



TRANE®

Free Cooling /Case study Integrated Solution “Refrigerant Migration”

CenTraVac Chillers



Highest Reliability & Consistent Performance



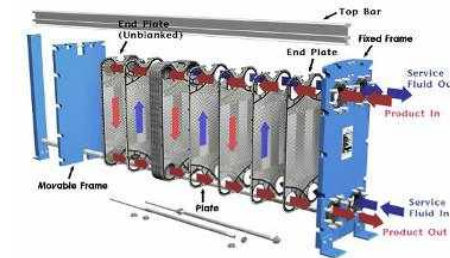
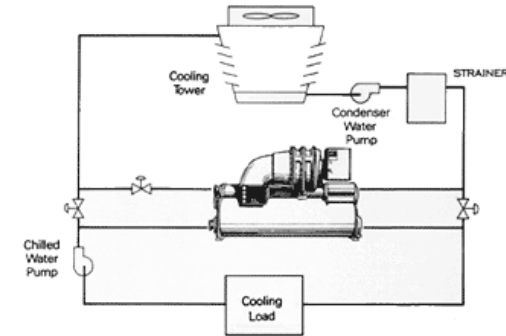
TRANE® Free Cooling on with Control

Free Cooling Using Water Economizers

- Types of systems
 - *Strainer Cycle*
 - *Plate-and-Frame Heat Exchanger*
 - *Refrigerant Migration*
- 차가운 외기를 활용함
- 운전비용 절감효과

터보냉동기 “Free Cooling”

- 압축기 가동 없이 정격용량의 최대 45%까지 냉동용량 공급
- Refrigerant migrates to the area of lowest temperature
- 추가 설치공간 불필요
- Manual or automatic controls



Integrated Energy Saving Solution



TRANE

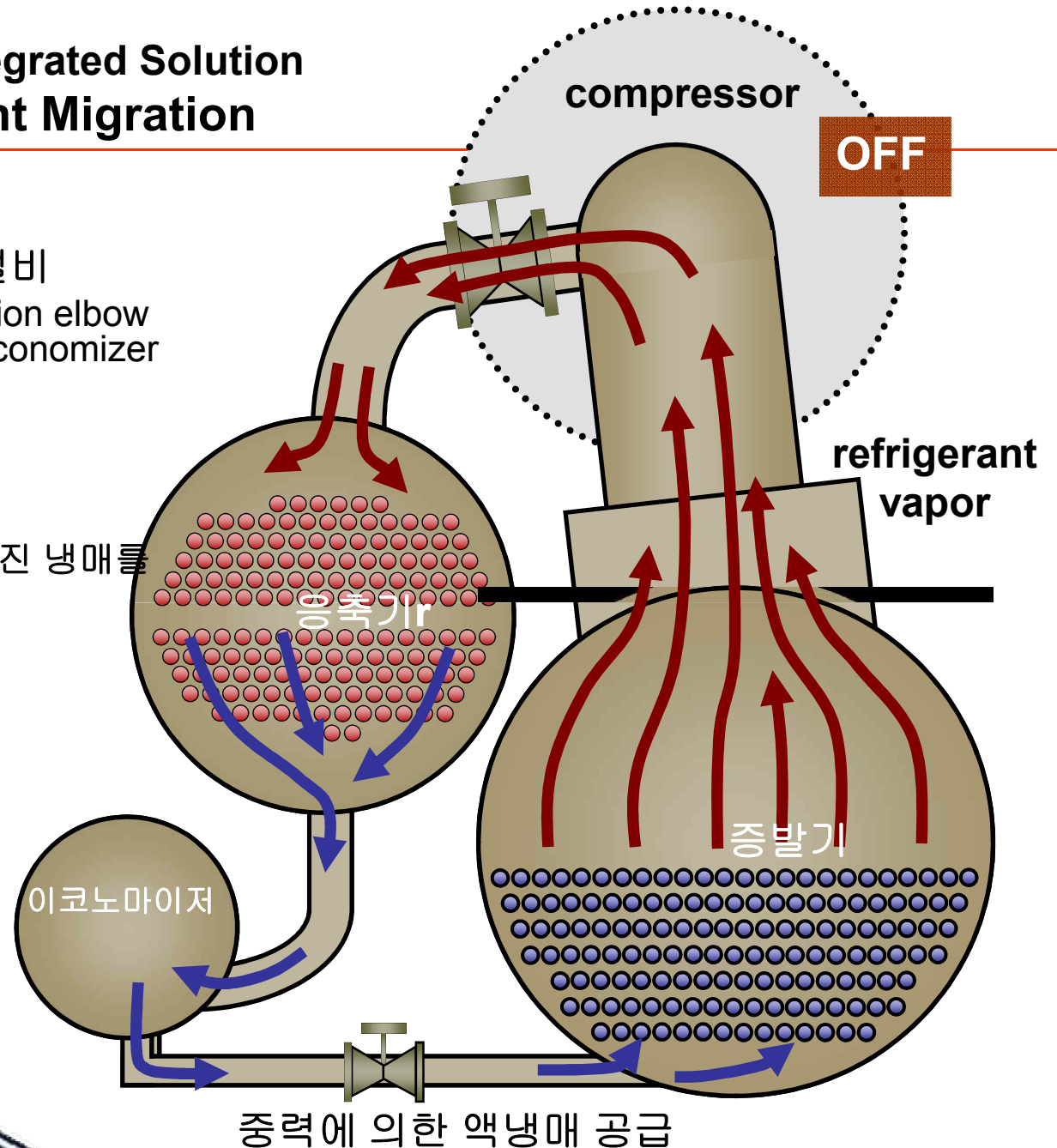
Trane's Integrated Solution Refrigerant Migration

Free Cooling 을 위한 부대설비

- 추가배관작업 (from suction elbow to condenser and the economizer to the evaporator)
- 2개의 **Shut-off valves**
- 일부 냉매 추가 충전
- 자동제어 모듈설치
- 정상 냉방운전시 추가충진 냉매를 보관할 보조탱크

Benefits

- 시스템 효율개선
- 추가 공간 불필요
- 통합 Free cooling 제어
- 저렴한 비용
- 저렴한 유지보수비용
- 공급가능 냉방용량 사전 인지



Selection Output



TRANE®

Free Cooling Simple Cooling System “Plate and Frame”

Standard System

- Primary Secondary
- 2 냉동기 병렬운전

Traditional “Plate & Frame”

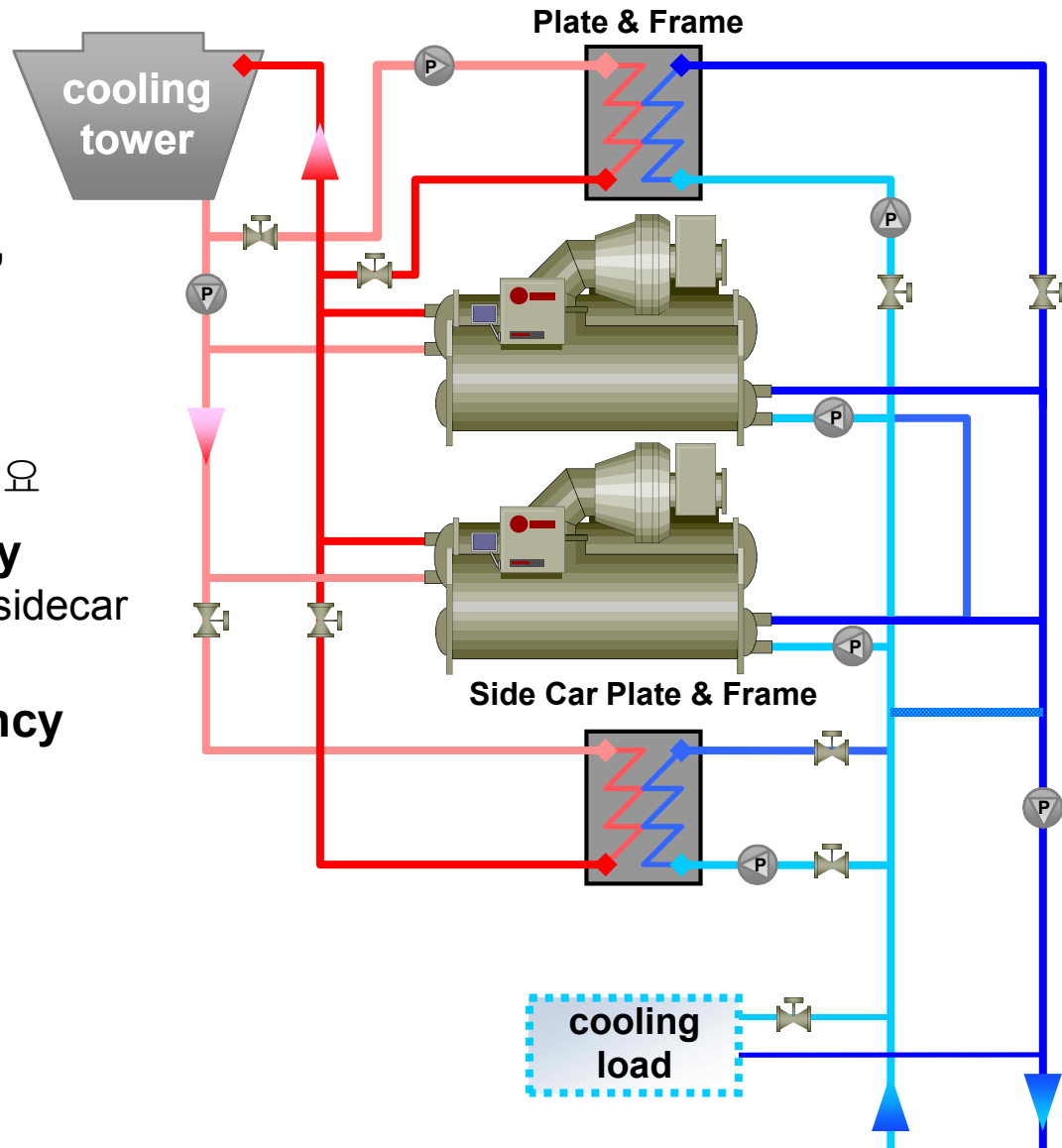
- 판형열교환기 추가
- Isolation valves
- 추가펌프 설치
- 별도의 제어 알고리즘 필요

Improved System Efficiency

- Plate & frame placed in sidecar configuration

Maximizing System Efficiency

- 냉동기와 열교환기의 직렬연결운전





TRANE®

Free Cooling Simple Cooling System “Refrigerant Migration”

Standard System

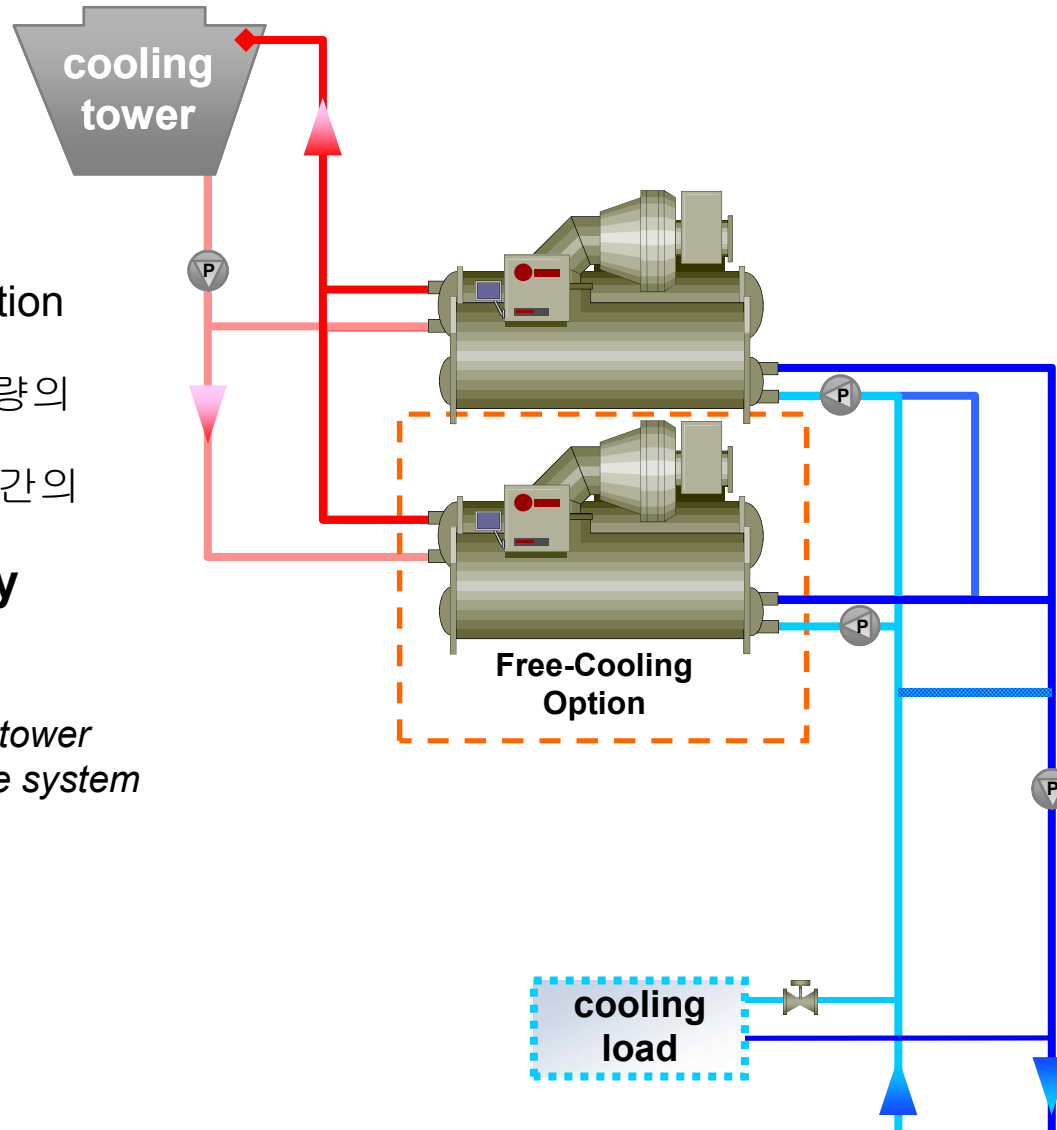
- Primary Secondary
- 2 냉동기 병렬운전

Trane “Free Cooling”

- Refrigerant migration option added to chiller
- 압축기 운전없이 정격용량의 45% 공급가능
- 기계운전 및 free cooling간의 통합제어 운전

Maximize System Efficiency

- 냉동기 직렬운전
- Free Cooling chiller
 - *coldest water from the tower*
 - *warmest water from the system*
- Chilled water reset
- 냉각탑 제어





TRANE®

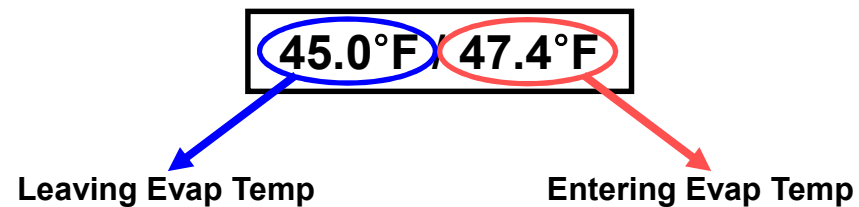
Free Cooling Simple Cooling System “Selection Output”

CenTraVac Chiller (with Free Cooling)

Design: 800 ton chiller (44°F/54°F ~ 85°F & 2.5gpm/ton)

Capacity (tons)	Percent of Total Capacity	Entering Condenser	Entering Condenser	Entering Condenser	Entering Condenser	Entering Condenser
		35°F(1.7'c)	40°F(4.4'c)	45°F(7.2'c)	50°F(10'c)	55°F(12.8'c)
359	45%	43.3°F / 47.6°F	48.1°F / 52.4°F	52.8°F / 57.1°F	57.6°F / 61.9°F	62.5°F / 66.8°F
319	40%	42.5°F / 46.3°F	47.3°F / 51.1°F	52.1°F / 55.9°F	56.9°F / 60.7°F	61.8°F / 65.5°F
279	35%	41.7°F / 45.0°F	46.5°F / 49.8°F	51.3°F / 54.7°F	56.2°F / 59.9°F	61.1°F / 64.5°F
239	30%	40.9°F / 43.7°F	45.7°F / 48.6°F	50.6°F / 53.5°F	55.5°F / 58.4°F	60.4°F / 63.3°F
199	25%	40.1°F / 42.5°F	45.0°F / 47.4°F	49.9°F / 52.3°F	54.8°F / 57.2°F	59.8°F / 62.1°F
159	20%	39.3°F / 41.2°F	44.2°F / 46.1°F	49.2°F / 51.1°F	54.1°F / 56.0°F	59.1°F / 61.0°F
119	15%	38.5°F / 40.0°F	43.5°F / 44.9°F	48.5°F / 49.9°F	53.4°F / 54.8°F	58.4°F / 59.8°F
79	10%	37.8°F / 38.7°F	42.7°F / 43.7°F	47.7°F / 48.7°F	52.7°F / 53.6°F	57.7°F / 58.6°F

- No chilled Water Reset
- Chilled Water Reset
- Trim Chiller
- Higher Temp Application





TRANE® Free Cooling “Case Study”

HALTOM HIGH SCHOOL (2007년 Texas)

Problem

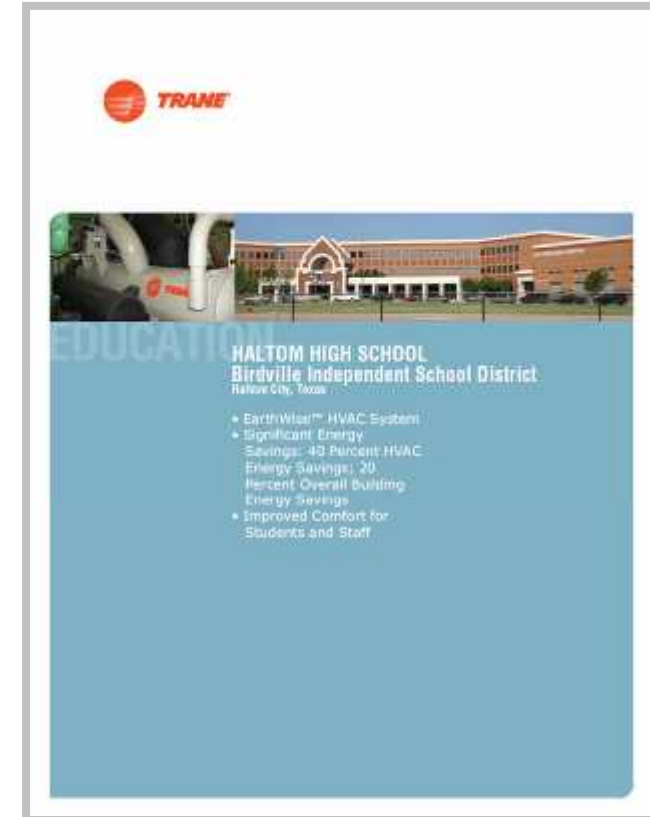
- 17년된 2대의 터보냉동기
- 계속되는 유지보수
- 기존 운전조건
 - 6.6 °C to 12.2 °C
 - 병렬운전
 - 배관시스템 : Primary Secondary

시스템 변경후

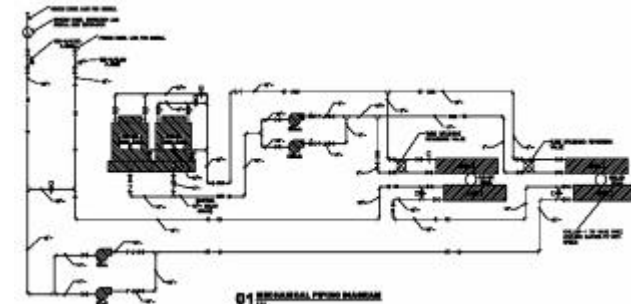
- Two CenTraVac CVHF 400-ton
- EarthWise System Design
 - 4.4 °C to 14.4 °C
 - 냉동기 직렬운전
 - 변유량 운전
- Free-Cooling Option (upstream chiller)
- Variable Frequency Drives (downstream Chiller)

운전결과

- Comparing energy consumption in 2005 to 2007
 - 40% savings on HVAC energy use
 - 20% savings on entire building energy use



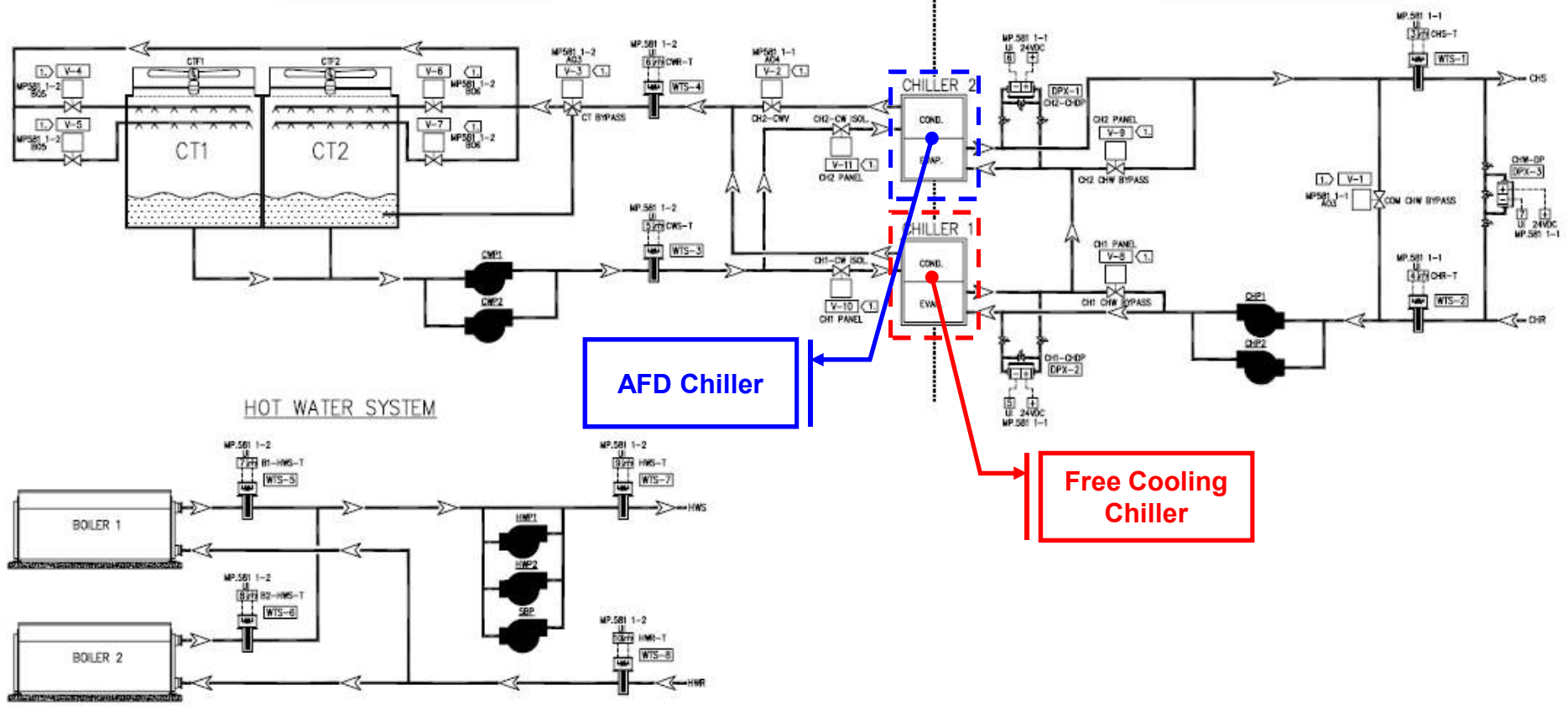
CASE-SLX182-EN



BILL OF MATERIALS					
ITEM	QTY	PART NO	DESCRIPTION	VENDOR	MANUF
WTS-1, 2	2	4190-1135	8" DUCTIMMERSION TEMPERATURE SENSOR (THERMISTOR)	TRANE	TRANE
WTS-ACC	2	4190-1112	8" BRASS IMMERSION WEL.	TRANE	TRANE
WTS-3-3	6	4190-1132	4" DUCTIMMERSION TEMPERATURE SENSOR (THERMISTOR)	TRANE	TRANE
WTS-ACC	6	4190-1104	4" BRASS IMMERSION WEL.	TRANE	TRANE
DPX-1, 2	2	M23005SPECJALV	WATER DIFFERENTIAL PRESSURE TRANSDUCER 0-25 PSID 4-20MA OUT	KELLE	SETRA
DPX-3	1	M23006POC20LV	WATER DIFFERENTIAL PRESSURE TRANSDUCER 0-50 PSID 4-20MA OUT	KELLE	SETRA

CONDENSER WATER SYSTEM

CHILLED WATER SYSTEM

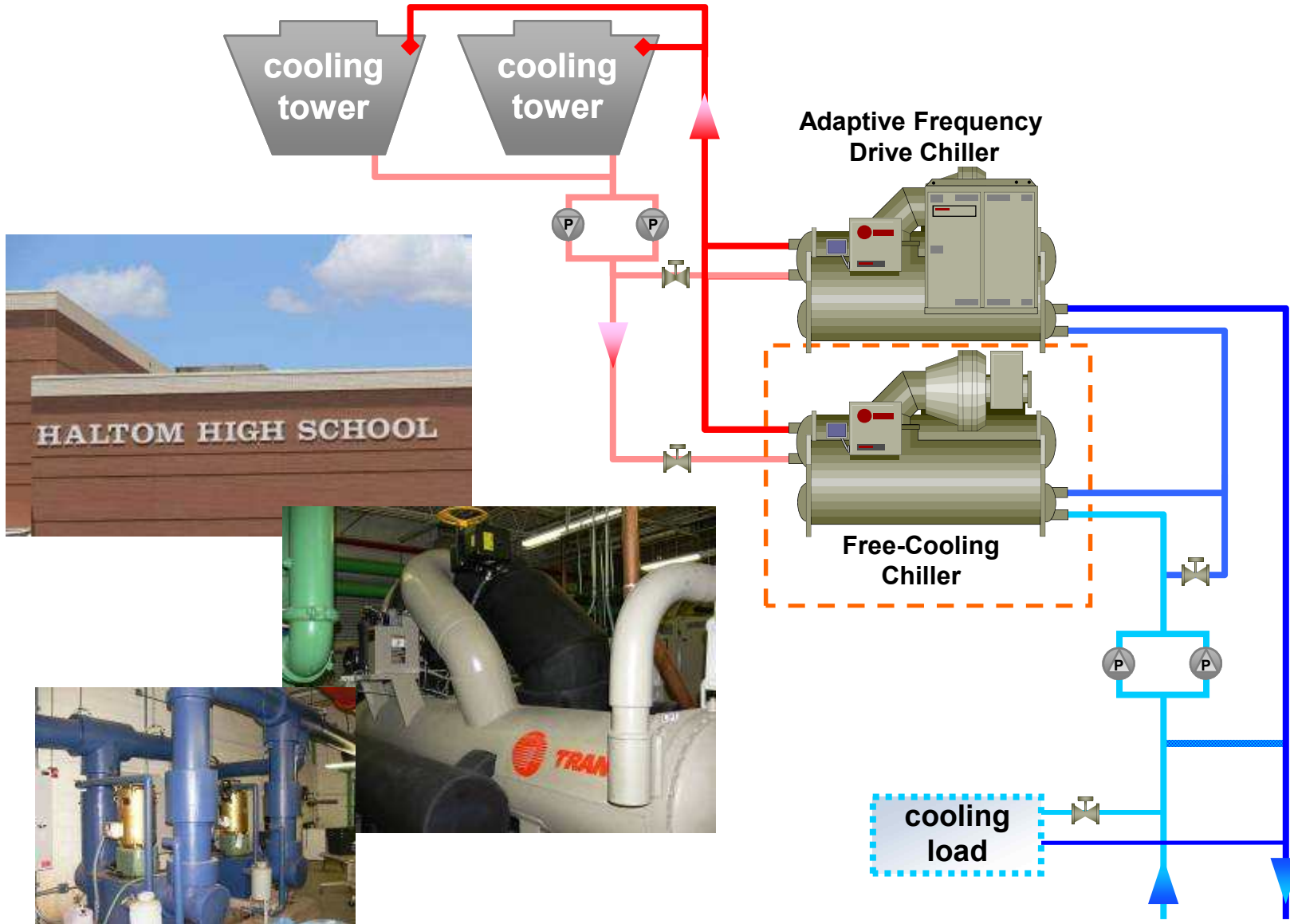


NOTES:
 (1) SEE CENTRAL PLANT VALVE DRAWING FOR VALVE WIRING DETAILS.



TRANE®

Free Cooling Case Study System Layout “Halton High School”



HALTOM HIGH SCHOOL

