

WATER SIDE SEQUENCE OF OPERATIONS

1. GAS HOT WATER SYSTEMS SEQUENCE OF OPERATIONS (B-1 & B-2)

(A) GENERAL

THE NEW GAS HOT WATER SYSTEMS WILL CONSIST OF ONE NEW HOT WATER BOILERS AND ONE HOT WATER PUMPS THE BOILER WILL BE FACTORY FURNISHED WITH A PREWIRED BOILER CONTROL PANEL WHICH WILL PERFORM BOILER CAPACITY, LIMIT AND SAFETY CONTROLS, MONITOR AND ALARM BOILER OPERATION.

(B) HOT WATER COIL LOOP

HOT WATER FLOW TO HOT WATER COILS AND PANEL SYSTEMS WILL BE REGULATED THROUGH EXISTING HOT WATER COIL VALVES. WHEN HEATING IS REQUIRED, THE HOT WATER VALVES WILL BE MODULATED TO SATISFY THE HEATING DEMAND. WHEN HEATING IS NOT REQUIRED, THE HOT WATER VALVES WILL BE FULLY CLOSED. EXCESS WATER IN THE COIL LOOP WILL BE BYPASSED THROUGH THE HOT WATER BYPASS VALVE. A DIFFERENTIAL PRESSURE SENSOR WILL BE INSTALLED ACROSS THE HOT WATER SUPPLY AND RETURN LINES. THE EXISTING CONTROLLER WILL MODULATE THE OPENING OF THE BYPASS VALVE TO MAINTAIN THE DIFFERENTIAL PRESSURE SETPOINT.

(C) STARTUP

THE OPERATOR WILL ASSIGN PUMP AND BOILER ORDER OF ACTIVATION PRIOR TO SYSTEM STARTUP. THIS SEQUENCE OF OPERATIONS ASSUMES THE FOLLOWING ORDER: NEW B-1 & HWP-1, AND NEW B-2 & HWP-2

THE HOT WATER SYSTEM WILL BE ACTIVATED WHEN EITHER:

1. THE OPERATOR SCHEDULED START TIME IS REACHED, OR
2. ANY HEATING SYSTEM IS ENERGIZED.

AT STARTUP, THE EXISTING CONTROLLER WILL OPEN THE BOILER ISOLATION VALVE AND THEN START THE MATCHING HOT WATER PUMP. PUMP WATER FLOW WILL BE CONFIRMED BY AN EXISTING DIFFERENTIAL PRESSURE SENSOR.

WHEN ANY SYSTEM REQUIRES HEATING, THE HOT WATER BYPASS VALVE OPENING WILL BE DECREASED. WHEN THE VALVE OPENING HAS BEEN DECREASED TO THE 50% POSITION FOR TEN MINUTES, THE EXISTING CONTROLLER WILL ENERGIZE THE BOILER.

(D) BOILER OPERATION

UPON RECEIPT OF THE STARTUP SIGNAL FROM THE CONTROLLER, THE OLIER CONTROL PANEL WILL INITIATE BOILER STARTUP SEQUENCE AND PERFORM ALL SAFETY AND LIMIT CONTROL. THE BOILER HOT WATER SUPPLY TEMPERATURE SETPOINT WILL BE ADJUSTABLE AT THE BOILER CONTROL PANEL OR CONTROLLER. AT STARTUP, BOILER WILL OPERATE AT 40% CAPACITY. IF THE SUPPLY TEMPERATURE SETPOINT CANNOT BE ACHIEVED, THE BOILER CONTROL PANEL WILL GRADUALLY MODULATE BOILER CAPACITY UP TO 100%.

(E) SYSTEM HOT WATER SUPPLY TEMPERATURE

THE OPERATOR WILL INPUT A SYSTEM HOT WATER SUPPLY TEMPERATURE SETPOINT AT THE EXISTING CONTROLLER THERMOWELLS WILL BE PROVIDED AT THE NEW COMMON HOT WATER SUPPLY AND RETURN LINES FOR WATER TEMPERATURE MONITORING. THE CONTROLLER WILL MODULATE THE FAN COIL MIXING VALVE TO ACHIEVE THE SYSTEM WATER SUPPLY TEMPERATURE SETPOINT.

(F) SYSTEM CAPACITY CONTROL

THE EXISTING CONTROLLER WILL MODULATE THE HOT WATER MIXING VALVE, BOILERS AND PUMPS OPERATION TO MAINTAIN THE HOT WATER SUPPLY TEMPERATURE SETPOINT. AT STARTUP, THE MIXING VALVE BOILER AND BYPASS PORTS WILL BOTH BE AT THE 50% POSITION. IF THE SUPPLY TEMPERATURE SETPOINT CANNOT BE ACHIEVED WITH THIS INITIAL MIXING VALVE SETTING, THE EXISTING CONTROLLER WILL GRADUALLY INCREASE THE BOILER PORT OPENING AND DECREASE THE BYPASS PORT OPENING. CONVERSELY, IF THE SUPPLY WATER TEMPERATURE IS TOO HIGH, THE EXISTING CONTROLLER WILL DECREASE THE BOILER PORT OPENING AND INCREASE THE BYPASS PORT OPENING.

(G) SHUT OFF CYCLE

WHEN SYSTEM HEATING DEMAND DECREASES, THE HOT WATER BYPASS VALVE WILL EVENTUALLY BE MODULATED FULLY OPEN. WHEN THE BYPASS VALVE HAS BEEN FULLY OPEN FOR FIFTEEN MINUTES, THE EXISTING CONTROLLER WILL DE-ACTIVATE NEW B-1A. AND EXISTINGHOT WATER PUMP P-1/P-2 WILL CONTINUE TO RUN UNTIL THE OPERATOR SCHEDULED STOP TIME IS REACHED.

(H) BOILER WATER FLOW

BOILER OPERATION WILL BE CONTINGENT UPON A MINIMUM WATER FLOW RATE. A FLOW SENSOR WILL BE INSTALLED UPSTREAM OF THE BOILER. WHEN WATER FLOW THROUGH A BOILER APPROACHES THE LOW FLOW LIMIT DEFINED BY THE OPERATOR, THE CONTROLLER WILL SHUT DOWN THE BOILER DE-ENERGIZE THE CORRESPONDING EXISTING PUMPS, AND CLOSE THE BOILER ISOLATION VALVE. THE BOILER FACTORY SAFETY CONTROLS WILL ALSO SHUT-OFF THE BOILER, WHEN THE WATER FLOW IS TOO LOW.

(I) ALARM OPERATION

IF THE PUMP FAILS TO START OR FAILS DURING OPERATION, AND IF THE BBOILER FAILS TO START OR FAILS DURING OPERATION, THE BOILER CONTROLLER WILL IMMEDIATELY SOUND AN ALARM.

(J) MANUAL OPERATION

HOA SWITCHES WILL BE PROVIDED ON THE EXISTING CONTROLLER FOR ALL HOT WATER PUMPS AND BOILER ISOLATION VALVES. THE HOT WATER BYPASS VALVE WILL BE PROVIDED WITH A MANUAL MODULATION CONTROL SWITCH.

CHILLER CONTROL SEQUENCE

SEQUENCE OF OPERATION

1. AIR COOLED CHILLERS, PUMPS

A. CHILLER INCLUDING CHILLER PRIMARY CHILLED WATER PUMPS AND OTHER ASSOCIATED COMPONENTS.

1. GENERAL:

- WHEN OUTDOOR AIR TEMPERATURE IS ABOVE 50°F (ADJ.) OR ON A CALL FOR INCREASED COOLING, THE CHILLER PLANT SHALL BE ENABLED.
- PROVIDE INTEGRATOR PANEL AND WIRING TO CONNECT CHILLER CONTROL CENTER INTERFACE CONTROLS TO THE BMCS FOR EACH CHILLER. CHILLER CONTROL CENTER INTERFACE CONTROLS ARE FURNISHED UNDER SECTION 15950. ALL INPUT DATA SPECIFIED UNDER SECTION 15950 SHALL BE CAPABLE OF BEING MONITORED THROUGH THE BMCS WITHOUT LOSS OF DATA.

2. CHILLER CONTROL

- WHEN CHILLER PLANT IS ENABLED, THE FIRST (LEAD) CHILLER SHALL BE ENABLED.
- THE SECOND CHILLER SHALL BE ENABLED IN SEQUENCE AS REQUIRED TO MAINTAIN A MINIMUM SECONDARY CHILLED WATER SUPPLY TEMPERATURE OF 42°F (ADJ.), OR HIGHER AS DICTATED BY RESET PRIMARY CHILLED WATER SUPPLY TEMPERATURE. IF SYSTEMS ARE FUNCTIONING PROPERLY, THE PRIMARY AND SECONDARY CHILLED WATER SUPPLY TEMPERATURES WILL BE THE SAME. THE PRIMARY CHILLED SUPPLY TEMPERATURE SET POINT FOR EACH CHILLER SHALL BE RESET TO A MAXIMUM OF 48°F (ADJ.) AS REQUIRED TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SET POINTS OF THE MAIN AIR HANDLING UNITS. IF THE CONTROL VALVE FOR THE CHILLED WATER COIL FOR ANY OF THE LISTED AIR HANDLING UNITS IS FULLY OPEN WITHOUT SATISFYING DISCHARGE AIR TEMPERATURE SET POINT, THE PRIMARY CHILLED WATER SUPPLY TEMPERATURE SETPOINT SHALL BE GRADUALLY RETURNED TO 42°F (ADJ.).

4. CHILLED WATER PUMPS

- WHEN A CHILLER IS ENABLED, ITS ASSOCIATED CHILLED WATER PUMP SHALL BE ENABLED BY THE BMCS. THE ASSOCIATED CHILLED WATER, NORMALLY OPEN CONTROL VALVE AT THE CHILLER SHALL BE OPENED. CONTROL VALVES SHALL HAVE ELECTRIC ACTUATOR AND SHALL BE LINE SIZE. CONTROL VALVE AND ACTUATOR SHALL BE CONSTRUCTED? OF CORROSION RESISTANT MATERIALS AT THE CHILLER, THE CONTROL VALVE SHALL HAVE END SWITCH WHICH SHALL BE DIRECTLY INTERLOCKED WITH THE CHILLER INDEPENDENT OF THE BMCS.

1) CH-1 SHALL BE ASSOCIATED WITH CHP-1.

2) CH-2 SHALL BE ASSOCIATED WITH CHP-2.

WHEN CH-1 IS ENABLED, PRIMARY CHILLED WATER PUMP CHP-1 SHALL BE ENABLED.

WHEN CH-2 IS ENABLED, PRIMARY CHILLED WATER PUMP CHP-2 SHALL BE ENABLED.

NOTE: CH-1 AND CH-2 PUMPS AND START SEQUENCE AS PREVIOUSLY PROGRAMMED THROUGH EXISTING BMCS PROTOCOL.

- PROVIDE EACH PUMP WITH CURRENT SWITCH FOR OPERATING STATUS.

5. MISCELLANEOUS:

- PROVIDE WIRING TREATMENT SYSTEM FURNISHED. IF CHEMICAL CONTROLLER SENSES ALARM CONDITION, AN ALARM SIGNAL SHALL BE RECEIVED BY THE BMCS.

- WHEN CHILLER PLANT IS ENABLED, THE PUMP SHALL BE ENABLED. PROVIDE CURRENT SENSOR FOR PUMP STATUS.

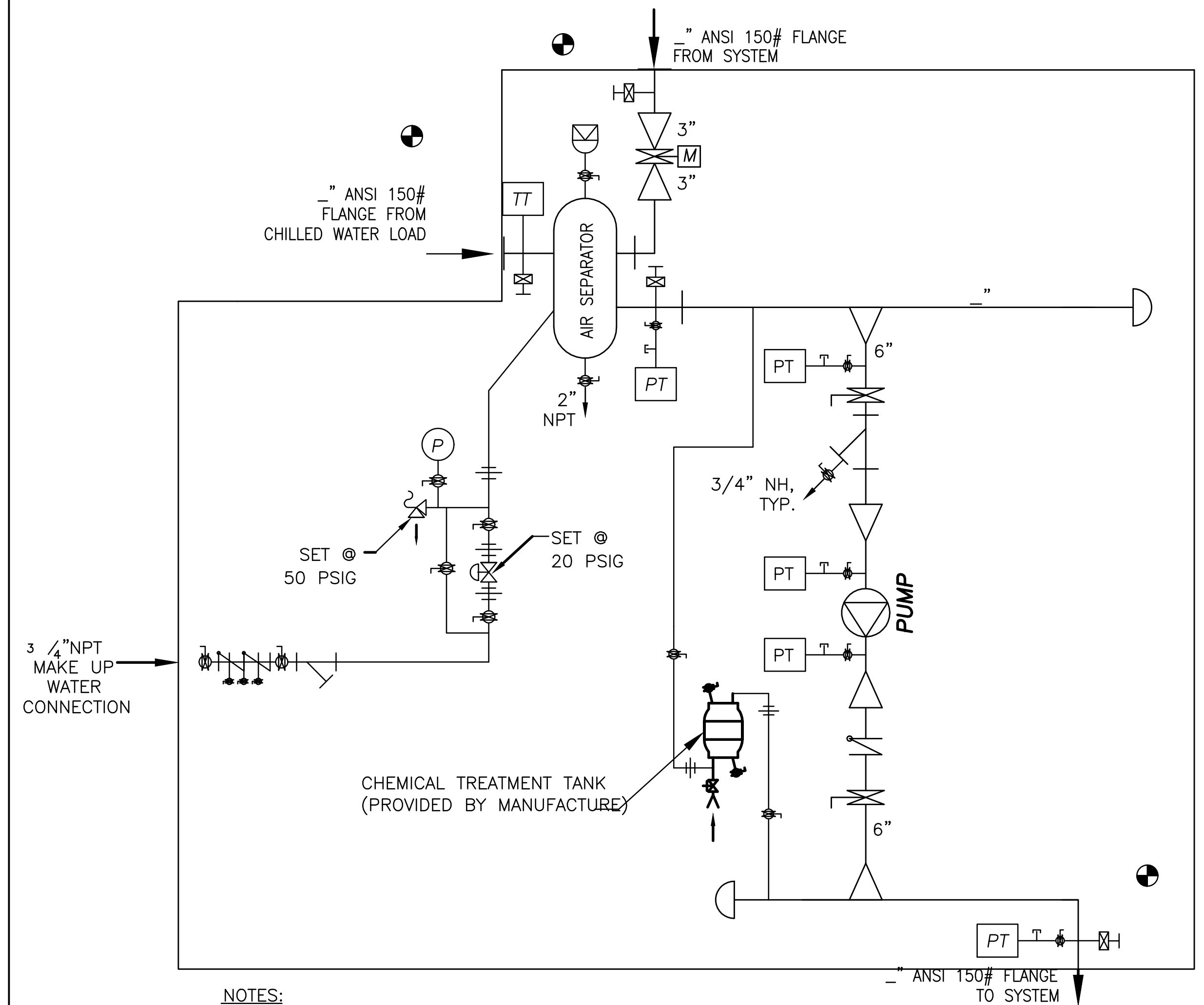
6. MAKE UP WATER CONTROL:

- PROVIDE ALL WIRING BETWEEN LEVEL SENSING DEVICE AND MAKE-UP WATER CONTROL VALVES TO OPEN CONTROL VALVE WHEN WATER IS REQUIRED. ALL WIRING SHALL BE INDEPENDENT OF THE BMCS.

13. COORDINATE CONTROLS WITH UNIT MANUFACTURER, CONTROL AND ELECTRICAL CONTRACTORS FOR CONNECTION TO POWER AND LIFE SAFETY SYSTEMS AS REQUIRED BY CODE.

14. INSTALLATION OF FIELD DEVICES SUCH AS RELAYS, SENSORS, LOCAL CONTROLLERS, ETC SHALL FOLLOW THE INSTRUCTIONS IN THE CONTRACT DOCUMENTS. OTHERWISE THE CONTROLS CONTRACTOR SHALL FIELD VERIFY THE OPTIMUM LOCATIONS FOR MOUNTING THE DEVICES.

15. THE CONTROL CONTRACTOR SHALL, AS PART OF HIS SHOP DRAWING ACTIVITY, PREPARE AND SUBMIT TO THE USERS ENGINEER CONTROL/WIRING & PIPING DIAGRAMS WHICH INDICATES, GRAPHICALLY AND WITH SUFFICIENT DETAIL, THE INTENT OF THE ABOVE DESCRIBED SEQUENCE OF OPERATIONS. THESE CONTROL WIRING AND/OR PIPING DIAGRAMS SHALL BE SUPPORTED WITH APPROPRIATE MANUFACTURERS' CATALOG DATA AND POWER REQUIREMENT.



NOTES:

1. FOR PIPE SIZES SEE PLANS.

TYPICAL WATER PUMP PACKAGE PIPING DIAGRAM

SCALE NONE 1

RECORD DRAWINGS

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DESIGN FOR:
BUILDING 1408
REPLACE CHILLER, BOILER AND AHU'S
EDWARDS AIR FORCE BASE, CALIFORNIA 93523-8450

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