## SYMBOLS

| SYMBOL | DESCRIPTION |
|---|---|
| | FAN - CENTRIFUGAL |
| | FAN - AXIAL |
| | FAN - PLENUM / PLUG |
| | PUMP |
| | FILTER - PLEATED |
| | FILTER - BAG |
| | FILTER - CARBON |
| H / C | COIL - HEATING |
| C / C | COIL - COOLING |
| P / C | COIL - PREHEATING |
| R / C | COIL - REHEATING |

| SYMBOL | DESCRIPTION |
|---|---|
| | THERMOWELL |
| | AVERAGING ELEMENT |
| | VALVE - 2 WAY |
| | VALVE - 3 WAY |
| M | ACTUATOR - MOTOR |
| | ACTUATOR - DIAPHRARM |
| | ACTUATOR - PISTON |
| | DAMPER |
| | DAMPER - FIRE / SMOKE |
| | MANUAL SWITCH |
| | HORN / STROBE |
| | STROBE |
| | PANIC BUTTON |
| | UNDERFLOOR TEMPERATURE SENSOR |
| XX / YY | EQUIPMENT TAG<br>XX - DEVICE TYPE<br>YY - DEVICE NUMBER |
| XX / YY | BMS DEVICE<br>XX - DEVICE TYPE<br>YY - DEVICE NUMBER |
| XX / YY | NON-BMS DEVICE<br>XX - DEVICE TYPE<br>YY - DEVICE NUMBER |
| | LOCAL HARD WIRED CONNECTION |
| OS / XX | OCCUPANCY SENSOR |

| SYMBOL | DESCRIPTION |
|---|---|
| | HUMIDIFIER |
| VFD | VARIABLE FRQUENCY DRIVE |
| | MOTOR STARTER |
| XXX | PANEL<br>(SEE ABBREVIATIONS) |

## ABBREVIATIONS

| SYMBOL | DESCRIPTION |
|---|---|
| A | AQUASTAT |
| AC | ALARM CONTACT |
| AFS | AIR FLOW SWITCH |
| AFT | AIR FLOW TRANSMITTER |
| AHU | AIR-HANDLING UNIT |
| AI | ANALOG INPUT |
| AO | ANALOG OUTPUT |
| AS | AIR SEPERATOR |
| BCP | BOILER CONTROL PANEL |
| BMS | BUILDING MANAGEMENT SYSTEM |
| BTU | FLOW AND TEMPERATURE METER |
| CA | COMMON ALARM |
| CCP | CHILLER CONTROL PANEL |
| CHWR | CHILLED WATER RETURN |
| CHWS | CHILLED WATER SUPPLY |
| C02 | CARBON DIOXIDE |
| CP | CONTROL PANEL |
| CPF | CHEMICAL POT FEEDER |
| CRAC | COMPUTER ROOM A/C UNIT |
| CS | CURRENT SENSOR |
| DC | DRY COOLER |
| DDCP | DIRECT DIGITAL CONTROL PANEL |
| DES | DAMPER END SWITCH |
| DI | DIGITAL INPUT |
| DO | DIGITAL OUTPUT |
| DPT | DIFFERENTIAL PRESSURE TRANSMITTER |
| DRS | DAMPER RESET SWITCH |
| EF | EXHAUST FAN |
| EFSO | EMERGENCY FUEL SHUT OFF SYSTEM |
| EGCP | EMERGENCY GENERATOR CONTROL PANEL |
| ET | EXPANSION TANK |
| FAS | FIRE ALARM SYSTEM |
| FBK | FEEDBACK |
| FC | FAIL CLOSE |
| FCU | FAN COIL UNIT |
| FCV | FLOW CONTROL VALVE |
| FIP | FAIL IN PLACE |
| FLP | FAIL LAST POSITION |
| FLSS | FIRE AND LIFE SAFETY STSTEM |
| FLT | FAULT |
| FM | FLOW METER |
| FMS | FLOW MEASURING STATION |
| FOPP | FIBER OPTIC PATCH PANEL |
| FS | FLOW SWITCH |
| FSC | FAN START CIRCUIT |
| FSD | FIRE SMOKE DAMPER |
| FT | FLOW TRANSMITTER |
| FO | FAIL OPEN |
| FOCP | FUEL OIL CONTROL PANEL |
| FZ | FREEZE PROTECTION DEVICE (FREEZESTAT) |
| GCP | GENERATOR CONTROL PANEL |
| GWR | GLYCOL WATER RETURN |
| GWS | GLYCOL WATER SUPPLY |
| HC | HEATING CONTROLLER |
| HLA | HIGH LEVEL ALARM |
| HWR | HOT WATER RETURN |
| HWS | HOT WATER SUPPLY |
| HT | HUMIDITY TRANSMITTER |

## ABBREVIATIONS

| SYMBOL | DESCRIPTION |
|---|---|
| HX | HEAT EXCHANGER |
| IMH | IMMERSION HEATER |
| I/P | INTERNET PROTOCOL |
| LD | LEAK DETECTION |
| LLA | LOW LEVEL ALARM |
| LS | LEAK SENSOR |
| LSH | LEVEL SWITCH HIGH |
| LSHH | LEVEL SWITCH HIGH HIGH |
| LSL | LEVEL SWITCH LOW |
| LSLL | LEVEL SWITCH LOW LOW |
| LT | LEVEL TRANSMITTER |
| MCP | MASTER CONTROL PANEL |
| MID | MOTORIZED ISOLATION DAMPER |
| MIV | MOTORIZED ISOLATION VALVE |
| NIC | NETWORK INTERFACE CONTROLLER |
| NC | NORMALLY CLOSED |
| NO | NORMALLY OPEN |
| P | PUMP |
| PCD | PRESSURE CONTROL DAMPER |
| PCV | PRESSURE CONTROL VALVE |
| PDS | PRESSURE DIFFERENTIAL SWITCH |
| PSH | PRESSURE SWITCH HIGH |
| PSL | PRESSURE SWITCH LOW |
| PT | PRESSURE TRANSMITTER |
| RFL | RESETTABLE FUSIBLE LINK |
| SCD | SMOKE CONTROL DAMPER |
| SS | START/STOP |
| SD | SMOKE DETECTOR |
| SP | SET POINT |
| ST | STATUS |
| SW | SWITCH |
| TCD | TEMPERATURE C0NTROL DAMPER |
| TCV | TEMPERATURE CONTROL VALVE |
| TEC | TERMINAL EQUIPMENT C0NTROLLER |
| TF | TRANSFER FAN |
| THL | TEMPERATURE HIGH LIMIT |
| TSD | TOUCH SCREEN DISPLAY |
| TT | TEMPERATURE TRANSMITTER |
| UPS | UNINTERRUPTIBLE POWER SUPPLY |
| UH | UNIT HEATER |
| VAV | VARIABLE AIR VOLUME |
| VES | VALVE END SWITCH |
| VFD | VARIABLE FREQUENCY DRIVE |

# CONTROLS SYMBOLS & ABBREVIATIONS

1

SCALE: NTS

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 4 | 10/01/20 | 90% FD UPDATE |
| 3 | 08/21/20 | 90% DRAFT FD UPDATE |
| 2 | 05/03/19 | 100% FD SUBMISSION |
| 1 | 02/22/19 | 90% FD SUBMISSION |

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Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

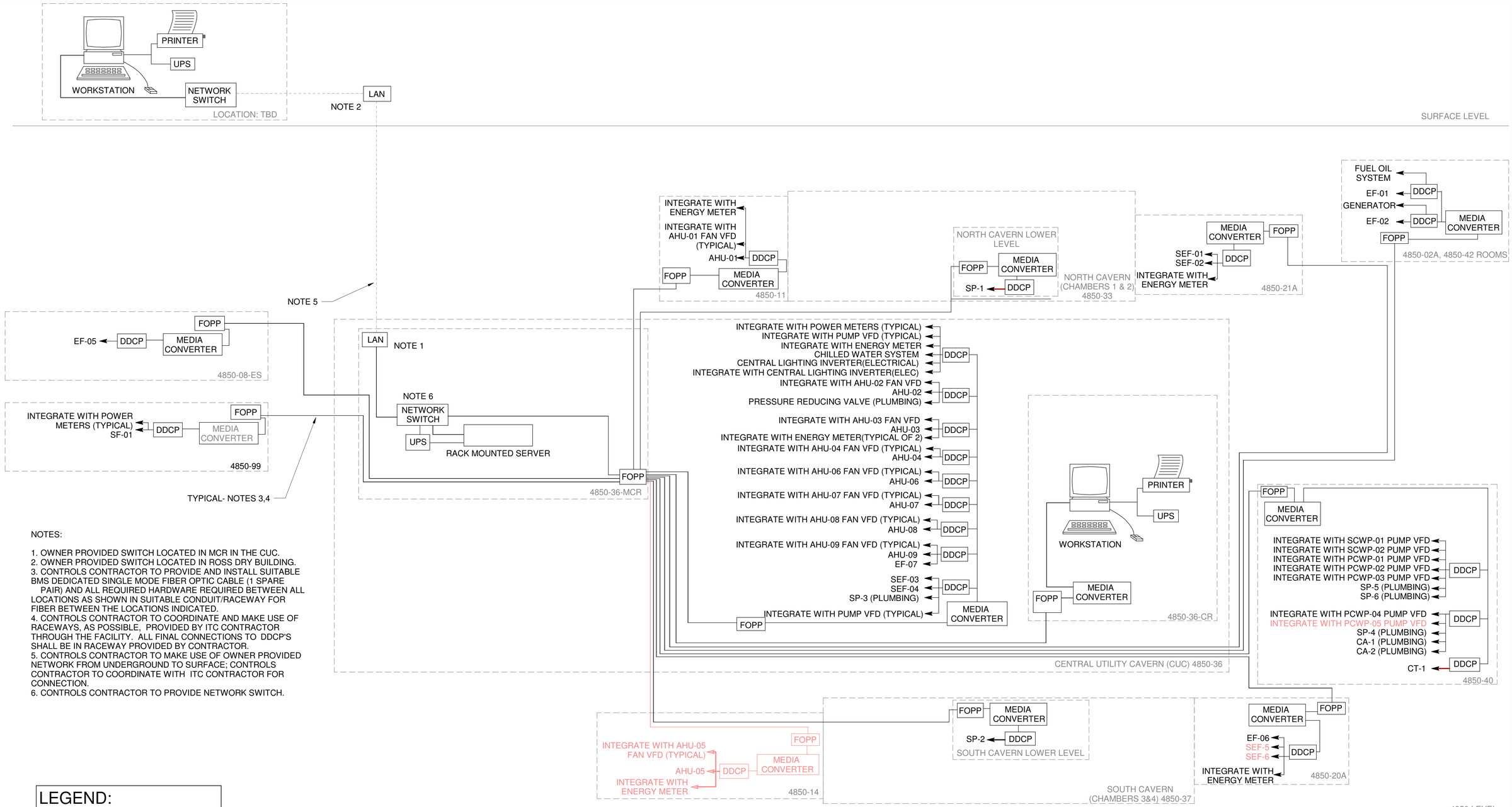
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

**LBNF-FSCF-BSI**
**UNDERGROUND, MECHANICAL CONTROLS**
**SYMBOLS & ABBREVIATIONS**

DRAWING NO. 15-1-6K U1-FD-M-900 REV. 4

10/01/20

NOT FOR CONSTRUCTION




NOTES:

1. OWNER PROVIDED SWITCH LOCATED IN MCR IN THE CUC.
2. OWNER PROVIDED SWITCH LOCATED IN ROSS DRY BUILDING.
3. CONTROLS CONTRACTOR TO PROVIDE AND INSTALL SUITABLE BMS DEDICATED SINGLE MODE FIBER OPTIC CABLE (1 SPARE PAIR) AND ALL REQUIRED HARDWARE REQUIRED BETWEEN ALL LOCATIONS AS SHOWN IN SUITABLE CONDUIT/RACEWAY FOR FIBER BETWEEN THE LOCATIONS INDICATED.
4. CONTROLS CONTRACTOR TO COORDINATE AND MAKE USE OF RACEWAYS, AS POSSIBLE, PROVIDED BY ITC CONTRACTOR THROUGH THE FACILITY. ALL FINAL CONNECTIONS TO DDCP'S SHALL BE IN RACEWAY PROVIDED BY CONTRACTOR.
5. CONTROLS CONTRACTOR TO MAKE USE OF OWNER PROVIDED NETWORK FROM UNDERGROUND TO SURFACE; CONTROLS CONTRACTOR TO COORDINATE WITH ITC CONTRACTOR FOR CONNECTION.
6. CONTROLS CONTRACTOR TO PROVIDE NETWORK SWITCH.

LEGEND:

- SOUTH CAVERN (FUTURE)
- BASE SCOPE

# BUILDING MANAGEMENT SYSTEM ARCHITECTURE

SCALE: NTS

1

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 6 | 10/01/20 | 90% FD UPDATE |
| 5 | 08/21/20 | 90% DRAFT FD UPDATE |
| 4 | 05/03/19 | 100% FD SUBMISSION |
| 3 | 02/22/19 | 90% FD SUBMISSION |
| 2 | 11/16/18 | 60% FD SUBMISSION |
| 1 | 07/27/18 | 30% FD SUBMISSION |

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SCALE:

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Long-Baseline Neutrino Facility

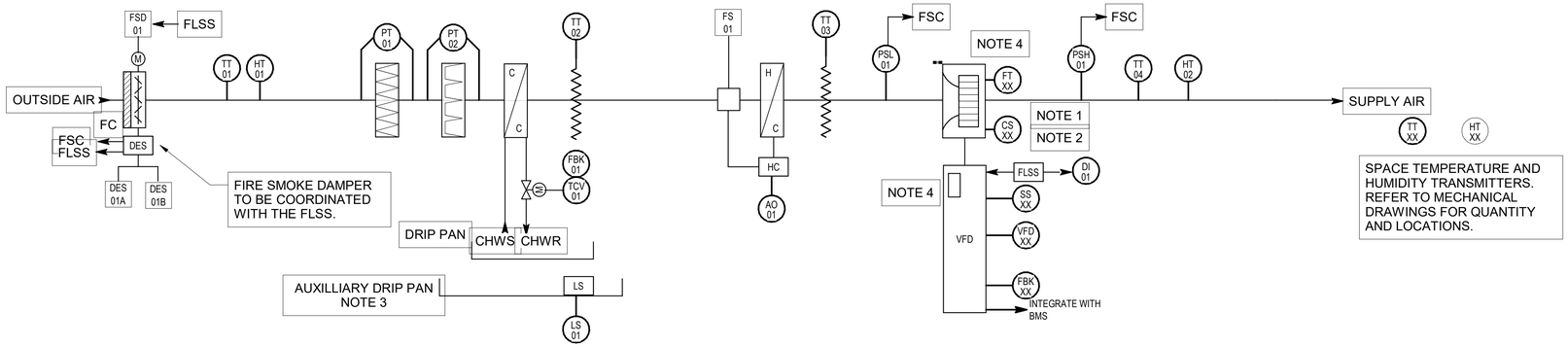
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

**LBNF-FSCF-BSI**
**UNDERGROUND, MECHANICAL CONTROLS SHEET 1**

DRAWING NO. 15-1-6K U1-FD-M-901 REV. 6

10/01/20

NOT FOR CONSTRUCTION




NOTES:

1. REFER TO MECHANICAL SCHEDULES FOR QUANTITY OF FANS.
2. EACH FAN TO BE PROVIDED WITH CURRENT SENSORS.
3. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.
4. QUANTITY OF VFDS AND FANS TO BE COORDINATED WITH APPROVED SUBMITTALS. CONTRACTOR TO PROVIDE I/O AND SENSORS FOR EACH VFD AND FAN AS REQUIRED TO SUPPORT FINAL DESIGN.
5. THE POINTS INDICATED ARE TYPICAL PER FAN, WITHIN THE FAN WELL.; ONLY ONE BMS INPUT PROVIDED BY FLSS FOR THE AHU.

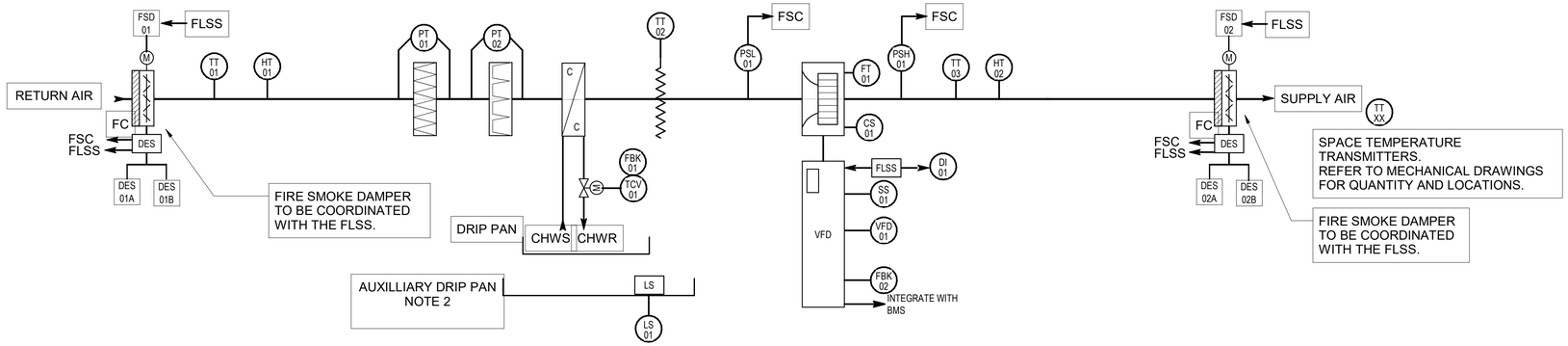
## AIR HANDLING UNIT CONSTANT AIR VOLUME WITH COOLING AND HEATING (AHU-1)

1

SCALE: NTS

## M902 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AHU-1 CONSTANT VOLUME W/ COOLING & HEATING | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | SUPPLY FAN ARRAY - VFD |
| AI | FT | XX | FLOW TRANSMITTER | SUPPLY FAN |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | HT | XX | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | 04 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | AO | 01 | ANALOG OUTPUT | REHEAT SETPOINT |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | SUPPLY FAN ARRAY - VFD |
| DI | CS | XX | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | SUPPLY FAN ARRAY - VFD |
| AHU-2 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | 02 | FEEDBACK | |
| AI | FT | 01 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | 01 | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | 01 | START/STOP | |




NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.

## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-2)

2

SCALE: NTS

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 6 | 10/01/20 | 90% FD UPDATE |
| 5 | 08/21/20 | 90% DRAFT FD UPDATE |
| 4 | 05/03/19 | 100% FD SUBMISSION |
| 3 | 02/22/19 | 90% FD SUBMISSION |
| 2 | 11/16/18 | 60% FD SUBMISSION |
| 1 | 07/27/18 | 30% FD SUBMISSION |

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Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

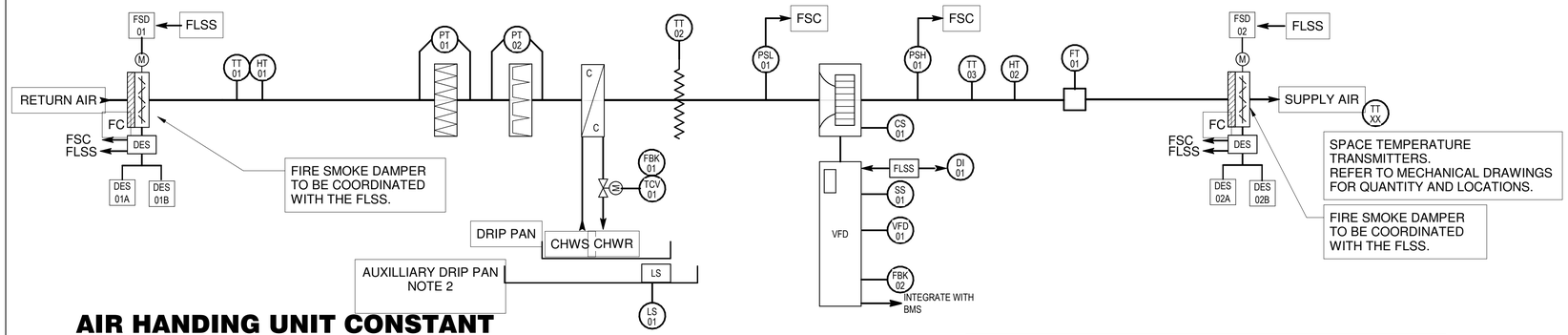
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 2

DRAWING NO. 15-1-6K U1-FD-M-902 REV. 6

10/01/20

NOT FOR CONSTRUCTION



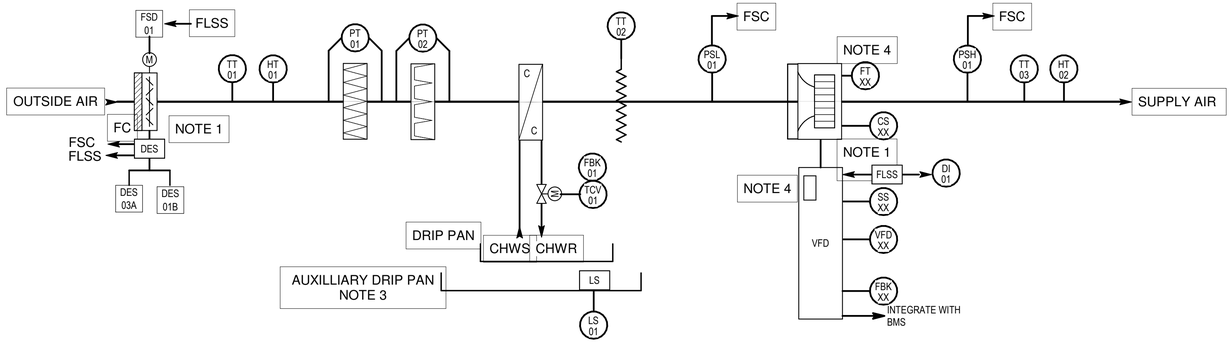

## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-3)

1

SCALE: NTS

NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.




## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-4)

2

SCALE: NTS

TT XX

SPACE TEMPERATURE TRANSMITTERS. REFER TO MECHANICAL DRAWINGS FOR QUANTITY AND LOCATIONS.

NOTES:

1. REFER TO MECHANICAL SCHEDULES FOR QUANTITY OF FANS.
2. EACH FAN TO BE PROVIDED WITH CURRENT SENSORS.
3. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.
4. QUANTITY OF VFDS AND FANS TO BE COORDINATED WITH APPROVED SUBMITTALS. CONTRACTOR TO PROVIDE I/O AND SENSORS FOR EACH VFD AND FAN AS REQUIRED TO SUPPORT FINAL DESIGN.
5. THE POINTS INDICATED ARE TYPICAL PER FAN, WITHIN THE FAN WELL.; ONLY ONE BMS INPUT PROVIDED BY FLSS FOR THE AHU.

## M903 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AHU-3 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | 02 | FEEDBACK | |
| AI | FT | 01 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | 01 | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | SUPPLY FAN ARRAY - VFD |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | 01 | START/STOP | |
| AHU-4 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | SUPPLY FAN ARRAY - VFD |
| AI | FT | XX | FLOW TRANSMITTER | SUPPLY FAN |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | SUPPLY FAN ARRAY - VFD |
| DI | CS | XX | CURRENT SENSOR | SUPPLY FAN ARRAY - VFD |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | SUPPLY FAN ARRAY - VFD |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 6 | 10/01/20 | 90% FD UPDATE |
| 5 | 08/21/20 | 90% DRAFT FD UPDATE |
| 4 | 05/03/19 | 100% FD SUBMISSION |
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| 2 | 11/16/18 | 60% FD SUBMISSION |
| 1 | 07/27/18 | 30% FD SUBMISSION |

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Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 3

DRAWING NO. 15-1-6K U1-FD-M-903 REV. 6

10/01/20

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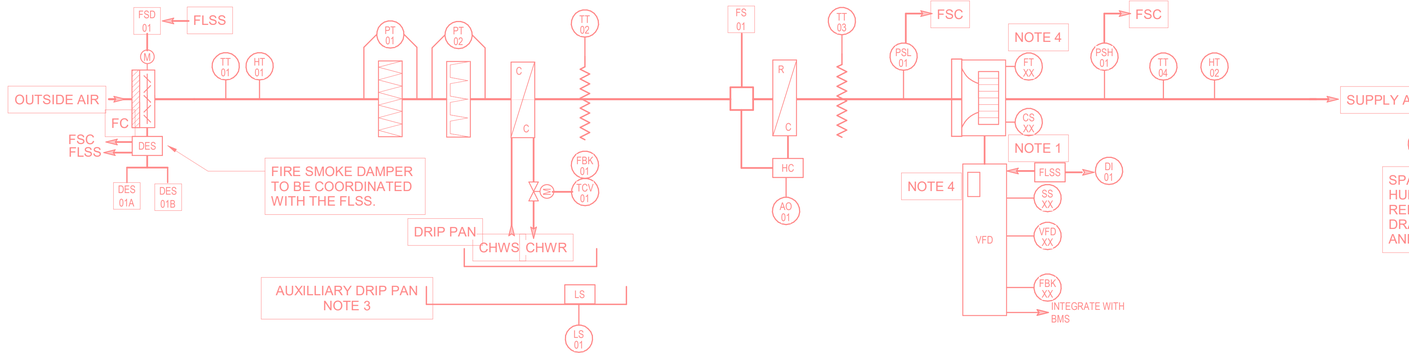


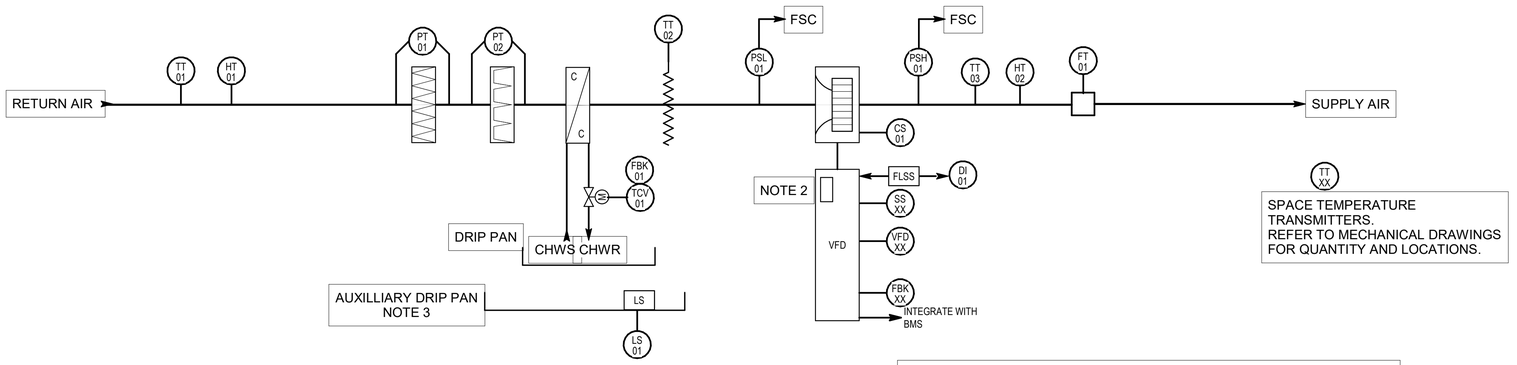

## AIR HANDLING UNIT CONSTANT AIR VOLUME WITH COOLING AND HEATING (AHU-5)

1

SCALE: NTS

NOTES:

1. REFER TO MECHANICAL SCHEDULES FOR QUANTITY OF FANS.
2. EACH FAN TO BE PROVIDED WITH CURRENT SENSORS.
3. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.
4. QUANTITY OF VFDS AND FANS TO BE COORDINATED WITH APPROVED SUBMITTALS. CONTRACTOR TO PROVIDE I/O AND SENSORS FOR EACH VFD AND FAN AS REQUIRED TO SUPPORT FINAL DESIGN.
5. THE POINTS INDICATED ARE TYPICAL PER FAN, WITHIN THE FAN WELL.; ONLY ONE BMS INPUT PROVIDED BY FLSS FOR THE AHU.




## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-6)

2

SCALE: NTS

NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.

## M904 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AHU-5 CONSTANT VOLUME W/ COOLING & HEATING | | | | |
| | | | INTEGRATE WITH BMS | NOTE 2 |
| AI | FBK | 01 | FEEDBACK | NOTE 2 |
| AI | FBK | XX | FEEDBACK | SUPPLY FAN ARRAY - VFD, NOTE 2 |
| AI | FT | XX | FLOW TRANSMITTER | SUPPLY FAN, NOTE 2 |
| AI | HT | 01 | HUMIDITY TRANSMITTER | NOTE 2 |
| AI | HT | 02 | HUMIDITY TRANSMITTER | NOTE 2 |
| AI | HT | XX | HUMIDITY TRANSMITTER | NOTE 2 |
| AI | PT | 01 | PRESSURE TRANSMITTER | NOTE 2 |
| AI | PT | 02 | PRESSURE TRANSMITTER | NOTE 2 |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | 04 | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | XX | TEMPERATURE TRANSMITTER | NOTE 2 |
| AO | AO | 01 | ANALOG OUTPUT | TEMPERATURE SETPOINT, NOTE 2 |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | NOTE 2 |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | SUPPLY FAN ARRAY - VFD, NOTE 2 |
| DI | CS | XX | CURRENT SENSOR | SUPPLY FAN ARRAY - VFD, NOTE 2 |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN, NOTE 2 |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR, NOTE 2 |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | NOTE 2 |
| DI | PSL | 01 | PRESSURE SWITCH LOW | NOTE 2 |
| DO | SS | XX | START/STOP | SUPPLY FAN ARRAY - VFD, NOTE 2 |
| AHU-6 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | |
| AI | FT | 01 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.
2. ITEM IN I/O LIST IS SOUTH CAVERN (FUTURE) SCOPE.

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 6 | 10/01/20 | 90% FD UPDATE |
| 5 | 08/21/20 | 90% DRAFT FD UPDATE |
| 4 | 05/03/19 | 100% FD SUBMISSION |
| 3 | 02/22/19 | 90% FD SUBMISSION |
| 2 | 11/16/18 | 60% FD SUBMISSION |
| 1 | 07/27/18 | 30% FD SUBMISSION |

REVISIONS

ARUP
Arup USA Inc
77 Water Street, New York NY 10005, T 212 896 3000
www.arup.com

Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

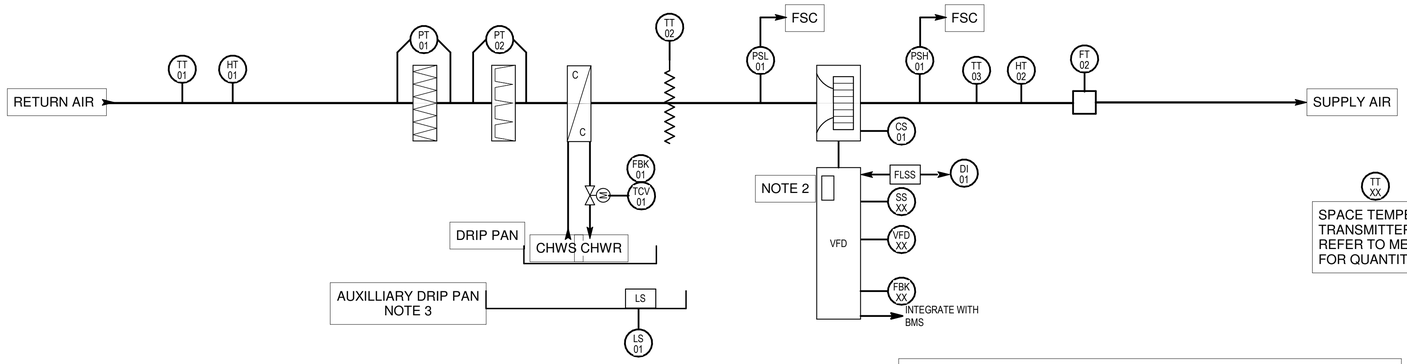
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 4

DRAWING NO. 15-1-6K U1-FD-M-904 REV. 6

10/01/20

NOT FOR CONSTRUCTION




TT XX

SPACE TEMPERATURE TRANSMITTERS.
REFER TO MECHANICAL DRAWINGS FOR QUANTITY AND LOCATIONS.

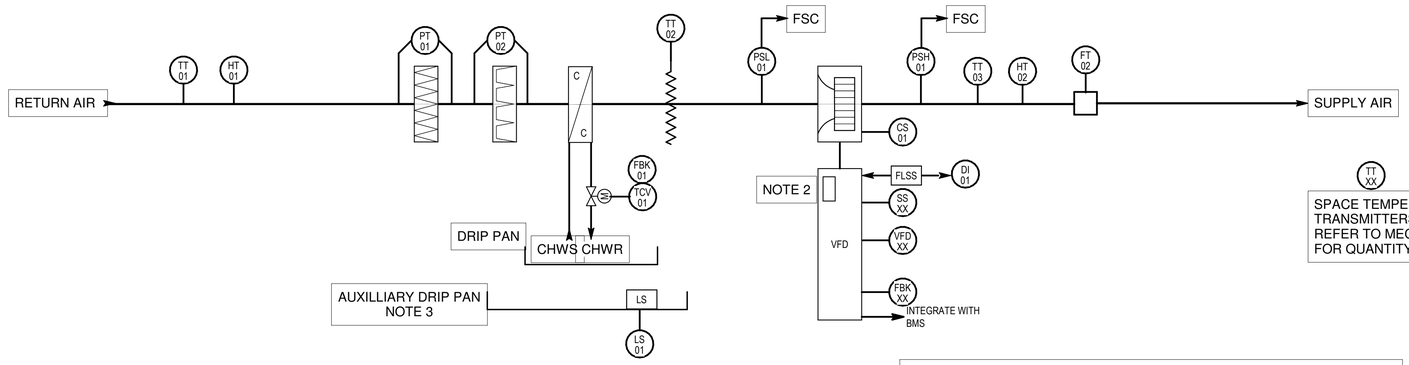
NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.

## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-7)

SCALE: 12" = 1'-0"

1




TT XX

SPACE TEMPERATURE TRANSMITTERS.
REFER TO MECHANICAL DRAWINGS FOR QUANTITY AND LOCATIONS.

NOTES:

1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. AUXILLIARY DRIP PAN AND LEAK SENSOR TO BE PROVIDED.

## AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-8)

SCALE: 12" = 1'-0"

2

## M905 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AHU-7 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | |
| AI | FT | 02 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | |
| AHU-8 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | |
| AI | FT | 02 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AI | TT | XX | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 1 | 10/01/20 | 90% FD UPDATE |

REVISIONS

ARUP
Arup USA Inc
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www.arup.com

Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

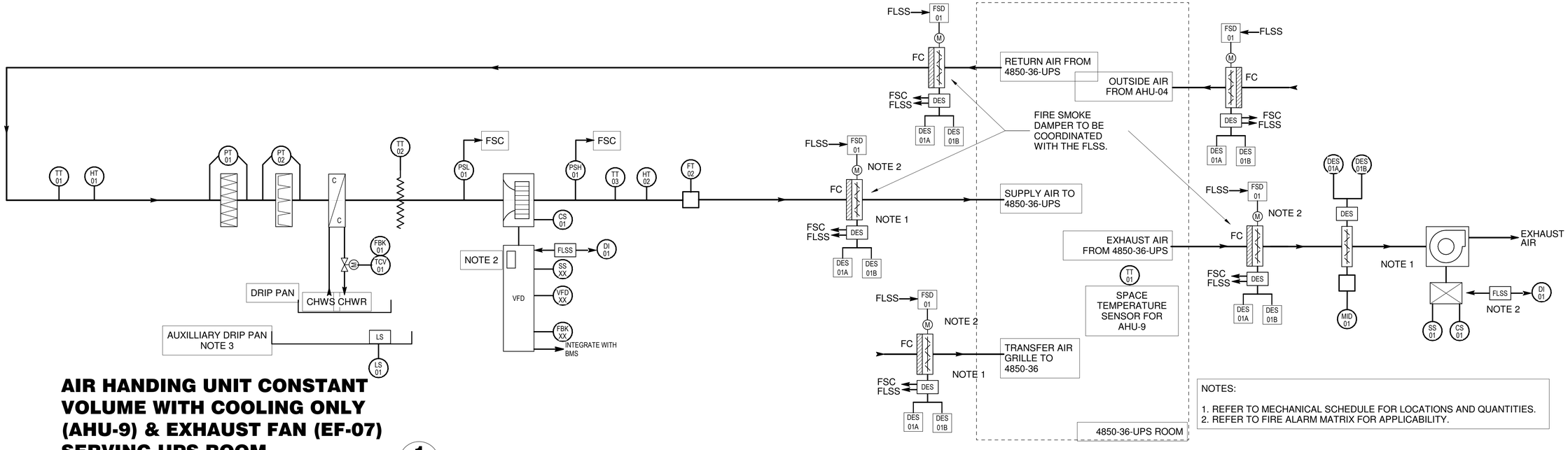
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JH | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 5

DRAWING NO. 15-1-6K U1-FD-M-905 REV. 1

10/01/20

NOT FOR CONSTRUCTION




# AIR HANDING UNIT CONSTANT VOLUME WITH COOLING ONLY (AHU-9) & EXHAUST FAN (EF-07) SERVING UPS ROOM

1

SCALE: 12" = 1'-0"

NOTES:

1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES.
2. REFER TO FIRE ALARM MATRIX FOR APPLICABILITY.

## M906 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AHU-9 CONSTANT VOLUME W/ COOLING ONLY | | | | |
| | | | INTEGRATE WITH BMS | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | XX | FEEDBACK | |
| AI | FT | 02 | FLOW TRANSMITTER | |
| AI | HT | 01 | HUMIDITY TRANSMITTER | |
| AI | HT | 02 | HUMIDITY TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | PT | 02 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 03 | TEMPERATURE TRANSMITTER | |
| AO | TCV | 01 | TEMPERATURE CONTROL VALVE | |
| AO | VFD | XX | VARIABLE FREQUENCY DRIVE | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DI | LS | 01 | LEAK SENSOR | CONDENSATE LEAK SENSOR |
| DI | PSH | 01 | PRESSURE SWITCH HIGH | |
| DI | PSL | 01 | PRESSURE SWITCH LOW | |
| DO | SS | XX | START/STOP | |
| FAN- STARTER (EF-07) | | | | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |
| MOTORIZED ISOLATING DAMPER | | | | |
| DI | DES | 01A | DAMPER END SWITCH | |
| DI | DES | 01B | DAMPER END SWITCH | |
| DO | MID | 01 | MOTORIZED ISOLATION DAMPER | |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 1 | 10/01/20 | 90% FD UPDATE |

REVISIONS

ARUP
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www.arup.com

Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

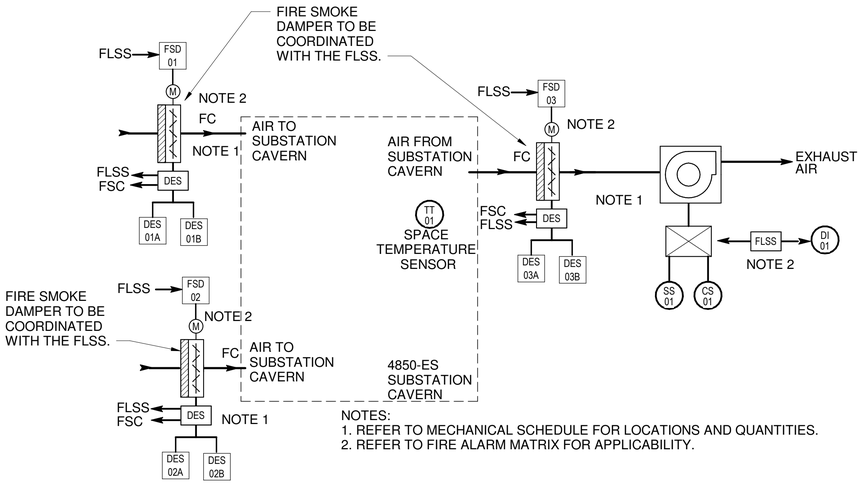
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JH | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 6

DRAWING NO. 15-1-6K U1-FD-M-906 REV. 1

10/01/20

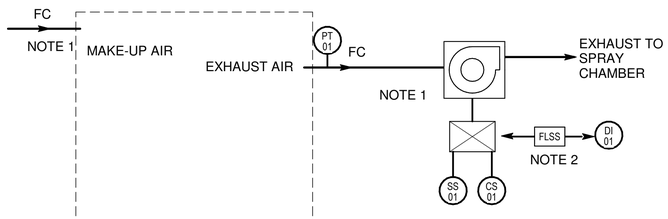
NOT FOR CONSTRUCTION




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES.
2. REFER TO FIRE ALARM MATRIX FOR APPLICABILITY.

## FAN - STARTER (EF-05) 1

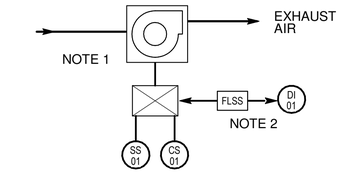
SCALE: NTS




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES.

## FAN - STARTER (EF-06) 2

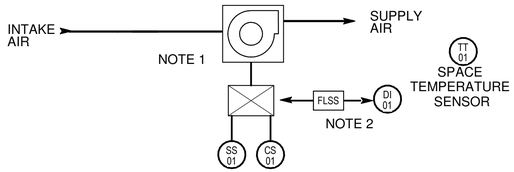
SCALE: 12" = 1'-0"




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES OF FANS.
2. REFER TO FIRE ALARM MATRIX FOR APPLICABILITY.

## EXHAUST FAN - STARTER (EF-01 & EF-02) 3

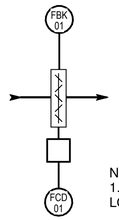
SCALE: NTS




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES OF FANS.
2. REFER TO FIRE ALARM MATRIX FOR APPLICABILITY.

## FAN - STARTER (SF-01) 4

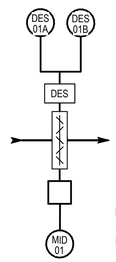
SCALE: NTS




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES OF FANS.

## FLOW CONTROL DAMPER TYPICAL 5

SCALE: NTS




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES OF FANS.

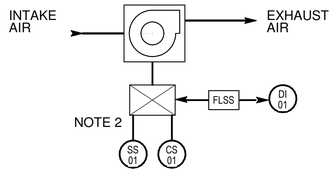
## MOTORIZED ISOLATING DAMPER TYPICAL 6

SCALE: NTS

## M907 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| EXHAUST FAN - STARTER | | | | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |
| FAN- STARTER (SF-01) | | | | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | SPACE TEMPERATURE |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |
| FAN- STARTER (EF-05) | | | | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | SPACE TEMPERATURE |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |
| FAN- STARTER (EF-06) | | | | |
| AI | PT | 01 | PRESSURE TRANSMITTER | SPACE TEMPERATURE |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |
| FLOW CONTROL DAMPER | | | | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FCD | 01 | FLOW CONTROL DAMPER | |
| MOTORIZED ISOLATING DAMPER | | | | |
| DI | DES | 01A | DAMPER END SWITCH | |
| DI | DES | 01B | DAMPER END SWITCH | |
| DO | MID | 01 | MOTORIZED ISOLATION DAMPER | |
| SMOKE EXHAUST FAN- STARTER | | | | |
| DI | CS | 01 | CURRENT SENSOR | |
| DI | DI | 01 | DIGITAL INPUT | FIRE ALARM SHUTDOWN |
| DO | SS | 01 | START/STOP | |

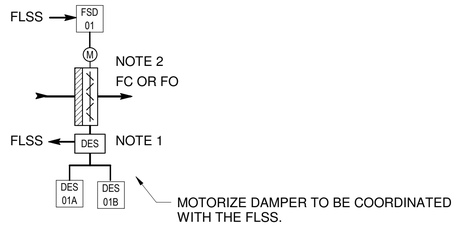
NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.




NOTES:
1. REFER TO MECHANICAL SCHEDULE FOR LOCATIONS AND QUANTITIES OF FANS
2. SEE DIV 26 DRAWINGS & SPECS FOR FIRE/SMOKE MODE SEQUENCE OF OPERATIONS.

## SMOKE EXHAUST FAN - STARTER TYPICAL 7

SCALE: NTS




NOTES:
1. REFER TO MECHANICAL PLANS FOR LOCATIONS.
2. REFER TO DIV 26 DRAWINGS & SPECS FOR DAMPER SEQUENCE AND FAIL POSITIONS.

## FIRE SMOKE DAMPER 8

SCALE: NTS

LEGEND:

| | |
|---|---|
| SOUTH CAVERN (FUTURE) | |
| BASE SCOPE | |

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 6 | 10/01/20 | 90% FD UPDATE |
| 5 | 08/21/20 | 90% DRAFT FD UPDATE |
| 4 | 05/03/19 | 100% FD SUBMISSION |
| 3 | 02/22/19 | 90% FD SUBMISSION |
| 2 | 11/16/18 | 60% FD SUBMISSION |
| 1 | 07/27/18 | 30% FD SUBMISSION |

REVISIONS

ARUP
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SCALE:

Fermilab
Long-Baseline Neutrino Facility

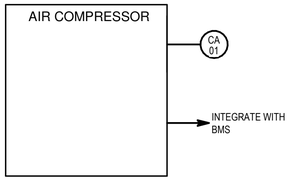
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 7

DRAWING NO. 15-1-6K U1-FD-M-907 REV. 6

10/01/20

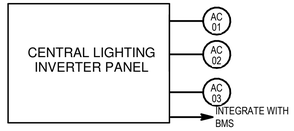
NOT FOR CONSTRUCTION




NOTES:
1. REFER TO PLUMBING DRAWINGS FOR LOCATION AND QUANTITIES
2. CONTRACTOR TO COORDINATE INTEGRATION PROTOCOL BASED ON APPROVED MANUFACTURER SHOP DRAWINGS.

## AIR COMPRESSOR TYPICAL 1

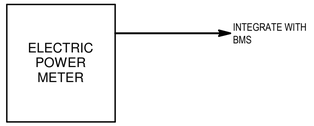
SCALE: NTS




NOTES:
1. REFER TO DIV 26 PLANS FOR QUANTITIES AND LOCATIONS

## CENTRAL LIGHTING INVERTER 2

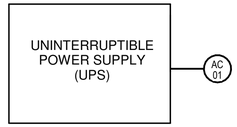
SCALE: NTS




NOTES:
1. ELECTRIC POWER METER PROVIDED BY DIV. 26. CONTROLS CONTRACTOR RESPONSIBLE FOR METER INTEGRATION WITH BMS. BMS CONTRACTOR TO INTEGRATE VIA MODBUS OR BACNET BASED ON APPROVED SUBMITTAL.

## ELECTRIC POWER METER TYPICAL 3

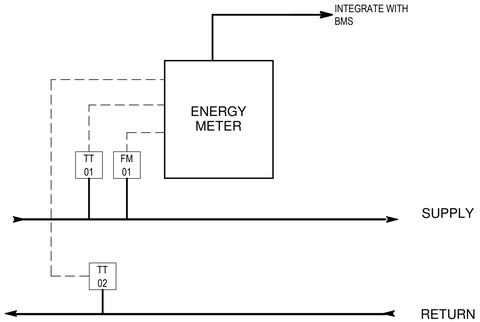
SCALE: NTS




NOTES:
1. REFER TO MECHANICAL PLANS AND SPECS FOR QUANTITIES AND LOCATIONS

## BAS UPS MONITORING TYPICAL 4

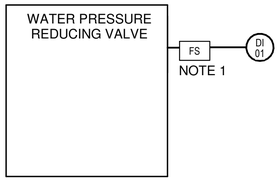
SCALE: NTS


NOTES:
1. SEE MECHANICAL DRAWINGS FOR QUANTITY AND LOCATIONS.
2. WIRING SHOWN FOR CONCEPTUAL DESIGN. ALL WIRING SUBJECT TO APPROVED EQUIPMENT SUBMITTAL.
3. CONTRACTOR RESPONSIBILITY TO PROVIDE FULLY FUNCTIONAL SYSTEM PER MANUFACTURER'S RECOMMENDED INSTALLATION INSTRUCTIONS. BMS CONTRACTOR TO INTEGRATE VIA MODBUS OR BACNET BASED ON APPROVED SUBMITTAL.

## ENERGY METER (BTU METER) TYPICAL 5

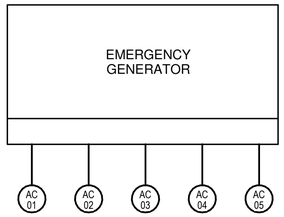
SCALE: NTS




NOTES:
1. REFER TO PLUMBING DRAWINGS FOR LOCATION OF FLOW SWITCH (FS).

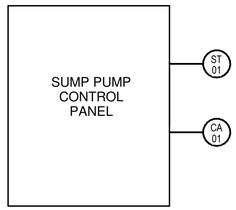
## WATER PRESSURE REDUCING VALVE 6

SCALE: NTS




## EMERGENCY GENERATOR 7

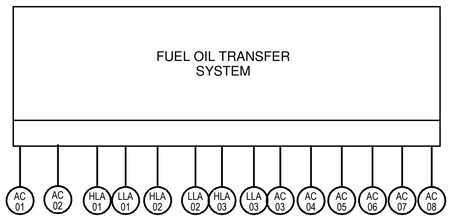
SCALE: NTS




NOTES:
1. SUMP PUMP SYSTEM AND CONTROL PANEL PROVIDED BY MANUFACTURER.
2. REFER TO PLUMBING FLOOR PLANS FOR QUANTITIES AND LOCATIONS.
3. BMS CONTRACTOR TO WIRE AND TERMINATE INPUTS FROM PANEL TO NEAREST DDC CONTROLLER.

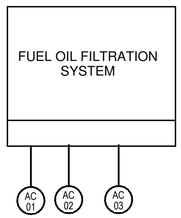
## SUMP PUMP PANEL TYPICAL 8

SCALE: NTS




## FUEL OIL TRANSFER SYSTEM 9

SCALE: NTS




## FUEL OIL FILTRATION SYSTEM 10

SCALE: NTS

## M908 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AIR COMPRESSOR | | | | |
| | | | INTEGRATE WITH BMS | |
| DI | CA | 01 | COMMON ALARM | FLOW STATUS |
| CENTRAL LIGHTING INVERTER | | | | |
| | | | INTEGRATE WITH BMS | |
| DI | AC | 01 | ALARM CONTACT | |
| DI | AC | 02 | ALARM CONTACT | LOW BATTERY |
| DI | AC | 03 | ALARM CONTACT | ON BYPASS |
| ELECTRIC POWER METER | | | | |
| | | | INTEGRATE WITH BMS | |
| EMERGENCY GENERATOR | | | | |
| DI | AC | 01 | ALARM CONTACT | |
| DI | AC | 02 | ALARM CONTACT | |
| DI | AC | 03 | ALARM CONTACT | |
| DI | AC | 04 | ALARM CONTACT | |
| DI | AC | 05 | ALARM CONTACT | |
| ENERGY METER | | | | |
| | | | INTEGRATE WITH BMS | |
| FUEL OIL FILTRATION SYSTEM | | | | |
| DI | AC | 01 | ALARM CONTACT | FILTER SATURATED |
| DI | AC | 02 | ALARM CONTACT | FILTER WATER HIGH LEVEL |
| DI | AC | 03 | ALARM CONTACT | SYSTEM BASIN LEAK |
| FUEL OIL TRANSFER SYSTEM | | | | |
| DI | AC | 01 | ALARM CONTACT | SUPPLY PUMP SET LOSS OF FLOW |
| DI | AC | 02 | ALARM CONTACT | GENERATOR DAY TANK LEAK |
| DI | AC | 03 | ALARM CONTACT | GENERATOR DAY TANK OVERFILL |
| DI | AC | 04 | ALARM CONTACT | FUEL TANK 1 OVERFILL |
| DI | AC | 05 | ALARM CONTACT | FUEL TANK 1 LEAK |
| DI | AC | 06 | ALARM CONTACT | FUEL TANK 2 OVERFILL |
| DI | AC | 07 | ALARM CONTACT | FUEL TANK 2 LEAK |
| DI | AC | 08 | ALARM CONTACT | RETURN PUMP LOSS OF FLOW |
| DI | HLA | 01 | HIGH LEVEL ALARM | GENERATOR DAY TANK HIGH LEVEL |
| DI | HLA | 02 | HIGH LEVEL ALARM | FUEL TANK 1 HIGH LEVEL |
| DI | HLA | 03 | HIGH LEVEL ALARM | FUEL TANK 2 HIGH LEVEL |
| DI | LLA | 01 | LOW LEVEL ALARM | GENERATOR DAY TANK LOW LEVEL |
| DI | LLA | 02 | LOW LEVEL ALARM | FUEL TANK 1 LOW LEVEL |
| DI | LLA | 03 | LOW LEVEL ALARM | FUEL TANK 2 LOW LEVEL |
| SUMP PUMP | | | | |
| DI | CA | 01 | COMMON ALARM | COMPRESSOR COMMON ALARM |
| DI | ST | 01 | STATUS | PUMP RUN |
| UPS MONITORING | | | | |
| DI | AC | 01 | ALARM CONTACT | |
| WATER PRESSURE REDUCING VALVE | | | | |
| DI | DI | 01 | DIGITAL INPUT | FLOW STATUS |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 5 | 10/01/20 | 90% FD UPDATE |
| 4 | 08/21/20 | 90% DRAFT FD UPDATE |
| 3 | 05/03/19 | 100% FD SUBMISSION |
| 2 | 02/22/19 | 90% FD SUBMISSION |
| 1 | 11/16/18 | 60% FD SUBMISSION |

REVISIONS

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www.arup.com

Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

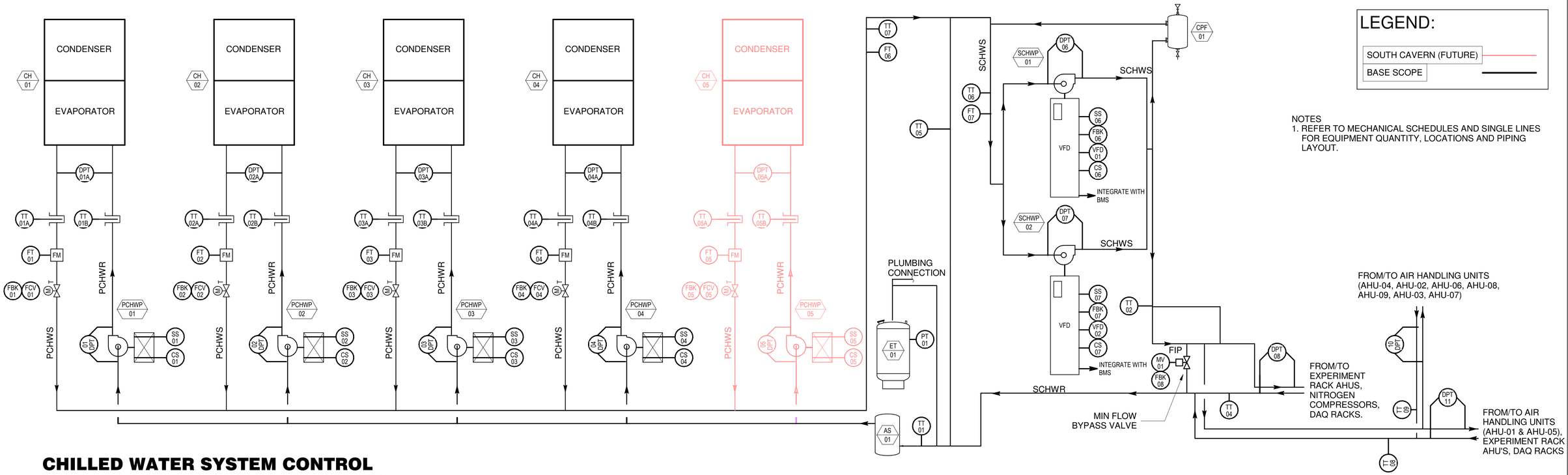
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

**LBNF-FSCF-BSI**
**UNDERGROUND, MECHANICAL CONTROLS SHEET 8**

DRAWING NO. 15-1-6K U1-FD-M-908 REV. 5

10/01/20

NOT FOR CONSTRUCTION




# CHILLED WATER SYSTEM CONTROL DIAGRAM

2

SCALE: 12" = 1'-0"

## M909 INSTRUMENTATION AND INPUT-OUTPUT

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| CHILLED WATER SYSTEM | | | | |
| | | | INTEGRATE WITH BMS | SCHWP-01 |
| | | | INTEGRATE WITH BMS | SCHWP-02 |
| AI | DPT | 01 | DIFFERENTIAL PRESSURE TRANSMITTER | PCHWP-01 |
| AI | DPT | 01A | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 02 | DIFFERENTIAL PRESSURE TRANSMITTER | PCHWP-02 |
| AI | DPT | 02A | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 03 | DIFFERENTIAL PRESSURE TRANSMITTER | PCHWP-03 |
| AI | DPT | 03A | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 04 | DIFFERENTIAL PRESSURE TRANSMITTER | PCHWP-04 |
| AI | DPT | 04A | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 05 | DIFFERENTIAL PRESSURE TRANSMITTER | PCHWP-05, NOTE 2 |
| AI | DPT | 05A | DIFFERENTIAL PRESSURE TRANSMITTER | NOTE 2 |
| AI | DPT | 06 | DIFFERENTIAL PRESSURE TRANSMITTER | SCHWP-01 |
| AI | DPT | 07 | DIFFERENTIAL PRESSURE TRANSMITTER | SCHWP-02 |
| AI | DPT | 08 | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 10 | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | DPT | 11 | DIFFERENTIAL PRESSURE TRANSMITTER | |
| AI | FBK | 01 | FEEDBACK | |
| AI | FBK | 02 | FEEDBACK | |
| AI | FBK | 03 | FEEDBACK | |
| AI | FBK | 04 | FEEDBACK | |
| AI | FBK | 05 | FEEDBACK | NOTE 2 |
| AI | FBK | 06 | FEEDBACK | SCHWP-01 |
| AI | FBK | 07 | FEEDBACK | SCHWP-02 |
| AI | FBK | 08 | FEEDBACK | MIN FLOW BYPASS VALVE |

## M909 INSTRUMENTATION AND INPUT-OUTPUT

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AI | FT | 01 | FLOW TRANSMITTER | |
| AI | FT | 02 | FLOW TRANSMITTER | |
| AI | FT | 03 | FLOW TRANSMITTER | |
| AI | FT | 04 | FLOW TRANSMITTER | |
| AI | FT | 05 | FLOW TRANSMITTER | NOTE 2 |
| AI | FT | 06 | FLOW TRANSMITTER | |
| AI | FT | 07 | FLOW TRANSMITTER | |
| AI | PT | 01 | PRESSURE TRANSMITTER | |
| AI | TT | 01 | TEMPERATURE TRANSMITTER | |
| AI | TT | 01A | TEMPERATURE TRANSMITTER | |
| AI | TT | 01B | TEMPERATURE TRANSMITTER | |
| AI | TT | 02 | TEMPERATURE TRANSMITTER | |
| AI | TT | 02A | TEMPERATURE TRANSMITTER | |
| AI | TT | 02B | TEMPERATURE TRANSMITTER | |
| AI | TT | 03A | TEMPERATURE TRANSMITTER | |
| AI | TT | 03B | TEMPERATURE TRANSMITTER | |
| AI | TT | 04 | TEMPERATURE TRANSMITTER | |
| AI | TT | 04A | TEMPERATURE TRANSMITTER | |
| AI | TT | 04B | TEMPERATURE TRANSMITTER | |
| AI | TT | 05 | TEMPERATURE TRANSMITTER | |
| AI | TT | 05A | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | 05B | TEMPERATURE TRANSMITTER | NOTE 2 |
| AI | TT | 06 | TEMPERATURE TRANSMITTER | |
| AI | TT | 07 | TEMPERATURE TRANSMITTER | |
| AI | TT | 08 | TEMPERATURE TRANSMITTER | |
| AI | TT | 09 | TEMPERATURE TRANSMITTER | |

## M909 INSTRUMENTATION AND INPUT-OUTPUT

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| AO | FCV | 01 | FLOW CONTROL VALVE | |
| AO | FCV | 02 | FLOW CONTROL VALVE | |
| AO | FCV | 03 | FLOW CONTROL VALVE | |
| AO | FCV | 04 | FLOW CONTROL VALVE | |
| AO | FCV | 05 | FLOW CONTROL VALVE | NOTE 2 |
| AO | MV | 01 | MOTORIZED VALVE | MIN FLOW BYPASS VALVE |
| AO | VFD | 01 | VARIABLE FREQUENCY DRIVE | SCHWP-01 |
| AO | VFD | 02 | VARIABLE FREQUENCY DRIVE | SCHWP-02 |
| DI | CS | 01 | CURRENT SENSOR | PCHWP-01 |
| DI | CS | 02 | CURRENT SENSOR | PCHWP-02 |
| DI | CS | 03 | CURRENT SENSOR | PCHWP-03 |
| DI | CS | 04 | CURRENT SENSOR | PCHWP-04 |
| DI | CS | 05 | CURRENT SENSOR | PCHWP-05, NOTE 2 |
| DI | CS | 06 | CURRENT SENSOR | SCHWP-01 |
| DI | CS | 07 | CURRENT SENSOR | SCHWP-02 |
| DO | SS | 01 | START/STOP | PCHWP-01 |
| DO | SS | 02 | START/STOP | PCHWP-02 |
| DO | SS | 03 | START/STOP | PCHWP-03 |
| DO | SS | 04 | START/STOP | PCHWP-04 |
| DO | SS | 05 | START/STOP | PCHWP-05, NOTE 2 |
| DO | SS | 06 | START/STOP | SCHWP-01 |
| DO | SS | 07 | START/STOP | SCHWP-02 |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.
2. ITEM IN I/O LIST IS SOUTH CAVERN (FUTURE) SCOPE.

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 5 | 10/01/20 | 90% FD UPDATE |
| 4 | 08/21/20 | 90% DRAFT FD UPDATE |
| 3 | 05/03/19 | 100% FD SUBMISSION |
| 2 | 02/22/19 | 90% FD SUBMISSION |
| 1 | 11/16/18 | 60% FD SUBMISSION |

REVISIONS

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www.arup.com

Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

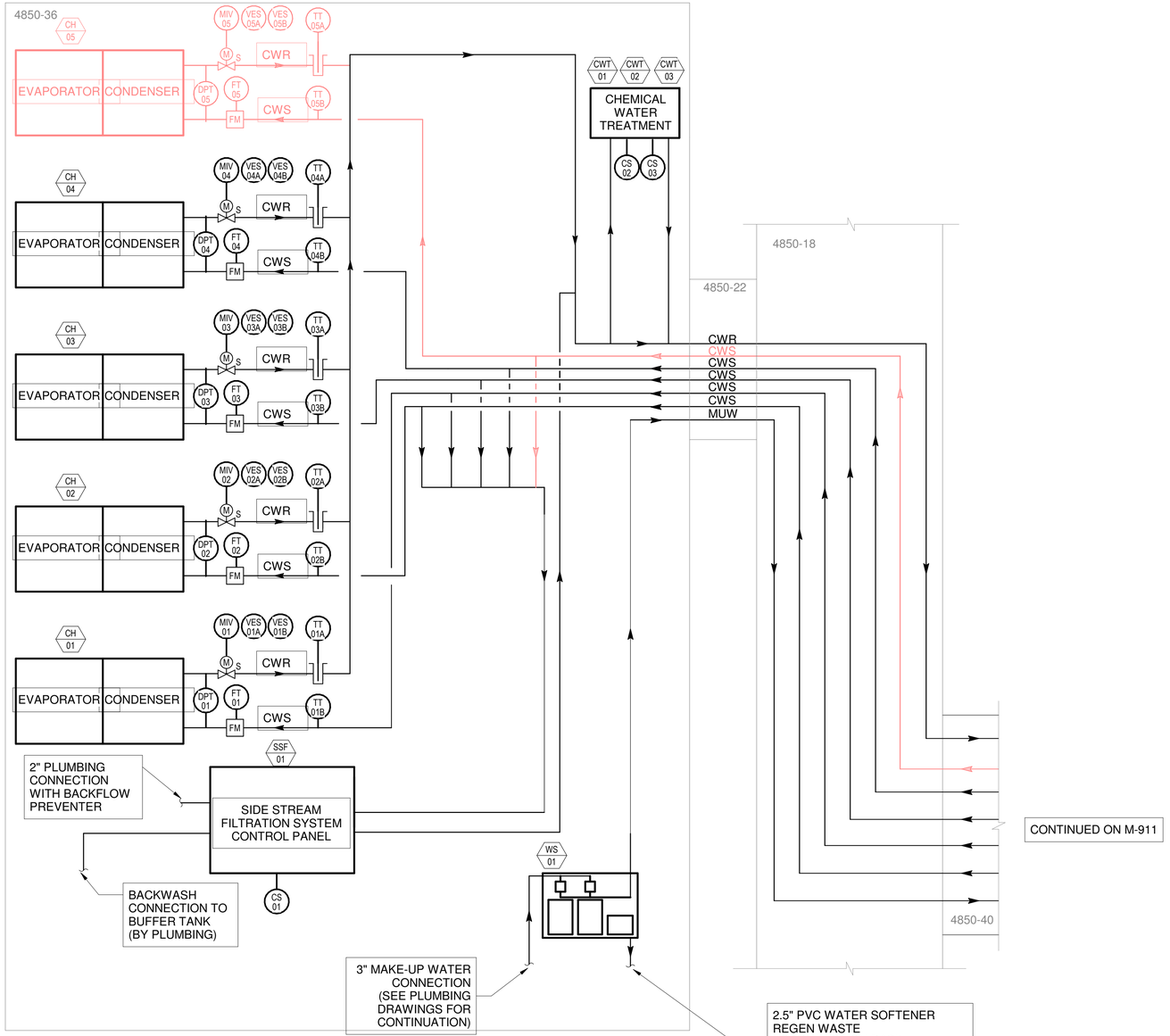
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

**LBNF-FSCF-BSI**
**UNDERGROUND, MECHANICAL CONTROLS SHEET 9**

DRAWING NO. 15-1-6K U1-FD-M-909 REV. 5

10/01/20

NOT FOR CONSTRUCTION




NOTES
1. REFER TO MECHANICAL SCHEDULES AND SINGLE LINES FOR EQUIPMENT QUANTITY, LOCATIONS AND PIPING LAYOUT.
2. CONTROLS CONTRACTOR TO COORDINATE WITH SHOP DRAWINGS FROM CT MANUFACTURER.
3. BMS CONTRACTOR TO PROVIDE VALVES THAT HAVE MOTORIZED COMPONENT.

## CONDENSER WATER SYSTEM CONTROL DIAGRAM (1 OF 2)

1

SCALE: 12" = 1'-0"

## M910 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| CONDENSER WATER SYSTEM | | | | |
| AI | DPT | 01 | DIFFERENTIAL PRESSURE TRANSMITTER | CH-01 |
| AI | DPT | 02 | DIFFERENTIAL PRESSURE TRANSMITTER | CH-02 |
| AI | DPT | 03 | DIFFERENTIAL PRESSURE TRANSMITTER | CH-03 |
| AI | DPT | 04 | DIFFERENTIAL PRESSURE TRANSMITTER | CH-04 |
| AI | DPT | 05 | DIFFERENTIAL PRESSURE TRANSMITTER | CH-05, NOTE 2 |
| AI | FT | 01 | FLOW TRANSMITTER | CH-01 |
| AI | FT | 02 | FLOW TRANSMITTER | CH-02 |
| AI | FT | 03 | FLOW TRANSMITTER | CH-03 |
| AI | FT | 04 | FLOW TRANSMITTER | CH-04 |
| AI | FT | 05 | FLOW TRANSMITTER | CH-05, NOTE 2 |
| AI | TT | 01A | TEMPERATURE TRANSMITTER | CH-01 |
| AI | TT | 01B | TEMPERATURE TRANSMITTER | CH-01 |
| AI | TT | 02A | TEMPERATURE TRANSMITTER | CH-02 |
| AI | TT | 02B | TEMPERATURE TRANSMITTER | CH-02 |
| AI | TT | 03A | TEMPERATURE TRANSMITTER | CH-03 |
| AI | TT | 03B | TEMPERATURE TRANSMITTER | CH-03 |
| AI | TT | 04A | TEMPERATURE TRANSMITTER | CH-04 |
| AI | TT | 04B | TEMPERATURE TRANSMITTER | CH-04 |
| AI | TT | 05A | TEMPERATURE TRANSMITTER | CH-05, NOTE 2 |
| AI | TT | 05B | TEMPERATURE TRANSMITTER | CH-05, NOTE 2 |
| DI | CS | 01 | CURRENT SENSOR | SSF PUMP STATUS |
| DI | CS | 02 | CURRENT SENSOR | CWT-02 PUMP STATUS |
| DI | CS | 03 | CURRENT SENSOR | CWT-02 PUMP STATUS |
| DI | VES | 01A | VALVE END SWITCH | CH-01 |
| DI | VES | 01B | VALVE END SWITCH | CH-01 |
| DI | VES | 02A | VALVE END SWITCH | CH-02 |
| DI | VES | 02B | VALVE END SWITCH | CH-02 |
| DI | VES | 03A | VALVE END SWITCH | CH-03 |
| DI | VES | 03B | VALVE END SWITCH | CH-03 |
| DI | VES | 04A | VALVE END SWITCH | CH-04 |
| DI | VES | 04B | VALVE END SWITCH | CH-04 |
| DI | VES | 05A | VALVE END SWITCH | CH-05, NOTE 2 |
| DI | VES | 05B | VALVE END SWITCH | CH-05, NOTE 2 |
| DO | MIV | 01 | MOTORIZED ISOLATION VALVE | CH-01 |
| DO | MIV | 02 | MOTORIZED ISOLATION VALVE | CH-02 |
| DO | MIV | 03 | MOTORIZED ISOLATION VALVE | CH-03 |
| DO | MIV | 04 | MOTORIZED ISOLATION VALVE | CH-04 |
| DO | MIV | 05 | MOTORIZED ISOLATION VALVE | CH-05, NOTE 2 |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.
2. ITEM IN I/O LIST IS SOUTH CAVERN (FUTURE) SCOPE.

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 5 | 10/01/20 | 90% FD UPDATE |
| 4 | 08/21/20 | 90% DRAFT FD UPDATE |
| 3 | 05/03/19 | 100% FD SUBMISSION |
| 2 | 02/22/19 | 90% FD SUBMISSION |
| 1 | 11/16/18 | 60% FD SUBMISSION |

REVISIONS

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Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

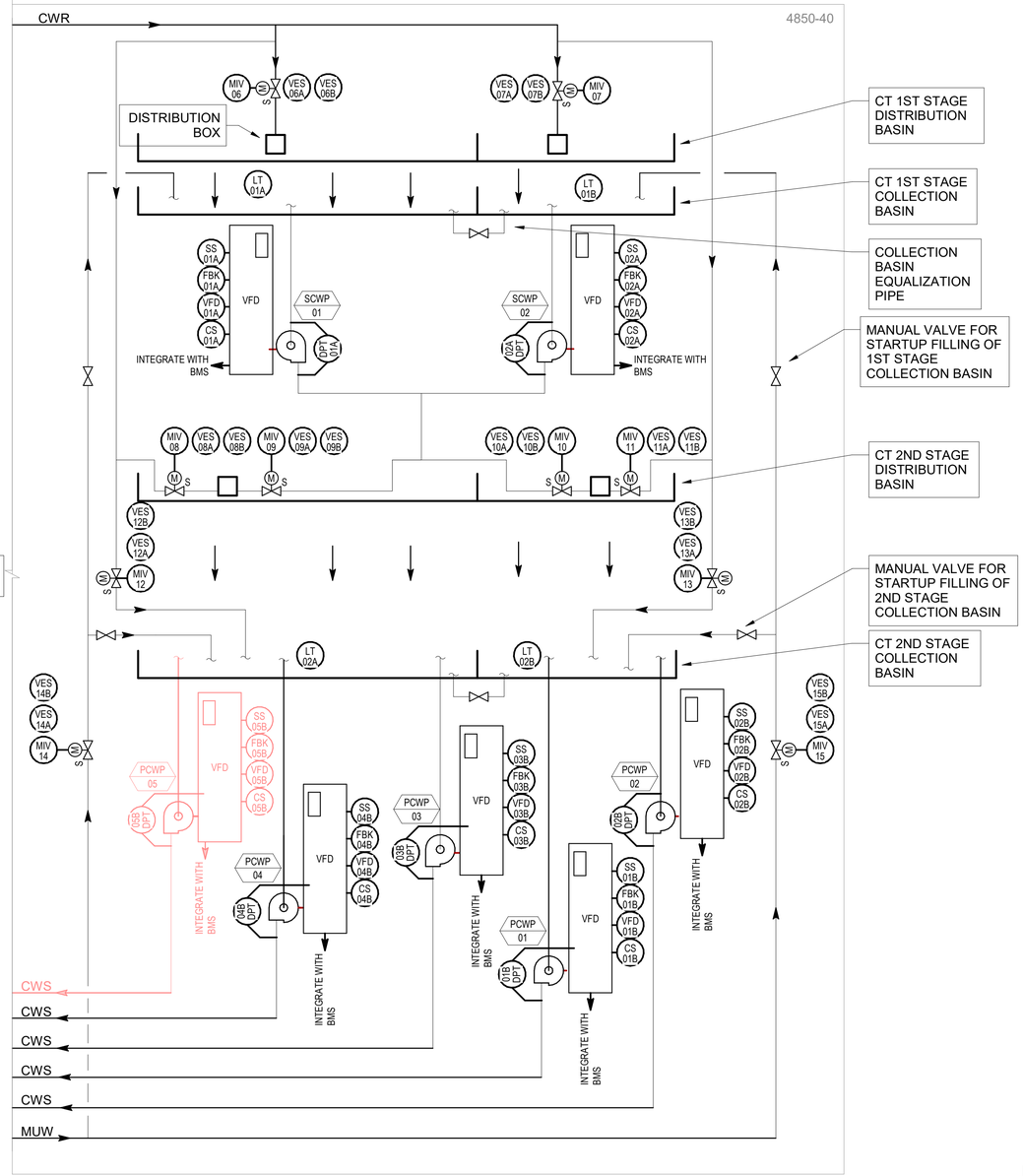
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

**LBNF-FSCF-BSI**
**UNDERGROUND, MECHANICAL CONTROLS SHEET 10**

DRAWING NO. 15-1-6K U1-FD-M-910 REV. 5

10/01/20

NOT FOR CONSTRUCTION




NOTES
1. REFER TO MECHANICAL SCHEDULES AND SINGLE LINES FOR EQUIPMENT QUANTITY, LOCATIONS AND PIPING LAYOUT.
2. CONTROLS CONTRACTOR TO COORDINATE WITH SHOP DRAWINGS FROM CT MANUFACTURER.
3. BMS CONTRACTOR TO PROVIDE VALVES THAT HAVE MOTORIZED COMPONENT.

# CONDENSER WATER SYSTEM CONTROL DIAGRAM (2 OF 2)

1

SCALE: 12" = 1'-0"

## M911 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| CONDENSER WATER SYSTEM | | | | |
| AI | LT | 01A | LEVEL TRANSMITTER | 1ST STAGE COLLECTION BASIN (N) |
| AI | LT | 01B | LEVEL TRANSMITTER | 1ST STAGE COLLECTION BASIN (S) |
| AI | LT | 02A | LEVEL TRANSMITTER | 2ND STAGE COLLECTION BASIN |
| AI | LT | 02B | LEVEL TRANSMITTER | 2ND STAGE COLLECTION BASIN |
| DI | VES | 06A | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN (N) |
| DI | VES | 06B | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN (N) |
| DI | VES | 07A | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN (S) |
| DI | VES | 07B | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN (S) |
| DI | VES | 08A | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN BYPASS (N) |
| DI | VES | 08B | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN BYPASS (N) |
| DI | VES | 09A | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN (N) |
| DI | VES | 09B | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN (N) |
| DI | VES | 10A | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN (S) |
| DI | VES | 10B | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN (S) |
| DI | VES | 11A | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN BYPASS (S) |
| DI | VES | 11B | VALVE END SWITCH | 1ST STAGE DISTRIBUTION BASIN BYPASS (S) |
| DI | VES | 12A | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN BYPASS (N) |
| DI | VES | 12B | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN BYPASS (N) |
| DI | VES | 13A | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN BYPASS (S) |
| DI | VES | 13B | VALVE END SWITCH | 2ND STAGE DISTRIBUTION BASIN BYPASS (S) |
| DI | VES | 14A | VALVE END SWITCH | MAKE UP WATER |
| DI | VES | 14B | VALVE END SWITCH | MAKE UP WATER |
| DI | VES | 15A | VALVE END SWITCH | MAKE UP WATER (S) |
| DI | VES | 15B | VALVE END SWITCH | MAKE UP WATER (S) |
| DO | MIV | 06 | MOTORIZED ISOLATION VALVE | 1ST STAGE DISTRIBUTION BASIN (N) |
| DO | MIV | 07 | MOTORIZED ISOLATION VALVE | 1ST STAGE DISTRIBUTION BASIN (S) |
| DO | MIV | 08 | MOTORIZED ISOLATION VALVE | 1ST STAGE DISTRIBUTION BASIN BYPASS (N) |
| DO | MIV | 09 | MOTORIZED ISOLATION VALVE | 2ND STAGE DISTRIBUTION BASIN (N) |
| DO | MIV | 10 | MOTORIZED ISOLATION VALVE | 2ND STAGE DISTRIBUTION BASIN (S) |
| DO | MIV | 11 | MOTORIZED ISOLATION VALVE | 1ST STAGE DISTRIBUTION BASIN BYPASS (S) |
| DO | MIV | 12 | MOTORIZED ISOLATION VALVE | 2ND STAGE DISTRIBUTION BASIN BYPASS (N) |
| DO | MIV | 13 | MOTORIZED ISOLATION VALVE | 2ND STAGE DISTRIBUTION BASIN BYPASS (S) |
| DO | MIV | 14 | MOTORIZED ISOLATION VALVE | MAKE UP WATER |
| DO | MIV | 15 | MOTORIZED ISOLATION VALVE | MAKE UP WATER (S) |
| PCWP-01 | | | | |
| | | | INTEGRATE WITH BMS | PCWP-01 |
| AI | DPT | 01B | DIFFERENTIAL PRESSURE TRANSMITTER | PCWP-01 |
| AI | FBK | 01B | FEEDBACK | PCWP-01 |
| AO | VFD | 01B | VARIABLE FREQUENCY DRIVE | PCWP-01 |
| DI | CS | 01B | CURRENT SENSOR | PCWP-01 |
| DO | SS | 01B | START/STOP | PCWP-01 |

NOTE:
1. ALL ITEMS IN I/O LIST ARE BASE SCOPE UNLESS OTHERWISE NOTED.
2. ITEM IN I/O LIST IS SOUTH CAVERN (FUTURE) SCOPE.
3. (S) INDICATES SOUTH SIDE OF COOLING TOWER, (N) INDICATES NORTH SIDE OF COOLING TOWER.

## M911 INSTRUMENTATION AND INPUT-OUTPUT LIST

| POINT TYPE | ITEM TYPE | ITEM NO. | DESCRIPTION | NOTES |
|---|---|---|---|---|
| PCWP-02 | | | | |
| | | | INTEGRATE WITH BMS | PCWP-02 |
| AI | DPT | 02B | DIFFERENTIAL PRESSURE TRANSMITTER | PCWP-02 |
| AI | FBK | 02B | FEEDBACK | PCWP-02 |
| AO | VFD | 02B | VARIABLE FREQUENCY DRIVE | PCWP-02 |
| DI | CS | 02B | CURRENT SENSOR | PCWP-02 |
| DO | SS | 02B | START/STOP | PCWP-02 |
| PCWP-03 | | | | |
| | | | INTEGRATE WITH BMS | PCWP-03 |
| AI | DPT | 03B | DIFFERENTIAL PRESSURE TRANSMITTER | PCWP-03 |
| AI | FBK | 03B | FEEDBACK | PCWP-03 |
| AO | VFD | 03B | VARIABLE FREQUENCY DRIVE | PCWP-03 |
| DI | CS | 03B | CURRENT SENSOR | PCWP-03 |
| DO | SS | 03B | START/STOP | PCWP-03 |
| PCWP-04 | | | | |
| | | | INTEGRATE WITH BMS | PCWP-04 |
| AI | DPT | 04B | DIFFERENTIAL PRESSURE TRANSMITTER | PCWP-04 |
| AI | FBK | 04B | FEEDBACK | PCWP-04 |
| AO | VFD | 04B | VARIABLE FREQUENCY DRIVE | PCWP-04 |
| DI | CS | 04B | CURRENT SENSOR | PCWP-04 |
| DO | SS | 04B | START/STOP | PCWP-04 |
| PCWP-05 | | | | |
| | | | INTEGRATE WITH BMS | PCWP-05, NOTE 2 |
| AI | DPT | 05B | DIFFERENTIAL PRESSURE TRANSMITTER | PCWP-05, NOTE 2 |
| AI | FBK | 05B | FEEDBACK | PCHWP-05, NOTE 2 |
| AO | VFD | 05B | VARIABLE FREQUENCY DRIVE | PCHWP-05, NOTE 2 |
| DI | CS | 05B | CURRENT SENSOR | PCHWP-05, NOTE 2 |
| DO | SS | 05B | START/STOP | PCHWP-05, NOTE 2 |
| SCWP-01 | | | | |
| | | | INTEGRATE WITH BMS | SCWP-01 |
| AI | DPT | 01A | DIFFERENTIAL PRESSURE TRANSMITTER | SCWP-01 |
| AI | FBK | 01A | FEEDBACK | SCWP-01 |
| AO | VFD | 01A | VARIABLE FREQUENCY DRIVE | SCWP-01 |
| DI | CS | 01A | CURRENT SENSOR | SCWP-01 |
| DO | SS | 01A | START/STOP | SCWP-01 |
| SCWP-02 | | | | |
| | | | INTEGRATE WITH BMS | SCWP-02 |
| AI | DPT | 02A | DIFFERENTIAL PRESSURE TRANSMITTER | SCWP-02 |
| AI | FBK | 02A | FEEDBACK | SCWP-02 |
| AO | VFD | 02A | VARIABLE FREQUENCY DRIVE | SCWP-02 |
| DI | CS | 02A | CURRENT SENSOR | SCWP-02 |
| DO | SS | 02A | START/STOP | SCWP-02 |

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 1 | 10/01/20 | 90% FD UPDATE |

REVISIONS

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www.arup.com

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Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

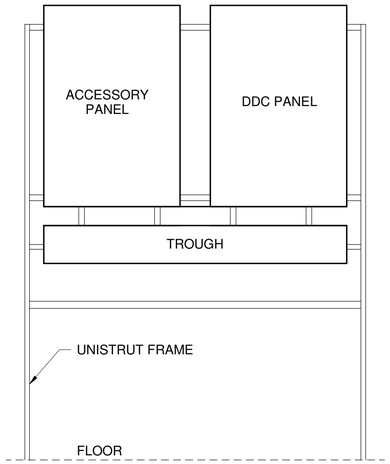
| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JH | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 11

DRAWING NO. 15-1-6K U1-FD-M-911 REV. 1

10/01/20

NOT FOR CONSTRUCTION

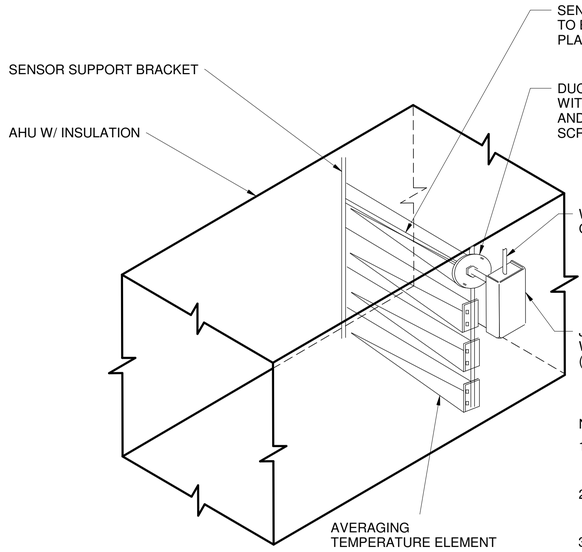



NOTES:
1. REFER TO 230900 SPECIFICATIONS FOR ALL BMS PANEL REQUIREMENTS.

## BMS PANEL INSTALLATION DETAIL

1

SCALE: NTS

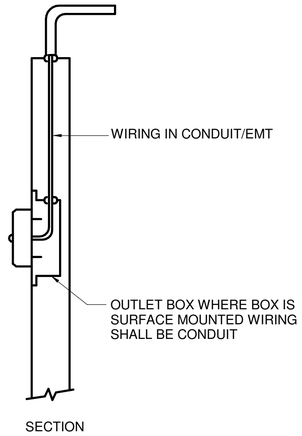



NOTES:
1. REFER TO SPECIFICATIONS FOR INSTALLATION REQUIREMENTS.
2. MINIMUM BENDING RADIUS OF AVERAGING TEMPERATURE ELEMENT IS 3 INCHES.
3. SENSOR SUPPORT BRACKET ATTACHED TO DUCT WITH BOLTS.

## DUCT TEMPERATURE SENSOR INSTALLATION (AVERAGING TYPE)

2

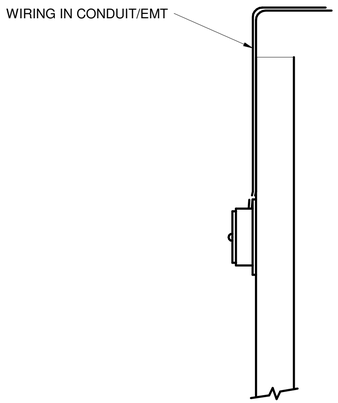
SCALE: NTS




## TEMPERATURE SENSOR INSTALLATION (FINISHED WALL MOUNTING)

3

SCALE: NTS




## TEMPERATURE SENSOR INSTALLATION (UNFINISHED WALL MOUNTING)

4

SCALE: NTS

LEGEND:

SOUTH CAVERN (FUTURE)

BASE SCOPE

| REV. | DATE | DESCRIPTION |
|---|---|---|
| 5 | 10/01/20 | 90% FD UPDATE |
| 4 | 08/21/20 | 90% DRAFT FD UPDATE |
| 3 | 05/03/19 | 100% FD SUBMISSION |
| 2 | 02/22/19 | 90% FD SUBMISSION |
| 1 | 11/16/18 | 60% FD SUBMISSION |

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Davis Brody Bond
Architects and Planners

SCALE:

Fermilab
Long-Baseline Neutrino Facility

| | | |
|---|---|---|
| DESIGNED | JV | ARUP |
| DRAWN | JV | ARUP |
| CHECKED | SA | ARUP |

# LBNF-FSCF-BSI
## UNDERGROUND, MECHANICAL CONTROLS SHEET 12

DRAWING NO. 15-1-6K U1-FD-M-912 REV. 5

10/01/20

NOT FOR CONSTRUCTION