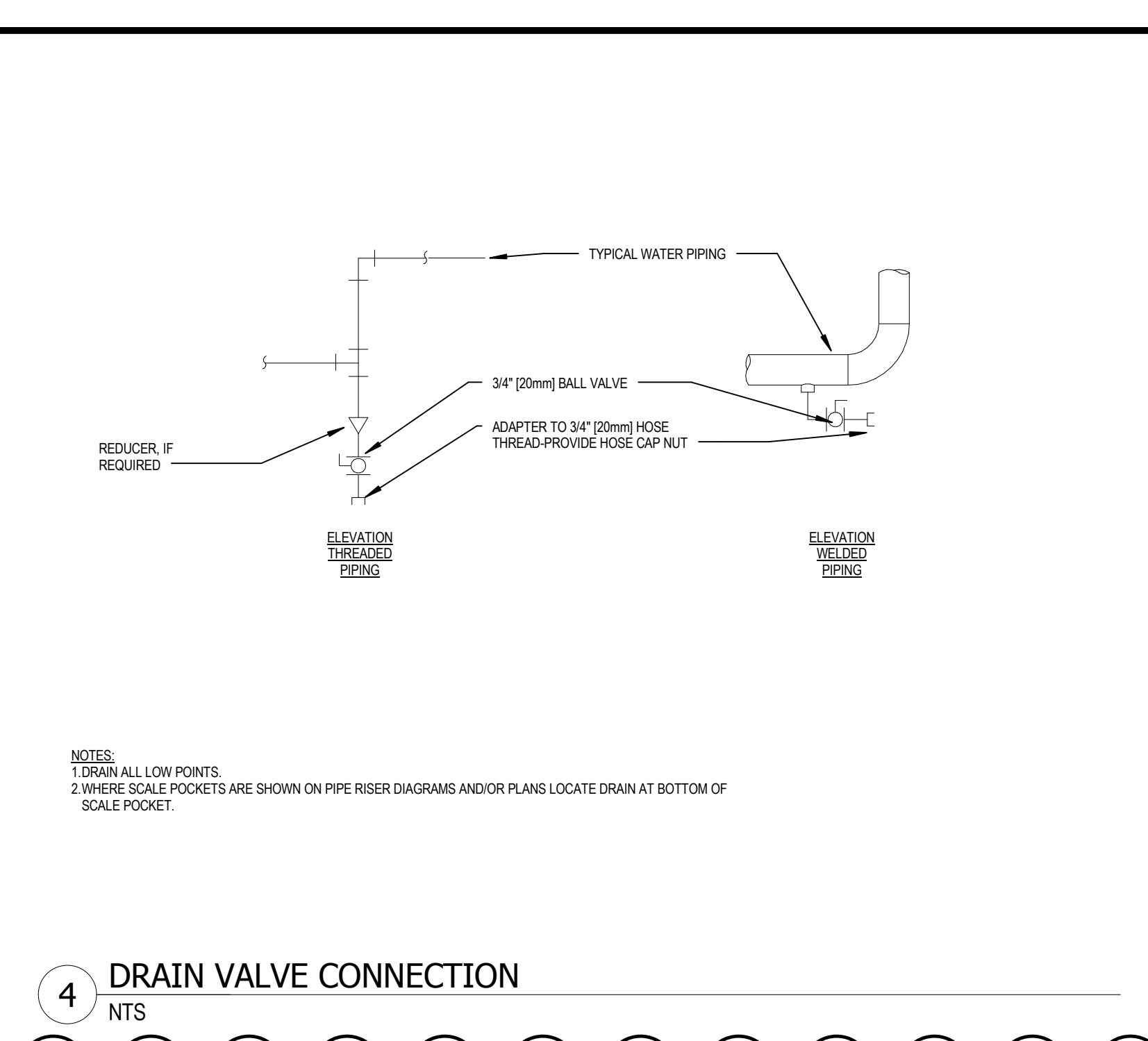
1 HYDRONIC INLINE CIRCULATING PUMP
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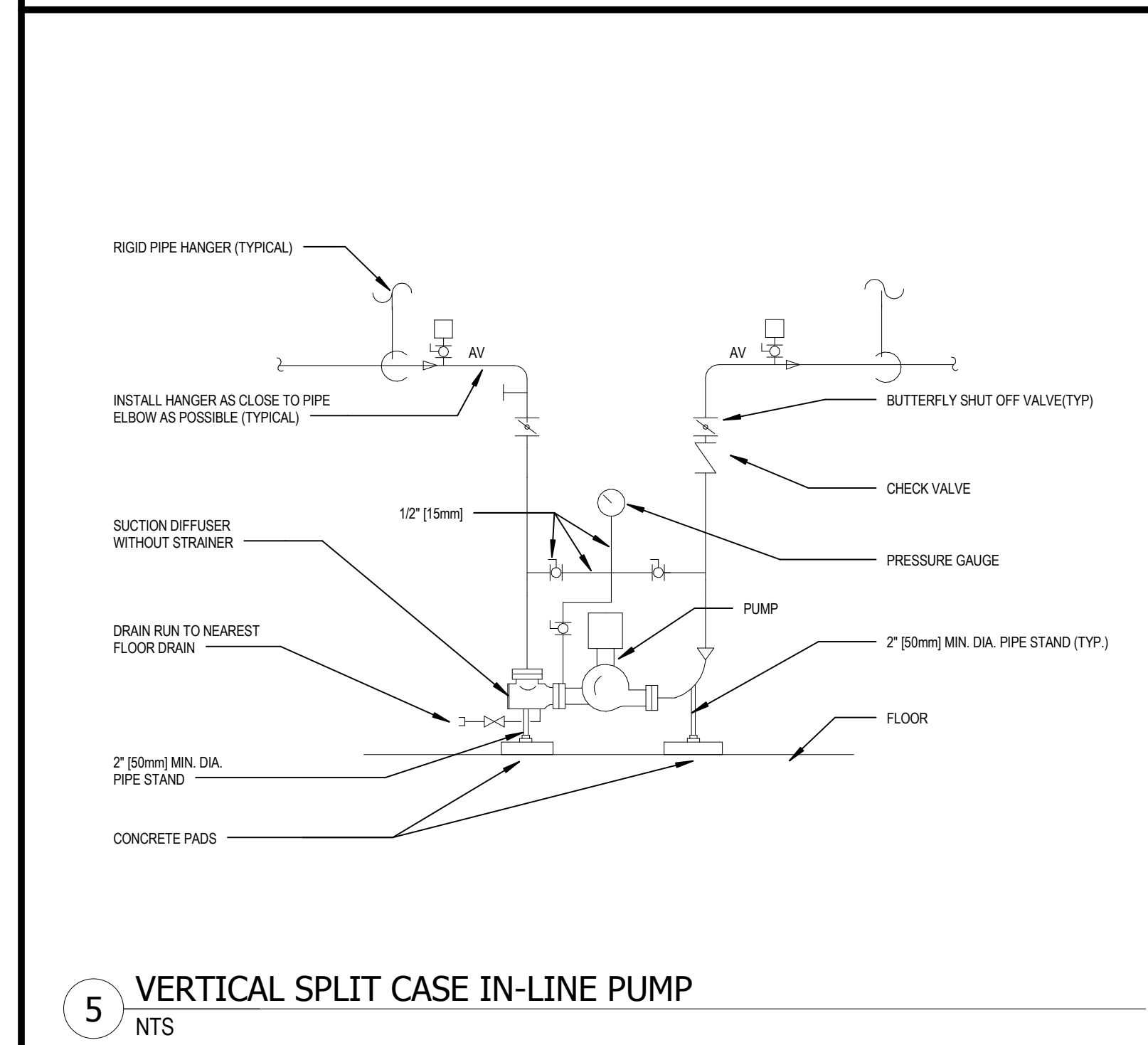
2 DOUBLE SUCTION FLOOR-MOUNTED PUMPS - PIPING SUPPORT
 NTS



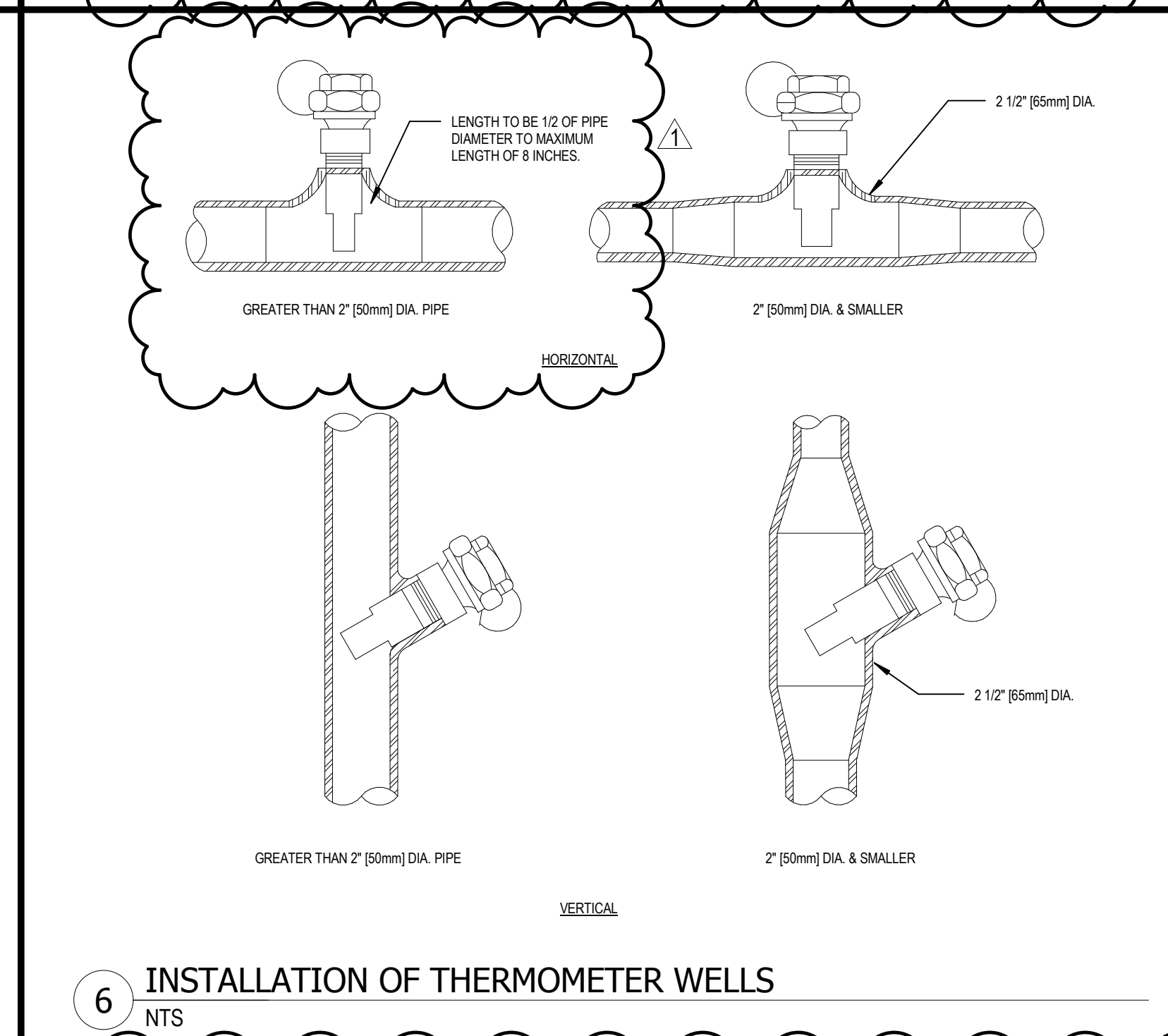
3 AIR VENT CONNECTION
 NTS



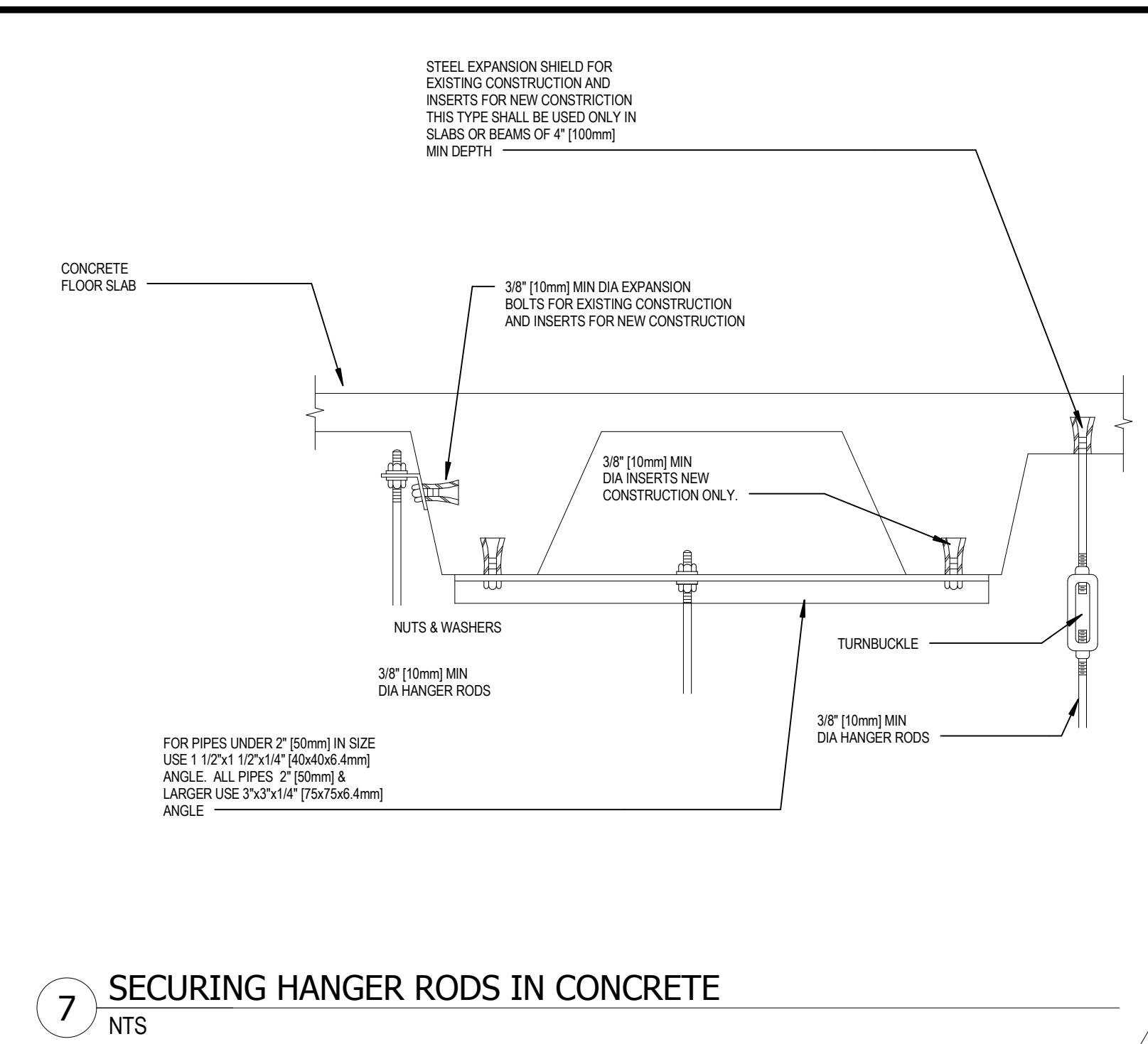
4 DRAIN VALVE CONNECTION
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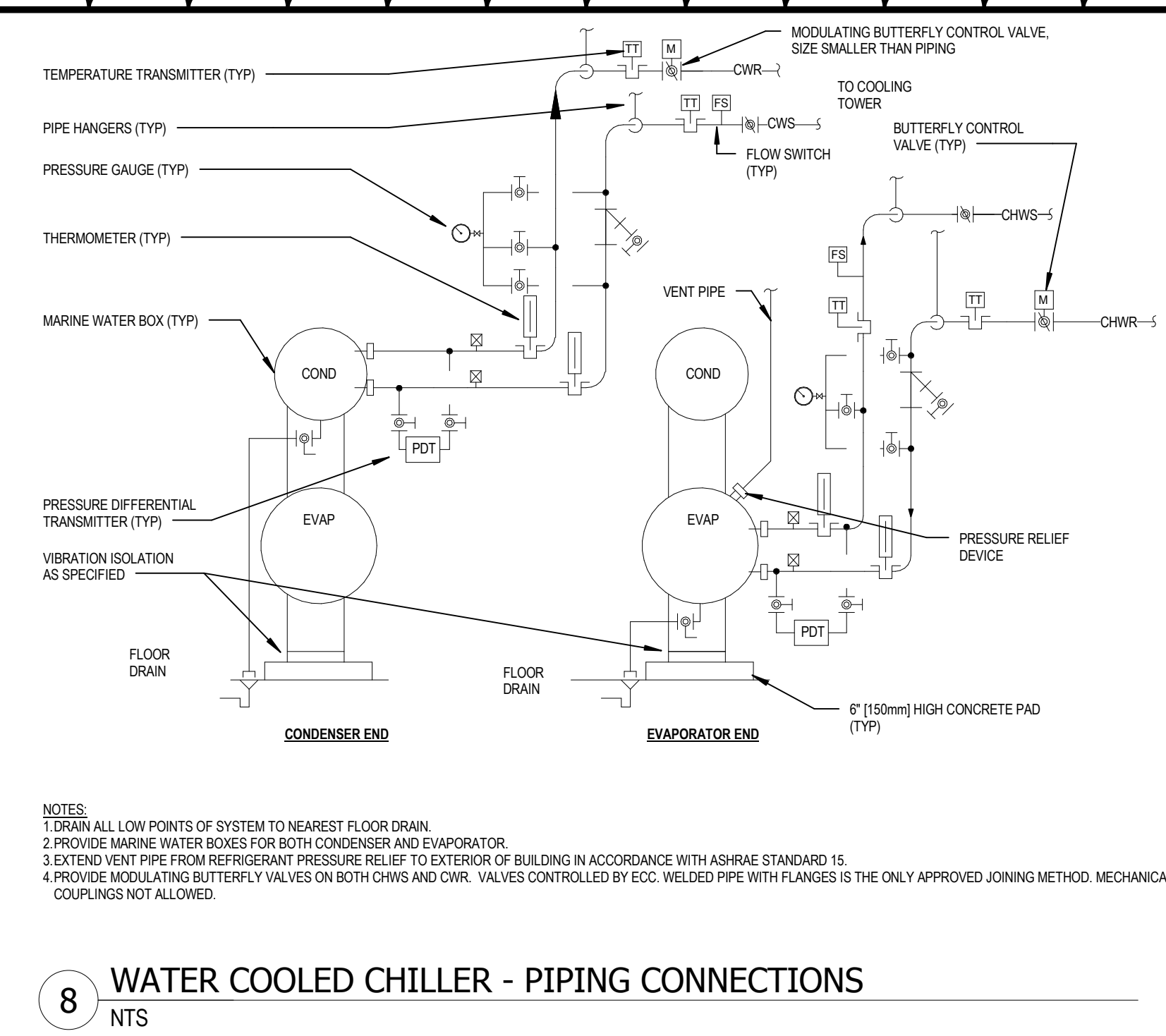
5 VERTICAL SPLIT CASE IN-LINE PUMP
 NTS



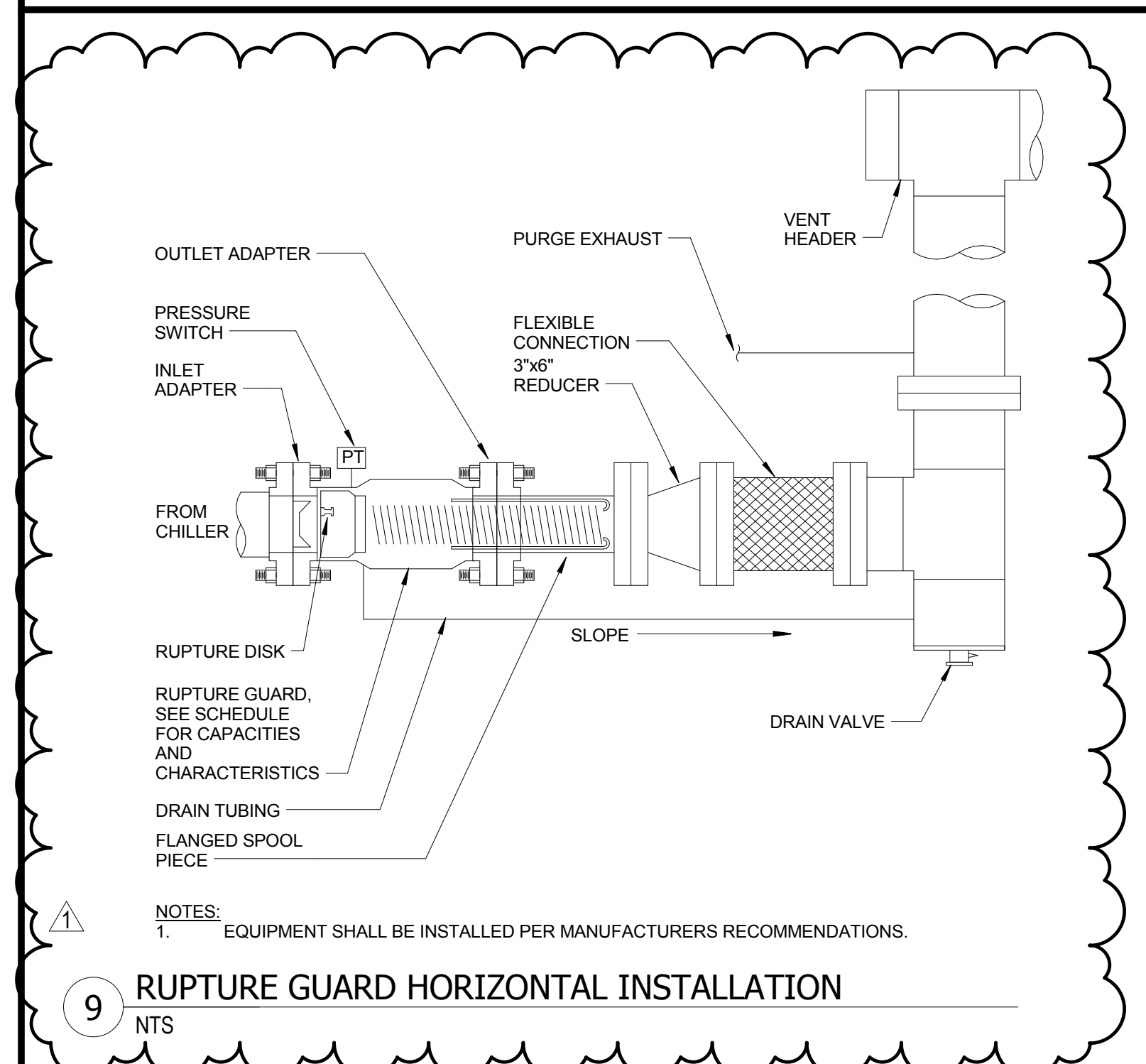
6 INSTALLATION OF THERMOMETER WELLS
 NTS



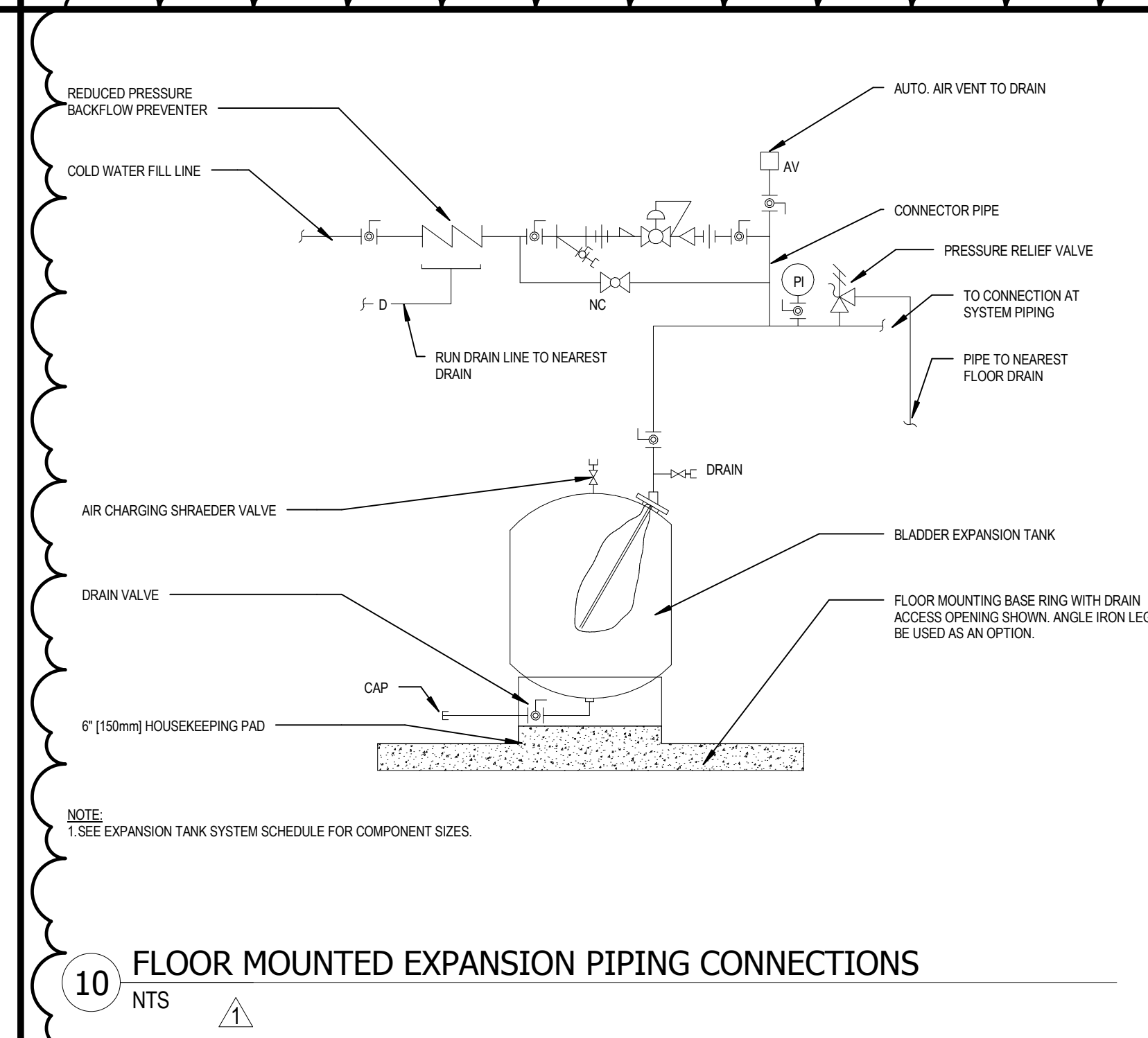
7 SECURING HANGER RODS IN CONCRETE
 NTS



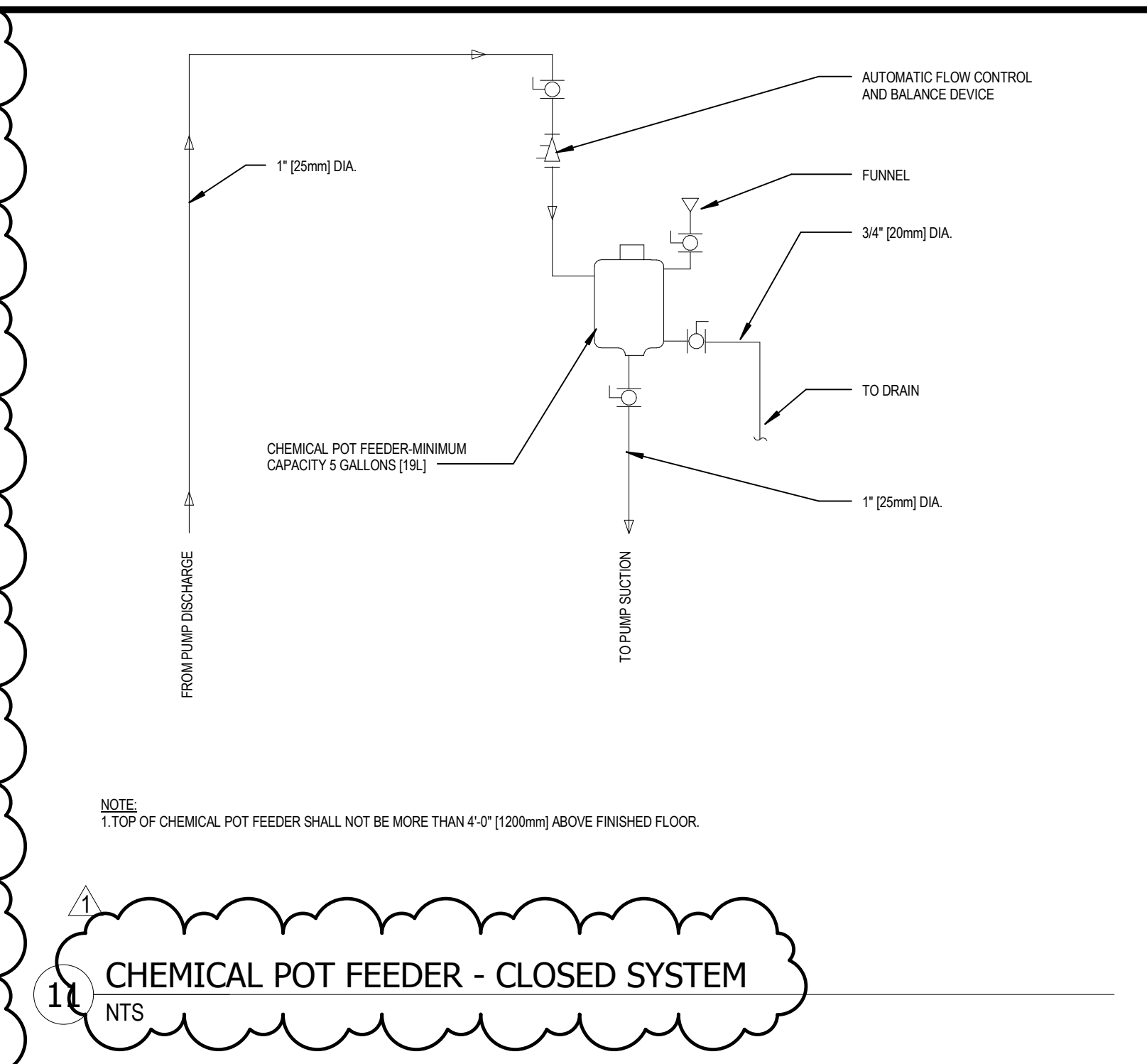
8 WATER COOLED CHILLER - PIPING CONNECTIONS
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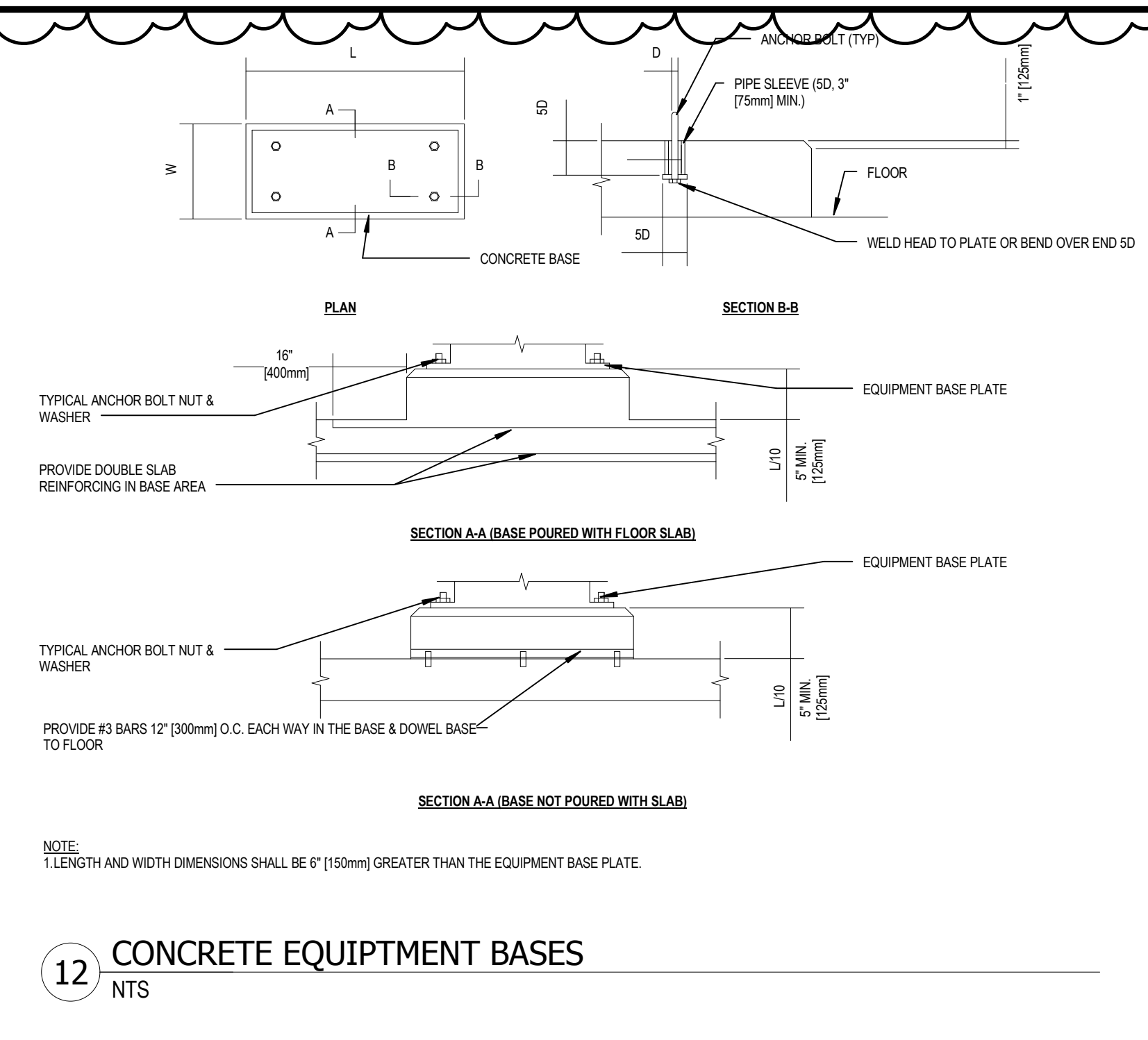
9 RUPTURE GUARD HORIZONTAL INSTALLATION
 NTS



10 FLOOR MOUNTED EXPANSION PIPING CONNECTIONS
 NTS



11 CHEMICAL POT FEEDER - CLOSED SYSTEM
 NTS

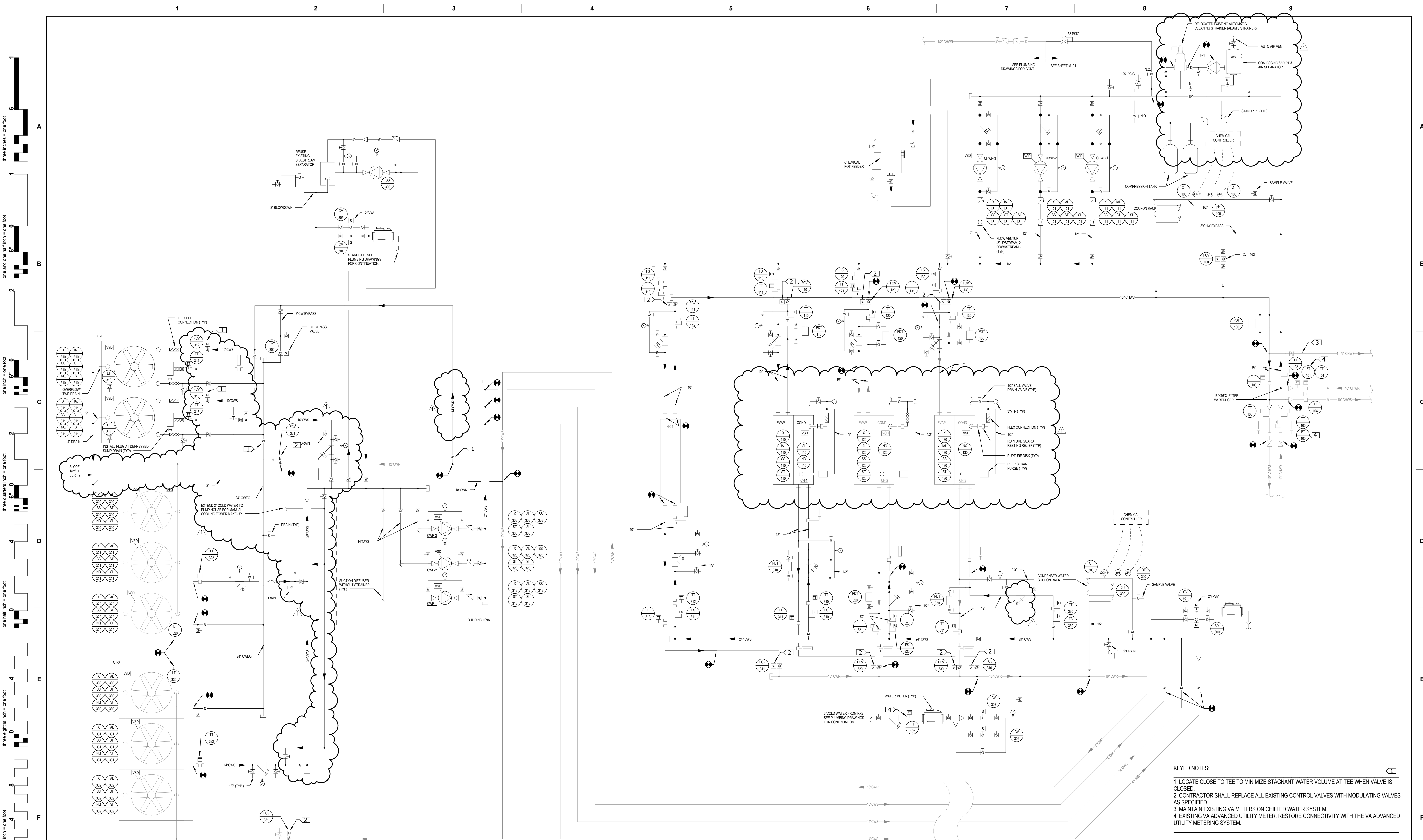


12 CONCRETE EQUIPMENT BASES
 NTS

PARTIALLY SPRINKLERED CONSTRUCTION DOCUMENTS

CONSULTANTS: 420 5th Street North, Suite 100 Minneapolis, Minnesota 55401 Telephone 612.758.4000 HGA Project Number: 3359-003-00	SEAL 	ARCHITECTS/ENGINEERS: 6587 Hamilton Avenue Pittsburgh, Pennsylvania 15206 Ph: 412.287.7333 Fax: 412.287.7334 www.ae-works.com AE Works Project Number: 14023	Drawing Title MECHANICAL DETAILS	Project Title: REPLACE CHILLER AND COOLING TOWER	Project Number 626A4-14-201
			Approved: Project Director	Location: TVHS YORK CAMPUS, MURFREESBORO, TN 37129	Building Number AS INDICATED
Addendum 1 Revisions:	Date 5-26-16		Date: 03/11/2016	Checked: JW	Drawn: GWS


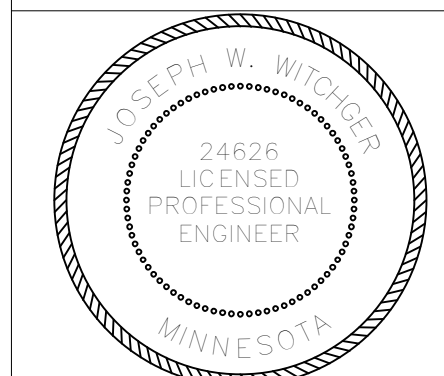
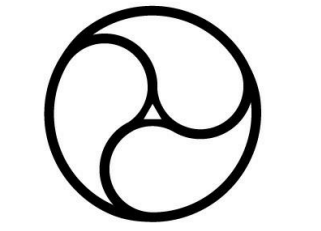

Office of Construction and Facilities Management
 Department of Veterans Affairs



1 WATER CHILLER PIPING
1" = 1'-0"

- KEYED NOTES:**
1. LOCATE CLOSE TO TEE TO MINIMIZE STAGNANT WATER VOLUME AT TEE WHEN VALVE IS CLOSED.
 2. CONTRACTOR SHALL REPLACE ALL EXISTING CONTROL VALVES WITH MODULATING VALVES AS SPECIFIED.
 3. MAINTAIN EXISTING VA METERS ON CHILLED WATER SYSTEM.
 4. EXISTING VA ADVANCED UTILITY METER. RESTORE CONNECTIVITY WITH THE VA ADVANCED UTILITY METERING SYSTEM.

**PARTIALLY SPRINKLERED
CONSTRUCTION DOCUMENTS**

CONSULTANTS:  420 5th Street North, Suite 100 Minneapolis, Minnesota 55401 Telephone 612.758.4000 HGA Project Number: 3359-003-00	SEAL 	ARCHITECTS/ENGINEERS:  6587 Hamilton Avenue Pittsburgh, Pennsylvania 15206 Ph: 412.287.7333 Fax: 412.287.7334 www.ae-works.com AE Works Project Number: 14023	Drawing Title MECHANICAL SCHEMATICS	Project Title: REPLACE CHILLER AND COOLING TOWER	Project Number 626A4-14-201
			Approved: Project Director	Location: TVHS YORK CAMPUS, MURFREESBORO, TN 37129	Building Number AS INDICATED
Addendum 1 Revisions:	5-26-16 Date		Date: 03/11/2016	Checked: JW	Drawn: GWS
				Drawing Number M601	Office of Construction and Facilities Management 

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A
 B
 C
 D
 E
 F

1 2 3 4 5 6 7 8 9

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PUMP SCHEDULE																													
MARK	CONSTRUCTION PHASE	LOCATION	BUILDING SERVED	SYSTEM	PUMP TYPE	FLUID	CIRCULATING FLUID				PUMP HEAD				115% CAPACITY				115% HEAD				ELECTRICAL MOTOR					DESIGN BASIS	REMARKS
							FLOW (GPM)	FLOW (LPS)	HEAD (FT)	HEAD (M)	NPSH REQUIRED (MAX) (FT)	NPSH REQUIRED (MAX) (M)	TEMPERATURE (F)	TEMPERATURE (C)	SP GR	FLOW (GPM)	FLOW (LPS)	HEAD (FT)	HEAD (M)	MIN % EFFICIENCY	NOMINAL POWER (HP)	NOMINAL POWER (KW)	PUMP MOTOR PHASE	PUMP MOTOR VOLT	PUMP MOTOR MAX RPM	PUMP MOTOR CONTROL			
CHMP-1	NEW	BUILDING 107	ALL	CHILLED WATER	CENTRIFUGAL	100% WATER	2,500	39.626	190	570	54.00	12.22	1	2875	45570	190	1241	82	150	111.9	3	480	1785	VFD					
CHMP-2	NEW	BUILDING 107	ALL	CHILLED WATER	CENTRIFUGAL	100% WATER	2,500	39.626	190	570	54.00	12.22	1	2875	45570	190	1241	82	150	111.9	3	480	1785	VFD					
CHMP-3	NEW	BUILDING 107	ALL	CHILLED WATER	CENTRIFUGAL	100% WATER	2,500	39.626	190	570	54.00	12.22	1	2875	45570	190	1241	82	150	111.9	3	480	1785	VFD					
P-1	NEW	BUILDING 107	ALL	CHILLED WATER	IN LINE	100% WATER	1,000	15.850	10.5	10.5	54.00	12.22	1	1150	18229	66	9	3.7	3	480	1750	VFD		BAG SERIES 80					
CWP-1	NEW	BUILDING 109	ALL	CONDENSER WATER	IN LINE	100% WATER	3,750	58.439	110	330	83.00	4.37	13.11	83.00	28.33	1	4313	68355	107	738	82	150	111.9	3	480	1750	VFD	ARMSTRONG SERIES 4300	
CWP-2	NEW	BUILDING 109	ALL	CONDENSER WATER	IN LINE	100% WATER	3,750	58.439	110	330	83.00	4.37	13.11	83.00	28.33	1	4313	68355	107	738	82	150	111.9	3	480	1750	VFD	ARMSTRONG SERIES 4300	
CWP-3	NEW	BUILDING 109	ALL	CONDENSER WATER	IN LINE	100% WATER	3,750	58.439	110	330	83.00	4.37	13.11	83.00	28.33	1	4313	68355	107	738	82	150	111.9	3	480	1750	VFD	ARMSTRONG SERIES 4300	


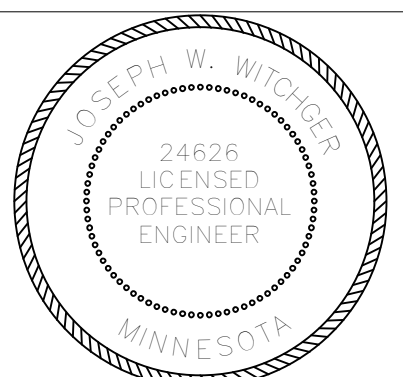
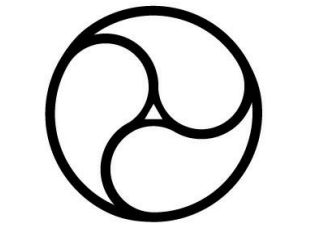

AIR AND DIRT SEPARATOR SCHEDULE														
MARK	CONSTRUCTION PHASE	LOCATION	SYSTEM	AS TYPE	INLET SIZE		FLOW		PRESSURE DROP		STRAINER NEEDED	DESIGN BASIS	REMARKS	
					(IN)	(MM)	(GPM)	(L)	(FT)	(KPa)				
AS-1	NEW	BUILDING 107	CHILLED WATER	SIDESTREAM CONDENSING	8	203	990	15033	1.2	3.6	YES	BAG CRS		

EXPANSION TANK SCHEDULE																										
MARK	LOCATION	SYSTEM	TANK TYPE	APPROX SYSTEM VOLUME		SYSTEM TEMPERATURE RANGE				INITIAL TANK PRESSURE		MAXIMUM OPERATING PRESSURE		RELIEF VALVE		MINIMUM TANK VOLUME		MINIMUM TANK BLADDER VOLUME		TANK INLET SIZE		COLD WATER FILL SIZE		DESIGN BASIS	REMARKS	
				(GAL)	(L)	(F)	(C)	(F)	(C)	(PSIG)	(kPa)	(PSIG)	(kPa)	(GAL)	(L)	(GAL)	(L)	(IN)	(MM)	(IN)	(MM)					
ET-1	BUILDING 107	CHILLED WATER	BLADDER	35,000	132,489	40	4	100	38	35	241.29	140	965.16	125	861.75	138	598	158	598	1.5	38.1	0.5	12.7		BAG CRS	

COOLING TOWER SCHEDULE																																	
MARK	CONSTRUCTION PHASE	LOCATION	SYSTEM	TOWER TYPE	TOTAL NOMINAL CAPACITY		NUMBER OF CELLS	TOWER FLOW RATE PER CELL		TOWER PRESSURE DROP		TEMPERATURE				FAN MOTOR				SLUMP HEATER		CAPACITY		TOWER HEIGHT M		DESIGN BASIS / EXISTING MODEL	REMARKS						
					(TONS)	(KW)		(GPM)	(LPS)	(FT)	(M)	AMBIENT (F)	EWI (C)	LWT (F)	LWT (C)	NUMBER OF FANS	(HP)	TOWER FAN KW	TOWER FAN PHASE	TOWER FAN VOLT	TOWER FAN RPM	TOWER FAN SPEED CONTROL	HEATER TYPE	(BTU/H)	(L)			(G)	(FT)				
CT-1	NEW	BUILDING 109	CONDENSER WATER	CROSS FLOW	1200	1200	2	1800	28.531	11.34	34.03	78.00	25.56	83.00	33.89	83.00	28.33	1	45	18.75	3	480	1800	VFD	ELECTRIC	47.7	14	34.660	15.731	11'3 3/4"	3.04	BAC SERIES 3000	SSE-1424-GR
CT-2	EXISTING	BUILDING 109	CONDENSER WATER	CROSS FLOW	1200	1200	3	1200	19.020								1	25	18.75	3	480	1800	HIGH/LOW			53.520	24.277	9'11 3/4"	3.04	BAC SERIES 3000			
CT-3	EXISTING	BUILDING 109	CONDENSER WATER	CROSS FLOW	1200	1200	3	1200	19.020								1	25	18.75	3	480	1800	HIGH/LOW			53.520	24.277	9'11 3/4"	3.04	BAC SERIES 3000			

WATER COOLED CHILLER SCHEDULE																																	
MARK	CONSTRUCTION PHASE	LOCATION	BUILDING SERVED	CHILLER TYPE	CAPACITY			MIN COP	NPLV (kW/TON)	DESIGN FLOW				EVAPORATOR				CONDENSER				COND FOULING FACTOR	REFRIGERANT CHARGE (LBS)	ELECTRICAL		DESIGN BASIS / EXISTING MODEL	REMARKS						
					(TONS)	(KW)	(kW/TON)			(GPM)	(LPS)	(F)	(C)	(F)	(C)	(F)	(C)	(F)	(C)	(F)	(C)			(F)	(C)			(F)	(C)	(HP)	(KVA)	(VOLT)	(SPEED CONTROL)
CH-1	NEW CONSTRUCTION	BUILDING 107	ALL	CENTRIFUGAL	900	626.5	2.62	0.34	1800	26.551	54.00	12.22	42.00	5.66	13.56	46.68	0.001	3700	42.796	85.00	29.44	94.41	34.67	19.42	49.26	0.00025	1400	487	3	480	VSD	TRANE CVP6	
CH-2	EXISTING	BUILDING 107	ALL	CENTRIFUGAL	1200	684	0.578	0.578	2400	38.041	54.00	12.22	44.00	6.67	27.8	83.4	0.00025	3600	57.061	85.00	29.44	94.36	34.64	18.22	54.66	0.00025	1400	487	3	4160	VSD	TRANE CVP6	
CH-3	EXISTING	BUILDING 107	ALL	CENTRIFUGAL	1200	666	0.555	0.576	2400	38.041	54.00	12.22	44.00	6.67	15.2	45.6	0.001	3600	57.061	85.00	29.44	94.30	34.61	19.6	58.8	0.00025	2450	487	3	4160	VSD	CARRIER 19XR	

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			Approved: Project Director	Location: TVHS YORK CAMPUS, MURFREESBORO, TN 37129	Building Number AS INDICATED	

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CONTROL POINTS LIST
CONTROL TAG, PROCESS NUMBER, CONTROL POINT, DI, AI, DO, AO, SOFTWARE, LOCATION, AV, DV, SCHED, TREND (Z), ALARM, REMARKS, COMMENTS

CONTROL POINTS LIST
CONTROL TAG, PROCESS NUMBER, CONTROL POINT, DI, AI, DO, AO, SOFTWARE, LOCATION, AV, DV, SCHED, TREND (Z), ALARM, REMARKS, COMMENTS

LEGEND: DI = "DIGITAL INPUT", AI = "ANALOG INPUT", DO = "DIGITAL OUTPUT", AO = "ANALOG OUTPUT"
PANELS: CCP = CHILLER CONTROL PANEL, BCP = BOILER CONTROL PANEL, HRCHCP = HEAT RECOVERY CHILLER CONTROL PANEL
NOTES: 1. PROVIDE POINT FEEDBACK TO BAS VIA BACNET. 2. MODULATE ELECTRICAL CONTROL VALVE WITH FEEDBACK.

PARTIALLY SPRINKLERED CONSTRUCTION DOCUMENTS

Table with 2 columns: Addendum 1 Revisions, Date

CONSULTANTS: HGA logo and address: 420 5th Street North, Suite 100, Minneapolis, Minnesota 55401

SEAL: Professional Engineer seal for Joseph W. Winkler, License No. 24626

ARCHITECTS/ENGINEERS: AE WORKS logo and address: 6587 Hamilton Avenue, Pittsburgh, Pennsylvania 15206

Table with 2 columns: Drawing Title (MECHANICAL CONTROL POINTS), Approved: Project Director

Table with 2 columns: Project Title (REPLACE CHILLER AND COOLING TOWER), Project Number (62644-14-201), Drawing Number (M801)

Office of Construction and Facilities Management logo and Department of Veterans Affairs logo