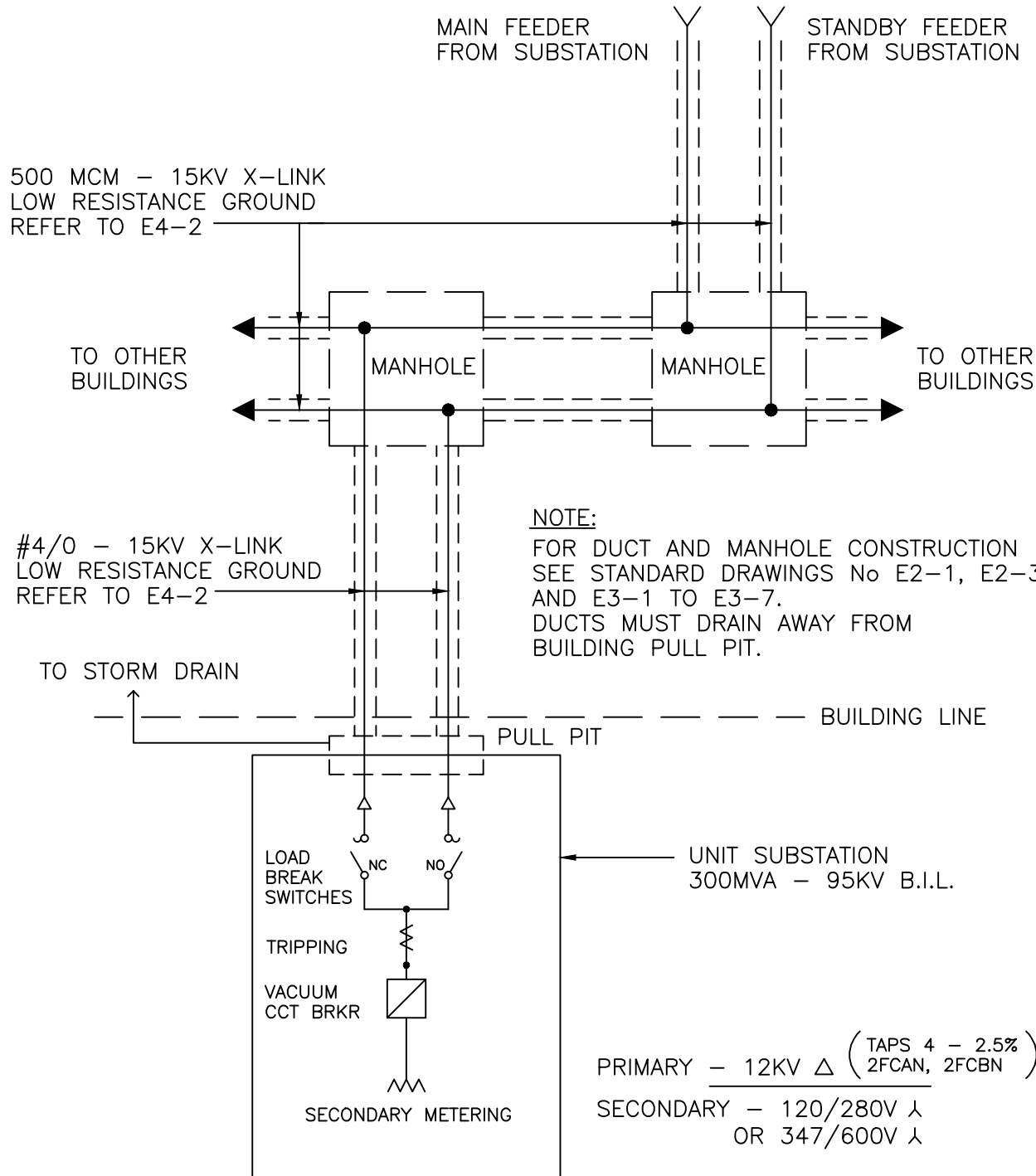


SYSTEM VOLTAGE
12.48KV LOW RESISTANCE GROUNDED

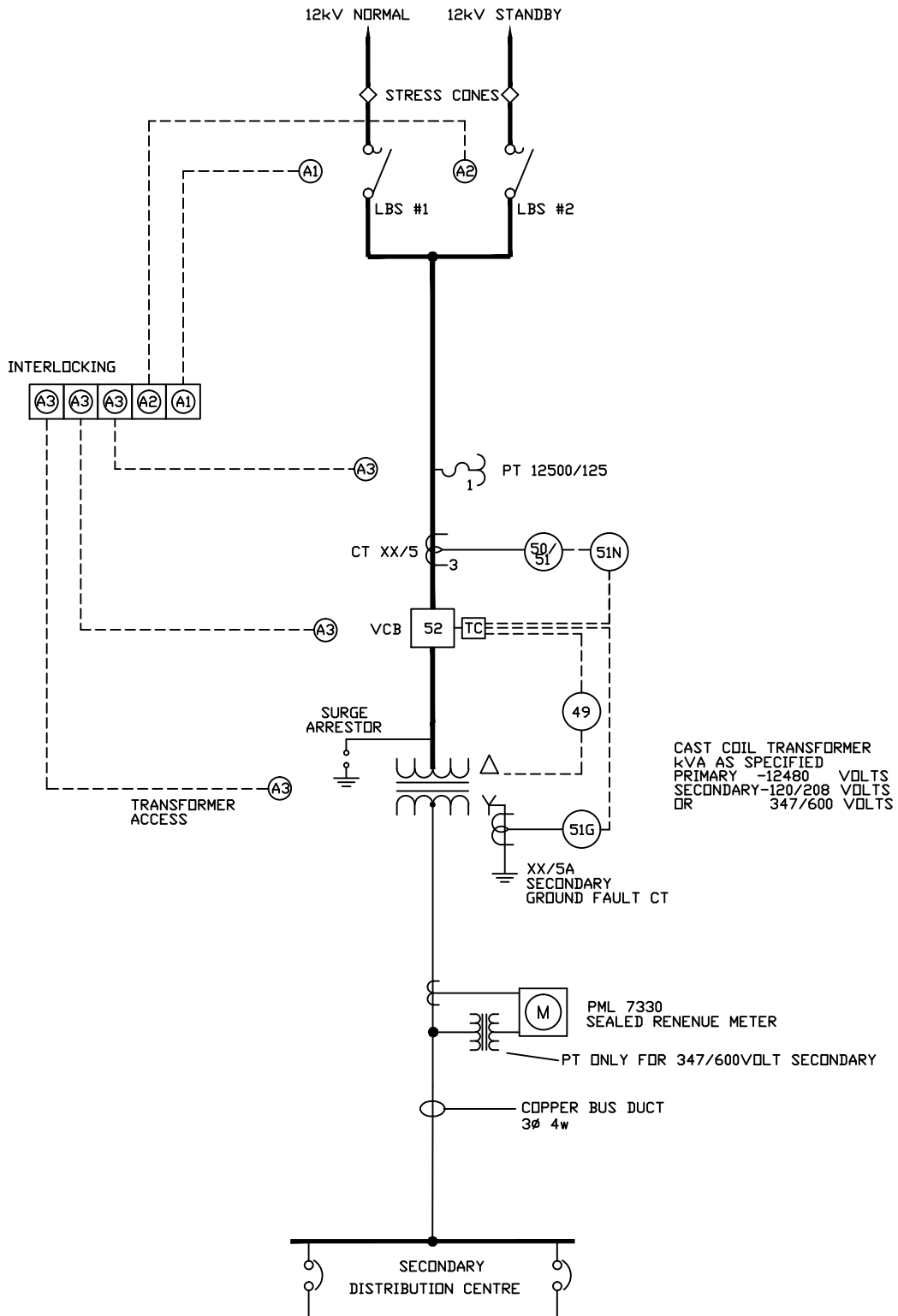


UBC UTILITIES
UNIVERSITY OF BRITISH COLUMBIA

REVISION: 1
DATE: 11/12/02
DRAWN: RNH
APPROVED: KH

SINGLE LINE DIAGRAM
DISTRIBUTION SYSTEMS
12KV DUAL RADIAL FEEDERS
TYPICAL BUILDING SUPPLY

STANDARD No
E1-1



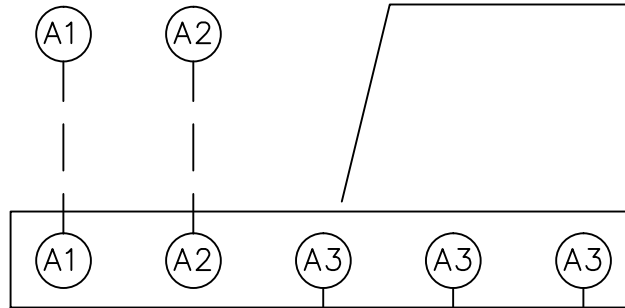
UBC UTILITIES
 UNIVERSITY OF BRITISH COLUMBIA

REVISION: 1
 DATE: 11/12/02
 DRAWN: RNH
 APPROVED: KH

ELECTRICAL UNIT SUBSTATION
 ONE LINE DIAGRAM

STANDARD No
E1-2

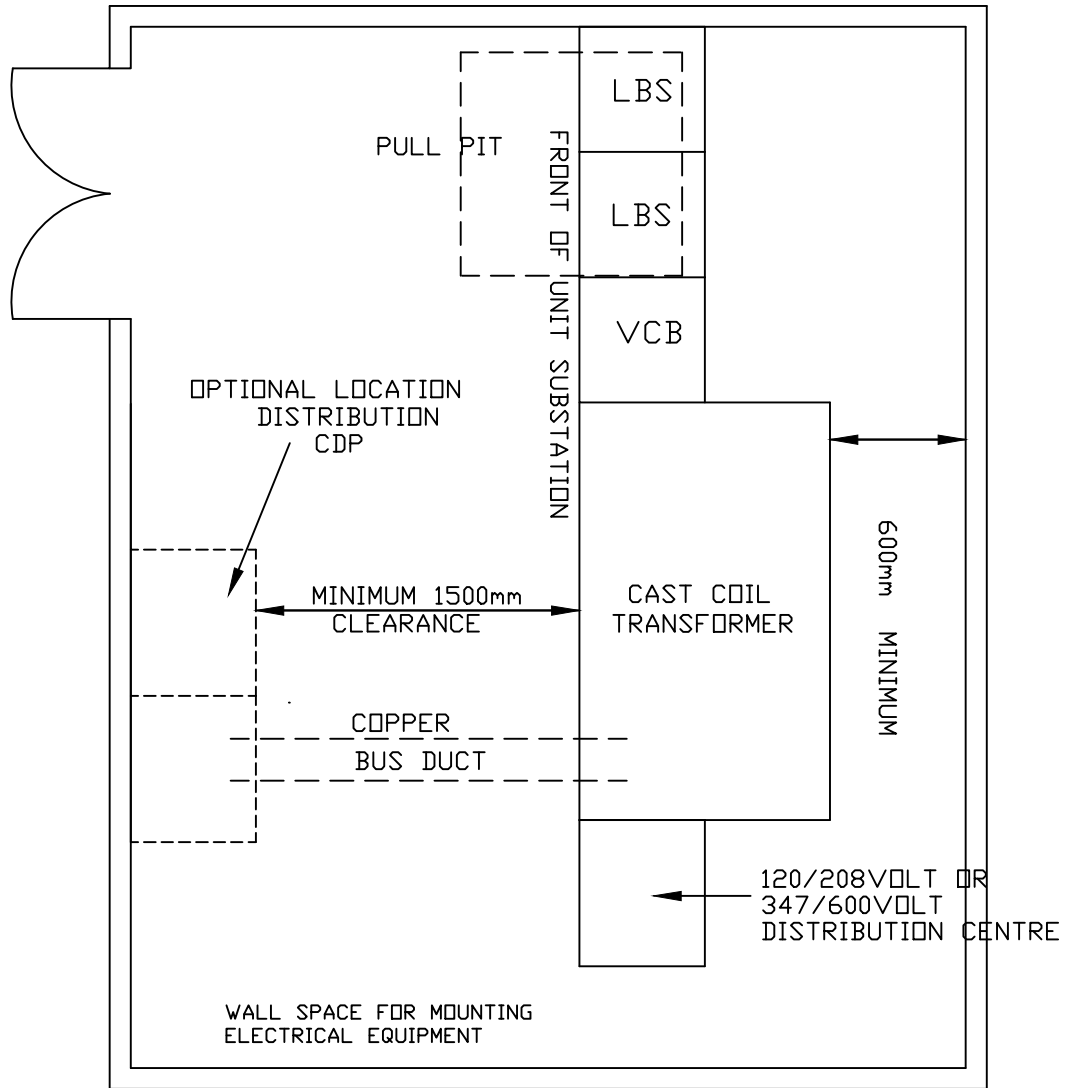
LBS #1 LBS #2
NORMAL STANDBY



KEYS A1 AND A2 TO BE
IN POSITION BEFORE
A3 KEYS ARE RELEASED

NOTES

1. ACCESS TO ALL HIGH VOLTAGE EQUIPMENT IS TO BE INTERLOCKED USING KEY A3 AS DESCRIBED BELOW.
2. A1 KEY IS RELEASED WHEN LBS #1 IS IN OPEN POSITION
A2 KEY IS RELEASED WHEN LBS #2 IS IN OPEN POSITION
A3 KEYS ARE RELEASED WHEN KEYS A1 & A2 ARE INSERTED INTO KEY EXCHANGE
WHEN AN A3 KEY IS REMOVED, KEYS A1 & A2 REMAIN CAPTIVE



* MINIMUM CEILING HEIGHT 10'

| TYPICAL DIMENSIONS | W | D | H |
|---------------------|--------------|--------------|--------------|
| LBS | 36" (915mm) | 36" (915mm) | 90" (2300mm) |
| VCB | 36" (915mm) | 36" (915mm) | 90" (2300mm) |
| TRANSFORMER-500kVA | 88" (2250mm) | 66" (1700mm) | 72" (1850mm) |
| TRANSFORMER-750kVA | 96" (2450mm) | 66" (1700mm) | 90" (2300mm) |
| TRANSFORMER-1000kVA | 96" (2450mm) | 66" (1700mm) | 90" (2300mm) |
| TRANSFORMER-1500kVA | 96" (2450mm) | 66" (1700mm) | 90" (2300mm) |

* LAYOUT BASED ON NO REAR ACCESS TO EQUIPMENT

1. UTILITIES JURISDICTION

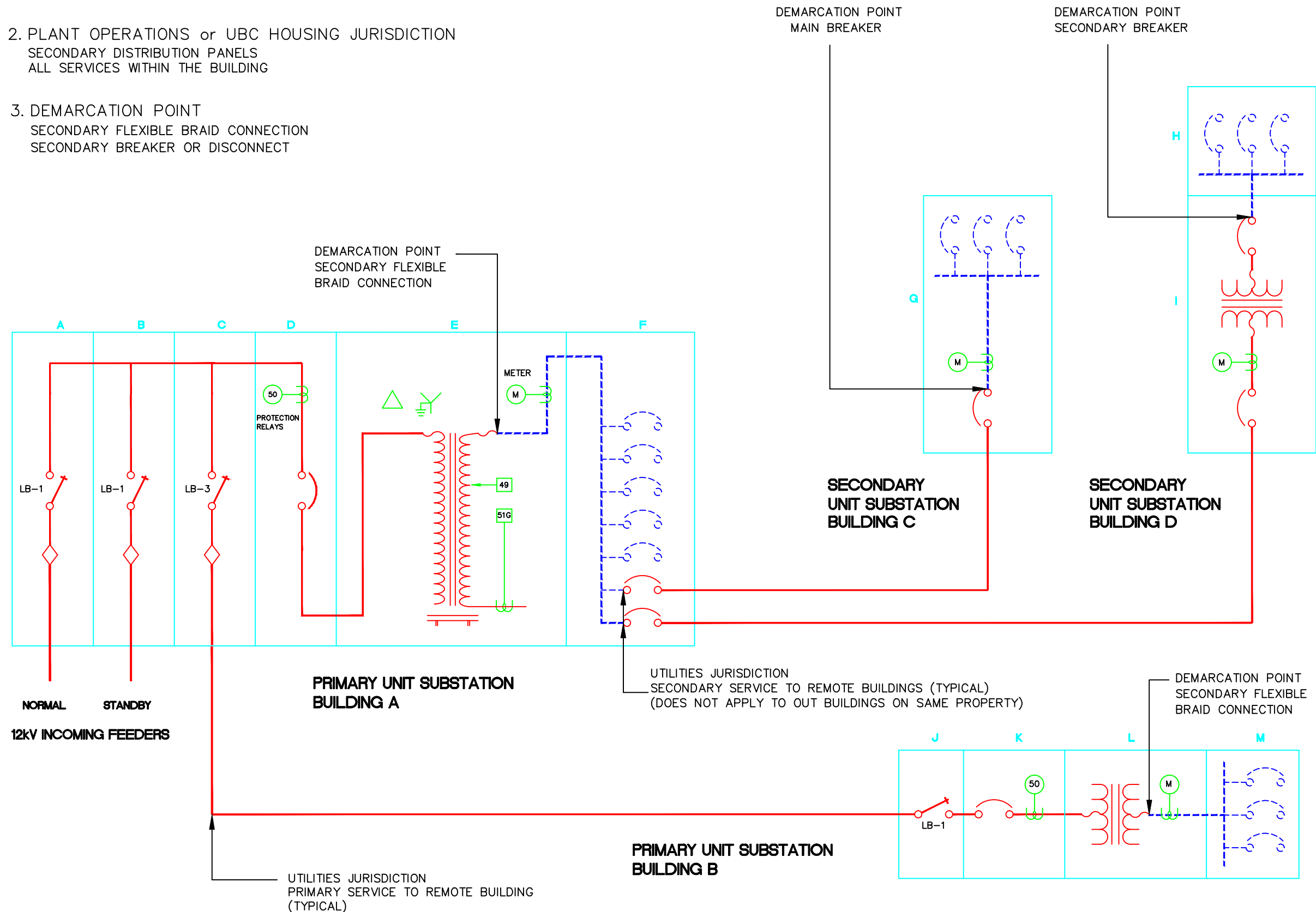
ALL HV EQUIPMENT & TRANSFORMER
 ALL SERVICE PROTECTION & METERING
 ALL SERVICES TO REMOTE BUILDINGS (NOT ON SAME PROPERTY)

2. PLANT OPERATIONS or UBC HOUSING JURISDICTION

SECONDARY DISTRIBUTION PANELS
 ALL SERVICES WITHIN THE BUILDING

3. DEMARCATION POINT

SECONDARY FLEXIBLE BRAID CONNECTION
 SECONDARY BREAKER OR DISCONNECT



LEGEND

RED SOLID LINES INDICATES UTILITIES JURISDICTION (POWER)

GREEN SOLID LINES INDICATES UTILITIES JURISDICTION (PROTECTION & METERING)

BLUE DASHED LINES INDICATES PLANT OPERATIONS JURISDICTION (SECONDARY FEEDS W/I BLDGS)

CYAN SOLID LINES INDICATES SUBSTATION CELL ARRANGEMENT

50 PROTECTIVE RELAYS

51G PROTECTIVE RELAYS

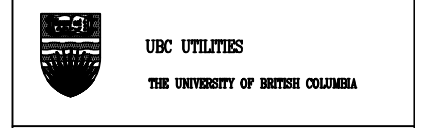
M REVENUE METER

○ LOAD BREAK SWITCH

○ CIRCUIT BREAKER

~ FLEXIBLE BRAID LINK

| 3 | 17/04/08 | DRAWING MODS | RNH |
|-----|----------|-------------------|-----|
| 2 | 23/11/99 | APPROVED AS SHOWN | RD |
| 1 | 18/11/99 | ISSUED FOR REVIEW | RD |
| NO. | DATE | REVISIONS | BY |



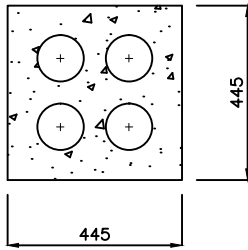
BUILDING/FACILITY
 ELECTRICAL UTILITY SERVICES

PROJECT TITLE
 ELECTRICAL JURISDICTION UTILITIES, PLANT OPERATIONS & UBC HOUSING

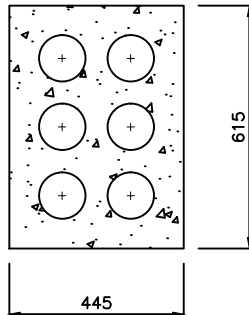
DRAWING TITLE
 JURISDICTIONAL BLOCK DIAGRAM

| | | | |
|-----------------|----------|-------------|----------|
| SCALE | NTS | DATE | 11/12/02 |
| DRAWN | RD | E1-5 | |
| REVIEWED | KH | | |
| CAD FILENAME | E1-5.DWG | | |
| UBC PROJECT NO. | | | |

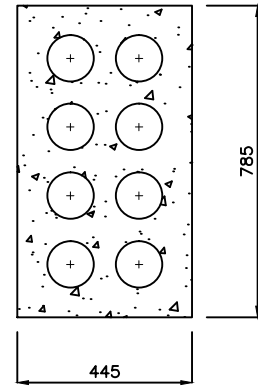
THIS DRAWING IS INTENDED TO SHOW EQUIPMENT OPERATIONS AND CONTROL JURISDICTION. IT DOES NOT NECESSARILY INDICATE EQUIPMENT OWNERSHIP



4 DUCT BANK



6 DUCT VERTICAL
OR HORIZONTAL

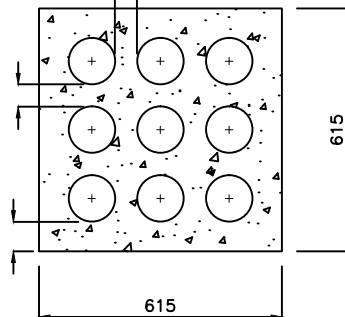


8 DUCT VERTICAL
OR HORIZONTAL

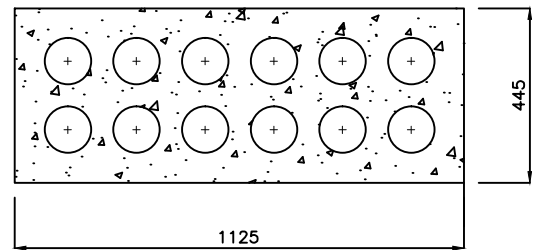
45mm SEPARATION
(Typical on all sections)

45mm SEPARATION
(Typical on all sections
except at MH windows)

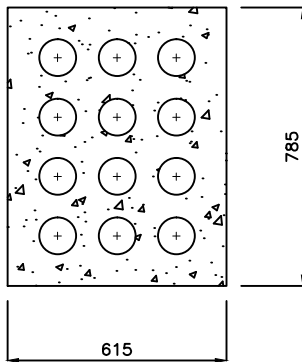
75mm CONCRETE COVER
(Typical on all sections)



9 DUCT BANK



12 DUCT HORIZONTAL

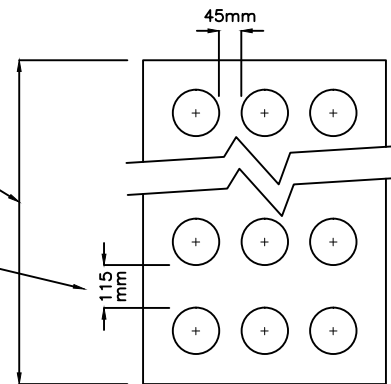


12 DUCT BANK

OVERALL DIMENSIONS OF
WINDOW SHALL BE
GOVERNED BY DUCT
BANK SIZE

VERTICAL SEPARATION
AT MANHOLE WINDOW
(TYPICAL)

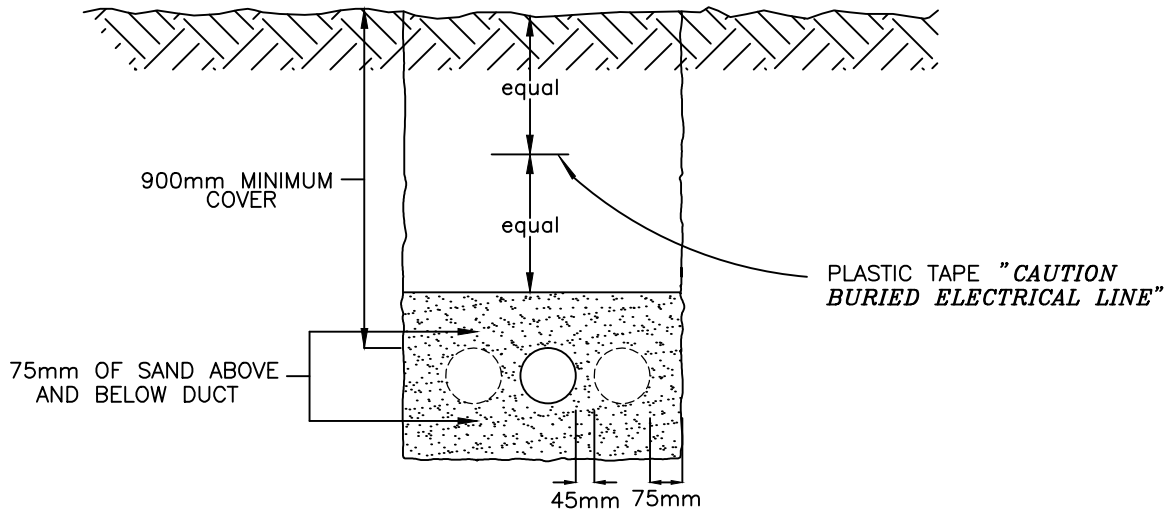
Note: The vertical separation from
45mm to 115mm shall be developed
gradually starting 6m from the
outside wall of the manhole.



SECTION AT MANHOLE WINDOW

Notes:

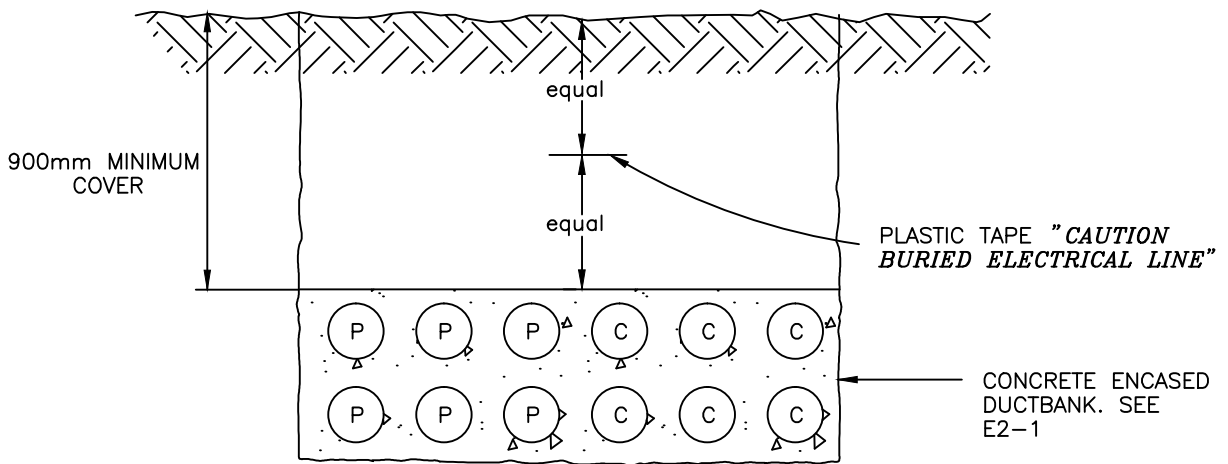
- All duct sizes shall be 125mm DB-2.
- 100mm ducts used by permission only.
- All ducts must drain away from building pull pit.



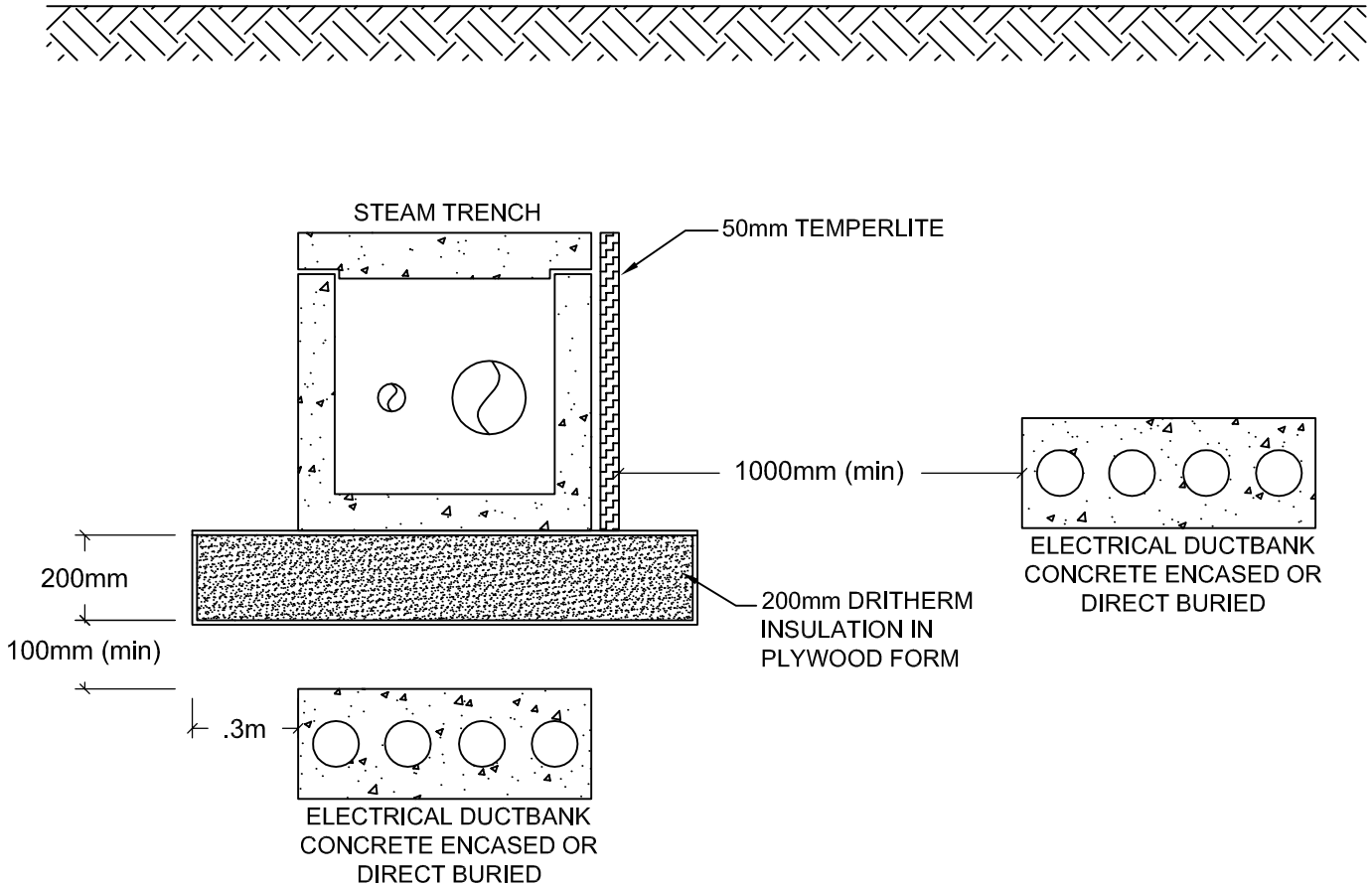
TYPICAL TRENCH DETAIL
FOR DIRECTLY BURIED ELECTRICAL CONDUIT

Notes:

- All power conduits shall be Rigid PVC conduit.
- All conduits used for building services shall be minimum 100mm diam.



TYPICAL TRENCH DETAIL
FOR CONCRETE ENCASED DUCTBANK

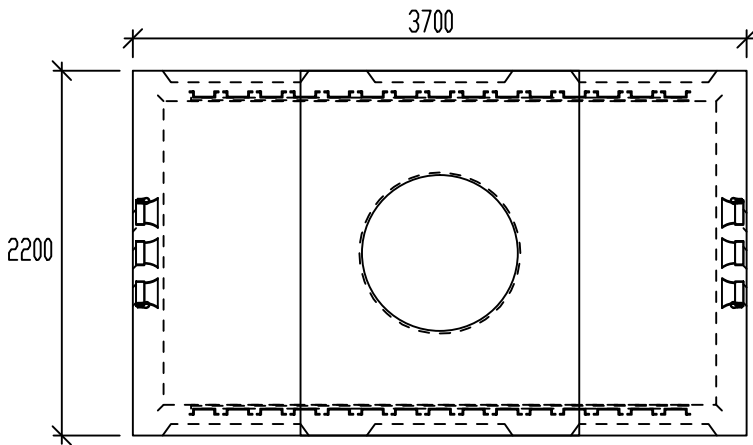


NOTES:

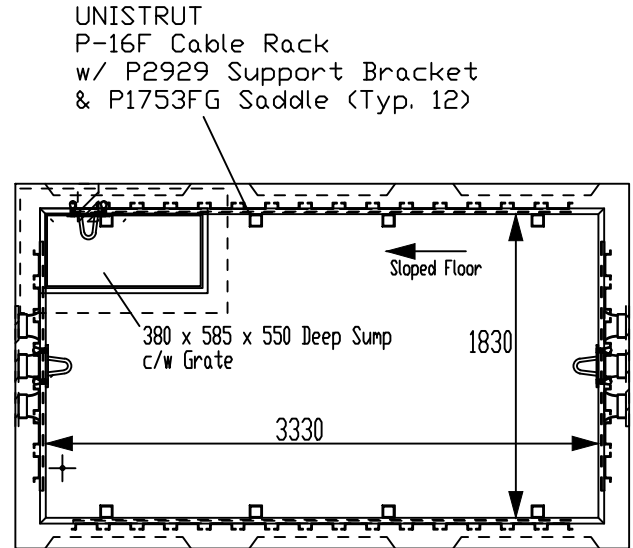
1. ALL MEASUREMENTS ARE BASED ON THE STEAM DISTRIBUTION CONCEALED WITHIN CONCRETE TRENCH.
2. FOR DIRECT BURIED STEAM DISTRIBUTION PIPING REFER TO BC HYDRO CIVIL STANDARD ES 54 H4 (sh 1-3).
3. IN ALL CASES, ELECTRICAL DUCTBANK SHALL NOT RUN PARALLEL TO STEAM TRENCH FOR LONGER THAN 10m.
4. IN ALL CASES, ELECTRICAL DUCTBANK SHALL NOT RUN DIRECTLY ABOVE STEAM LINES EXCEPT AT CROSSINGS.
5. DRITHERM PRODUCT AVAILABLE FROM:
 - BURNABY INSULATION SUPPLIES
5970 BERESFORD ST.
BURNABY, BC
604-430-6981

A.E. CONCRETE MANHOLE

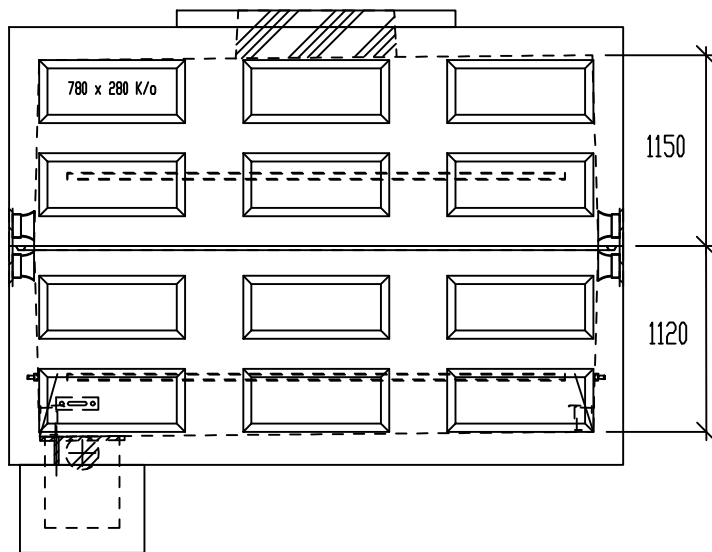
Custom UBC #331822



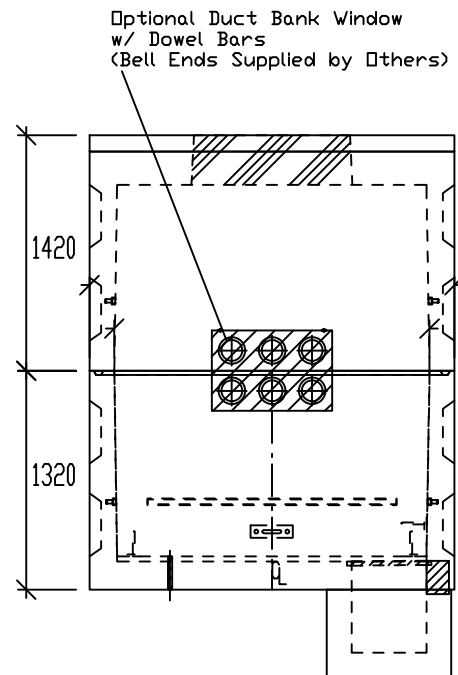
Plan View - Top



Plan View - Bottom



Side View



End View

General Notes:

- Lifting loops cast in.
- Cement to CAN / CSA A5-93 Portland Cement.
- Reinforcing steel to CSA G-30.18-M92 Grade 400.
- Minimum concrete strength 35 MPa @ 28 Days.
- Interior to be painted white to 150mm from floor
- Exterior to be coated with black damp proofing

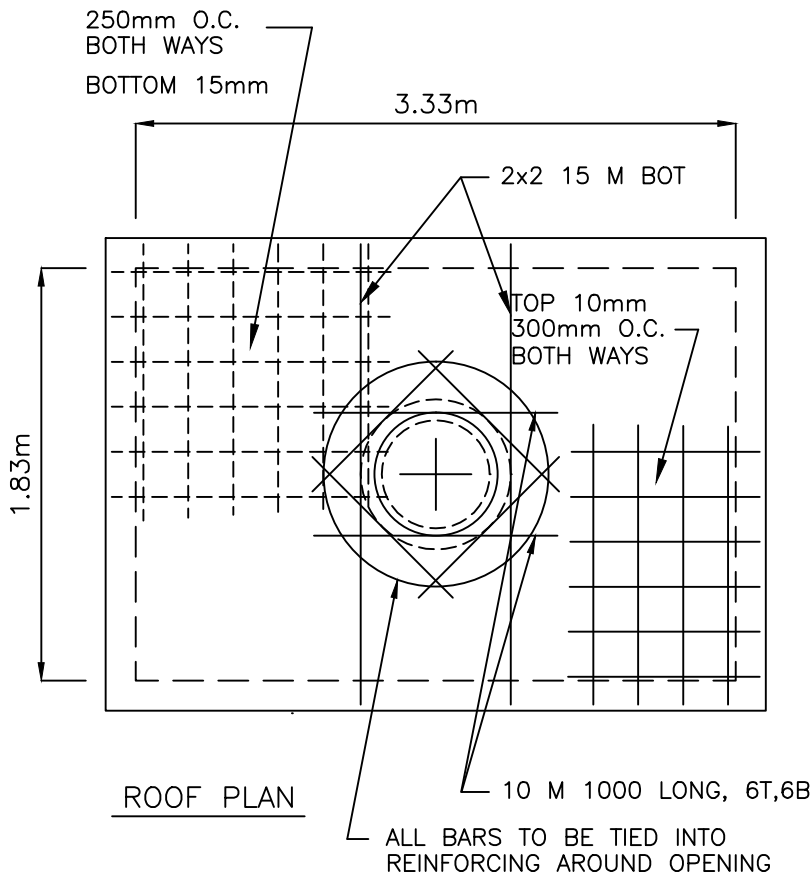
REVISION: 1
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 APPROVED: KH

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 UNIVERSITY OF BRITISH COLUMBIA

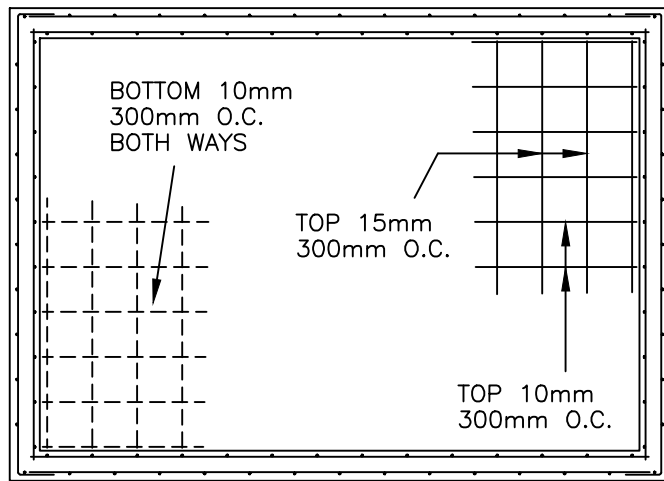
STANDARD ELECTRICAL PRECAST MANHOLE

STANDARD No

E3-1



ROOF PLAN



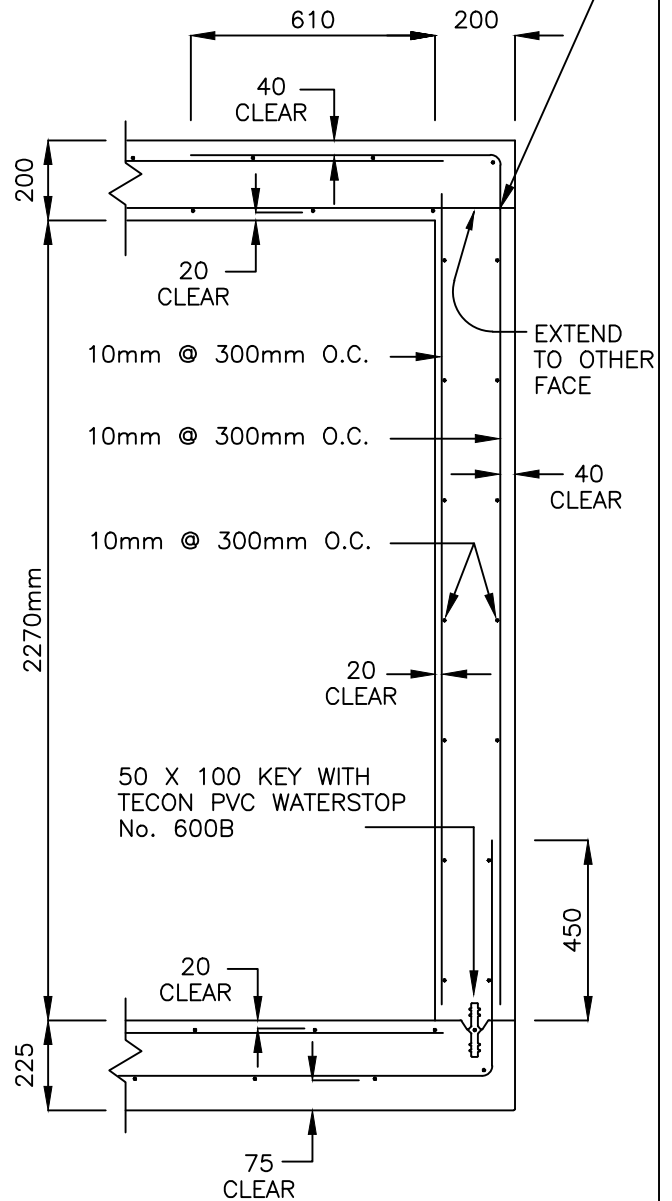
FLOOR PLAN

NTS

NOTES:

1. CEMENT TO CSA CAN3-A5, TYPE 10 NORM
2. CONCRETE TO MEET CSA-A23.1-94 EXPOSURE C-1 CONCRETE 35MPA AT 28 DAYS
3. REINFORCING STEEL TO CSA-G30.18, 400MPA
4. DESIGN STRUCTURE FOR CS-600 LOADING
5. PROVIDE 19X450 EYEBOLTS FOR PULLING, SLACAN 9970, CAST INTO EACH INSTALLED DUCT BANK. POSITION EYE BASE AT INSIDE EDGE OF MANHOLE.
6. ALL DIMENSIONS IN MILLIMETERS (mm)
7. REFER TO A.E. CONCRETE CHAMBER 331822 FOR TYPICAL MANHOLE DIMENSIONS
8. CONTRACTOR TO CAST BELL ENDS FOR DUCT ENTRY INTO MANHOLE AS REQUIRED, DO NOT DAMAGE REINFORCING STEEL

ADDITIONAL CORNER BARS TYPICAL ALONG PERIMETER 15 M @ 300



TYPICAL WALL SECTION

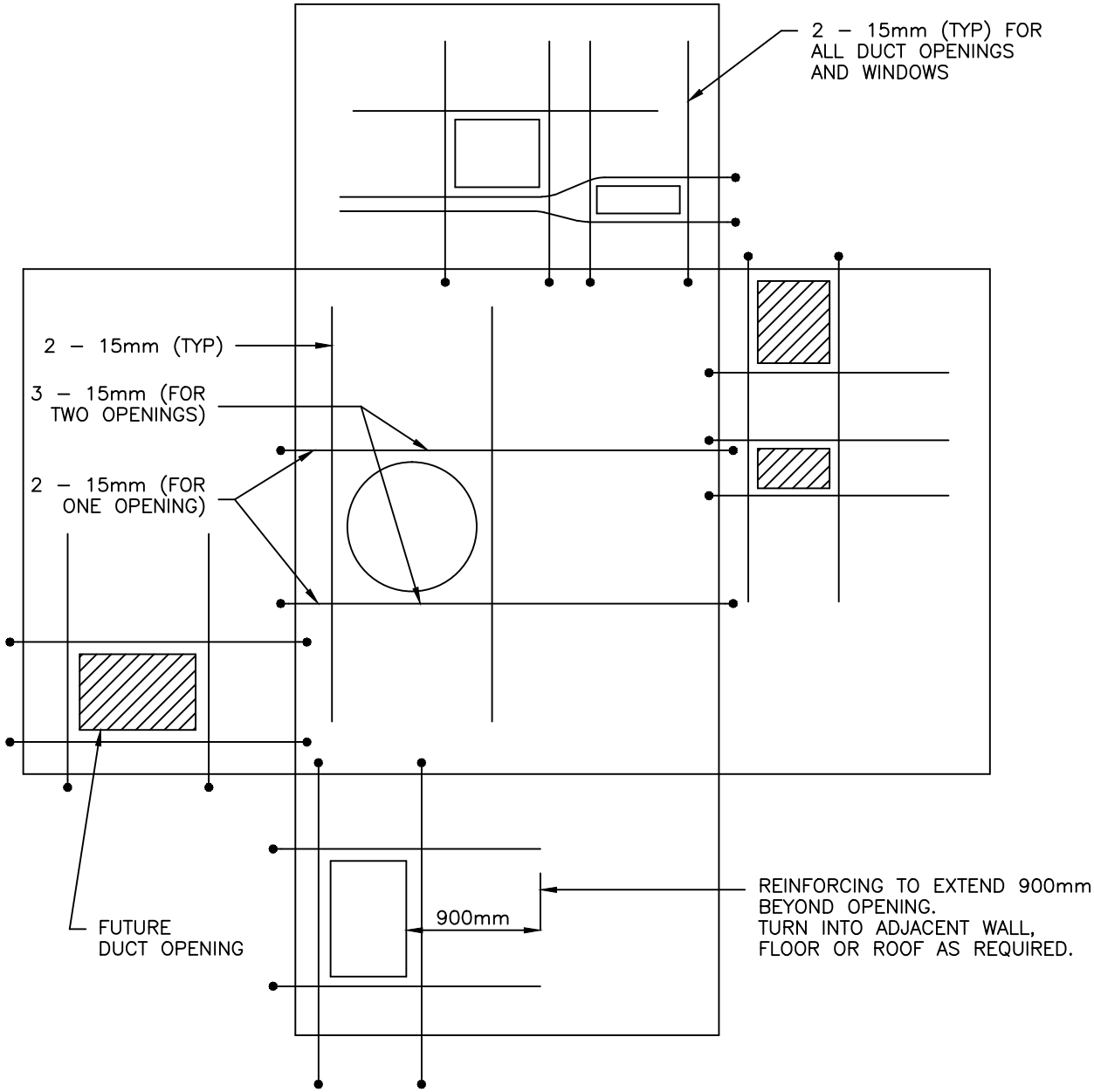
NTS

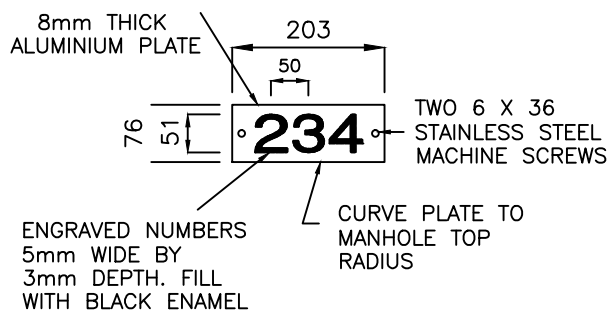
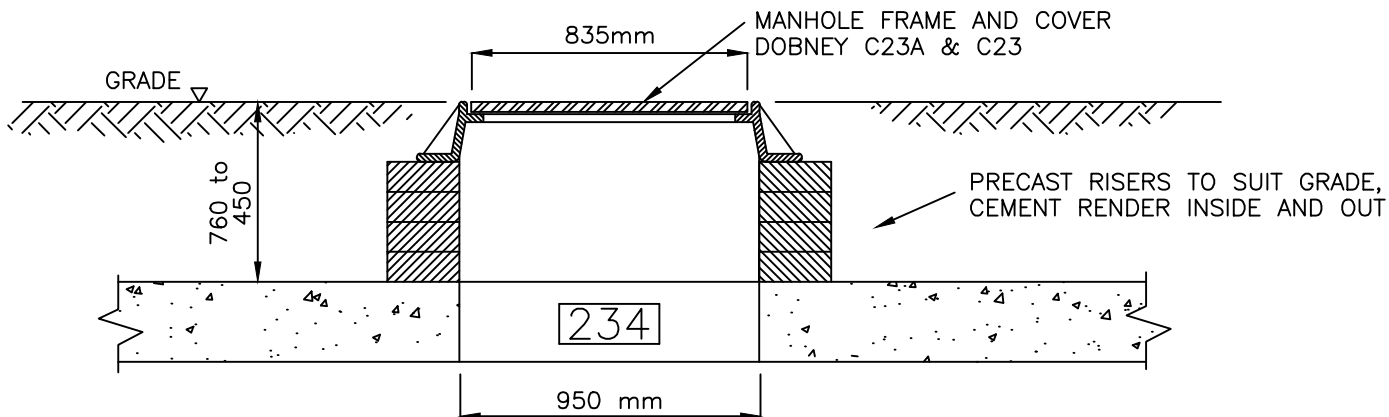
AT ANY WINDOW OR DUCT ENTRY LOCATION

1. PROVIDE 2-15 M E.F. EACH SIDE OF WALL OPENING, VERTICALLY FROM TOP TO BOTTOM.
2. WINDOW SHOULD BE A MIN OF 400 FROM CORNER
3. CORNERS OF WINDOW, IF SAW CUT IN FIELD, MUST BE CORED.
4. WINDOW KNOCKOUTS NOT TO BE PROVIDED. CORE INDIVIDUAL HOLES FOR EACH DUCT TO SUIT DUCT BANK ENTRY LOCATION.

REINFORCING SHOWN IS IN ADDITION TO THAT SHOWN ON STANDARD DRAWING No. E3-2

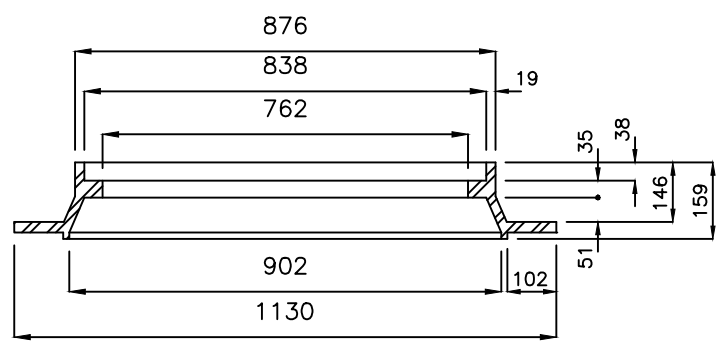
REINFORCING IS TYPICAL FOR OPENINGS IN WALLS AND ROOF.



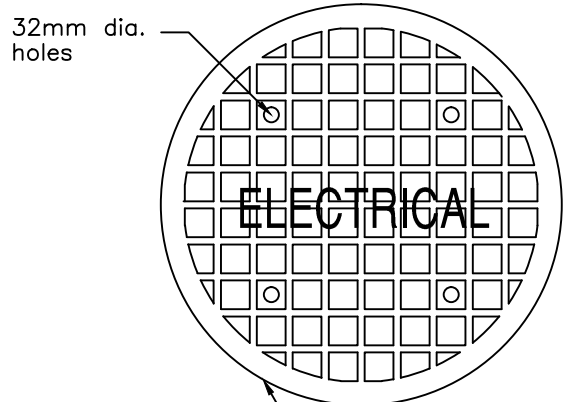


MANHOLE NUMBERING DETAIL

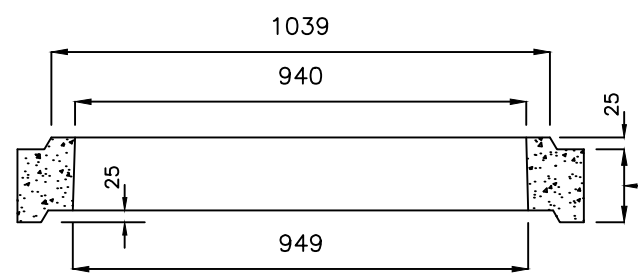
MANHOLE COVER PLAN
Dobney #C23A



MANHOLE FRAME SECTION
Dobney C23 Frame

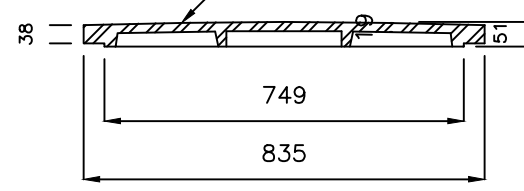


CAST IRON COVER,
DOBNEY FOUNDRY CO.
NO. C23A, 109 Kg WT.
STOCK #400-0411



COVER RISER SECTION

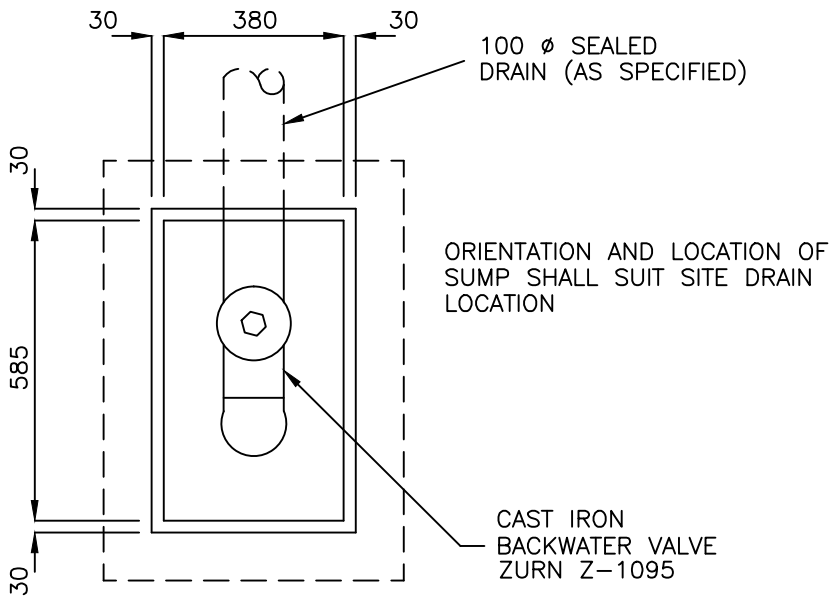
PRECAST
CONCRETE RISER
a 150 HIGH
b 125 HIGH
c 100 HIGH
AE CONCRETE #
SVTZ-41-XXXX



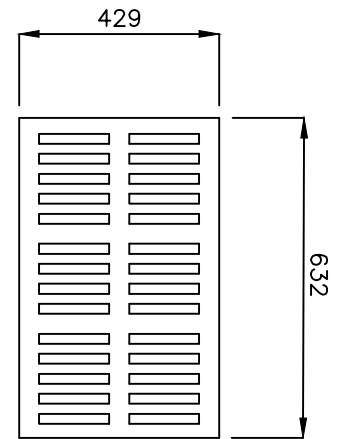
MANHOLE COVER SECTION
Dobney #C23A COVER

NOTES: (FOR PRECAST ITEM)

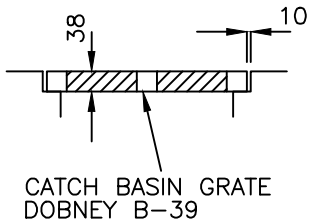
1. MANHOLE MANUFACTURED BY A.E. CONCRETE PRECAST PRODUCTS LTD.
2. CONCRETE TO CSA CAN3-A5, TYPE 10 NORM
3. CONCRETE STRENGTH 35MPA AT 23 DAYS
4. REINFORCING STEEL TO CSA 630-12 GR40
5. DESIGNED FOR HS20 WHEEL LOADING



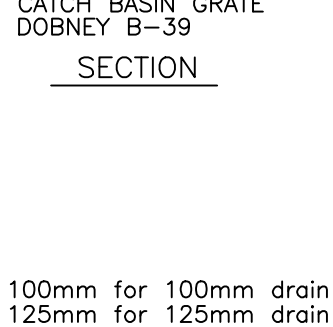
PLAN



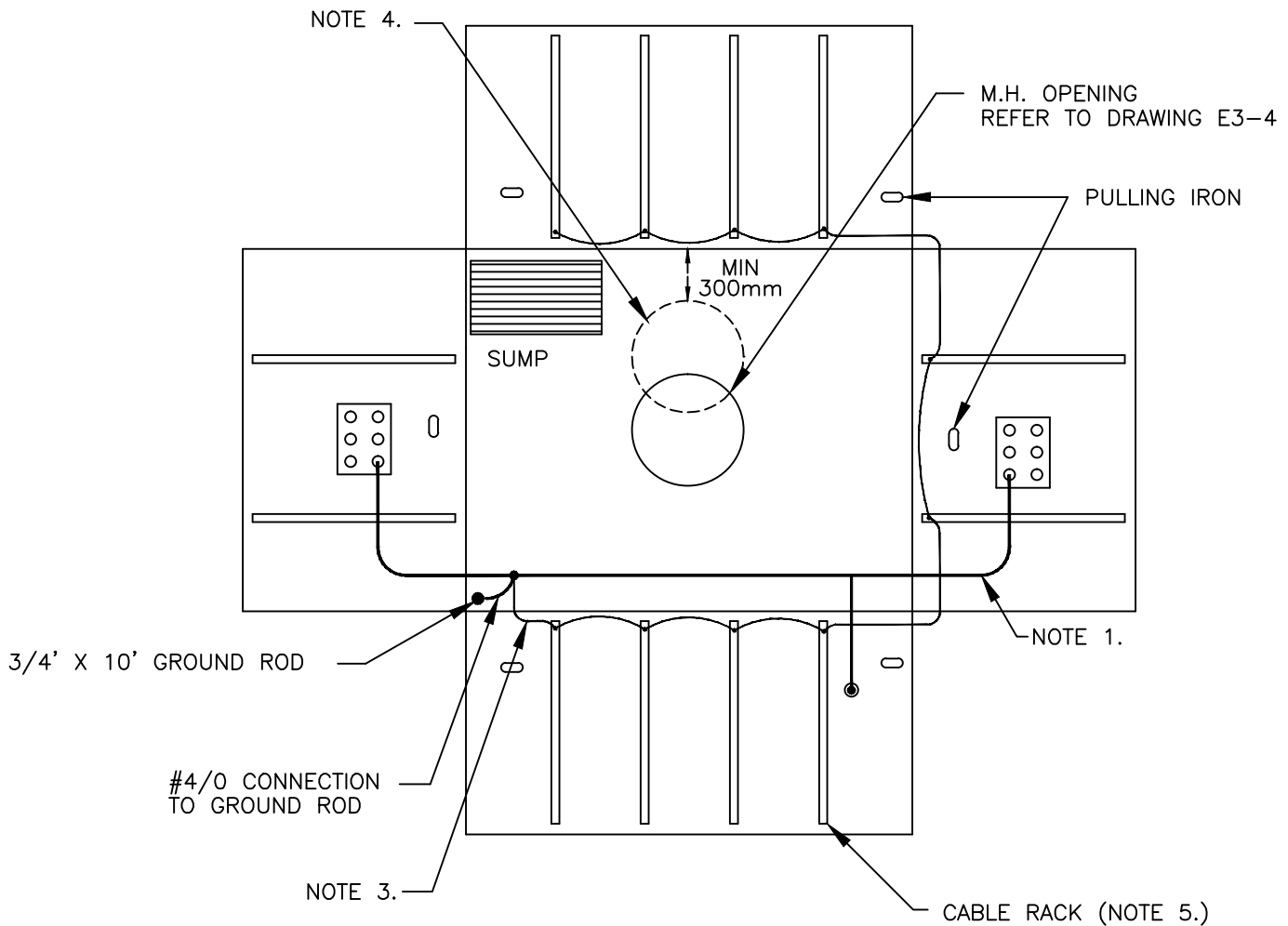
PLAN - SUMP COVER
Dobney # B-39



SECTION

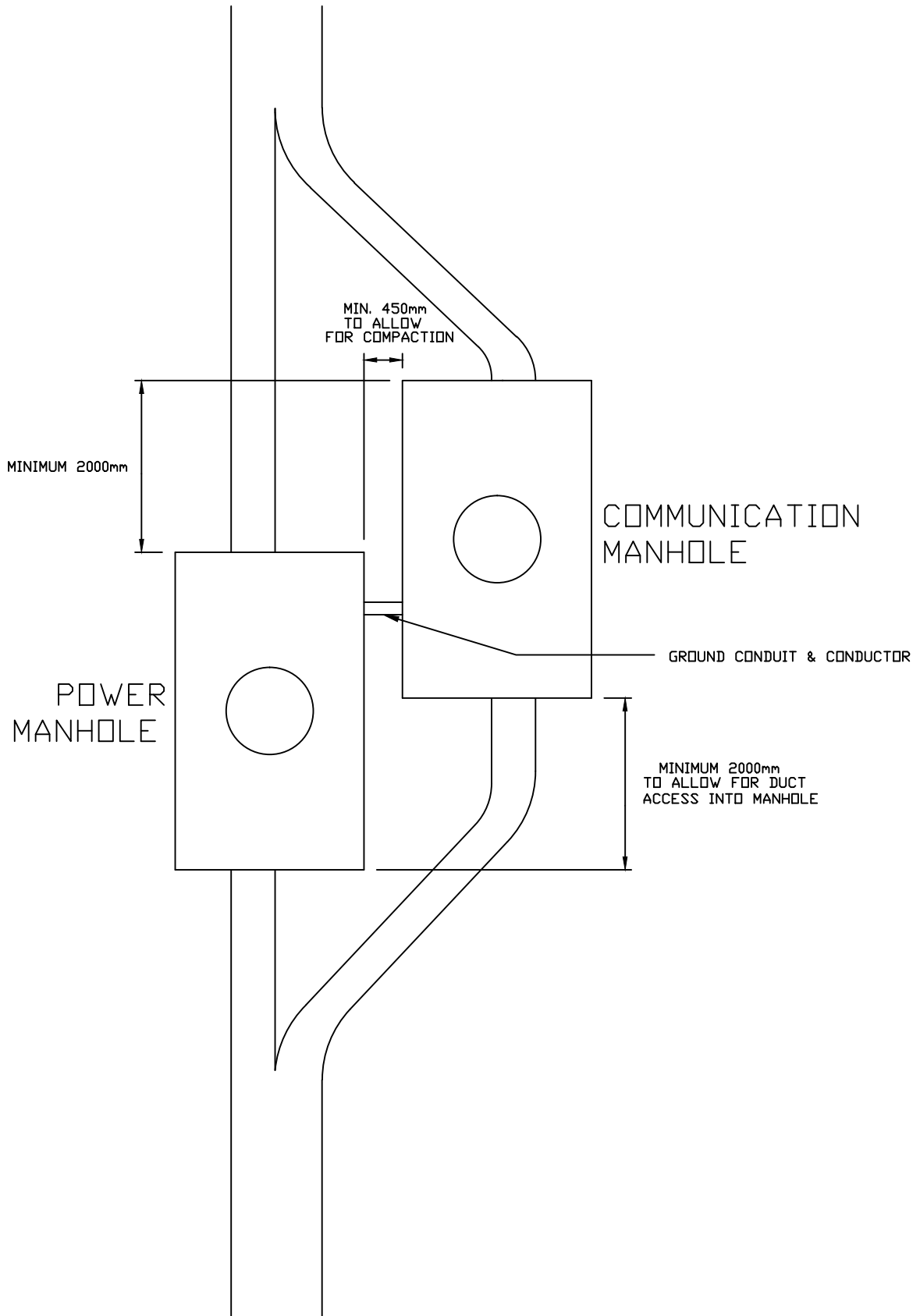


DETAILS OF SUMP AND SUMP COVER



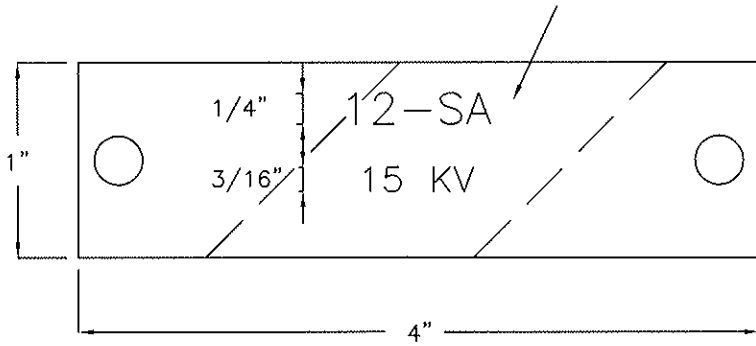
GROUNDING NOTES:

1. SYSTEM GROUND TO BE 500 MCM TW.
2. TAP CONDUCTOR TO GROUND ROD TO BE MIN. #4/0 AWG BARE Cu.
3. BONDING OF ALL NON-CURRENT CARRYING METAL PARTS (CABLE RACKS, SHEATHS, ETC.) TO BE MIN. #2 AWG BARE Cu.
4. MANHOLE OPENING MAY BE OFFSET FROM CENTRE BUT MAINTAIN MINIMUM 300mm DISTANCE BETWEEN OUTSIDE EDGE OF OPENING & INSIDE EDGE OF MANHOLE
5. MOUNT CABLE RACKING AS SHOWN. 4 STRUTS TO BE ON EACH SIDE WALL. 2 STRUTS TO BE ON EACH END WALL. MOUNT 1 BRACKET ON EACH STRUT AT MIDPOINT.

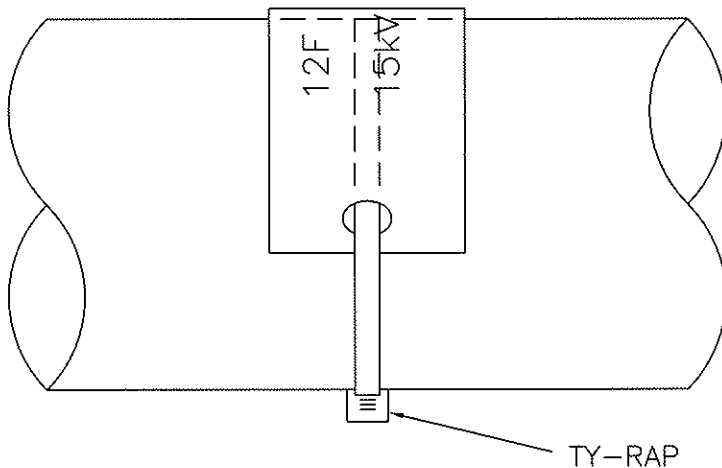
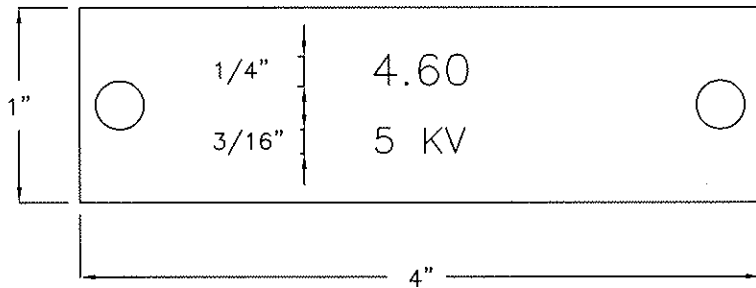


12KV SYSTEM

1" COLORED STRIPE
WHERE APPLICABLE



4KV SYSTEM



12KV & 4KV SYSTEM

GENERAL NOTES:

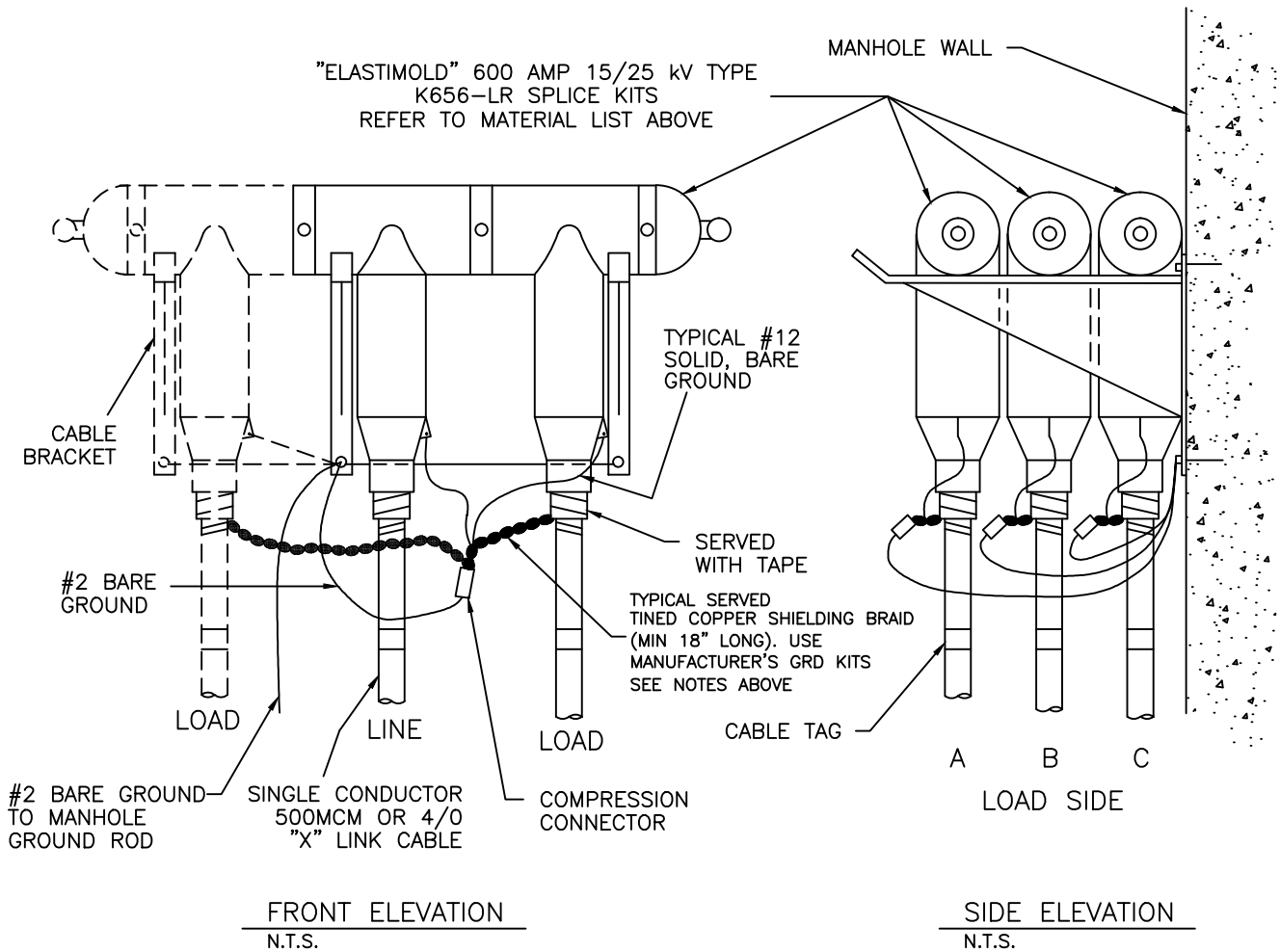
1. TAGS WITHIN MANHOLES SHALL BE INSTALLED ON EVERY CABLE AT EACH DUCT ENTRY AND AT ALL SPLICES.

NOTE:

1. TAGS ARE ALUMINUM .018 ADDRESS -O-COLOR AND ARE TYPED ON AN ADDRESSOGRAPH PRINTER.
2. THE HOLES SHALL BE ENLARGED TO 1/4"Ø WITH A METAL PUNCH TO ACCEPT A SELF-LOCKING NYLON TY-RAP T+B #TY528MX.
3. COLORS ARE:
 - FEEDER 12-S - YELLOW
 - FEEDER 12-SA - YELLOW WITH RED STRIPE
 - FEEDER 12-SH - YELLOW WITH BLUE STRIPE
 - FEEDER 12-SS - YELLOW WITH GREEN STRIPE
 - FEEDER 12-SB - YELLOW WITH WHITE STRIPE
 - FEEDER 12-F10 - GREEN
 - FEEDER 12-F11 - BLUE
 - FEEDER 12-F12 - ORANGE
 - FEEDER 12-F13 - GREEN WITH BLUE STRIPE
 - FEEDER 12-F14 - GREEN WITH RED STRIPE
 - FEEDER 12-F20 - RED
 - FEEDER 12-F21 - BROWN
 - FEEDER 12-F22 - PINK
 - FEEDER 12-F23 - RED WITH BLUE STRIPE
 - FEEDER 12-F24 - RED WITH YELLOW STRIPE
 - FEEDER 12-F25 - RED WITH WHITE STRIPE
 - FEEDER 12-F26 - BLUE WITH WHITE STRIPE
 - FEEDER 12-F27 - GREEN WITH WHITE STRIPE
 - FEEDER 12-28 - ORANGE WITH WHITE STRIPE
 - FEEDER 12-FSC32 - RED
 - FEEDER 12-FSC42 - BLUE
4. TAG DIMENSIONS AS SHOWN
TAG: 4" x 1"
FEEDER: 1/4" WIDE LETTERING
CABLE TYPE: 3/16" WIDE LETTERING
5. CABLE TAG SUPPLIER
GRAFF-RITE INDUSTRIES LTD.
#1-2054 KINGSWAY AVE.
PORT COQUITLAM, BC, V3C 1S5
TEL: 942-9699 / FAX: 942-1534

- INSTALLATION NOTES:**
1. TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS.
 2. GROUND COPPER CABLE SHIELD AT LINE SIDE OF EACH CABLE SECTION ONLY ISOLATE CABLE SHIELD AT LOAD SIDE AS PER DETAIL. LINE SIDE GRD KITS TO CONSIST OF EQUIV. #2 GROUNDING BRAID C/W SOLDER STOP. BRAID TO BE MIN 18" LONG, PLUS CONSTANT FORCE ROLL SPRING CLIP, INSULATING BODY & MASTIC SEAL STRIPS. KITS TO BE EQUIVALENT TO BC HYDRO STANDARD ES53-Z5-05
 3. USE 600 AMP TEE FITTINGS ONLY FOR BOTH 500MCM & 4/0 TAP CONDUCTORS AS PER MATERIAL LIST
 4. ALL INDIVIDUAL COMPONENTS TO BE REVIEWED & APPROVED BY MANUFACTURER & UBC UTILITIES PRIOR TO PURCHASE
 5. CONTACT HALLWOOD AGENCIES LTD (604-451-1401)

- MATERIAL LIST:**
1. ELASTIMOLD 600 A SERIES ELBOW HOUSING CAT# K656BLR
 2. ELASTIMOLD INSULATING PLUG CAT# K650BIP
 3. ELASTIMOLD CONNECTING PLUG CAT# K650CP
 4. ELASTIMOLD CABLE ADAPTERS FOR 4/0 CAT# 655CA-H or J (See Elastimold Table W7)
 5. ELASTIMOLD CABLE ADAPTERS FOR 500MCM CAT# 655CA-L (See Elastimold Table W7)
 6. ELASTIMOLD CABLE LUGS FOR 4/0 CAT# 03700270 (See Elastimold Table X6)
 7. ELASTIMOLD CABLE LUGS FOR 500MCM CAT# 03700330 (See Elastimold Table X6)
 8. GROUND KITS FOR 500MCM TO BE 3M CAT# 8461 OR RAYCHEM HVT-GRD2
 9. GROUND KITS FOR 4/0 TO BE 3M CAT# 8460 OR RAYCHEM HVT-GRD1
- CONTACTOR TO VERIFY COMPLETE PARTS LIST WITH MANUFACTURER PRIOR TO PURCHASE TO ENSURE COMPATIBILITY BETWEEN THE DIFFERENT CABLE MANUFACTURERS & ELASTIMOLD PARTS OBTAIN ADDITIONAL PARTS AS REQUIRED BY MANUFACTURER FOR A COMPLETE OPERATING SYSTEM



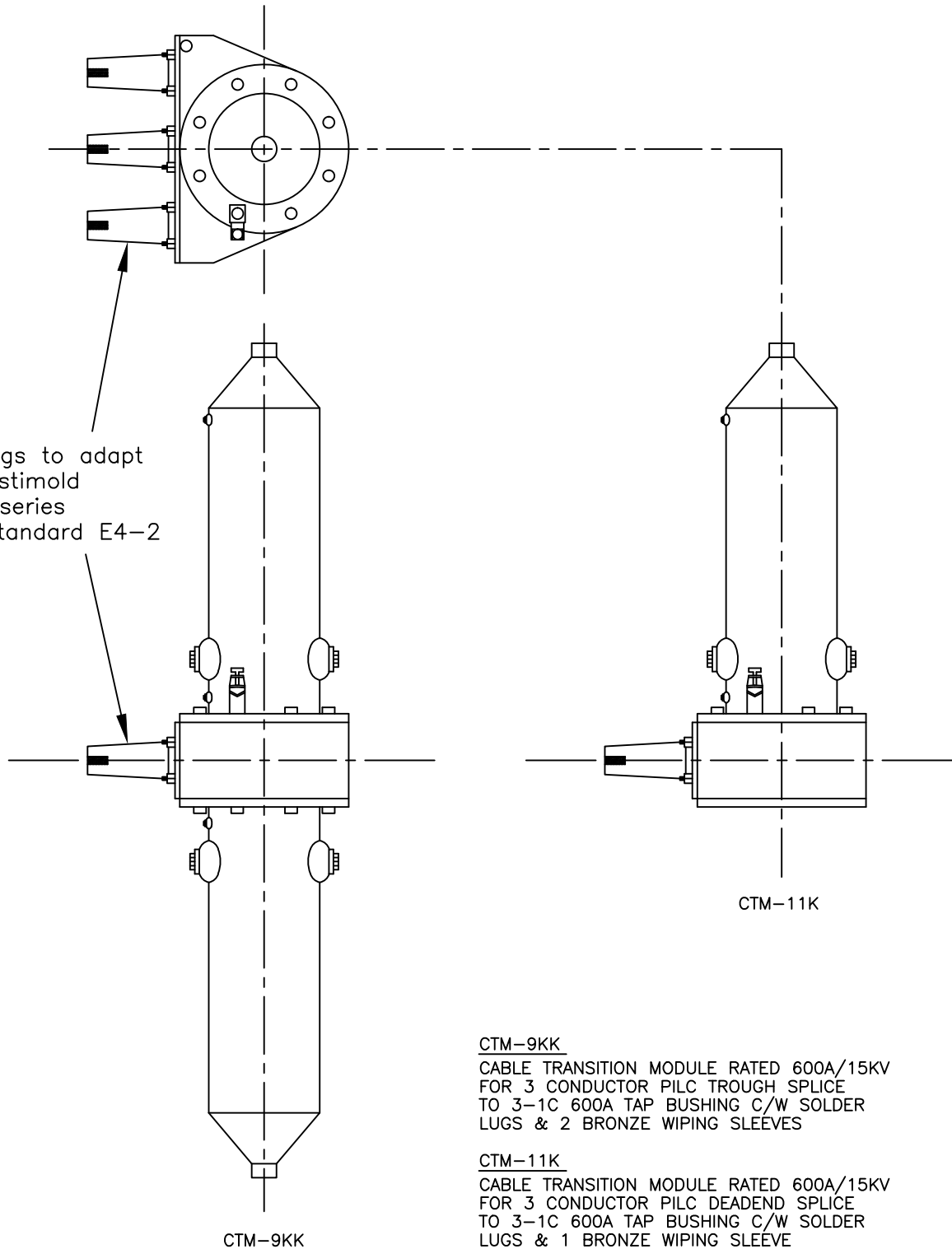
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DATE: 11/12/02
DRAWN: RNH
APPROVED: KH

ELASTIMOLD SPLICE CONNECTION
MOUNTING AND SHIELD GROUNDING DETAILS
FOR SPLICES BETWEEN 2 (OR MORE)
15 KV 'X'- LINK 500 MCM & 4/0 CABLES

STANDARD No

E4-2



CTM-9KK
 CABLE TRANSITION MODULE RATED 600A/15KV
 FOR 3 CONDUCTOR PILC TROUGH SPLICE
 TO 3-1C 600A TAP BUSHING C/W SOLDER
 LUGS & 2 BRONZE WIPING SLEEVES

CTM-11K
 CABLE TRANSITION MODULE RATED 600A/15KV
 FOR 3 CONDUCTOR PILC DEADEND SPLICE
 TO 3-1C 600A TAP BUSHING C/W SOLDER
 LUGS & 1 BRONZE WIPING SLEEVE

SHOWN IS TYPICAL ASSEMBLY DRAWING OF
 CTM MODULE COMPLETE WITH SPUN COPPER
 ALLOY SLEEVES.

UBC UTILITIES
 UNIVERSITY OF BRITISH COLUMBIA

REVISION: 1
 DATE: 11/12/02
 DRAWN: RNH
 APPROVED: KH

PATTON & COOKE TRANSITION SPLICE
 KIT TYPE CTM FOR 500 MCM
 PILC 15 KV CABLES

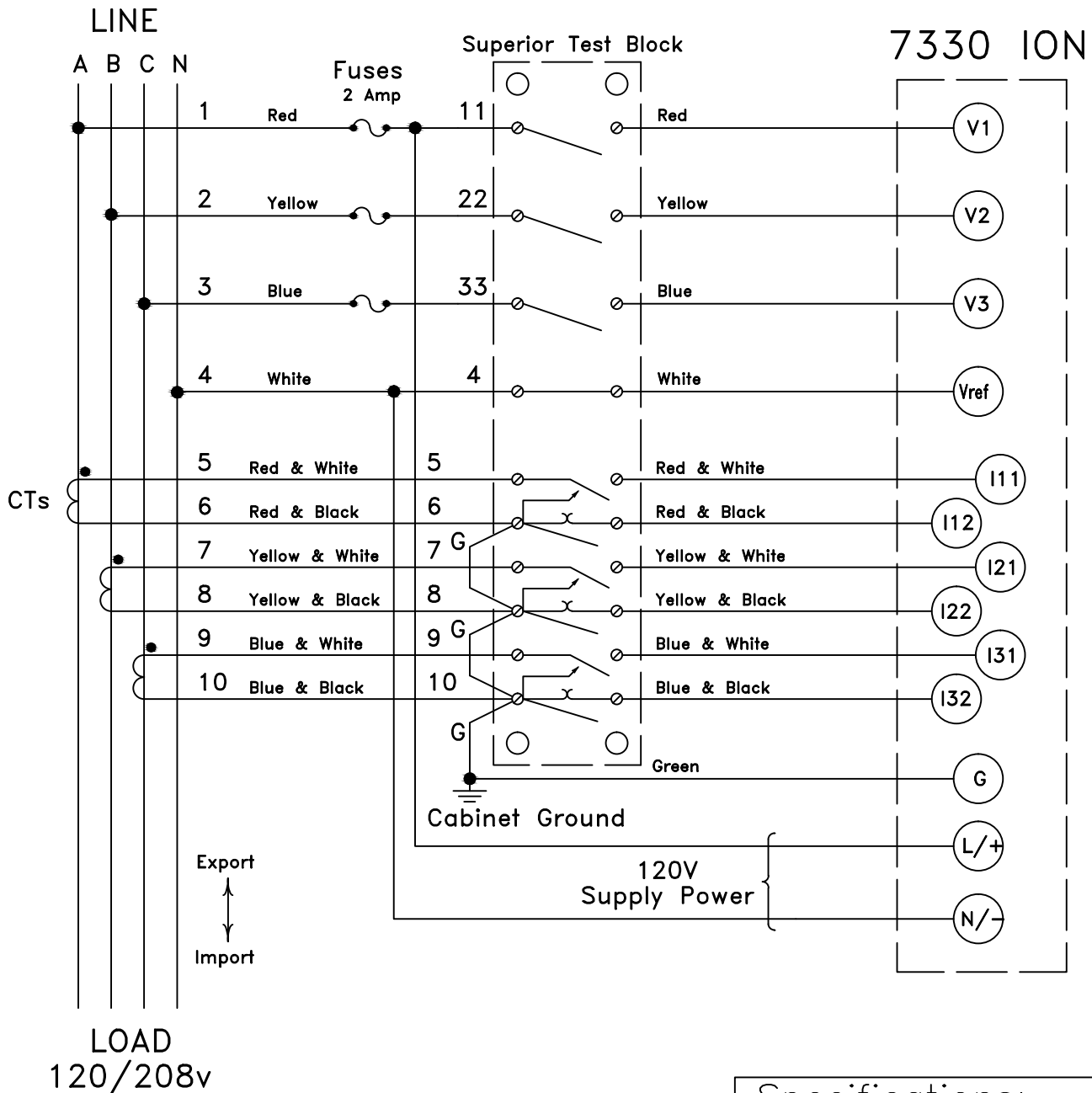
STANDARD No

E4-3

STANDARD METER WIRING DIAGRAM:

Power Measurement Ltd Revenue Sealed PML 7330 ION Meter

4-Wire Wye: 120/208V 3-Element Direct Connection



Specifications:

ALL EQUIPMENT TO BE APPROVED BY UBC UTILITIES PRIOR TO INSTALLATION

- PML meter:**
- 7330 ION, 120V input, c/w ethernet port
 - revenue sealed at factory and programmed with UBC Utilities standard displays
- Test Switch:**
- Superior 10 pole/30amp/600volt
 - CAT# 1082F or equivalent
- Fuses & Holders:**
- Gould Ultrasafe class CC or equivalent
- CT's:**
- Revenue class
- PT's: (when used)**
- Revenue class with 360/120 ratio

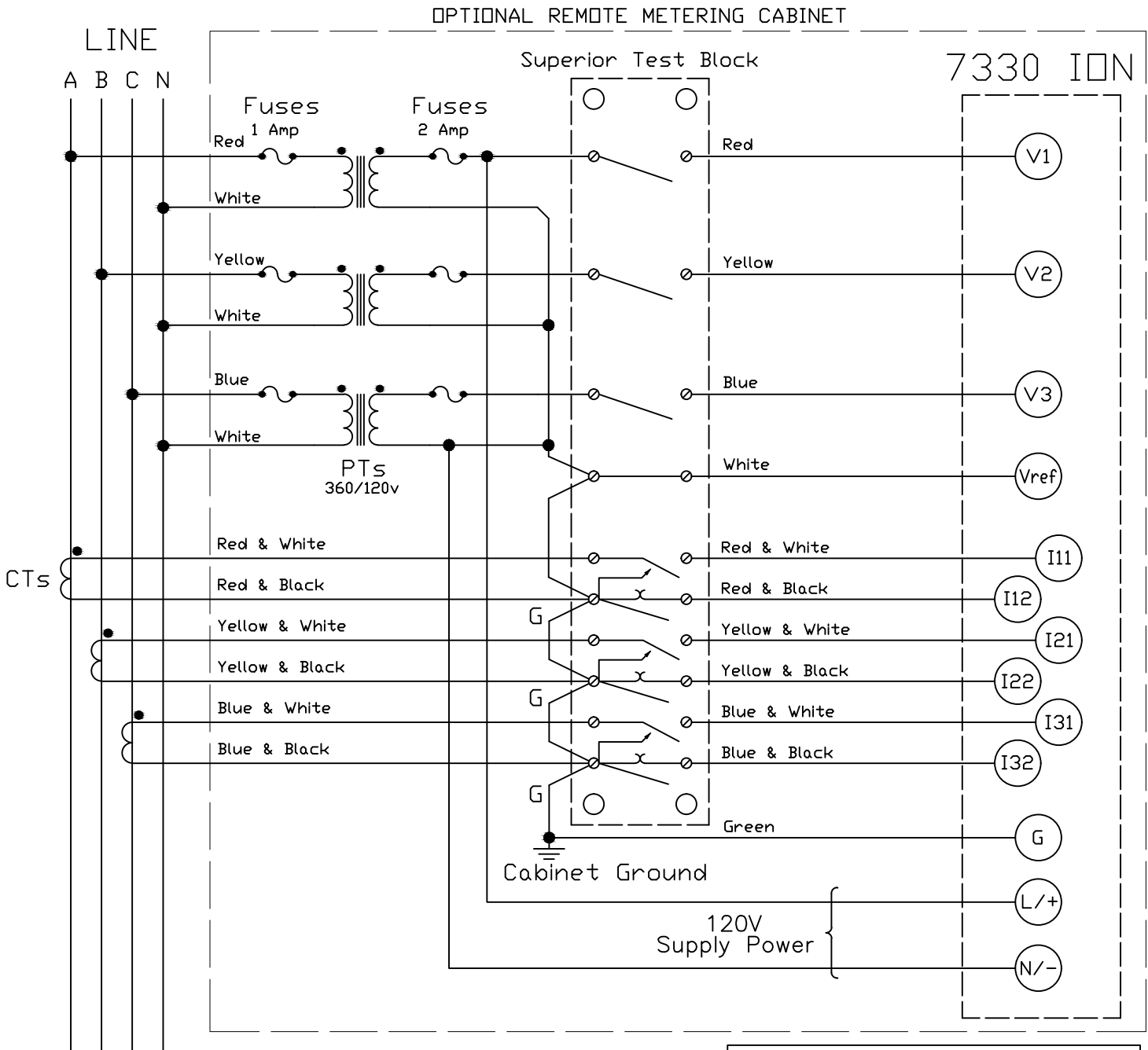
Notes:

- Use SIS switchboard wire for all connections.
- All CT wiring to be MIN #12.
- All Potential wiring to be MIN #14.
- Final wiring to be as per manufacturer.
- Provide colour coding and numbering on wiring as shown.
- Ground system at test block only as shown.

STANDARD METER WIRING DIAGRAM:

Power Measurement Ltd Revenue Sealed PML 7330 ION Meter

4-Wire Wye: 347/600V 3-Element 3 PT Connection



LOAD
347/600v

Specifications:

ALL EQUIPMENT TO BE APPROVED BY
UBC UTILITIES PRIOR TO INSTALLATION

- PML meter:
- 7330 ION, 120V input, c/w ethernet port
 - revenue sealed at factory and programmed with UBC Utilities standard displays
- Test Switch:
- Superior 10 pole/30amp/600volt
 - CAT# 1082F or equivalent
- Fuses & Holders:
- Gould Ultrasafe class CC or equivalent
- CT's:
- Revenue class
- PT's: (when used)
- Revenue class with 360/120 ratio

Notes:

- Use SIS switchboard wire for all connections.
- All CT wiring to be MIN #12.
- All Potential wiring to be MIN #14.
- Final wiring to be as per manufacturer.
- Provide colour coding and numbering on wiring as shown.
- Ground system at test block only as shown.

REVISION: 1
DATE: 11/12/02
DRAWN: RNH
APPROVED: KH

SCHNEIDER 7330 ION METER
347/600V 3 PHASE 4 WIRE SYSTEM
3 ELEMENT WIRING CONNECTION DIAGRAM

STANDARD No

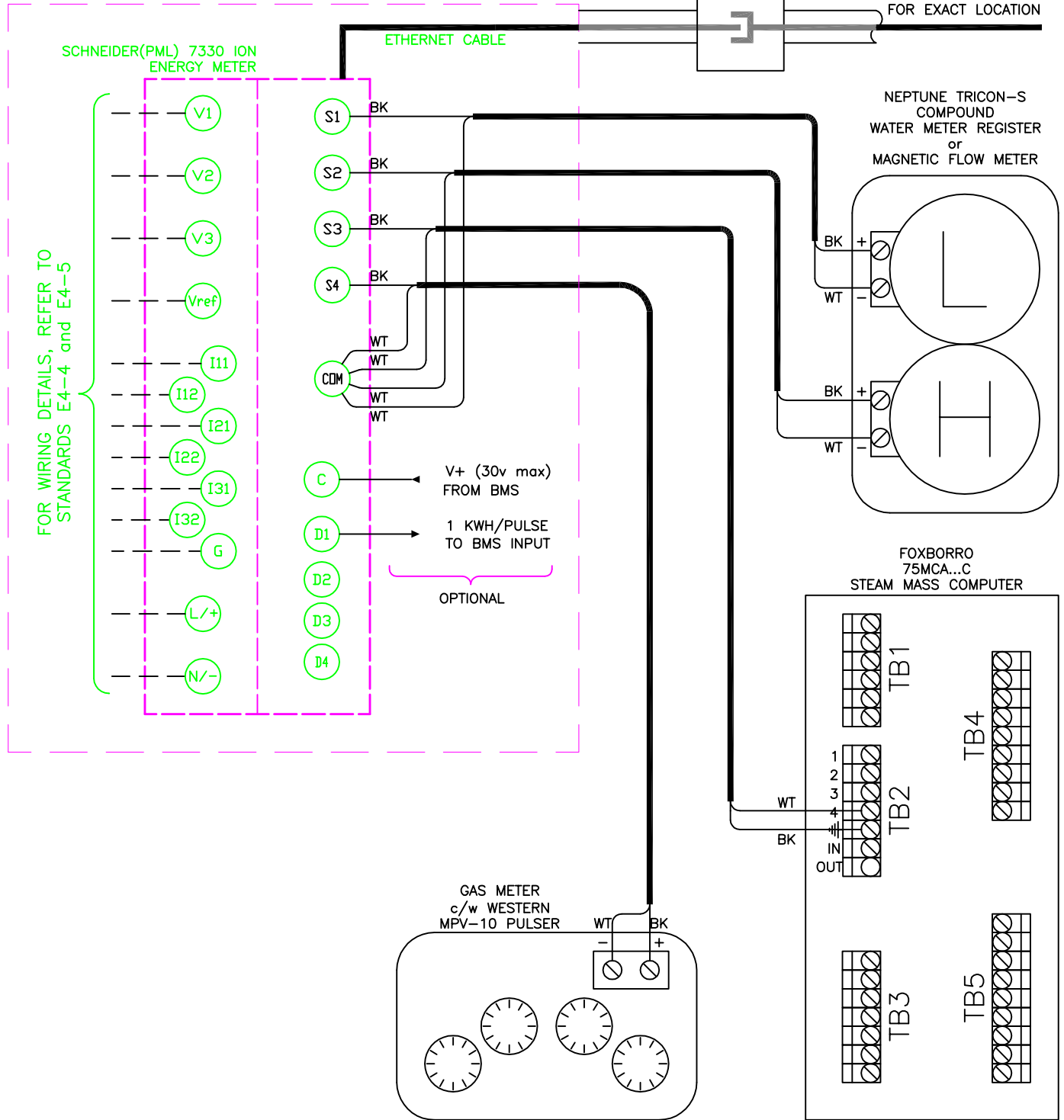
E4-5

UBC UTILITIES
UNIVERSITY OF BRITISH COLUMBIA

EXISTING METERING COMPARTMENT IN MAIN SWITCHGEAR (typ.)

DEMARICATION BOX. MAX. 7m FROM METER

TO TELECOM. ROOM. CONTACT UBC IT SERVICES FOR EXACT LOCATION



NOTES:

- All cables to be run in approved raceway between terminations.
- All cables shall be #18-2 Beldon 9318 or equivalent.
- All shields to be grounded at 7330 ION meter end only.
- Programming and commissioning of Foxborro and PML 7330 ION meters shall be done by UBC Utilities.
- All field wiring shall be checked for correct polarity and continuity.

EXISTING METERING COMPARTMENT IN
MAIN SWITCHGEAR (typ.)

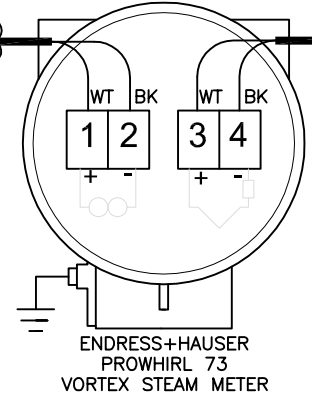
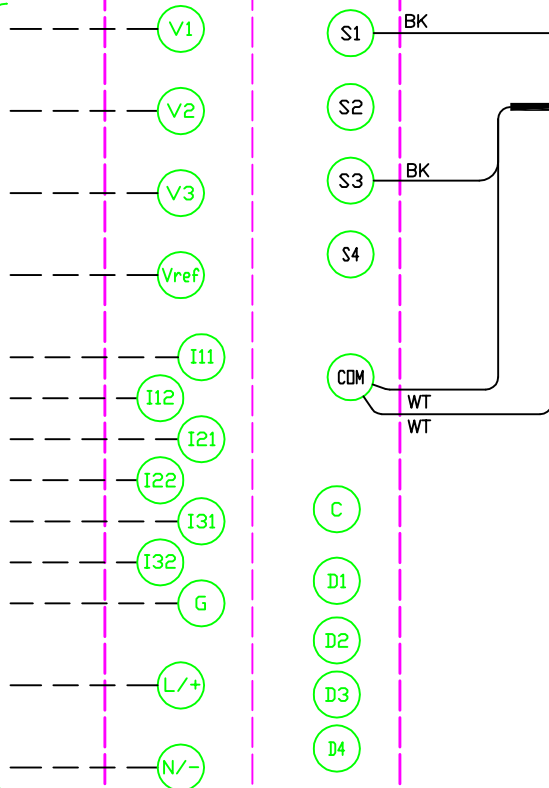
DEMARICATION BOX
MAX. 7m FROM METER

TO TELECOM. ROOM.
CONTACT UBC IT SERVICES
FOR EXACT LOCATION

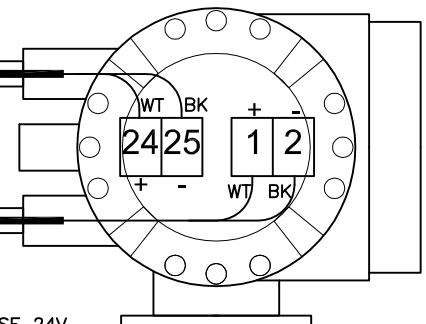
SCHNEIDER(PML) 7330 ION
ENERGY METER

CAT6 ETHERNET CABLE

FOR WIRING DETAILS, REFER TO
STANDARDS E4-4 and E4-5

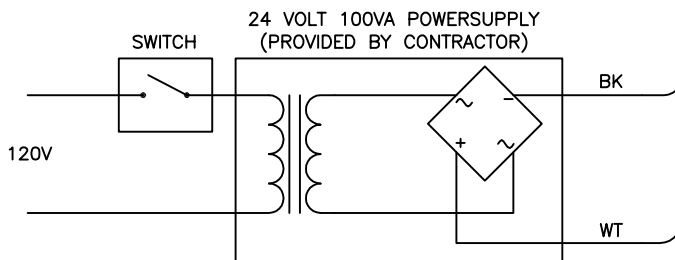


ENDRESS+HAUSER
PROWHIRL 73
VORTEX STEAM METER



ENDRESS+HAUSER
PROLINE PROMAG
50W**-****A
ELECTROMAGNETIC FLOW
WATER METER

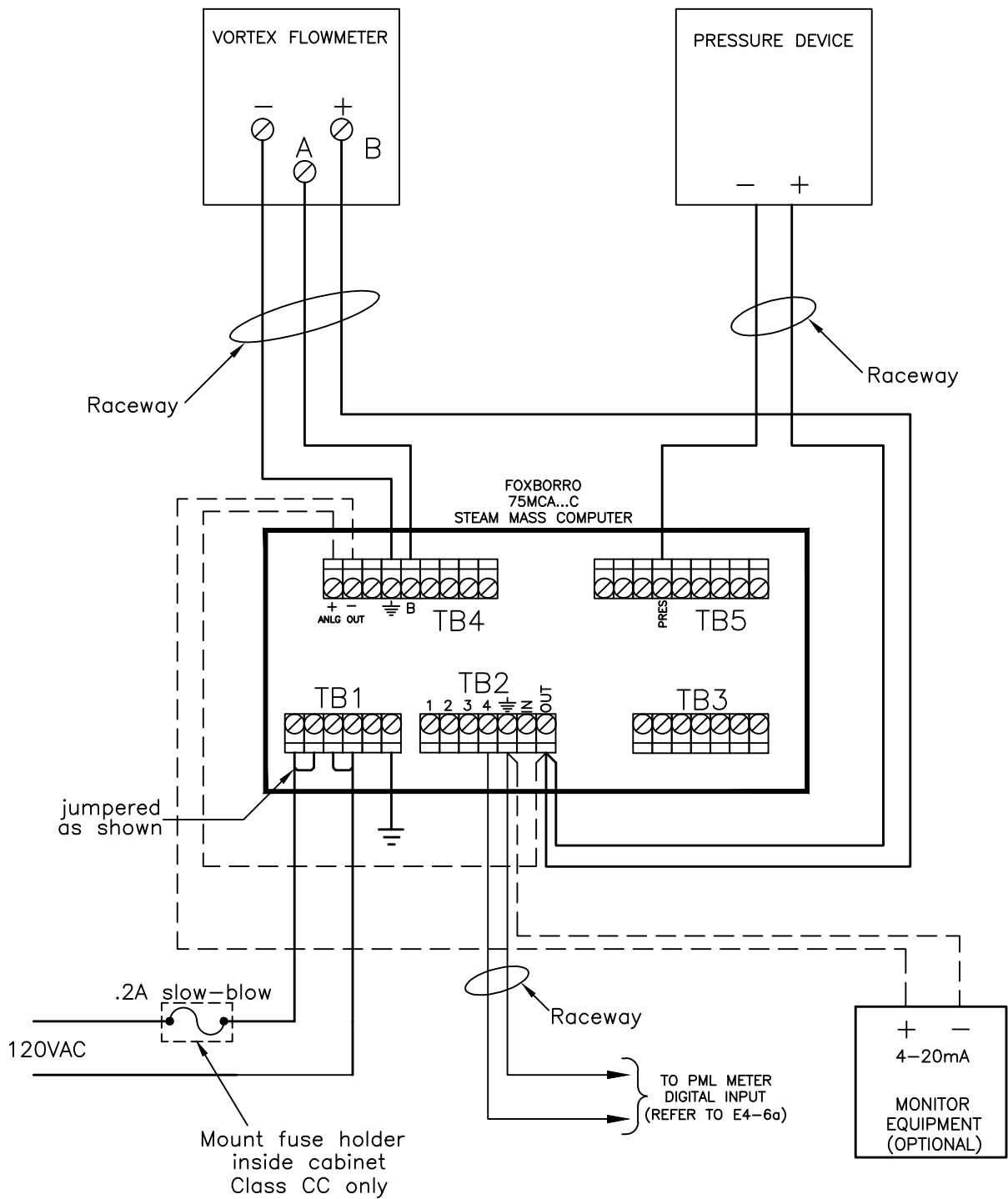
**OPTIONAL. MAY USE 24V
DC POWER SUPPLY FOR
WATER METER IF METER
VOLTAGE IS SPECIFIED AT
ORDERING**



24 VOLT 100VA POWERSUPPLY
(PROVIDED BY CONTRACTOR)

NOTES:

- All cables to be run in approved raceway between terminations.
- All cables shall be #18-2 (or 18-3 as req.) Beldon 9318 or equivalent.
- All shields to be grounded at 7330 ION meter end only.
- 24 volt DC power supply shall be provided as part of installation. Mount DC power supply within main electric metering section or as close as practical.
- Programming and commissioning of PML 7330 ION meters shall be done by UBC Utilities. Commissioning of Endress+Hauser meters may be done by the contractor.
- All field wiring shall be checked for correct polarity and continuity.



NOTES:

- All cables to be run in approved raceway between terminations.
- All cables shall be #18-2 or #18-3 Beldon 9318 or equivalent.
- All shields to be grounded at Foxboro mass computer only.
- Programming and commissioning of Foxboro computer shall be done by UBC Utilities.
- All field wiring shall be checked for correct polarity and continuity.

UBC UTILITIES
UNIVERSITY OF BRITISH COLUMBIA

REVISION: 1
DATE: 21/01/05
DRAWN: RNH
APPROVED: RNH

Foxboro Vortex Pulse Input
Steam Meter with Analog
Pressure Transmitter wiring diagram

STANDARD No

E4-8