NEW SHIP PLATFORM CBR-D INTEGRATION

CHIP WARDER

SECTION HEAD, CBR-D INTEGRATION

SHIPBOARD CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL PROTECTION BRANCH-B57

Presented By: Brian Liska

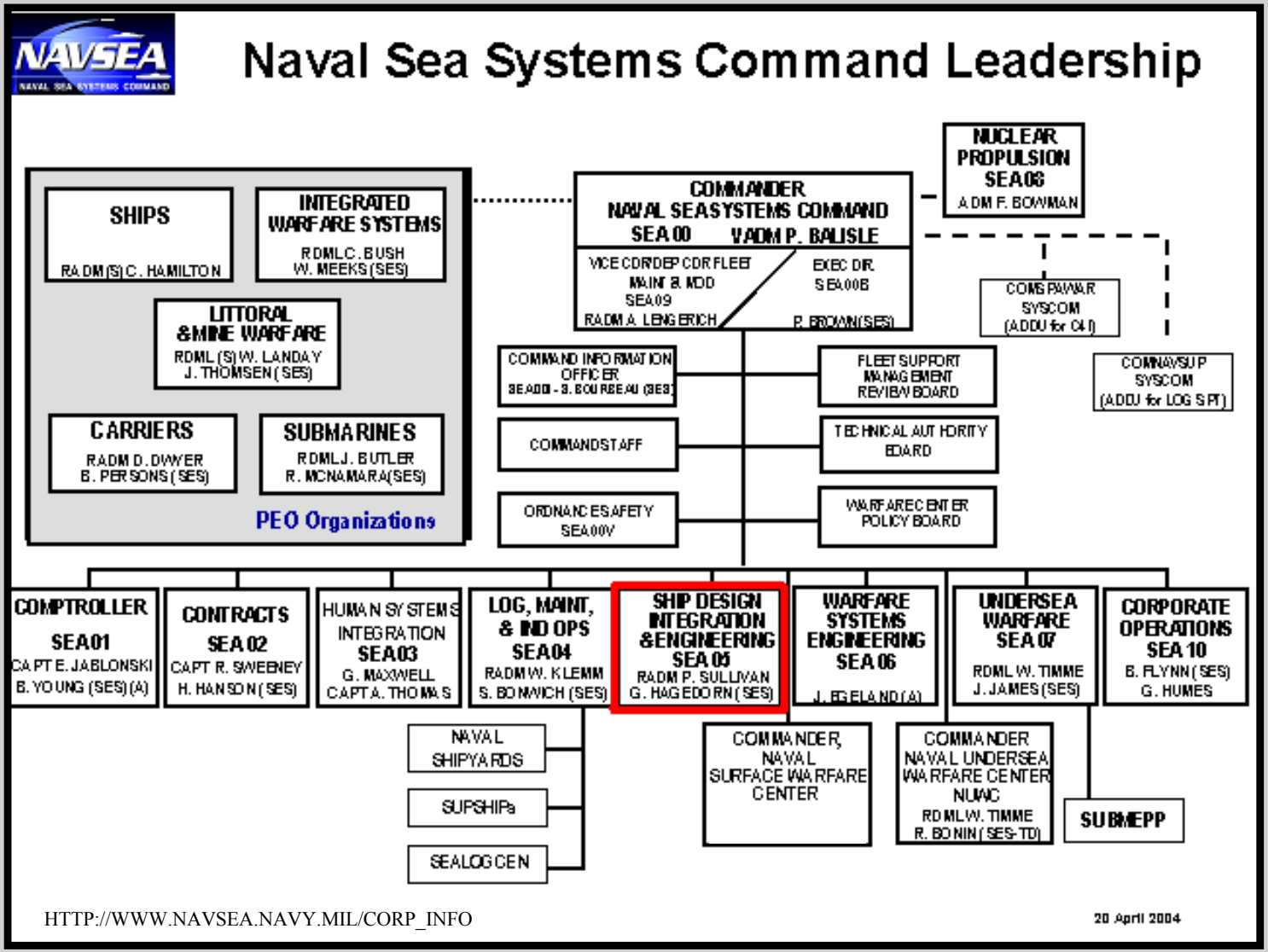
Chemical Biological Radiological
Collective Protection
Joint Project

JOINT PROGRAM EXECUTIVE OFFICE
JPEO-CBD
CHEMICAL AND BIOLOGICAL DEFENSE

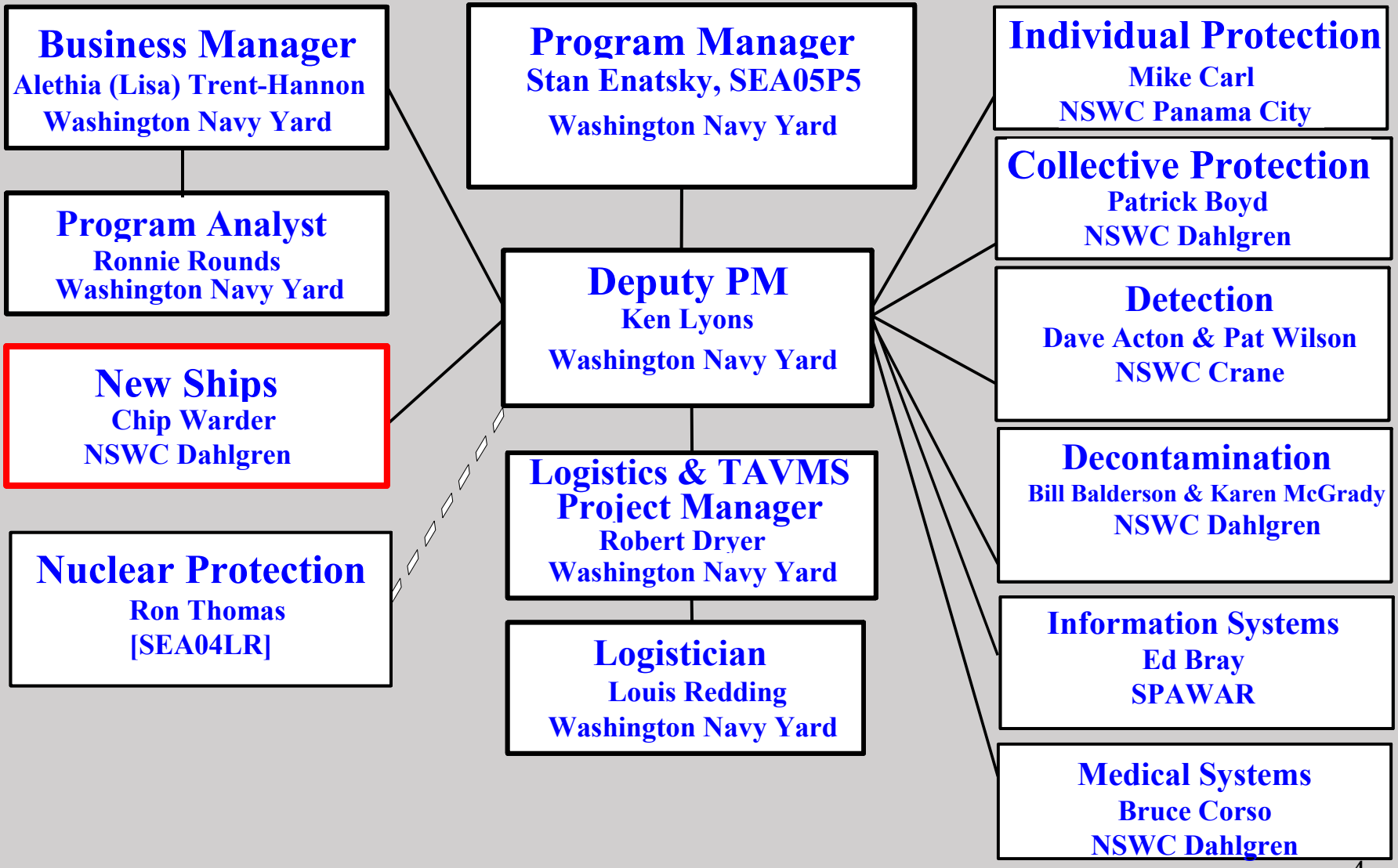
OVERVIEW

- NAVSEA Structure
- NAVY CBR-D Structure
- Platform Support
- Governing Documents
- New Ship Platform Support Responsibilities
- CBR-D Commodity Areas
- COLPRO Design Work
- COLPRO Integration Process

NAVSEA STRUCTURE



NAVY CBR-D STRUCTURE



PLATFORM SUPPORT

- DD(X)
  - NAVY'S NEW DESTROYER CLASS
- LCS
  - NAVY'S NEW LITTORAL COMBAT SHIP CLASS
- CVN 21
  - NAVY'S NEW AIRCRAFT CARRIER SHIP CLASS
- LHA(R)
  - NAVY'S NEW BIG DECK AMPHIBIOUS ASSUALT SHIP CLASS (REPLACES LHA CLASS SHIPS)
- T-AOE(X)
  - NAVY'S NEW FAST COMBAT SUPPORT SHIP CLASS
- NSC
  - COAST GUARD'S NEW NATIONAL SECURITY CUTTER SHIP CLASS
- LHD-8
  - NAVY'S LAST LHD CLASS SHIP TO BE BUILT
- LPD-17
  - NAVY'S NEW AMPHIBIOUS TRANSPORT DOCK SHIP CLASS

GOVERNING DOCUMENTS

- OPNAV INSTRUCTION 9070.1
  - STATES THE SURVIVABILITY POLICY OF NEW SURFACE SHIPS
  - STATES CBR PROTECTION REQUIREMENTS BY SHIP CLASS
- NAVAL VESSEL RULES (NVR)
  - FORMERLY CALLED ”GENERAL SPECIFICATIONS FOR NEW CONSTRUCTION US NAVY SHIPS”
  - DETAIL SPECIFICATIONS THAT MUST BE USED BY SHIPBUILDER
  - CBR-D CHAPTER SPECIFICALLY STATES REQUIREMENTS FOR NEW SHIPS

NEW SHIP SUPPORT RESPONSIBILITIES

- CAPABILITIES/OPERATIONAL REQUIREMENTS REVIEW
  - GENERAL REQUIREMENTS FOR SHIP
  - ENSURE CBR-D CAPABILITIES MEET OPNAVINST 9070.1 FOR SHIP TYPE/MISSION
- PERFORMANCE SPECIFICATION REVIEW
  - OUTLINE SPECIFIC SYSTEMS TO MEET PERFORMANCE REQUIREMENTS
  - ENSURE APPROVED SYSTEMS ARE SPECIFIED TO MEET REQUIREMENTS
- SHIP SPECIFICATIONS REVIEW
  - ENCOMPASS DETAIL DESCRIPTION OF SYSTEM COMPONENTS
  - ENSURE PROPER EQUIPMENT, DESIGN, DRAWINGS, AND VERBIAGE ARE INCORPORATED
  - PROVIDE LATEST TECHNOLOGIES TO PROGRAM OFFICE AND REQUEST SYSTEMS FOR PLATFORM
- DESIGN DEVELOPMENT
  - DETAIL DESIGN INTEGRATION (CAD/MODELLING)
  - LOCATE EQUIPMENT AND SYSTEMS TO INTEGRATE WITH SHIP
  - PERFORM INTEGRATION CALCULATIONS AND EQUIPMENT SIZING AS REQUIRED
  - PROVIDE TECHNICAL INFORMATION TO SHIPBUILDER FOR INTEGRATION COST ANALYSIS
  - ATTEND DESIGN REVIEWS TO INCORPORATE SYSTEM INTEGRATION

NAVSEA
WARFARE CENTERS
DAHLGREN

CBR-D COMMODITY AREAS

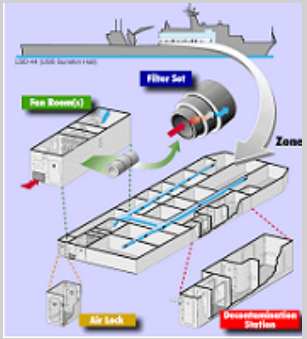
SHIPBOARD
CHEMICAL-BIOLOGICAL-RADIOLOGICAL
PROTECTION BRANCH

Collective Protection System

-Uses Highly Filtered Air to Overpressurize Zones.

-Single Pass System

-Eliminates Need for Individual Protective Equipment (IPE)



Medical Systems

-Biological Agent Identification

Detectors

-Currently: Provide Point Detection of CBR elements

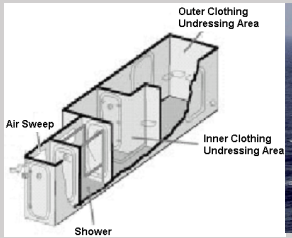
-Future: Standoff Detection will provide advance warning of a CBR attack.

Decontamination

-Personnel Decontamination Stations

-Allows Ingress to Protected Areas

-Prevents Zone Contamination



-Countermeasures Washdown System

-Provides Decontamination for 100% of topside, through hundreds of spray nozzles

-Also employed in firefighting.

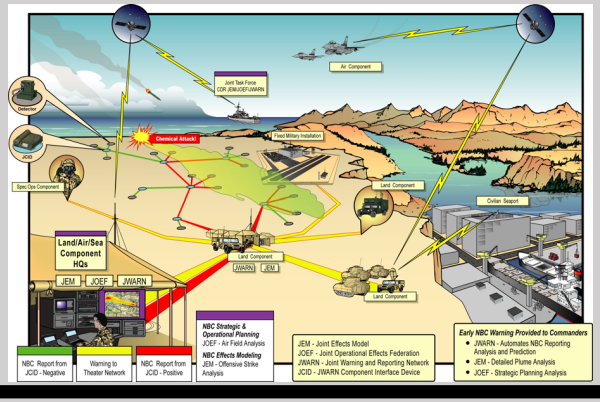
Individual Protective Equipment

-Personal Protection in a CBR environment

Information Systems

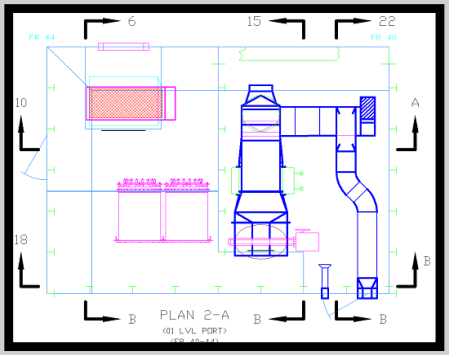
-Shapes the Battle Space

- CBR Attack Early Warning Network

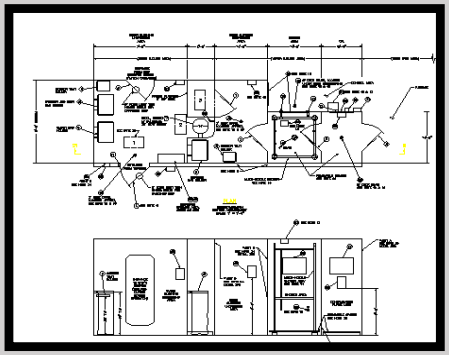


COLPRO DESIGN WORK

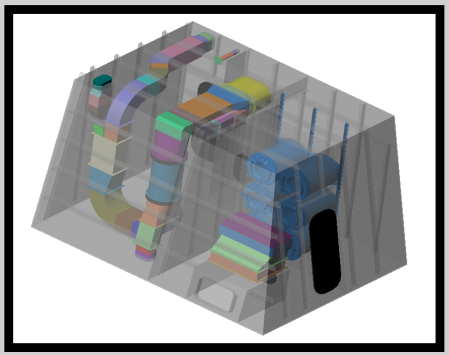
CPS Fan Room



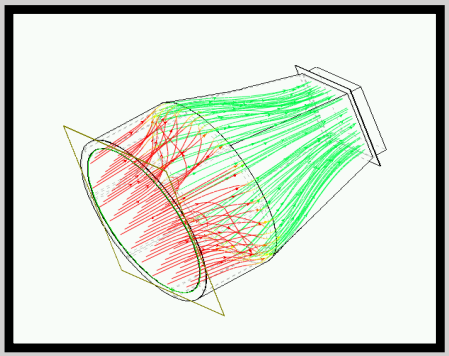
CPS Decontamination Station



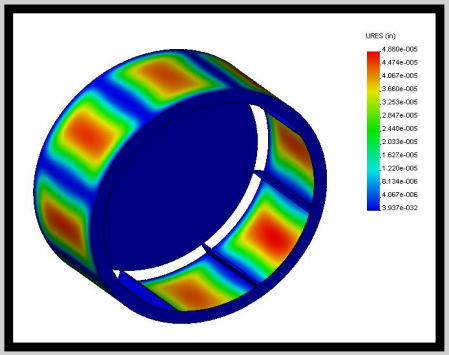
CPS Fan Room



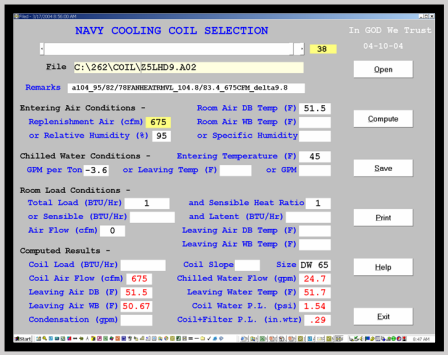
CPS Filter (M98)



Filter Housing (M98)



Load Calcs & Equipment Sizing

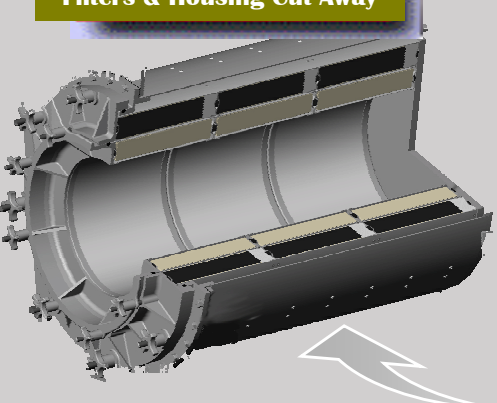


CAPABILITIES

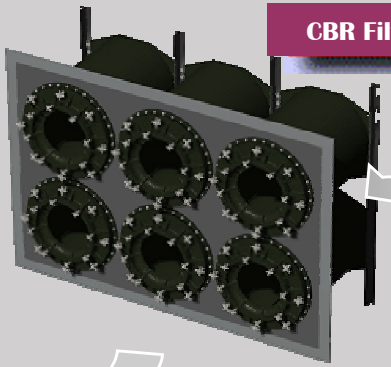
- CAD DESIGN
- 3-D MODELING
- CFD
- FEA
- HVAC LOAD CALCS
- EQUIPMENT SIZING

SHIPBOARD COLPRO COMPONENTS

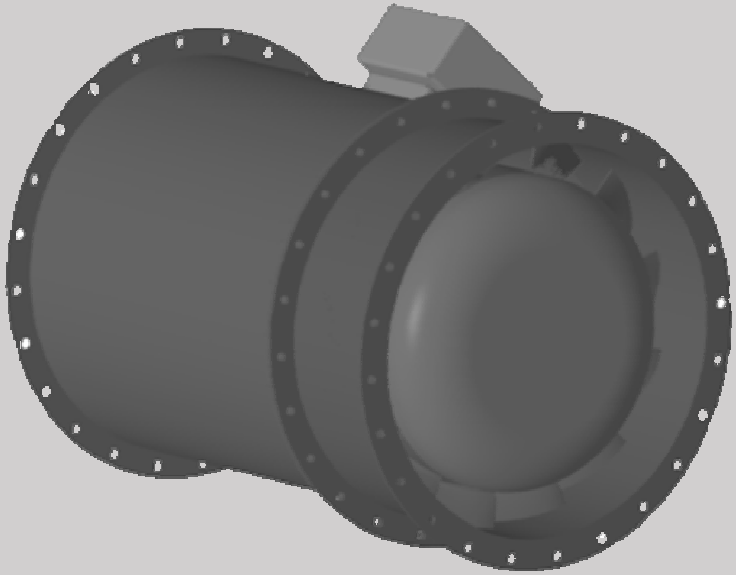
Filters & Housing Cut Away

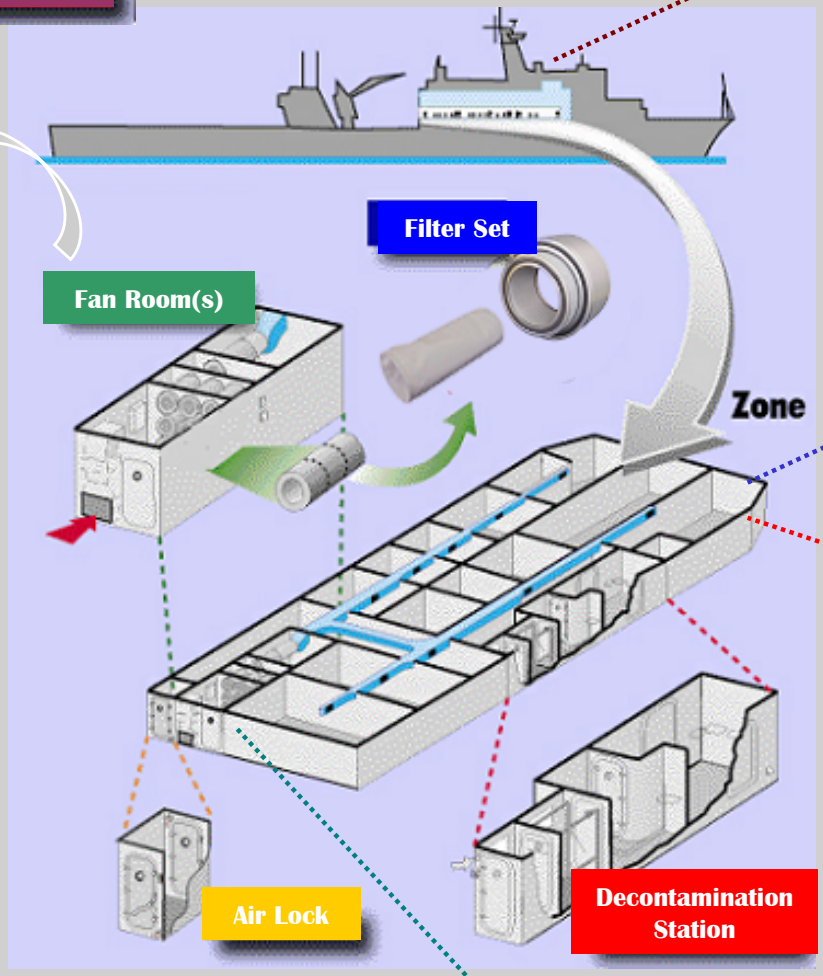


CBR Filter Bank



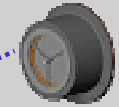
CPS High Pressure Fan





Static Outside Air Probe

Pressure Control Valve

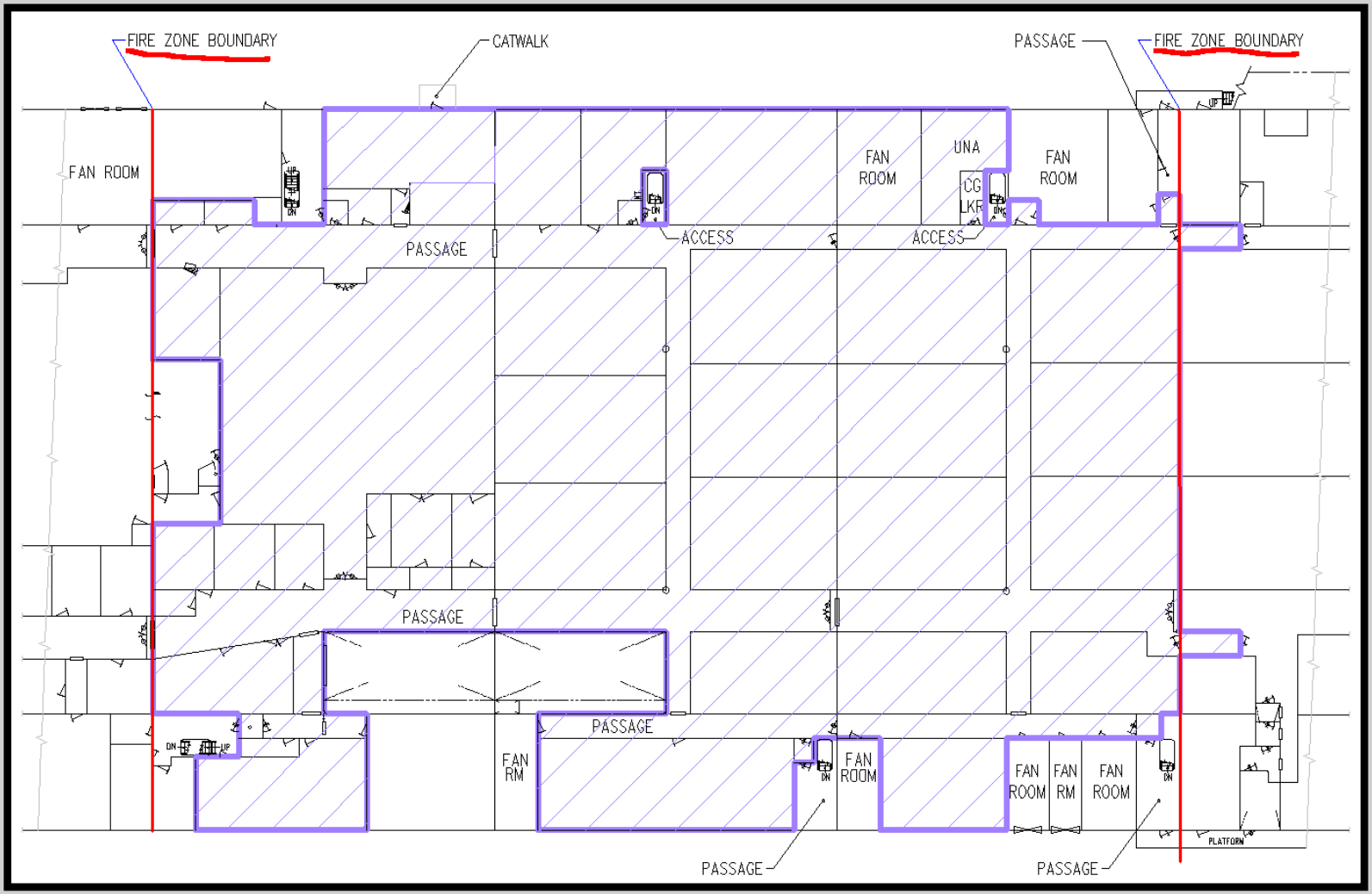


Zone Pressure Alarm

Differential Pressure Gauge

COLPRO INTEGRATION PROCESS

- DEFINE TP ZONES
  - –SINGLE OR MULTI DECK
  - –TP ZONES MUST BE WITHIN FIRE ZONE BOUNDARY

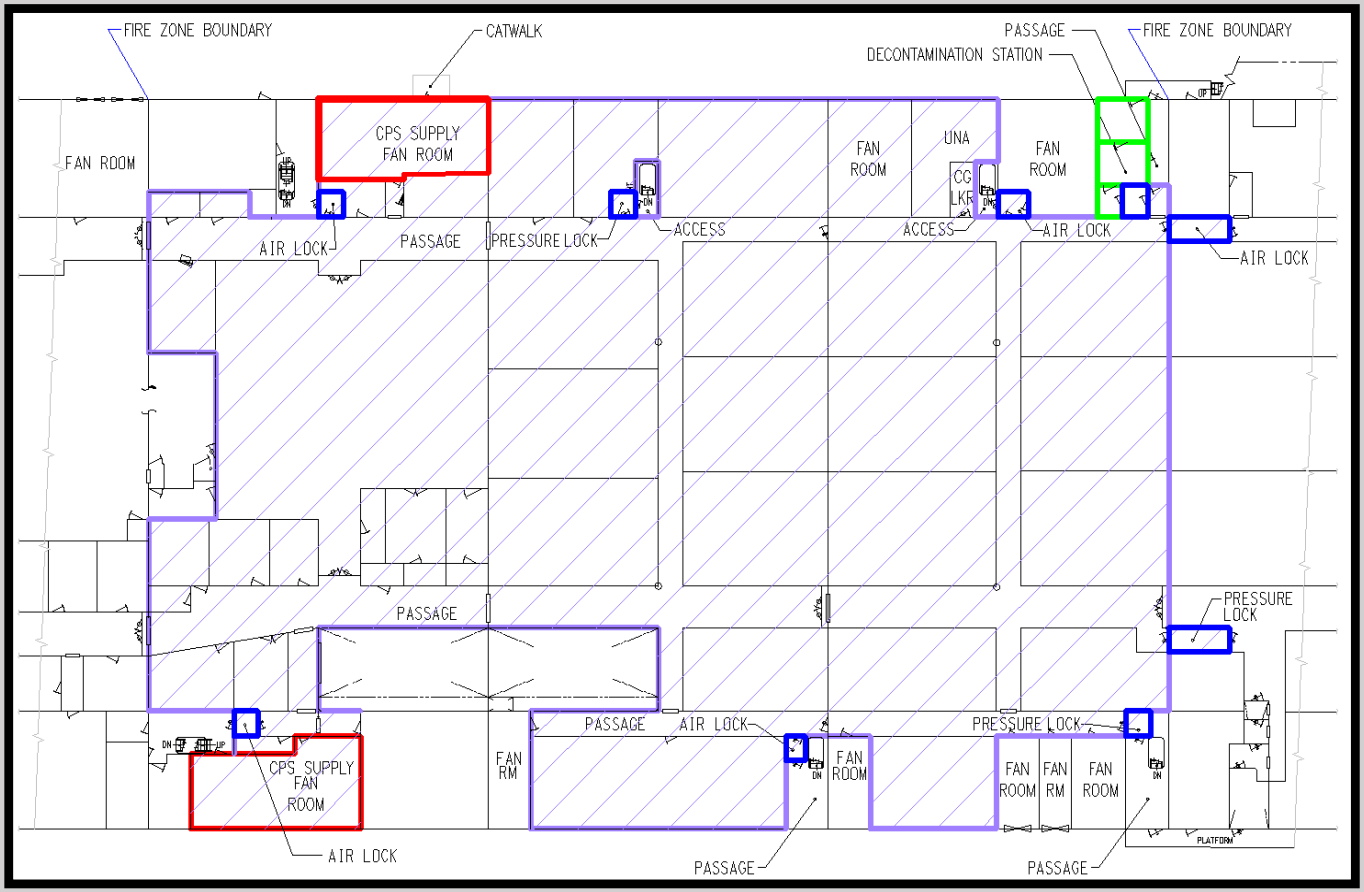


FIRE ZONE BOUNDARY

CPS ZONE BOUNDARY

COLPRO INTEGRATION PROCESS

- LOCATE FAN ROOMS, AIRLOCKS AND DECONTAMINATION STATIONS
  - –FAN ROOMS HOUSE AIRLIFT, PREFILTER, PREHEATER, CBR FILTERS, FAN, AND COOLING COIL
  - –AIRLOCKS ALLOW EGRESS AND INGRESS (ONLY IN A NON CONTAMINATED ENVIRONMENT) FROM TP ZONES WITHOUT LOSING ZONE PRESSURE
  - –DECONTAMINATION STATIONS ALLOW INGRESS (IN A CONTAMINATED ENVIRONMENT)TO TP ZONES FROM THE WEATHER DECK



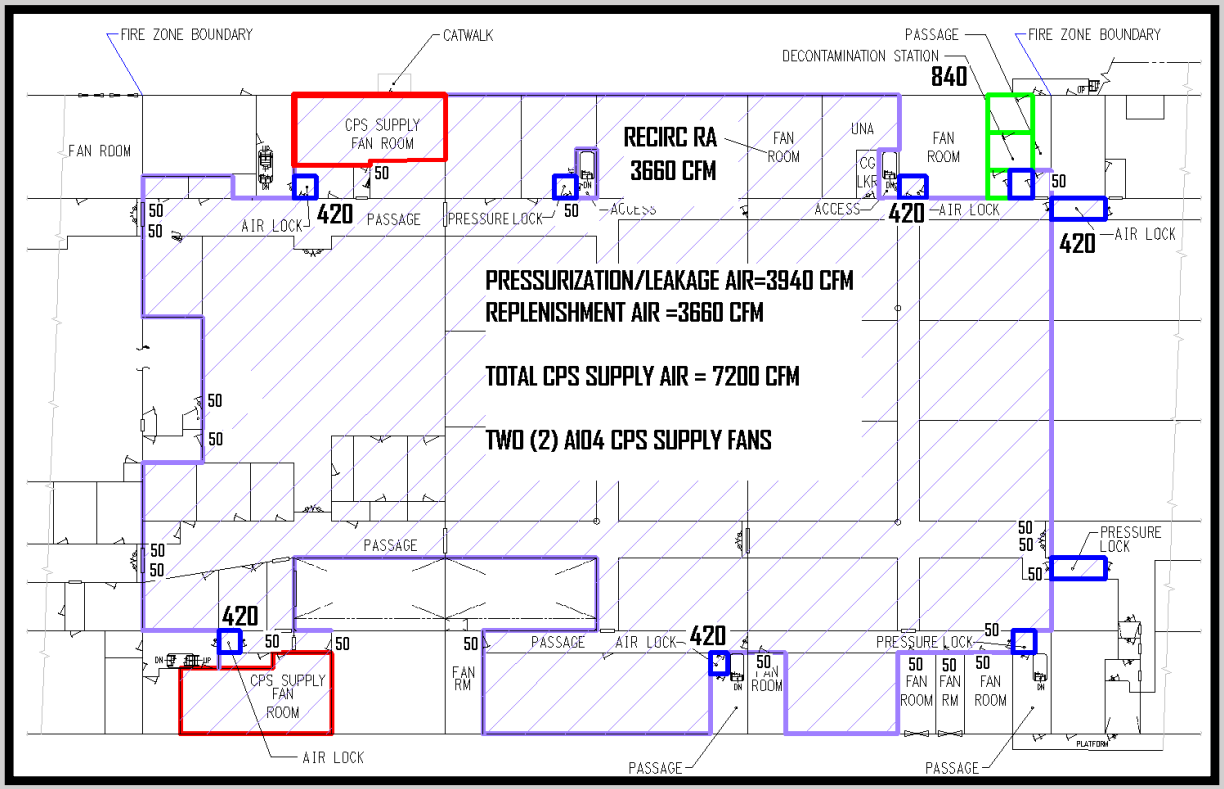
CPS FAN ROOMS

AIR/PRESSURE LOCKS

DECONTAMINATION STATION

COLPRO INTEGRATION PROCESS

- DETERMINE SUPPLY AIR QUANTITY
  - –USUALLY SUMMATION OF REPLENISHMENT AIR TO RECIRCS
- DETERMINE AIR NEEDED FOR AIRLOCKS/DECONTAMINATION STATIONS SWEEPS AND LEAKAGE
  - –50 CFM FOR EACH DOOR
  - –420 CFM FOR EACH AIRLOCK/DECONTAMINATION STATION
  - –840 CFM FOR CASUALTY DECONTAMINATION STATION
- DETERMINE QUANTITY/SIZE OF CPS FANS
  - –A105~5400 CFM
  - –A104~3600 CFM
  - –A103~2400 CFM
  - –A102~1800 CFM
  - –A101~1200 CFM



COLPRO INTEGRATION PROCESS

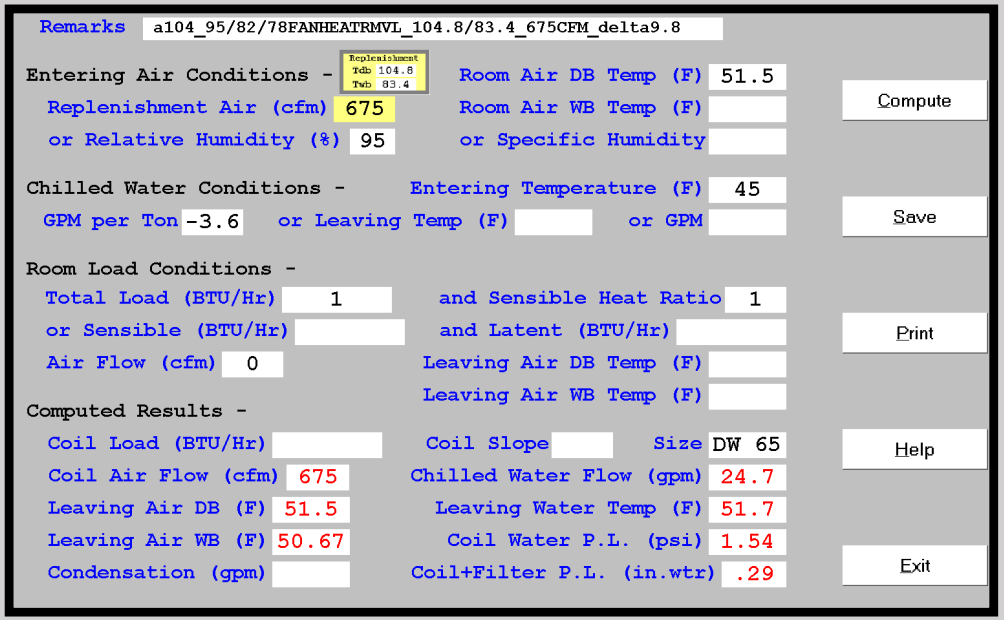
- CALCULATE HEAT GAIN FROM CPS FANS
  - –HIGH PRESSURE FAN WITH MOTOR IN AIRSTREAM GENERALLY ADDS 5 TO 12 DEGRES F
- SIZE COOLING COIL AND GPM
  - –BYPASS AROUND COIL IF DUCTED DIRECTLY TO RECIRC (REMOVES FAN HEAT ONLY)
  - –100% OF AIR COOLED TO DESIGN TEMPERATURE IF DUCTED DIRECTLY TO SPACE (REMOVES FAN HEAT AND COOLS AIR DOWN TO SPACE DESIGN CONDITIONS)

DESIGN CONDITIONS

- AMBIENT AIR CONDITIONS
  - ➢3600 CFM
  - ➢ 95°F DB, 82°F WB, 55%RH
- BYPASS AIR CONDITIONS (WITH FAN HEAT)
  - ➢2925 CFM
  - ➢104°F DB, 83°WB, 40%RH
- ENTERING COIL AIR CONDITIONS (WITH FAN HEAT)
  - ➢675 CFM
  - ➢104°F DB, 83°WB, 40%RH
- LEAVING COIL CONDITIONS
  - ➢675 CFM
  - ➢51.5°F DB, 51°WB, 95%RH
- MIXED AIR CONDITIONS
  - ➢3600 CFM
  - ➢ 95°F, 82°F, 55%RH

Fan Heat Calculation	
Qmotor=	38200
CFM=	3600
delta T=	9.8

Mixed Air Calculation	
T1 =	51.5
T2 =	104.8
CFM1 =	675
CFM2 =	2925
TMIX =	94.80625



COLPRO INTEGRATION PROCESS

- LOAD IMPACT CALCULATIONS (DELTA FROM BASELINE DESIGN):
  - –WEIGHT ~ EQUIPMENT, DUCT, FOUNDATIONS, PIPING, ETC
  - –ELECTRICAL ~ FANS, HEATERS
  - –AC PLANT ~ IMPACT TO PUMPS (GPM FROM COILS)
  - –COST ~ EQUIPMENT & MATERIAL, LABOR, ENGINEERING

BASELINE SUPPLY SYSTEM

CPS SUPPLY SYSTEM

ESTIMATE DELTA ABOVE BASELINE

Equipment	Baseline HVAC Supply System					Equipment	CPS Supply System					Totals			
----	QNTY	Size/Name	WEIGHT (LBS)	LOAD	Cost	----	QNTY	Size/Name	WEIGHT (LBS)	LOAD	Cost	WEIGHT (LBS)	LOAD	Units	Cost
MOISTURE SEPARATOR	0	Moisture Separator	0	----	0	MOISTURE SEPARATOR	2	Moisture Separator	2000	----	11,000	2000	----	----	11,000
PREFILTER/HOUSING	2	NSIF Prefilter	100	----	6,000	PREFILTER/HOUSING	2	NSIF Prefilter	100	----	6,000	0	----	----	0
PREHEATER	1	29EH	58	24.3	2260	PREHEATER	2	33EH	160	92.8	8664	44	34.6	KW	4,313
PREHEATER (2)	1	31EH	58	33.9	2091	PREHEATER (2)	0	35EH	0	0	0				
THYRISTOR CONTROLLER	2	Thyristor Controller	400	----	37,200	THYRISTOR CONTROLLER	2	Thyristor Controller	400	----	37,200	0	----	----	0
CPS FILTER HOUSING	0	600 CFM Housing with Filters	0	----	0	CPS FILTER HOUSING	12	600 CFM Housing with Filters	2,100	----	86,904	2100	----	----	86,904
SUPPLY FAN	1	A01.5A4W6	160	0.932125	3656	SUPPLY FAN	0	A101	0	0	0	900	20.320325	KW	32,155
SUPPLY FAN (2)	1	A02A4W6	180	1.11855	4189	SUPPLY FAN (2)	0	A103	0	0	0				
SUPPLY FAN (3)	0					SUPPLY FAN (3)	2	A104	1240	22.371	40000				
SUPPLY FAN (4)	0					SUPPLY FAN (4)	0	A105	0	0	0				
WTC VALVE	0	24"Dia WTC Valve	0	----	0	WTC VALVE	2	24"Dia WTC Valve	530	----	31,330	530	----	----	31,330
COOLING COIL	0	51	0	----	0	COOLING COIL	2	67	1664	50	15442	1664	50	GPM	15,442
COOLING COIL (2)	0	51	0	----	0	COOLING COIL (2)	0	54	0		0				
REHEATER	0	26EH	0	0	0	REHEATER	0	31EH	0	0	0	0	0	----	0
REHEATER (2)	0	31EH	0	0	0	REHEATER (2)	0	24EH	0	0	0				
CONTACTOR	0	Contactor	0	----	0	CONTACTOR	0	Contactor	0	----	0	0	----	----	0
SUPPLY DUCT	2	Supply Duct (Avg)	9000	----	60000	SUPPLY DUCT	2	CPS Supply Duct (Avg)	10800	----	72000	1800	----	----	12,000
PIPING	0	0.50 NPT CUNI Pipe	0	----	0	PIPING	600	1.5 NPT CUNI Pipe	1218	----	2124	1218	----	----	2,124
AIRLOCK/PRESSURE LOCK	0	None	0	----	0	AIRLOCK/PRESSURE LOCK	4	Steel Airlock	4000	----	40000	4000	----	----	40,000
AIRLOCK/PRESSURE LOCK (2)	0	Steel Airlock	0	----	0	AIRLOCK/PRESSURE LOCK (2)	0	None	0	----	0				
DECON STATION	0	Aluminum Decon.	0	----	0	DECON STATION	1	Steel Decon.	8800	----	30000	14800	----	----	80,000
DECON STATION (2)	0	None	0	----	0	DECON STATION (2)	1	Aluminum Cas. Decon.	6000	----	50000				
ZONE PRESSURE ALARM	0	Zone Pressure Alarm	0	----	0	ZONE PRESSURE ALARM	1	Zone Pressure Alarm	25	----	8200	25	----	----	8,200
PRESSURE CONTROL VALVE	0	Pressure Control Valve	0	----	0	PRESSURE CONTROL VALVE	1	Pressure Control Valve	14	----	1,850	14	----	----	1,850
EXHAUST FAN	1	CC01.5A4W6 - CW	310	0.7457	9447	EXHAUST FAN	1	A01.5A4W6	160	0.932125	3656	-150	0.186425	KW	-5,791
EXHAUST FAN (2)	1	CC02A4W6 - CW	310	1.11855	12517	EXHAUST FAN (2)	1	CC02A4W6 - CW	310	1.11855	12517				
FAN CONTROLLER	4	Fan Controller	100	----	22,000	FAN CONTROLLER	4	Fan Controller	100	----	22,000	0	----	----	0
FOUNDATION	6	Foundation (Avg)	1800	----	21,000	FOUNDATION	8	Foundations (Avg)	2,400	----	28,000	600	----	----	7,000
SUMMARY	----	----	12476	62.11493	180,360	SUMMARY	----	----	42021	117.2217 50	506,887	29545	55.11 50	KW GPM	326,527

QUESTIONS