BUILDINGS SPECIFICATIONS AND GENERAL NOTES

ROOF TYPE & SLOPE

- [■] GABLE
- [ ] SHED
- [■] 4:12
- [ ] 3:12
- [ ] N/A
- [ ] OTHER

VAPOUR BARRIER

- [ ] N/A
- [ ] 4 MIL
- [■] 6 MIL
- [ ] TUCK TAPE
- [ ] OTHER

NOTES:

BUILDING VENTILATION

LOUVERS

- [■] N/A
- [ ] 12' X 12' MANUALLY ADJ.
- [ ] 18' X 18' MANUALLY ADJ.
- [ ] 24' X 24' MANUALLY ADJ.
- [ ] OTHER
- [ ] w/LOUVER HOOD
- [ ] w/LOUVER HOOD
- [ ] w/LOUVER HOOD

FANS

- [■] N/A
- [ ] 12' X 12' EXHAUST FAN — [ ] XP — 12 - 1 — 120 / 1 / 60
- [ ] 24' X 24' EXHAUST FAN — [ ] XP — 24 - 1 — 120 / 1 / 60
- [ ] OTHER — [ ] XP

ALL FANS c/w HOOD AND BIRD SCREEN

- [ ] HVAC
- [ ] HEATERS

NOTES: HVAC OPENINGS 4- 16" x 16", 2- 29" x 29", 1- 25" x 31" C/W HOODS

ROOF VENTILATION

RIDGE VENT

- [ ] 6' THROAT x _____ LENGTH
- [ ] 9' THROAT x _____ LENGTH

CHAIN OPERATED w/MANUAL DAMPER AND BIRD SCREEN

- [ ] WHIRLYBIRD
- [ ] ROOF VENTS
- [ ] OTHER

MATERIAL & BUILDING COLOUR

- [■] ASTM-A653 / A792 SS GRADE 37 22 GAUGE STEEL PREPAINTED

WALL: REGENT GRAY (QC8730) — ROOF: REGENT GRAY (QC8730)
TRIM: REGENT GRAY (QC8730) — DOOR: REGENT GRAY (QC8730)

- [ ] ASTM A792SS GRADE 37 AZ 50 22 GAUGE GALVALUME

WALL: GALVALUME — ROOF: GALVALUME
TRIM: GALVALUME — DOOR: WARM GRAY

NOTES:

WALL THICKNESS

INTERLOCKING STRUCTURAL RIB PANELS

- [■] 3 1/2'
- [ ] 4 1/2'
- [ ] 5 1/2'
- [■] 2 " Z CHANNEL
- [ ] DRYWALL OR OTHERS

FINAL WALL THICKNESS (INCHES) 5 1/2

NOTES:

DESIGN DATA

- [ ] N/A — APPROXIMATE BUILDING WEIGHT: 14316 LBS
- [■] P-ENG DWGS REQUIRED

GROUND SNOW= 1.7 kPa — WIND 1/10 = 0.24 kPa
RAIN SURCHAGE= 0.1 kPa — WIND 1/50 = 0.36 kPa

INTERIOR LINING

- [ ] N/A
- [■] WHITE
- [ ] PLAIN
- [ ] 24 GA FLUTED ALUM
- [■] 22 GA FLUTED STEEL
- [ ] 20 GA 10% PERF. ALUM
- [ ] 20 GA 33% PERF. ALUM

NOTES:

WINDOWS

- [■] N/A
- [ ] 38" X 36" DBL. GLAZED
- [ ] 48" X 36" DBL. GLAZED

SLIDING c/w SCREEN AND WINDOW FLASHING w/DRIP

NOTES:

FOUNDATION

- [■] BY OTHERS
- [ ] BY METALEX
- [■] SKID (STEEL)
- [ ] CONCRETE
- [ ] TIMBER
- [ ] SKID SKIRTING 22ga
- [ ] SKID BACKSHEETING 18ga
- [ ] UNDER SKID INSULATION

NOTES:

GENERAL NOTES

INCLUDE 9 HVAC OPENINGS AND 6 CABLE TRAY OPENINGS

INSULATION

BUILDING

- [ ] N/A
- [■] FIBERGLASS
- [ ] ROXUL RHT 40
- [ ] OTHER

WALLS

- [ ] R12
- [■] R20
- [ ] R24
- [ ] R32
- [ ] R36

ROOF

- [ ] R12
- [ ] R20
- [ ] R24
- [■] R32
- [ ] R36

VESSEL INSULATION

- [■] N/A
- [ ] 1.5' FIBERGLASS
- [ ] 0.020 PLAIN CORROGATED ALUM.
- [ ] OTHER

NOTES:

DOORS

- [ ] 3' X 7' 20 GA STEEL HC
- [ ] 3' X 7' 20 GA STEEL PU
- [ ] 3' X 7' 18 GA STEEL PS
- [ ] 6' X 7' 20 GA STEEL HC
- [ ] 6' X 7' 20 GA STEEL PU
- [■] 2 6' X 7' 16 GA STEEL PS

c/w IWG WINDOW, CHECK CHAIN, WEATHER STRIPPING and

- [■] 9 CANOPY 20 ga steel galvaneal finished - Painted REGENT GRAY (QC8730)
  3 doubles, 2 singles & approximately 4 custom size
- [■] 2 HYDRAULIC CLOSURE
- [ ] EXPANDABLE FRAME
- [ ] SNIFFER PORT
- [ ] KICK PLATE
- [■] 2 REMOV. TRANSOM PANEL 3' 6 1/2" HIGH
- [ ] ROLL UP DOOR
- [ ] OVER HEAD DOOR
- [■] 2 OTHER 88TP PANIC HARDWARE

NOTES:

OTHERS

- [■] 2 EAVESTROUGH — PAINTED REGENT GRAY (QC8730) 20 GA STEEL GALVANEAL FINISHED
- [■] 4 DOWNSPOUT — PAINTED REGENT GRAY (QC8730) 20 GA STEEL GALVANEAL FINISHED
- [■] 2 STEEL ICE RAKE — PAINTED REGENT GRAY (QC8730)
- [■] 7 TIE ROD — ANGLE 2" x 2" — [■] 7 TIE ROD EXT.
- [ ] ROOF TRUSSES
- [ ] PARTITION WALL
- [ ] VESSEL CUT OUT — DIAM.
- [■] 1 REMOVABLE WALL PANEL 1500mm x 2600mm
- [ ] REMOVABLE ROOF PANEL
- [■] RIB STIFFENERS FOR GABLE WALLS
- [ ] RIB STIFFENERS FOR ROOF OR INSULATION RIB 18ga
- [■] CONTAINMENT FLASHING

NOTES: 1 ADDITIONAL DOWNSPOUT APPROXIMATE 8 m

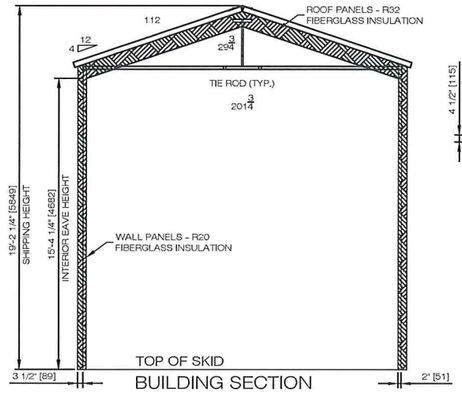
P-ENG STAMP

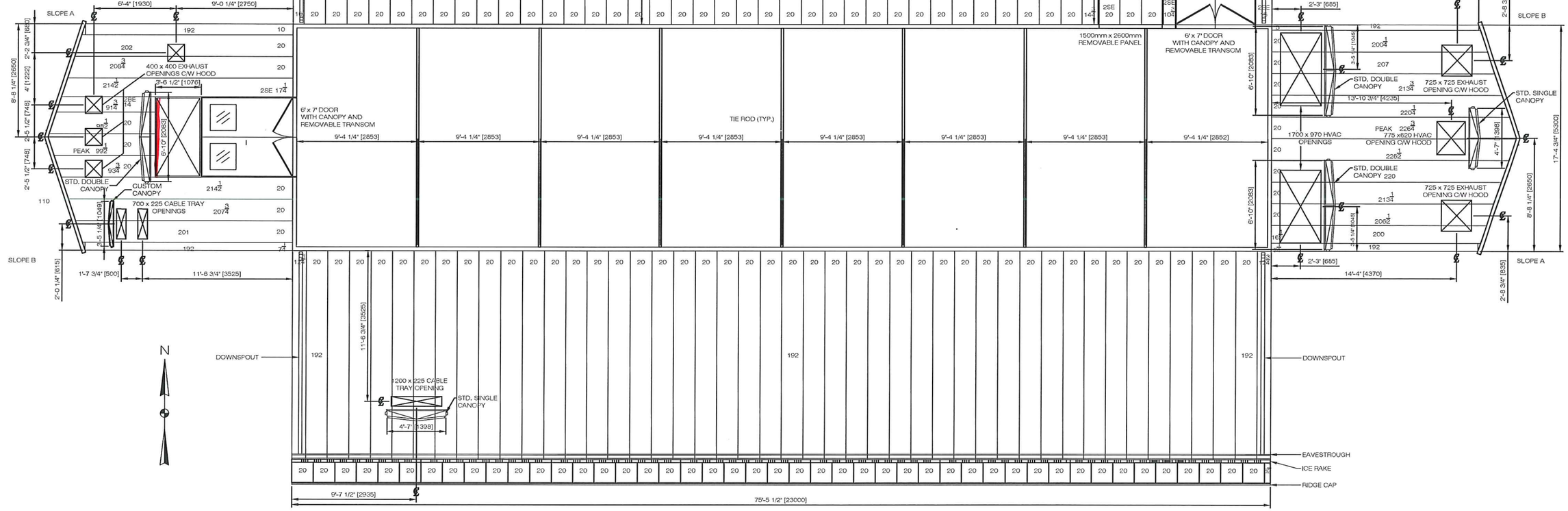
REVISIONS

REV	DESCRIPTION	DRAWN BY	DATE
-	-	-	-
0	ISSUED FOR CONSTRUCTION	GC	2014.04.08
D	IFA - ADD THE CANOPIES ABOVE CABLE TRAY OPENING, UPDATED THE INT. LINING AND EAVESTROUGH GAUGE	FS	2014.04.02
C	IFA - ADD THE REMOVABLE WALL PANEL AND OVERSIZED CANOPY	GC	2014.02.21
B	IFA - DELETED THE REMOVABLE WALL PANEL, ADDED THE INFORMATION REGARDING TO TRANSOM PANEL AND OPENINGS	FS	2013.12.04
A	ISSUED FOR APPROVAL-REF: 131647-S IFC0	GC	2014.01.27

METALEX
METAL BUILDINGS INC.
4204 - 46 Avenue, PO Box 1058
Stettler, AB T0C 2L0
P - 403.742.1300 I F - 403.742.1308
E - info@mmbi.ca I W - www.mmbi.ca

PROJECT: VES-21
CLIENT: Sabre Instrument Services Inc.
LOCATION: KEYSTONE HARDISTY TANK TERMINAL
DWG NO.: 14015-S
SHEET NO.: 1 OF 2
SCALE: NTS
TITLE: 5300mm x 23000mm x 4876mm SELF FRAME BUILDING GABLE STYLE 4:12 PITCH





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-	-	-	-
0	ISSUED FOR CONSTRUCTION	GC	2014.04.08
D	IFA - ADD THE CANOPIES ABOVE CABLE TRAY OPENING, UPDATED THE INT. LINING AND EAVESTROUGH GAUGE	FS	2014.04.02
C	IFA - ADD THE REMOVABLE WALL PANEL AND OVERSIZED CANOPY	GC	2014.02.21
B	IFA - DELETED THE REMOVABLE WALL PANEL, ADDED THE INFORMATION REGARDING TO TRANSOM PANEL AND OPENINGS	FS	2013.12.04
A	ISSUED FOR APPROVAL-REF: 131647-S IFC0	GC	2014.01.27

REVISIONS

METALEX
METAL BUILDINGS INC.
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P - 403.742.1300 I F - 403.742.1308
E - info@mmbi.ca I W - www.mmbi.ca

PROJECT:	VES-21
LOCATION:	KEYSTONE HARDISTY TANK TERMINAL
DWG NO.:	14015-S
SHEET NO.:	2 OF 2
SCALE:	NTS
CLIENT:	Sabre Instrument Services Inc.
TITLE:	5300mm x 23000mm x 4876mm SELF FRAME BUILDING GABLE STYLE 4:12 PITCH

1.0 GENERAL

1.1 THE ARCHITECTURAL DRAWINGS ARE INTENDED TO PROVIDE DESIGN INFORMATION TO A QUALIFIED SELF FRAMED BUILDING DESIGNER REGISTERED AS A PROFESSIONAL ENGINEER IN THE PROVINCE OF ALBERTA. UPSIDE ENGINEERING TAKES NO RESPONSIBILITY FOR THE RESULTING BUILDING STRUCTURE ITSELF OR ITS PERFORMANCE CHARACTERISTICS. THE DESIGNER/FABRICATOR CHOSEN VIA COMPETITIVE BID PROCESS SHALL BE RESPONSIBLE FOR ISSUING AUTHENTICATED DRAWINGS FOR ALL BUILDING ELEMENTS, THIS SHALL INCLUDE BUT MAY NOT BE LIMITED TO: BUILDING STRUCTURE, WALL REINFORCEMENT AS REQUIRED FOR EQUIPMENT, ROOF HANGERS, AND ANY BUILDING MOUNTED SUPPORTS FOR MECHANICAL AND ELECTRICAL. SPECIFIC INSULATING DETAILS, DOORS, WINDOWS, FANS, LOUVERS, HEATERS, HVAC EQUIPMENT (AND DUCTING IF REQUIRED), VENTS (AND OPERATORS), FLASHING, ICE RAKES, EAVESTROUGH, UTILITY ELECTRICAL (LIGHTS, SWITCHES, RECEPTACLES ETC) AND ANY OTHER COMPONENT SPECIFIED IN THE PURCHASE ORDER AND ITS ACCOMPANYING SCOPE OF WORK. ALL SUCH DOCUMENTS SHALL BE MADE AVAILABLE TO UPSIDE ENGINEERING FOR REVIEW/COMMENT PRIOR TO CONSTRUCTION.

1.2 BUILDING SHALL BE DESIGNED IN ACCORDANCE WITH THE FOLLOWING:

- 1.2.1 ALBERTA BUILDING CODE (2006).
- 1.2.2 UEL/TCPL SPEC. 25472-130-3PS-AKBP-P0001 – PRE-ENGINEERED BUILDING SPECIFICATION.
- 1.2.3 TCPL SPEC. 25472-100-3PS-AKBP-W0003 – ELECTRICAL EQUIPMENT SHELTER (EES) AND VFD EQUIPMENT SHELTER (VES) SPECIFICATION.

1.3 ALL DIMENSIONS ARE IN MILLIMETERS.

1.4 FLOOR, WALL AND ROOF PENETRATIONS/OPENINGS NOT SHOWN ON THE DRAWINGS ARE TO BE CUT, FLASHED AND WEATHER SEALED ON SITE. ALL CABLE TRAY WALL PENETRATIONS TO BE PROVIDED WITH A CANOPY.

1.5 MANDOORS SHALL BE 915x2134 U.N.O. AND INCLUDE A 610x750 SAFETY GLASS WINDOW.

1.6 EAVE GUTTERS:

- 0.91mm (20 GA) PRE-PAINTED GALVANIZED STEEL, COLOUR QC8730 GREY.

1.7 DOWNSPOUTS:

- 0.91mm (20 GA) PRE-PAINTED GALVANIZED STEEL, 100mm SQUARE SHAPE, COLOUR QC8730 GREY.

1.8 ICE RAKE:

- CONTINUOUS PRE-PAINTED GALVANIZED ANGLE C/W VERTICAL RODS COLOUR QC8730 GREY.

1.9 DOOR CANOPIES:

- STRUCTURALLY SUPPORTED 1.2 (18 GA) PRE-PAINTED GALVANIZED STEEL, COLOUR QC8730 GREY. ALLOW ADEQUATE SPACE ABOVE DOOR FOR PLACEMENT OF EXTERIOR LIGHT FIXTURE.

1.10 FLASHING:

- PRE-PAINTED GALVANIZED COLOUR QC8730 GREY.

1.11 TRIMS AND ACCENTS:

- COLOUR QC8730 GREY.

1.12 ALL SCREWS SHALL BE NUMBER 14 PREDRILLED METAL SCREWS COMPATIBLE WITH THE SHEETING AND SHALL NOT CAUSE CORROSION OR STAINING OF THE SHEETING.

1.13. ALL VENDOR DRAWINGS SHALL INCLUDE DETAILED INFORMATION INDICATING STRUCTURAL MEMBERS, ANCHOR BOLTS AND FOUNDATION LOADINGS. ALL VENDOR DRAWINGS TO BE AUTHENTICATED BY A PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF ALBERTA.

2.0 SELF-FRAMED CONSTRUCTION

2.1 ALL SELF-FRAMED BUILDINGS TO BE GABLE TYPE WITH 0.76 (22 GA) MIN GALVANIZED STEEL WALL PANELS WITH R20 FIBERGLASS INSULATION AND 0.76 (22 GA) MIN GALVANIZED STEEL ROOF PANELS WITH R30 FIBERGLASS INSULATION AND 6 MIL VAPOR BARRIER.

2.2 EXTERIOR WALL AND ROOF PANELS:

- PANEL RIBS AT 400 MAX O.C.
- PANELS SHALL BE PRE-PAINTED QC8730 GREY
- TRIM AND DOORS SHALL BE PRE-PAINTED QC8730 GREY

2.3 INTERIOR LINER SHALL BE PRE-FINISHED GALVANIZED SHEET STEEL, MIN 0.76 (22 GA) WITH ZINC COATING, V-RIB PROFILE.

3.0 DESIGN BASIS

3.1 SITE METEOROLOGICAL CONDITIONS, ELEVATION AND EARTHQUAKE ZONE DATA.

3.2 THE FOLLOWING DATA IS BASED ON ALBERTA BUILDING CODE INFORMATION FOR HARDISTY, ALBERTA.

DESIGN TEMPERATURE	
JANUARY 2.5%	-33°C
JANUARY 1.0%	-35°C
JULY 2.5% DRY	30°C
JULY 2.5% WET	19°C
DEGREE DAYS BELOW 18	5900
GROUND FROST PENETRATION	N/A
RAINFALL	
15 MINUTE RAINFALL	20mm
ONE DAY RAINFALL (1/50)	76mm
ANNUAL RAINFALL	325mm
MOIST INDEX	0.48
TOTAL ANNUAL PERCIPITATION	425mm
DRIVING RAIN WIND PRESSURE (1/5)	140Pa
DESIGN SNOW LOAD	
1/50 Ss	1.7kPa
1/50 Sr	0.1kPa
DESIGN WIND LOAD	
HOURLY WIND PRESSURE (1/10)	0.24kPa
HOURLY WIND PRESSURE (1/50)	0.36kPa
SEISMIC DATA	
Sa(0.2)	0.12
Sa(0.5)	0.06
Sa(1.0)	0.02
Sa(2.0)	0.01
PGA	0.06

NOT FOR CONSTRUCTION

SDN#: 25472-130-A1-0000-P0001
UEL#: 2012016-1ED-ACH-000-0001-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-07-002	LOW VOLTAGE-EES-21 BUILDING PLAN AND ELEVATIONS
4663-02-02-07-004	LOW VOLTAGE-EES-22 BUILDING PLAN AND ELEVATIONS
4663-02-02-07-006	OFFICE BUILDING PLAN
4663-02-02-07-008	MEDIUM VOLTAGE-VES-21 BUILDING PLAN

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
0A	2013-04-09	ISSUED FOR REVIEW (UEL PROJ# 2012016)	2197104	CMR	JMS	CDU	DRP	DCB	UPSIDE
0B	2013-05-15	ISSUED FOR BID (UEL PROJ# 2012016)	2197104	ADB	JMS	CDU	KGS	DCB	UPSIDE
0C	2013-05-29	RE-ISSUED FOR BID (UEL PROJ# 2012016)	2197104	ADB	JMS	CDU	KGS	DCB	UPSIDE
0D	2013-11-14	ISSUED FOR DESIGN (UEL PROJ# 2012016)	2197104	ADB	JMS	RDS	RGM	DCB	UPSIDE

APPROVAL: ADB JMS RDS RGM DCB

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA ROBERT GARRIOTT 2013-NOV-14

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 6508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 02

BUILDING GENERAL NOTES

SCALE NTS	DRAWING No 4663-02-02-07-001	REV 0D

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME---DESIGNFILE

1.0 GENERAL

1.1 ALL NOTES ON THIS DRAWING ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT DESIGN DRAWINGS AND PROJECT DOCUMENTS. INCLUDING THE FOLLOWING SPECIFICATIONS:
- 25472-130-3PS-SS00-P0001 STRUCTURAL STEEL SPECIFICATION
- 25472-130-3PS-S000-P0001 STRUCTURAL DESIGN CRITERIA SPECIFICATION
- 25472-130-3PS-AKBP-P0001 PRE-ENGINEERED BUILDING SPECIFICATION

1.2 THE EXISTING PLANT COORDINATE SYSTEM TO BE USED TO REFERENCE LOCATIONS.

1.3 ALL CODES, STANDARDS AND SPECIFICATIONS REFERENCED ON THIS DRAWING TO BE THE LATEST EDITION INCLUDING ADDENDA AND SUPPLEMENTS, IF ANY. IF A CONFLICT EXISTS BETWEEN THE REFERENCED CODES, STANDARDS, DRAWINGS OR SPECIFICATIONS, THE MORE STRINGENT ARE TO BE APPLIED.

1.4 UNLESS NOTED OTHERWISE, ALL DIMENSIONS ARE METRIC UNITS (MILLIMETERS) WITH ELEVATIONS IN METERS.

1.5 "DESIGN DRAWINGS" REFER TO THE ENGINEERED, SEALED (AS REQUIRED), DATED, SIGNED AND ISSUED FOR CONSTRUCTION OR DESIGN.

1.6 ALL STEEL SECTIONS DESIGNATIONS, LOADS, FORCES, AND MOMENTS ARE TO BE SPECIFIED IN SI UNITS PER CANADIAN INSTITUTE OF STEEL CONSTRUCTION (CISC) HANDBOOK.

1.7 DESIGN OF STEEL STRUCTURES TO CONFORM TO THE REQUIREMENTS OF CSA S16 "LIMIT STATES DESIGN OF STEEL STRUCTURES".

1.8 DETAILING, FABRICATION, DELIVERY AND ERECTION OF STEEL STRUCTURES TO CONFORM TO THE REQUIREMENTS OF CSA S16 "LIMIT STATES DESIGN OF STEEL STRUCTURES".

1.9 WELDED CONNECTIONS SHALL BE SHOP WELDED WHERE POSSIBLE.

1.10 ALL MEMBERS WITH THE WEB IN THE HORIZONTAL PLANE TO HAVE PROVISION FOR DRAINAGE OF WATER, IF ENDS ARE NOT OPEN, 13mm DIA HOLES AT 1500 c/c TO BE DRILLED ON THE CENTERLINE OF THE WEB FOR THE FULL LENGTH OF THE MEMBER, WITH A MINIMUM OF ONE HOLE PER BEAM.

1.11 MONORAILS AND PERMANENT LIFTING LUGS TO HAVE ALLOWABLE LIFTING CAPACITIES CLEARLY STENCILED (MIN 50mm HIGH) IN A CONTRASTING COLOR TO THAT OF THE COATING. LETTERING FOR MONORAILS TO BE CLEARLY LEGIBLE FROM OPERATING LEVEL.

1.12 ALL HSS MEMBERS TO BE CAPPED GAS-TIGHT AT OPEN ENDS, SEALED WITH 6mm CLOSURE PLATE AND FULLY SEAL WELDED.

1.13 THE UNDERSIDE OF BUILDING SKIDS TO BE INSULATED WITH SPRAY-ON URETHANE, 75mm THICK MINIMUM, WITH FIRE RETARDANT CONFORMING TO ASTM E84.

2.0 MATERIALS

2.1 STRUCTURAL STEEL:

-W, STRUCTURAL TEES, AND S SHAPES = CSA G40.21, GRADE 350W

-RECTANGULAR AND SQUARE HSS SECTIONS = CSA G40.21, GRADE 350W CLASS C

-ANGLES, PLATES & CHANNELS = CSA G40.21, GRADE 300W

2.2 FLOOR PLATE, KICK PLATE, RAILINGS, AND MISCELLANEOUS STEEL:

-CSA G40.21, GRADE 300W

2.3 GRATING AND STAIR TREADS:

-ASTM A 1011/A 1011M STRUCTURAL STEEL GRADE ASTM A36, TYPE 1.

2.4 GUSSET PLATES:

-CSA G40.21, GRADE 300W. MINIMUM THICKNESS 10mm

2.5 LIFTING LUG AND LIFTING EYE PLATES:

-CSA G40.21, GRADE 350WT, CAT. 4, OR ALTERNATIVELY GRADE 350W IF CLEARLY MARKED THAT LIFT OPERATIONS ARE ONLY PERMITTED AT TEMPERATURES ABOVE -7°C.

2.6 HIGH STRENGTH BOLTS, NUTS, AND WASHERS:

-ASTM A325, TYPE 1, ASTM A563 NUTS, ASTM F463 WASHERS. (GALVANIZED FOR PAINTED AND FIREPROOFED STRUCTURES)

2.7 THREADED ANCHOR RODS (FOR EQUIPMENT HOLD DOWN):

-ASTM A307, GRADE A (NON-GALVANIZED)

2.8 WELDING ELECTRODES, FILLER METAL AND FLUX:

-CSA W48, E49XX

2.9 STEEL TYPES OTHER THEN THOSE LISTED ABOVE MAY BE CONSIDERED BASED ON SPECIAL NEEDS AND SHALL BE ONLY BE USED WITH APPROVAL OF OWNER. UPSIDE ENGINEERING LTD IS TO BE INFORMED OF ANY SUCH DEVIATIONS PRIOR TO ASSEMBLY.

3.0 CONNECTION DESIGNS

3.1 DESIGN, DETAILING, AND FABRICATION OF ALL CONNECTIONS TO CONFORM TO CSA S16 "LIMIT STATES DESIGN OF STEEL STRUCTURES" AND CISC "HANDBOOK OF STEEL CONSTRUCTION".

3.2 ALL FORCES AND MOMENTS SHOWN ON THE DESIGN DRAWINGS ARE FACTORED VALUES (PER LIMIT STATES DESIGN). ALL CONNECTION DESIGN FORCES ARE TO BE REVERSIBLE AND ACT CONCURRENTLY.

3.3 IF CONNECTION DETAILS OR FORCES ARE NOT SHOWN ON THE DESIGN DRAWINGS, CONNECTIONS TO BE DESIGNED BY P. ENG REGISTERED IN THE PROVINCE OF ALBERTA TO RESIST THE FOLLOWING:

3.3.1 BEAM SHEAR CONNECTIONS TO BE DESIGNED TO RESIST THE FACTORED REACTION FROM THE UNIFORM BEAM LOAD THAT WOULD CREATE A BENDING MOMENT EQUAL TO THE BENDING CAPACITY OF THE LATERALLY SUPPORTED SECTION BUT NOT LESS THAN HALF THE FACTORED SHEAR RESISTANCE OF THE MEMBER CONNECTED.

3.3.2 VERTICAL BRACING CONNECTIONS TO BE DESIGNED FOR 50% CAPACITY OF NET SECTION IN TENSION OR 100% OF THE COMPRESSION CAPACITY OF THE COMPRESSION BRACING, WHICHEVER GOVERNS THE MEMBER SELECTION.

4.0 WELDED CONNECTIONS

4.1 WELDED PROCEDURES, MATERIALS AND QUALITY STANDARDS ARE TO CONFORM TO THE REQUIREMENTS OF CSA W59, "WELDED STEEL CONSTRUCTION (METAL ARC WELDING)".

4.2 ALL WELDING, WHETHER IN THE SHOP OR IN THE FIELD, ARE TO BE PERFORMED BY A FABRICATOR AND/OR AN ERECTOR CERTIFIED TO CSA W47.1 "CERTIFICATION OF COMPANIES FOR FUSION WELDING OF STEEL".

4.3 ALL WELDERS TO BE CWB CERTIFIED AND TO HAVE A CERTIFICATION TICKET AVAILABLE FOR REVIEW UPON REQUEST.

4.4 FOR WELDED CONNECTIONS MINIMUM FILLET WELD SIZE TO BE 6mm AND ALL JOINTS ARE ASSUMED FULLY WELDED UNO.

4.5 WHENEVER THE WELD MAY BE SUBJECTED TO LOAD, PLUG OR SLOT WELDS ARE NOT BE USED WITHOUT THE PRIOR APPROVAL FROM UPSIDE ENGINEERING LTD.

4.6 INSPECTION OF WELDING TO BE UNDERTAKEN BY A THIRD PARTY INSPECTOR CERTIFIED BY THE CANADIAN WELDING BUREAU TO THE REQUIREMENTS OF CSA STANDARD W178.1 "CERTIFICATION OF WELDING INSPECTION ORGANIZATIONS".

4.7 ALL WELDS TO BE 100% VISUALLY INSPECTED IN ACCORDANCE WITH CSA W59.

4.8 IN ADDITION TO VISUAL INSPECTION, THE FOLLOWING NON-DESTRUCTIVE TESTING TO BE CONDUCTED. OTHER METHODS MAY BE USED IF APPROVED BY UPSIDE ENGINEERING LTD.

4.8.1 ALL MEMBER SPLICES TO BE TESTED 100% USING ULTRASONIC METHODS IN ACCORDANCE WITH CSA W59.

4.8.2 COMPLETE PENETRATION WELDS TO BE TESTED AT RANDOM ACCOUNTING FOR NOT LESS THAN 10% OF THE TOTAL LENGTH PER WORK PACKAGE USING ULTRASONIC METHODS IN ACCORDANCE WITH CSA W59.

4.8.3 10% OF GROOVE OR BUTT AND FILLET WELDS TO HAVE MAGNETIC PARTICLE INSPECTION (MPI) EXCEPT FILLETS WELDS ON LIFTING LUGS, WHICH SHALL HAVE 100% MPI.

4.9 ALL INSPECTION AND TESTING REPORTS TO BE MADE AVAILABLE TO UPSIDE ENGINEERING LTD. HOWEVER, ALL NON-CONFORMANCE REPORTS TO BE FORWARDED TO UPSIDE ENGINEERING LTD IMMEDIATELY AFTER THE COMPLETION OF THE INSPECTION AND TESTING.

4.10 IN ADDITION TO THE ABOVE NOTED INSPECTION AND TESTING PERFORMED BY THE CONTRACTOR, THE OWNER MAY, AT THE OWNER'S OWN COST, RETAIN A THIRD PARTY TO WITNESS OR CONDUCT INDEPENDENT INSPECTION AND TESTING. THE CONTRACTOR TO PROVIDE ACCESS (AT NO ADDITIONAL COST) FOR THE THIRD PARTY INSPECTOR TO DO THIS WORK.

4.11 ANY WELDING DEFECTS TO BE CORRECTED BY THE CONTRACTOR AT THE CONTRACTOR'S OWN COST.

5.0 BOLTED CONNECTIONS

5.1 ALL BOLTS TO BE ASTM A325 TYPE 1. BOLTS SHALL BE GALVANIZED FOR PAINTED AND FIREPROOFED STRUCTURES, UNLESS NOTED OTHERWISE ON DESIGN DRAWINGS, BLACK BOLTS MAY BE USED FOR UNPAINTED STRUCTURES.

5.2 ALL BOLTED CONNECTIONS TO BE "BEARING TYPE" UNLESS NOTED OTHERWISE ON DESIGN DRAWINGS.

5.3 "SLIP CRITICAL" CONNECTIONS TO BE USED WHENEVER VIBRATORY, DYNAMIC OR CRITICAL LOAD REVERSAL OCCURS AND SHALL BE NOTED ON THE DESIGN DRAWINGS.

5.4 DESIGN OF BOLTED CONNECTIONS TO ASSUME THAT BOLTS HAVE THREADS INCLUDED IN THE SHEAR PLANE, UNLESS THREADS EXCLUDED BOLT VALUES ARE APPROVED BY UPSIDE ENGINEERING LTD.

5.5 UNLESS NOTED OTHERWISE ON DESIGN DRAWING, BOLTS ARE NOT TO BE LESS THAN 19mm DIA.

5.6 BOLT HOLES FOR STEEL TO STEEL CONNECTIONS TO BE 2mm LARGER THAN THE BOLT DIAMETER. EXCEPT THAT 22mm HOLES MAY BE USED FOR 19mm DIA. BOLTS.

5.8 ALL BRACING CONNECTIONS TO HAVE A MINIMUM OF 2 BOLTS PER LONGITUDINAL BOLT LINE ALONG THE LONGITUDINAL AXIS OF THE MEMBER.

5.9 ALL CROSS BRACING TO BE CONNECTED AT POINT OF INTERSECTION.

5.10 FASTEN HORIZONTAL BRACING TO INTERMEDIATE BEAMS TO ELIMINATE SAG.

5.11 ALL DOUBLE ANGLE BRACING TO BE INTERCONNECTED AT A SPACING NOT TO EXCEED 1200mm. INTERCONNECTION TO CONSIST OF FILLER PLATE (MIN 10mm THICK) AND A MINIMUM OF ONE 19mm DIA A325 BOLT, SNUG TIGHT.

5.12 ALL STRUCTURAL CONNECTIONS (EXCEPT FOR DESIGNATED CONNECTIONS USED TO ACCOMMODATE MOVEMENT, STAIR TREAD BOLTING, AND FOUNDATION ANCHOR BOLT CONNECTIONS) TO BE TENSIONED BY PROPER INSTALLATION USING THE TURN-OF-NUT METHOD PER CSA S16.

5.13 FOR "EXPANSION" SLOTTED CONNECTIONS, WHEN INDICATED ON DESIGN DRAWINGS, USE HORIZONTAL LONG SLOT COMPLETE WITH ONE HEAVY HEX NUT AND ONE 8mm THICK STRUCTURAL PLATE WASHER. NUT TO BE SNUG TIGHTENED THEN BACKED OFF 1/4 TURN BEFORE DAMAGING THREADS.

5.14 FOR "FIT-UP" SLOTTED CONNECTIONS, WHEN INDICATED ON DESIGN DRAWINGS (WHEN CONNECTING TO CONCRETE, MASONRY, OR EXISTING STEEL), USE HORIZONTAL LONG SLOT COMPLETE WITH ONE 8mm THICK STRUCTURAL PLATE WASHER AND ONE HEAVY HEX NUT FULLY TIGHTENED USING TURN-OF-NUT METHOD.

6.0 FLOORING AND GRATING

6.1 ALL OPEN FLOORING AND STAIR TREADS TO BE SERRATED GALVANIZED GRATING, WITH MINIMUM BEARING BARS OF 32mmx4.8mm SPACED AT 30mm WITH CROSS BARS AT 102mm C/C U.N.O.

6.2 SOLID FLOORING TO BE MINIMUM 6mm THICK CHECKERED PLATE WITH A NON-SLIP RAISED PATTERN.

6.3 SMOOTH SOLID PLATE FLOORING TO BE MINIMUM 6mm THICK COATED WITH ANTI-SLIP PAINT AND TO BE USED ONLY WITH THE APPROVAL OF UPSIDE ENGINEERING LTD IN SITUATIONS WHERE IT IS REQUIRED DUE TO MAINTENANCE REASONS.

7.0 PROTECTIVE SURFACE COATINGS

7.1 ALL COATINGS FOR STRUCTURAL STEEL, GRATING AND REPAIRS TO CONFORM TO TES-COAT-P1.

7.2 ALL STRUCTURAL STEEL TO BE PAINTED.

7.3 ALL HANDRAIL, KICK PLATES, LADDERS, LADDER CAGES AND MONORAILS TO BE PAINTED SAFETY YELLOW.

7.4 ALL BUILDINGS TO BE PAINTED.

7.5 SURFACES SPECIFIED AS GALVANIZED TO BE HOT DIP GALVANIZED IN ACCORDANCE WITH CSA G164, "HOT DIP GALVANIZING OF IRREGULARLY SHAPED ARTICLES". WELDED JOINTS IN GALVANIZED SECTIONS TO BE FULLY SEALED WITH 5mm FILLET WELD IN ADDITION TO STRUCTURAL WELDING SHOWN. TOUCH UP ALL FIELD WELDS AS PER PROJECT SPECIFICATIONS.

7.6 GALVANIZED BOLTS, NUTS AND WASHERS TO BE USED FOR ALL PAINTED STRUCTURES.

7.7 APPROPRIATE REMEDIAL MEASURES TO BE TAKEN AFTER GALVANIZING BOLTS, NUTS AND HARDWARE. THEY INCLUDE, BUT ARE NOT LIMITED TO, RE-TAPPING THE NUTS TO ENSURE THEY FIT PROPERLY AFTER GALVANIZING.

7.8 ALL SHOP COATINGS TO BE EXCLUDED FROM AREAS WITHIN 50mm OF JOINTS TO BE FIELD WELDED. COATINGS OTHER THAN THE CLASS A OR B COATINGS SPECIFIED IN CSA S16 TO BE EXCLUDED FROM AREAS WITHIN 50mm OF THE FAYING SURFACES FOR "SLIP-CRITICAL" BOLTED CONNECTIONS. THE FABRICATOR TO CERTIFY THE COATING CLASS AND INDICATE IT ON THE FABRICATION DRAWING.

7.9 FIELD WELDS AND ANY DAMAGE TO PAINTED STEEL SURFACES TO BE TOUCHED-UP WITH MATCHING PAINT.

LEGEND:

- – DENOTES WORK POINT
- – DENOTES HANDRAIL
- – DENOTES GRATING SPAN DIRECTION
- – DENOTES GRATING
- – DENOTES CHECKERED PL 6
- PS-0XX-0X – DENOTES PIPE SUPPORT TAG
  - PIPE SUPPORT No
  - STRUCTURAL STEEL LOCATION PLAN
- ES-0XX-0X – DENOTES ELECTRICAL SUPPORT TAG
  - ELECTRICAL SUPPORT No
  - STRUCTURAL STEEL LOCATION PLAN

SDN#: 25472-130-SS-0000-P0001
UEL#: 2012016-1ED-STR-000-0001-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	KGS	RGM	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA ROBERT MARRIOTT

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

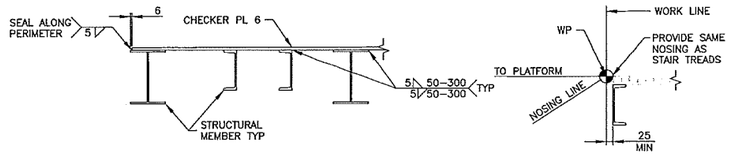
STRUCTURAL STEEL GENERAL NOTES

SCALE NTS | DRAWING No 4663-02-00-06-001 | REV 00

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME — DESIGNFILE

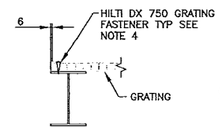


FLOOR PLATE CONNECTION DETAIL

DETAIL 1 / SCALE 1:10

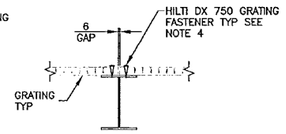
NOSING DETAILS

DETAIL 2 / SCALE 1:10



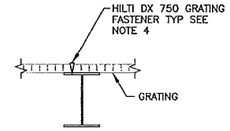
PERIMETER FRAMING

DETAIL 3 / SCALE 1:10



SPLICE OVER FRAMING

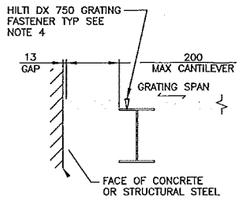
DETAIL 4 / SCALE 1:10



CONTINUOUS OVER FRAMING

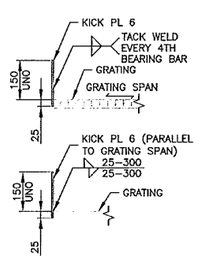
DETAIL 5 / SCALE 1:10

GRATING CONNECTION DETAILS



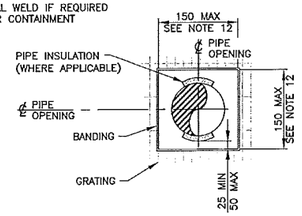
END FRAMING GRATING CONNECTION DETAILS

DETAIL 6 / SCALE 1:10



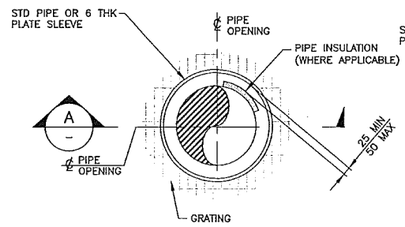
KICK PLATE WELDING DETAILS

DETAIL 7 / SCALE 1:10



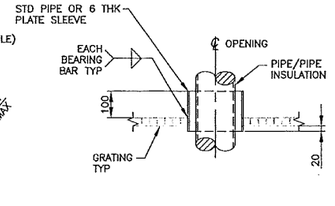
OPENING FOR PIPES 114 DIA AND SMALLER

DETAIL 8 / SCALE 1:5

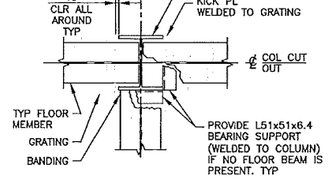


OPENING FOR PIPES 168 DIA AND LARGER

DETAIL 9 / SCALE 1:5

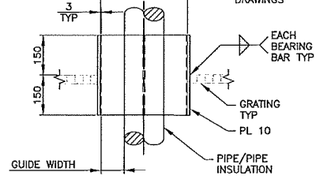


SECTION A / SCALE 1:10



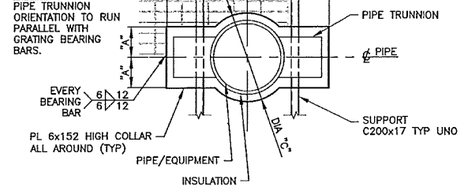
GRATING CUTOUT AT COLUMN

DETAIL 10 / SCALE 1:10



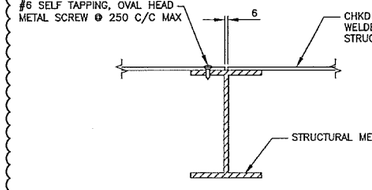
PIPE VERTICAL GUIDE

DETAIL 11 / SCALE 1:10



TRUNNION CUT–OUT DETAIL
(ALL DIMENSIONS TO INSIDE OF COLLAR)
(SEE TABLE 1 AND 2)

DETAIL 12 / SCALE 1:20



REMOVABLE CHKD PLATE OVER A W–SHAPE MEMBER

DETAIL 13 / SCALE 1:5

01

NOTES:

1. FOR STRUCTURAL STEEL GENERAL NOTES SEE DWG No 4663–02–00–06–001.
2. FLOOR PLATE SHALL BE 6mm THICK RAISED PATTERN NON–SLIP CHECKER PLATE (UNO).
3. ALL GRATING AND STAIR TREADS SHALL BE SERRATED GALVANIZED WITH MINIMUM BEARING BARS OF 32 x 4.8 SPACED AT 30mm C/C WITH CROSSBARS AT 102mm C/C.
4. GRATING SHALL BE ATTACHED TO SUPPORT STEEL WITH HILTI DX 750 GRATING SYSTEM OR APPROVED EQUAL. MINIMUM 4 FASTENERS PER PANEL. INSTALL AS PER MANUFACTURER'S INSTRUCTIONS.
5. REMOVABLE CHECKER PLATE OR GRATING PANELS SHALL HAVE A MAXIMUM PANEL WEIGHT OF 45kg/m².
6. REMOVABLE GRATING SHALL BE ATTACHED TO SUPPORT STEEL AS PER MANUFACTURER'S RECOMMENDATIONS, WITH A MINIMUM OF 2 CLIPS PER PANEL AT EACH SUPPORT BEAM.
7. CANTILEVERED GRATING SHALL NOT BE USED FOR REMOVABLE SECTIONS.
8. WHERE MORE THAN ONE GRATING PANEL IS REQUIRED, BEARING BARS SHALL BE LOCATED IN A STRAIGHT LINE WHERE POSSIBLE.
9. ALL OPENINGS LARGER THAN 300mm SHALL BE STRUCTURALLY FRAMED AS PER CONSTRUCTION DRAWINGS.
10. WHERE POSSIBLE, GRATING PANELS SHALL BE SPLIT AT CENTRELINE OF OPENINGS.
11. OPENINGS THROUGH FLOOR PLATE OR GRATING 150 DIA OR LESS MAY BE FIELD LOCATED AND CUT.
12. KICK PLATES OR PIPE SLEEVES SHALL BE INSTALLED AROUND ALL OPENINGS LARGER THAN 150 DIA.
13. BANDING BARS SHALL BE PROVIDED AT GRATING OPENINGS WHEREVER REQUIRED, INCLUDING, BUT NOT LIMITED TO THE FOLLOWING LOCATIONS:
    A) OPEN ENDS OF GRATING AT HEAD OF LADDER APPROACH TO PLATFORM.
    B) ALL DIMENSIONED OPENINGS IN GRATING.
    C) ALL HINGED SECTIONS.
    D) GRATING PANELS WITH 4 OR LESS CROSS BARS.
    E) ALL CUTOUTS HAVING UNSUPPORTED BEARING BARS.
    F) OPEN ENDS OF REMOVABLE GRATING PANELS.

TABLE 1

PIPE DIAMETER	TRUNNION DIAMETER	A	B
60.3	48.3	*C/2	304.8
88.9	60.3	*C/2	304.8
114.3	88.9	*C/2	355.6
168.3	114.3	*C/2	381.0
219.1	168.3	*C/2	431.8
273.1	168.3	*C/2	457.2
323.9	219.1	177.8	482.6
355.6	273.1	203.2	508.0
406.4	323.9	228.6	558.8
457.2	323.9	228.6	584.2
508.0	323.9	228.6	609.6
609.6	406.4	279.4	660.4

* TRUNNION CUT–OUT SHAPE IS SQUARE FOR PIPE DIAMETERS 60.3 THRU 273.1.

TABLE 2

OD OF PIPE/EQUIP PLUS INSUL	C
60.3	203.2
88.9	254.0
114.3	254.0
141.3	304.0
168.3	304.0
219.1	355.6
273.1	406.4
323.9	457.2
355.6	508.0
406.4	558.8
457.2	609.6
508.0	660.4
558.8	711.2
609.6	762.0
660.4	812.8
711.2	863.6
762.0	914.4

SDN#: 25472–130–SS–0000–P0005
UEL#: 2012016–1ED–STR–000–0005–01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663–02–00–06–001	STRUCTURAL STEEL GENERAL NOTES

REVISION

REV No	DATE	DESCRIPTION
00	2013–11–08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014–02–10	RE–ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	KGS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE
	CMR				DCB	

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ROBERT MARRIOTT ALBERTA

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

2014-02-10

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

STRUCTURAL STEEL
STANDARD FLOOR PLATE AND GRATING DETAILS

SCALE AS SHOWN | DRAWING No 4663–02–00–06–005 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME–DESIGNITE

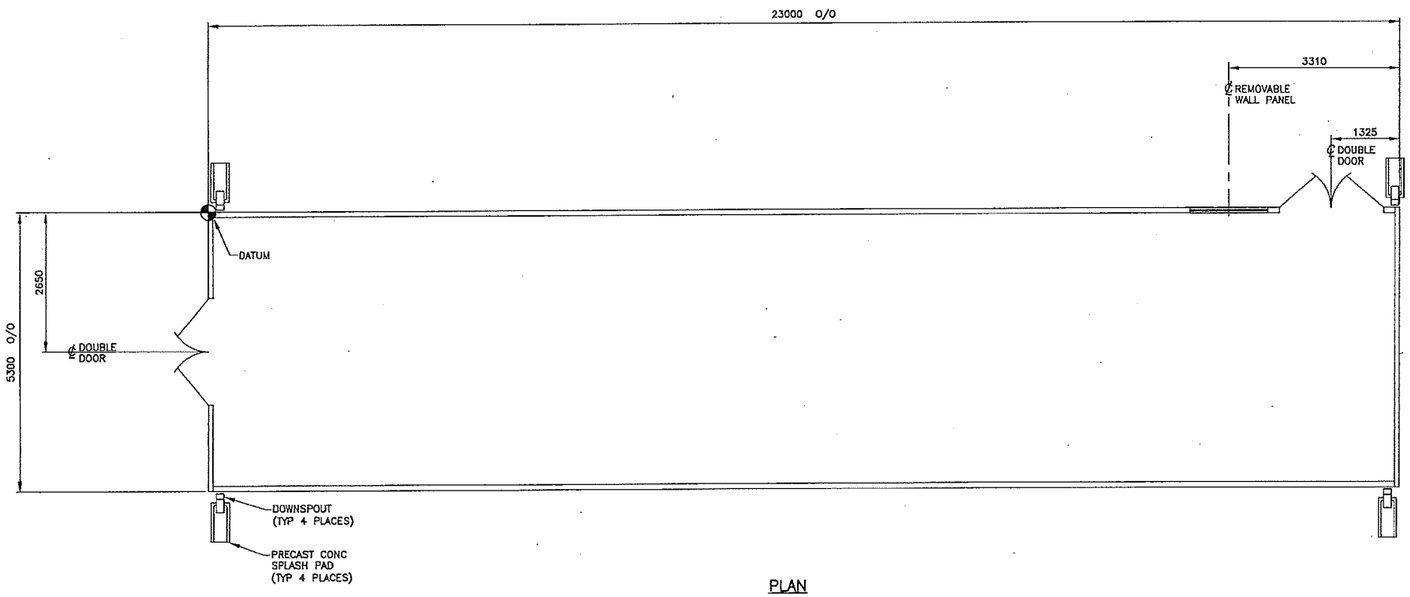
12 11 10 9 8 7 6 5 4 3 2 1

H G F E D C B A

PLANT NORTH

NOTES:

1. FOR BUILDING GENERAL NOTES REFER TO DWG No 4663-02-02-07-001.
2. FOR ELECTRICAL EQUIPMENT LAYOUT REFER TO DWG No 4663-06-02-03-046.
3. ACCESS PLATFORMS SHALL BE DESIGNED, FABRICATED AND INSTALLED BY OTHERS.
4. BUILDING HVAC SYSTEM SHALL BE DESIGNED, SUPPLIED AND INSTALLED BY OTHERS.



PLAN

NOT FOR CONSTRUCTION

SDN#: 25472-130-A1-0000-P0005
UEL#: 2012016-1ED-ACH-000-0008-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-07-001	BUILDING GENERAL NOTES
4663-02-02-07-009	MEDIUM VOLTAGE-VES-21 BUILDING - ELEVATIONS

REVISION

REV No	DATE	DESCRIPTION
0A	2013-05-09	ISSUED FOR REVIEW (UEL PROJ# 2012016)
0B	2013-05-29	ISSUED FOR BID (UEL PROJ# 2012016)
0C	2013-11-14	ISSUED FOR DESIGN (UEL PROJ# 2012016)
0D	2014-02-03	RE-ISSUED FOR DESIGN (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
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2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE
	CMR	NFC	RDS	RGM	DCB	

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA ROBERT MARRIOTT 29880

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT/ ENG. APPROVAL

DATE

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

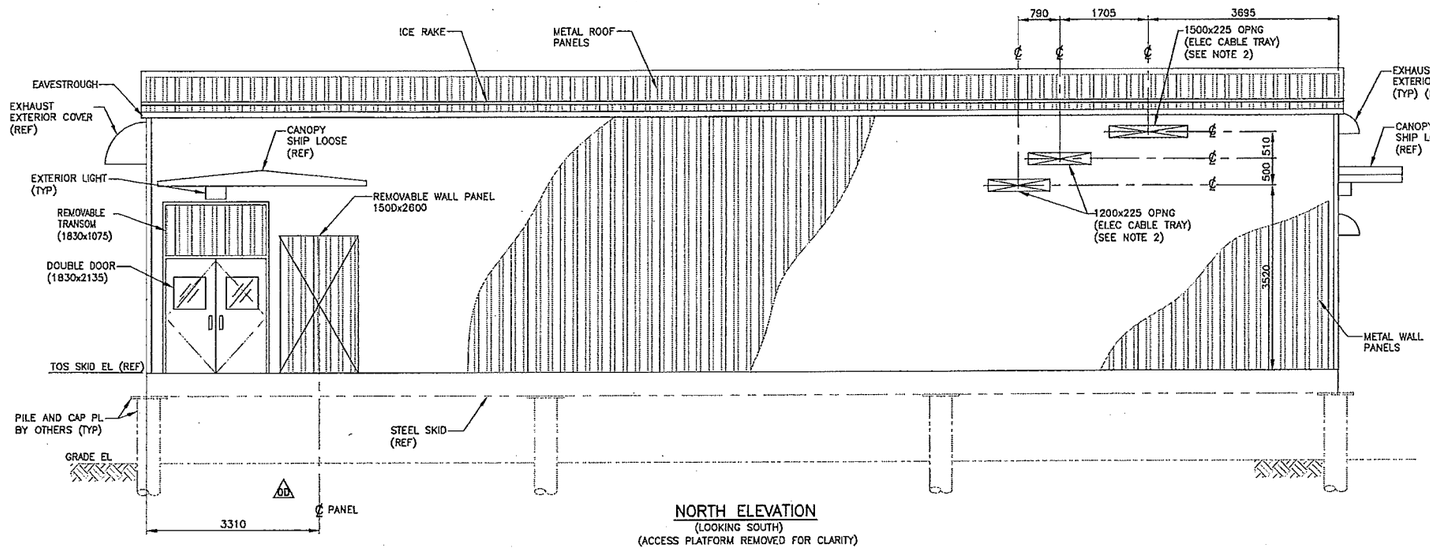
MEDIUM VOLTAGE-VES-21 BUILDING
PLAN

SCALE 1:50 | DRAWING No 4663-02-02-07-008 | REV 0D

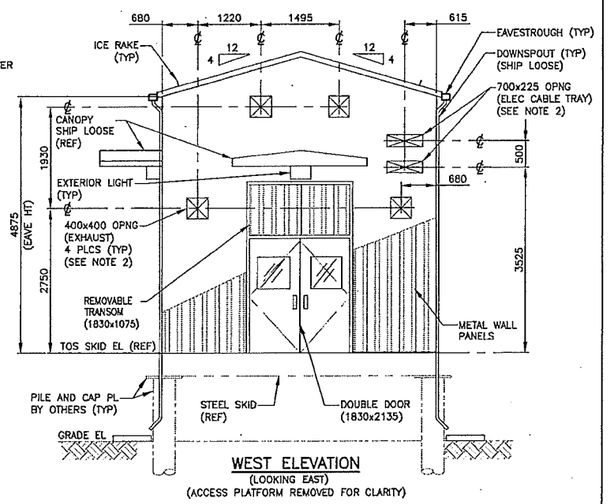
TIME ——— DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



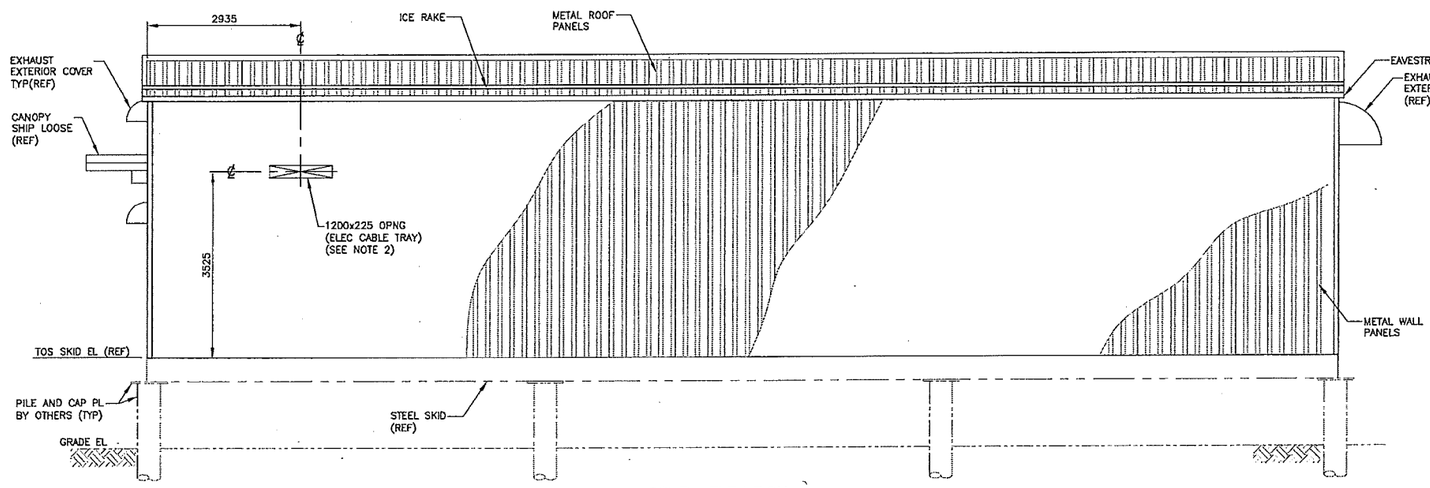
NORTH ELEVATION
(LOOKING SOUTH)
(ACCESS PLATFORM REMOVED FOR CLARITY)



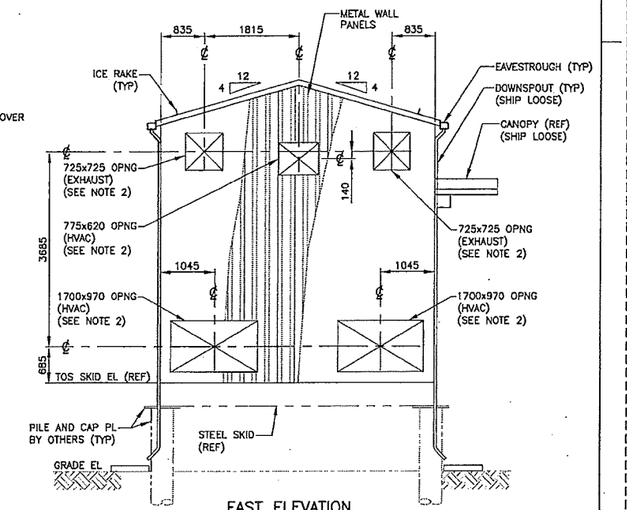
WEST ELEVATION
(LOOKING EAST)
(ACCESS PLATFORM REMOVED FOR CLARITY)

NOTES:

1. FOR BUILDING GENERAL NOTES REFER TO DWG No. 4663-02-02-07-001.
2. VENDOR TO ADD CANOPIES OVER ALL WALL PENETRATIONS FOR CABLE TRAY, HVAC DUCTING, DOORS, AND REMOVABLE WALL PANELS.



SOUTH ELEVATION
(LOOKING NORTH)
(ACCESS PLATFORM REMOVED FOR CLARITY)



EAST ELEVATION
(LOOKING WEST)
(ACCESS PLATFORM REMOVED FOR CLARITY)

NOT FOR CONSTRUCTION

SDN#: 25472-130-A2-0000-P0005
UEL#: 2012016-1ED-ACH-000-0009-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-02-02-07-001	BUILDING GENERAL NOTES
4663-02-02-07-008	MEDIUM VOLTAGE-VES-21 BUILDING - PLAN

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
0A	2013-05-09	ISSUED FOR REVIEW (UEL PROJ# 2012016)	2197104	ADB	JWS	CDU	KGS	DCB	UPSIDE
0B	2013-05-29	ISSUED FOR BID (UEL PROJ# 2012016)	2197104	ADB	JWS	CDU	KGS	DCB	UPSIDE
0C	2013-11-14	ISSUED FOR DESIGN (UEL PROJ# 2012016)	2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
00	2014-02-03	RE-ISSUED FOR DESIGN (UEL PROJ# 2012016)	2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT	PERMIT/ ENG. APPROVAL
	DATE

PROFESSIONAL ENGINEER ALBERTA — ROBERT MARRIOTT — 2014-Feb-03

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

MEDIUM VOLTAGE-VES-21 BUILDING ELEVATIONS

SCALE 1:50 | DRAWING No 4663-02-02-07-009 | REV 0D

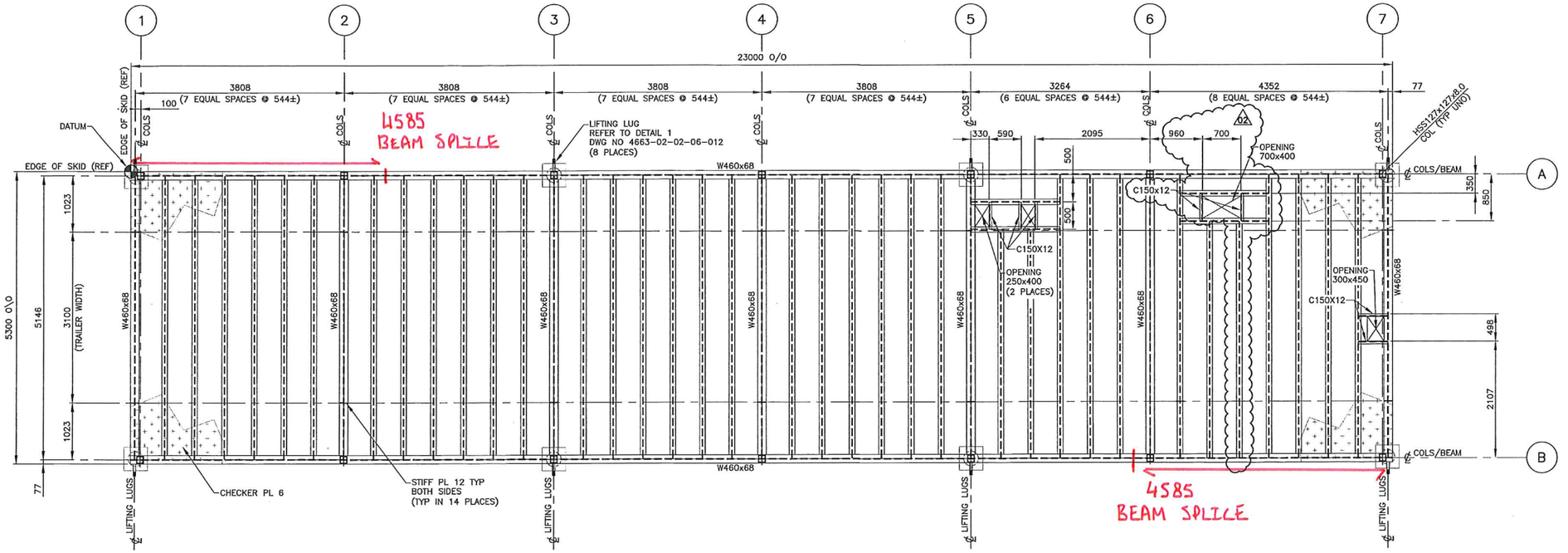
TIME — DESIGNTILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

NOTES:

1. FOR STRUCTURAL STEEL GENERAL NOTES REFER TO DRAWING 4663-02-00-06-001.
2. FOR STRUCTURAL STEEL STANDARD FLOOR PLATE AND GRATING DETAILS REFER TO DRAWING 4663-02-00-06-005.
3. SKID DESIGNED FOR LIVE LOAD = 4.8 kPa. DEAD LOAD = WEIGHT OF EQUIPMENT, CABLE TRAY AND SELF WEIGHT OF STRUCTURE.



PLAN AT TOS EL. 677.250
T.O. CHK PL EL AT 677.256
(ALL MEMBERS TO BE W250x22 UNO)

SDN#: 25472-130-SS-0000-P0139
UEL#: 2012016-1ED-STR-000-0139-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-00-06-026	STRUCTURAL STEEL LOCATION PLAN
4663-02-02-06-010	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLANS
4663-02-02-06-011	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN AND ELEVATION
4663-02-02-06-012	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL ELEVATIONS, SECTIONS AND DETAILS

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-02-03	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
02	2012-02-26	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA ROBERT MARRIOTT 2014-FEB-26

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

TransCanada — in business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

MEDIUM VOLTAGE-VES-21
STRUCTURAL STEEL PLAN

SCALE 1:40 | DRAWING No 4663-02-02-06-009 | REV 02

TC_A1_BR.DWG 594X841

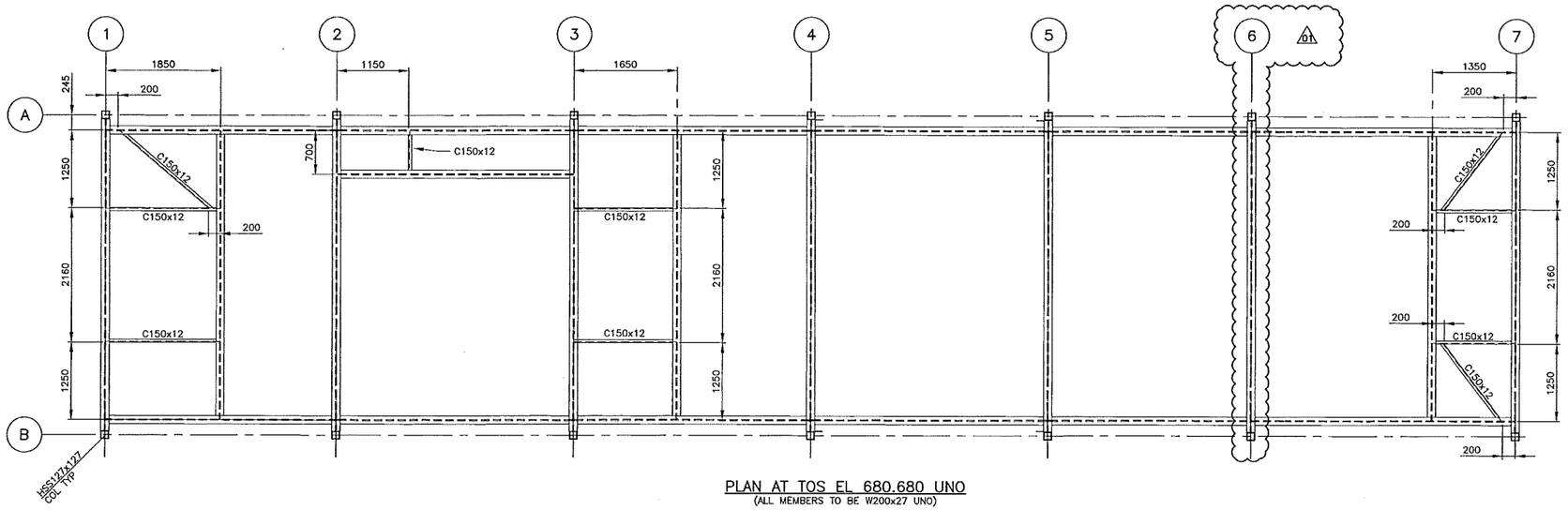
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME-DESIGNFILE

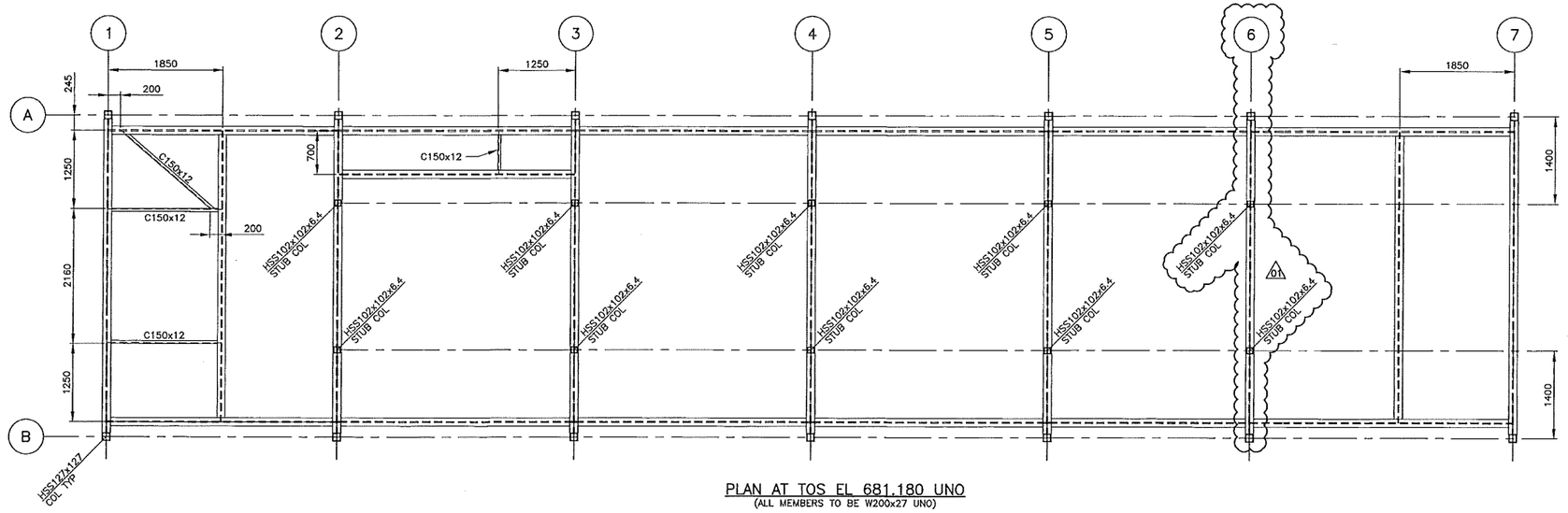
NOTES:

1. FOR STRUCTURAL STEEL GENERAL NOTES REFER TO DRAWING 4663-02-00-06-001.

PLANT NORTH



PLAN AT TOS EL 680.680 UNO
(ALL MEMBERS TO BE W200x27 UNO)



PLAN AT TOS EL 681.180 UNO
(ALL MEMBERS TO BE W200x27 UNO)

SDN#: 25472-130-SS-0000-P0140
UEL#: 2012016-1ED-STR-000-0140-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-06-009	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-06-012	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL ELEVATIONS, SECTIONS AND DETAILS

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-02-03	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE
	CHR	MD	RDS	RGM	DCB	

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA — ROBERT MARSHALL — 29829

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:
2014-FEB-03

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLANS

SCALE 1:40 | DRAWING No 4663-02-02-06-010 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME — DESIGNFILE

NOTES:

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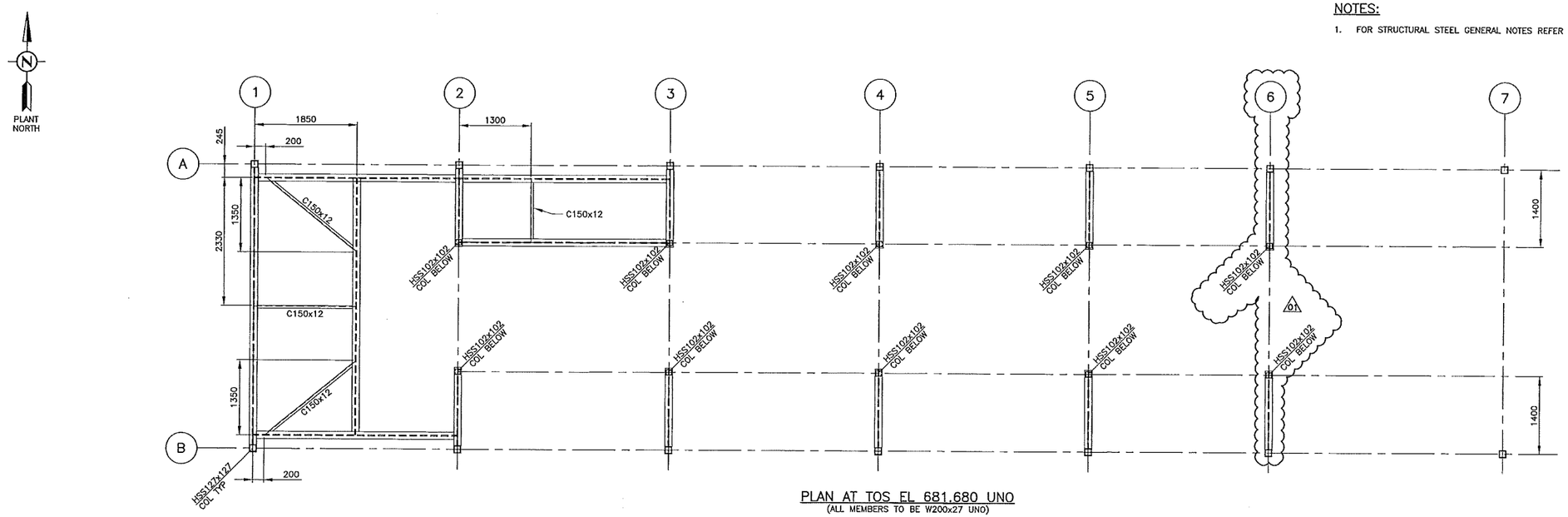
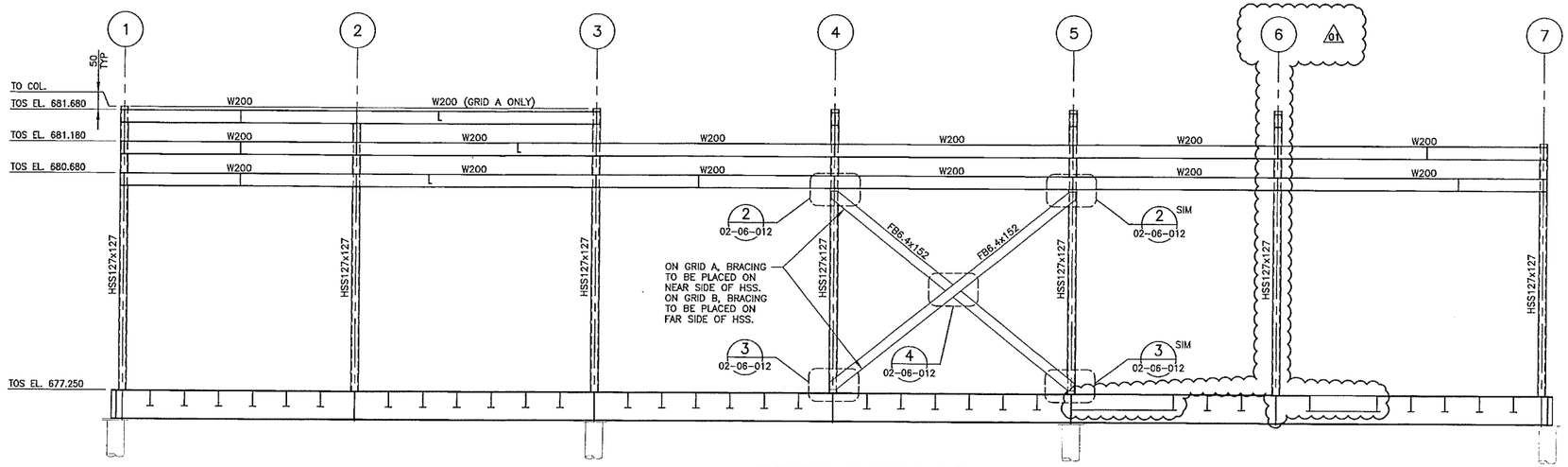


PLAN AT TOS EL 681.680 UNO
(ALL MEMBERS TO BE W200x27 UNO)



ELEVATION AT GRID A & B
(LOOKING NORTH)

SDN#: 25472-130-SS-0000-P0141
UEL#: 2012016-1ED-STR-000-0141-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-06-009	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-06-012	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL ELEVATIONS, SECTIONS AND DETAILS

REVISION

REV No.	DATE	DESCRIPTION
00	2013-11-08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-02-03	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA ROBERT GEORGE MARRIOTT 28939

2014-FEB-03

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN AND ELEVATION

SCALE 1:30 | DRAWING No 4663-02-02-06-011 | REV 01

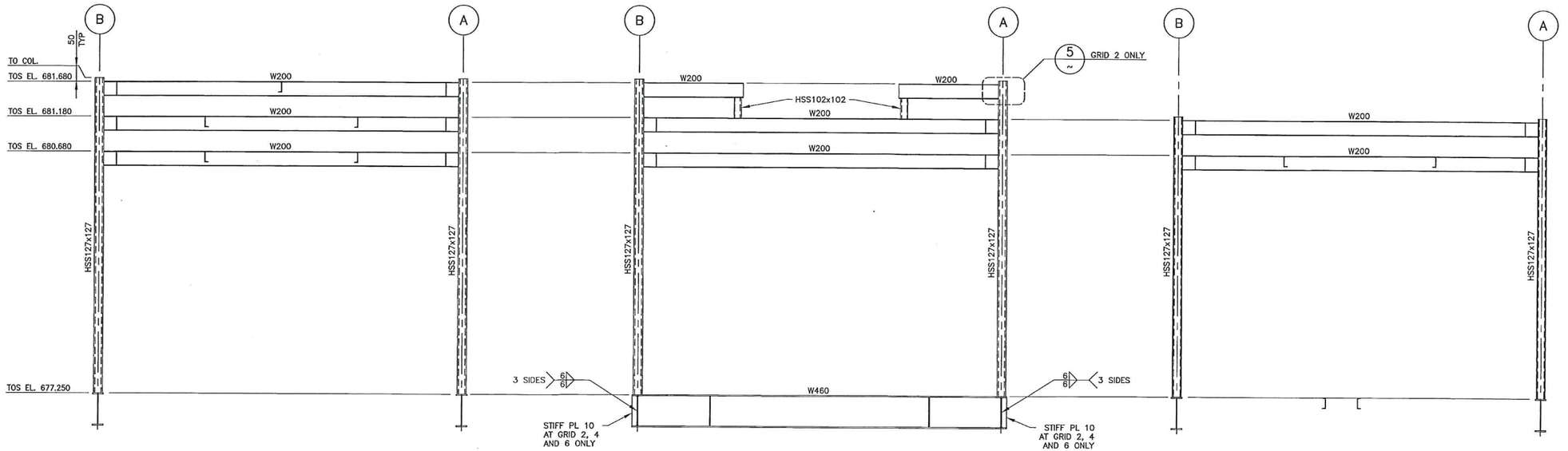
TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME-DESIGNFILE

NOTES:

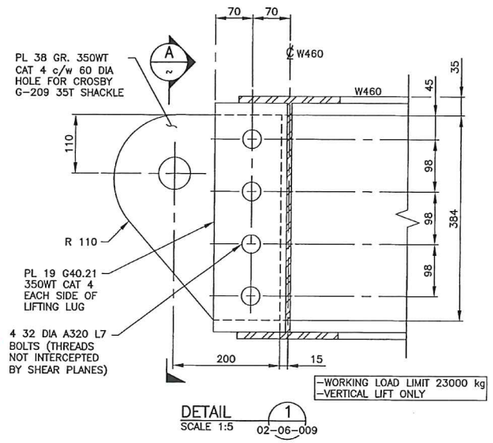
1. FOR STRUCTURAL STEEL GENERAL NOTES REFER TO DRAWING 4663-02-00-06-001.



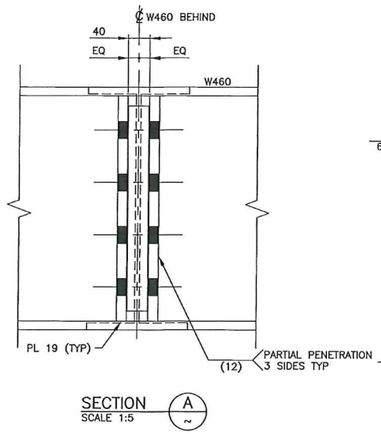
ELEVATION AT GRID 1
(LOOKING WEST)

ELEVATION AT GRID 2,3,4,5 & 6
(LOOKING WEST)

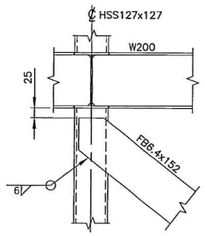
ELEVATION AT GRID 7
(LOOKING WEST)



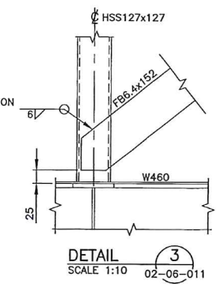
DETAIL 1
SCALE 1:5
02-06-009



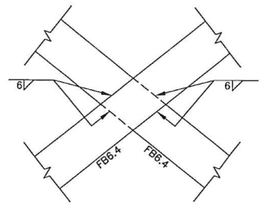
SECTION A
SCALE 1:5



DETAIL 2
SCALE 1:10
02-06-011



DETAIL 3
SCALE 1:10
02-06-011



DETAIL 4
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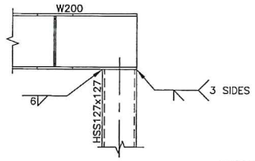
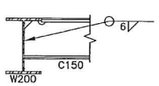
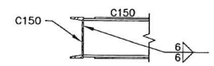
02-06-011



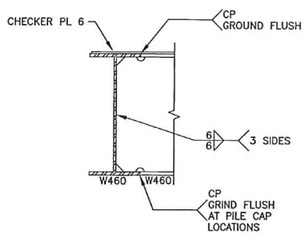
DETAIL 5
SCALE 1:10



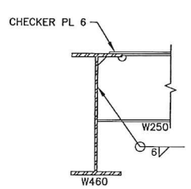
TYPICAL C150 TO W200 CONNECTION
SCALE 1:10



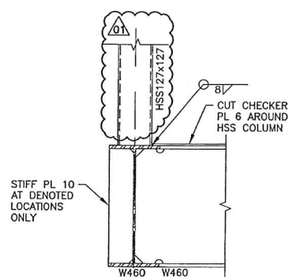
TYPICAL C150 TO C150 CONNECTION
SCALE 1:10



TYPICAL W460 TO W460 CONNECTION
SCALE 1:10



TYPICAL W250 TO W460 CONNECTION
SCALE 1:10



TYPICAL HSS127x127 TO W460 CONNECTION
SCALE 1:10

SDN#: 25472-130-SS-0000-P0142
UEL#: 2012016-1ED-STR-000-0142-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-06-009	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-08	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-02-03	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	ADB	NFC	RDS	RGM	DCB	UPSIDE
2197104	CMR	NFC	RDS	RGM	DCB	UPSIDE
	GMR				DCB	

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA ROBERT MARRIOTT

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

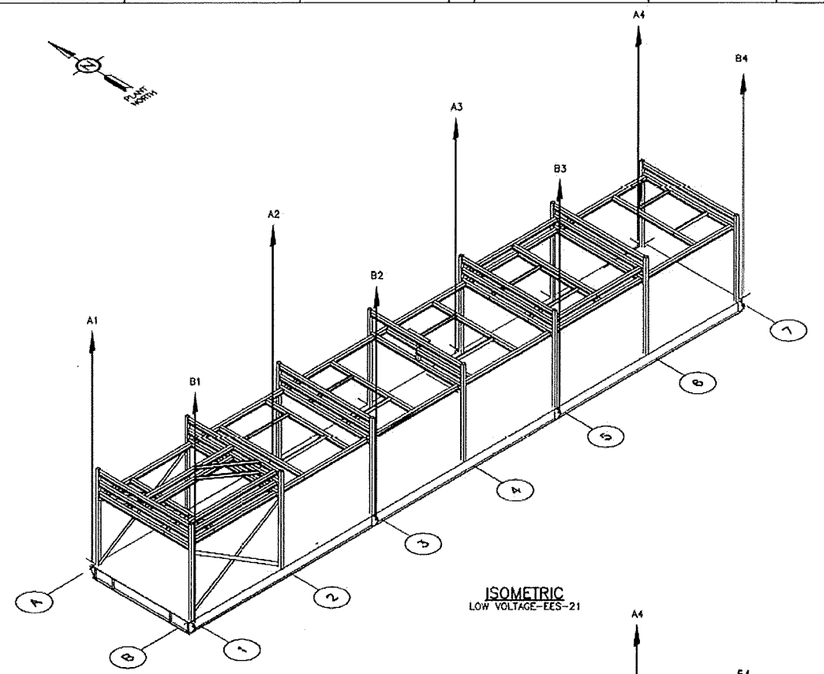
MEDIUM VOLTAGE-VES-21
STRUCTURAL STEEL ELEVATIONS,
SECTIONS AND DETAILS

SCALE 1:30 UNO | DRAWING No 4663-02-02-06-012 | REV 01

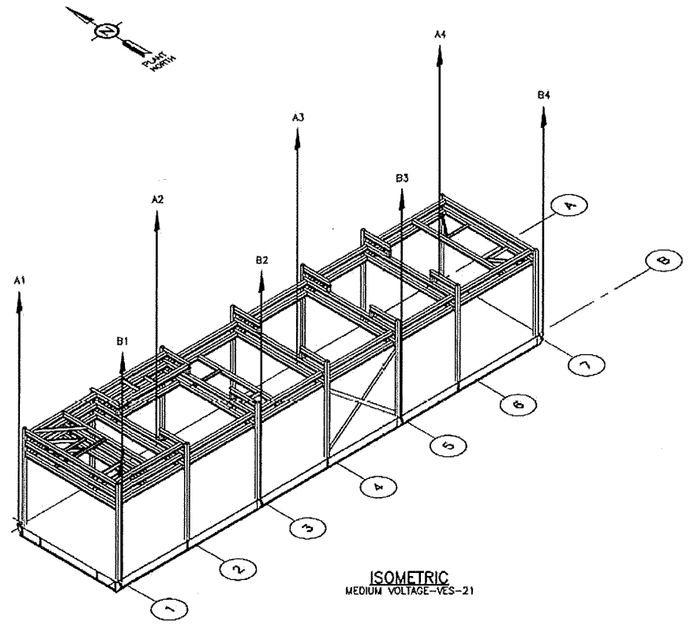
TIME DESIGNATE

TC_A1_BR.DWG 594X841

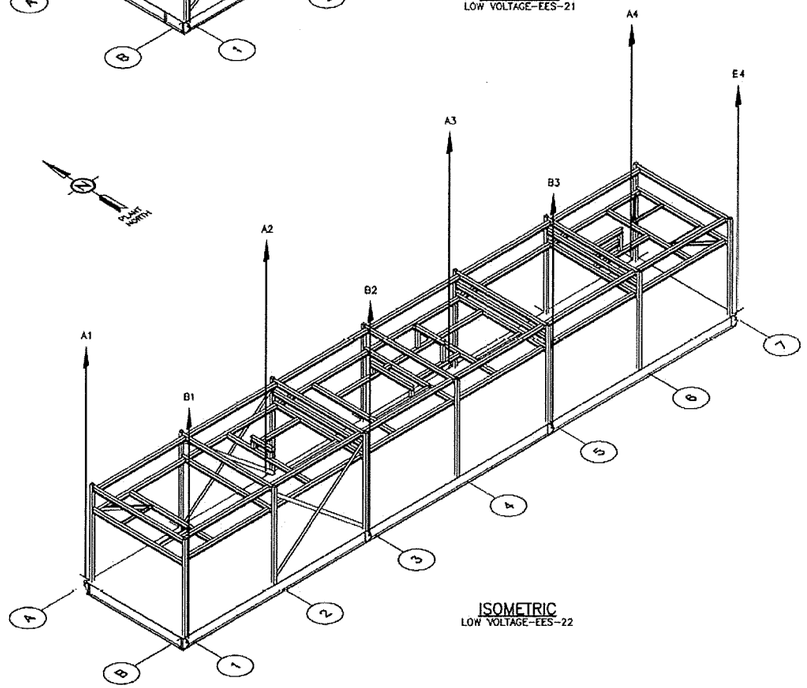
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



ISOMETRIC
LOW VOLTAGE-EES-21



ISOMETRIC
MEDIUM VOLTAGE-VES-21



ISOMETRIC
LOW VOLTAGE-EES-22

LOW VOLTAGE-EES-21

ESTIMATED LIFTING LOADS	
LIFTING LUG	LIFTING LUG LOAD (kN)
A1	145
A2	340
A3	340
A4	125
B1	130
B2	305
B3	320
B4	125
TOTAL	1830

LOW VOLTAGE-EES-22

ESTIMATED LIFTING LOADS	
LIFTING LUG	LIFTING LUG LOAD (kN)
A1	125
A2	340
A3	340
A4	145
B1	125
B2	320
B3	305
B4	130
TOTAL	1830

MEDIUM VOLTAGE-VES-21

ESTIMATED LIFTING LOADS	
LIFTING LUG	LIFTING LUG LOAD (kN)
A1	55
A2	200
A3	225
A4	70
B1	55
B2	205
B3	180
B4	60
TOTAL	1050

NOTES:

2. ALL LOADS SPECIFIED (UNFACTORED).

NOT FOR CONSTRUCTION

SDN#: 25472-130-SS-0000-P0143
UEL#: 2012016-1ED-STR-000-0143-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-02-02-06-001	LOW VOLTAGE-EES-21 STRUCTURAL STEEL PLAN
4663-02-02-06-005	LOW VOLTAGE-EES-22 STRUCTURAL STEEL PLAN
4663-02-02-06-009	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN

REVISION

REV No	DATE	DESCRIPTION
0A	2014-04-14	ISSUED FOR DESIGN (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	CMR	DDP	RDS	RGM	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA ROBERT MARRIOTT

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:
0A	2014-APR-14	

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Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

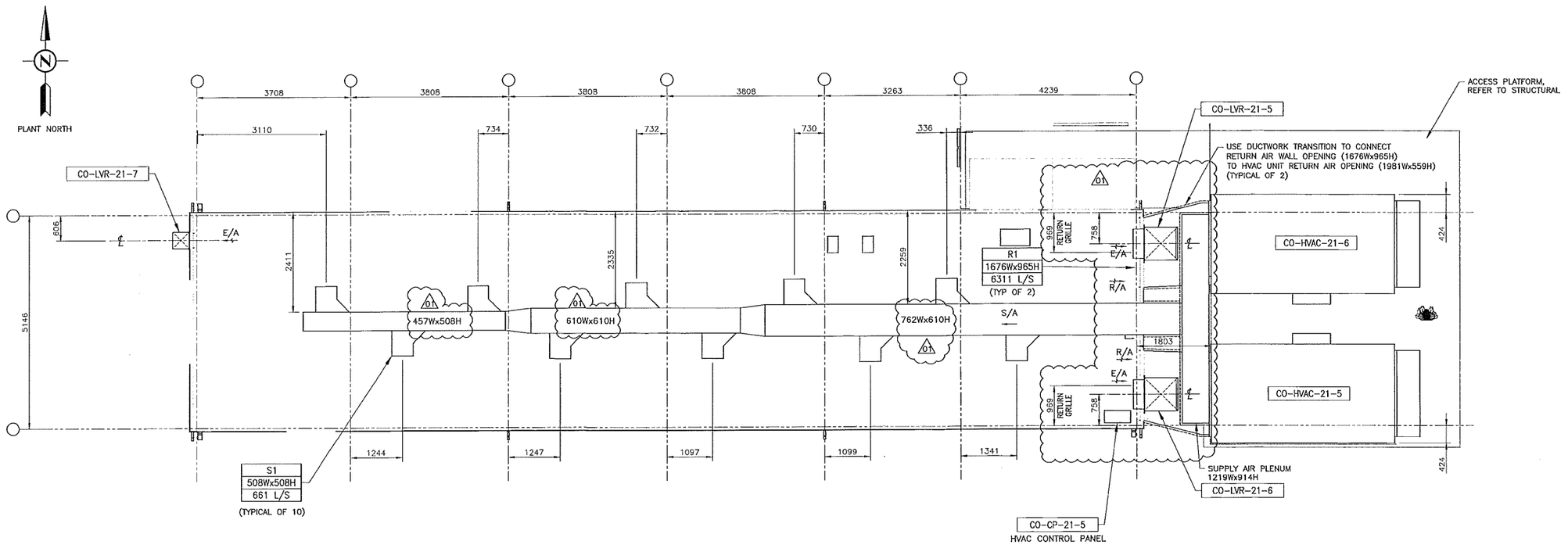
FIA # 4663	CHAINAGE:	DISCIPLINE # 02

LOW VOLTAGE-EES AND MEDIUM VOLTAGE-VES EES-21, EES-22, VES-21 - LIFTING LOADS DETAILS

SCALE 1:100	DRAWING No 4663-02-02-06-013	REV 0A

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



PLAN VIEW – CO-VES-21
MEDIUM VOLTAGE ELECTRICAL EQUIPMENT SHELTER

HVAC EQUIPMENT SCHEDULE – MEDIUM VOLTAGE VES (BUILDING CO-VES-21)

TAG	DESCRIPTION	QTY.	POWER	MOTOR	ELECTRIC HEAT	UNIT CURRENT	SUPPLY AIR FLOW	OUTSIDE AIR FLOW	ESP	COMMENTS
CO-HVAC-21-5/6	BUILDING HEATING/COOLING UNIT	2	480V/3 PHASE/60Hz	20 HP	30.0 KW	139.4A	6607 L/S	296 L/S	500Pa	50 TON R410A SCROLL COMPRESSOR, FULL ECONOMIZER, HERESITE COATED COILS, LOW AMBIENT OPERATION TO -40°C, HIGH EFFICIENCY FILTERS
CO-LVR-21-5/6	BUILDING PRESSURE RELIEF DAMPER	2	--	--	--	--	1652 L/S	--	--	SIZE: 24"Hx24"W, SETTING: +0.1" W.C.
CO-LVR-21-7/8/9/10	BUILDING PRESSURE RELIEF DAMPER	4	--	--	--	--	826 L/S	--	--	SIZE: 12"Hx12"W, SETTING: +0.1" W.C.

AIR DEVICE SCHEDULE – MEDIUM VOLTAGE VES (BUILDING CO-VES-21)

EQUIPMENT No.	MANUFACTURER	DESCRIPTION
S1 508Wx508H 661 L/S	E.H. PRICE (OR EQUAL) INDUSTRIAL LOUVERED FACE SUPPLY MODEL No: 20x20/152G /L/A/R/B12	SIZE :- 20x20 BORDER STYLE :- SURFACE MOUNT, 32mm STANDARD BLADE ORIENTATION :- FRONT BLADE PARALLEL TO LONG DIMENSION FASTENING:- COUNTER SUNK SCREW HOLES BLADES :- INDIVIDUALLY ADJUSTABLE FRONT BLADES, GANGED REAR BLADES. FINISH :- B12 WHITE
R1 1676Wx965H 6311 L/S	RETURN AIR GRILLE 16 GAUGE, 66x38 GALVANIZED WIRE MESH	SIZE :- 66x38 MOUNTING FRAME:- 50mm 16 GAUGE GALVANIZED METAL U-FRAME, c/w WELDED MITERED CORNERS, GASKET SEAL BETWEEN FRAME AND DUCT. FASTENING:- SELF DRILLING AND TAPPING SHEET METAL SCREWS

GENERAL NOTES

1. ALL MATERIALS AND CONSTRUCTION PROCEDURES SHALL BE IN ACCORDANCE WITH THE FOLLOWING LATEST EDITIONS (UNLESS NOTED OTHERWISE) INCLUDING ADDENDUMS AND SUPPLEMENTS OF:
   - ASHRAE HANDBOOKS, STANDARDS AND GUIDELINES
   - SMACNA STANDARDS
   - PROJECT SPECIFICATIONS
2. IN CASE OF DISCREPANCY BETWEEN THESE NOTES, THE CONTRACT SCOPE DRAWINGS AND SPECIFICATIONS, CONSULT THE ENGINEER OF RECORD FOR CLARIFICATION.
3. ALL COORDINATES AND ELEVATIONS ARE METRIC MEASUREMENT.
4. PRIOR TO FABRICATION OF DUCTWORK, CHECK ALL AVAILABLE SPACES, HEIGHTS AND POSSIBLE CONFLICTS WITH OTHER TRADES.
5. DUCTWORK SIZES ARE FOR NET FREE AREA (INTERNAL). SHEETMETAL THICKNESS, INSULATION AND CLADDING MATERIALS SHALL BE ADDED TO ALL DIMENSIONS AND ELEVATIONS.
6. ALL HVAC ELEVATIONS ARE REFERENCED FROM TOP OF STRUCTURAL STEEL OR TO TOP OF FINISHED FLOOR UNLESS NOTED OTHERWISE.
7. OVERALL EQUIPMENT DIMENSIONS AND CONNECTION DIMENSIONS SHALL BE MEASURED AND VERIFIED WITH APPROVED IFC VENDOR DRAWINGS.
8. DUCTWORK PENETRATING BUILDING EXTERIOR WALLS & ROOF SHALL BE FRAMED OPENINGS c/w RAIN HOOD, CONTINUOUS SEALANT AND FLASHING. REFER TO ARCHITECTURAL AND STRUCTURAL DRAWINGS.
9. ICE FALL PROTECTION SHALL BE SUPPLIED AND INSTALLED ON ALL BUILDING EAVE ELEVATIONS (BY GWC) FOR THE FOLLOWING:
   - EXTERIOR SUPPLY, EXHAUST AND RETURN AIR DUCTWORK WITHIN 8'-0" OF BUILDING WALL PANELS.
10. ALL EXTERIOR DUCTWORK SHALL BE CONSTRUCTED WITH SLOPED TOP SIDE TO PREVENT SNOW ACCUMULATION.

SDN#: 25472-130-P1-0000-P0250
UEL#: 2012016-1EC-GAD-000-0250-01

REFERENCE DRAWINGS

DRAWING No	TITLE
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REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-06-10	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	KEW	MLC	MLC	RDS	DCB	UPSIDE
2197104	KEW	MLC	MLC	RDS	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA MICHAEL CARRIERE
JUNE 10, 2014

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 02

MEDIUM VOLTAGE CO-VES-21 BUILDING
HVAC EQUIPMENT & DUCTWORK LAYOUT

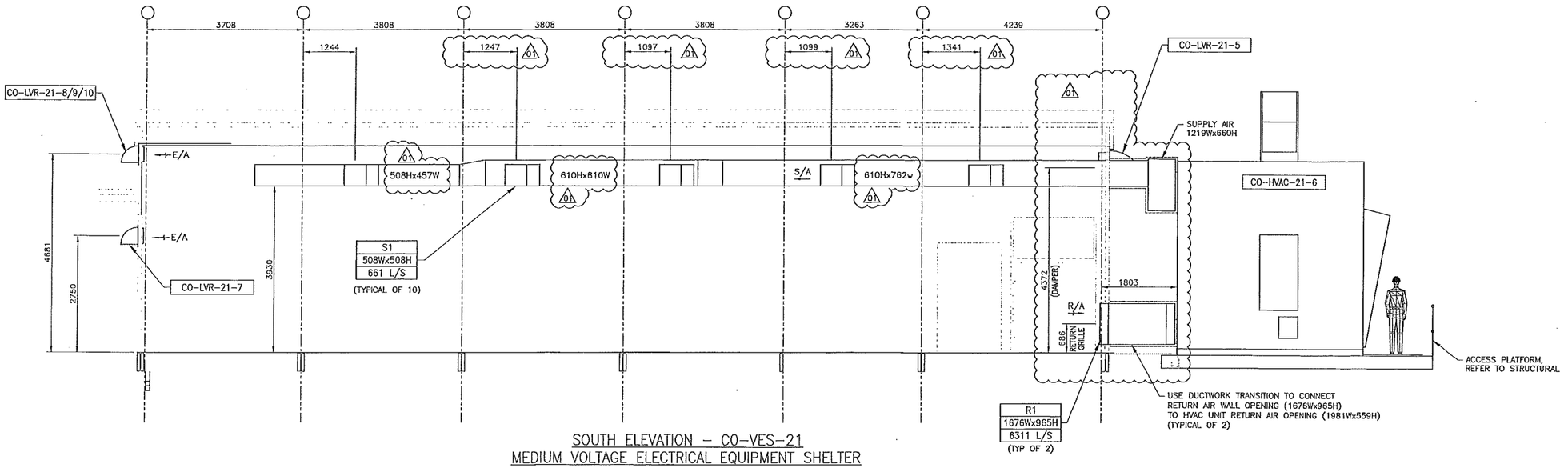
SCALE 1:50 | DRAWING No 4663-01-00-03-250 | REV 01

TC_A1_BR.DWG 594X841

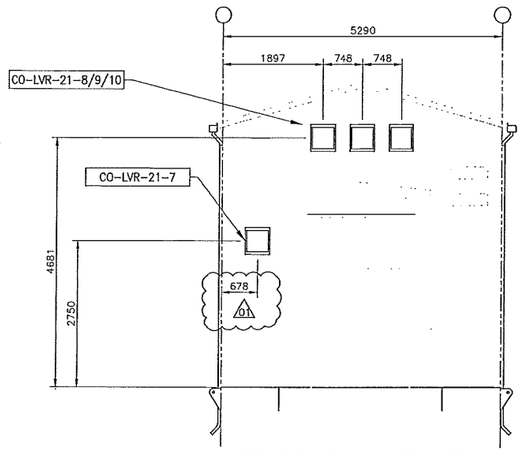
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME = DESIGNFILE

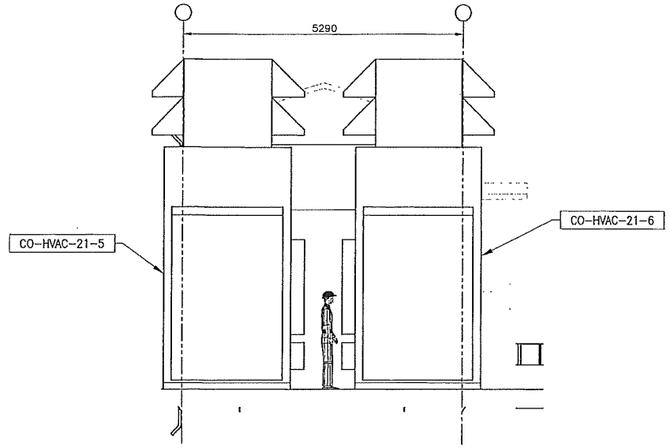
2014TTDwgs - Process Ventilation\Plot\PV_-_Re-Issued for Construction\2012016-1EC-GAD-000-0250-01.dwg, 3/31/2014 12:39 PM, \\uelprint\HO\2012\Last Ltr's, Plotter\PV_2012016.tbl\TT Standard Dwgs



SOUTH ELEVATION – CO-VES-21
MEDIUM VOLTAGE ELECTRICAL EQUIPMENT SHELTER



WEST ELEVATION – CO-VES-21
MEDIUM VOLTAGE ELECTRICAL EQUIPMENT SHELTER



EAST ELEVATION – CO-VES-21
MEDIUM VOLTAGE ELECTRICAL EQUIPMENT SHELTER

SDN#: 25472-130-P1-0000-P0251
UEL#: 2012016-1EC-GAD-000-0251-01

REFERENCE DRAWINGS

DRAWING No	TITLE
--	--

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)
01	2014-06-10	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	KEW	MLC	MLC	RDS	DCB	UPSIDE
2197104	KEW	MLC	MLC	RDS	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA
MICHAEL CARRIERE
JUNE 19 2014

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 02

MEDIUM VOLTAGE CO-VES-21 BUILDING HVAC EQUIPMENT & DUCTWORK LAYOUT

SCALE 1:50	DRAWING No 4663-01-00-03-251	REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME
DESIGNFILE

J:\DATA\Dwgs - Process Ventilation\Re-TEC - Re-Issued for Construction\2012016-1EC-GAD-000-0251-01.dwg, 1:50, 2014-06-10 12:56:58 PM, User=mlc, 2012016 REVIT Detailed Design

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	MANUFACTURER	MODEL	TAG	SCOPE OF SUPPLY
1	1	NORMAL POWER, 4160 V SWITCHGEAR	SIEMENS		CO-SWGR-01	OWNER
2	1	NORMAL POWER, 4160 V MCC	SIEMENS		(PART OF CO-SWGR-01)	OWNER
3	4	4160V VFD	SIEMENS		CO-VFD-21 CO-VFD-22 CO-VFD-23 CO-VFD-24	OWNER
4	1	PORTABLE LIFT DEVICE	SIEMENS		–	OWNER
5	1	5 kV TEST DEVICE	SIEMENS		–	OWNER
6	1	PANEL, TERMINAL CONTROL	POLYPHASE		CO-HTCP-06	OWNER
7	1	PANEL, COMMUNICATION	POLYPHASE		CO-TCMP-03	OWNER
8						
9	1	PANEL, HVAC CONTROL	SOUTHAMPTON TRANE		CO-CP-21-5	OWNER
10	1	PANEL, SWITCHBOARD MIMIC			CO-MMP-01	OWNER
11						
12	1	MVI TRIP PANEL	SABRE		IJB-50	OWNER
13						
14	1	100A BREAKER W/ENCLOSURE	EATON/C-H	GHC1100 C/W SGADN100 & NJ100		
15	1	PANELBOARD, 120 V, 100 A, 1ø, 3W, 36 CCT	AMETEK	FPB	CO-UACP-03	OWNER
16	1	PANELBOARD, 208/120 V, 225 A, 3ø, 4W, 42 CCT, 225 A MAIN BREAKER	CUTLER-HAMMER	P1aB4C2-42ED	CO-ACP-03	BUILDING VENDOR
17						
18						
19						
20						
21	1	TRANSFORMER, 45 kVA, 480-208Y/120 V,	HAMMOND	NMK045KBC	CO-DT-03	BUILDING VENDOR
22						
23						
24						
25	3	RECEPTACLE -- SINGLE, INTERIOR	CAH CAH HUBBELL	FD BOX AS 21 HBL 5261I		
26	21	LIGHT, FLUORESCENT	METALUX	DMF-232-120V-EB81		BUILDING VENDOR
27	5	LIGHT, HPS	LUMARK	HPWP-GL-70-MT-LL		BUILDING VENDOR
28	32	LIGHT, EMERGENCY/EXIT	LUMACELL	RG12S144E2MQ12W		BUILDING VENDOR
29	8	SWITCH, LIGHT -- 15 A, 3-WAY	CROUSE-HINDS CROUSE-HINDS HUBBELL	ENCLOSURE: FD BOX COVERPLATE: DS185 SWITCH: 1203I		BUILDING VENDOR
30	67	RECEPTACLE -- DUPLEX, INTERIOR	CROUSE-HINDS CROUSE-HINDS HUBBELL	ENCLOSURE: FD BOX COVERPLATE: ~~WRLD-1~~ DS23 RECEPTACLE: ~~HBL5262I~~ 5362I		BUILDING VENDOR
31	2	RECEPTACLE -- DUPLEX, GFCI	CROUSE-HINDS CROUSE-HINDS HUBBELL	ENCLOSURE: FD BOX COVERPLATE: ~~WRLD-1~~ RECEPTACLE: ~~GF15ILA~~ WD1010MXA GFR20ILA		BUILDING VENDOR
32	2	GROUND BUSBAR (EQUIPMENT)	BURNDY	BBB14412F		BUILDING VENDOR
33	2	GROUND BUSBAR, ISOLATING (INSTRUMENT)	BURNDY	BBB14412F		BUILDING VENDOR
34						

BILL OF MATERIAL

ITEM	QTY	DESCRIPTION	MANUFACTURER	MODEL	TAG	SCOPE OF SUPPLY
35	3	SMOKE DETECTOR, COMPLETE WITH RELAY MODULE	KIDDE	P1235CA SM120X	CO-ASH-8665A CO-ASH-8665B CO-ASH-8665C	BUILDING VENDOR
36	3	HEAT DETECTOR, 140°F	FENWAL	12-X27120-000-140	CO-ASH-8665D CO-ASH-8665E CO-ASH-8665F	BUILDING VENDOR
37	1	ALARM STROBE, RED, 120 VAC	CROUSE-HINDS	XBL16UL12060RYNN	CO-YA-8665D	BUILDING VENDOR
38	2	DOOR SWITCH, REED TYPE	GRI	4400-A	CO-YS-8665A CO-YS-8665B	BUILDING VENDOR
39	1	TEMPERATURE TRANSMITTER (INSIDE)	ROSEMOUNT	644HAK6M5Q4G1 WITH INTEGRAL 3-WIRE RTD (PT-100) FOR AMBIENT TEMPERATURE MEASUREMENT	CO-TT-8665	BUILDING VENDOR
40						
41						
42						
43						
44	2	PORTABLE CARBON DIOXIDE FIRE EXTINGUISHER		15 LB ULC RATED 10B:C		BUILDING VENDOR
45						
46						
47						
48						
49						
50	1	STORAGE CABINET				OWNER
51	2	ELECTRIC UNIT HEATER C/W REMOTE THERMOSTAT, ON/OFF SWITCH, AND WALL MOUNT BRACKET	CALORITECH	GX307 AND WB1540	CO-HTR-21-3 CO-HTR-21-4	BUILDING VENDOR
52	2	60A DISCONNECT	CUTLER-HAMMER	1HD362NF		
53	1	JUNCTION BOX	HAMMOND	EJ664 OR EQUAL	CO-JB-21	
54						
55	AS REQ'D	LADDER TYPE ALUMINUM CABLE TRAY, STRAIGHT SECTION, 900 mm WIDE, 188 mm SIDE RAILS, 229 mm RUNG SPACING, NEMA VE 1, 20C+.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	NOTE 1	BUILDING VENDOR
56	AS REQ'D	LADDER TYPE ALUMINUM CABLE TRAY, STRAIGHT SECTION, 300 mm WIDE, 188 mm SIDE RAILS, 229 mm RUNG SPACING, NEMA VE 1, 20C+.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
57						
58	2	90° HORIZONTAL ELBOW, LADDER TYPE TRAY, 900 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
59	4	90° HORIZONTAL ELBOW, LADDER TYPE TRAY, 300 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS.	~~B-LINE~~ T&B	01 ~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
60	~~2~~ Ø	45° HORIZONTAL ELBOW, LADDER TYPE TRAY, 600 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
61	~~4~~ Ø	90° VERTICAL OUTSIDE, LADDER TYPE TRAY, 900 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
62	2	HORIZONTAL TEE, LADDER TYPE TRAY, 300 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS.	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
63	1	HORIZONTAL TEE, LADDER TYPE TRAY, 900 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
64	3	HORIZONTAL TEE, LADDER TYPE TRAY, 600 mm WIDE, 188 mm SIDE RAILS, 600 mm BENDING RADIUS	~~B-LINE~~ T&B	~~SERIES 57 OR EQUAL~~ AH 37 SERIES	–	BUILDING VENDOR
65						
66						

NOTES:

1. REFER TO CABLE TRAY LAYOUT DWG. Nos. 4663-06-02-03-007, 4663-06-02-03-008 AND 4663-06-02-03-009 FOR TRAY TAGS.

SDN# 25472-130-E2-0000-P0003
UEL# 2012016-1EF-ELD-000-0003-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-007	CO-VES-21 CABLE TRAY & GNDING LAYOUT TRAYS AT EL.681.686 & EL.681.187
4663-06-02-03-008	CO-VES-21 CABLE TRAY & GROUNDING LAYOUT TRAYS AT EL. 680.672
4663-06-07-01-001	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 1
4663-06-07-01-002	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-06-07-01-003	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 3
4663-06-07-01-004	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 4

REVISION

REV No	DATE	DESCRIPTION
00	2014-01-23	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-03-17	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	SRL	JED	DCB	UPSIDE
2197104	MAA	PLR	AA	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA
2014-MAR-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

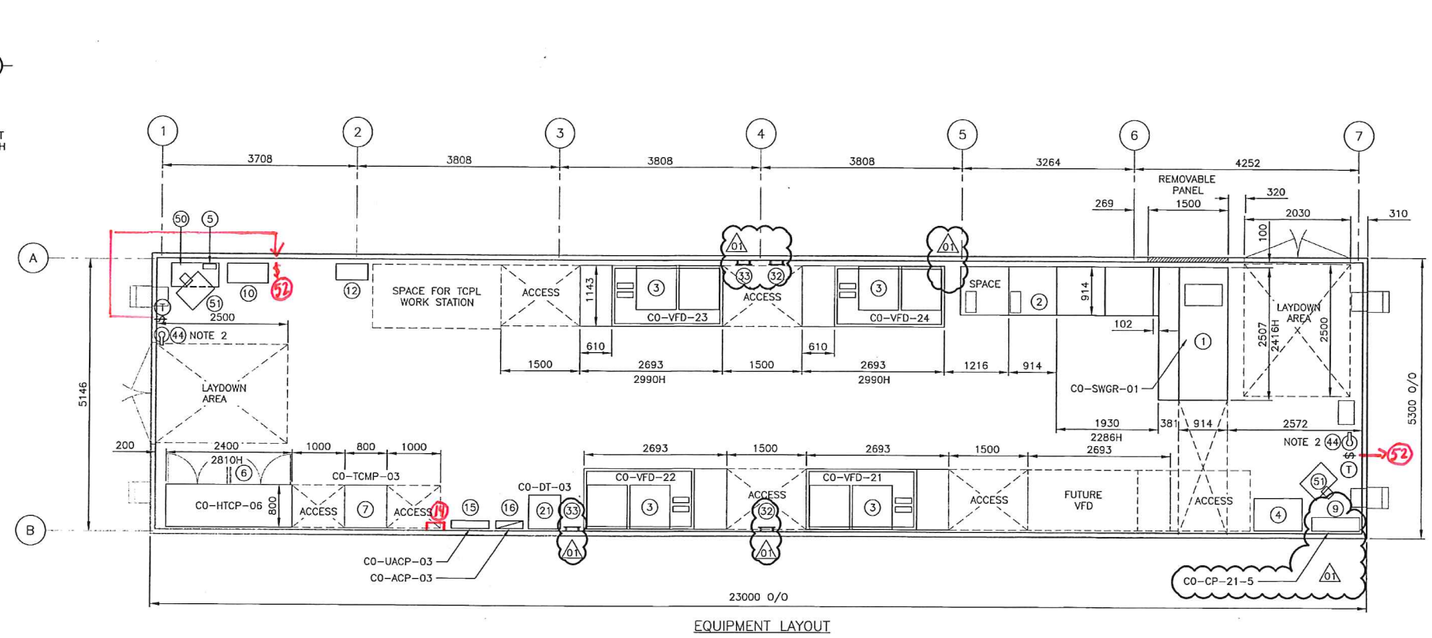
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21
ELECTRICAL EQUIPMENT
BILL OF MATERIAL

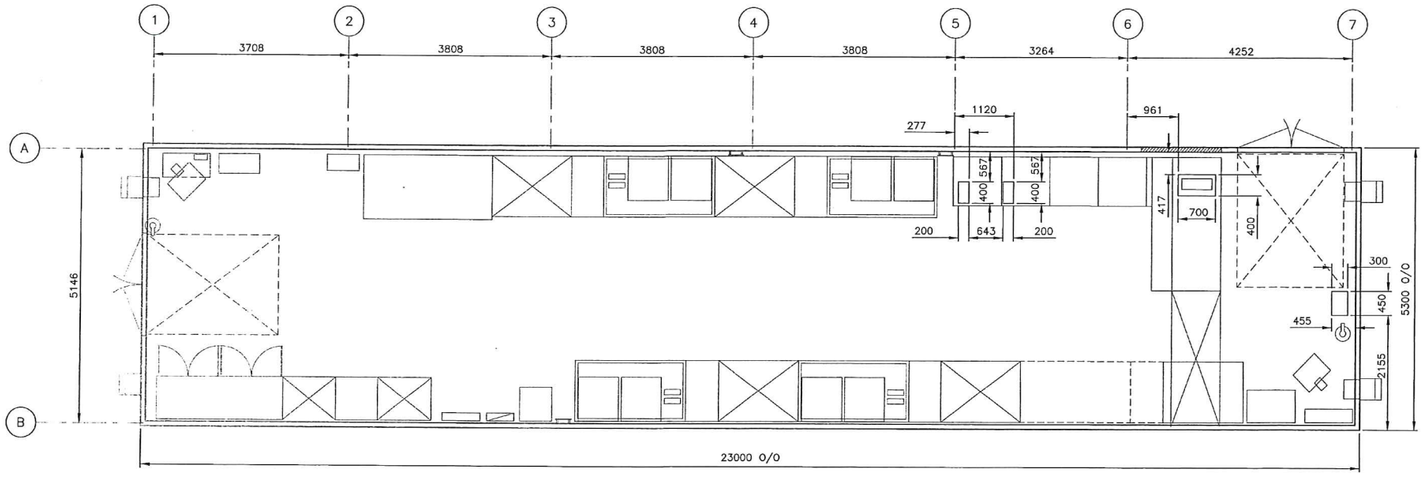
SCALE NTS | DRAWING No 4663-06-02-03-003 | REV 01

TC_A1_BR.DWG 594X841

TIME — DESIGNFILE



EQUIPMENT LAYOUT



FLOOR CUT-OUTS

1 0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20

SCALE 1:50

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. BUILDING VENDOR SHALL LOCATE THE FIRE EXTINGUISHERS.

SDN# 25472-130-E2-0000-P0001
UEL# 2012016-1EF-ELD-000-0001-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-003	CO-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL
4663-06-07-01-001	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 1
4663-06-07-01-002	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-06-07-01-003	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 3
4663-06-07-01-004	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 4

TC_A1_BR.DWG 594X841

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-01-23	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	BEM	MAB	AAA	JED	DCB	UPSIDE
01	2014-03-18	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	MAA	PLR	AAA	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT	PERMIT/ ENG. APPROVAL
	DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-MAR-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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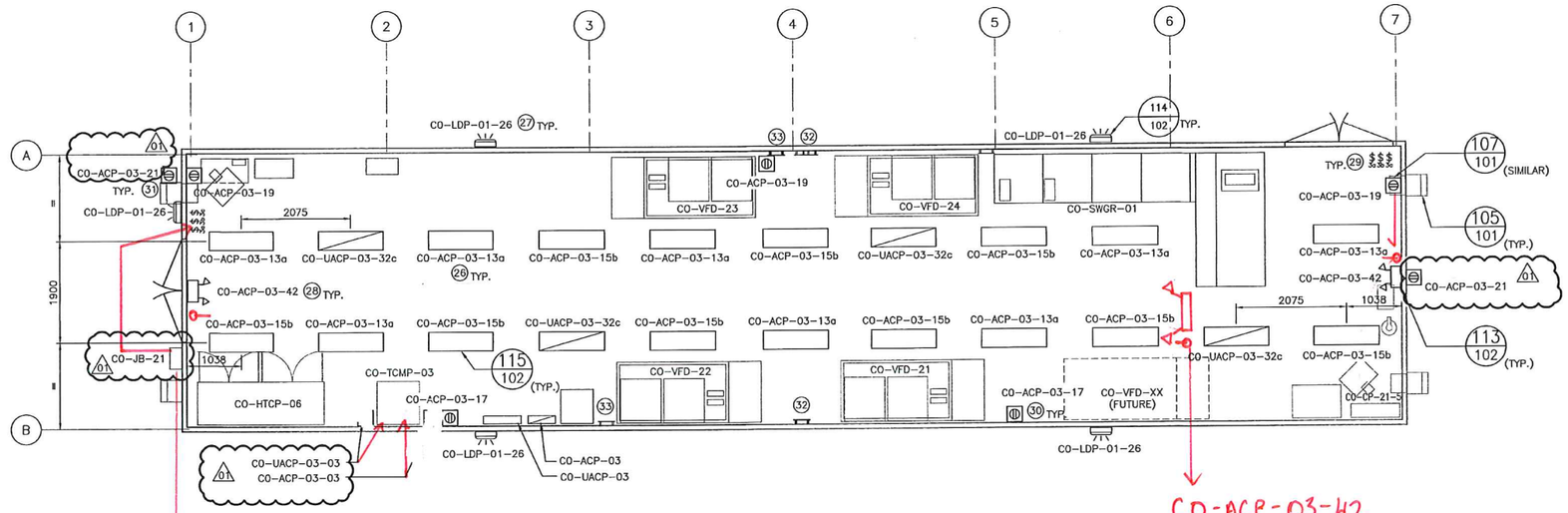
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-VES-21
ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS 01

SCALE 1:50	DRAWING No 4663-06-02-03-001	REV 01

TIME — DESIGNFILE



LIGHTING LAYOUT

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. ALL ELECTRICAL INSTALLATION DETAIL DRAWING NUMBERS PRECEDED BY NO. "4663-06-00-ID-".
3. WIRE EXTERIOR WALLPACKS TO JUNCTION BOX FOR FUTURE CONNECTION TO CO-LDP-01.

LEGEND:

- FLUORESCENT LUMINAIRE (EMERGENCY)
- FLUORESCENT LUMINAIRE
- EXTERIOR LIGHTING (WALL MOUNTED)
- EMERGENCY LIGHTING FIXTURE (WALL MOUNTED)
- DUPLEX RECEPTACLE

CO-LDP-01-01c — SWITCH # / CCT # / PANEL #

SINGLE RECEPTACLE

1 0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20

SCALE 1:50

SDN# 25472-130-E2-0000-P0004
UEL# 2012016-1EF-ELD-000-0004-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-00-05-001	CO-LDP-01 (480 V) LIGHTING DISTRIBUTION PANEL SCHEDULES
4663-06-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES
4663-06-02-03-003	CO-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAA	PLR	TAE	JED	DCB	UPSIDE
2197104	BEM	LLL	HMM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA
2014-OCT-08

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

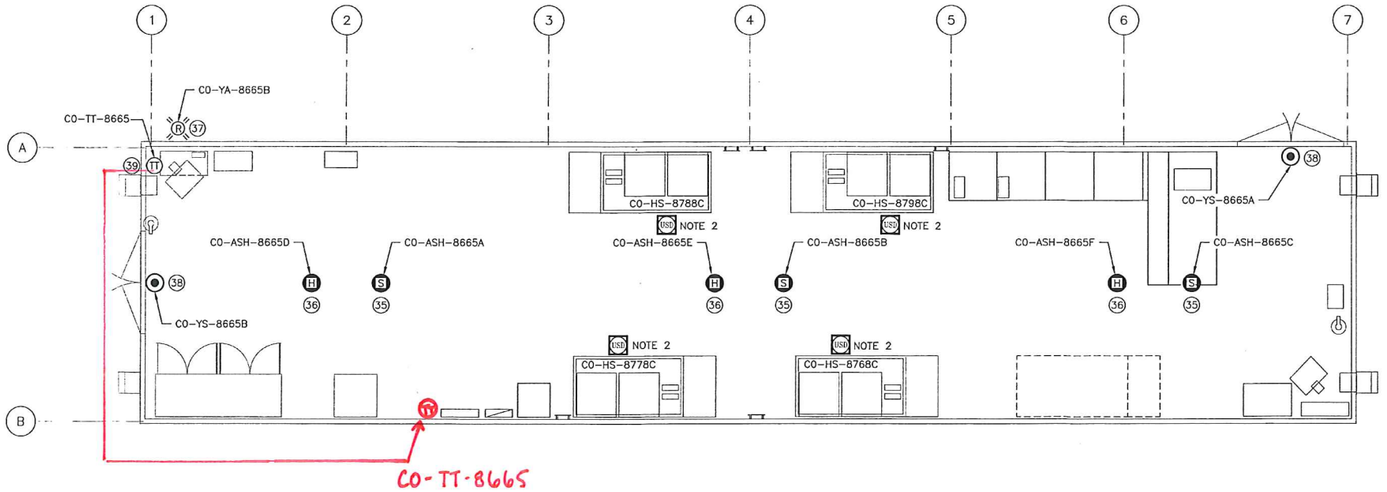
CO-VES-21
LIGHTING AND LOW VOLTAGE UTILITIES LAYOUT

SCALE 1:50 | DRAWING No 4663-06-02-03-004 | REV 01

TC_A1_BR.DWG 594X841

CO-ACP-03-42

PLANT NORTH



INSTRUMENTATION LAYOUT

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS.
2. USD PUSHBUTTONS ARE IN THE VFD AND SUPPLIED BY SIEMENS.

1 0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20

SCALE 1:50

SDN# 25472-130-E2-0000-P0006
UEL# 2012016-1EF-ELD-000-0006-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-05-03-SC-510	CO-HTCP-06, PLC-11/15 SLOT 05 ANALOG INPUT - SINGLE ENDED I/O WIRING DIAGRAM
4663-05-03-SC-518	CO-HTCP-06, PLC-11/15 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)
4663-05-03-SC-519	CO-HTCP-06, PLC-11/15 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 2 OF 2)
4663-05-03-SC-520	CO-HTCP-06, PLC-11/15 SLOT 11 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)
4663-05-03-SC-522	CO-HTCP-06, PLC-11/15 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM
4663-05-03-SC-533	CO-HTCP-06, PLC-11/16 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)
4663-05-03-SC-535	CO-HTCP-06, PLC-11/16 SLOT 11 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)
4663-06-02-03-003	CO-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JIM	PLR	PJN	TYH	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA TANVIR YASIN YASIN

2014_APR_22

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21
INSTRUMENTATION DEVICES
LAYOUT

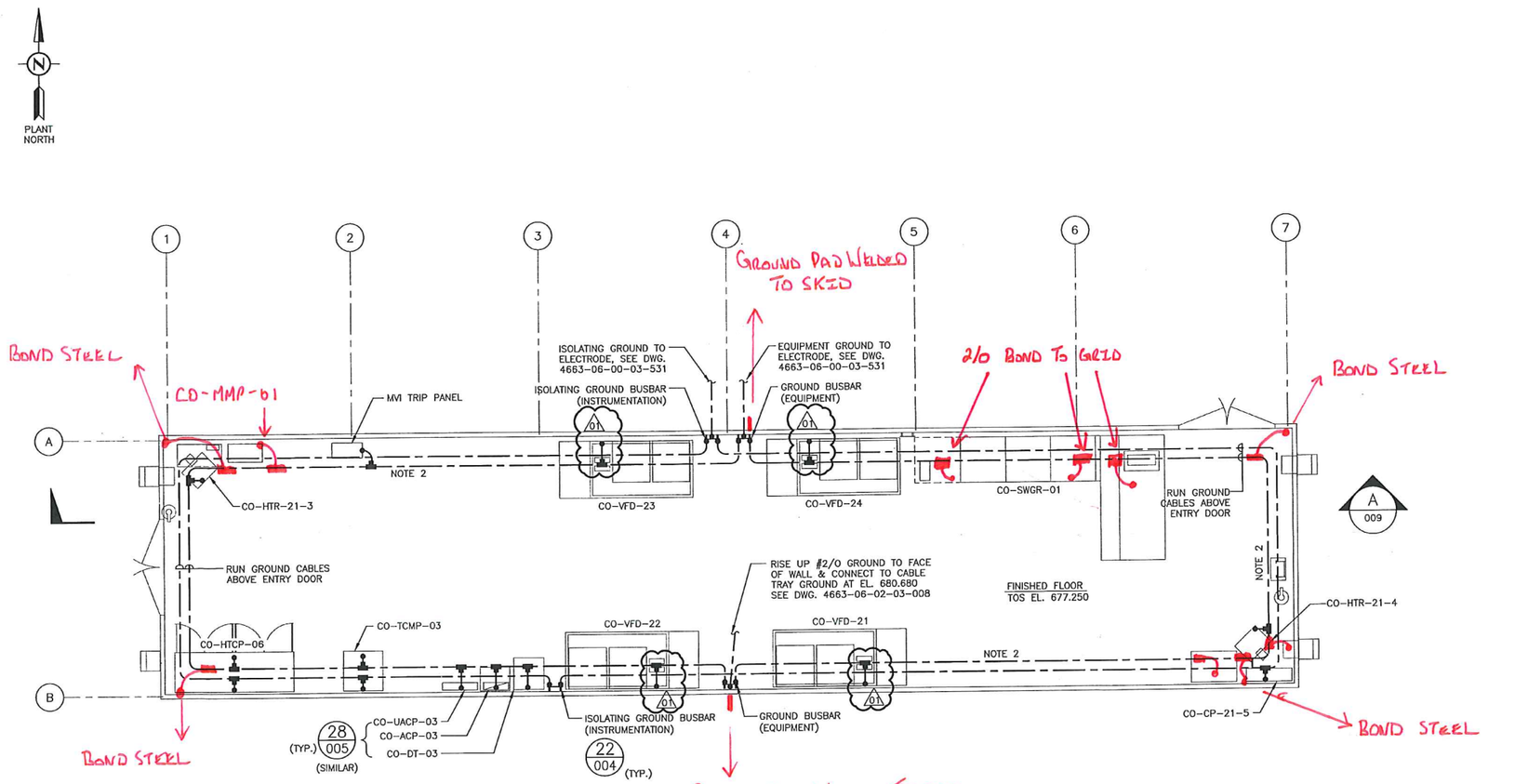
SCALE 1:50 | DRAWING No 4663-06-02-03-006 | REV 00

TIME — DESIGN FILE

TC_A1_BR.DWG 594X841

GROUND PAD TO SUPPORT "YGHA" OR EQUAL LUGS. DETAIL 5 ON DRAWING 4663-06-00-ID-001

BOND STEEL TO EQUIPMENT LOOP WITH 2/0.



EQUIPMENT GROUND LOOP IS CABLE TRAY GROUND LOOP

ISOLATED GROUND LOOP TO BE INSTALLED IN LOWER TRAY

LEGEND:

- #4/0 UNDERGROUND GROUND GRID
- #2/0 CABLE TRAY GROUND
- #2 EQUIPMENT GROUND
- COMPRESSION TYPE CONNECTION
- 3-POINT GROUNDING CONDUCTOR CONNECTION
- 4-POINT GROUNDING CONDUCTOR CONNECTION
- GROUND BUS

CO-TRY-XXXX XXXX XXX.XXX

- TRAY TYPE: L=LADDER S=SOLID V=VENTILATED
- TRAY NOMINAL SIZE: 15=150MM 30=300MM 45=450MM 60=600MM 90=900MM
- G=WITH GROUND CABLE ()=NO GROUND CABLE
- ELEVATION: XXX=(M), XXX=(MM)
- SEQUENTIAL NUMBER: 01 TO 99
- DESTINATION AREA: 0=WITHIN EES/VES BUILDINGS 1=TK-21, 23, 25 2=TK-22, 24, 26 3=TK-27, 29, 31 4=TK-28, 30, 32 5=PUMPS 6=MATRIX EAST 7=MATRIX WEST 8=SWTHYARD NORTH 9=SWTHYARD SOUTH
- VOLTAGE: 1=ABOVE 4160V (SPACED) 2=4160V (SPACED) 3=480V FEEDER (SPACED) 4=24V (INSTRUMENTATION) 5=MIXED WITHOUT BARRIER (120V UP TO 480V) 6=MIXED WITH BARRIER
- EQUIPMENT TYPE: TRY=CABLE TRAY
- SITE DESIGNATION: CO=KHTT

NOTES:

1. ALL ELECTRICAL INSTALLATION DETAIL DRAWING NUMBERS PRECEDED BY N° 4663-06-00-ID.
2. ~~RUN #2/0 AWG GROUND VIA STEEL CHANNEL SECURED TO WALL EVERY 3 m INTERVALS, 300 mm ABOVE FINISHED FLOOR~~
3. ALL GROUNDING WIRE RUN INSIDE BLDG SHALL BE FT4 RATED GREEN INSULATED CABLE

1 0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20

SCALE 1:50

SDN#: 25472-130-E2-0000-P0005
UEL#: 2012016-1EF-ELD-000-0005-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-02-03-007	CO-VES-21 CABLE TRAY LAYOUT ELEVATIONS, SECTIONS AND DETAILS
4663-06-02-03-008	CO-VES-21 CABLE TRAY LAYOUT ELEVATIONS, SECTIONS AND DETAILS
4663-02-02-06-009	MEDIUM VOLTAGE-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-008	MEDIUM VOLTAGE-VES-21 BUILDING PLAN
4663-02-02-07-009	MEDIUM VOLTAGE-VES-21 BUILDING ELEVATIONS

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAA	PLR	AAA	JED	DCB	UPSIDE
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	LLL	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODING 2014-OCT-08

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

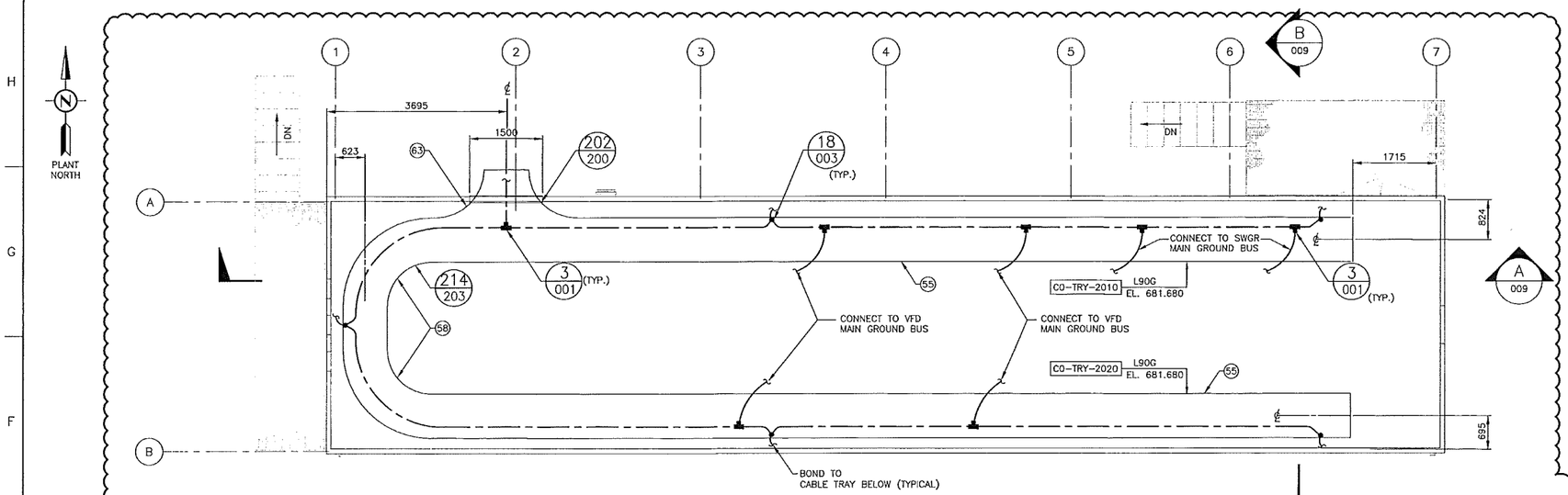
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 ELECTRICAL EQUIPMENT GROUNDING LAYOUT

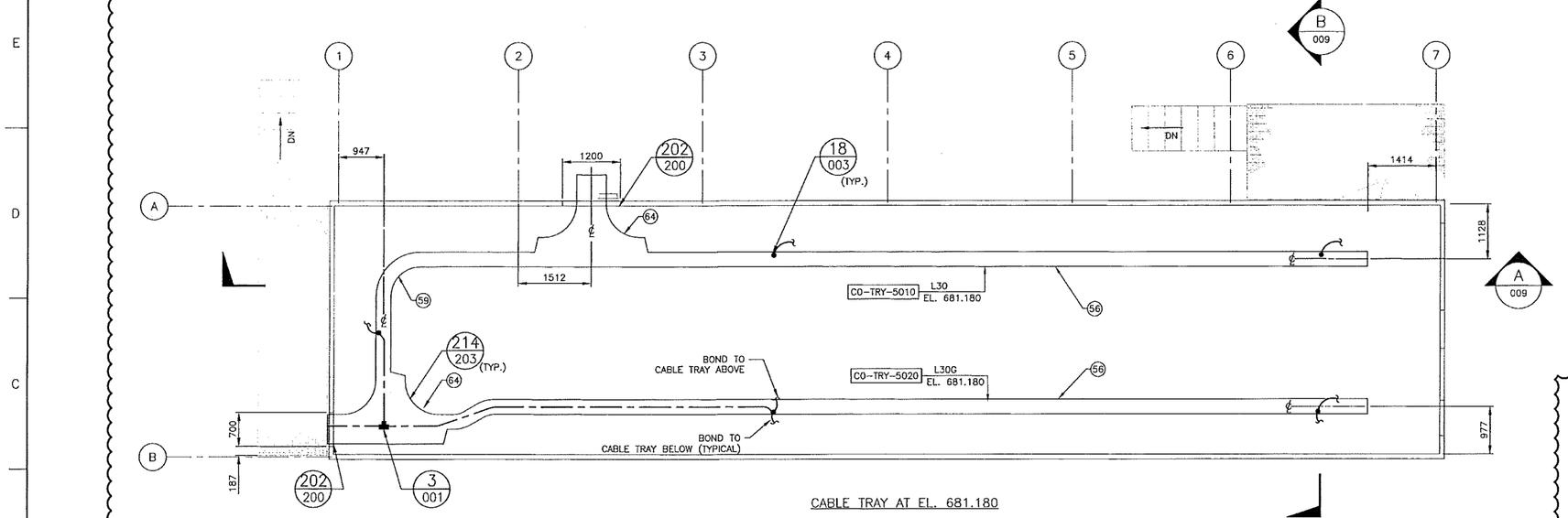
SCALE 1:50 | DRAWING No 4663-06-02-03-005 | REV 01

TC_A1_BR.DWG 594X841

TIME — DESIGNFILE



CABLE TRAY AT EL. 681.680



CABLE TRAY AT EL. 681.180

SCALE 1:50

LEGEND:

- #4/0 UNDERGROUND GROUND GRID
- #2/0 CABLE TRAY GROUND
- #2 EQUIPMENT GROUND
- COMPRESSION TYPE CONNECTION
- 3-POINT GROUNDING CONDUCTOR CONNECTION
- 4-POINT GROUNDING CONDUCTOR CONNECTION
- GROUND BUS

CO-TRY-XXXX XXXX XXX.XXX

- TRAY TYPE: L=LADDER, S=SOLID, V=VENTILATED
- TRAY NOMINAL SIZE: 15=150MM, 30=300MM, 45=450MM, 60=600MM, 90=900MM
- G=WITH GROUND CABLE, ()=NO GROUND CABLE
- ELEVATION: XXX=(M), XXX=(MM)
- SEQUENTIAL NUMBER: 01 TO 99
- DESTINATION AREA: 0=WITHIN EES/VES BUILDINGS, 1=TK-21, 23, 25, 2=TK-22, 24, 26, 3=TK-27, 29, 31, 4=TK-28, 30, 32, 5=PUMPS, 6=MATRIX EAST, 7=MATRIX WEST, 8=SWTHYARD NORTH, 9=SWTHYARD SOUTH
- VOLTAGE: 1=ABOVE 4160V (SPACED), 2=4160V (SPACED), 3=480V FEEDER (SPACED), 4=24V (INSTRUMENTATION), 5=MIXED WITHOUT BARRIER (120V UP TO 480V), 6=MIXED WITH BARRIER
- EQUIPMENT TYPE: TRY=CABLE TRAY
- SITE DESIGNATION: CO=KHTT

NOTES:

1. ALL ELECTRICAL INSTALLATION DETAIL DRAWING NUMBERS PRECEDED BY N° 4663-06-00-ID.
2. ALL DIMENSIONS TO BE FROM CENTER LINE OF CABLE TRAY TO BUILDING GRID LINE AS SHOWN.

SDN#: 25472-130-E2-0000-P0007
UEL#: 2012016-1EF-ELD-000-0007-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-00-00-050	ELECTRICAL LIGHTING, GROUNDING, & CABLE TRAY GENERAL NOTES
4663-06-02-03-008	CO-VES-21 CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL.680.672
4663-06-02-03-009	CO-VES-21 CABLE TRAY & GROUNDING LAYOUT ELEVATIONS, SECTIONS AND DETAILS
4663-02-02-07-009 & 010	MEDIUM VOLTAGE CO-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-011	MEDIUM VOLTAGE CO-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-008	MEDIUM VOLTAGE CO-VES-21 BUILDING SECTIONS
4663-02-02-07-009	MEDIUM VOLTAGE CO-VES-21 BUILDING ELEVATIONS
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-003	CO-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-01-03	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)	2197104	BEM	PLR	AAA	JED	DCB	UPSIDE
01	2014-03-18	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	MM	PLR	AAA	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOORLY 2014-MAR-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

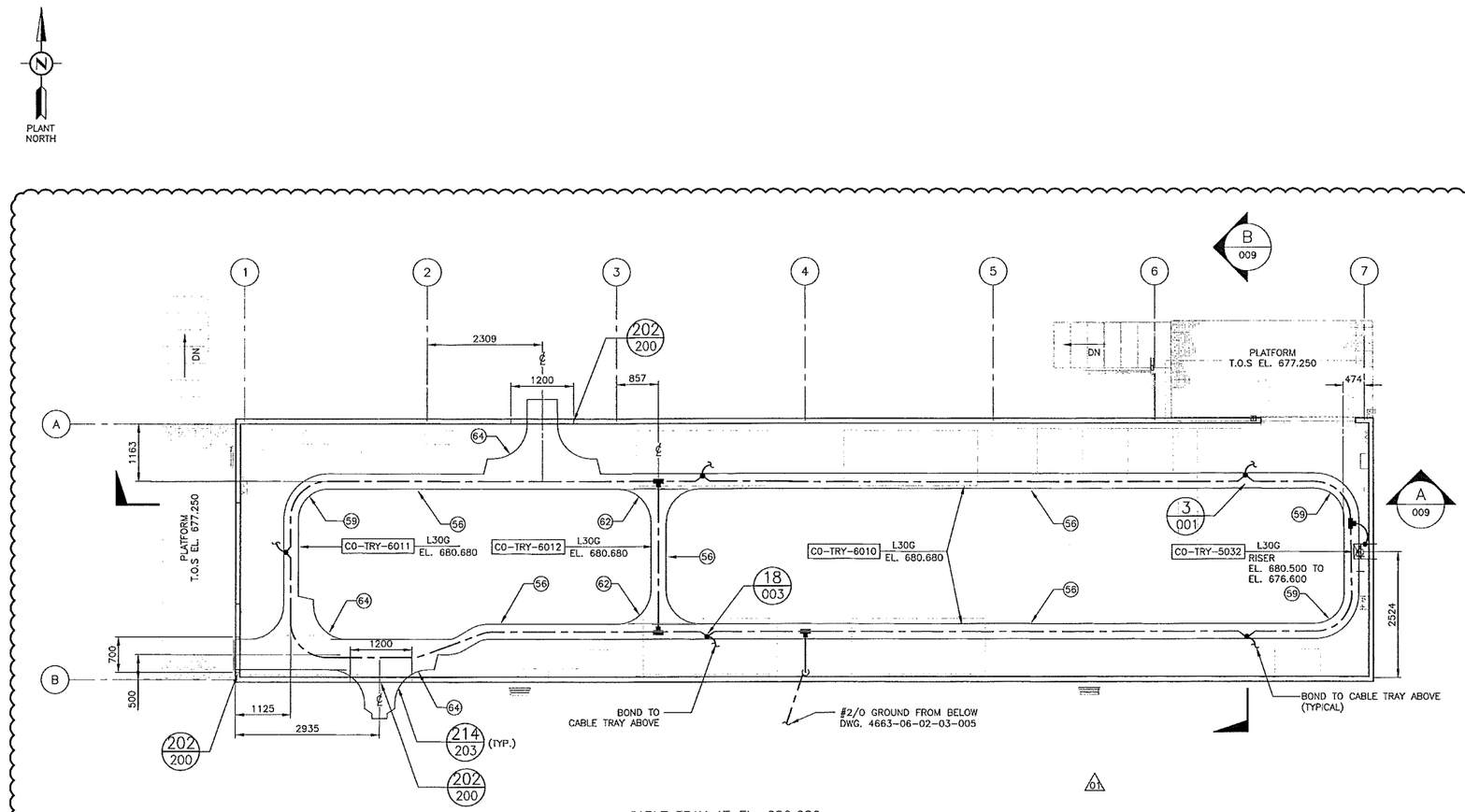
CO-VES-21
CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL.681.686 & EL.681.187

SCALE 1:50 | DRAWING No 4663-06-02-03-007 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME — DESIGNFILE



CABLE TRAY AT EL. 680.680

LEGEND:

- #4/0 UNDERGROUND GROUND GRID
- #2/0 CABLE TRAY GROUND
- #2 EQUIPMENT GROUND
- COMPRESSION TYPE CONNECTION
- 3-POINT GROUNDING CONDUCTOR CONNECTION
- 4-POINT GROUNDING CONDUCTOR CONNECTION
- GROUND BUS

C0-TRY-XXXX XXXX XXX.XXX

- TRAY TYPE: L=LADDER, S=SOLID, V=VENTILATED
- TRAY NOMINAL SIZE: 15=150MM, 30=300MM, 45=450MM, 60=600MM, 90=900MM
- G=WITH GROUND CABLE, ()=NO GROUND CABLE
- ELEVATION: XXX=(M), XXX=(MM)
- SEQUENTIAL NUMBER: 01 TO 99
- DESTINATION AREA: 0=WITHIN EES/VES BUILDINGS, 1=TK-21, 23, 25, 2=TK-22, 24, 26, 3=TK-27, 29, 31, 4=TK-28, 30, 32, 5=PUMPS, 6=MATRIX EAST, 7=MATRIX WEST, 8=SWTHYARD NORTH, 9=SWTHYARD SOUTH
- VOLTAGE: 1=ABOVE 4160V (SPACED), 2=4160V (SPACED), 3=480V FEEDER (SPACED), 4=24V (INSTRUMENTATION), 5=MIXED WITHOUT BARRIER (120V UP TO 480V), 6=MIXED WITH BARRIER
- EQUIPMENT TYPE: TRY=CABLE TRAY
- SITE DESIGNATION: C0=KHTT

NOTES:

1. ALL ELECTRICAL INSTALLATION DETAIL DRAWING NUMBERS PRECEDED BY N° 4663-06-00-ID.
2. ALL DIMENSIONS TO BE FROM CENTER LINE OF CABLE TRAY TO BUILDING GRID LINE AS SHOWN.

1 0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20

SCALE 1:50

SDN#: 25472-130-E2-0000-P0008
UEL#: 2012016-1EF-ELD-000-0008-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-00-00-050	ELECTRICAL LIGHTING, GROUNDING & CABLE TRAY GENERAL NOTES
4663-06-02-03-007	C0-VES-21 CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL.681.686 & EL.681.187
4663-06-02-03-009	C0-VES-21 CABLE TRAY & GROUNDING LAYOUT ELEVATIONS, SECTIONS AND DETAILS
4663-02-02-07-009 & 010	MEDIUM VOLTAGE C0-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-011	MEDIUM VOLTAGE C0-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-008	MEDIUM VOLTAGE C0-VES-21 BUILDING SECTIONS
4663-02-02-07-009	MEDIUM VOLTAGE C0-VES-21 BUILDING ELEVATIONS
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-003	C0-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL

TC_A1_BR.DWG 594X841

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-01-03	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)	2197104	BEM	PLR	AAA	JED	DCB	UPSIDE
01	2014-03-18	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)	2197104	MA	PLR	AAA	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY
2014-MAR-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

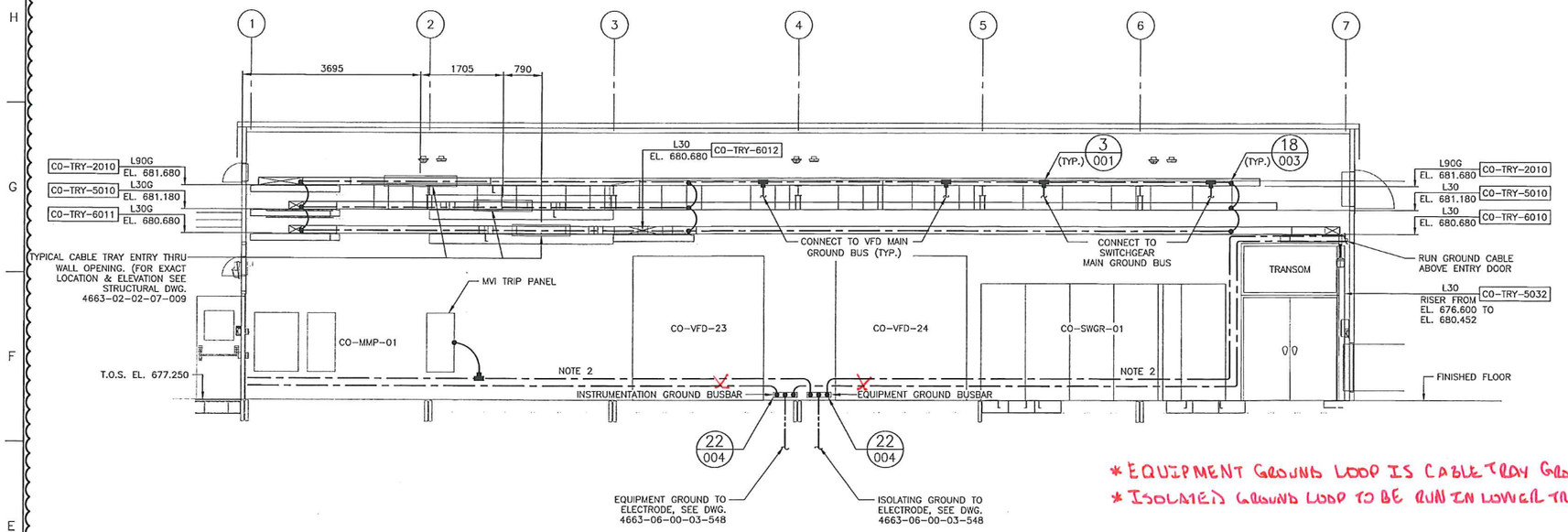
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

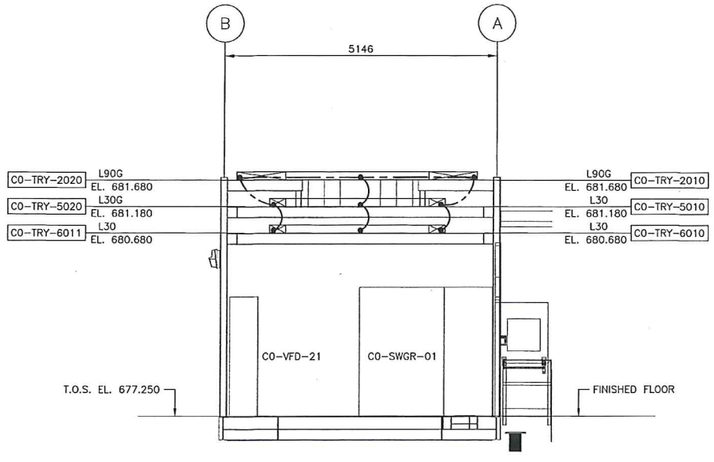
C0-VES-21
CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL. 680.672

SCALE 1:50 | DRAWING No 4663-06-02-03-008 | REV 01

TIME — DESIGNFILE



SECTION A
SCALE 1:50 005/007/008



SECTION B
SCALE 1:50 007/008

01

0 METRES 1 2 3 4 5 6 7
0 FEET 5 10 15 20
SCALE 1:50

ALL TRAY TO TRAY JUMPERS TO BE 4/0.

BOND STEEL IN 4 CORNERS WITH 4/0.

LEGEND:

- #4/0 UNDERGROUND GROUND GRID
- #2/0 CABLE TRAY GROUND
- #2 EQUIPMENT GROUND
- COMPRESSION TYPE CONNECTION
- 3-POINT GROUNDING CONDUCTOR CONNECTION
- 4-POINT GROUNDING CONDUCTOR CONNECTION
- GROUND BUS

C0-TRY-XXXX
- TRAY TYPE: L=LADDER, S=SOLID, V=VENTILATED
- TRAY NOMINAL SIZE: 15=150MM, 30=300MM, 45=450MM, 60=600MM, 90=900MM
- G=WITH GROUND CABLE, ()=NO GROUND CABLE
- XXXX / XXX.XXX
  - ELEVATION: XXX=(M), XXX=(MM)
  - SEQUENTIAL NUMBER: 01 TO 99
  - DESTINATION AREA: 0=WITHIN EES/VES BUILDINGS, 1=TK-21, 23, 25, 2=TK-22, 24, 26, 3=TK-27, 29, 31, 4=TK-28, 30, 32, 5=PUMPS, 6=MATRIX EAST, 7=MATRIX WEST, 8=SWTHYARD NORTH, 9=SWTHYARD SOUTH
  - VOLTAGE: 1=ABOVE 4160V (SPACED), 2=4160V (SPACED), 3=480V FEEDER (SPACED), 4=24V (INSTRUMENTATION), 5=MIXED WITHOUT BARRIER (120V UP TO 480V), 6=MIXED WITH BARRIER
  - EQUIPMENT TYPE: TRY=CABLE TRAY
  - SITE DESIGNATION: C0=KHTT

NOTES:

1. ALL ELECTRICAL INSTALLATION DETAIL DRAWING NUMBERS PRECEDED BY N° 4663-06-00-ID.
2. ~~RUN #2/0 AWG GROUND VIA STEEL CHANNEL SECURED TO WALL EVERY 3m INTERVALS, 300mm ABOVE FINISHED FLOOR.~~
3. ALL DIMENSIONS TO BE FROM CENTER LINE OF CABLE TRAY TO BUILDING GRID LINE AS SHOWN.

* EQUIPMENT GROUND LOOP IS CABLE TRAY GROUND LOOP
* ISOLATED GROUND LOOP TO BE RUN IN LOWER TRAY

NOTE: THE CONTENT ON THIS DRAWING WAS PREVIOUSLY ISSUED UNDER DRAWING NUMBER 4663-06-02-03-008, REV. 0A

SDN#: 25472-130-E2-0000-P0009
UEL#: 2012016-1EF-ELD-000-0009-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-00-00-050	ELECTRICAL LIGHTING, GROUNDING, & CABLE TRAY GENERAL NOTES
4663-06-02-03-007	C0-VES-21 CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL.681.686 & EL.681.187
4663-06-02-03-008	C0-VES-21 CABLE TRAY, CABLING & GROUNDING LAYOUT TRAYS AT EL.680.672
4663-02-02-07-009 & 010	MEDIUM VOLTAGE C0-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-011	MEDIUM VOLTAGE C0-VES-21 STRUCTURAL STEEL PLAN
4663-02-02-07-008	MEDIUM VOLTAGE C0-VES-21 BUILDING SECTIONS
4663-02-02-07-009	MEDIUM VOLTAGE C0-VES-21 BUILDING ELEVATIONS
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-003	C0-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-01-03	ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)	2197104	BEM	PLR	AAA	JED	DCB	UPSIDE
01	2014-03-18	RE-ISSUED FOR CONSTRUCTION (UEL PROJ# 2012016)	2197104	MAA	PLR	AAA	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-MAR-21

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VES-21
CABLE TRAY, CABLING & GROUNDING LAYOUT ELEVATIONS, SECTIONS AND DETAILS

SCALE 1:50 | DRAWING No 4663-06-02-03-009 | REV 01

TIME DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

NAME: C0-UACP-03	PHASES: 1	BUS SIZE: 100 A	LOCATION: C0-VES-21	MAIN BREAKER: N/A
VOLTAGE: 120 V	WIRES: 2	MOUNTING: SURFACE		FEEDER: 1-2C #1/0 AWG (C0-P-0765)

EXTERNAL 100A ENCLOSED BREAKER
BOM #14

DESCRIPTION	LOAD (WATTS)	FUSE SIZE (AMPS)	BRKR SIZE (AMPS)	CCT NO.	CCT NO.	BRKR SIZE (AMPS)	FUSE SIZE (AMPS)	LOAD (WATTS)	DESCRIPTION
C0-HTCP-06 CONTROL POWER	120	20	30	1	2	30	20	50	C0-HTCP-06 (FIRE/BEACON SUPPLY)
C0-TCMP-03 CONTROL POWER	200	20	30	3	4	30	20	0	SPARE
SPARE	0	20	30	5	6	30	20	0	SPARE
SPARE	0	20	30	7	8	30	20	0	SPARE
SPARE	0	20	30	9	10	30	20	25	C0-MMP-01 MIMIC PANEL
SPARE	0	20	30	11	12	30	20	400	C0-VFD-21 CONTROL POWER
SPARE	0	20	30	13	14	30	20	400	C0-VFD-22 CONTROL POWER
SPARE	0	20	30	15	16	30	20	400	C0-VFD-23 CONTROL POWER
SPARE	0	20	30	17	18	30	20	400	C0-VFD-24 CONTROL POWER
C0-SWGR-01 CONTROL POWER	150	20	30	19	20	30	20	400	C0-VFD-XX CONTROL POWER (FUTURE)
C0-MVC-11 CONTROL POWER	50	20	30	21	22	30	20	50	C0-IJB-50 REMOTE TRIPPING JUNCTION BOX
C0-MVC-12 CONTROL POWER	50	20	30	23	24	30	20	100	C0-CP-21-5 HVAC CONTROL PANEL
C0-MVC-21 CONTROL POWER	50	20	30	25	26	30	20	50	C0-T-11 TRANSFORMER CONTROL POWER
C0-MVC-22 CONTROL POWER	50	20	30	27	28	30	20	50	SMOKE DETECTORS
C0-MVC-23 CONTROL POWER	50	20	30	29	30	30	20	200	INTERIOR EMERGENCY LIGHTS (C0-VES-21)
C0-MVC-24 CONTROL POWER	50	20	30	31	32	30	20	0	SPARE
C0-MVC-XX CONTROL POWER (FUTURE)	50	20	30	33	34	30	20	0	SPARE
C0-MVC-XX CONTROL POWER (FUTURE)	50	20	30	35	36	30	20	0	SPARE
LEFT SIDE (WATTS): 870		TOTAL (WATTS): 3395						2525	RIGHT SIDE (WATTS):

30 20

NAME: C0-ACP-03	PHASES: 3	BUS SIZE: 225 A	LOCATION: C0-VES-21	MAIN BREAKER: 225 A
VOLTAGE: 120/208 V	WIRES: 4	MOUNTING: SURFACE		FEEDER: 4C # 2/0 (C0-P-2721)

DESCRIPTION	WATTS A	WATTS B	WATTS C	BRKR SIZE (AMPS)	CCT NO.	CCT NO.	BRKR SIZE (AMPS)	WATTS A	WATTS B	WATTS C	DESCRIPTION
C0-HTCP-06 CONTROL POWER	120			15	1	2	15	40			C0-HTCP-06 CABINET LIGHTS
C0-TCMP-03 CONTROL POWER		200		15	3	4	15		1500		C0-SWGR-01 SPACE HEATERS
SPARE			0	15	5	6	15			600	C0-SWGR-01 SPACE HEATERS
SPARE	0			15	7	8	15	0			SPARE
SPARE		0		15	9	10	15		0		SPARE
SPARE			0	15	11	12	15			0	SPARE
C0-VES-21 INTERIOR LIGHTS	570			15	13	14	15	0			SPARE
C0-VES-21 INTERIOR LIGHTS		640		15	15	16	15		0		SPARE
C0-VES-21 INTERIOR RECEPTACLE			600	~~15~~ 20	17	18	15			0	SPARE
C0-VES-21 INTERIOR RECEPTACLE	400			~~15~~ 20	19	20	15	0			SPARE
C0-VES-21 EXTERIOR RECEPTACLE		400		~~15~~ 20	21	22	15		0		SPARE
SPARE			0	15	23	24	15			0	SPARE
02 SPARE	0			15	25	26	15	0			SPARE
SPARE		0		15	27	28	15		0		SPARE
C0-BPM-21 SPACE/OIL SUMP HEATER			630	15	29	30	15			0	SPARE
C0-BPM-22 SPACE/OIL SUMP HEATER	630			15	31	32	15	0			SPARE
C0-BPM-23 SPACE/OIL SUMP HEATER		630		15	33	34	15		0		SPARE
C0-BPM-24 SPACE/OIL SUMP HEATER			630	15	35	36	15			0	SPARE
C0-RPL-02 RECEPTACLE	200			15	37	38	15	0			SPARE
SPARE		0		15	39	40	20		1650		C0-T-11 CABINET HEATERS
SPARE			0	15	41	42	15			20	EMERGENCY/EXIT LIGHT BATTERY PACK
02 LEFT SIDE (WATTS) 5650	1920	1870	1860	TOTAL WATTS: 9460				40	3150	620	3810 RIGHT SIDE (WATTS)

NOTES:

1. ALL EQUIPMENT & CABLE TAGS SHALL BEGIN WITH 130-KSHTT-C0-...

SDN# 25472-130-EC-0000-P0004
UEL# 2012016-1EF-CAB-000-0038-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-003	C0-VES-21 ELECTRICAL EQUIPMENT BILL OF MATERIAL
4663-06-02-03-004	C0-VES-21 LIGHTING AND LOW VOLTAGE UTILITIES LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-17	ISSUED FOR CONSTRUCTION (UEL PROJ # 2012016)
01	2014-04-17	RE-ISSUED FOR CONSTRUCTION (UEL PROJ # 2012016)
02	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	MJM	JED	DCB	UPSIDE
2197104	BEM	PLR	MAB	JED	DCB	UPSIDE
2197104	BEM	LLL			DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-OCT-08

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
In business to deliver

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VES-21
C0-ACP-03 AND C0-UACP-03
DISTRIBUTION PANEL SCHEDULES

SCALE N.T.S. | DRAWING No 4663-06-00-05-004 | REV 02

TC_A1_BR.DWG 594X841

TIME DESIGNFILE

REV	CABLE NUMBER	DESCRIPTION				SYSTEM VOLTAGE (VOLT)	APPLICATION	ROUTE			LENGTH (m) NOTE 1	COMMENTS
		CONDUCTORS		RATING (VOLT)	TYPE			FROM	VIA	TO		
		QTY.	SIZE									
00	CO-P-0801	3C	#2/0 AWG	5 kV	HV TECK90	4160 V	POWER	CO-SWGR-01 4160 V SWITCHGEAR, CO-VES-21	CABLE TRAY	CO-VFD-21 4160 V VFD, CO-VES-21	30	SHIELDED CABLE, 133% INSULATION AND ALLOW 100% CABLE SPACING
00	CO-P-0802	3C	#2/0 AWG	5 kV	HV TECK90	4160 V	POWER	CO-SWGR-01 4160 V SWITCHGEAR, CO-VES-21	CABLE TRAY	CO-VFD-22 4160 V VFD, CO-VES-21	35	SHIELDED CABLE, 133% INSULATION AND ALLOW 100% CABLE SPACING
00	CO-P-0803	3C	#2/0 AWG	5 kV	HV TECK90	4160 V	POWER	CO-SWGR-01 4160 V SWITCHGEAR, CO-VES-21	CABLE TRAY	CO-VFD-23 4160 V VFD, CO-VES-21	30	SHIELDED CABLE, 133% INSULATION AND ALLOW 100% CABLE SPACING
00	CO-P-0804	3C	#2/0 AWG	5 kV	HV TECK90	4160 V	POWER	CO-SWGR-01 4160 V SWITCHGEAR, CO-VES-21	CABLE TRAY	CO-VFD-24 4160 V VFD, CO-VES-21	30	SHIELDED CABLE, 133% INSULATION AND ALLOW 100% CABLE SPACING

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING, ESTIMATING, MEASUREMENT OR CUTTING OF CABLE.
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0012
UEL#: 2012016-1EF-CBS-000-0002-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES COODY
2014-MAR-31

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING
MEDIUM VOLTAGE CABLE SCHEDULE
SHEET 1

SCALE N/A | DRAWING No 4663-06-07-04-001 | REV 00

TC_A1_BR.DWG 594X841

TIME---DESIGN FILE

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE	ROUTE			LENGTH	COMMENTS
		CONDUCTORS		RATING	TYPE			FROM	VIA	TO		
		QTY.	SIZE	(VOLT)			(VOLT)				(m) NOTE 1	
00	CO-C-2700	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MBKR-B-01 SWGR MAIN BREAKER SHUNT TRIP, CO-VES-21	40	
00	CO-C-2701	20	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MBKR-B-01 SWGR MAIN BREAKER AND NGR STATUS, CO-VES-21	40	
00	CO-C-2704	20	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MFR-21, CO-MVC-21 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	
00	CO-C-2705	20	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MFR-22, CO-MVC-22 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	
00	CO-C-2706	20	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MFR-23, CO-MVC-23 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	
00	CO-C-2707	20	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MFR-24, CO-MVC-24 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	
01	CO-C-2708	12	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01, CO-MFR-11, CO-MVC-11 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	
01	CO-C-2709	12	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01, CO-MFR-12, CO-MVC-12 MULTILIN 350 STATUS & ALARMS, CO-VES-21	40	01
00	CO-C-2710	30	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-21, CO-MFR-BPM-21 MULTILIN 369 STATUS & ALARMS, CO-VES-21	27	
00	CO-P-2711	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-21 VFD-21 TERMINAL BLOCK, CO-VES-21	20	MOTOR SPACE HEATER
00	CO-C-2711	30	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-22, CO-MFR-BPM-22 MULTILIN 369 STATUS & ALARMS, CO-VES-21	25	
00	CO-P-2712	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-22 VFD-22 TERMINAL BLOCK, CO-VES-21	15	MOTOR SPACE HEATER
00	CO-C-2712	30	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-23, CO-MFR-BPM-23 MULTILIN 369 STATUS & ALARMS, CO-VES-21	35	
00	CO-P-2713	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-23 VFD-23 TERMINAL BLOCK, CO-VES-21	40	MOTOR SPACE HEATER
00	CO-C-2713	30	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-24, CO-MFR-BPM-24 MULTILIN 369 STATUS & ALARMS, CO-VES-21	40	
00	CO-P-2714	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-24 VFD-24 TERMINAL BLOCK, CO-VES-21	45	MOTOR SPACE HEATER
00	CO-P-2715	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-IJB-50, CO-CP-MVI-01 MVI CONTROL PANEL FOR REMOTE TRIPPING, CO-VES-21	28	
01	CO-C-2715	6	#14 AWG	600	TECK90	CONTROL 01	24 Vdc	CO-SWGR-01 TRIP COMMAND AND STATUS, CO-VES-21	CABLE TRAY	CO-IJB-50, CO-CP-MVI-01 MVI CONTROL PANEL FOR REMOTE TRIPPING	27	

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING ESTIMATING, MEASUREMENT OR CUTTING OF CABLE
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0260
UEL#: 2012016-1EF-CBS-000-0260-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

For REV 01 ONLY
2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TC_A1_BR.DWG 594XB41

TransCanada
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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING POWER AND CONTROL CABLE SCHEDULE SHEET 1

SCALE N/A | DRAWING No 4663-06-02-04-061 | REV 01

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE	ROUTE			LENGTH	COMMENTS
		CONDUCTORS		RATING	TYPE			FROM	VIA	TO	(m)	
		QTY.	SIZE	(VOLT)			(VOLT)				NOTE 1	
02	CO-C-2716	4	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-IJB-50, CO-CP-MVI-01 MVI CONTROL PANEL FOR REMOTE TRIPPING, STATUS	35	
02	CO-C-2717	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-SWGR-01, CO-MVC-21 TRIP COMMAND, CO-VES-21 △02	CABLE TRAY	CO-VFD-21 VFD-21 TERMINAL BLOCK, CO-VES-21	30	
02	CO-C-2718	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-SWGR-01, CO-MVC-22 TRIP COMMAND, CO-VES-21	CABLE TRAY	CO-VFD-22 VFD-22 TERMINAL BLOCK, CO-VES-21	35	
02	CO-C-2719	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-SWGR-01, CO-MVC-23 TRIP COMMAND, CO-VES-21	CABLE TRAY	CO-VFD-23 VFD-23 TERMINAL BLOCK, CO-VES-21	25	
02	CO-C-2720	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-SWGR-01, CO-MVC-24 TRIP COMMAND, CO-VES-21	CABLE TRAY	CO-VFD-24 VFD-24 TERMINAL BLOCK, CO-VES-21	21	
01	CO-P-2721	4	#2/0 AWG	600	RW90	POWER	208Vac	CO-DT-03 45 kVA TRANSFORMER, CO-VES-21	CONDUIT	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	13	ALLOW 100% CABLE SPACING
01	CO-P-2721-1	6	#12 AWG	600	RW90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	SWITCH BANK WEST CO-VES-21	22	
01	CO-P-2721-2	9	#12 AWG	600	RW90	POWER	120 Vac	SWITCH BANK WEST CO-VES-21	CONDUIT	SWITCH BANK EAST CO-VES-21	35	
01	CO-P-2721-3	6	#12 AWG	600	RW90	POWER	120 Vac	SWITCH BANK EAST CO-VES-21	CONDUIT	INTERIOR LIGHTING CO-VES-21	55	
00	CO-C-2721	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-21 VFD COMMANDS, CO-VES-21	27	
00	CO-P-2722	2	#12 AWG	600	RW90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-EES-21	CONDUIT	EMERGENCY LIGHTING CO-VES-21	45	
00	CO-C-2722	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-22 VFD COMMANDS, CO-VES-21	25	
00	CO-C-2723	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-23 VFD COMMANDS, CO-VES-21	35	
00	CO-C-2724	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-24 VFD COMMANDS, CO-VES-21	40	
01	CO-P-2725	2	#12 AWG	600	RW90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	EXTERIOR RECEPTACLE CO-VES-21	46	
01	CO-P-2726	4	#12 AWG	600	RW90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	INTERIOR RECEPTACLE EAST CO-VES-21	20	
01	CO-P-2727	4	#12 AWG	600	RW90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	INTERIOR RECEPTACLE WEST CO-VES-21	55	
02	CO-P-2728	2	#10 AWG △02	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	MV MCC SPACE HEATER, CO-VES-21	40	

NOTES:

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SDN#: 25472-130-EW-0000-P0261
UEL#: 2012016-1EF-CBS-000-0261-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE
2197104	BEM	LLL	HHM	JED	DCB	UPSIDE
2197104	EDK EDK	MTM MTM	NJR NJR	VMA VMA	DCB DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA HIMA ROHANI

FOR REV 02 ONLY 2015-APR-23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING
POWER AND CONTROL CABLE SCHEDULE
SHEET 2

SCALE N/A | DRAWING No 4663-06-02-04-062 | REV 02

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE	ROUTE			LENGTH	COMMENTS
		CONDUCTORS		RATING	TYPE			FROM	VIA	TO	(m)	
		QTY.	SIZE	(VOLT)			(VOLT)				NOTE 1	
00	CO-P-2729	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01 SPACE HEATER, CO-VES-21	38	
00	CO-C-2730	8	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-TCMP-03 COMMUNICATION PANEL STATUS & ALARM, CO-VES-21	15	
00	CO-C-2761	2	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-YA-8665B FIRE BEACON (RED) CMD, CO-VES-21	15	
00	CO-C-2770	2	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-YA-8665A INTRUSION ALARM, CO-VES-21	20	
00	CO-C-2771	2	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-YA-8665B INTRUSION ALARM, CO-VES-21	20	
00	CO-P-2790	4	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	16	
00	CO-P-2791	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-ACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-TCMP-03 COMMUNICATION PANEL, CO-VES-21	15	~~CONNECT TO RECEPTACLE MOUNTED ON CO-TCMP-03~~
00	CO-C-2800	10	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-52-01 SWGR MAIN BREAKER CONTROL, CO-VES-21	27	
00	CO-C-2801	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-11 CO-T-11 VACUM CONTACTOR, CO-VES-21	30	
00	CO-C-2802	12	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-12 CO-T-12 VACUM CONTACTOR CO-VES-21	30	
00	CO-C-2803	20	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-21 CO-VFD-21 VACUM CONTACTOR, CO-VES-21	30	
00	CO-C-2804	20	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-22 CO-VFD-22 VACUM CONTACTOR, CO-VES-21	28	
00	CO-C-2805	20	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-23 CO-VFD-23 VACUM CONTACTOR, CO-VES-21	22	
00	CO-C-2806	20	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-MMP-01 MIMIC PANEL, CO-VES-21	CABLE TRAY	CO-MVC-24 CO-VFD-24 VACUM CONTACTOR, CO-VES-21	27	
00	CO-C-2821	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MVC-21 CO-VFD-21 TRIP CONTACTOR, CO-VES-21	27	
00	CO-C-2822	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MVC-22 CO-VFD-22 TRIP CONTACTOR, CO-VES-21	25	
00	CO-C-2823	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MVC-23 CO-VFD-23 TRIP CONTACTOR, CO-VES-21	35	
00	CO-C-2824	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-MVC-24 CO-VFD-24 TRIP CONTACTOR, CO-VES-21	40	

NOTES:

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2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0262
UEL#: 2012016-1EF-CBS-000-0262-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	BEM	PLR	IRM	JED	DCB	UPSIDE
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	BEM	LLL	HHM	JED	DCB	UPSIDE
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

FOR REV 02 ONLY

2015-APR-27

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING
POWER AND CONTROL CABLE SCHEDULE
SHEET 3

SCALE N/A | DRAWING No 4663-06-02-04-063 | REV 02

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE	ROUTE			LENGTH	COMMENTS
		CONDUCTORS		RATING	TYPE			FROM	VIA	TO		
		QTY.	SIZE	(VOLT)			(VOLT)				(m) NOTE 1	
01	CO-P-2854-1	2	#12 AWG	600	RW90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	SWITCH BANK WEST CO-VES-21	25	
01	CO-P-2854-2	3	#12 AWG	600	RW90	POWER	120 Vac	SWITCH BANK WEST CO-VES-21	CONDUIT	SWITCH BANK EAST CO-VES-21	35	
01	CO-P-2854-3	2	#12 AWG	600	RW90	POWER	120 Vac	SWITCH BANK EAST CO-VES-21	CONDUIT	INTERIOR LIGHTING CO-VES-21	55	
00	CO-C-2860	8	#14 AWG	600	TECK90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-CP-21-5 CO-HVAC-21-5/6 STATUS, CO-VES-21	35	
00	CO-P-2861	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-CP-21-5 PANEL POWER, SERVICE BOX SB-01A, CO-VES-21	30	
00	CO-C-2863	4	#14 AWG	600	TECK90	CONTROL	120 Vac	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-CP-21-5 HVAC TRIP CMD, CO-VES-21	35	
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
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01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
00	CO-P-2900	4	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	17	2 CCTS., 2ND CIRCUIT FOR TB-AUX(BEACON/HORNS)
00	CO-P-2901	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-TCMP-03 COMMUNICATION PANEL, CO-VES-21	15	CONNECT TO RECEPTACLE MOUNTED ON CO-TCMP-03
00	CO-P-2902	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01 SWITCHGEAR TERMINAL BLOCK, CO-VES-21	40	UPS POWER TO CO-SWGR-01 TERMINAL BLOCK
00	CO-P-2903	4	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01, CO-MVC-11/12 SWITCHGEAR TERMINAL BLOCK SECTION 1, CO-VES-21	40	UPS POWER TO CONTACTOR FOR T-11/T-12

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING ESTIMATING, MEASUREMENT OR CUTTING OF CABLE
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0263
UEL#: 2012016-1EF-CBS-000-0263-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	BEM	PJR	IRM	JED	DCB	UPSIDE
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	BEM	LLL	HMM	JED	DCB	UPSIDE
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA

FOR REV 02 ONLY 2015-APR-23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING POWER AND CONTROL CABLE SCHEDULE SHEET 4

SCALE N/A | DRAWING No 4663-06-02-04-064 | REV 02

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE (VOLT)	ROUTE			LENGTH (m) NOTE 1	COMMENTS
		CONDUCTORS		RATING (VOLT)	TYPE			FROM	VIA	TO		
		QTY.	SIZE									
00	CO-P-2904	4	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01, CO-MVC-21/22 SWITCHGEAR TERMINAL BLOCK SECTION 2, CO-VES-21	40	UPS POWER TO CONTACTOR FOR VFD-21/VFD-22
00	CO-P-2905	4	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-SWGR-01, CO-MVC-23/24 SWITCHGEAR TERMINAL BLOCK SECTION 3, CO-VES-21	40	UPS POWER TO CONTACTOR FOR VFD-23/VFD-24
00	CO-P-2911	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-21 VFD TERMINAL BOX, CO-VES-21	20	UPS POWER TO CO-MFR-BPM-21 & CO-VFD-21
00	CO-P-2912	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-22 VFD TERMINAL BOX, CO-VES-21	16	UPS POWER TO CO-MFR-BPM-22 & CO-VFD-22
00	CO-P-2913	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-23 VFD TERMINAL BOX, CO-VES-21	30	UPS POWER TO CO-MFR-BPM-23 & CO-VFD-23
00	CO-P-2914	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-VFD-24 VFD TERMINAL BOX, CO-VES-21	35	UPS POWER TO CO-MFR-BPM-24 & CO-VFD-24
00	CO-P-2917	2	#12 AWG	600	TECK90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CABLE TRAY	CO-MMP-01 MIMIC PANEL, CO-VES-21	25	
01	CO-P-2920	2	#12 AWG	600	RW90	POWER	120 Vac	CO-UACP-03 AC DISTRIBUTION PANEL, CO-VES-21	CONDUIT	CO-ASH-8665A SMOKE DETECTOR, CO-VES-21	15	
01	CO-P-2921	2	#12 AWG	600	RW90	POWER	120 Vac	CO-ASH-8665A SMOKE DETECTOR, CO-VES-21	CONDUIT	CO-ASH-8665B SMOKE DETECTOR, CO-VES-21	18	
01	CO-P-2922	2	#12 AWG	600	RW90	POWER	120 Vac	CO-ASH-8665B SMOKE DETECTOR, CO-VES-21	CONDUIT	CO-ASH-8665C SMOKE DETECTOR, CO-VES-21	18	
00	CO-C-2961	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665A SMOKE DETECTOR STATUS, CO-VES-21	15	
00	CO-C-2962	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665B SMOKE DETECTOR STATUS, CO-VES-21	20	
00	CO-C-2963	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665C SMOKE DETECTOR STATUS, CO-VES-21	30	
00	CO-C-2964	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665D HEAT DETECTOR STATUS, CO-VES-21	13	
00	CO-C-2965	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665E HEAT DETECTOR STATUS, CO-VES-21	22	
00	CO-C-2966	2	#14 AWG	600	RW90	CONTROL	24 Vdc	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CONDUIT	CO-ASH-8665F HEAT DETECTOR STATUS, CO-VES-21	30	
02	–	–	–	–	–	–	–	–	–	–	–	
02	–	–	–	–	–	–	–	–	–	–	–	△02
02	–	–	–	–	–	–	–	–	–	–	–	
02	–	–	–	–	–	–	–	–	–	–	–	

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING ESTIMATING, MEASUREMENT OR CUTTING OF CABLE
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0264
UEL#: 2012016-1EF-CBS-000-0264-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE
2197104	BEM	LLL	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REF DRAWING ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING
POWER AND CONTROL CABLE SCHEDULE
SHEET 5

SCALE N/A | DRAWING No 4663-06-02-04-065 | REV 02

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE (VOLT)	ROUTE			LENGTH	COMMENTS
		CONDUCTORS		RATING (VOLT)	TYPE			FROM	VIA	TO	(m) NOTE 1	
		QTY.	SIZE									
00	CO-CS-2710	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATIONS	24 VDC	CO-HTCP-06 TB-COM-RJ45-1, CO-VES-21	CABLE TRAY	CO-VFD-21 VARIABLE FREQUENCY DRIVE, CO-VES-21	27	
00	CO-CS-2711	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATIONS	24 VDC	CO-HTCP-06 TB-COM-RJ45-2, CO-VES-21	CABLE TRAY	CO-VFD-22 VARIABLE FREQUENCY DRIVE, CO-VES-21	25	
00	CO-CS-2712	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATIONS	24 VDC	CO-HTCP-06 TB-COM-RJ45-3, CO-VES-21	CABLE TRAY	CO-VFD-23 VARIABLE FREQUENCY DRIVE, CO-VES-21	35	
00	CO-CS-2713	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATIONS	24 VDC	CO-HTCP-06 TB-COM-RJ45-4, CO-VES-21	CABLE TRAY	CO-VFD-24 VARIABLE FREQUENCY DRIVE, CO-VES-21	40	
00	CO-CS-2714	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATIONS	24 VDC	CO-VFD-21 VARIABLE FREQUENCY DRIVE, CO-VES-21	CABLE TRAY	CO-SWGR-01 PROTECTIVE RELAYS, CO-VES-21	30	
00	CO-CS-2720	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-BPM-21 MULTILIN 369, CO-VES-21	22	
00	CO-CS-2721	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-VFD-21 VFD INTERFACE BOARD, CO-VES-21	22	
00	CO-CS-2722	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-21 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2723	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-BPM-22 MULTILIN 369, CO-VES-21	20	
00	CO-CS-2724	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-VFD-22 VFD INTERFACE BOARD, CO-VES-21	20	
00	CO-CS-2725	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-22 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2726	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-BPM-23 MULTILIN 369, CO-VES-21	36	
00	CO-CS-2727	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-VFD-23 VFD INTERFACE BOARD, CO-VES-21	36	
00	CO-CS-2728	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-23 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2729	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-BPM-24 MULTILIN 369, CO-VES-21	40	
00	CO-CS-2730	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-VFD-24 VFD INTERFACE BOARD, CO-VES-21	40	
00	CO-CS-2731	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-24 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2735	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-B-01 MULTILIN 350, CO-VES-21	30	

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING ESTIMATING, MEASUREMENT OR CUTTING OF CABLE
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHTT-"

SDN#: 25472-130-EW-0000-P0460
UEL#: 2012016-1EF-CBS-000-0460-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY

2014-MAR-31

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.

PERMIT NUMBER: P 5508

The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-VES-21 BUILDING INSTRUMENTATION CABLE SCHEDULE SHEET 1

SCALE N/A	DRAWING No 4663-06-03-04-061	REV 00

TIME-DESIGNTILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

REV	CABLE NUMBER	DESCRIPTION				APPLICATION	SYSTEM VOLTAGE (VOLT)	ROUTE			LENGTH (m) NOTE 1	COMMENTS
		CONDUCTORS		RATING (VOLT)	TYPE			FROM	VIA	TO		
		QTY.	SIZE									
00	CO-CS-2736	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-B-02 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2737	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-T-11 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2738	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 SCADA SWITCH SW1201, CO-VES-21	CABLE TRAY	CO-MFR-T-12 MULTILIN 350, CO-VES-21	30	
00	CO-CS-2740	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 CONTROL SWITCH SW1231, CO-VES-21	CABLE TRAY	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	15	
00	CO-CS-2741	4PR	#23 AWG	300	BELDEN 121872A	COMMUNICATIONS	24 VDC	CO-TCMP-03 CONTROL SWITCH SW1231, CO-VES-21	CABLE TRAY	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	15	
01	–	–	–	–	–	–	–	–	–	–	–	01
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
01	–	–	–	–	–	–	–	–	–	–	–	
00	CO-I-2900	1PR	#16 AWG	300	ACIC	INSTRUMENTATION	24 VDC	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-TT-8665 INTERIOR AMBIENT TEMPERATURE TRANSMITTER, CO-VES-21	20	
00	CO-I-2901	4PR	#16 AWG	300	ACIC	INSTRUMENTATION	24 VDC	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-21 VARIABLE FREQUENCY DRIVE, CO-VES-21	27	
00	CO-I-2902	4PR	#16 AWG	300	ACIC	INSTRUMENTATION	24 VDC	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-22 VARIABLE FREQUENCY DRIVE, CO-VES-21	25	
00	CO-I-2903	4PR	#16 AWG	300	ACIC	INSTRUMENTATION	24 VDC	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-23 VARIABLE FREQUENCY DRIVE, CO-VES-21	35	
00	CO-I-2904	4PR	#16 AWG	300	ACIC	INSTRUMENTATION	24 VDC	CO-HTCP-06 TERMINAL CONTROL PANEL, CO-VES-21	CABLE TRAY	CO-VFD-24 VARIABLE FREQUENCY DRIVE, CO-VES-21	40	
	CO-CS-2714A	2PR	#22 AWG	300	BELDEN 123107A	COMMUNICATION	24VDC	CO-SWGR-01 MULTILIN T60	CABLE TRAY	CO-MFR-23		

NOTES:

1. CABLE LENGTHS ARE FOR ENGINEERING PURPOSES ONLY AND SHALL NOT BE USED FOR BIDDING ESTIMATING, MEASUREMENT OR CUTTING OF CABLE
2. ALL CABLE TAGS SHALL BE PREFIXED BY "130-KSHIT-"

SDN#: 25472-130-EW-0000-P0461
UEL#: 2012016-1EF-CBS-000-0461-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-28	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	IRM	JED	DCB	UPSIDE
2197104	BEM	LLL	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA — JAMES DOODY — 2014-OCT-08

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

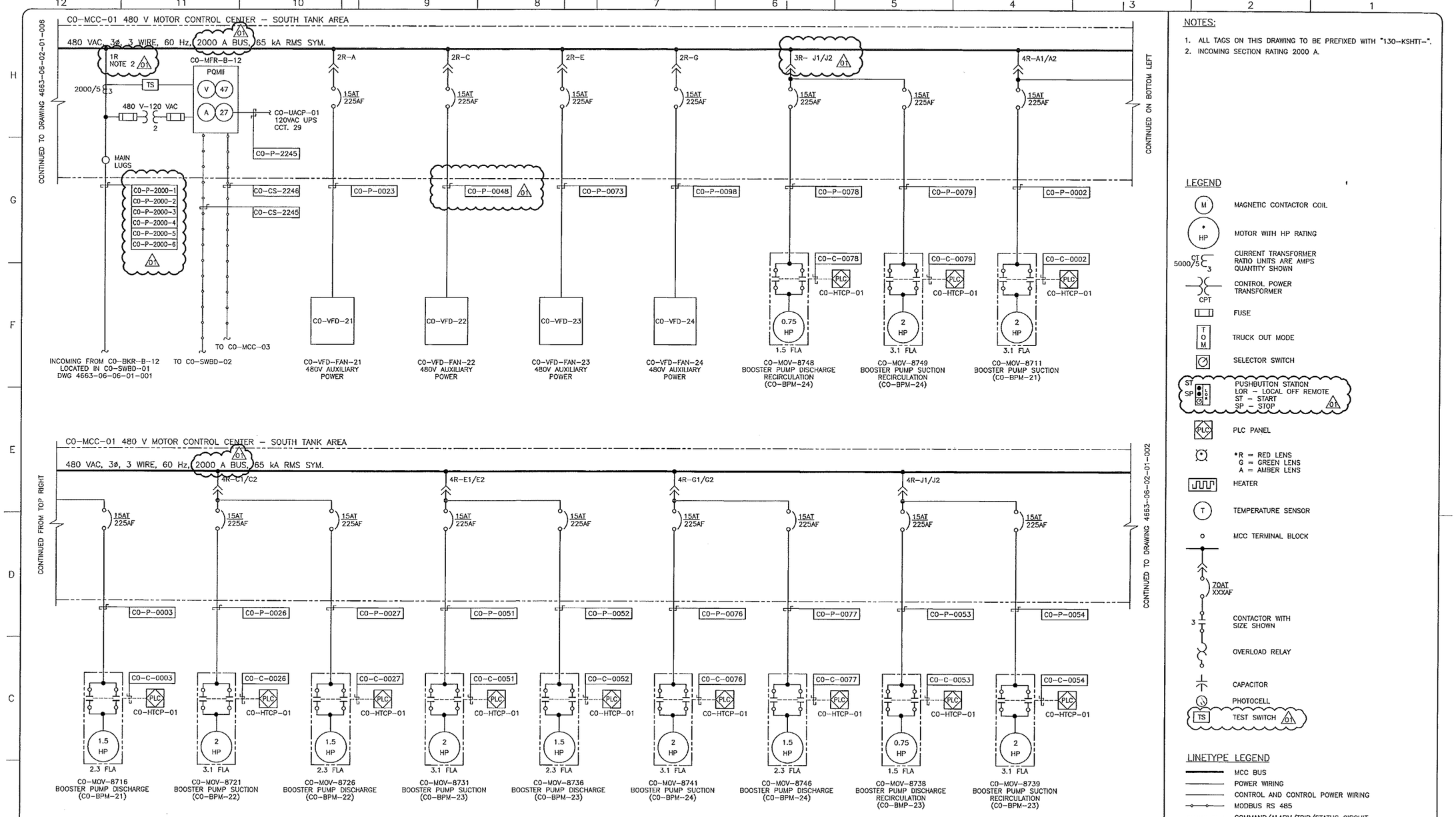
FIA # 4663 | CHANAGE: | DISCIPLINE # 06

CO-VES-21 BUILDING
INSTRUMENTATION CABLE SCHEDULE
SHEET 2

SCALE N/A | DRAWING No 4663-06-03-04-062 | REV 01

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130-KSHTT-".
2. INCOMING SECTION RATING 2000 A.

LEGEND

- M — MAGNETIC CONTACTOR COIL
- * HP — MOTOR WITH HP RATING
- CT 5000/5 — CURRENT TRANSFORMER RATIO UNITS ARE AMPS QUANTITY SHOWN
- CPT — CONTROL POWER TRANSFORMER
- FUSE
- T O M — TRUCK OUT MODE
- SELECTOR SWITCH
- ST / SP / L O R — PUSHBUTTON STATION LOR – LOCAL OFF REMOTE ST – START SP – STOP
- PLC — PLC PANEL
- *R = RED LENS G = GREEN LENS A = AMBER LENS
- HEATER
- T — TEMPERATURE SENSOR
- MCC TERMINAL BLOCK
- 70AT XXXAF
- 3 — CONTACTOR WITH SIZE SHOWN
- OVERLOAD RELAY
- CAPACITOR
- PHOTOCELL
- TS — TEST SWITCH

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0001
UEL# 2012016-1EF-SLD-000-0001-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-06-01-001	CO-SWBD-01 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-03-016	CO-EES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-26	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-01-16	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
2197104	JIM	PLR	MAB	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER ALBERTA — JAMES DOOLEY — 2014-JAN-21

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

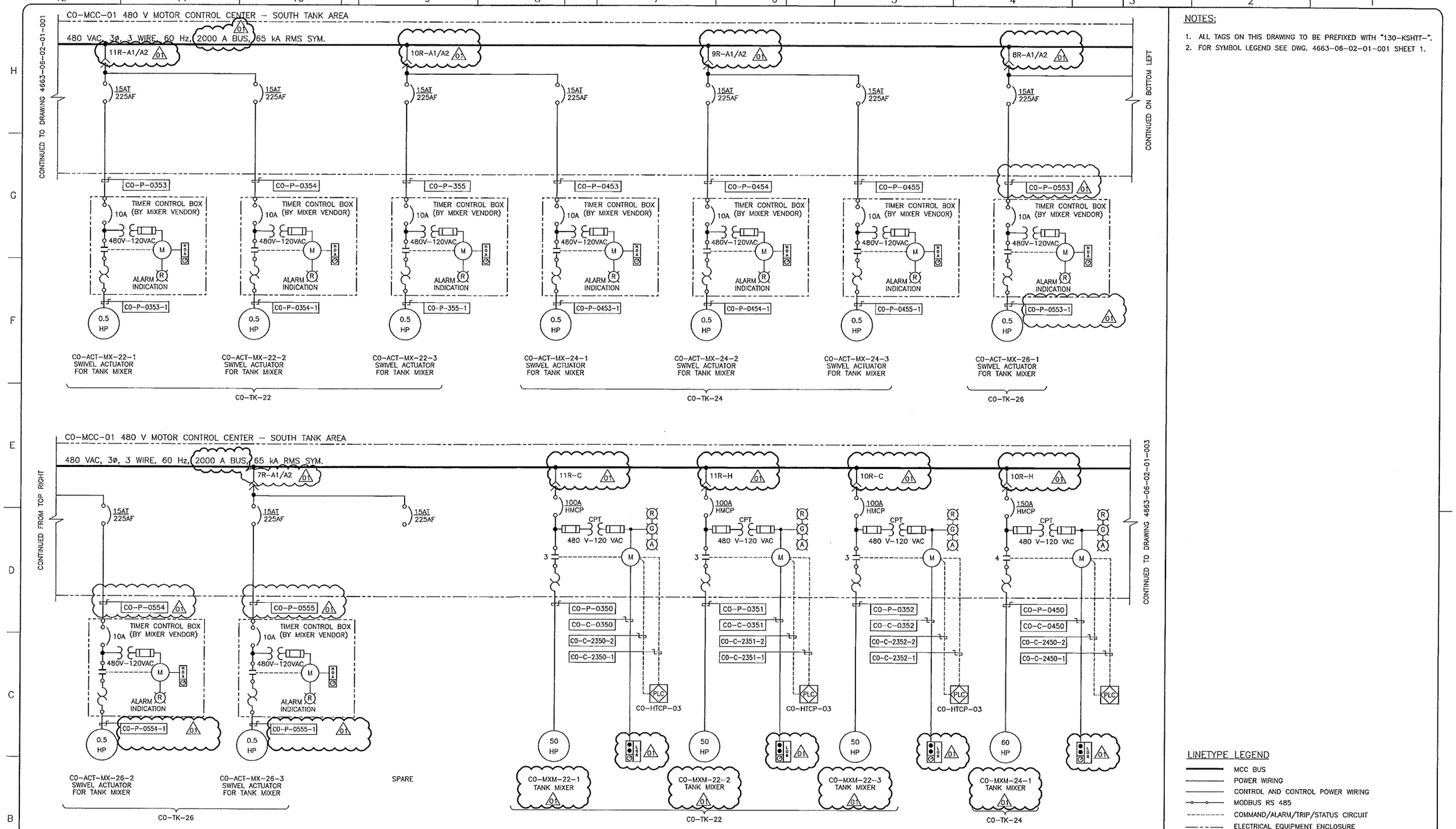
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MCC-01
480 V SINGLE LINE DIAGRAM
SHEET 1

SCALE N.T.S. | DRAWING No 4663-06-02-01-001 | REV 01

TIME — DESIGNFILE

TC_A1_BR.DWG S94X841



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130-KSHTT-".
2. FOR SYMBOL LEGEND SEE DWG. 4663-06-02-01-001 SHEET 1.

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0002
UEL# 2012016-1EF-SLD-000-0002-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-05-06-01-001	CO-SWBD-01 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-03-016	CO-EES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-26	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-01-16	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
2197104	JIM	PLR	MAB	JED	DCB	UPSIDE
	Jim		MAB	JED	DCB	

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY PERMIT TO PRACTICE 2014-JAN-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

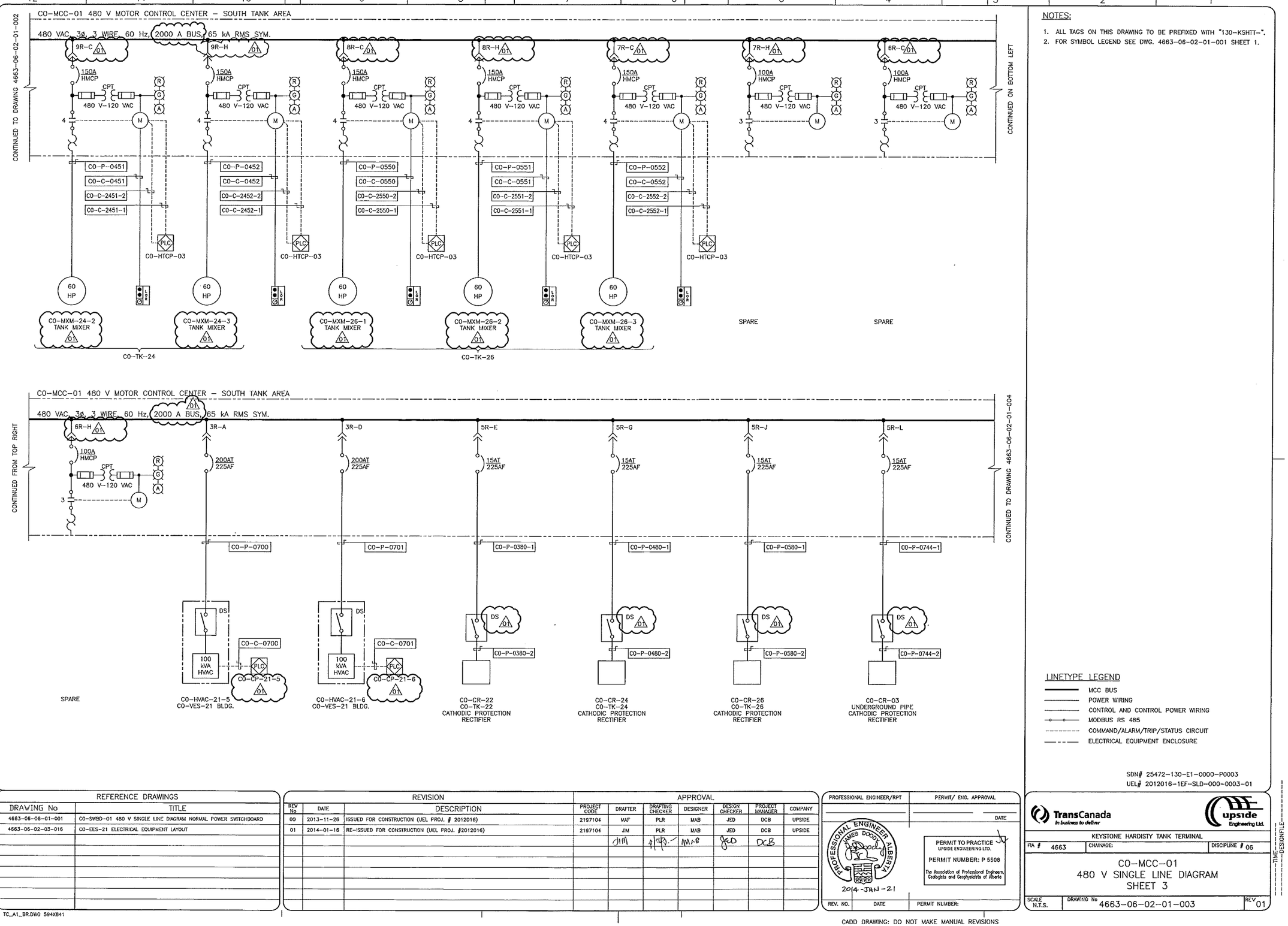
CO-MCC-01
480 V SINGLE LINE DIAGRAM
SHEET 2

SCALE	DRAWING No	REV
N.T.S.	4663-06-02-01-002	01

TIME-DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130-KSHTT-".
2. FOR SYMBOL LEGEND SEE DWG. 4663-06-02-01-001 SHEET 1.

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0003
UEL# 2012016-1EF-SLD-000-0003-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-06-01-001	CO-SWBD-01 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-03-016	CO-EES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2013-11-26	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
01	2014-01-16	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JIM	PLR	MAB	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA

2014-JAN-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 05

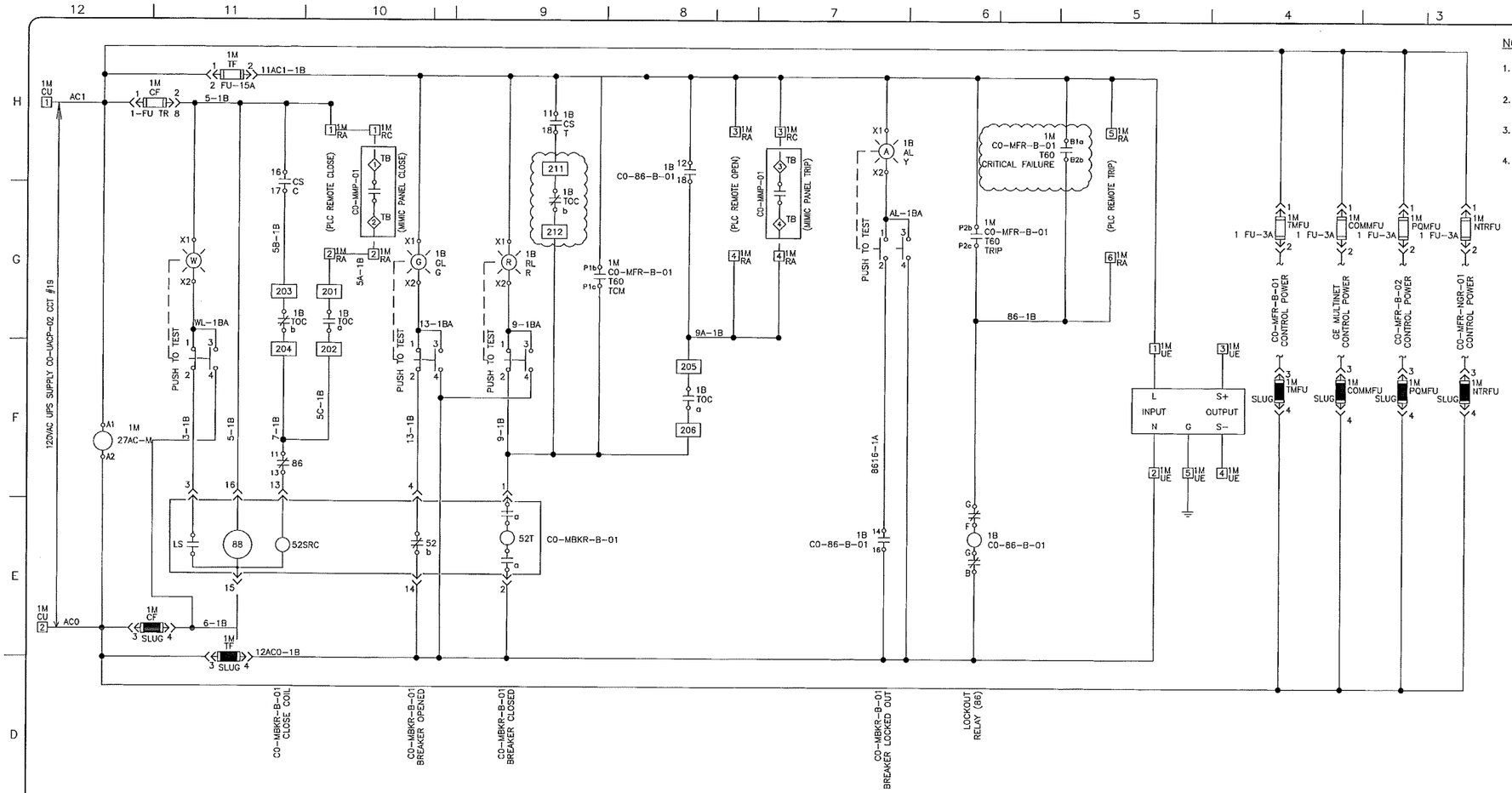
CO-MCC-01
480 V SINGLE LINE DIAGRAM
SHEET 3

SCALE N.T.S.	DRAWING No 4663-06-02-01-003	REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

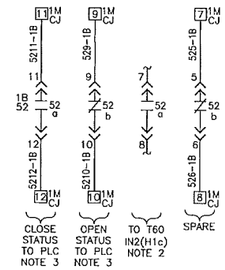
TIME — DESIGNFILE



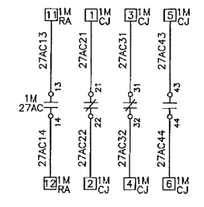
NOTES:

1. FOR MIMIC PANEL INTERCONNECTION DIAGRAM SEE DWG. 4663-06-07-06-070
2. FOR CO-MFR-B-01 (T60) SCHEMATIC SEE DWG. 4663-06-07-06-003
3. FOR CO-HTCP-06 PLC INTERCONNECTIONS SEE DWG. 4663-06-07-06-027
4. CLOUD INDICATES CHANGES FROM SIEMENS VENDOR DRAWING MVS13-30130433-200SC01C1 ALREADY COMPLETED BY SIEMENS.

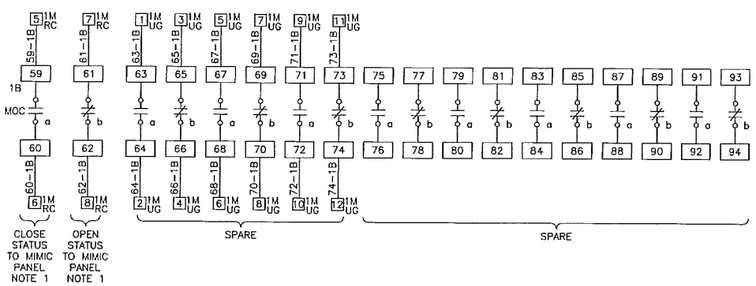
52 (CO-MBKR-B-01 STATUS)



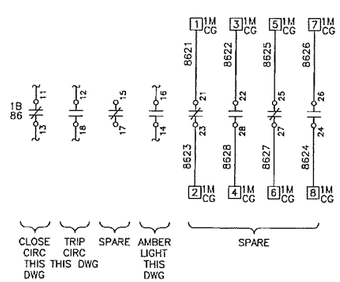
27AC (UNDER VOLTAGE RELAY)



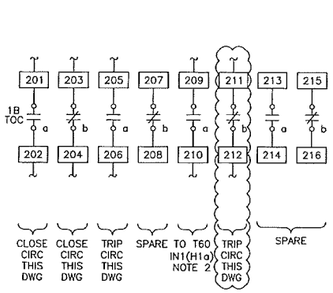
MOC (CO-MBKR-B-01 STATUS)



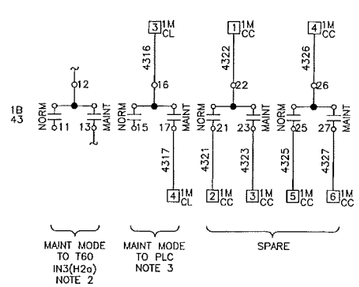
86 (CO-86-B-01 LOCKOUT RELAY)



TOC (TRUCK-OUT STATUS)



43 (MAINTENANCE MODE SWITCH)



SDN# 25472-130-E7-0000-P0352
UEL# 2012016-1EF-EWD-000-0352-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-07-06-003	CO-MBKR-B-01 4160V MAIN BREAKER MULTILIN SCHEMATIC
4663-06-07-06-027	CO-SWGR-01, CO-TCMP-03 & CO-HTCP-06 INTERCONNECTION DIAGRAM

REVISION

REV No	DATE	DESCRIPTION
00	2015-04-20	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	EDK	MTM/MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA 2015 APR 23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

00 | REV. NO. | DATE | PERMIT NUMBER:

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TransCanada — In business to deliver

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KEYSTONE HARDISTY TANK TERMINAL

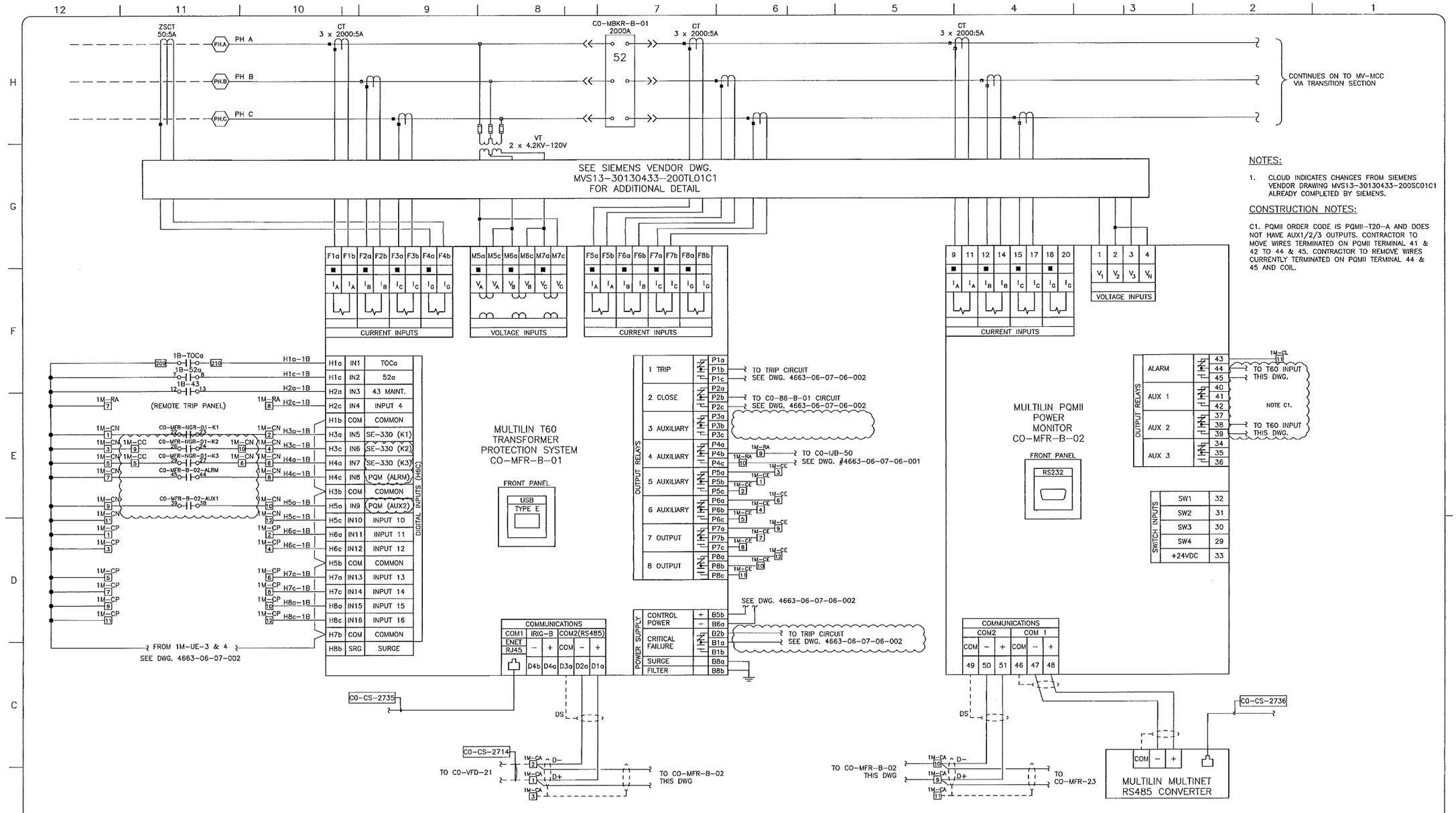
FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-MBKR-B-01
4160V MAIN BREAKER
SCHEMATIC DIAGRAM

SCALE N.T.S.	DRAWING No 4663-06-07-06-002	REV 00

TC_A1_BR.DWG 594X841

TEMP



NOTES:

1. CLOUD INDICATES CHANGES FROM SIEMENS VENDOR DRAWING MVS13-30130433-200SC01C1 ALREADY COMPLETED BY SIEMENS.

CONSTRUCTION NOTES:

C1. PQMII ORDER CODE IS PQMII-T20-A AND DOES NOT HAVE AUX1/2/3 OUTPUTS. CONTRACTOR TO MOVE WIRES TERMINATED ON PQMII TERMINAL 41 & 42 TO 44 & 45. CONTRACTOR TO REMOVE WIRES CURRENTLY TERMINATED ON PQMII TERMINAL 44 & 45 AND COIL.

SDN# 25472-130-E7-0000-P0353
UEL# 2012016-1EF-EWD-000-0353-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-07-06-002	CO-MBKR-B-01 4160V MAIN BREAKER SCHEMATIC DIAGRAM
4663-06-07-06-027	CO-SWGR-01, CO-TCMP-03 & CO-HTCP-06 INTERCONNECTION DIAGRAM
4663-06-07-06-080	NEUTRAL GROUNDING RESISTOR SCHEMATIC & INTERCONNECTION WIRING DIAGRAM

REVISION

REV No	DATE	DESCRIPTION
00	2015-04-20	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	EDK EDK	MTM MTM	NJR NJR	VMA VMA	DCB DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 69818 2015-APR-23

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

00 | REV. NO. | DATE | PERMIT NUMBER:

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Upside Engineering Ltd.

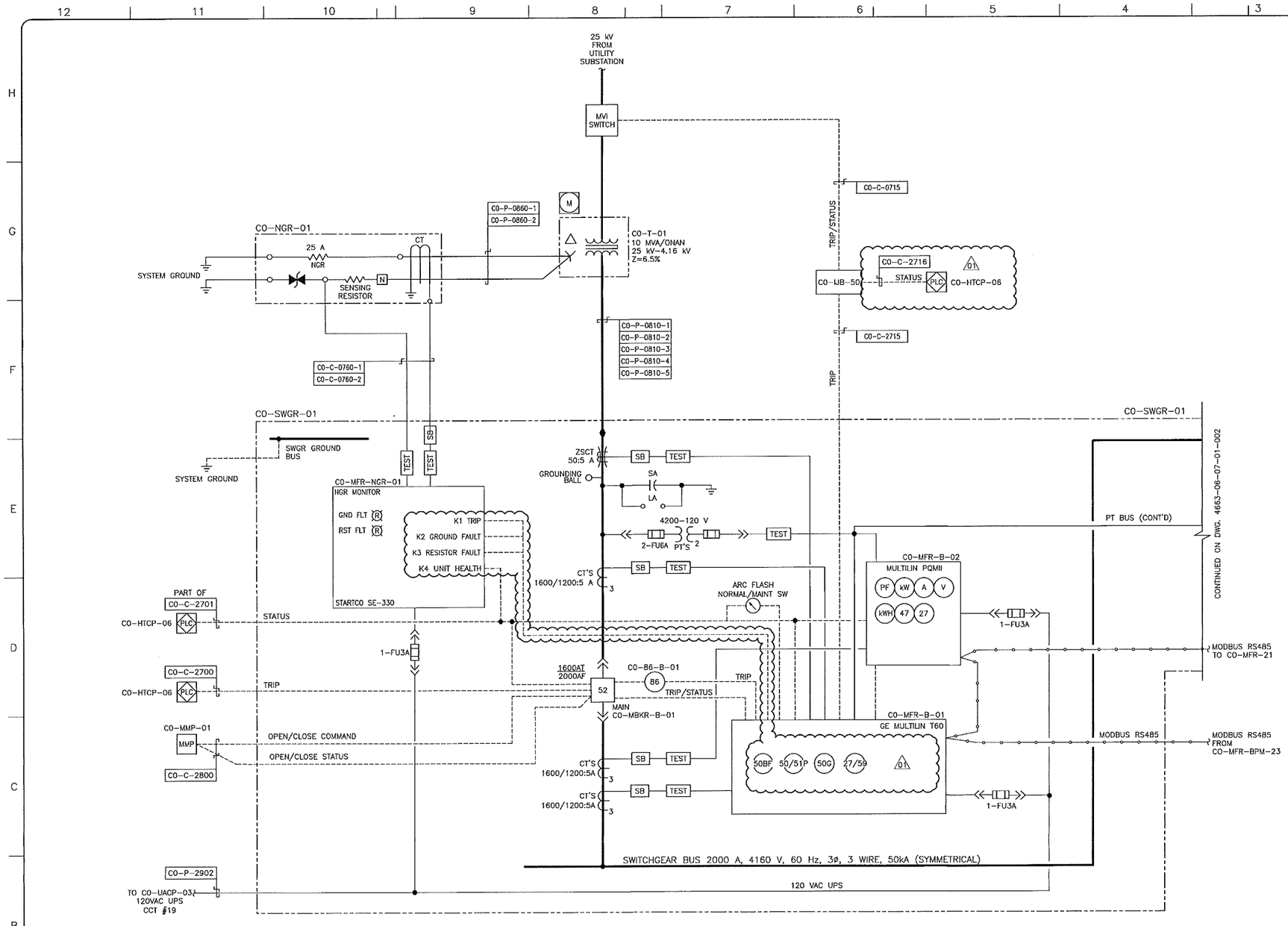
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MBKR-B-01
4160V MAIN BREAKER MULTILIN
SCHEMATIC DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-003 | REV. 00

TC_A1_BR.DWG 594X841



NOTES:

1. THE SIZING OF C.T.'S, FUSES, BREAKERS AND STARTERS ARE PRELIMINARY ONLY AND SHALL BE VERIFIED BY THE VENDOR.
2. 120 V AC UPS CONTROL SUPPLY AND 120 V AC POWER SUPPLY FOR MCC CELL HEATERS SHALL BE PROVIDED AT ONE POINT (INCOMING CELL OF MCC). VENDOR TO PROVIDE CONNECTIONS TO EACH MCC CELL. VENDOR TO PROVIDE LOSS OF CONTROL POWER RELAY TO MONITOR 120 V UPS SUPPLY.
3. COMMUNICATION OUTPUTS FROM EACH PROTECTION RELAY SHALL BE CONNECTED INTERNALLY IN DAISY CHAIN BY MCC/SWITCHGEAR VENDOR.
4. MAIN BREAKER SECTION SHALL BE SERVICE ENTRANCE RATED.

01

LEGEND:

- TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW

A – AMMETER	51 – AC TIME OVERCURRENT RELAY
V – VOLT METER	50G – TIME DELAY GROUND FAULT PROTECTION
kWH – KILOWATT HOUR	59 – OVERVOLTAGE RELAY
kW – KILOWATT	81 – FREQUENCY RELAY
PF – POWER FACTOR	86 – LOCK OUT RELAY
27 – UNDERVOLTAGE RELAY	87 – DIFFERENTIAL PROTECTION
47 – PHASE SEQUENCE VOLTAGE RELAY	K – KEY INTERLOCK
50 – INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY	M – MAGNETIC CONTACTOR COIL

- PT – POTENTIAL TRANSFORMER, QUANTITY SHOWN
- ZSCT – ZERO SEQUENCE CURRENT TRANSFORMER
- CURRENT TRANSFORMER, QUANTITY & POLARITY SHOWN
- VACUUM CONTACTOR
- 52 – DRAWOUT CIRCUIT BREAKER
- GROUNDING DEVICE
- FUSE
- SB – CT SHORTING BLOCK
- TEST – TEST BLOCK
- DPS – DIFFERENTIAL PRESSURE SWITCH
- RTD – RTD TERMINAL BOX
- VT – VIBRATION TRANSMITTER
- PLC – PLC PANEL
- EMERGENCY STOP
- R – RED INDICATING LIGHT
- SA LA – LIGHTNING ARRESTER AND SURGE CAPACITOR
- ARC FLASH NORMAL/MAINTENANCE SW
- MFR – MULTIFUNCTION RELAY
- MPR – MOTOR PROTECTION RELAY
- STRESS CONE
- MMP – MIMIC PANEL

LINETYPE LEGEND

- SWITCHGEAR BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0041
UEL# 2012016-1EF-SLD-000-0041-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-046	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-00-03-590	SUBSTATION SOUTH AREA CABLE TRAY, CABLING AND GROUNDING LAYOUT
4663-06-07-06-001	CO-IJB-50 REMOTE TRIPPING JUNCTION BOX INTERCONNECTION WIRING DIAGRAM

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JTM	PLR	MAB	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA — FOR REV 01 ONLY — 2015-APR-27

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver
upside Engineering Ltd.

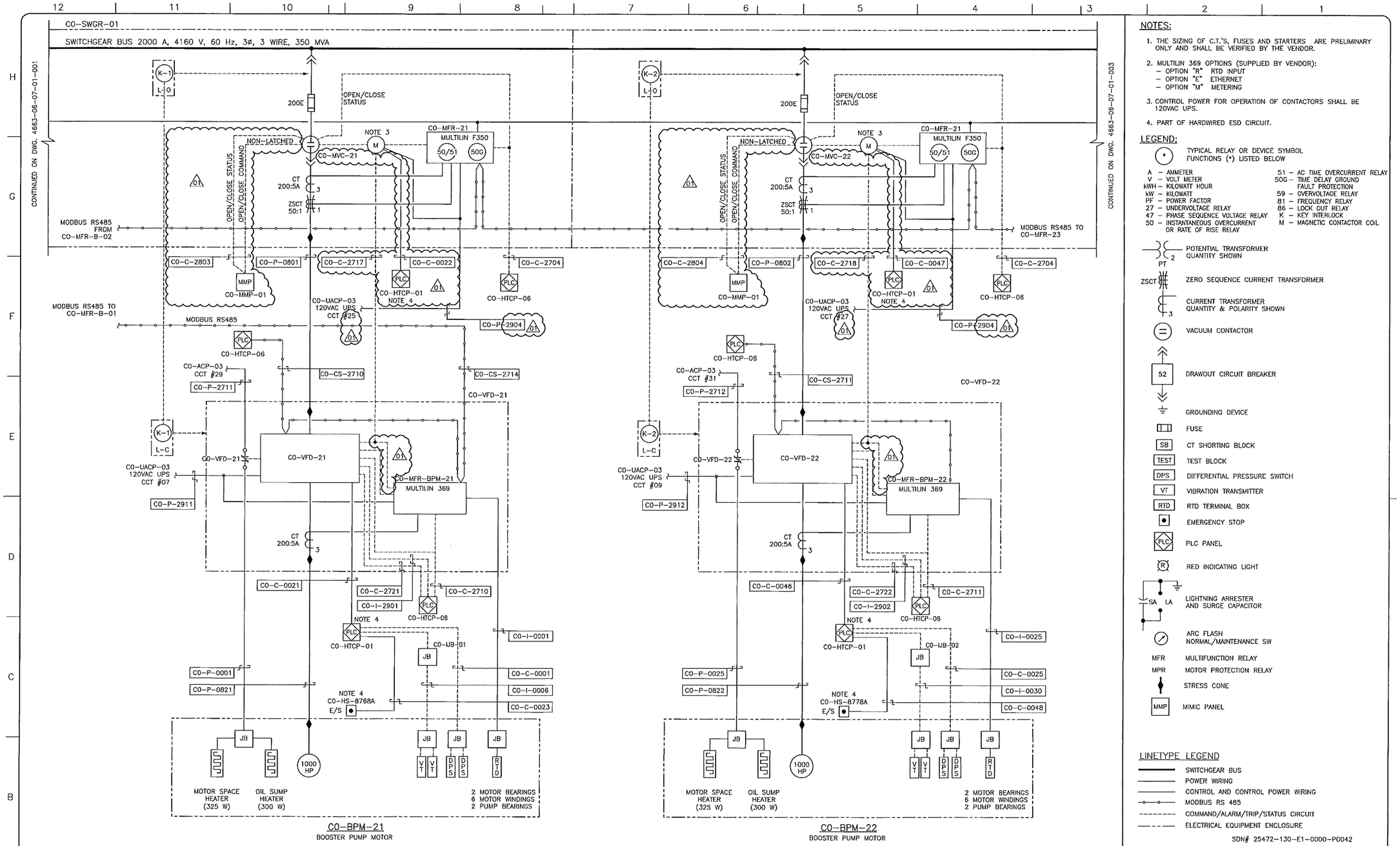
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-SWGR-01
4160 V SWITCHGEAR
SINGLE LINE DIAGRAM, SHEET 1

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-01-001	01

TC_A1_BR.DWG 594X841



NOTES:

1. THE SIZING OF C.T.'S, FUSES AND STARTERS ARE PRELIMINARY ONLY AND SHALL BE VERIFIED BY THE VENDOR.
2. MULTILIN 369 OPTIONS (SUPPLIED BY VENDOR):
   - OPTION "R" RTD INPUT
   - OPTION "E" ETHERNET
   - OPTION "M" METERING
3. CONTROL POWER FOR OPERATION OF CONTACTORS SHALL BE 120VAC UPS.
4. PART OF HARDWIRED ESD CIRCUIT.

LEGEND:

- (*) TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW
- A – AMMETER
- V – VOLT METER
- kWH – KILOWATT HOUR
- kW – KILOWATT
- PF – POWER FACTOR
- 27 – UNDERVOLTAGE RELAY
- 47 – PHASE SEQUENCE VOLTAGE RELAY
- 50 – INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
- 51 – AC TIME OVERCURRENT RELAY
- 50G – TIME DELAY GROUND FAULT PROTECTION
- 59 – OVERVOLTAGE RELAY
- 81 – FREQUENCY RELAY
- 86 – LOCK OUT RELAY
- K – KEY INTERLOCK
- M – MAGNETIC CONTACTOR COIL
- PT – POTENTIAL TRANSFORMER QUANTITY SHOWN
- ZSCT – ZERO SEQUENCE CURRENT TRANSFORMER
- CURRENT TRANSFORMER QUANTITY & POLARITY SHOWN
- VACUUM CONTACTOR
- 52 – DRAWOUT CIRCUIT BREAKER
- GROUNDING DEVICE
- FUSE
- SB – CT SHORTING BLOCK
- TEST – TEST BLOCK
- DPS – DIFFERENTIAL PRESSURE SWITCH
- VT – VIBRATION TRANSMITTER
- RTD – RTD TERMINAL BOX
- EMERGENCY STOP
- PLC – PLC PANEL
- R – RED INDICATING LIGHT
- SA LA – LIGHTNING ARRESTER AND SURGE CAPACITOR
- ARC FLASH NORMAL/MAINTENANCE SW
- MFR – MULTIFUNCTION RELAY
- MPR – MOTOR PROTECTION RELAY
- STRESS CONE
- MMP – MIMIC PANEL

LINETYPE LEGEND

- SWITCHGEAR BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0042
UEL# 2012016-1EF-SLD-000-0042-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-046	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-00-03-590	SUBSTATION SOUTH AREA CABLE TRAY, CABLING AND GROUNDING LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	PLR	MAB	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA

FOR REV 01 ONLY

2015-APR-29

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

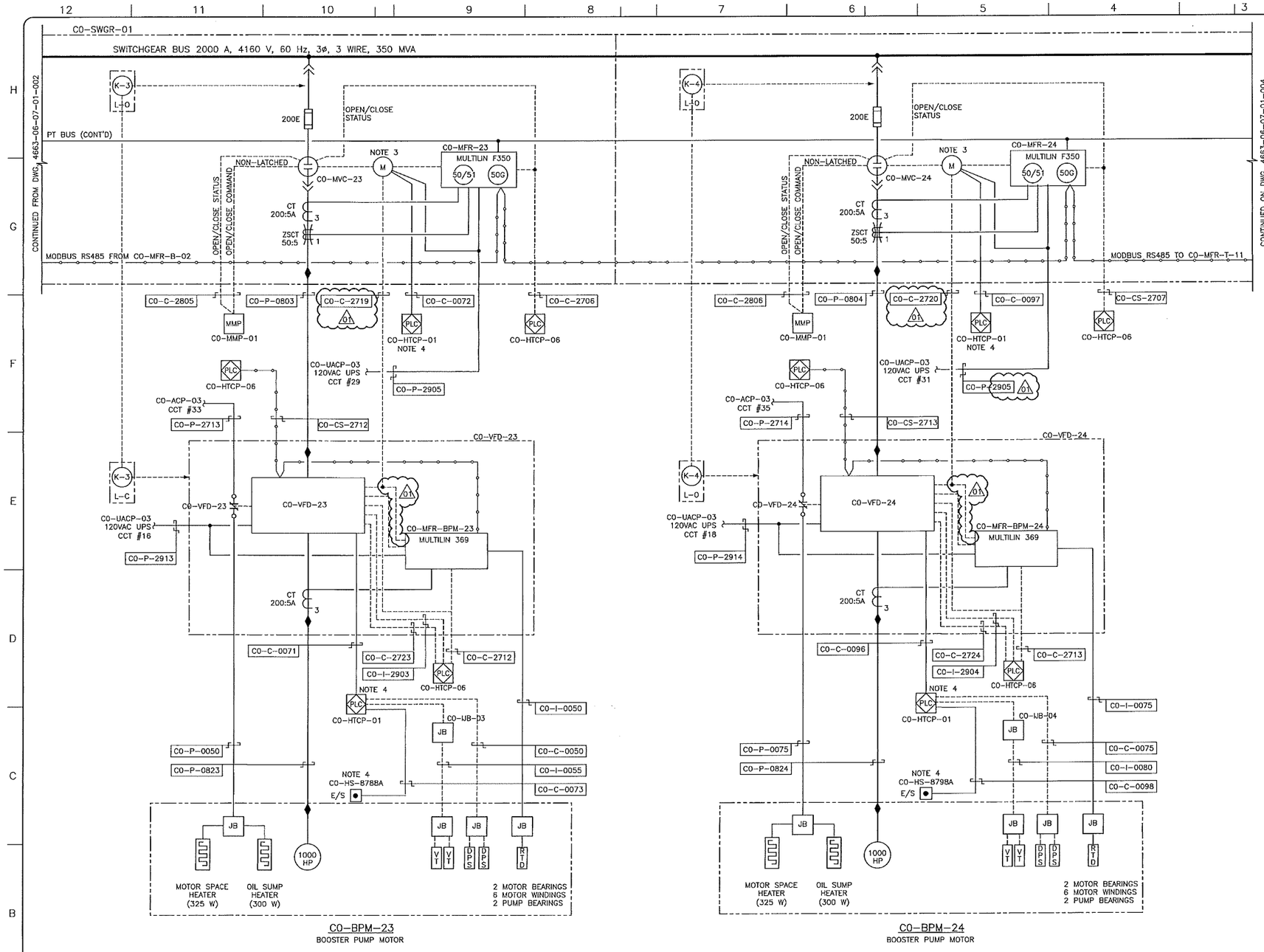
FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-SWGR-01
4160 V SWITCHGEAR
SINGLE LINE DIAGRAM, SHEET 2

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-01-002	01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. THE SIZING OF C.T.'S, FUSES AND STARTERS ARE PRELIMINARY ONLY AND SHALL BE VERIFIED BY THE VENDOR.
2. MULTILIN 369 OPTIONS (SUPPLIED BY VENDOR):
   - OPTION "R" RTD INPUT
   - OPTION "E" ETHERNET
   - OPTION "M" METERING
3. CONTROL POWER FOR OPERATION OF CONTACTORS SHALL BE 120VAC UPS.
4. PART OF HARDWIRED ESD CIRCUIT.

LEGEND:

- TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW

A – AMMETER	51 – AC TIME OVERCURRENT RELAY
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kW – KILOWATT	81 – FREQUENCY RELAY
PF – POWER FACTOR	86 – LOCK OUT RELAY
27 – UNDERVOLTAGE RELAY	K – KEY INTERLOCK
47 – PHASE SEQUENCE VOLTAGE RELAY	M – MAGNETIC CONTACTOR COIL
50 – INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY	

- PT — POTENTIAL TRANSFORMER QUANTITY SHOWN
- ZSCT — ZERO SEQUENCE CURRENT TRANSFORMER
- CURRENT TRANSFORMER QUANTITY & POLARITY SHOWN
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- 52 — DRAWOUT CIRCUIT BREAKER
- GROUNDING DEVICE
- FUSE
- SB — CT SHORTING BLOCK
- TEST — TEST BLOCK
- DPS — DIFFERENTIAL PRESSURE SWITCH
- VT — VIBRATION TRANSMITTER
- RTD — RTD TERMINAL BOX
- EMERGENCY STOP
- PLC — PLC PANEL
- R — RED INDICATING LIGHT
- SA LA — LIGHTNING ARRESTER AND SURGE CAPACITOR
- ARC FLASH NORMAL/MAINTENANCE SW
- MFR — MULTIFUNCTION RELAY
- MPR — MOTOR PROTECTION RELAY
- STRESS CONE
- MMP — MIMIC PANEL

LINETYPE LEGEND

- SWITCHGEAR BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0043
UEL# 2012016-1EF-SLD-000-0043-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-045	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-00-03-590	SUBSTATION SOUTH AREA CABLE TRAY, CABLING AND GROUNDING LAYOUT

REVISION

REV No	DATE	DESCRIPTION	APPROVAL: PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
0A	2013-06-28	ISSUED FOR REVIEW (UEL PROJ. #2012016)	2197104	JIM	PLR	RKW	JED	DCB	UPSIDE
0B	2013-11-26	ISSUED FOR BID (UEL PROJ. #2012016)	2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	PLR	MAB	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA — NIMA ROHANI — 2015-APR-20

FOR REV 01 ONLY

PERMIT TO PRACTICE — UPSIDE ENGINEERING LTD. — PERMIT NUMBER: P 5508 — The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TC_A1_BR.DWG 594X841

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-SWGR-01
4160 V SWITCHGEAR
SINGLE LINE DIAGRAM, SHEET 3

SCALE N.T.S. | DRAWING No 4663-06-07-01-003 | REV 01

CONTINUED FROM DWG. 4663-06-07-01-003

CO-SWGR-01

SWITCHGEAR BUS 2000 A, 4160 V, 60 Hz, 3ø, 3 WIRE, 350 MVA

400E

PT (BUS CONT'D)

OPEN/CLOSE STATUS

OPEN/CLOSE COMMAND

LATCHED

CO-MVC-11

NOTE 3

M

CO-MFR-T-11

MULTILIN F350

50/51

50G

CT 600:5 A 3

ZSCT 50:1 1

MODBUS RS485 FROM CO-MFR-22

CO-C-2801

MMP

CO-MMP-01

CO-P-2907

CO-UACP-03 120VAC UPS CCT #21

PLC

CO-HTCP-06

CO-C-2708

CO-P-0811

CO-C-0755

TO CO-T-11 4160VAC-480V/277V

CONTINUED ON DWG 4663-06-06-01-001

400E

PT (BUS CONT'D)

OPEN/CLOSE STATUS

OPEN/CLOSE COMMAND

LATCHED

CO-MVC-12

NOTE 3

M

CO-MFR-T-12

MULTILIN F350

50/51

50G

CT 600:5A 3

ZSCT 50:1 1

CO-C-2802

MMP

CO-MMP-01

CO-P-2908

CO-UACP-03 120VAC UPS CCT #23

PLC

CO-HTCP-06

CO-C-2709

CO-P-0812

CO-C-1755

TO CO-T-12 4160VAC-480V/277V

CONTINUED ON DWG 4663-06-06-01-002

NOTES:

1. THE SIZING OF C.T.'S, FUSES AND STARTERS ARE PRELIMINARY ONLY AND SHALL BE VERIFIED BY THE VENDOR.
2. MULTILIN 369 OPTIONS (SUPPLIED BY VENDOR):
   - OPTION "R" RTD INPUT
   - OPTION "E" ETHERNET
   - OPTION "M" METERING
3. CONTROL POWER FOR OPERATION OF CONTACTORS SHALL BE 120VAC UPS.

LEGEND:

(*) TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW

A – AMMETER
V – VOLT METER
kWH – KILOWATT HOUR
kW – KILOWATT
PF – POWER FACTOR
27 – UNDERVOLTAGE RELAY
47 – PHASE SEQUENCE VOLTAGE RELAY
50 – INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
51 – AC TIME OVERCURRENT RELAY
50G – TIME DELAY GROUND FAULT PROTECTION
59 – OVERVOLTAGE RELAY
81 – FREQUENCY RELAY
86 – LOCK OUT RELAY
K – KEY INTERLOCK
M – MAGNETIC CONTACTOR COIL

PT 2 POTENTIAL TRANSFORMER QUANTITY SHOWN

ZSCT ZERO SEQUENCE CURRENT TRANSFORMER

3 CURRENT TRANSFORMER QUANTITY & POLARITY SHOWN

VACUUM CONTACTOR

52 DRAWOUT CIRCUIT BREAKER

GROUNDING DEVICE

FUSE

SB CT SHORTING BLOCK

TEST TEST BLOCK

DPS DIFFERENTIAL PRESSURE SWITCH

VT VIBRATION TRANSMITTER

RTD RTD TERMINAL BOX

EMERGENCY STOP

PLC PLC PANEL

R RED INDICATING LIGHT

SA LA LIGHTNING ARRESTER AND SURGE CAPACITOR

ARC FLASH NORMAL/MAINTENANCE SW

MFR MULTIFUNCTION RELAY

MPR MOTOR PROTECTION RELAY

STRESS CONE

MMP MIMIC PANEL

LINETYPE LEGEND

- SWITCHGEAR BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0044
UEL# 2012016-1EF-SLD-000-0044-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-046	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-00-03-590	SUBSTATION SOUTH AREA CABLE TRAY, CABLING AND GROUNDING LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	PLR	MAB	JEED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DOCHUK ALBERTA

2014-APR-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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KEYSTONE HARDISTY TANK TERMINAL

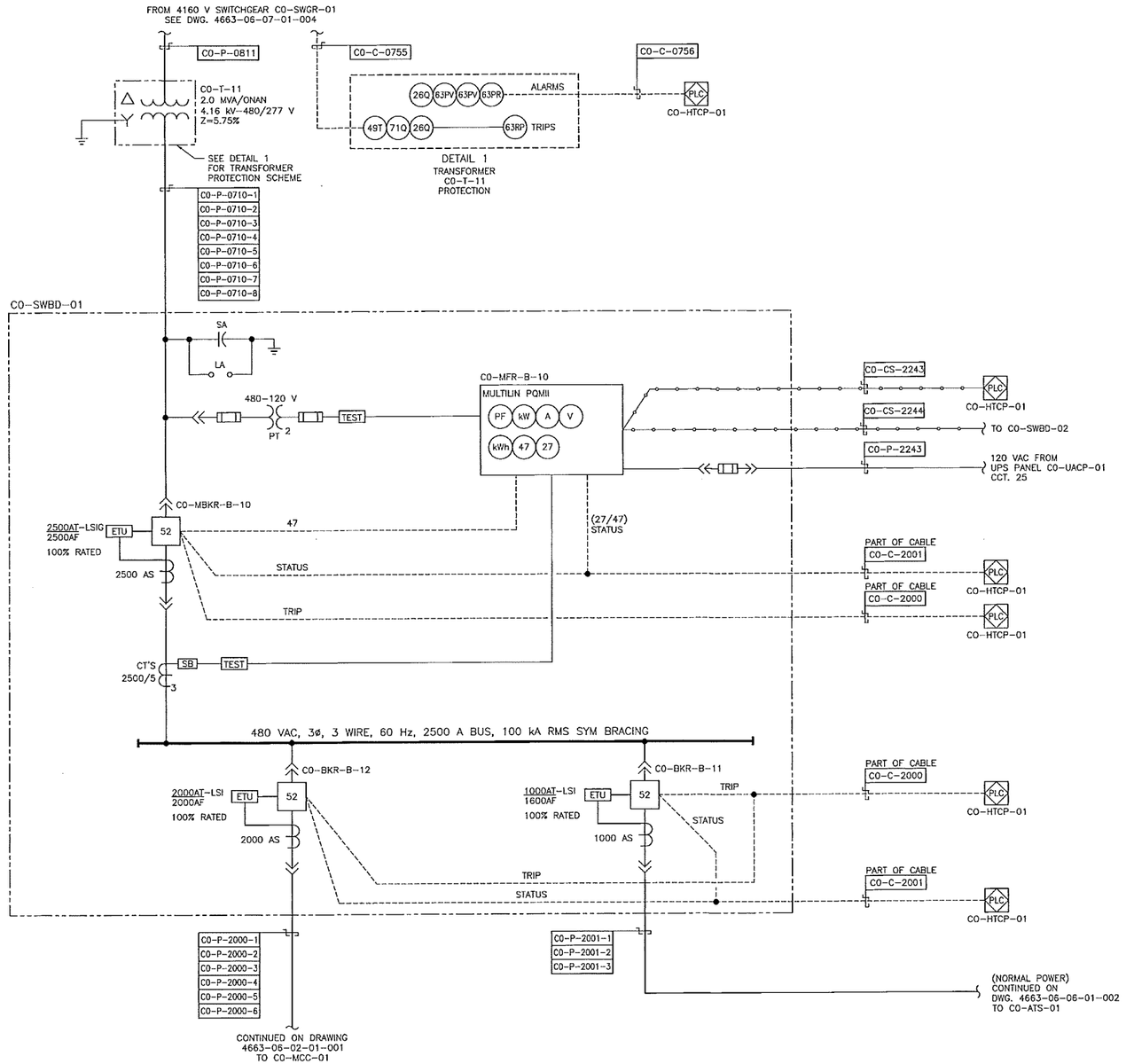
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-SWGR-01
4160 V SWITCHGEAR
SINGLE LINE DIAGRAM, SHEET 4

SCALE N.T.S. | DRAWING No 4663-06-07-01-004 | REV 00

TC_A1_BR.DWG 594X841

TIME - DESIGNFILE



NOTES:

1. FEEDER BREAKER SHALL BE 65kAIC MINIMUM RMS SYMMETRICAL INTERRUPTING RATING.

LEGEND:

(•)	TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (•) LISTED BELOW
A	AMMETER
C	INTELLIGENT O/L RELAY
V	VOLT METER
kWH	KILOWATT HOUR METER
kW	REAL POWER
PF	POWER FACTOR METER
27	UNDERVOLTAGE RELAY
47	PHASE SEQUENCE VOLTAGE RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
51	AC TIME OVERCURRENT RELAY
51G	TIME DELAY GROUND FAULT PROTECTION
51N	GROUND SENSING RELAY
59	OVERVOLTAGE RELAY
81	FREQUENCY RELAY
86	LOCK-OUT RELAY
87T	DIFFERENTIAL PROTECTIVE RELAY
3	CURRENT TRANSFORMER RATIO UNITS ARE AMPS QUANTITY SHOWN
PT 3	POTENTIAL TRANSFORMER QUANTITY SHOWN
	CIRCUIT BREAKER
	DEVICE GROUNDING
	FUSE
SB	CT SHORTING BLOCK
TEST	TEST BLOCK
SA LA	LIGHTNING ARRESTER AND SURGE CAPACITOR
MFR	MULTIFUNCTION RELAY
PLC	PLC PANEL
	R = RED LENS G = GREEN LENS A = AMBER LENS
	ARC FLASH NORMAL/MAINTENANCE SW
ETU	ELECTRONIC TRIP UNIT
52	DRAWOUT CIRCUIT BREAKER
MMP	MIMIC PANEL

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0045
UEL# 2012016-1EF-SLD-000-0045-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-07-01-004	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM SHEET 4
4663-06-02-01-001	CO-MCC-01 480V SINGLE LINE DIAGRAM SHEET 1
4663-06-06-01-002	CO-SWBD-02 480V SINGLE LINE DIAGRAM EMERGENCY POWER SWITCHBOARD

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	MAB	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY

2014-APR-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

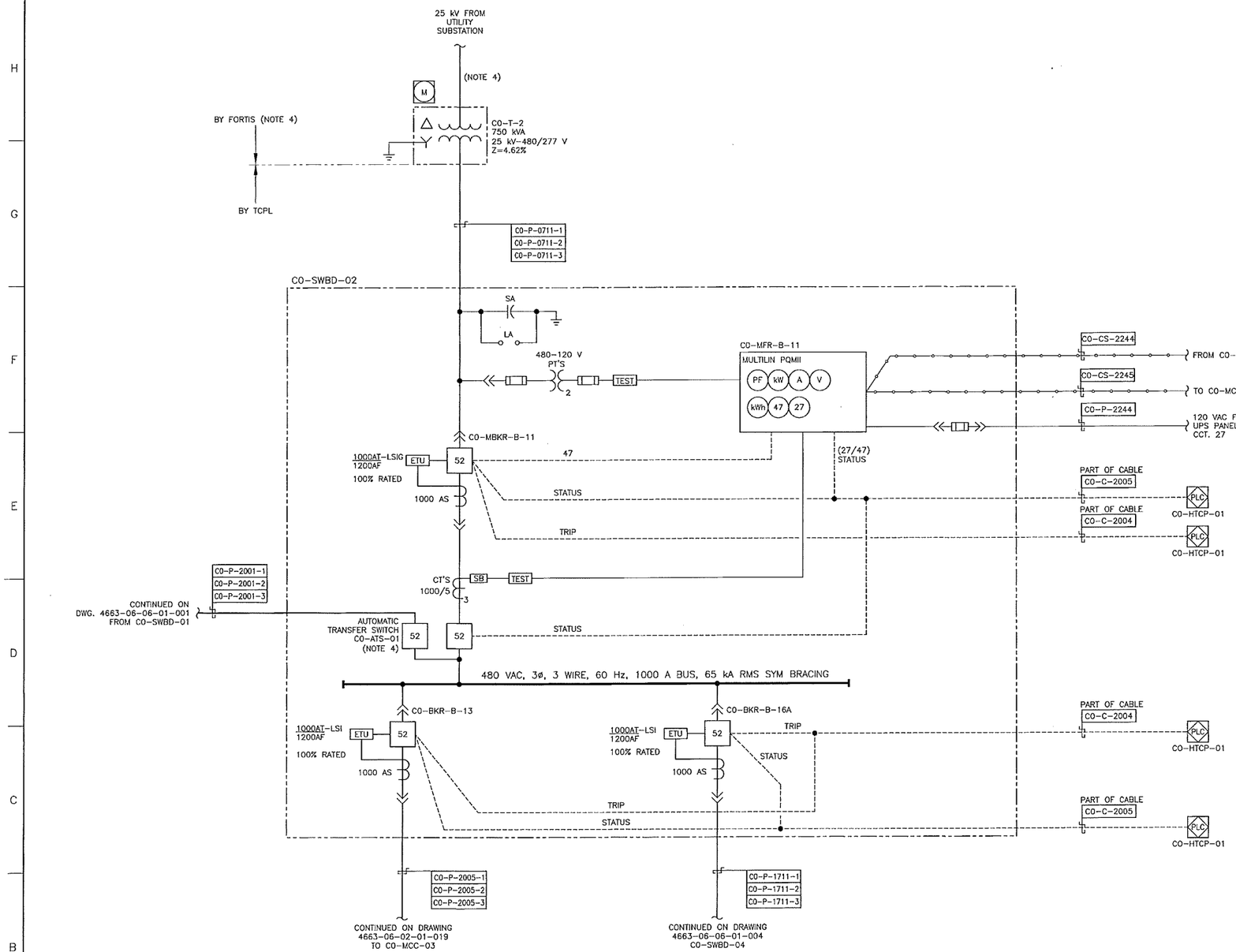
FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-SWBD-01
480 V SINGLE LINE DIAGRAM
NORMAL POWER SWITCHBOARD

SCALE N.T.S.	DRAWING No 4663-06-06-01-001	REV 00

TC_A1_BR.DWG 594X841

TIME — DESIGNFILE



NOTES:

1. TRANSFER SWITCH SHALL BE 100% RATED.
2. MAIN BREAKER SHALL INCLUDE GROUND FAULT TRIP.
3. AUTOMATIC TRANSFER SWITCH SHALL TRANSFER FROM NORMAL TO EMERGENCY IN THE EVENT OF UNDER VOLTAGE. TEST SWITCH SHALL BE PROVIDED FOR TESTING OF TRANSFER SCHEME. UPON STABILIZATION OF NORMAL POWER, TRANSFER SWITCH SHALL TRANSFER BACK AUTOMATICALLY.
   PREFERRED SOURCE SELECTOR SWITCH SHALL ENABLE EITHER NORMAL OR EMERGENCY POWER TO FEED LOAD.
4. PRIMARY DUCT BY TCPL. CABLE BY FORTIS

LEGEND:

⊙	TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW
A	AMMETER
C	INTELLIGENT O/L RELAY
V	VOLT METER
kWH	KILOWATT HOUR METER
kW	REAL POWER
PF	POWER FACTOR METER
27	UNDERVOLTAGE RELAY
47	PHASE SEQUENCE VOLTAGE RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
51	AC TIME OVERCURRENT RELAY
51G	TIME DELAY GROUND FAULT PROTECTION
51N	GROUND SENSING RELAY
59	OVERVOLTAGE RELAY
81	FREQUENCY RELAY
86	LOCK-OUT RELAY
87T	DIFFERENTIAL PROTECTIVE RELAY
3	CURRENT TRANSFORMER RATIO UNITS ARE AMPS QUANTITY SHOWN
3 PT	POTENTIAL TRANSFORMER QUANTITY SHOWN
	CIRCUIT BREAKER
	DEVICE GROUNDING
	FUSE
SB	CT SHORTING BLOCK
TEST	TEST BLOCK
SA LA	LIGHTNING ARRESTER AND SURGE CAPACITOR
MFR	MULTIFUNCTION RELAY
PLC	PLC PANEL
	*R = RED LENS G = GREEN LENS A = AMBER LENS
M	UTILITY COMPANY REVENUE METER
52	DRAWOUT CIRCUIT BREAKER
MMP	MIMIC PANEL

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0046
UEL# 2012016-1EF-SLD-000-0046-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-07-01-001	CO-SWBD-01 480V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-06-01-004	CO-SWBD-04 480 V SINGLE LINE DIAGRAM EMERGENCY POWER SWITCHBOARD
4663-06-02-01-019	CO-MCC-03 ESSENTIAL BUS 480V SINGLE LINE DIAGRAM, SHEET 1

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	MAB	JEJ	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-APR-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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KEYSTONE HARDISTY TANK TERMINAL

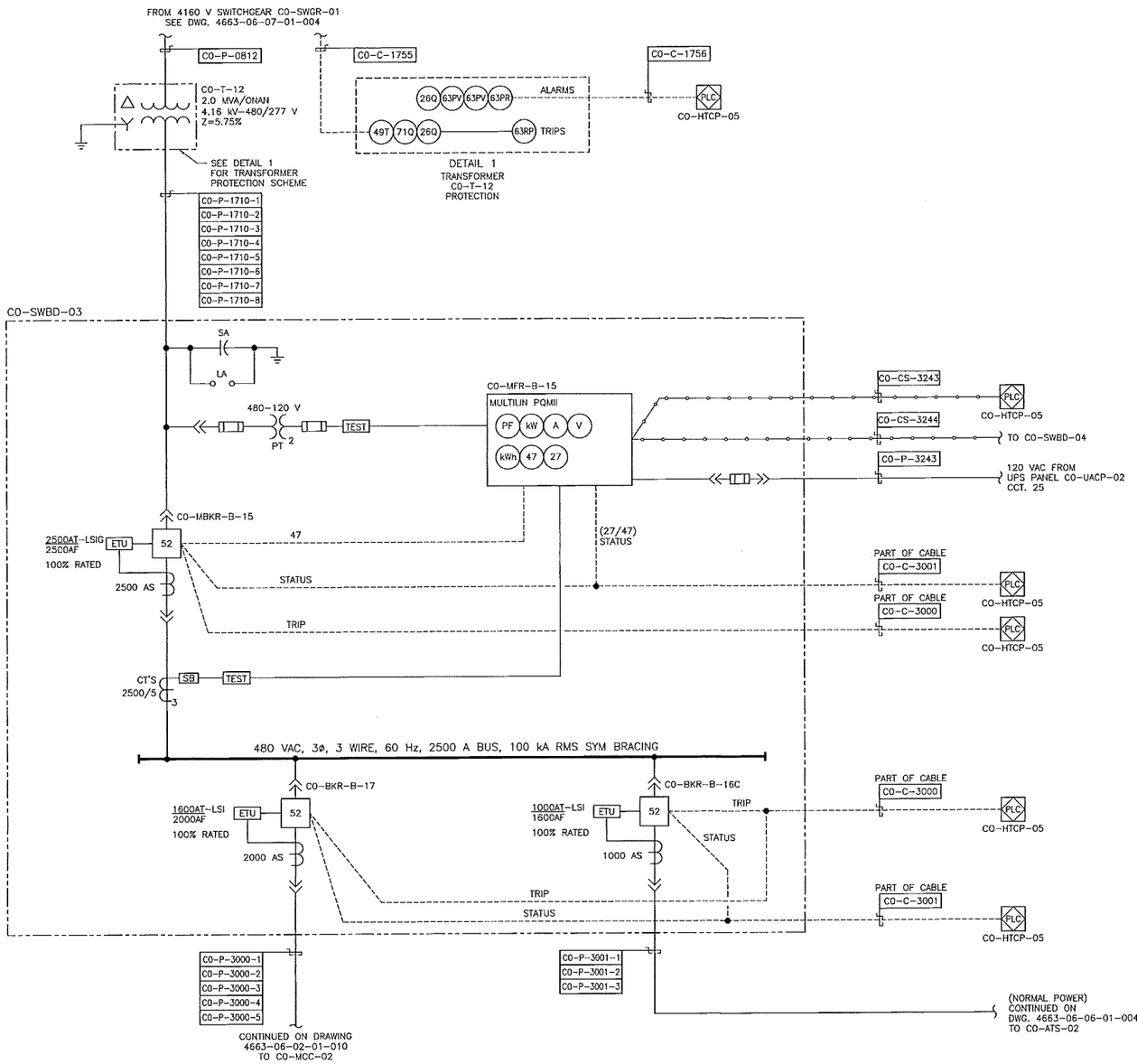
FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-SWBD-02
480 V SINGLE LINE DIAGRAM EMERGENCY POWER SWITCHBOARD

SCALE N.T.S.	DRAWING No 4663-06-06-01-002	REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841



NOTES:

1. FEEDER BREAKER SHALL BE 65kAIC MINIMUM RMS SYMMETRICAL INTERRUPTING RATING.

LEGEND:

(•)	TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (•) LISTED BELOW
A	AMMETER
C	INTELLIGENT O/L RELAY
V	VOLT METER
kWH	KILOWATT HOUR METER
kW	REAL POWER
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47	PHASE SEQUENCE VOLTAGE RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
51	AC TIME OVERCURRENT RELAY
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	R = RED LENS G = GREEN LENS A = AMBER LENS
	ARC FLASH NORMAL/MAINTENANCE SW
ETU	ELECTRONIC TRIP UNIT
52	DRAWOUT CIRCUIT BREAKER
MMP	MIMIC PANEL

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0047
UEL# 2012016-1EF-SLD-000-0047-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-07-01-004	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM SHEET 4
4663-06-02-01-010	CO-MCC-02 480V SINGLE LINE DIAGRAM SHEET 1
4663-06-06-01-004	CO-SWBD-04 480V SINGLE LINE DIAGRAM EMERGENCY POWER SWITCHBOARD

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	MAB	JEB	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOCHERTY 29809

2014-APR-21

PERMIT/ ENG. APPROVAL

DATE

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KEYSTONE HARDISTY TANK TERMINAL

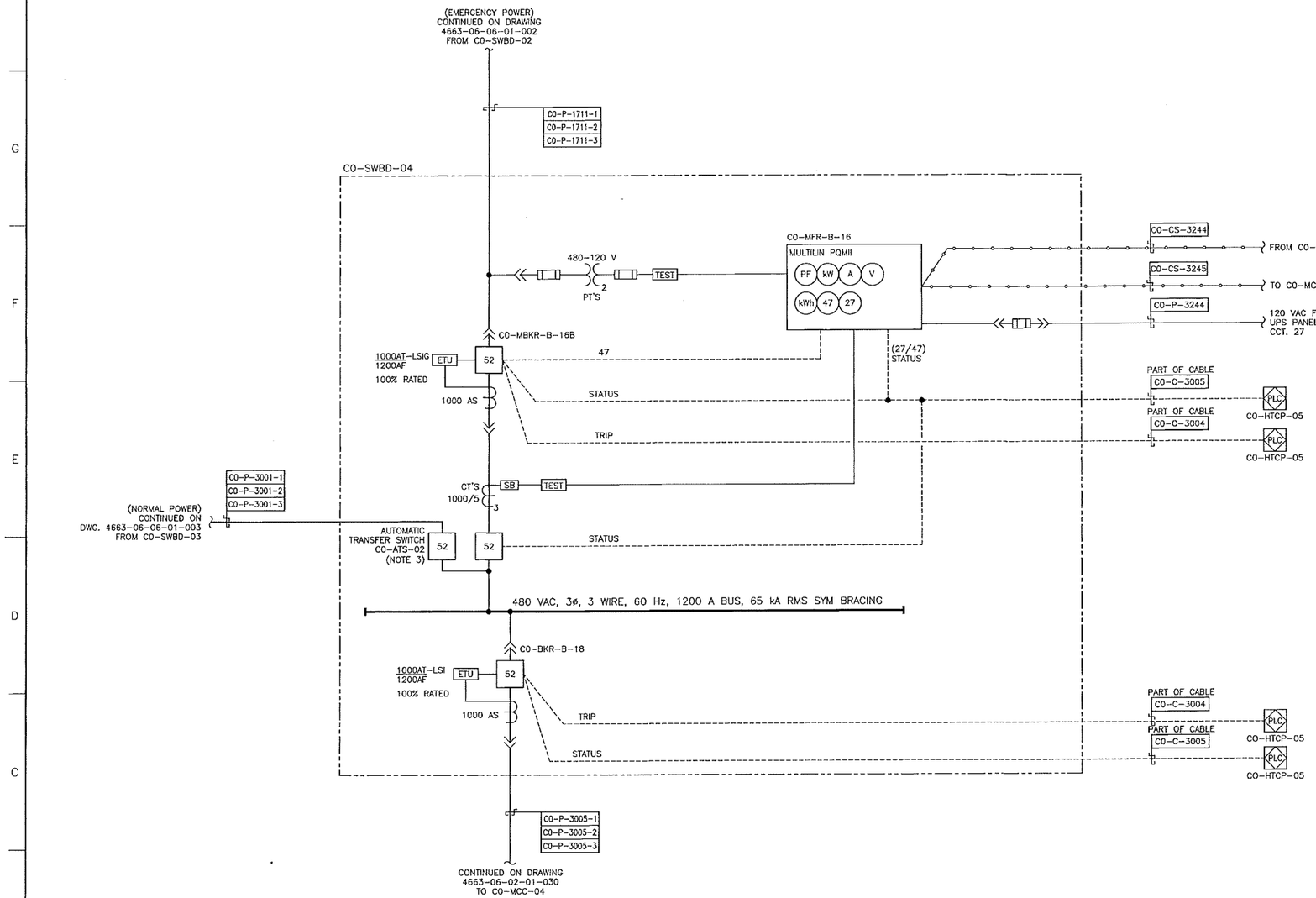
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-SWBD-03
480 V SINGLE LINE DIAGRAM
NORMAL POWER SWITCHBOARD

SCALE N.T.S. | DRAWING No 4663-06-06-01-003 | REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841



NOTES:

1. TRANSFER SWITCH SHALL BE 100% RATED.
2. MAIN BREAKER SHALL INCLUDE GROUND FAULT TRIP.
3. AUTOMATIC TRANSFER SWITCH SHALL TRANSFER FROM NORMAL TO EMERGENCY IN THE EVENT OF UNDER VOLTAGE. TEST SWITCH SHALL BE PROVIDED FOR TESTING OF TRANSFER SCHEME. UPON STABILIZATION OF NORMAL POWER, TRANSFER SWITCH SHALL TRANSFER BACK AUTOMATICALLY.

   PREFERRED SOURCE SELECTOR SWITCH SHALL ENABLE EITHER NORMAL OR EMERGENCY POWER TO FEED LOAD.

LEGEND:

(*)	TYPICAL RELAY OR DEVICE SYMBOL FUNCTIONS (*) LISTED BELOW
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C	INTELLIGENT O/L RELAY
V	VOLT METER
kWH	KILOWATT HOUR METER
kW	REAL POWER
PF	POWER FACTOR METER
27	UNDERVOLTAGE RELAY
47	PHASE SEQUENCE VOLTAGE RELAY
50	INSTANTANEOUS OVERCURRENT OR RATE OF RISE RELAY
51	AC TIME OVERCURRENT RELAY
51G	TIME DELAY GROUND FAULT PROTECTION
51N	GROUND SENSING RELAY
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3	CURRENT TRANSFORMER RATIO UNITS ARE AMPS QUANTITY SHOWN
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	CIRCUIT BREAKER
	DEVICE GROUNDING
	FUSE
SB	CT SHORTING BLOCK
TEST	TEST BLOCK
SA LA	LIGHTNING ARRESTER AND SURGE CAPACITOR
MFR	MULTIFUNCTION RELAY
PLC	PLC PANEL
	*R = RED LENS G = GREEN LENS A = AMBER LENS
M	UTILITY COMPANY REVENUE METER
52	DRAWOUT CIRCUIT BREAKER
MMP	MIMIC PANEL

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0048
UEL# 2012016-1EF-SLD-000-0048-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-06-01-002	CO-SWBD-02 480V SINGLE LINE DIAGRAM EMERGENCY POWER SWITCHBOARD
4663-06-06-01-003	CO-SWBD-03 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-01-030	CO-MCC-04 ESSENTIAL BUS 480V SINGLE LINE DIAGRAM, SHEET 1

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	MAB	JEKD	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA
JAMES DOODY
2014-APR-21

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
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PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

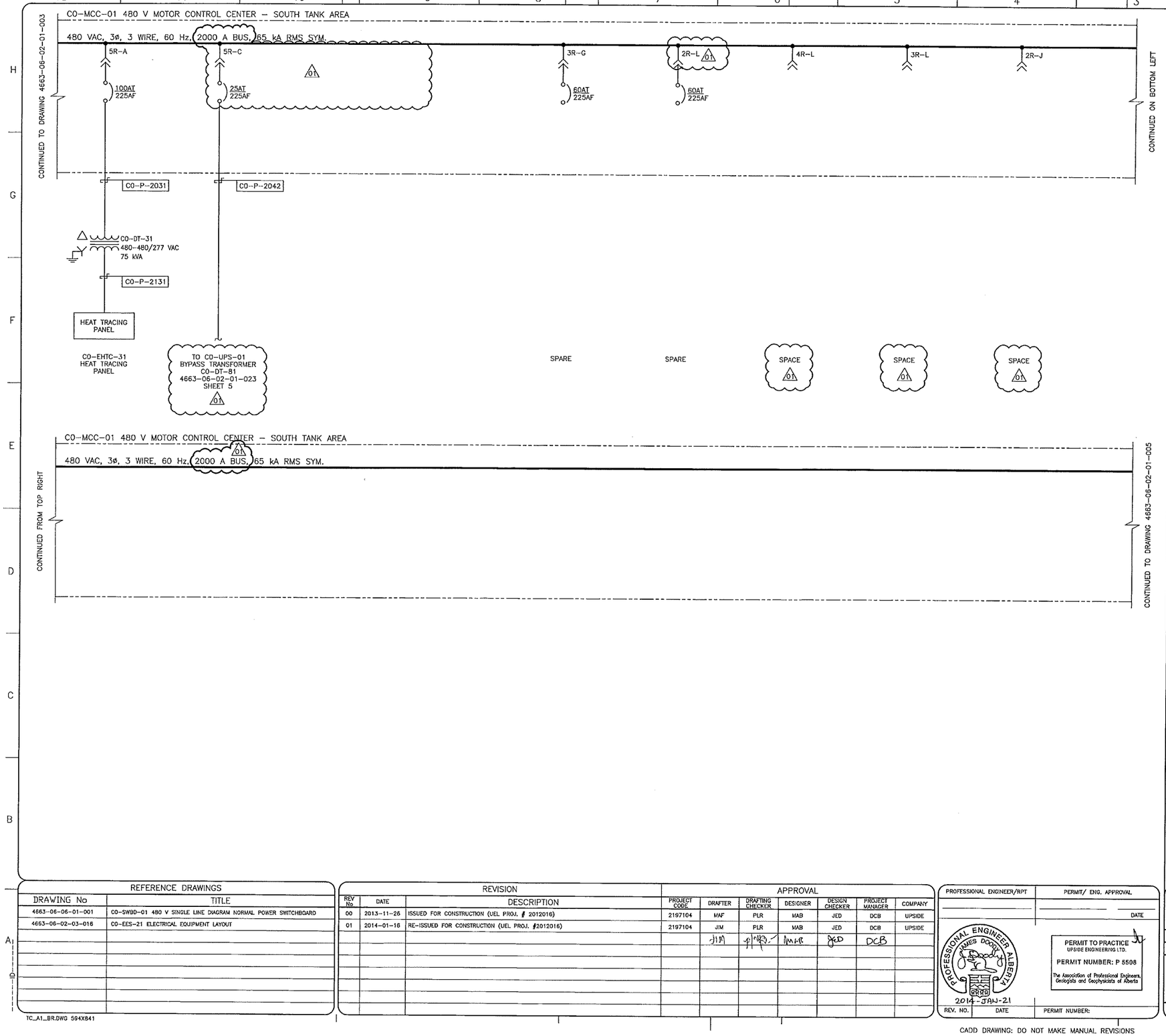
FIA # 4663	CHAINAGE:	DISCIPLINE # 06

CO-SWBD-04
480 V SINGLE LINE DIAGRAM
EMERGENCY POWER SWITCHBOARD

SCALE N.T.S.	DRAWING No 4663-06-06-01-004	REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130-KSHTT-".
2. FOR SYMBOL LEGEND SEE DWG. 4663-06-02-01-001 SHEET 1.

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0004
UEL# 2012016-1EF-SLD-000-0004-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-06-01-001	CO-SWBD-01 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-03-016	CO-EES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION			APPROVAL						
REV No.	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2013-11-26	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)	2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
01	2014-01-16	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JIM	PLR	MAB	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY

2014-JAN-21

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
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REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

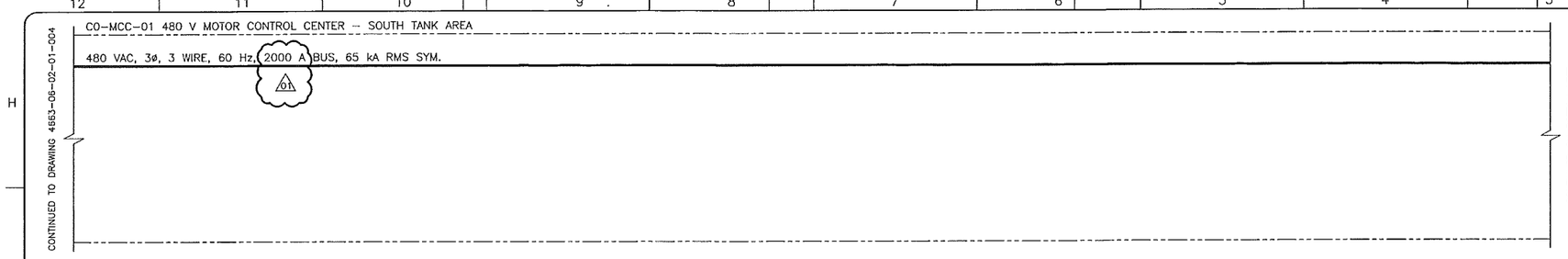
FIA # 4663	CHAINAGE:	DISCIPLINE # 06

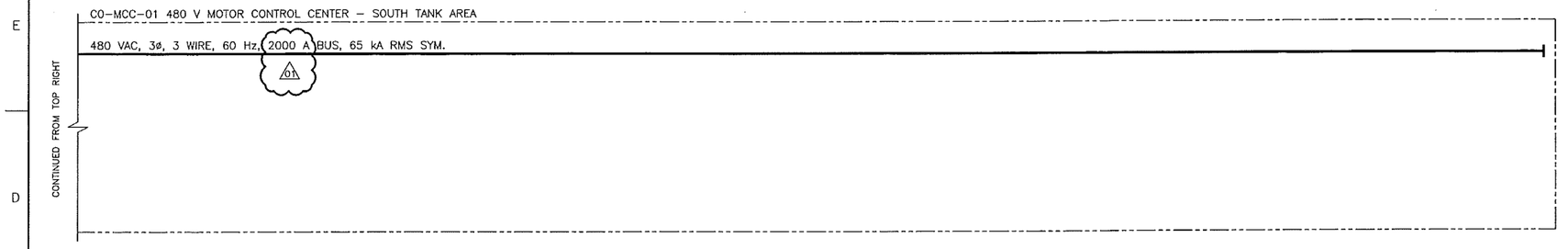
CO-MCC-01
480 V SINGLE LINE DIAGRAM
SHEET 4

SCALE N.T.S.	DRAWING No 4663-06-02-01-004	REV 01

TC_A1_BR.DWG 594X841

TIME — DESIGNFILE





NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130-KSHTT-".
2. FOR SYMBOL LEGEND SEE DWG. 4663-06-02-01-001 SHEET 1.

LINETYPE LEGEND

- MCC BUS
- POWER WIRING
- CONTROL AND CONTROL POWER WIRING
- MODBUS RS 485
- COMMAND/ALARM/TRIP/STATUS CIRCUIT
- ELECTRICAL EQUIPMENT ENCLOSURE

SDN# 25472-130-E1-0000-P0005
UEL# 2012016-1EF-SLD-000-0005-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-06-01-001	CO-SWBD-01 480 V SINGLE LINE DIAGRAM NORMAL POWER SWITCHBOARD
4663-06-02-03-016	CO-EES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-26	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-01-16	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	PLR	MAB	JED	DCB	UPSIDE
2197104	JIM	PLR	MAB	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA
2014-JAN-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MCC-01
480 V SINGLE LINE DIAGRAM
SHEET 5

SCALE N.T.S. | DRAWING No 4663-06-02-01-005 | REV 01

TIME - DESIGNFILE

TC_A1_GR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

CO-VES-21

FORTIS ALBERTA UTILITY

CO-IJB-50
REMOTE TRIPPING JUNCTION BOX

FROM 120VAC UPS DISTRIBUTION PANEL CO-UACP-03 (DWG 4663-05-00-05-004)

120VAC PWR CO-P-2715

PS1 POWER SUPPLY TB-ACP

COIJB50-TBACP-L/COUACP03-22-L BLK → L
COIJB50-TBACP-N/COUACP03-22-N WHT → N
1
2

TRIP CO-C-2715

TB1

1 COIJB50-TB1-1/COSWGR01-RA1M-9 BLK → 1 BLK COIJB50-TB1-1/FORTIS-MVI-1 1
4C SPARE
2 COIJB50-TB1-3/COSWGR01-RA1M-10 BLK → 2 BLK COIJB50-TB1-3/FORTIS-MVI-2 2
3 BLK COIJB50-TB1-4/FORTIS-MVI-3 3
4 COIJB50-TB1-5/COHTCP06-TB1511-52 SPARE 4
5 COIJB50-TB1-6/COHTCP06-TB1511-53 2
6 2C SPARE

REFER TO SCHEMATIC BELOW

CO-C-0715

INTERRUPTER JUNCTION BOX
(FORTIS OWNED & SUPPLIED)

1 COIJB50-TB1-1/FORTIS-MVI-1 BLK
2 COIJB50-TB1-3/FORTIS-MVI-2 BLK
3 COIJB50-TB1-4/FORTIS-MVI-3 BLK
4 SPARE

REFER TO FORTIS G&W TRIDENT C/W SEL 751A DETAIL

CO-SWGR-01

03

1MRA CO-MFR-B-01 P4b P4c

1 COIJB50-TB1-1/COSWGR01-RA1M-9 BLK → 9
4C SPARE
2 COIJB50-TB1-3/COSWGR01-RA1M-10 BLK → 10

REFER TO SIEMENS DWG MVS13-30130433-200SCO1C1

CO-C-2716

CO-HTCP-06

03

TB-1511
52 COIJB50-TB1-5/COHTCP06-TB1511-52 1
53 COIJB50-TB1-6/COHTCP06-TB1511-53 2
2C SPARE

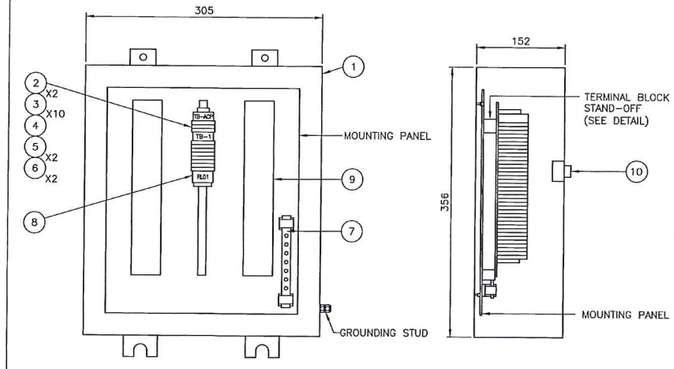
REFER TO SIEMENS DWG 4663-05-03-SC-521

TO FORTIS INTERRUPTER JUNCTION BOX

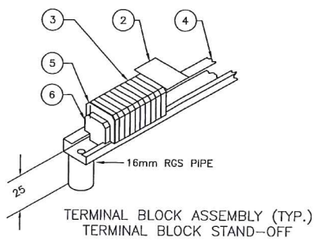
CO-SWGR-01
RA-1M 9 — CO-MFR-B-01 — RA-1M 10
P4b TRIP P4c
TB1-1 TB1-3 TB1-4
TB1-2 TB1-2/RL01-A1 RL01 TB1-4/RL01-A2

TB1-5 RL01 TB1-6 TO CO-HTCP-06 03
TBACP-L 2A TBACP-1 RL01 16 17 TBACP-2 LAMP TEST 1 2 R TBACP-N
3
TRIP POWER AVAILABLE

FROM 120 VAC UPS DISTRIBUTION



JUNCTION BOX CO-IJB-50 DETAIL



TERMINAL BLOCK ASSEMBLY (TYP.)
TERMINAL BLOCK STAND-OFF

NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130 KSHTT-" UNLESS SPECIFIED OTHERWISE.
2. LAMACOID TAG SHALL BE SUPPLIED AND SHALL HAVE BLACK LETTERS ON WHITE BACKGROUND AND FASTENED TO COVER WITH STAINLESS STEEL SCREWS. REFER TO INSTALLATION DETAIL 601.
3. TERMINAL BLOCKS SHALL BE NUMBERED SEQUENTIALLY ACCORDING TO APPROPRIATE TERMINATION DIAGRAM.
4. CORROSION INHIBITOR SHALL BE SUPPLIED LOOSE AND UNOPENED FOR INSTALLATION BY CUSTOMER.
5. ALL DIMENSIONS IN MILLIMETER UNLESS OTHERWISE NOTED.
6. ALL CABLE CONNECTOR SHALL BE ~~APPLETON TMG CONNECTOR CLASS I ZONE 2~~ T&B ST5027SS OR APPROVED EQUAL, SIZED TO SUIT CABLE.
7. ALL CONDUIT/CABLE ENTRIES BY BOTTOM OR SIDE WITH WEATHER SEALING.
8. DINRAIL, BACKPAN AND DOOR TO BE CONNECTED TO GROUND BAR WITH MINIMUM #14 WIRE, COLOUR GREEN.

LEGEND:

- VES — ELECTRICAL EQUIPMENT SHELTER
- MVI — UTILITY INTERRUPTER
- KSHTT — KEYSTONE HARDISTY TANK TERMINAL
- CABLE CONNECTOR FOR CLASSIFIED AREA
- CABLE CONNECTOR FOR NON-CLASSIFIED AREA
- JUNCTION BOX TERMINAL
- (RL) — RELAY/CONTACTOR
- (R) — INDICATING PILOT LIGHTS (LED): R – RED, G – GREEN, A – AMBER
- ---- — FIELD WIRING

ITEM No.	QTY	DESCRIPTION
1	1	HOFFMAN STEEL NEMA 12 ENCLOSURE CAT.#A1412CH C/W MOUNTING PLATE A14P12 OR APPROVED EQUAL
2	AS REQ'D	WEIDMULLER CONNECTOR MARKER SCHT5
3	AS REQ'D	WEIDMULLER TERMINAL BLOCK WDU4
4	AS REQ'D	WEIDMULLER ASSEMBLY RAIL TS35
5	AS REQ'D	WEIDMULLER END PLATE WAP
6	AS REQ'D	WEIDMULLER END BRACKET WEN 3512
7	AS REQ'D	WEIDMULLER PERFORATED BUSBAR NSCH 15X2 C/W CLIP AND BASE
8	AS REQ'D	OMRON 2PDT RELAY CAT#G2R-2-SN(S) C/W P2RF-08-E BASE
9	AS REQ'D	WIRING DUCT, 50W X 75H C/W COVER, PANDUIT CAT # F1X3LG6 OR APPROVED EQUAL
10	AS REQ'D	GE INDICATOR LAMP, RED CAT#CR104PLT82R

SDN# 25472-130-E7-0000-P0351
UEL# 2012016-1EF-EWD-000-0351-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REV No	DATE	DESCRIPTION
00	2014-02-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-03-19	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
02	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
03	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JHP	DMC	SRL	JED	DCB	UPSIDE
2197104	JIM	TAE	HHM	JED	DCB	UPSIDE
2197104	BEM	LLL	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM/MTV	NJR	VMA	DCB DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA RIMA ROHANI 23888

FOR REV 03 ONLY 2015-APR-23

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-IJB-50
REMOTE TRIPPING JUNCTION BOX
INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-001 | REV 03

TC_A1_BR.DWG 594X841

CO-VES-21

CO-CP-21-5

H	COCP215H/COUACP03-24L
N	COCP215N/COUACP03-24N

REFER TO SOUTHAMPTONTRANE DWG ES12073-RP-VES21

C0-P-2861

CO-UACP-03 (120 V AC, 1ø UPS SUPPLY)

COCP215H/COUACP03-24L	20 A	CCT #24 30A	L
COCP215N/COUACP03-24N			N

CO-HTCP-06

TB-UACP 1	COHTCP06-TBUACP-1/COUACP03-01L	1
TB-UACP 5	COHTCP06-TBUACP-5/COUACP03-01N	2
TB-AUX 1	COHTCP06-TBAUX-1/COUACP03-02L	3
TB-AUX 11	COHTCP06-TBAUX-11/COUACP03-02N	4

REFER TO DWG 4663-05-03-SC-501

C0-P-2900

1	COHTCP06-TBUACP-1/COUACP03-01L	20 A	CCT #01 30A	L
2	COHTCP06-TBUACP-5/COUACP03-01N			N
3	COHTCP06-TBAUX-1/COUACP03-02L	20 A	CCT #02 30A	L
4	COHTCP06-TBAUX-11/COUACP03-02N			N

CO-TCMP-03

TB2 L	COTCMP03-TB2-L/COUACP03-03L	6
TB2 6	COTCMP03-TB2-6/COUACP03-03N	

REFER TO DWG 4663-04-03-WD-201

C0-P-2901

~~L5-20R~~

WIRE DIRECTLY TO PANEL

COTCMP03-TB2-L/COUACP03-03L	20 A	CCT #03 30A	L	
COTCMP03-TB2-6/COUACP03-03N			N	

REFER TO DWG 4663-06-00-05-004

CO-HTCP-06

TB-ACP 1	COHTCP06-TBACP-1/COACP03-01L	1
TB-ACP 2	COHTCP06-TBACP-2/COACP03-01N	2
TB-ACP 3	COHTCP06-TBACP-3/COACP03-02L	3
TB-ACP 8	COHTCP06-TBACP-8/COACP03-02N	4

REFER TO DWG 4663-05-03-SC-501

C0-P-2790

CO-ACP-03 (120/208 V AC, 3ø SUPPLY)

1 COHTCP06-TBACP-1/COACP03-01L	CCT #01 15A	L	
2 COHTCP06-TBACP-2/COACP03-01N		N	
3 COHTCP06-TBACP-3/COACP03-02L	CCT #02 15A	L	
4 COHTCP06-TBACP-8/COACP03-02N		N	

CO-TCMP-03

TB1 L (BK)	COTCMP03-TB1-L/COACP03-03L	
TB1 7 (W)	COTCMP03-TB1-7/COACP03-03N	

REFER TO DWG 4663-04-03-WD-201

C0-P-2791

~~L5-15R~~

WIRE DIRECTLY TO PANEL

COTCMP03-TB1-L/COACP03-03L	(BK)	CCT #03 15A	L	
COTCMP03-TB1-7/COACP03-03N	(W)		N	

REFER TO DWG 4663-06-00-05-004

CO-MMP-01

FU1	COMMP01-FU1/COUACP03-10L	
FU2	COMMP01-FU2/COUACP03-10N	

REFER TO SIEMENS DWG : 7016-E09-001 / BECHTEL: 25472-130-V1A-ES00-P0028

C0-P-2917

CO-UACP-03 (120 V AC, 1ø UPS SUPPLY)

COMMP01-FU1/COUACP03-10L	20 A	CCT #10 30A	L
COMMP01-FU2/COUACP03-10N			N

CO-IJB-50

TB-ACP L	COIJB50-TBACP-L/COUACP03-22L	
TB-ACP N	COIJB50-TBACP-N/COUACP03-22N	

REFER TO DWG 4663-06-07-06-001

C0-P-2715

COIJB50-TBACP-L/COUACP03-22L	20 A	CCT #22 30A	L	
COIJB50-TBACP-N/COUACP03-22N			N	

REFER TO DWG 4663-06-00-05-004

NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTI".

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COXXXX-XX-XX/COACP01-XXL

- CIRCUIT NUMBER (L)LINE/(N)NEUTRAL
- DISTRIBUTION PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0625
UEL# 2012016-1EF-EWD-000-0625-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-04-03-WD-201	KHTI COMMUNICATION PANEL C0-TCMP-03 (C0-VES-21) POWER DISTRIBUTION WIRING DIAGRAM
4663-05-03-SC-501	KHTI CONTROL PANEL C0-HTCP-06 (C0-VES-21) AC POWER DISTRIBUTION WIRING DIAGRAM
4663-06-00-05-004	C0-VES-21 C0-ACP-03 AND C0-UACP-03 DISTRIBUTION PANEL SCHEDULES
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-04	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	PRG	HHM	SRL	GED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY

2014-APR-04

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VES-21
SUPPLIES TO TCMP/HTCP/MMP
INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-02-07-015 | REV 00

TIME-DESIGN FILE

TC_A1_BR.DWG 594XB41

CO-VES-21

CO-SWGR-01, SECTION

1MCU
1 (BK) COSWGR01-1MCU-1/COUACP03-19L
2 (W) COSWGR01-1MCU-2/COUACP03-19N

REFER TO SIEMENS DWG #MVS13-30130433-200SC01C1

CO-P-2902

CO-SWGR-01, SECTION 01

1TA1
CO-MVC-23 U1A COSWGR01-1TA1-U1A/COUACP03-29L 1
U0A COSWGR01-1TA1-U0A/COUACP03-29N 2
CO-MVC-24 U1B COSWGR01-1TA1-U1B/COUACP03-31L 3
U0B COSWGR01-1TA1-U0B/COUACP03-31N 4

REFER TO SIEMENS DWG #MVC13-30130433-100SC00C1 / MVC13-30130433-100SC00C2

U2B

CO-P-2905

CO-SWGR-01, SECTION 02

2TA1
CO-MVC-21 U1A COSWGR01-2TA1-U1A/COUACP03-25L 1
U0A COSWGR01-2TA1-U0A/COUACP03-25N 2
CO-MVC-22 U1B COSWGR01-2TA1-U1B/COUACP03-27L 3
U0B COSWGR01-2TA1-U0B/COUACP03-27N 4

REFER TO SIEMENS DWG #MVC13-30130433-100SC02C1 / MVC13-30130433-100SC02C2

CO-P-2904

CO-SWGR-01, SECTION 03

3TA1
CO-MVC-11 U1A COSWGR01-3TA1-U1A/COUACP03-21L 1
U0A COSWGR01-3TA1-U0A/COUACP03-21N 2
CO-MVC-12 U1B COSWGR01-3TA1-U1B/COUACP03-23L 3
U0B COSWGR01-3TA1-U0B/COUACP03-23N 4

REFER TO SIEMENS DWG #MVC13-30130433-100SC03C1 / MVC13-30130433-100SC03C2

CO-P-2903

CO-UACP-03 (120 V AC, 1ø SUPPLY)

1 COSWGR01-1MCU-1/COUACP03-19L (BK) 20 A — CCT #19 30A L
COSWGR01-1MCU-2/COUACP03-19N (W) N

1 COSWGR01-1TA1-U1A/COUACP03-29L 20 A — CCT #29 30A L
2 COSWGR01-1TA1-U0A/COUACP03-29N N

3 COSWGR01-1TA1-U1B/COUACP03-31L 20 A — CCT #31 30A L
4 COSWGR01-1TA1-U0B/COUACP03-31N N

1 COSWGR01-2TA1-U1A/COUACP03-25L 20 A — CCT #25 30A L
2 COSWGR01-2TA1-U0A/COUACP03-25N N

3 COSWGR01-2TA1-U1B/COUACP03-27L 20 A — CCT #27 30A L
4 COSWGR01-2TA1-U0B/COUACP03-27N N

1 COSWGR01-3TA1-U1A/COUACP03-21L 20 A — CCT #21 30A L
2 COSWGR01-3TA1-U0A/COUACP03-21N N

3 COSWGR01-3TA1-U1B/COUACP03-23L 20 A — CCT #23 30A L
4 COSWGR01-3TA1-U0B/COUACP03-23N N

REFER TO DWG 4663-06-00-05-004

NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COXXXX-XX-XX/COACP01-XXL

- CIRCUIT NUMBER (L)LINE/(N)NEUTRAL
- DISTRIBUTION PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0626
UEL# 2012016-1EF-EWD-000-0626-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-05-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	PRG	HHM	SRL		DCB	UPSIDE
	PRG					

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY

2014-APR-21

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VES-21
UPS SUPPLIES TO CO-SWGR-01
INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-02-07-016 | REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

C0-VES-21

C0-VFD-21

C0-VFD-21 CONTROL — TB4
- 4 (BK) C0VFD21-TB4-4/C0UACP03-12L
- 5 (W) C0VFD21-TB4-5/C0UACP03-12N

C0-P-2911

REFER TO SIEMENS DWG #A5E32776090B SHEET 7 OF 9

C0-VFD-22

C0-VFD-22 CONTROL — TB4
- 4 (BK) C0VFD22-TB4-4/C0UACP03-14L
- 5 (W) C0VFD22-TB4-5/C0UACP03-14N

C0-P-2912

REFER TO SIEMENS DWG #A5E32776090B SHEET 7 OF 9

C0-VFD-23

C0-VFD-23 CONTROL — TB4
- 4 (BK) C0VFD23-TB4-4/C0UACP03-16L
- 5 (W) C0VFD23-TB4-5/C0UACP03-16N

C0-P-2913

REFER TO SIEMENS DWG #A5E32776090B SHEET 7 OF 9

C0-VFD-24

C0-VFD-24 CONTROL — TB4
- 4 (BK) C0VFD24-TB4-4/C0UACP03-18L
- 5 (W) C0VFD24-TB4-5/C0UACP03-18N

C0-P-2914

REFER TO SIEMENS DWG #A5E32776090B SHEET 7 OF 9

C0-UACP-03 (120 V AC, 1ø SUPPLY)

- C0VFD21-TB4-4/C0UACP03-12L (BK) 20 A — CCT #12 30A — L
- C0VFD21-TB4-5/C0UACP03-12N (W) — N
- C0VFD22-TB4-4/C0UACP03-14L (BK) 20 A — CCT #14 30A — L
- C0VFD22-TB4-5/C0UACP03-14N (W) — N
- C0VFD23-TB4-4/C0UACP03-16L (BK) 20 A — CCT #16 30A — L
- C0VFD23-TB4-5/C0UACP03-16N (W) — N
- C0VFD24-TB4-4/C0UACP03-18L (BK) 20 A — CCT #18 30A — L
- C0VFD24-TB4-5/C0UACP03-18N (W) — N

REFER TO DWG 4663-06-00-05-004

NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHIT".

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

C0XXXX-XX-XX/C0ACP01-XXL
- XXL — CIRCUIT NUMBER (L)LINE/(N)NEUTRAL
- XX — DISTRIBUTION PANEL NUMBER
- XX — TERMINAL NUMBER
- C0ACP01 — TERMINAL BLOCK/STRIP NUMBER
- C0XXXX — INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0627
UEL# 2012016-1EF-EWD-000-0627-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-00-05-004	C0-VES-21 C0-ACP-03 AND C0-UACP-03 DISTRIBUTION PANEL SCHEDULES
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
4663-09-00-01-004	KHIT SAFETY PLAN BUILDINGS C0-EES-21, C0-EES-22, C0-VES-21 LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-04	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER JAMES DOOLEY 2014-APR-04

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VES-21
UPS SUPPLIES TO C0-VFD-21/22/23/24
INTERCONNECTION WIRING DIAGRAM

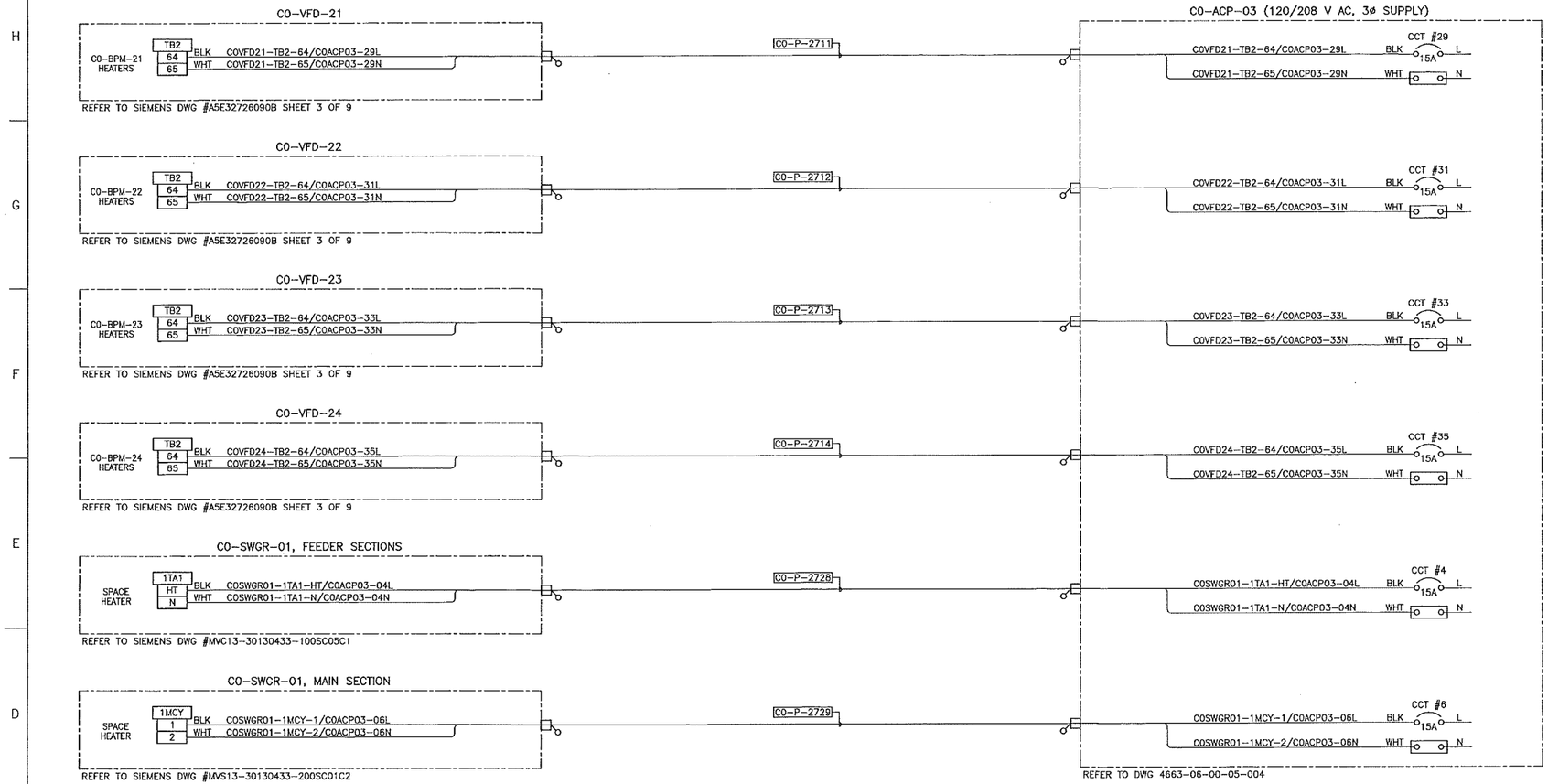
SCALE N.T.S. | DRAWING No 4663-06-02-07-017 | REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

CO-VES-21



NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COXXXX-XX-XX/COACP01-XXL

- CIRCUIT NUMBER (L)LINE/(N)NEUTRAL
- DISTRIBUTION PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0628
UEL# 2012016-1EF-EWD-000-0628-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	PRG	TAE	HNM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 29869

REV. NO. 00 DATE 2014-APR-17

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

TransCanada In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

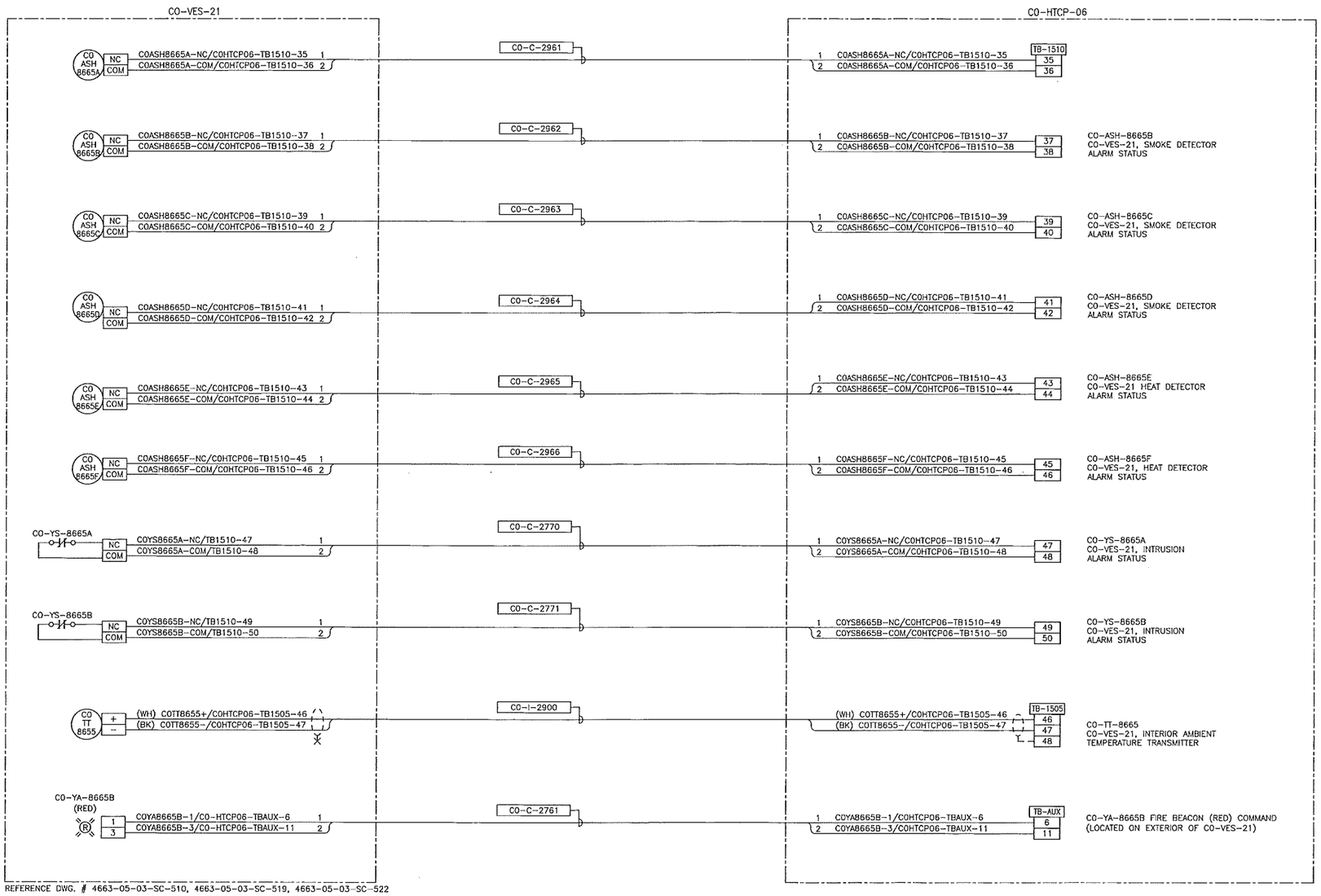
CO-VES-21
UTILITY SUPPLIES TO VFDS, SWGR INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-02-07-018	00

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME---DESIGNFILE



NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. INSTRUMENT REQUIRES EXTERNAL 120VAC POWER. SEE DRAWING 4663-06-02-07-002.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

- FUSED TERMINAL WITH 250mA FUSE.
- DISCONNECT TEST TERMINAL
- (R) RED INDICATING LIGHT

SDN# 25472-130-E7-0000-P0376
UEL# 2012016-1EF-EWD-000-0376-01

REFERENCE DRAWINGS

DRAWING No	TITLE
--	

REV No	DATE	DESCRIPTION
00	2014-03-14	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
	2197104	JIM	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA — JAMES DOOLEY — 2014-MAR-21

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

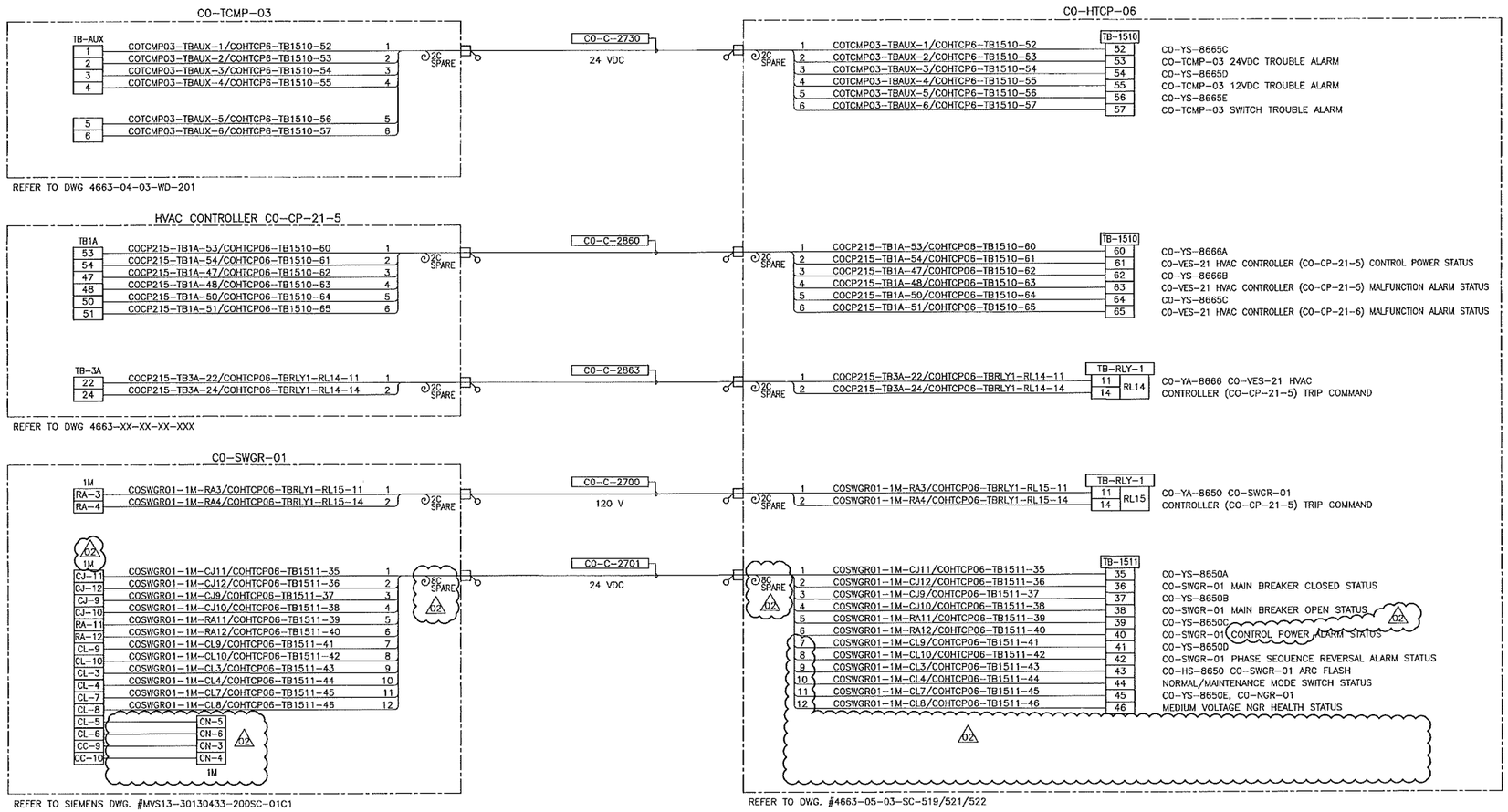
CO-VES-21
BUILDING INSTRUMENTS & CONTROL PANEL CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-026 | REV 00

TIME---DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".
2. SUPPLY AND INSTALL OF ALL CABLES SHALL BE BY EES VENDOR.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COPIT8712-X1-1/COWB01-TB1-1

- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- JUNCTION BOX NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0377
UEL# 2012016-1EF-EWD-000-0377-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-03-14	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JIM	TAE	HHM	JED	DCB	UPSIDE
01	2014-04-11	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JAP	PLR	HHM	JED	DCB	UPSIDE
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 2015-APR-27

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REV 02 ONLY

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

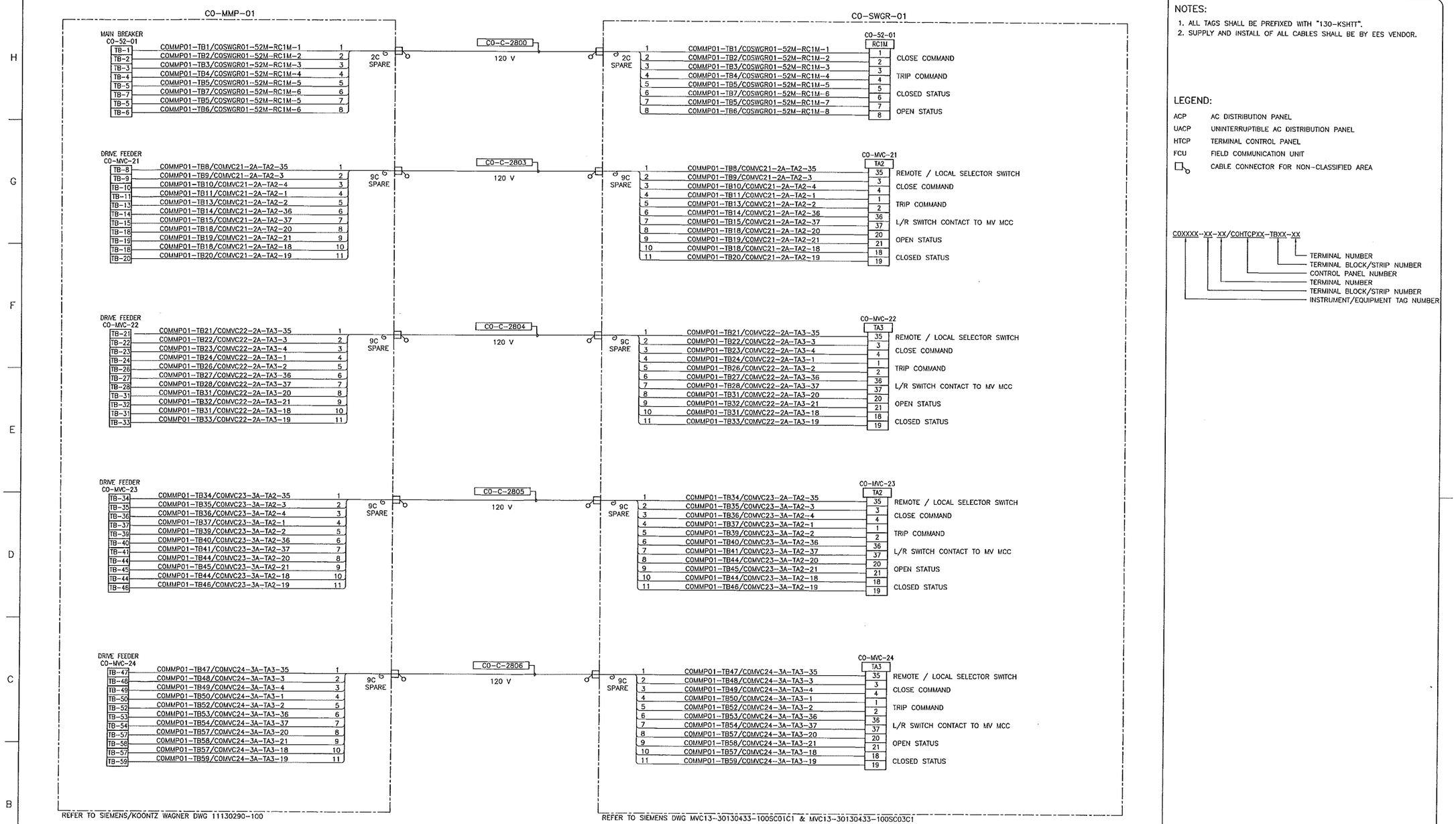
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-VES-21
CO-SWGR-01, CO-TCMP-03 & CO-CP-21-5 TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-027	02

TC_A1_BR.DWG 594X841



NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".
2. SUPPLY AND INSTALL OF ALL CABLES SHALL BE BY EES VENDOR.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COXXXX-XX-XX/COHTCPXX-TBXX-XX

- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- CONTROL PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0430
UEL# 2012016-1EF-EWD-000-0525-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

TC_A1_BR.DWG 594X841

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-11	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA JAMES D. DOYLE 24-APR-11

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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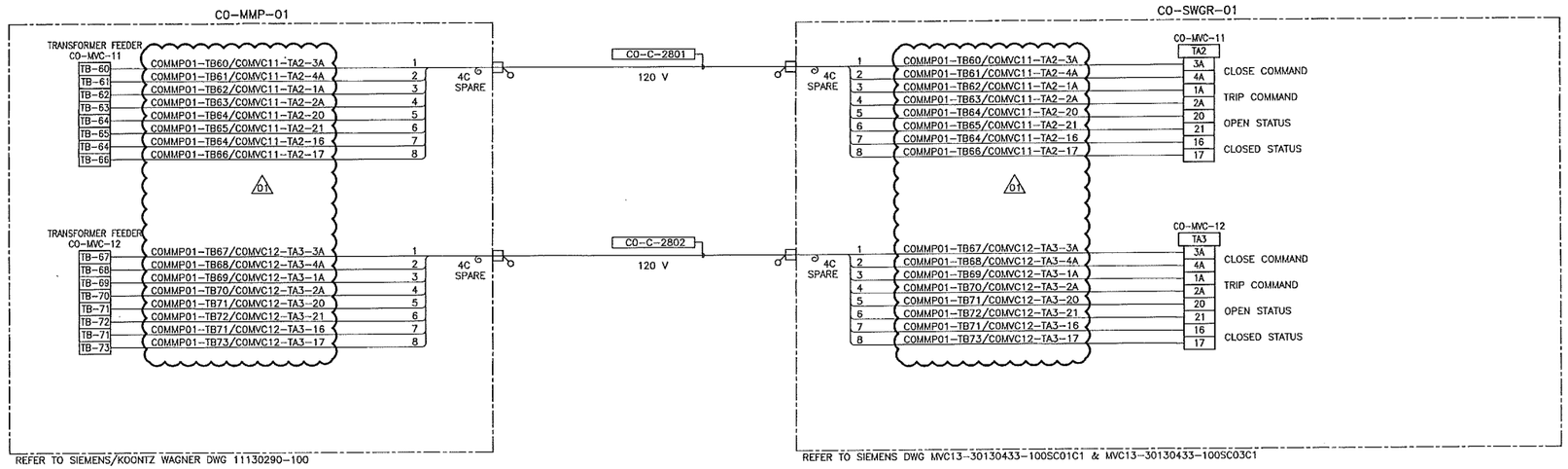
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MMP-01
MIMIC PANEL (CO-VES-21)
INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-070 | REV 00

TIME-DESIGNFILE



NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".
2. SUPPLY AND INSTALL OF ALL CABLES SHALL BE BY EES VENDOR.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COXXXX-XX-XX/COHTCPXX-TBXX-XX

- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- CONTROL PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0431
UEL# 2012016-1EF-EWD-000-0526-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-11	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-10-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	PLR	HHM	JED	DCB	UPSIDE
2197104	BEM	LLL	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-OCT-08

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

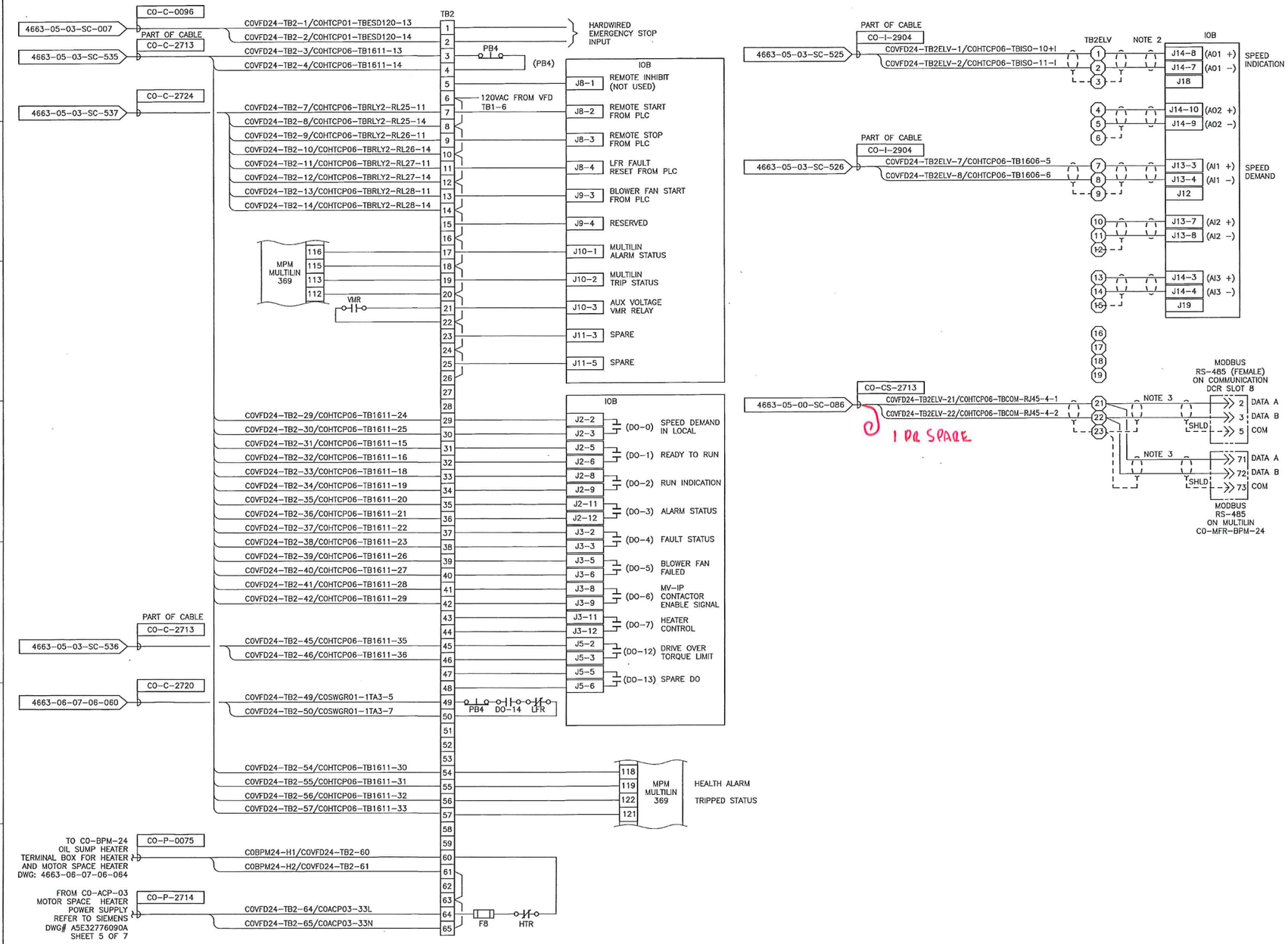
FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-MMP-01
MIMIC PANEL (CO-VES-21)
INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-071	01

TIME DESIGNFILE

TC_A1_BR.DWG 594X841



NOTES:

1. DANGER! THIS CONTACT MUST BE INTEGRATED WITH INPUT SWITCHGEAR TO DEACTIVATE THE DRIVE INPUT MEDIUM VOLTAGE UPON THE RARE EVENT OF A SECONDARY CIRCUIT FAULT.

   CONTACTS CLOSED = PERMISSIVE TO CLOSE BREAKER
   CONTACTS OPEN = TRIP BREAKER

2. CUT AND TAPE BACK ANALOG SHIELDS.

3. BUILDING VENDOR TO MODIFY VFD INTERNAL MODBUS COMMUNICATION WIRING AS SHOWN.

SDN# 25472-130-E7-0000-P0412
UEL# 2012016-1EF-EWD-000-0412-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAF	TAE	IRM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY
2014-APR-24

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

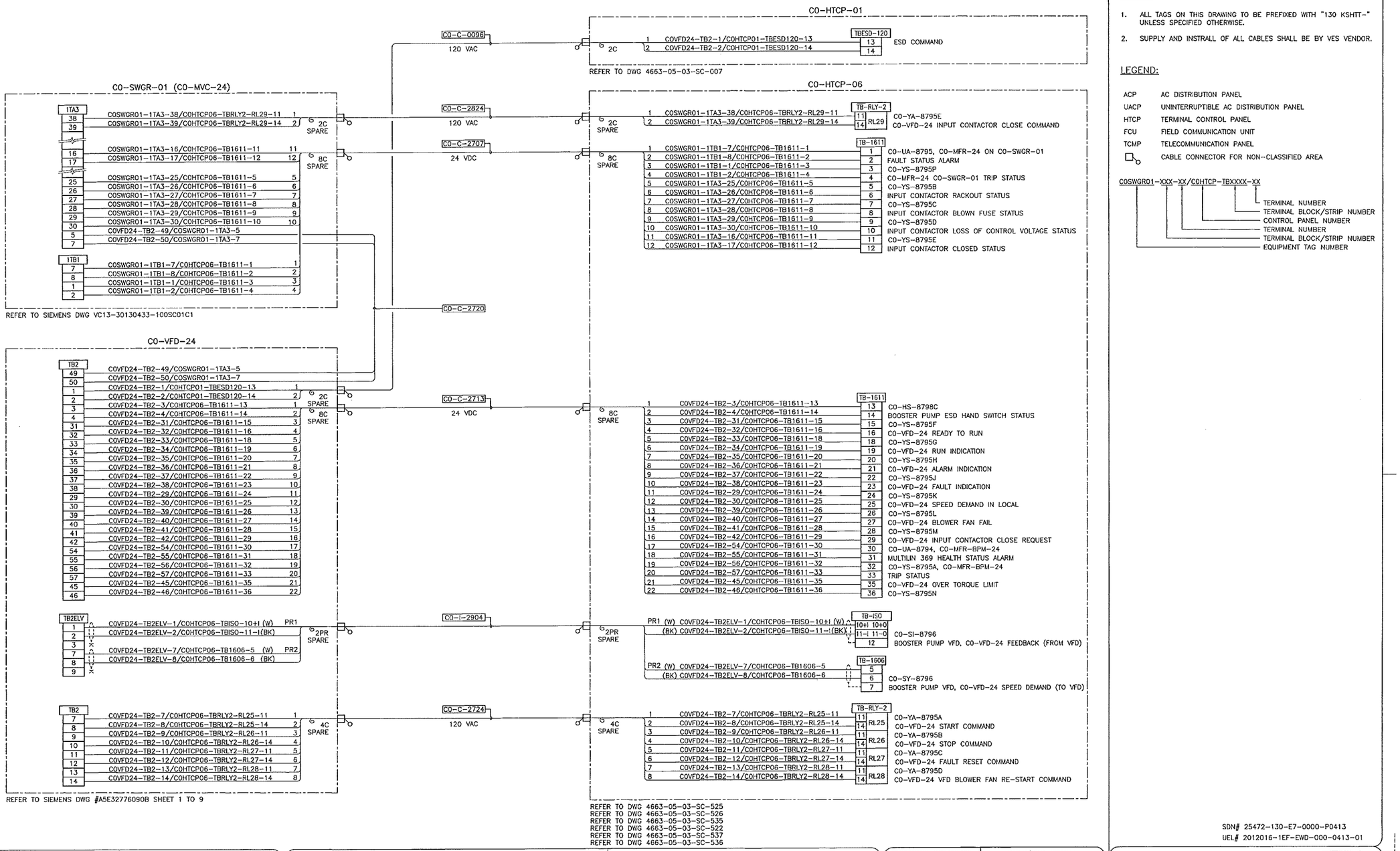
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VFD-24
4160V BOOSTER PUMP
SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-062 | REV 00

TC_A1_BR.DWG 594X841

TIME— —DESIGNFILE



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130 KSHTT-" UNLESS SPECIFIED OTHERWISE.
2. SUPPLY AND INSTRALL OF ALL CABLES SHALL BE BY VES VENDOR.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
TCMP	TELECOMMUNICATION PANEL
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COSWGR01-XXX-XX/COHTCP-TBXXXX-XX
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- CONTROL PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0413
UEL# 2012016-1EF-EWD-000-0413-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	PRG	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 29880
2014-APR-24

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

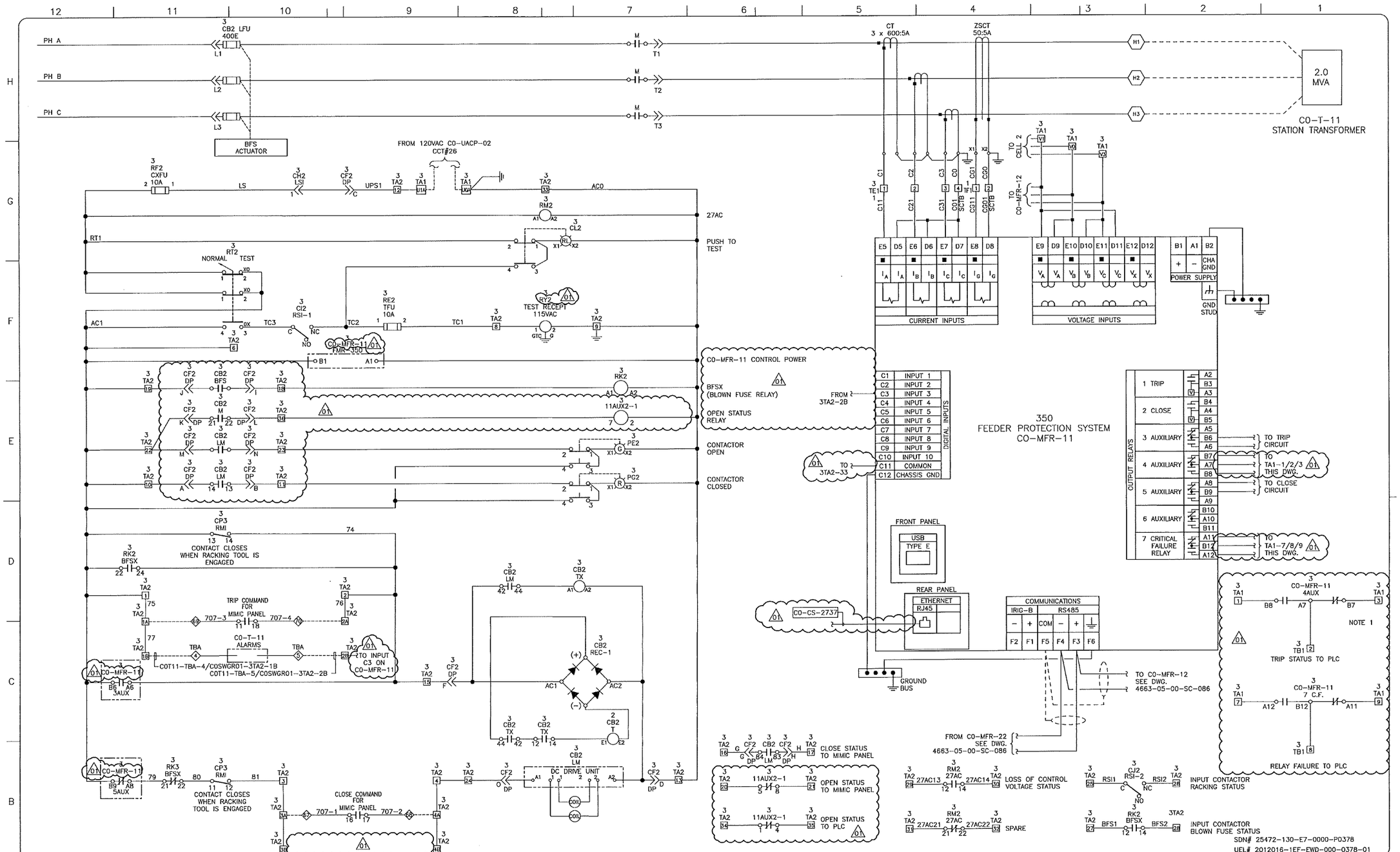
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

4160 V BOOSTER PUMP CO-BPM-24 CO-SWGR-01 MCC & VFD TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-063 | REV 00

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUTOUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (KOONTZ WAGNER ELECTRIC CO.)
4663-06-07-06-071	CO-MMP-01 MIMIC PANEL (CO-VES-21) INTERCONNECTION WIRING DIAGRAM
4663-06-07-06-082	CO-T-11 4160-480 V,2 MVA TRANSFORMER INTERCONNECTION WIRING DIAGRAM

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	PLR	MAB	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTH	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA

FOR REV 01 ONLY 2015-APR-23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

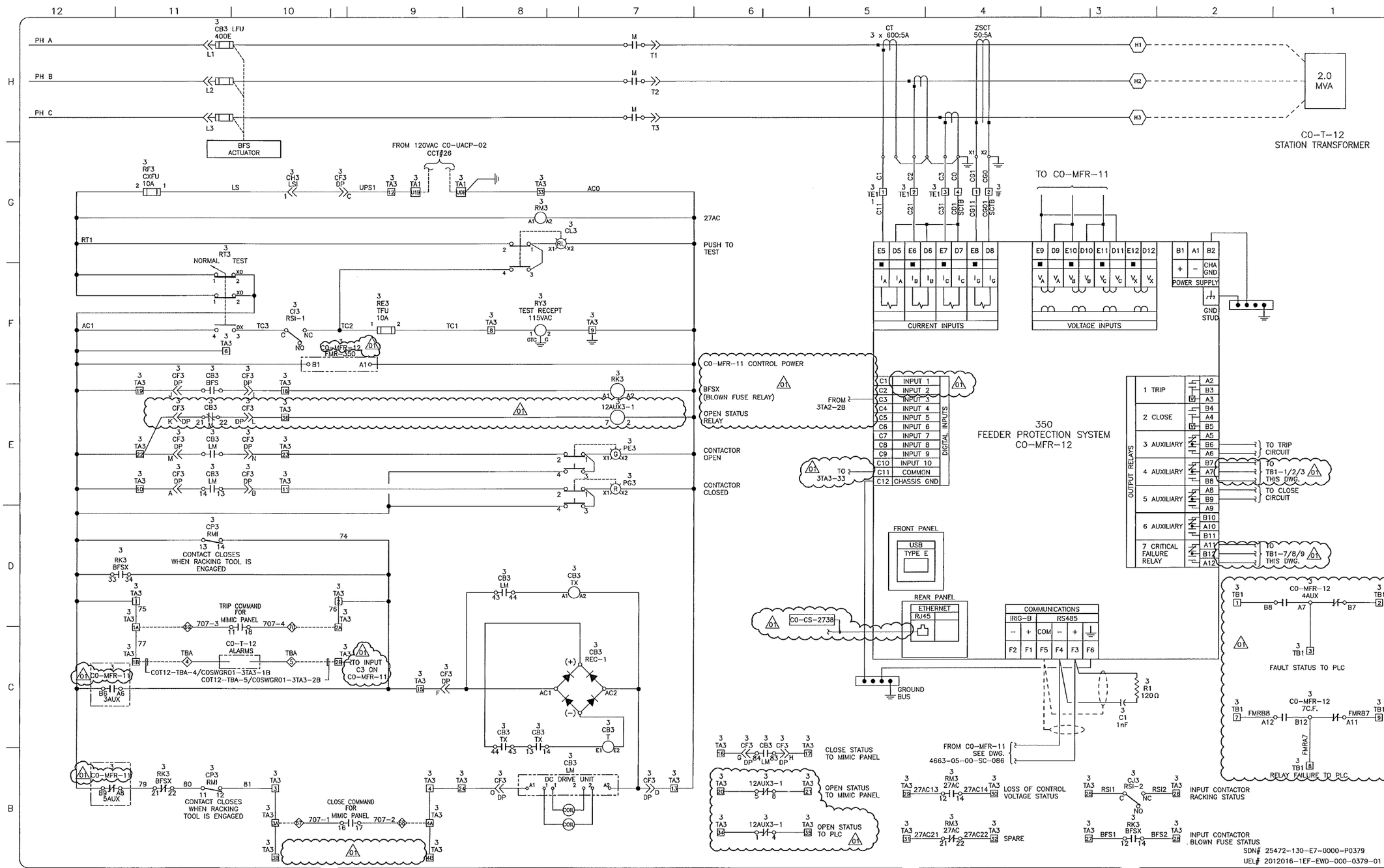
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MVC-11
STATION TRANSFORMER CO-T-11
SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-028 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



SDN# 25472-130-E7-0000-P0379
UEL# 2012016-1EF-EWD-000-0379-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUTOUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (KOONTZ WAGNER ELECTRIC CO.)
4663-06-07-06-071	CO-MMP-01 MIMIC PANEL (CO-VES-21) INTERCONNECTION WIRING DIAGRAM
4663-06-07-06-083	CO-T-12 4160-480 V,2 MVA TRANSFORMER INTERCONNECTION WIRING DIAGRAM

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	PLR	MAB	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIWA ROHAN 68148

FOR REV 01 ONLY 2015-APR-23

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

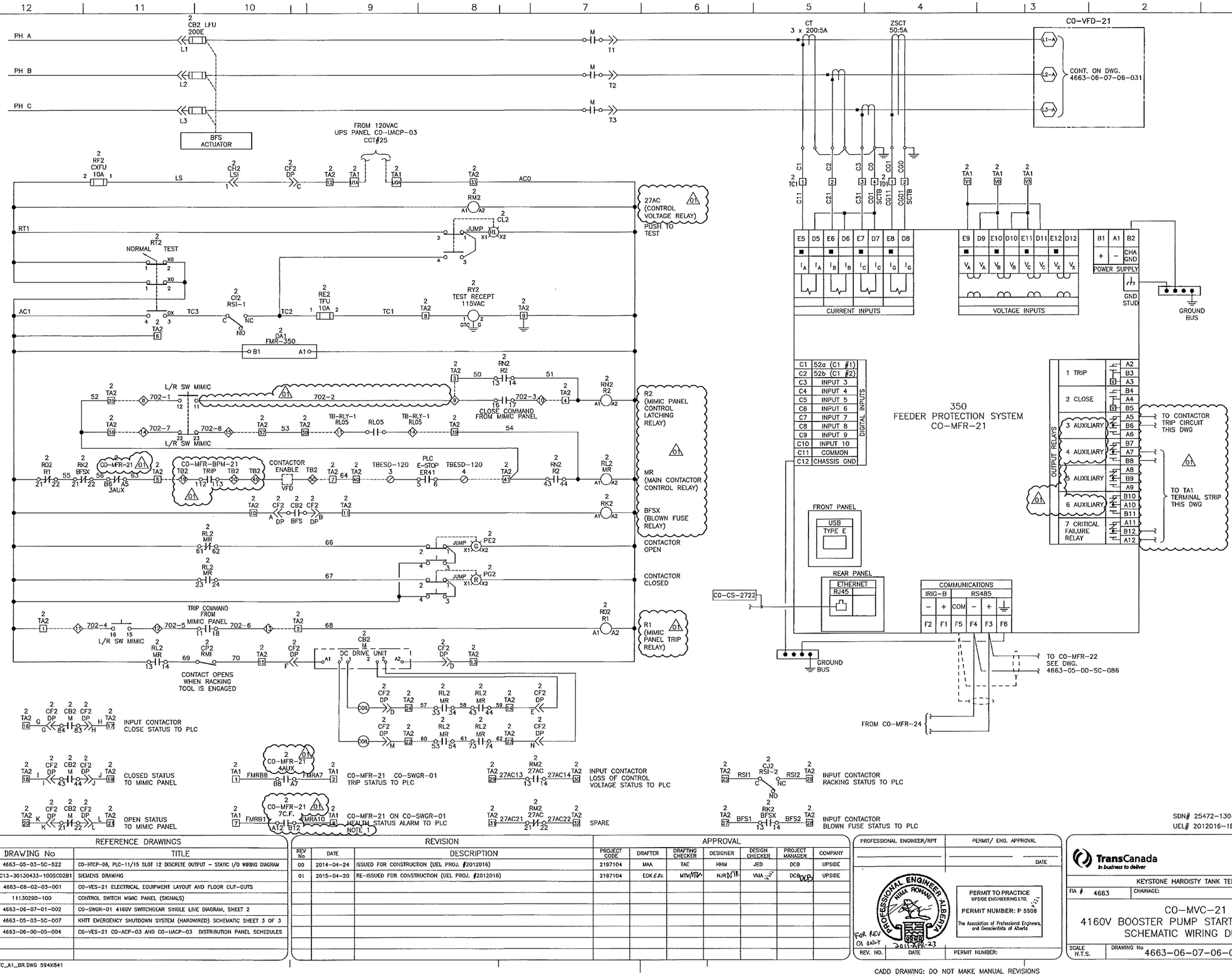
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MVC-12
STATION TRANSFORMER CO-T-12
SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-029 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



SDN# 25472-130-E7-0000-P0380
UEL# 2012016-1EF-EWD-000-0380-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-05-03-SC-522	CO-HTCP-08, PLC-11/15 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM
MVC13-30130433-100SC02B1	SIEMENS DRAWING
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (SIGNALS)
4663-06-07-01-002	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-05-03-SC-007	KHTT EMERGENCY SHUTDOWN SYSTEM (HARDWIRED) SCHEMATIC SHEET 3 OF 3
4663-06-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAA	TAE	HHM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTH/MTA	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REV 01 ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MVC-21
4160V BOOSTER PUMP STARTER & MULTILIN SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-030 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

CONT. FROM DWG. 4663-06-07-06-030

PH A
PH B
PH C

L1-A
L2-A
L3-A

C0-VFD-21
01

T1
T2
T3

1000:5 CT4
1000:5 CT5
1000:5 CT6

6-R6
6-R6A
6-R7
6-R6A
6-SB
6-R6A

G

6-S7
6-S7A
6-S7B

H1
H2
H3

F31 D5H
F32 D5H
F33 D5H

PT3
4.8kV
40:1

X1
X2
X3

F45 T2A1
F46 T2A1

T1-A
T2-A
T3-A

MOTOR

C0-BPM-21
BOOSTER PUMP MOTOR
(1000 HP)
3 PHASE
30 ~ 60 HZ
4160 V
1.15 SERVICE FACTOR

92	93	94	95	96	97	98	99	100
5A	1A	COM	5A	1A	COM	5A	1A	COM
PHASE A			PHASE B			PHASE C		

CURRENT INPUTS

105	106	107	108	109	110
VA	VN	VB	VN	VC	VN
PHASE A		PHASE B		PHASE C	

VOLTAGE INPUTS

369
MOTOR MANAGEMENT
RELAY
C0-MFR-BPM-21

CONTROL POWER

FILTER GROUND	123	7-T2
LINE +	124	7-P3
NEUTRAL	125	
SAFETY GROUND	126	

TO TB1-39, 40
SEE DWG. A5E32776090B SHEET 3 OF 9

OUTPUT RELAYS

TRIP	111	112
	113	
ALARM	114	115
	116	
AUX1 (HEALTH STATUS)	117	118
	119	
AUX2 (TRIP STATUS)	120	121
	122	

TO TB2-20, 19
SEE DWG. 4663-06-07-06-032

TO TB2-16, 17
SEE DWG. 4663-06-07-06-032

TO TB2-55, 54
SEE DWG. 4663-06-07-06-032

TO TB2-57, 56
SEE DWG. 4663-06-07-06-032

01

ETHERNET
RJ45

C0-CS-2720

TB2 RTD

TD-1 C0-BPM-21 PHASE A WINDING	111	1	+	RTD1
	112	2	–	
	113	3	COM	
	114	4	SH	
TD-2 C0-BPM-21 PHASE B WINDING	115	5	+	RTD2
	116	6	–	
	117	7	COM	
	118	8	SH	
TD-3 C0-BPM-21 PHASE C WINDING	119	9	+	RTD3
	120	10	–	
	121	11	COM	
	122	12	SH	
TD-4 C0-BPM-21 PHASE A WINDING	123	13	+	RTD4
	124	14	–	
	125	15	COM	
	126	16	SH	
TD-5 C0-BPM-21 PHASE B WINDING	127	17	+	RTD5
	128	18	–	
	129	19	COM	
	130	20	SH	
TD-6 C0-BPM-21 PHASE C WINDING	131	21	+	RTD6
	132	22	–	
	133	23	COM	
	134	24	SH	
BD-10 C0-BPM-21 MOTOR BEARING DE	135	25	+	RTD7
	136	26	–	
	137	27	COM	
	138	28	SH	
BD-11 C0-BPM-21 MOTOR BEARING NDE	139	29	+	RTD8
	140	30	–	
	141	31	COM	
	142	32	SH	
SPARE	143	33	+	RTD9
	144	34	–	
	145	35	COM	
	146	36	SH	
SPARE	147	37	+	RTD10
	148	38	–	
	149	39	COM	
	150	40	SH	
SPARE	151	41	+	RTD11
	152	42	–	
	153	43	COM	
	154	44	SH	
SPARE	155	45	+	RTD12
	156	46	–	
	157	47	COM	
	158	48	SH	

REFER TO DRAWING
No. 4663-06-07-06-034
FOR RTD FIELD CONNECTIONS

TO INSTRUMENT GROUND

CHANNEL 1			CHANNEL 2			CHANNEL 3			X FIBER	
RS485			RS485			RS485				
+	–	SHLD	+	–	SHLD	+	–	SHLD	TX	RX
71	72	73	74	75	76	77	78	79		

FROM C0-SWGR-01 MULTILIN PQMII SEE DWG# 4663-05-00-SC-086

TO C0-VFD-21 SEE DWG# 4663-05-00-SC-086

C0-CS-2714

SDN# 25472-130-E7-0000-P0381
UEL# 2012016-1EF-EWD-000-0381-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK EDK	MTM MTM	NJR NJR	VMA VMA	DCB DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 29880

FOR REV 01 ONLY 2015-APR-27

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
In business to deliver

upside Engineering Ltd.

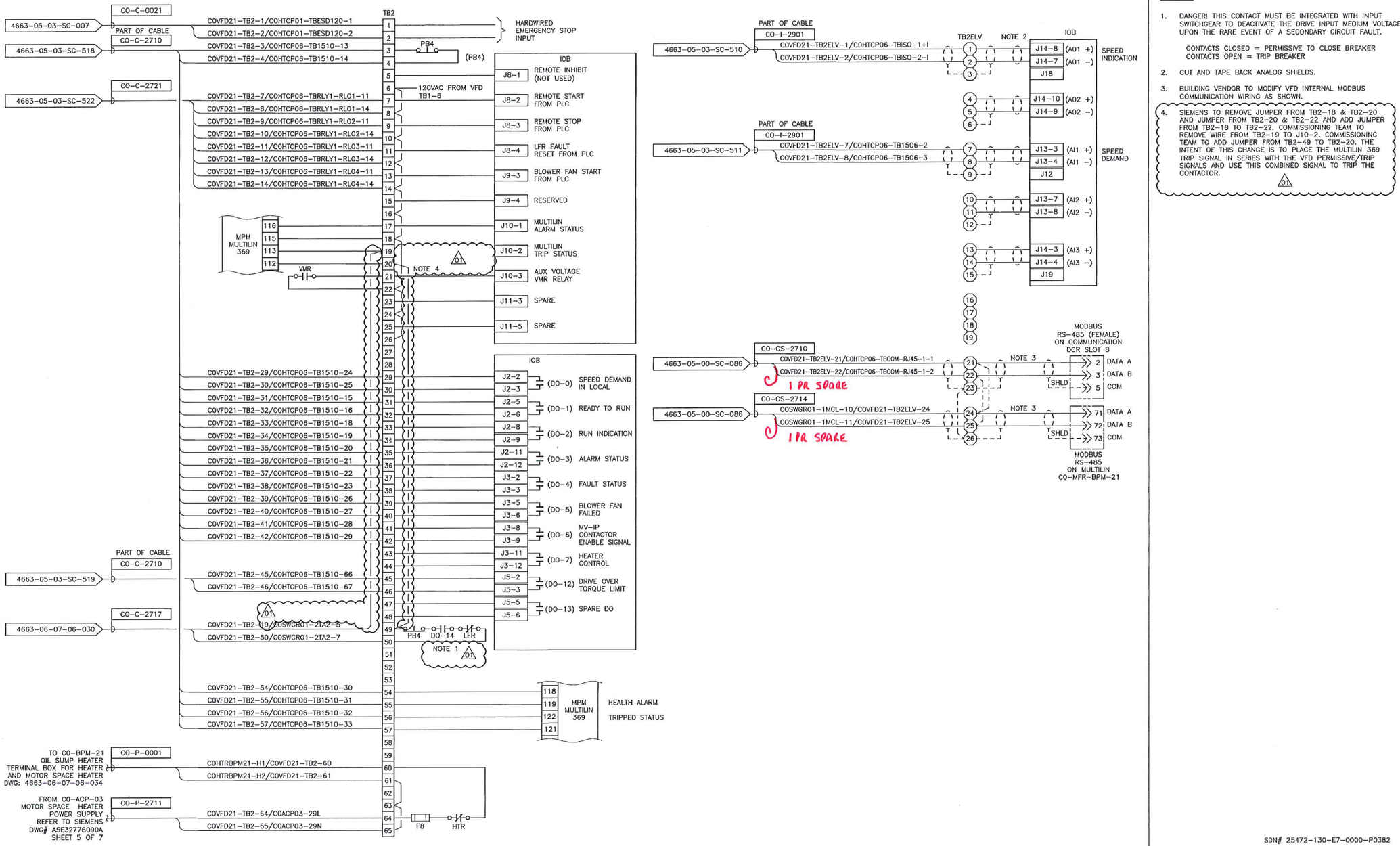
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VFD-21
BOOSTER PUMP VFD
SCHEMATIC AND INTERCONNECTION DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-031 | REV 01

TC_A1_BR.DWG 594X841



NOTES:

1. DANGER! THIS CONTACT MUST BE INTEGRATED WITH INPUT SWITCHGEAR TO DEACTIVATE THE DRIVE INPUT MEDIUM VOLTAGE UPON THE RARE EVENT OF A SECONDARY CIRCUIT FAULT.

   CONTACTS CLOSED = PERMISSIVE TO CLOSE BREAKER
   CONTACTS OPEN = TRIP BREAKER

2. CUT AND TAPE BACK ANALOG SHIELDS.
3. BUILDING VENDOR TO MODIFY VFD INTERNAL MODBUS COMMUNICATION WIRING AS SHOWN.
4. SIEMENS TO REMOVE JUMPER FROM TB2-18 & TB2-20 AND JUMPER FROM TB2-20 & TB2-22 AND ADD JUMPER FROM TB2-18 TO TB2-22. COMMISSIONING TEAM TO REMOVE WIRE FROM TB2-19 TO J10-2. COMMISSIONING TEAM TO ADD JUMPER FROM TB2-49 TO TB2-20. THE INTENT OF THIS CHANGE IS TO PLACE THE MULTILIN 369 TRIP SIGNAL IN SERIES WITH THE VFD PERMISSIVE/TRIP SIGNALS AND USE THIS COMBINED SIGNAL TO TRIP THE CONTACTOR. 01

SDN# 25472-130-E7-0000-P03B2
UEL# 2012016-1EF-EWD-000-0382-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION	APPROVAL: PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	TAE	IRM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REV 01 ONLY 26-APR-23

REV. NO. | DATE | PERMIT NUMBER:

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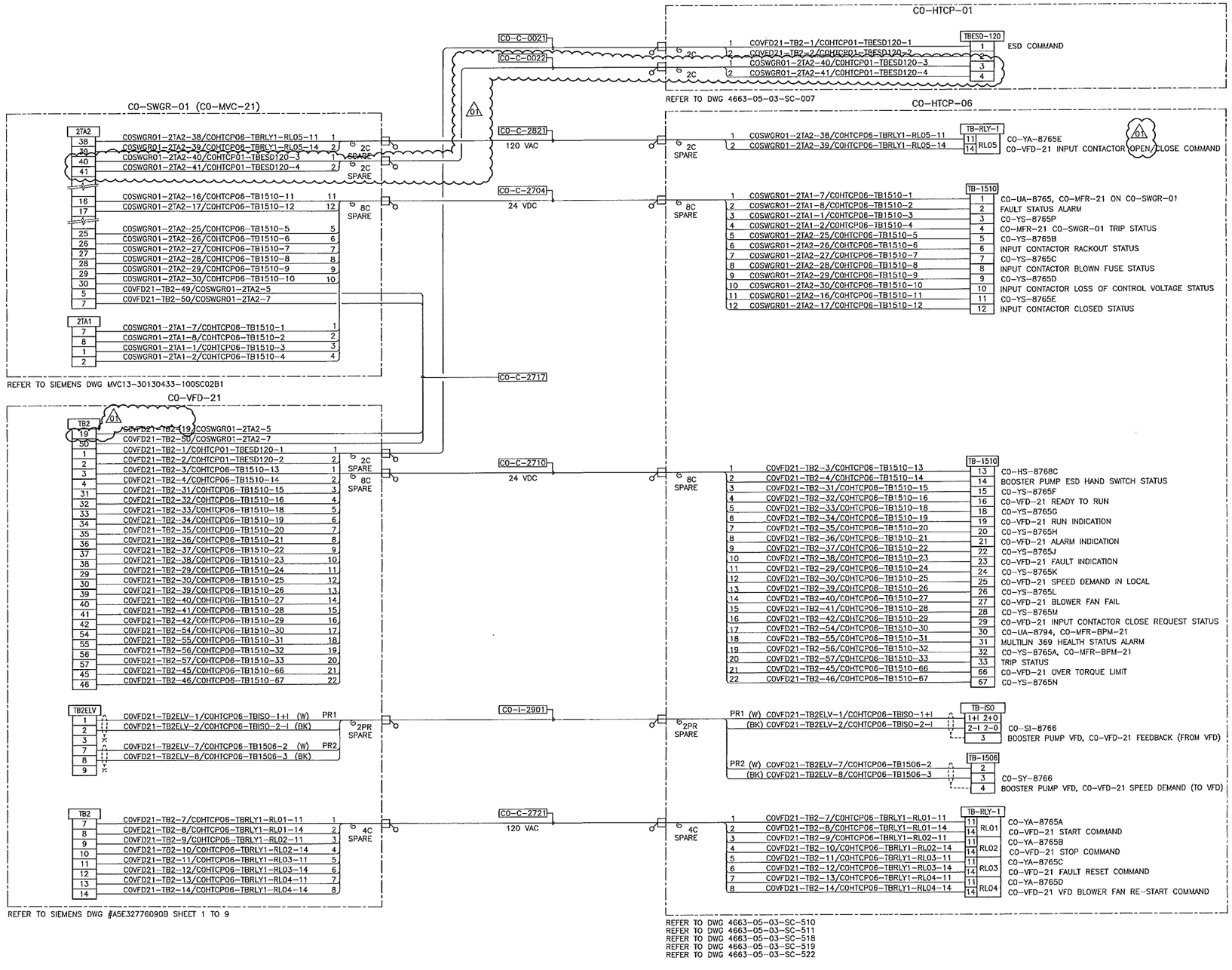
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-VFD-21
4160 V BOOSTER PUMP
SCHEMATIC WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-032	01

TC_A1_BR.DWG 594X841



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130 KSHTT-" UNLESS SPECIFIED OTHERWISE.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
TCMP	TELECOMMUNICATION PANEL
□	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COSWGR01-XXX-XX/COHTCP-TBXXXX-XX
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- CONTROL PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0383
UEL# 2012016-1EF-EWD-000-0383-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAF	TAE	HHM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

PUR REV 01 ONLY 2015-APR-23

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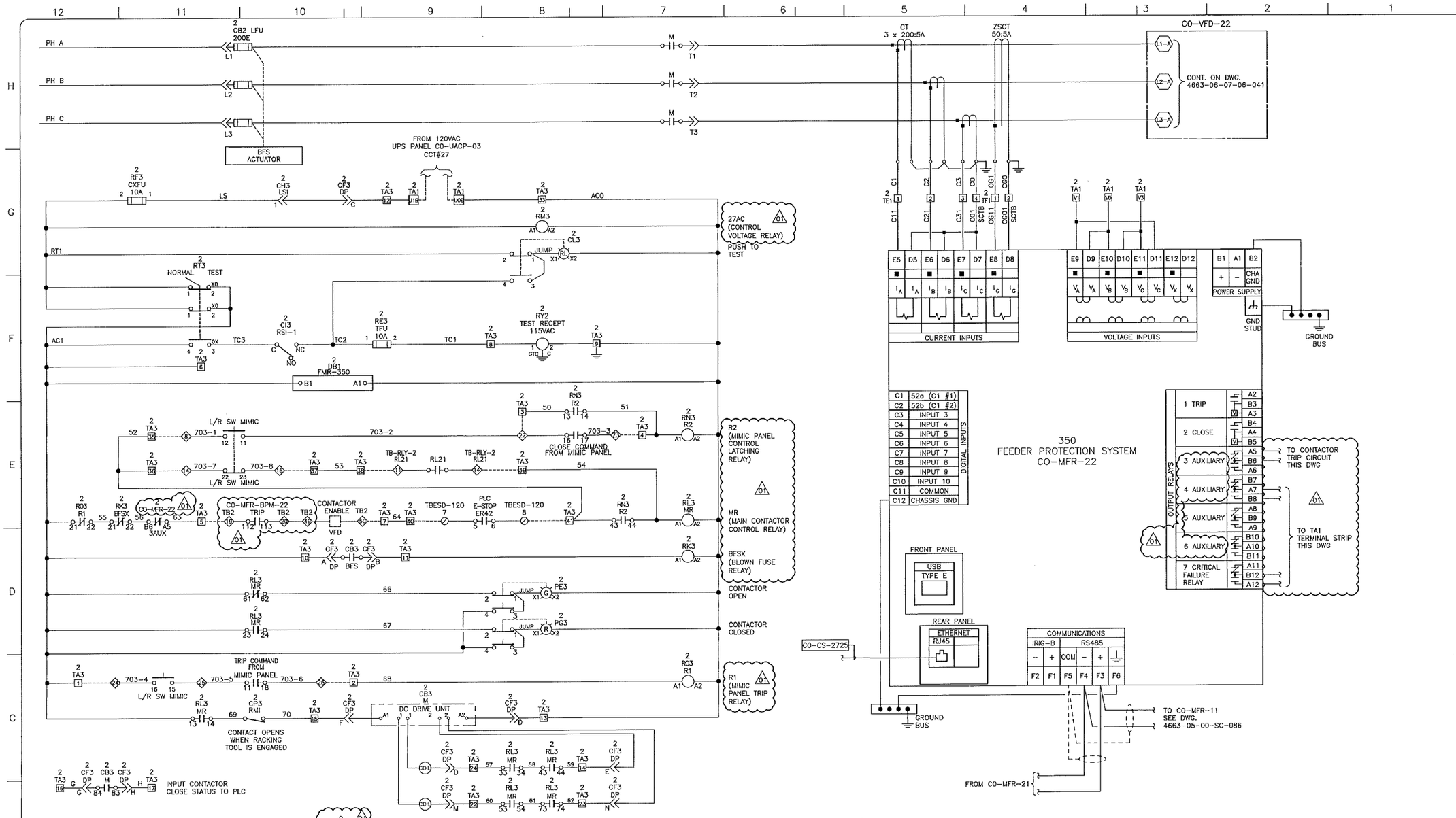
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

4160 V BOOSTER PUMP CO-BPM-21 CO-SWGR-01 MCC & VFD TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-033 | REV 01

TC_A1_BR.DWG 594X841



SDN# 25472-130-E7-0000-P0390
UEL# 2012016-1EF-EWD-000-0390-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-05-03-SC-537	CO-HTCP-06, PLC-11/16 SLOT 12 DISCRETE OUTPUT – STATIC I/O WIRING DIAGRAM
MVC13-30130433-100SC02C1	SIEMENS DRAWING
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (SIGNALS)
4663-05-07-01-002	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-05-03-SC-007	KHIT EMERGENCY SHUTDOWN SYSTEM (HARDWIRED) SCHEMATIC SHEET 3 OF 3
4663-05-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAA	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIKA ROHANI

PUR REV 01 ONLY

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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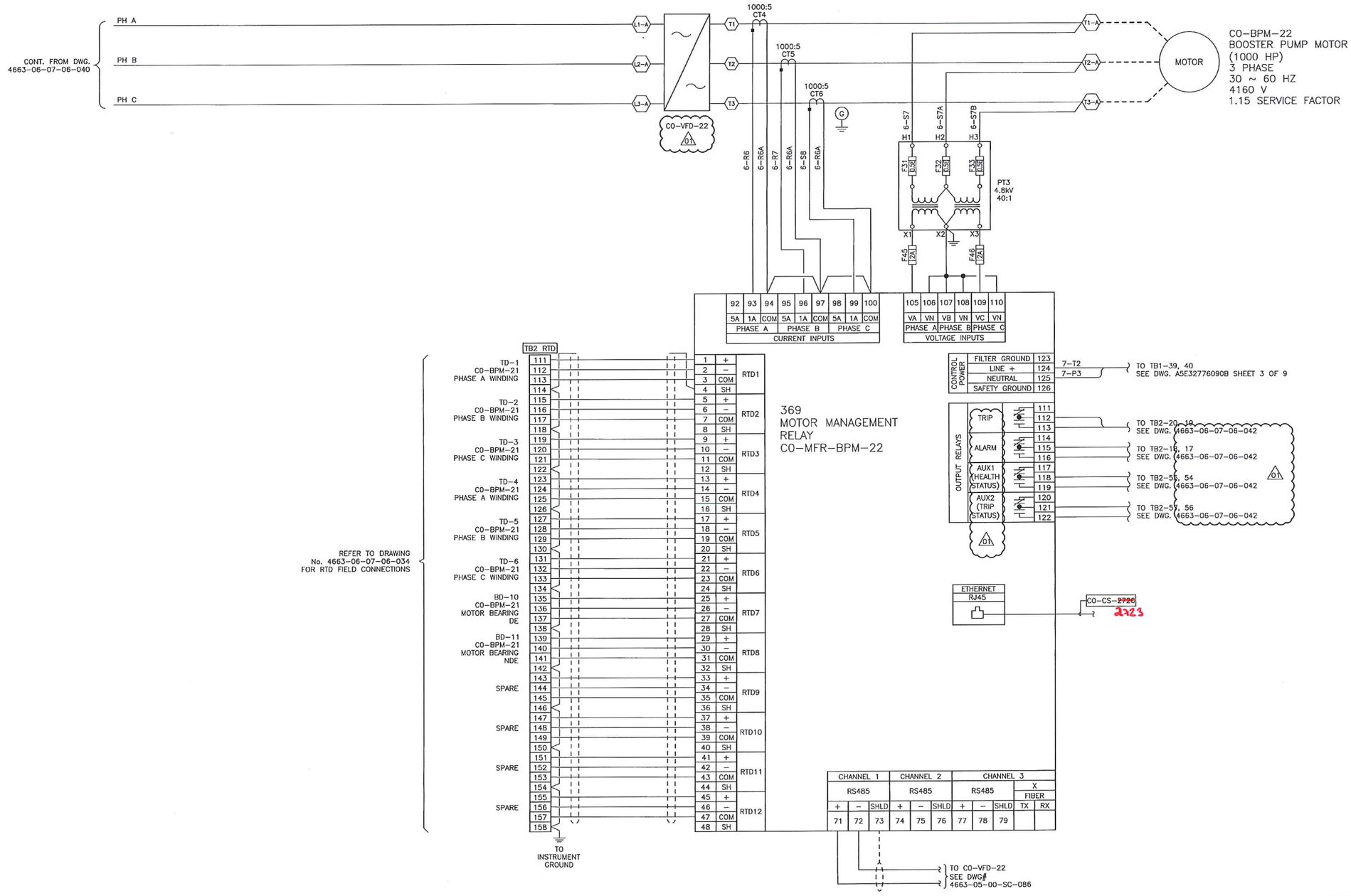
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-MVC-22
4160V BOOSTER PUMP STARTER & MULTILIN SCHEMATIC WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-040	01

TC_A1_BR.DWG 594X841



SDN# 25472-130-E7-0000-P0391
UEL# 2012016-1EF-EWD-000-0391-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	RQC	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTW/MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT
PERMIT/ ENG. APPROVAL
DATE
PROFESSIONAL ENGINEER ALBERTA RIMA ROMANI
FOR REV 01 ONLY 2015-APR-23
PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta
REV. NO. | DATE | PERMIT NUMBER:

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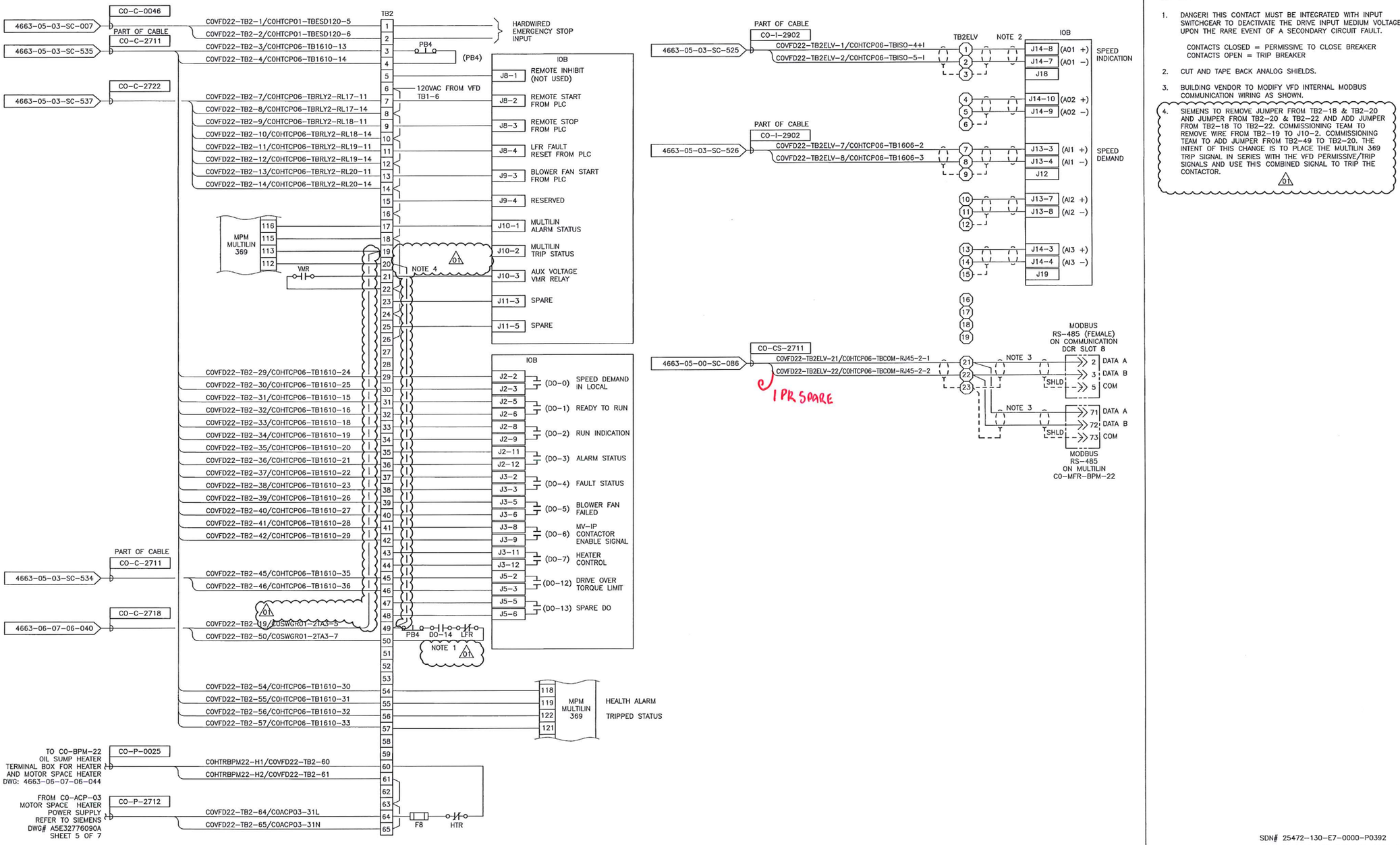
KEYSTONE HARDISTY TANK TERMINAL
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VFD-22
BOOSTER PUMP VFD
SCHEMATIC AND INTERCONNECTION DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-041 | REV 01

TC_A1_BR.DWG 594XB41

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. DANGER! THIS CONTACT MUST BE INTEGRATED WITH INPUT SWITCHGEAR TO DEACTIVATE THE DRIVE INPUT MEDIUM VOLTAGE UPON THE RARE EVENT OF A SECONDARY CIRCUIT FAULT.

   CONTACTS CLOSED = PERMISSIVE TO CLOSE BREAKER
   CONTACTS OPEN = TRIP BREAKER

2. CUT AND TAPE BACK ANALOG SHIELDS.

3. BUILDING VENDOR TO MODIFY VFD INTERNAL MODBUS COMMUNICATION WIRING AS SHOWN.

4. SIEMENS TO REMOVE JUMPER FROM TB2-18 & TB2-20 AND JUMPER FROM TB2-20 & TB2-22 AND ADD JUMPER FROM TB2-18 TO TB2-22. COMMISSIONING TEAM TO REMOVE WIRE FROM TB2-19 TO J10-2. COMMISSIONING TEAM TO ADD JUMPER FROM TB2-49 TO TB2-20. THE INTENT OF THIS CHANGE IS TO PLACE THE MULTILIN 369 TRIP SIGNAL IN SERIES WITH THE VFD PERMISSIVE/TRIP SIGNALS AND USE THIS COMBINED SIGNAL TO TRIP THE CONTACTOR. 01

SDN# 25472-130-E7-0000-P0392
UEL# 2012016-1EF-EWD-000-0392-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	TAE	IRM	JED	DCB	UPSIDE
2197104	EDK	MTM/MPA	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

FOR REV 01 ONLY 2015-APR-23

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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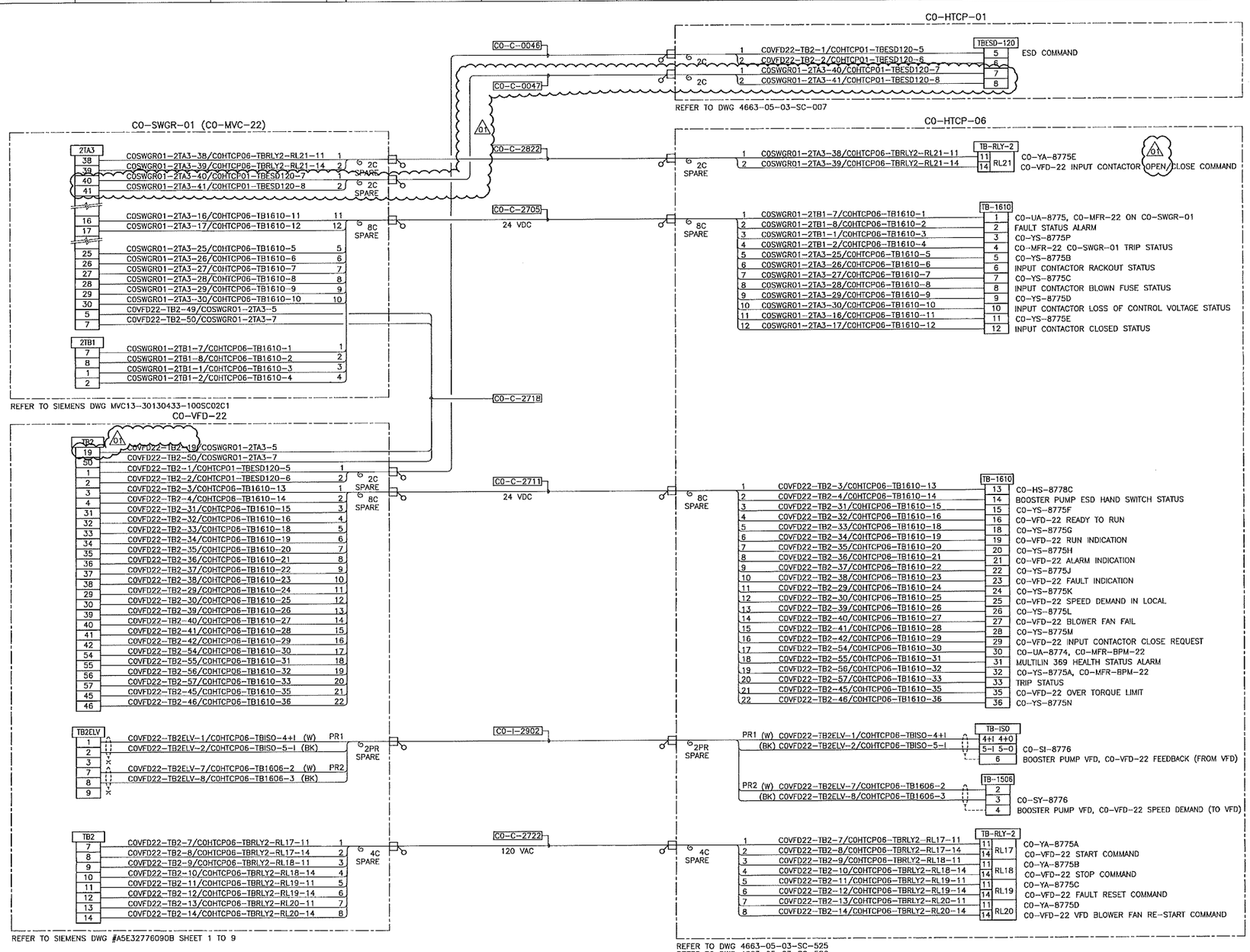
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VFD-22
4160V BOOSTER PUMP
SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-042 | REV 01

TC_A1_BR.DWG 594X841



NOTES:

1. ALL TAGS ON THIS DRAWING TO BE PREFIXED WITH "130 KSHTT-" UNLESS SPECIFIED OTHERWISE.
2. SUPPLY AND INSTRALL OF ALL CABLES SHALL BE BY VES VENDOR.

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT
TCMP	TELECOMMUNICATION PANEL
	CABLE CONNECTOR FOR NON-CLASSIFIED AREA

COSWGR01-XXX-XX/COHTCP-TBXXXX-XX
- XX: TERMINAL NUMBER
- XXXX: TERMINAL BLOCK/STRIP NUMBER
- XX: CONTROL PANEL NUMBER
- XX: TERMINAL NUMBER
- XXX: TERMINAL BLOCK/STRIP NUMBER
- COSWGR01: EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0393
UEL# 2012016-1EF-EWD-000-0393-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	MAF	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
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FOR REV 01 ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

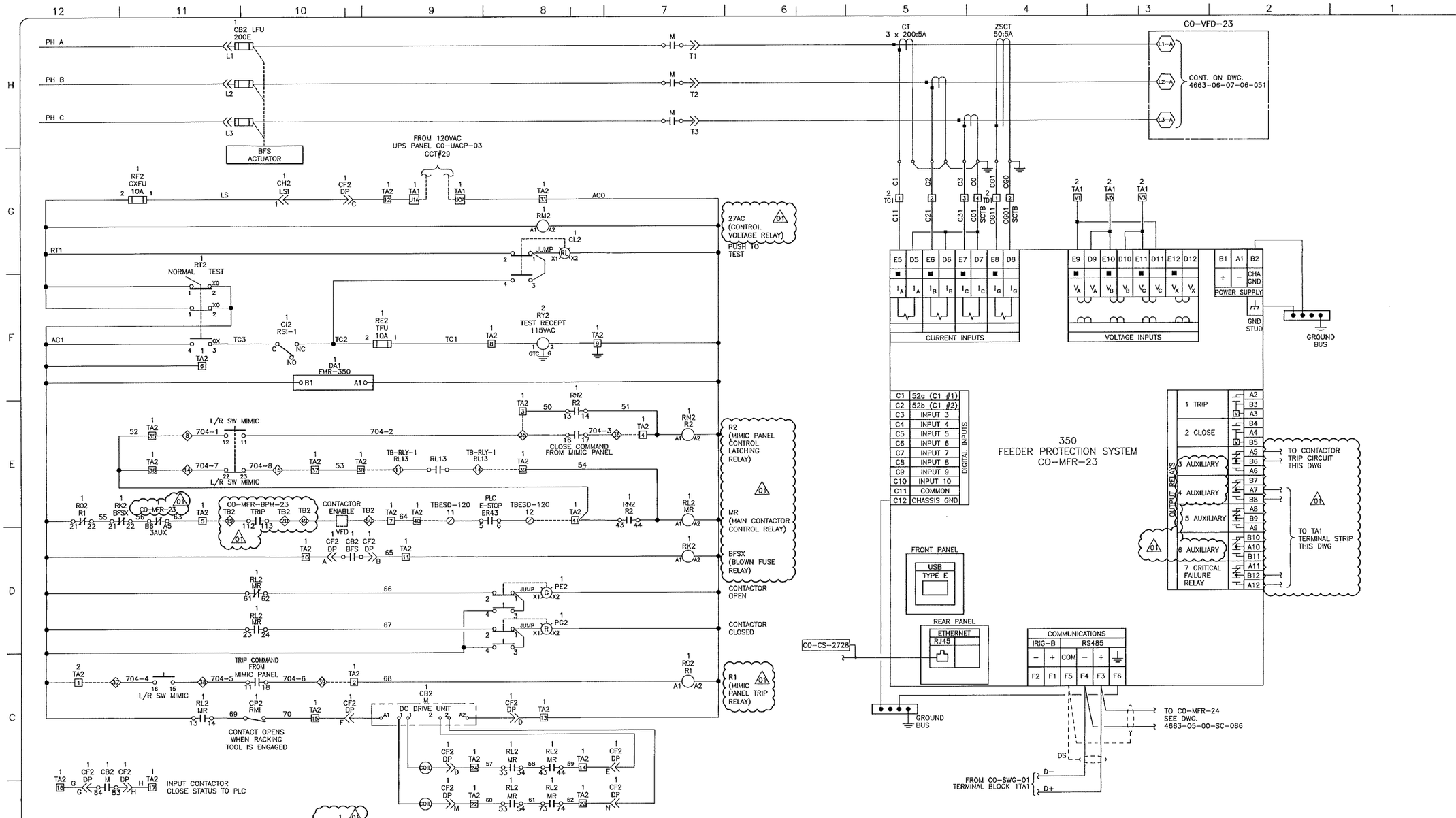
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

4160 V BOOSTER PUMP CO-BPM-22 CO-SWGR-01 MCC & VFD TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-043 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-05-03-SC-522	CO-HTCP-06, PLC-11/15 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM
MVC13-30130433-100SC03B1	SIEMENS DRAWING
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (SIGNALS)
4663-08-07-01-002	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-05-03-SC-007	KHIT EMERGENCY SHUTDOWN SYSTEM (HARDWIRED) SCHEMATIC SHEET 3 OF 3
4663-06-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAA	TAE	HHM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA

FOR REV 01 ONLY 2015-APR-27

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD. PERMIT NUMBER: P 5508 The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

SDN# 25472-130-E7-0000-P0400
UEL# 2012016-1EF-EWD-000-0400-01

TransCanada — In business to deliver

Upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MVC-23
4160V BOOSTER PUMP STARTER & MULTILIN SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-050 | REV 01

TC_A1_BR.DWG 594X841

TMF

CONT. FROM DWG. 4663-06-07-06-050

PH A
PH B
PH C

L1-A
L2-A
L3-A

CO-VFD-23
01

T1
T2
T3

1000:5 CT4
1000:5 CT5
1000:5 CT6

6-R6
6-R6A
6-R7
6-R6A
6-S8
6-R6A

T1-A
T2-A
T3-A

MOTOR

CO-BPM-23
BOOSTER PUMP MOTOR
(1000 HP)
3 PHASE
30 ~ 60 HZ
4160 V
1.15 SERVICE FACTOR

6-S7
6-S7A
6-S7B
H1
H2
H3
F31 D5A
F32 D5A
F33 D5A
PT3
4.8kV
40:1
X1
X2
X3
F45 2A1
F46 2A1

92	93	94	95	96	97	98	99	100
5A	1A	COM	5A	1A	COM	5A	1A	COM
PHASE A			PHASE B			PHASE C		

CURRENT INPUTS

105	106	107	108	109	110
VA	VN	VB	VN	VC	VN
PHASE A		PHASE B		PHASE C	

VOLTAGE INPUTS

TB2 RTD

TD-1 CO-BPM-21 PHASE A WINDING	111	1	+
	112	2	–
	113	3	COM
	114	4	SH
TD-2 CO-BPM-21 PHASE B WINDING	115	5	+
	116	6	–
	117	7	COM
	118	8	SH
TD-3 CO-BPM-21 PHASE C WINDING	119	9	+
	120	10	–
	121	11	COM
	122	12	SH
TD-4 CO-BPM-21 PHASE A WINDING	123	13	+
	124	14	–
	125	15	COM
	126	16	SH
TD-5 CO-BPM-21 PHASE B WINDING	127	17	+
	128	18	–
	129	19	COM
	130	20	SH
TD-6 CO-BPM-21 PHASE C WINDING	131	21	+
	132	22	–
	133	23	COM
	134	24	SH
BD-10 CO-BPM-21 MOTOR BEARING DE	135	25	+
	136	26	–
	137	27	COM
	138	28	SH
BD-11 CO-BPM-21 MOTOR BEARING NDE	139	29	+
	140	30	–
	141	31	COM
	142	32	SH
SPARE	143	33	+
	144	34	–
	145	35	COM
	146	36	SH
SPARE	147	37	+
	148	38	–
	149	39	COM
	150	40	SH
SPARE	151	41	+
	152	42	–
	153	43	COM
	154	44	SH
SPARE	155	45	+
	156	46	–
	157	47	COM
	158	48	SH

RTD1 RTD2 RTD3 RTD4 RTD5 RTD6 RTD7 RTD8 RTD9 RTD10 RTD11 RTD12

TO INSTRUMENT GROUND

REFER TO DRAWING No. 4663-06-07-06-034 FOR RTD FIELD CONNECTIONS

369
MOTOR MANAGEMENT
RELAY
CO-MFR-BPM-23

CONTROL POWER

FILTER GROUND	123	7-T2
LINE +	124	7-P3
NEUTRAL	125	
SAFETY GROUND	126	

TO TB1-39, 40
SEE DWG. A5E32776090B SHEET 3 OF 9

OUTPUT RELAYS

TRIP	NO	111	TO TB2-20, 19 SEE DWG. 4663-06-07-06-052
	COM	112	
	NC	113	
ALARM	NO	114	TO TB2-16, 17 SEE DWG. 4663-06-07-06-052
	COM	115	
	NC	116	
AUX1 (HEALTH STATUS)	NO	117	TO TB2-53, 54 SEE DWG. 4663-06-07-06-052
	COM	118	
	NC	119	
AUX2 (TRIP STATUS)	NO	120	TO TB2-57, 56 SEE DWG. 4663-06-07-06-052
	COM	121	
	NC	122	

01

ETHERNET
RJ45

CO-CS-~~2720~~ 2776

CHANNEL 1			CHANNEL 2			CHANNEL 3				
RS485			RS485			RS485			X FIBER	
+	–	SHLD	+	–	SHLD	+	–	SHLD	TX	RX
71	72	73	74	75	76	77	78	79		

TO CO-VFD-23
SEE DWG#
4663-05-00-SC-086

SDN# 25472-130-E7-0000-P0401
UEL# 2012016-1EF-EWD-000-0401-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	RQC	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

For REV 01 ONLY

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
In business to deliver

upside Engineering Ltd.

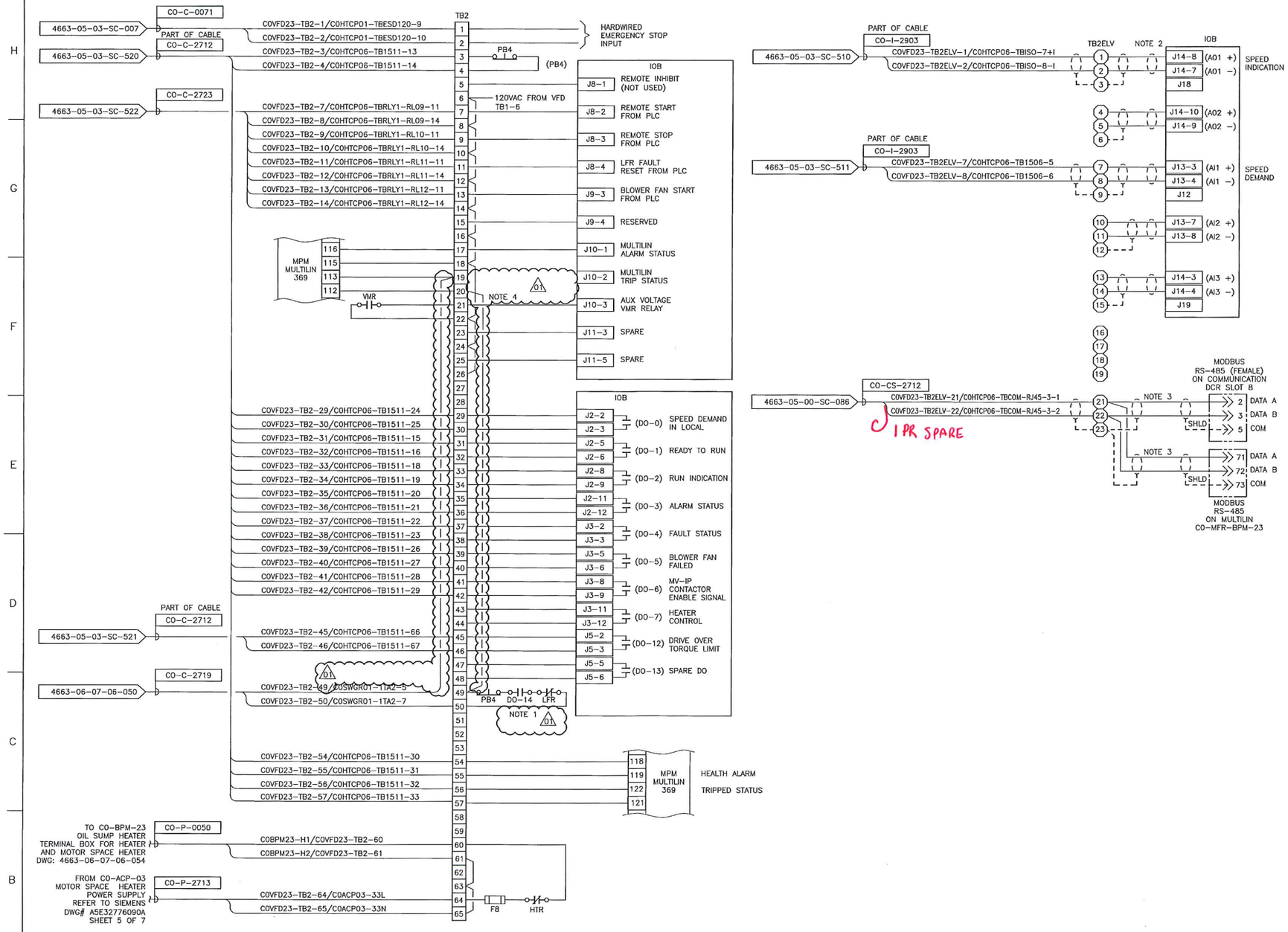
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VFD-23
BOOSTER PUMP VFD
SCHEMATIC AND INTERCONNECTION DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-051 | REV 01

TC_A1_BR.DWG 594X841



NOTES:

1. DANGER! THIS CONTACT MUST BE INTEGRATED WITH INPUT SWITCHGEAR TO DEACTIVATE THE DRIVE INPUT MEDIUM VOLTAGE UPON THE RARE EVENT OF A SECONDARY CIRCUIT FAULT.

   CONTACTS CLOSED = PERMISSIVE TO CLOSE BREAKER
   CONTACTS OPEN = TRIP BREAKER

2. CUT AND TAPE BACK ANALOG SHIELDS.

3. BUILDING VENDOR TO MODIFY VFD INTERNAL MODBUS COMMUNICATION WIRING AS SHOWN.

4. SIEMENS TO REMOVE JUMPER FROM TB2-18 & TB2-20 AND JUMPER FROM TB2-20 & TB2-22 AND ADD JUMPER FROM TB2-18 TO TB2-22. COMMISSIONING TEAM TO REMOVE WIRE FROM TB2-19 TO J10-2. COMMISSIONING TEAM TO ADD JUMPER FROM TB2-49 TO TB2-20. THE INTENT OF THIS CHANGE IS TO PLACE THE MULTILIN 369 TRIP SIGNAL IN SERIES WITH THE VFD PERMISSIVE/TRIP SIGNALS AND USE THIS COMBINED SIGNAL TO TRIP THE CONTACTOR. 01

SDN# 25472-130-E7-0000-P0402
UEL# 2012016-1EF-EWD-000-0402-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAF	TAE	IRM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
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TC_A1_BR.DWG 594XB41

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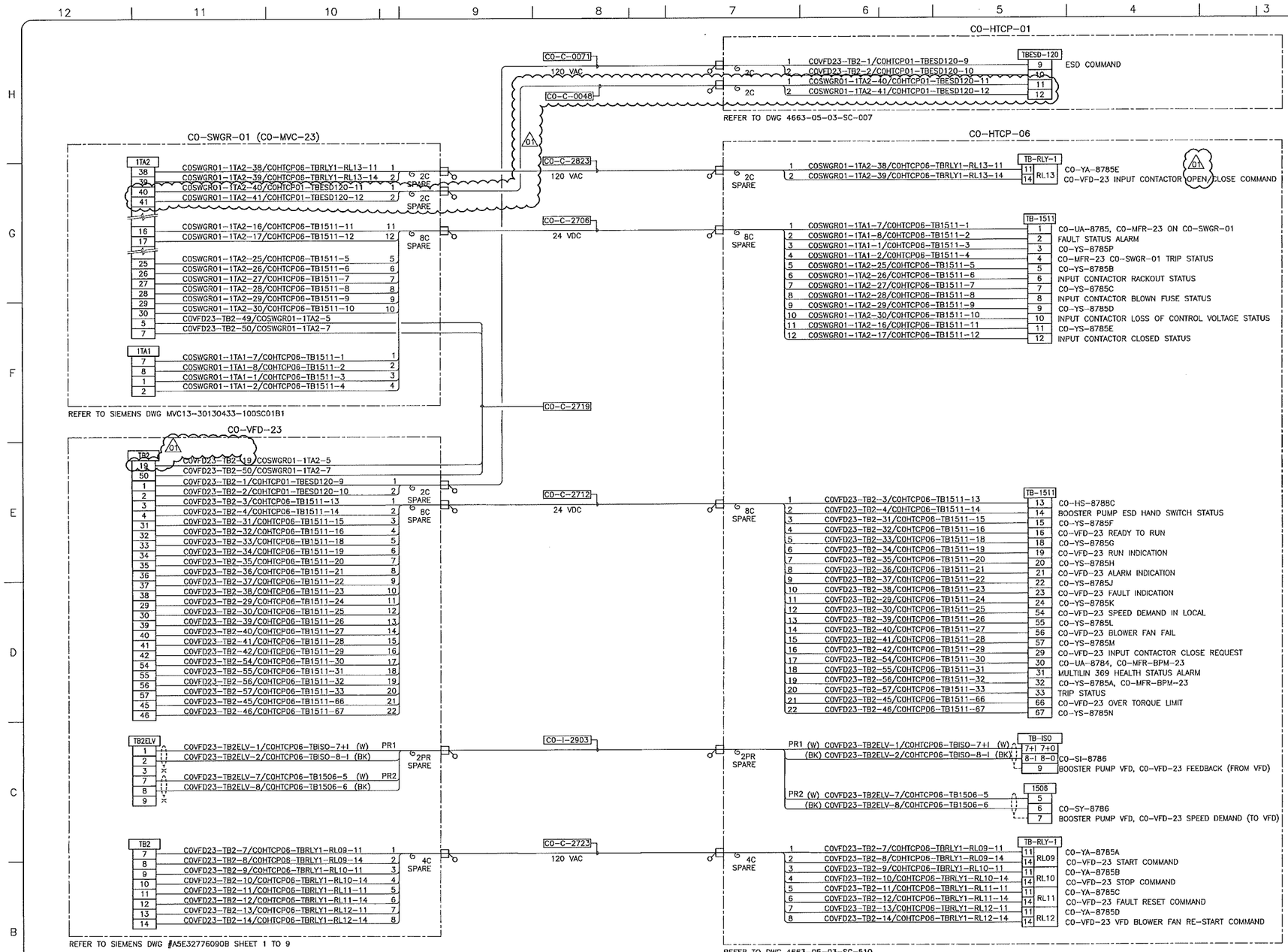
KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-VFD-23
4160V BOOSTER PUMP
SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-052 | REV 01



SDN# 25472-130-E7-0000-P0403
UEL# 2012016-1EF-EWD-000-0403-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTU	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PERMIT TO PRACTICE
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The Association of Professional Engineers and Geoscientists of Alberta

For REV 01 only
2015-APR-22

REV. NO.	DATE	PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

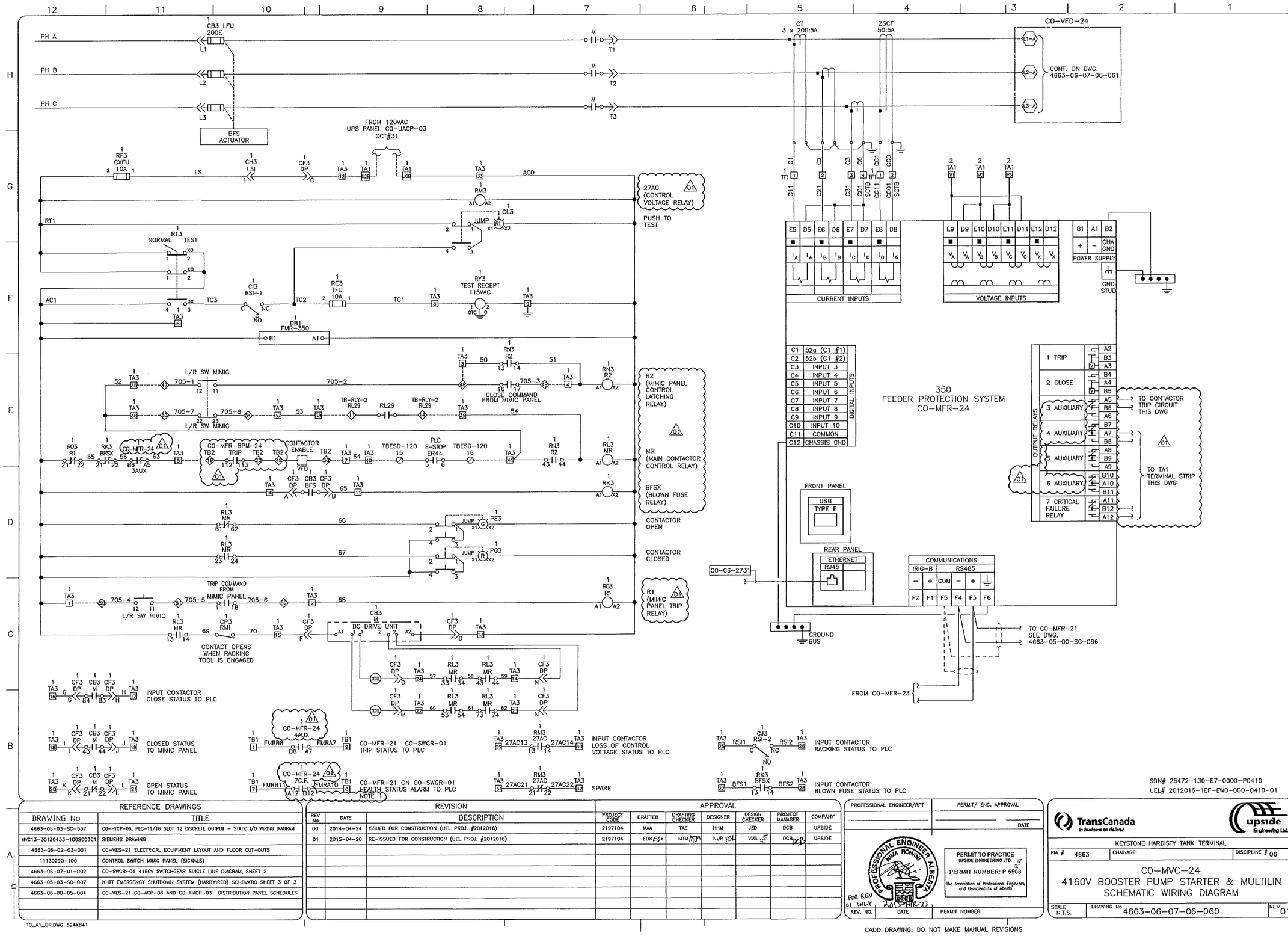
4160 V BOOSTER PUMP CO-BPM-23 CO-SWGR-01 MCC & VFD TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-053	01

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TC_A1_BR.DWG 594X841

TMP



REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-05-03-SC-537	CO-MTCP-06, PLC-11/16 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM
MVC13-30130433-100SC03C1	SIEMENS DRAWING
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
11130290-100	CONTROL SWITCH MIMIC PANEL (SIGNALS)
4663-06-07-01-002	CO-SWGR-01 4160V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 2
4663-05-03-SC-007	KHTT EMERGENCY SHUTDOWN SYSTEM (HARDWIRED) SCHEMATIC SHEET 3 OF 3
4663-06-00-05-004	CO-VES-21 CO-ACP-03 AND CO-UACP-03 DISTRIBUTION PANEL SCHEDULES

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAA	TAE	HHM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

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PERMIT NUMBER: P 5508
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FOR REV 01 ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

SDN# 25472-130-E7-0000-P0410
UEL# 2012016-1EF-EWD-000-0410-01

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-MVC-24
4160V BOOSTER PUMP STARTER & MULTILIN SCHEMATIC WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-060 | REV 01

TC_A1_BR.DWG 594X841

CONT. FROM DWG. 4663-06-07-06-060

PH A
PH B
PH C

L1-A
L2-A
L3-A

C0-VFD-24
01

T1
T2
T3

1000:5 CT4
1000:5 CT5
1000:5 CT6

6-R6
6-R6A
6-R7
6-R6A
6-S8
6-R6A

G

6-S7
6-S7A
6-S7B

H1
H2
H3

F31 D5A
F32 D5A
F33 D5A

PT3
4.8kV
40:1

X1
X2
X3

F45 2A
F46 2A

T1-A
T2-A
T3-A

MOTOR

C0-BPM-24
BOOSTER PUMP MOTOR
(1000 HP)
3 PHASE
30 ~ 60 HZ
4160 V
1.15 SERVICE FACTOR

92	93	94	95	96	97	98	99	100
5A	1A	COM	5A	1A	COM	5A	1A	COM
PHASE A			PHASE B			PHASE C		
CURRENT INPUTS								

105	106	107	108	109	110
VA	VN	VB	VN	VC	VN
PHASE A		PHASE B		PHASE C	
VOLTAGE INPUTS					

TB2 RTD

TD-1 C0-BPM-21 PHASE A WINDING	111	1	+
	112	2	–
	113	3	COM
	114	4	SH
TD-2 C0-BPM-21 PHASE B WINDING	115	5	+
	116	6	–
	117	7	COM
	118	8	SH
TD-3 C0-BPM-21 PHASE C WINDING	119	9	+
	120	10	–
	121	11	COM
	122	12	SH
TD-4 C0-BPM-21 PHASE A WINDING	123	13	+
	124	14	–
	125	15	COM
	126	16	SH
TD-5 C0-BPM-21 PHASE B WINDING	127	17	+
	128	18	–
	129	19	COM
	130	20	SH
TD-6 C0-BPM-21 PHASE C WINDING	131	21	+
	132	22	–
	133	23	COM
	134	24	SH
BD-10 C0-BPM-21 MOTOR BEARING DE	135	25	+
	136	26	–
	137	27	COM
	138	28	SH
BD-11 C0-BPM-21 MOTOR BEARING NDE	139	29	+
	140	30	–
	141	31	COM
	142	32	SH
SPARE	143	33	+
	144	34	–
	145	35	COM
	146	36	SH
SPARE	147	37	+
	148	38	–
	149	39	COM
	150	40	SH
SPARE	151	41	+
	152	42	–
	153	43	COM
	154	44	SH
SPARE	155	45	+
	156	46	–
	157	47	COM
	158	48	SH

RTD1 RTD2 RTD3 RTD4 RTD5 RTD6 RTD7 RTD8 RTD9 RTD10 RTD11 RTD12

TO INSTRUMENT GROUND

REFER TO DRAWING No. 4663-06-07-06-034 FOR RTD FIELD CONNECTIONS

369
MOTOR MANAGEMENT
RELAY
C0-MFR-BPM-24

CONTROL POWER

FILTER GROUND	123	
LINE +	124	7-T2
NEUTRAL	125	7-P3
SAFETY GROUND	126	

TO TB1-39, 40
SEE DWG. A5E32776090B SHEET 3 OF 9

OUTPUT RELAYS

TRIP	111	
	112	TO TB2-20, 19 SEE DWG. 4663-06-07-06-062
	113	
ALARM	114	
	115	TO TB2-18, 17 SEE DWG. 4663-06-07-06-062
	116	
AUX1 (HEALTH STATUS)	117	
	118	TO TB2-55, 54 SEE DWG. 4663-06-07-06-062
	119	
AUX2 (TRIP) STATUS	120	
	121	TO TB2-57, 56 SEE DWG. 4663-06-07-06-062
	122	

01

ETHERNET
RJ45

C0-CS-~~2720~~ 2729

CHANNEL 1			CHANNEL 2			CHANNEL 3				
RS485			RS485			RS485			X FIBER	
+	–	SHLD	+	–	SHLD	+	–	SHLD	TX	RX
71	72	73	74	75	76	77	78	79		

TO C0-VFD-24
SEE DWG# 4663-05-00-SC-086

SDN# 25472-130-E7-0000-P0411
UEL# 2012016-1EF-EWD-000-0411-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	C0-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-22	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	RQC	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK EDC	MTM MTM	NJR NJR	VMA VMA	DCB DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REV 01 ONLY 2017-MAR-23

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

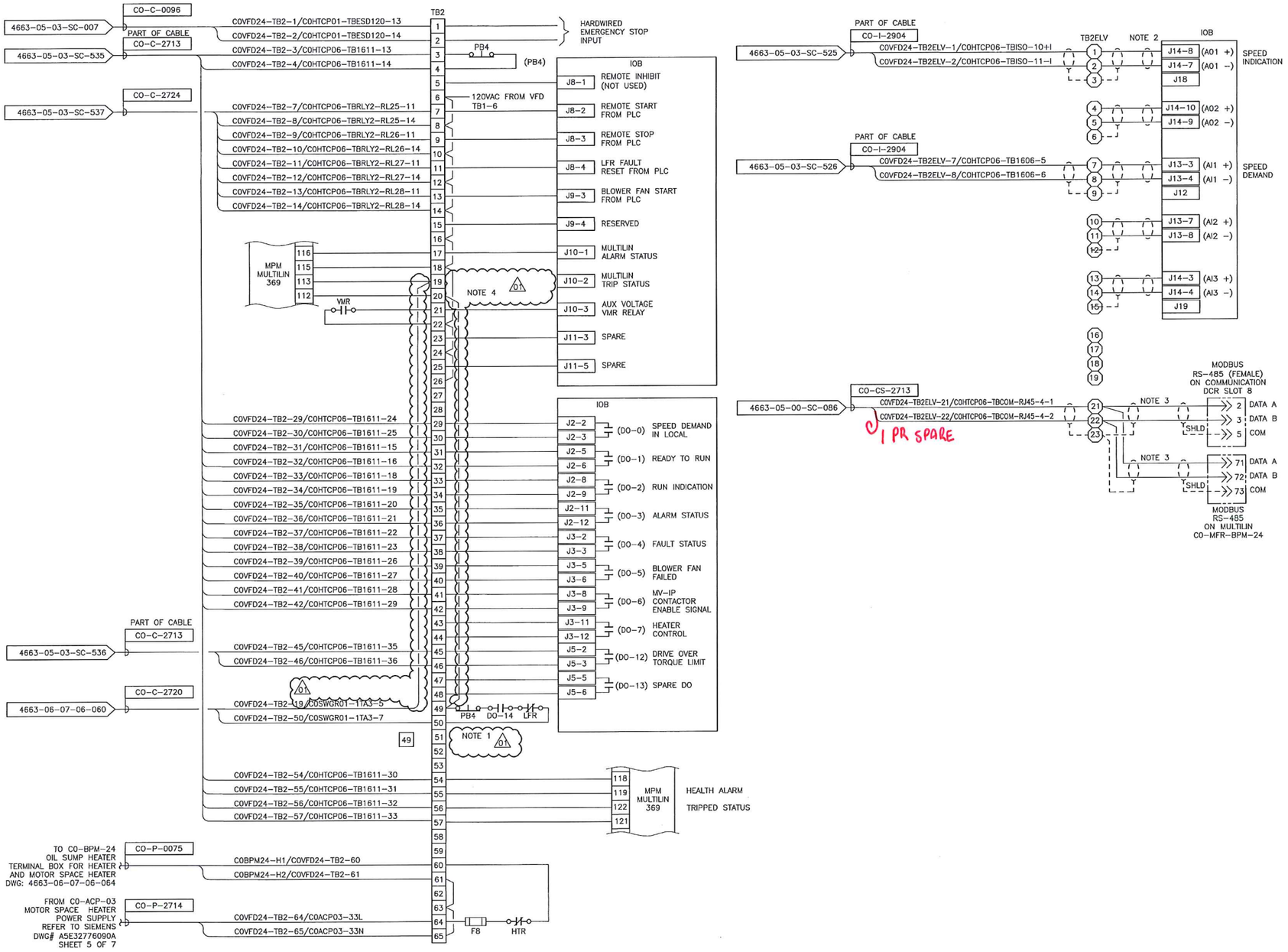
FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

C0-VFD-24
BOOSTER PUMP VFD
SCHEMATIC AND INTERCONNECTION DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-061 | REV 01

TC_A1_BR.DWG 594X841

TMF



NOTES:

1. DANGER! THIS CONTACT MUST BE INTEGRATED WITH INPUT SWITCHGEAR TO DEACTIVATE THE DRIVE INPUT MEDIUM VOLTAGE UPON THE RARE EVENT OF A SECONDARY CIRCUIT FAULT.

   CONTACTS CLOSED = PERMISSIVE TO CLOSE BREAKER
   CONTACTS OPEN = TRIP BREAKER

2. CUT AND TAPE BACK ANALOG SHIELDS.

3. BUILDING VENDOR TO MODIFY VFD INTERNAL MODBUS COMMUNICATION WIRING AS SHOWN.

4. SIEMENS TO REMOVE JUMPER FROM TB2-18 & TB2-20 AND JUMPER FROM TB2-20 & TB2-22 AND ADD JUMPER FROM TB2-18 TO TB2-22. COMMISSIONING TEAM TO REMOVE WIRE FROM TB2-19 TO J10-2. COMMISSIONING TEAM TO ADD JUMPER FROM TB2-49 TO TB2-20. THE INTENT OF THIS CHANGE IS TO PLACE THE MULTILIN 369 TRIP SIGNAL IN SERIES WITH THE VFD PERMISSIVE/TRIP SIGNALS AND USE THIS COMBINED SIGNAL TO TRIP THE CONTACTOR. 01

SDN# 25472-130-E7-0000-P0412
UEL# 2012016-1EF-EWD-000-0412-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	-

REVISION			APPROVAL						
REV No.	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAF	TAE	IRM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER NIMA ROHANI ALBERTA
FOR REV 01 ONLY
2015-APR-23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

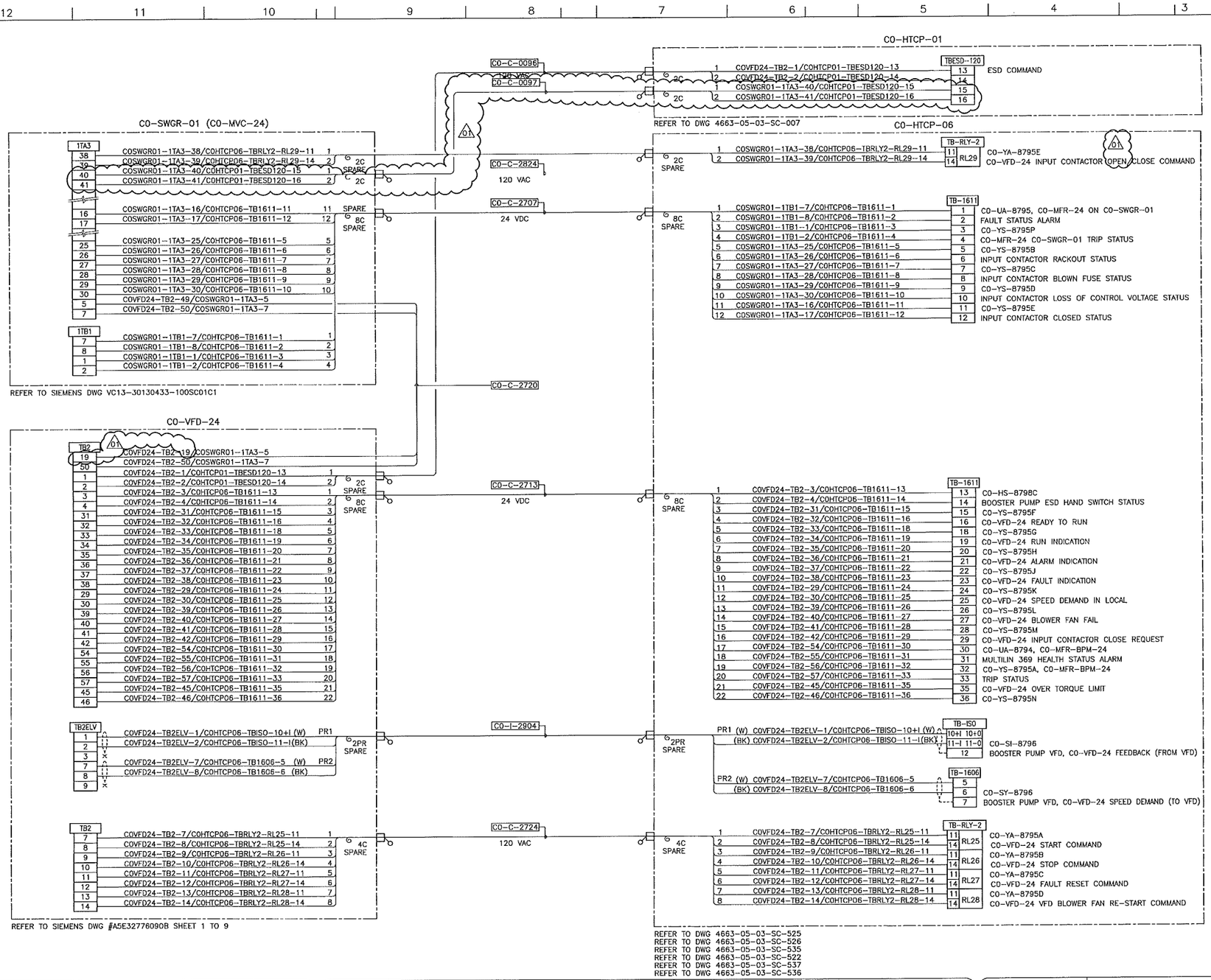
FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-VFD-24
4160V BOOSTER PUMP
SCHEMATIC WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-062	01

TC_A1_BR.DWG 594X841

TMF



REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-04-23	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	PRG	TAE	HHM	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 99188

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 6508
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For REF 01 ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

4160 V BOOSTER PUMP CO-BPM-24 CO-SWGR-01 MCC & VFD TO CO-HTCP-06 INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-063 | REV 01

TIME

FIELD

CO-T-01
PRIMARY UTILITY TRANSFORMER

25 kV FROM FORTIS: A, B, C
H1, H2, H3
X1, X2, X3, X0
4160 V TO SWITCHGEAR CO-SWGR-01: A, B, C
10 MVA/ONAN
25 kV-4160 V
BY FORTIS

CO-P-0860-1
CO-P-0860-2

CO-NGR-01
NEUTRAL GROUNDING RESISTOR

SYSTEM GROUND
G — 25 A NGR — N
CT
SENSING RESISTOR
ER-5KV
N
R
G
SHORTING TB
X1
X2
TB-2800-2
R

REFER TO POWEROHM
RESISTORS INC. DWG: P19130

CO-VES-21

CO-SWGR-01

CO-MFR-NGR-01
SE-330
NEUTRAL GROUNDING RESISTOR MONITOR

SENSING RESISTOR
6
7
8
9
10
11

1B TS-3
19 20
17 18
19 20

1M CG
12
COSWGR01-1MCG-12/CONGR01-TB28002-R
CO-C-0760-2

1B LE
1
2
COSWGR01-1BLE-1/CONGR01-TB-X1
COSWGR01-1BLE-2/CONGR01-TB-X2
CO-C-0760-1

RESISTOR FAULT
K3-29
K3-27

1MCL
5
6
7
8
COSWGR01-1MCL-7/COHTCP06-TB1511-45 11
COSWGR01-1MCL-8/COHTCP06-TB1511-46 12

PART OF
CO-C-2701

CO-HTCP-06
11 COSWGR01-1MCL-7/COHTCP06-TB1511-45
12 COSWGR01-1MCL-8/COHTCP06-TB1511-46
TB-1511
45
46
01

REFER TO DWG 4663-05-03-SC-521

HEALTH STATUS
K4-12
K4-13

GROUND FAULT ALARM
K2-26
K2-24

1MCC
9
10

1MCN
3
4
5
6
01
CONNECTED TO CO-MFR-B-01 DIGITAL INPUTS

POWER
1
2
3
4
5

1M-NTRFU
3A
SLUG

1M CU
1
2
INCOMING 120 VAC UPS POWER
REFER TO DWG. 4663-06-02-07-016

GROUND FAULT TRIP
K1-22
K1-23

1MCN
1
2
CONNECTED TO CO-MFR-B-01 DIGINAL INPUTS
01

REFER TO SIEMENS DWG: MVS13-30130433-200TL01C1 MVS13-30130433-200SC01C1

NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".
2. REFER TO DWG: 4663-06-00-05-004, UPS POWER DISTRIBUTION WITHIN MAIN CELL OF CO-SWGR-01. VENDOR.

LEGEND:

⊘	HTCP TERMINAL
□	SWGR TERMINAL
o	DEVICE TERMINAL
GND	GROUND
HTCP	TERMINAL CONTROL PANEL
TB	TERMINAL BLOCK
□●	CABLE CONNECTOR FOR HAZARDOUS AREA
□○	CABLE CONNECTOR FOR NON-HAZARDOUS AREA

COSWGR01-XXX-XX/COHTCP-TBXXXX-XX
- XX — TERMINAL NUMBER
- XXX — TERMINAL BLOCK/STRIP NUMBER
- XX — CONTROL PANEL NUMBER
- XXXX — TERMINAL NUMBER
- XX — TERMINAL BLOCK/STRIP NUMBER
- COSWGR01 — EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0420
UEL# 2012016-1EF-EWD-000-0521-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-00-03-591	SUBSTATION SOUTH AREA CABLE TRAY, CABLING, AND GROUNDING LAYOUT
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
4663-06-07-01-001	CO-SWGR-01 4160 V SWITCHGEAR SINGLE LINE DIAGRAM, SHEET 1

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-24	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	PRG	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEERS ALBERTA — NIMA ROHANI — GRRB

For REV 01 only 2015-MAR-23

PERMIT/ ENG. APPROVAL — DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 06

CO-NGR-01
NEUTRAL GROUNDING RESISTOR
SCHEMATIC & INTERCONNECTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-06-07-06-080 | REV 01

TC_A1_BR.DWG 594X841

FIELD

C0-VES-21

C0-T-11
4160-480 V, 2 MVA TRANSFORMER

TBA
- 1 — 63X RAPID RISE ALARM
- 2
- 3
- 4 — C0T11-TBA-4/COSWGR01-3TA2-1B — 1
- 5 — 63X RAPID RISE TRIP — C0T11-TBA-5/COSWGR01-3TA2-2B — 2
- 6 — NOTE 2 — 2C SPARE
- 7
- 8 — 26Q LIQUID TEMP. ALARM @ 105 °C — C0T11-TBA-8/C0HTCP01-TB111-9 — 3
- 9 — C0T11-TBA-9/C0HTCP01-TB111-10 — 4
- 10
- 11 — 26Q LIQUID TEMP. TRIP @ 115 °C
- 12

TBB
- 1
- 2 — 49T WINDING TEMP. ALARM @ 120 °C
- 3 — NOTE 2
- 4
- 5 — 49T WINDING TRIP @ 125 °C
- 6
- 7
- 8 — 71Q LIQUID LEVEL LOW ALARM
- 9 — NOTE 2
- 10
- 11 — 71Q LIQUID LEVEL LOW ALARM
- 12

TBC
- 1 — 63PV VACUUM ALARM @ -5 PSIG — C0T11-TBC-2/C0HTCP01-TB111-7 — 1
- 2 — C0T11-TBC-3/C0HTCP01-TB111-8 — 2
- 3
- 4 — 63PV PRESSURE ALARM @ +8 PSIG — C0T11-TBC-5/C0HTCP01-TB111-11 — 5
- 5 — C0T11-TBC-6/C0HTCP01-TB111-12 — 6
- 6
- 7 — 63PR PRESSURE RELIEF ALARM — C0T11-TBC-8/C0HTCP01-TB111-13 — 7
- 8 — C0T11-TBC-9/C0HTCP01-TB111-14 — 8
- 9 — 12C SPARE
- 10
- 11
- 12

TBP
- 1 — 63X POWER — C0T11-TBP-1/C0UACP03-26-L
- 2 — C0T11-TBP-2/C0UACP03-26-N — 2C SPARE
- 3
- 4 — CABINET HEATERS — C0T11-TBP-4/C0ACP03-40-L
- 5 — C0T11-TBP-5/C0ACP03-40-N — 2C SPARE
- 6

REFER TO NIAGARA TRANSFORMER CORP. DWG DWS35986

C0-C-0755 — C0-C-0756 — C0-P-0756 — C0-P-0755

C0-HTCP-06

C0-C-2708

		TB-1610	
1	C0SWGR01-3TA1-7/C0HTCP06-TB1610-37	37	C0-UA-8655, C0-MFR-11 ON C0-SWGR-01
2	C0SWGR01-3TA1-8/C0HTCP06-TB1610-38	38	FAULT STATUS ALARM
3	C0SWGR01-3TA1-1/C0HTCP06-TB1610-39	39	C0-YS-8655N
4	C0SWGR01-3TA1-2/C0HTCP06-TB1610-40	40	C0-MFR-21 C0-SWGR-01 TRIP STATUS
5	C0SWGR01-3TA2-25/C0HTCP06-TB1610-41	41	C0-YS-8655P
6	C0SWGR01-3TA2-26/C0HTCP06-TB1610-42	42	INPUT CONTACTOR RACKOUT STATUS
7	C0SWGR01-3TA2-27/C0HTCP06-TB1610-43	43	C0-YS-8655Q
8	C0SWGR01-3TA2-28/C0HTCP06-TB1610-44	44	INPUT CONTACTOR BLOWN FUSE STATUS
9	C0SWGR01-3TA2-29/C0HTCP06-TB1610-45	45	C0-YS-8655R
10	C0SWGR01-3TA2-30/C0HTCP06-TB1610-46	46	INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
11	C0SWGR01-3TA2-34/C0HTCP06-TB1610-47	47	C0-YS-8655S
12	C0SWGR01-3TA2-35/C0HTCP06-TB1610-48	48	INPUT CONTACTOR CLOSED STATUS

C0-SWGR-01, SECTION-03A (C0-MVC-11)

		3TA2	
1	C0T11-TBA-4/COSWGR01-3TA2-1B	1B	
2	C0T11-TBA-5/COSWGR01-3TA2-2B	2B	
11	C0SWGR01-3TA2-34/C0HTCP06-TB1610-47	34	
12	C0SWGR01-3TA2-35/C0HTCP06-TB1610-48	35	
5	C0SWGR01-3TA2-25/C0HTCP06-TB1610-41	25	
6	C0SWGR01-3TA2-26/C0HTCP06-TB1610-42	26	
7	C0SWGR01-3TA2-27/C0HTCP06-TB1610-43	27	
8	C0SWGR01-3TA2-28/C0HTCP06-TB1610-44	28	
9	C0SWGR01-3TA2-29/C0HTCP06-TB1610-45	29	
10	C0SWGR01-3TA2-30/C0HTCP06-TB1610-46	30	

		3TA1	
1	C0SWGR01-3TA1-7/C0HTCP06-TB1610-37	7	
2	C0SWGR01-3TA1-8/C0HTCP06-TB1610-38	8	
3	C0SWGR01-3TA1-1/C0HTCP06-TB1610-39	1	
4	C0SWGR01-3TA1-2/C0HTCP06-TB1610-40	2	

REFER TO SIEMENS DWG MVC13-30130433-100SC03B1

C0-HTCP-01

		TB-111	
1	C0T11-TBC-2/C0HTCP01-TB111-7	7	
2	C0T11-TBC-3/C0HTCP01-TB111-8	8	
3	C0T11-TBA-8/C0HTCP01-TB111-9	9	
4	C0T11-TBA-9/C0HTCP01-TB111-10	10	
5	C0T11-TBC-5/C0HTCP01-TB111-11	11	
6	C0T11-TBC-6/C0HTCP01-TB111-12	12	
7	C0T11-TBC-8/C0HTCP01-TB111-13	13	
8	C0T11-TBC-9/C0HTCP01-TB111-14	14	

ø 12C SPARE

REFER DWG 4663-05-03-SC-028

C0-UACP-03 (120 V AC, 1ø UPS SUPPLY)

C0T11-TBP-1/C0UACP03-26-L (BK) — 20 A — CCT #26 — 30A — L

C0T11-TBP-2/C0UACP03-26-N (W) — N

REFER TO DWG 4663-06-00-05-004

C0-ACP-03 (120 V AC, 1ø SUPPLY)

C0T11-TBP-4/C0ACP03-40-L (BK) — CCT #40 — 20A — L

C0T11-TBP-5/C0ACP03-40-N (W) — N

REFER TO DWG 4663-06-00-05-004

NOTES:
1. ALL TAGS SHALL BE PREFIXED WITH "130-KSH1T".
2. FIELD CONTRACTOR TO PROVIDE JUMPERS AS INDICATED.

LEGEND:

⊘	HTCP TERMINAL
□	MCC TERMINAL
○	DEVICE TERMINAL
MCC	MOTOR CONTROL CENTER
EES	ELECTRICAL EQUIPMENT SHELTER
HTCP	TERMINAL CONTROL PANEL
TB	TERMINAL BLOCK
□◣	CABLE CONNECTOR FOR HAZARDOUS AREA
□◢	CABLE CONNECTOR FOR NON-HAZARDOUS AREA

SDN# 25472-130-E7-0000-P0523
UEL# 2012016-1EF-EWD-000-0523-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-016	C0-EES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS
4663-05-00-03-591	SUBSTATION SOUTH AREA CABLE TRAY, CABLING AND GROUNDING LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER NIMA ROHANI ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS AND GEOPHYSICISTS OF ALBERTA

PER RDJ 01 ONLY 20 APR 15

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO.	DATE	PERMIT NUMBER:
01	20 APR 15	

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KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

C0-T-11
4160-480 V, 2 MVA TRANSFORMER INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-082	01

TC_A1_BR.DWG 594X841

FIELD

CO-EES-22

CO-T-12
4160-480 V, 2 MVA TRANSFORMER

TBA
- 63X RAPID RISE ALARM
- 63X RAPID RISE TRIP
- 26Q LIQUID TEMP. ALARM @ 105 °C
- 26Q LIQUID TEMP. TRIP @ 115 °C

COT12-TBA-4/COSWGR01-3TA3-1B → 1
COT12-TBA-5/COSWGR01-3TA3-2B → 2
NOTE 2
2C SPARE
COT12-TBA-8/COHTCP05-TB1212-3 → 3
COT12-TBA-9/COHTCP05-TB1212-4 → 4

TBB
- 49T WINDING TEMP. ALARM @ 120 °C
- 49T WINDING TRIP @ 125 °C
- 71Q LIQUID LEVEL LOW ALARM
- 71Q LIQUID LEVEL LOW ALARM

NOTE 2

TBC
- 63PV VACUUM ALARM @ -5 PSIG
- 63PV PRESSURE ALARM @ +8 PSIG
- 63PR PRESSURE RELIEF ALARM

COT12-TBC-2/COHTCP05-TB1212-1 → 1
COT12-TBC-3/COHTCP05-TB1212-2 → 2
COT12-TBC-5/COHTCP05-TB1212-5 → 5
COT12-TBC-6/COHTCP05-TB1212-6 → 6
COT12-TBC-8/COHTCP05-TB1212-7 → 7
COT12-TBC-9/COHTCP05-TB1212-8 → 8
12C SPARE

TBP
- 63X POWER
- CABINET HEATERS

COT12-TBP-1/COUACP02-26-L → 2C SPARE
COT12-TBP-2/COUACP02-26-N
COT12-TBP-4/COACP12-40-L → 2C SPARE
COT12-TBP-5/COACP12-40-N

REFER TO NIAGARA TRANSFORMER CORP. DWG DWS35986

C0-C-1755
C0-C-1756
C0-P-1756
C0-P-1755

CO-HTCP-06

		TB-1610	
1	COSWGR01-3TB1-7/COHTCP06-TB1610-52	52	CO-UA-8658, CO-MFR-12 ON CO-SWGR-01
2	COSWGR01-3TB1-8/COHTCP06-TB1610-53	53	FAULT STATUS ALARM
3	COSWGR01-3TB1-1/COHTCP06-TB1610-54	54	CO-YS-8658N
4	COSWGR01-3TB1-2/COHTCP06-TB1610-55	55	CO-MFR-21 CO-SWGR-01 TRIP STATUS
5	COSWGR01-3TA3-25/COHTCP06-TB1610-56	56	CO-YS-8658P
6	COSWGR01-3TA3-26/COHTCP06-TB1610-57	57	INPUT CONTACTOR RACKOUT STATUS
7	COSWGR01-3TA3-27/COHTCP06-TB1610-58	58	CO-YS-8658Q
8	COSWGR01-3TA3-28/COHTCP06-TB1610-59	59	INPUT CONTACTOR BLOWN FUSE STATUS
9	COSWGR01-3TA3-29/COHTCP06-TB1610-60	60	CO-YS-8658R
10	COSWGR01-3TA3-30/COHTCP06-TB1610-61	61	INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
11	COSWGR01-3TA3-34/COHTCP06-TB1610-62	62	CO-YS-8658S
12	COSWGR01-3TA3-35/COHTCP06-TB1610-63	63	INPUT CONTACTOR CLOSED STATUS

C0-C-2709

CO-SWGR-01, SECTION-3B (CO-MVC-12)

		3TA3	
1	COT12-TBA-4/COSWGR01-3TA3-1B	1B	
2	COT12-TBA-5/COSWGR01-3TA3-2B	2B	
11	COSWGR01-3TA3-34/COHTCP06-TB1610-62	34	
12	COSWGR01-3TA3-35/COHTCP06-TB1610-63	35	
5	COSWGR01-3TA3-25/COHTCP06-TB1610-56	25	
6	COSWGR01-3TA3-26/COHTCP06-TB1610-57	26	
7	COSWGR01-3TA3-27/COHTCP06-TB1610-58	27	
8	COSWGR01-3TA3-28/COHTCP06-TB1610-59	28	
9	COSWGR01-3TA3-29/COHTCP06-TB1610-60	29	
10	COSWGR01-3TA3-30/COHTCP06-TB1610-61	30	
		3TB1	
1	COSWGR01-3TB1-7/COHTCP06-TB1610-52	7	
2	COSWGR01-3TB1-8/COHTCP06-TB1610-53	8	
3	COSWGR01-3TB1-1/COHTCP06-TB1610-54	1	
4	COSWGR01-3TB1-2/COHTCP06-TB1610-55	2	

REFER TO SIEMENS DWG MVC13-30130433-100SC03C1

CO-HTCP-05

		TB-1212
1	COT12-TBC-2/COHTCP05-TB1212-1	1
2	COT12-TBC-3/COHTCP05-TB1212-2	2
3	COT12-TBA-8/COHTCP05-TB1212-3	3
4	COT12-TBA-9/COHTCP05-TB1212-4	4
5	COT12-TBC-5/COHTCP05-TB1212-5	5
6	COT12-TBC-6/COHTCP05-TB1212-6	6
7	COT12-TBC-8/COHTCP05-TB1212-7	7
8	COT12-TBC-9/COHTCP05-TB1212-8	8

12C SPARE

REFER DWG 4663-05-03-SC-424

CO-UACP-02 (120 V AC, 1ø UPS SUPPLY)

COT12-TBP-1/COUACP02-26-L (BK) → 20 A → CCT #26 → 30A → L
COT12-TBP-2/COUACP02-26-N (W) → N

REFER TO DWG 4663-06-00-05-005

CO-ACP-12 (120 V AC, 1ø SUPPLY)

COT12-TBP-4/COACP12-40-L (BK) → CCT #40 → 15A → L
COT12-TBP-5/COACP12-40-N (W) → N

REFER TO DWG 4663-06-00-05-005

NOTES:
1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHT1".
2. FIELD CONTRACTOR TO PROVIDE JUMPERS AS INDICATED.

LEGEND:
- ⊘ HTCP TERMINAL
- □ MCC TERMINAL
- o DEVICE TERMINAL
- MCC MOTOR CONTROL CENTER
- EES ELECTRICAL EQUIPMENT SHELTER
- HTCP TERMINAL CONTROL PANEL
- TB TERMINAL BLOCK
- CABLE CONNECTOR FOR HAZARDOUS AREA
- CABLE CONNECTOR FOR NON-HAZARDOUS AREA

SDN# 25472-130-E7-0000-P0524
UEL# 2012016-1EF-EWD-000-0524-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-031	CO-EES-22 ELECTRICAL EQUIPMENT LAYOUT
4663-06-00-03-572	SUBSTATION NORTH AREA CABLE TRAY, CABLING, AND GROUNDING LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-17	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

REV No	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2197104	PRG	TAE	HHM	JED	DCB	UPSIDE
01	2197104	EDK	MTM	NJR	VWA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

FOR REV 01 ONLY 2015-APR-23

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

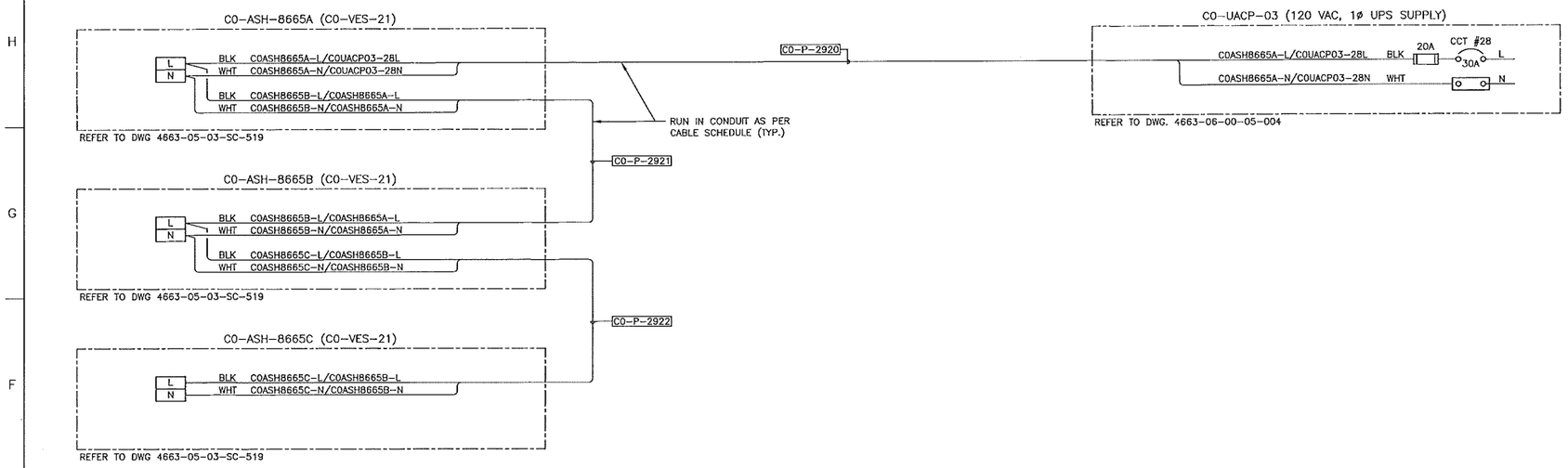
FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-T-12
4160-480 V, 2 MVA TRANSFORMER INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-07-06-083	01

TC_A1_BR.DWG 594X841

CO-VES-21



NOTES:

1. ALL TAGS SHALL BE PREFIXED WITH "130-KSHTT".

LEGEND:

ACP	AC DISTRIBUTION PANEL
UACP	UNINTERRUPTIBLE AC DISTRIBUTION PANEL
HTCP	TERMINAL CONTROL PANEL
FCU	FIELD COMMUNICATION UNIT

COXXXX-XX-XX/COUACP01-XXL

- CIRCUIT NUMBER (L)LINE/(N)NEUTRAL
- DISTRIBUTION PANEL NUMBER
- TERMINAL NUMBER
- TERMINAL BLOCK/STRIP NUMBER
- INSTRUMENT/EQUIPMENT TAG NUMBER

SDN# 25472-130-E7-0000-P0612
UEL# 2012016-1EF-EWD-000-0612-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-09-00-01-004	KHTT SAFETY PLAN BUILDINGS CO-EES-21, CO-EES-22, CO-VES-21 LAYOUT
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT
4663-06-02-03-006	CO-VES-21 INSTRUMENTATION DEVICES LAYOUT

REVISION

REV No	DATE	DESCRIPTION
00	2014-04-04	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	TAE	HKH	AFED	DCB/JW	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DOOLEY ALBERTA
2014-APR-04

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TC_A1_BR.DWG 594X841

TransCanada
In business to deliver

upside Engineering Ltd.

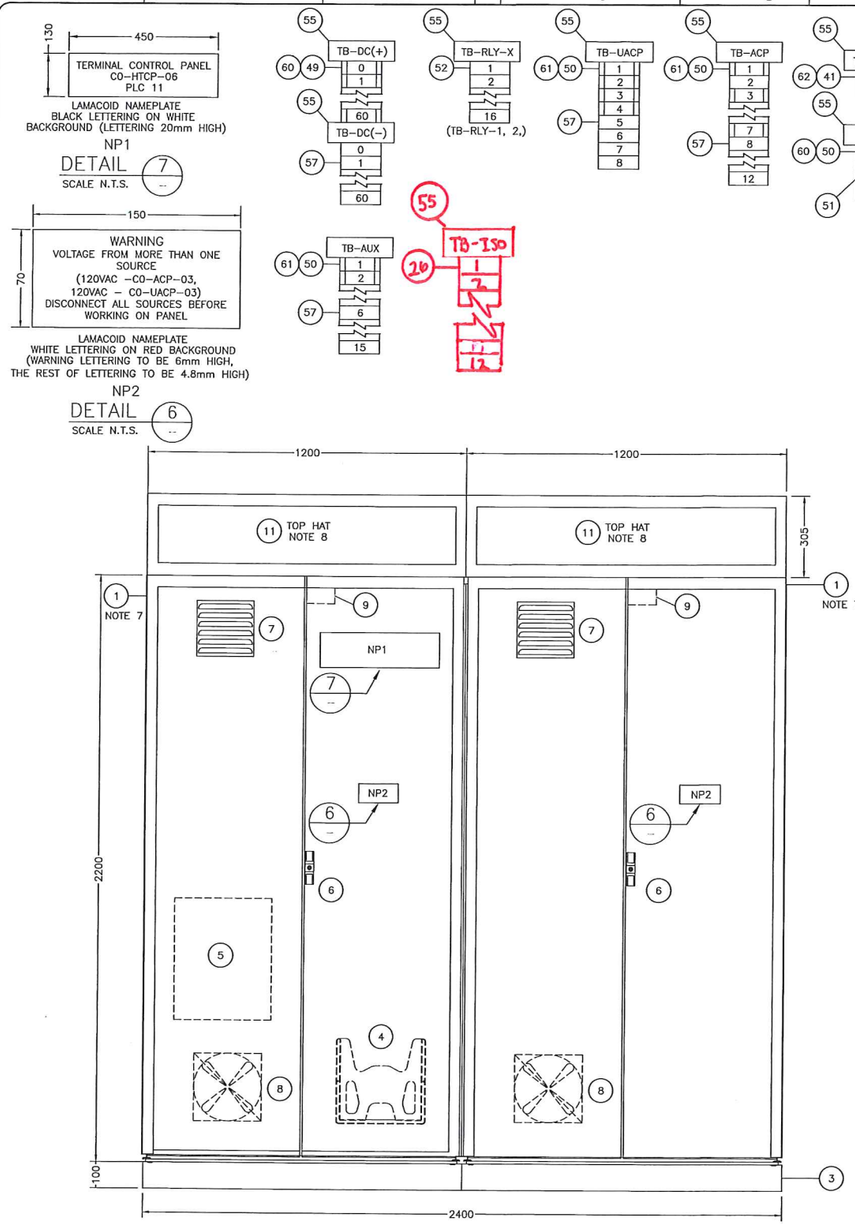
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		06

CO-VES-21
UPS SUPPLY TO SMOKE DETECTORS INTERCONNECTION WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-06-02-07-002	00

TIME---DESIGNFILE



PANEL FRONT VIEW

NOTES:

1. FOR BILL OF MATERIALS SEE DRAWING 4663-05-03-PA-503
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
3. TERMINAL BLOCKS TO BE MOUNTED ON STANDOFFS TO MAKE FLUSH WITH PANDUITS.
4. NAMEPLATES SHALL BE FASTENED WITH SELF TAPPING SCREWS.
5. A REMOVABLE PLEXI-GLASS COVER IS TO BE INSTALLED OVER THE POWER DISTRIBUTION TERMINALS.
6. VENDOR TO INSTALL END COVER AND END BRACKET WHEREVER REQUIRED.
7. PANEL IS ASSEMBLED WITH 2 STANDARD 1200 WIDE CABINETS TO ACHIEVE ONE CABINET OF THE REQUIRED WIDTH. CABINET IS MADE UP OF ONE LEFT SIDE WALL, ONE RIGHT SIDE WALL, AND ONE CONTINUOUS BACK PANEL.
8. PROVIDE GROMMETTED CUTOUTS BETWEEN TOP HAT AND FIELD WIREWAYS.

NAMEPLATE SCHEDULE

ITEM	LABEL	TYPE	NAMEPLATE SIZE WxH	LETTER SIZE	COLOR BACKGROUND/LETTER
NP1	PANEL NAMEPLATE (DETAIL 7)	LAMICOID	450mm X 130mm (18" X 5")	20.0mm (0.79")	WHITE/BLACK
NP2	WARNING PLATE (DETAIL 6)	LAMICOID	150mm X 70mm (6" X 2.75")	6.0mm (0.24")/4.8 (0.19")	RED/WHITE
NP3					
NP4					
NP5	PS-1	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP6	PS-2	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP7	PLC-11/15	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP8	PLC-11/16	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP9					
NP10					
NP11					
NP12					
NP13	DIODE MODULE	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP14					
NP15					
NP16					
NP17	ETHERNET CONNECTORS (TB-ETM)	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP18	MODBUS CONNECTORS (TB-COM)	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP19					
NP20	EQUIPMENT GROUND BUS	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK
NP21	INSTRUMENT GROUND BUS	LAMICOID	75mm X 25mm (2.95" X 0.98")	4.8mm (0.19")	WHITE/BLACK

SDN# 25472-130-JC-0000-P0081
UEL# 2012016-1EF-CAB-000-0035-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	SKC	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY 29880 2013-OCT-03

The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

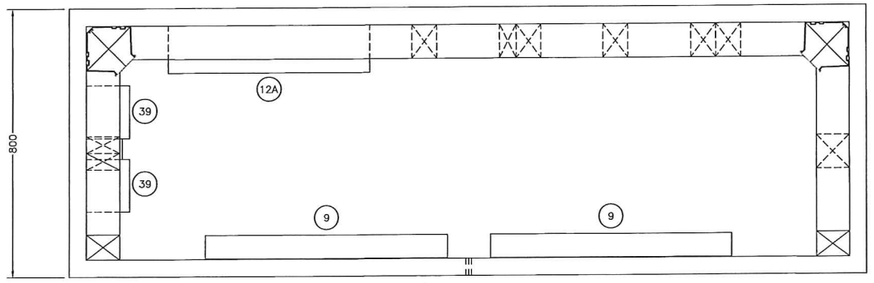
KHTT CONTROL PANEL
(CO-HTCP-06), PLC-11, (CO-VES-21)
PANEL LAYOUT SHEET 1 OF 2

SCALE N.T.S. | DRAWING No 4663-05-03-PA-501 | REV 00

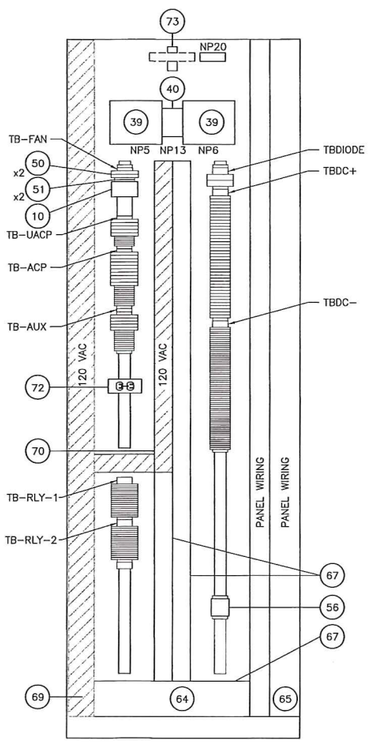
TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

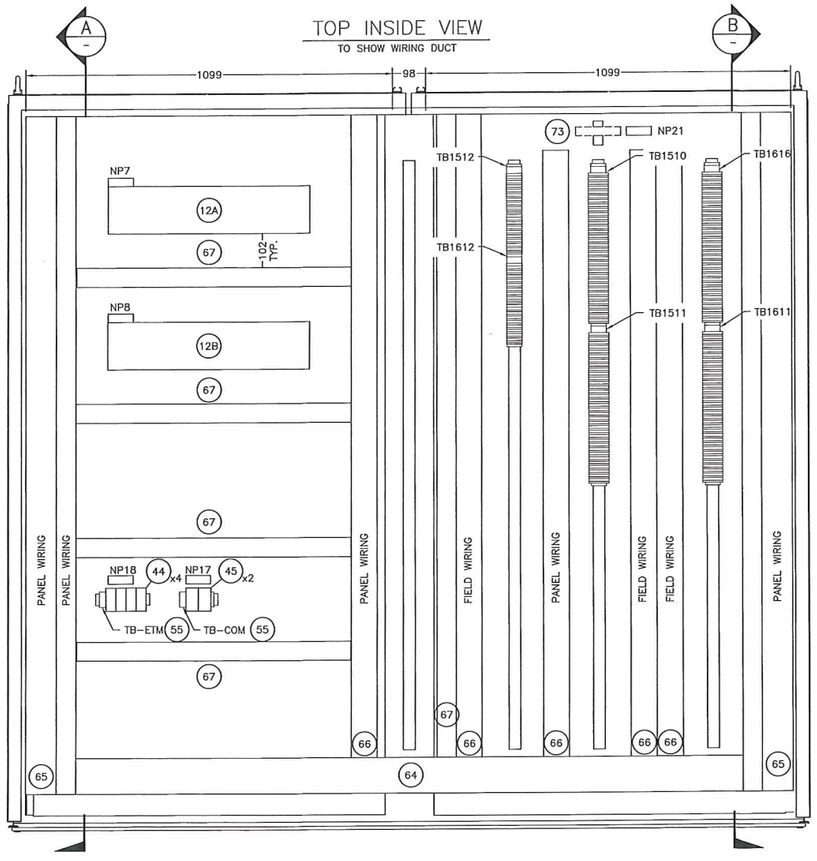
TIME ---- DESIGNFILE



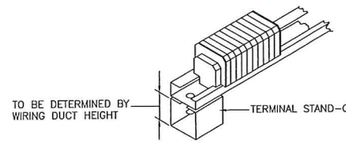
TOP INSIDE VIEW
TO SHOW WIRING DUCT



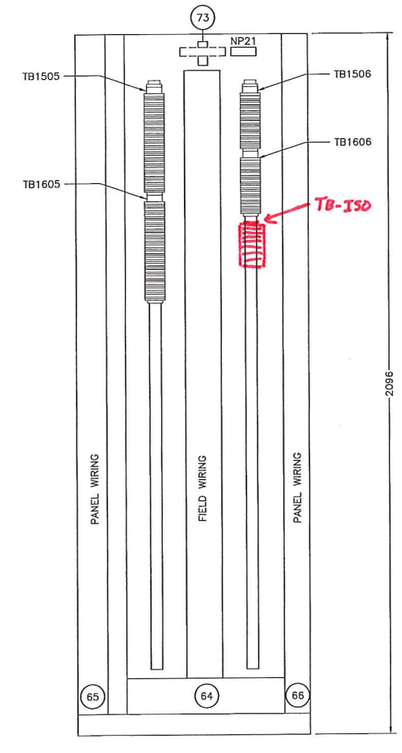
LEFT SIDE PAN LAYOUT (A)



FRONT VIEW DOORS REMOVED
BACK PAN LAYOUT



TYPICAL TERMINAL MOUNTING DETAIL
SCALE N.T.S.



RIGHT SIDE PAN LAYOUT (B)

NOTES:

1. FOR BILL OF MATERIALS SEE DRAWING 4663-05-03-PA-503. FOR LABEL DETAILS AND SCHEDULE SEE DRAWING 4663-05-03-PA-501.
2. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
3. TERMINAL BLOCKS TO BE MOUNTED ON STANDOFFS TO MAKE FLUSH WITH PANDUITS.
4. NAMEPLATES SHALL BE FASTENED WITH SELF TAPPING SCREWS.
5. PROVIDE A WIRE PARTITION FOR DUCTS WITH BOTH 120VAC AND 24VDC CONTROL CABLES.
6. REDUNDANT 24VDC POWER SUPPLY UNITS (PS-1 & PS-2) SHALL BE INSTALLED C/W REDUNDANCY DIODE.
7. A REMOVABLE PLEXI-GLASS COVER IS TO BE INSTALLED OVER THE POWER DISTRIBUTION TERMINALS.
8. 120 VAC WIRING CHANNELS SHOWN HATCHED. WIRING CHANNELS FOR 24 VDC ARE SHOWN WITHOUT HATCHING.
9. PROVIDE LABELS ON CARD FRONTS WITH : PLC 11/XX/YY, WHERE XX-RACK YY-SLOT

LEGEND:

120VAC WIRING CHANNEL

DC WIRING CHANNEL

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PS	NIU		ETM	CMM	AI	AO	SP	SP	SP	DI	DI	DO	SP	PS	PS
(13)	(16)		(17)	(18)	(19)	(20)				(21)	(21)	(23)		(13)	(13)
IC695PSD140	IC695NIU001		IC695ETM001	IC695CMM004	IC695ALG616	IC695ALG392	SPARE	SPARE	SPARE	IC694MDL660	IC694MDL660	IC694MDL740	SPARE	IC695PSD140	IC695PSD140

12A PLC-11/15
SCALE N.T.S.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
PS	NIU		ETM	SP	AI	AO	SP	SP	SP	DI	DI	DO	SP	PS	PS
(13)	(16)		(17)		(19)	(20)				(21)	(21)	(23)		(13)	(13)
IC695PSD140	IC695NIU001		IC695ETM001	SPARE	IC695ALG616	IC695ALG392	SPARE	SPARE	SPARE	IC694MDL660	IC694MDL660	IC694MDL740	SPARE	IC695PSD140	IC695PSD140

12B PLC-11/16
SCALE N.T.S.

SDN# 25472-130-JC-0000-P0082
UEL# 2012016-1EF-CAB-000-0036-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
	2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
		SKC	DMC	SRL	JED	DCB	

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEERS ALBERTA JAMES DOOLEY 2013-OCT-03

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.

PERMIT NUMBER: P 5508

The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

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TransCanada
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KEYSTONE HARDISTY TANK TERMINAL

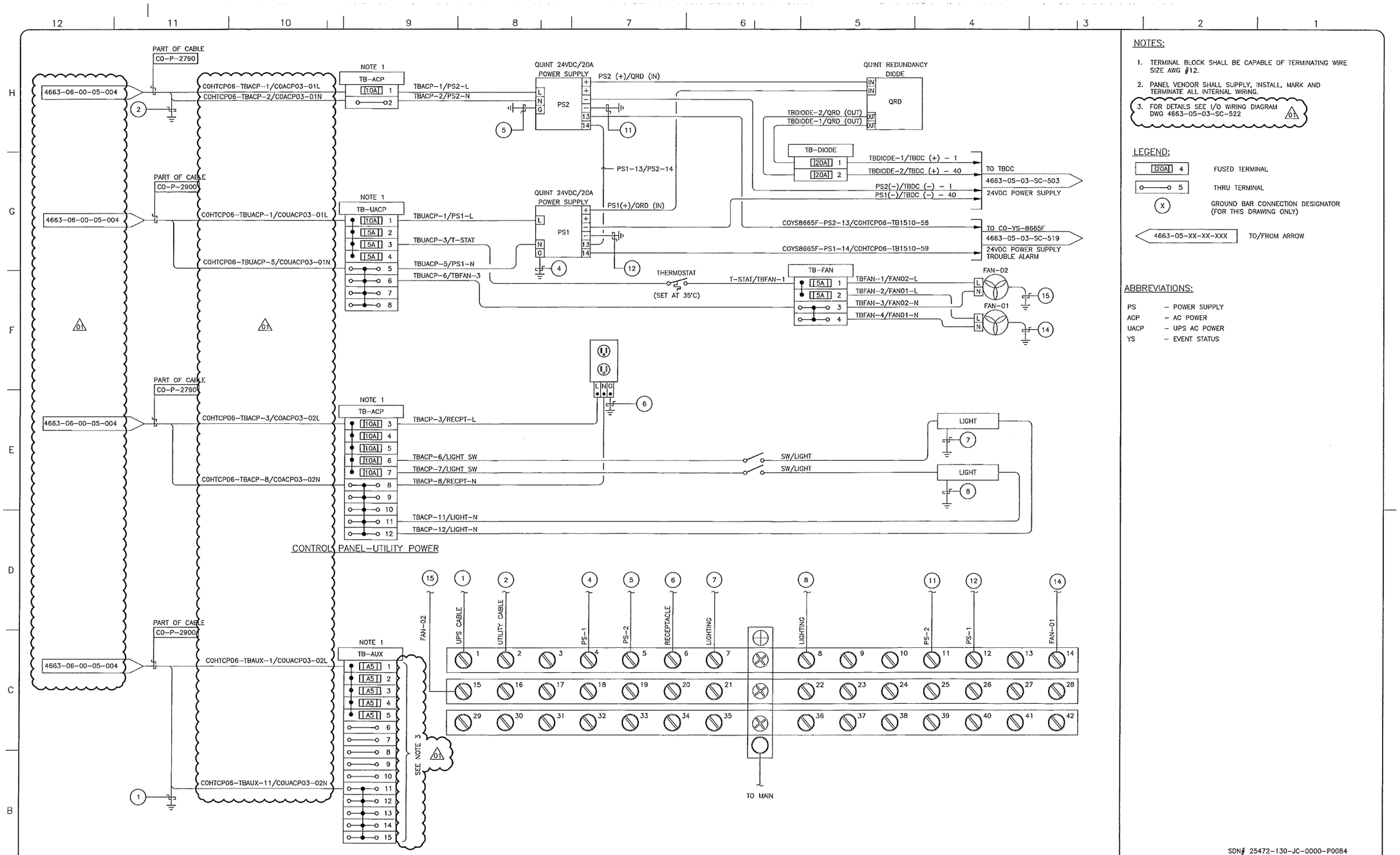
FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

KHTT CONTROL PANEL
(C0-HTCP-06), PLC-11, (C0-VES-21)
PANEL LAYOUT SHEET 2 OF 2

SCALE 1 : 8 | DRAWING No 4663-05-03-PA-502 | REV 00

TC_A1_BR.DWG 594X841

DESIGNFILE TIME



NOTES:

1. TERMINAL BLOCK SHALL BE CAPABLE OF TERMINATING WIRE SIZE AWG #12.
2. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
3. FOR DETAILS SEE I/O WIRING DIAGRAM DWG 4663-05-03-SC-522 (01)

LEGEND:

- 20A 4 — FUSED TERMINAL
- 5 — THRU TERMINAL
- (X) — GROUND BAR CONNECTION DESIGNATOR (FOR THIS DRAWING ONLY)
- 4663-05-XX-XX-XXX — TO/FROM ARROW

ABBREVIATIONS:

PS	– POWER SUPPLY
ACP	– AC POWER
UACP	– UPS AC POWER
YS	– EVENT STATUS

SDN# 25472-130-JC-0000-P0084
UEL# 2012016-1EF-EWD-000-0067-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. # 2012016)
01	2014-03-07	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
2197104	JHP	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA 2014-MAR-7

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 05

KHTT CONTROL PANEL
C0-HTCP-06 (C0-VES-21)
AC POWER DISTRIBUTION WIRING DIAGRAM

SCALE N.T.S.	DRAWING No 4663-05-03-SC-501	REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME-DESIGNFILE

TERMINAL CONTROL PANEL – DC POWER DISTRIBUTION

TB-DC (+)			TB-DC (–)		
		4663-05-03-SC-501 TBDIODE-1/TBDC(+)-1 (R)			4663-05-03-SC-501 PS2(–)/TBDC(–)-1 (BK/W)
		4663-05-03-SC-501 TBDIODE-2/TBDC(+)-40 (R)			4663-05-03-SC-501 PS1(–)/TBDC(–)-40 (BK/W)
[5A]	1	TBDC(+)-1/R15-BACKPLANE-(X) → RACK 15 BACKPLANE POWER SUPPLY	1	TBDC(–)-1/R15-BACKPLANE-(X)	RACK 15 BACKPLANE POWER SUPPLY
[5A]	2	TBDC(+)-2/R15-S0-(+) → RACK 15 SLOT 0 POWER SUPPLY	2	TBDC(–)-2/R15-S0-(–)	RACK 15 SLOT 0 POWER SUPPLY
[5A]	3	TBDC(+)-3/R15-S14-(+) → RACK 15 SLOT 14 POWER SUPPLY	3	TBDC(–)-3/R15-S14-(–)	RACK 15 SLOT 14 POWER SUPPLY
[5A]	4	TBDC(+)-4/R15-S15-(+) → RACK 15 SLOT 15 POWER SUPPLY	4	TBDC(–)-4/R15-S15-(–)	RACK 15 SLOT 15 POWER SUPPLY
[5A]	5	TBDC(+)-5/R15-S05-32 → RACK 15 SLOT 05 AI CARD (SE)	5	TBDC(–)-5/TB1505-46	RACK 15 SLOT 05 AI CARD (SE)
[5A]	6	TBDC(+)-6/TB1506-1 → RACK 15 SLOT 06 AO CARD	6	TBDC(–)-6/TB1506-26	RACK 15 SLOT 06 AO CARD
[5A]	7	TBDC(+)-7/TB1510-66 → RACK 15 SLOT 10 DI CARD	7	TBDC(–)-7/TB1510-68	RACK 15 SLOT 10 DI CARD
[5A]	8	TBDC(+)-8/TB1511-66 → RACK 15 SLOT 11 DI CARD	8	TBDC(–)-8/TB1511-68	RACK 15 SLOT 11 DI CARD
[5A]	9	TBDC(+)-9/TB1512-20 → RACK 15 SLOT 12 DO CARD (STATIC)	9	TBDC(–)-9/TB1512-37	RACK 15 SLOT 12 DO CARD (STATIC)
[5A]	10	TBDC(+)-10/R16-BACKPLANE-(X) → RACK 16 BACKPLANE POWER SUPPLY	10	TBDC(–)-10/R16-BACKPLANE-(X)	RACK 16 BACKPLANE POWER SUPPLY
[5A]	11	TBDC(+)-11/R16-S0-(+) → RACK 16 SLOT 0 POWER SUPPLY	11	TBDC(–)-11/R16-S0-(–)	RACK 16 SLOT 0 POWER SUPPLY
[5A]	12	TBDC(+)-12/R16-S14-(+) → RACK 16 SLOT 14 POWER SUPPLY	12	TBDC(–)-12/R16-S14-(–)	RACK 16 SLOT 14 POWER SUPPLY
[5A]	13	TBDC(+)-13/R16-S15-(+) → RACK 16 SLOT 15 POWER SUPPLY	13	TBDC(–)-13/R16-S15-(–)	RACK 16 SLOT 15 POWER SUPPLY
[5A]	14	TBDC(+)-14/R16-S05-32 → RACK 16 SLOT 05 AI CARD (SE)	14	TBDC(–)-14/TB1605-46	RACK 16 SLOT 05 AI CARD (SE)
[5A]	15	TBDC(+)-15/TB1606-1 → RACK 16 SLOT 06 AO CARD	15	TBDC(–)-15/TB1606-26	RACK 16 SLOT 06 AO CARD
[5A]	16	TBDC(+)-16/TB1610-66 → RACK 16 SLOT 10 DI CARD	16	TBDC(–)-16/TB1610-68	RACK 16 SLOT 10 DI CARD
[5A]	17	TBDC(+)-17/TB1611-66 → RACK 16 SLOT 11 DI CARD	17	TBDC(–)-17/TB1611-68	RACK 16 SLOT 11 DI CARD
[5A]	18	TBDC(+)-18/TB1612-20 → RACK 16 SLOT 12 DO CARD (STATIC)	18	TBDC(–)-18/TB1612-37	RACK 16 SLOT 12 DO CARD (STATIC)
[5A]	19	SPARE → SPARE	19	SPARE	SPARE
[5A]	20	SPARE → SPARE	20	SPARE	SPARE
[5A]	21	SPARE → SPARE	21	SPARE	SPARE
[5A]	22	SPARE → SPARE	22	SPARE	SPARE
[5A]	23	SPARE → SPARE	23	SPARE	SPARE
[5A]	24	SPARE → SPARE	24	SPARE	SPARE
[5A]	25	SPARE → SPARE	25	SPARE	SPARE
[5A]	26	SPARE → SPARE	26	SPARE	SPARE
[5A]	27	SPARE → SPARE	27	SPARE	SPARE
[5A]	28	SPARE → SPARE	28	SPARE	SPARE
[5A]	29	SPARE → SPARE	29	SPARE	SPARE
[5A]	30	SPARE → SPARE	30	SPARE	SPARE
[5A]	31	SPARE → SPARE	31	SPARE	SPARE
[5A]	32	SPARE → SPARE	32	SPARE	SPARE
[5A]	33	SPARE → SPARE	33	SPARE	SPARE
[5A]	34	SPARE → SPARE	34	SPARE	SPARE
[5A]	35	SPARE → SPARE	35	SPARE	SPARE
[5A]	36	SPARE → SPARE	36	SPARE	SPARE
[5A]	37	SPARE → SPARE	37	SPARE	SPARE
[5A]	38	SPARE → SPARE	38	SPARE	SPARE
[5A]	39	SPARE → SPARE	39	SPARE	SPARE
[5A]	40	SPARE → SPARE	40	SPARE	SPARE

NOTES:

1. TERMINAL BLOCK SHALL BE CAPABLE OF TERMINATING WIRE SIZE #12.
2. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.

LEGEND:

- [5A] 4 — FUSED TERMINAL
- o—o 5 — THRU TERMINAL
- 4663-05-XX-XX-XXX — FROM/TO ARROW

SDN# 25472-130-JC-0000-P0085
UEL# 2012016-1EF-EWD-000-0068-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	SKC	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA — JAMES DODDY — 2013-OCT-03

PERMIT/ ENG. APPROVAL — DATE

PERMIT TO PRACTICE
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The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 05

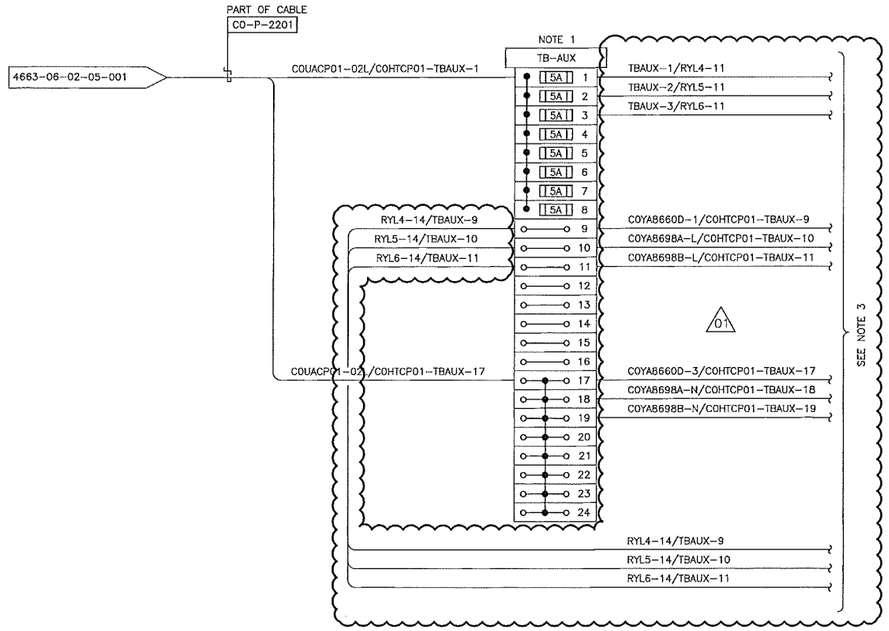
KHTT CONTROL PANEL
CO-HTCP-06 (CO-VES-21)
DC POWER DISTRIBUTION WIRING DIAGRAM

SCALE N.T.S.	DRAWING No 4663-05-03-SC-503	REV 00

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME---DESIGNFILE



NOTES:

1. TERMINAL BLOCK SHALL BE CAPABLE OF TERMINATING WIRE SIZE #12.
2. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
3. FOR DETAILS SEE I/O WIRING DIAGRAM DWG 4663-05-03-SC-014 (01)

LEGEND:

- [5A] 4 — FUSED TERMINAL
- 5 — THRU TERMINAL
- (X) — GROUND BAR CONNECTION DESIGNATOR (REFER TO 4663-05-03-SC-001)
- 4663-05-XX-XX-XXX — FROM/TO ARROW

SDN# 25472-130-JC-0000-P0087
UEL# 2012016-1EF-EWD-000-0040-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2013-11-20	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-02-27	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	RQC	DMC	SRL	JED	DCB	UPSIDE
2197104	MAF	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA — JAMES DOOLEY — 2014-FEB-27

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

KHTT CONTROL PANEL
CO-HTCP-01 (CO-EES-21)
AC POWER DISTRIBUTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-05-03-SC-002 | REV 01

TC_A1_BR.DWG 594X841

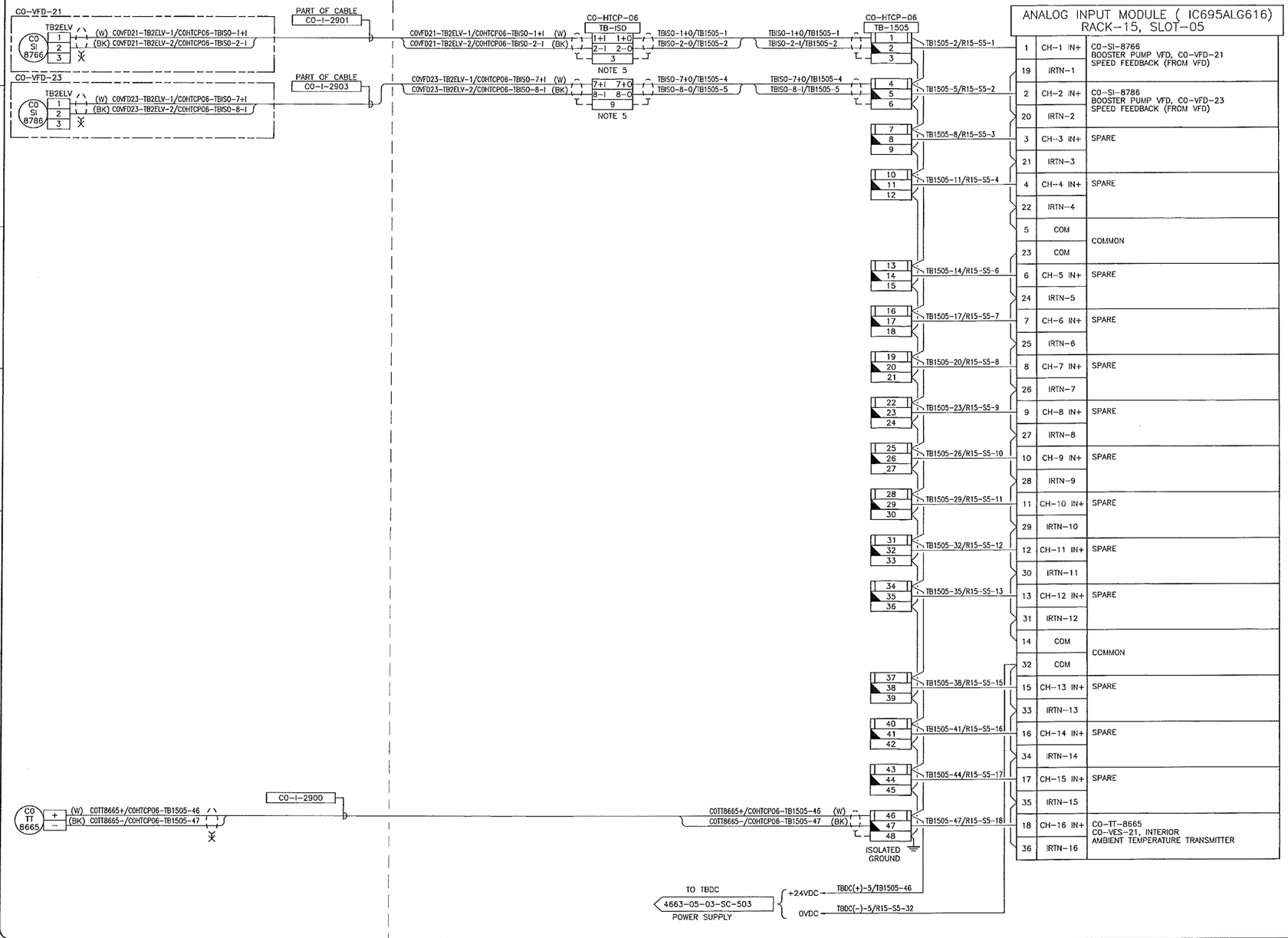
CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME — DESIGNFILE

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)



NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. TB-ISO IS FOR SIGNAL ISOLATORS USED TO ISOLATE REMOTE POWERED VFD SPEED FEEDBACK SIGNALS.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0146
UEL# 2012016-1EF-CLD-000-0146-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-MAR-12

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/15 SLOT 05 ANALOG INPUT - SINGLE ENDED I/O WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-05-03-SC-510 | REV 00

TIME-DESIGNFILE

TC_A1_BR.DWG 594X841

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21) | FIELD

TERMINAL CONTROL PANEL (CO-HTCP-06)

R15S06

ANALOG OUTPUT MODULE (IC694ALG392)
RACK-15, SLOT-06

24VDC INPUT	+24VDC	1	R15-S6-1/TB1506-1
CO-SY-8766 BOOSTER PUMP VFD, CO-VFD-21 SPEED DEMAND (TO VFD)	CH-1	3	R15-S6-3/TB1506-2
CO-SY-8786 BOOSTER PUMP VFD, CO-VFD-23 SPEED DEMAND (TO VFD)	CH-2	5	R15-S6-5/TB1506-5
SPARE	CH-3	7	R15-S6-7/TB1506-8
SPARE	CH-4	9	R15-S6-9/TB1506-11
SPARE	CH-5	11	R15-S6-11/TB1506-14
SPARE	CH-6	13	R15-S6-13/TB1506-17
SPARE	CH-7	15	R15-S6-15/TB1506-20
SPARE	CH-8	17	R15-S6-17/TB1506-23
COMMON	COM	19	R15-S6-19/TB1506-26
GROUND	GND	20	

CO-HTCP-06
TB-1506
1
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(W) COVFD21-TB2ELV-7/COHTCP06-TB1506-2
(BK) COVFD21-TB2ELV-8/COHTCP06-TB1506-3
(W) COVFD23-TB2ELV-7/COHTCP06-TB1506-5
(BK) COVFD23-TB2ELV-8/COHTCP06-TB1506-6

ISOLATED GROUND

TO TBDC
4663-05-03-SC-503
POWER SUPPLY
+24VDC — TBDC(+)-6/TB1506-1
0VDC — TBDC(-)-6/TB1506-26

PART OF CABLE CO-!-2901

PART OF CABLE CO-!-2903

CO-VFD-21
COVFD21-TB2ELV-7/COHTCP06-TB1506-2 (W)
COVFD21-TB2ELV-8/COHTCP06-TB1506-3 (BK)
TB2ELV 7 8 9
CO SY 8766

CO-VFD-23
COVFD23-TB2ELV-7/COHTCP06-TB1506-5 (W)
COVFD23-TB2ELV-8/COHTCP06-TB1506-6 (BK)
TB2ELV 7 8 9
CO SY 8786

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-00-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0147
UEL# 2012016-1EF-CLD-000-0147-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
219704	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY

2014-MAR-7

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/15 SLOT 06 ANALOG OUTPUT I/O WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-05-03-SC-511 | REV 00

TC_A1_BR.DWG 594X841

TIME — DESIGNFILE

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CO-SWGR-01

CO-UA-8765 (2-TA1)
- 7 — COSWGR01-2TA1-7/COHTCP06-TB1510-1 — 1
- 8 — COSWGR01-2TA1-8/COHTCP06-TB1510-2 — 2

CO-YS-8765P
- 1 — COSWGR01-2TA1-1/COHTCP06-TB1510-3 — 3
- 2 — COSWGR01-2TA1-2/COHTCP06-TB1510-4 — 4

CO-YS-8765B (2-TA2)
- 25 — COSWGR01-2TA2-25/COHTCP06-TB1510-5 — 5
- 26 — COSWGR01-2TA2-26/COHTCP06-TB1510-6 — 6

CO-YS-8765C
- 27 — COSWGR01-2TA2-27/COHTCP06-TB1510-7 — 7
- 28 — COSWGR01-2TA2-28/COHTCP06-TB1510-8 — 8

CO-YS-8765D
- 29 — COSWGR01-2TA2-29/COHTCP06-TB1510-9 — 9
- 30 — COSWGR01-2TA2-30/COHTCP06-TB1510-10 — 10

CO-YS-8765E
- 16 — COSWGR01-2TA2-16/COHTCP06-TB1510-11 — 11
- 17 — COSWGR01-2TA2-17/COHTCP06-TB1510-12 — 12

CO-VFD-21

CO-HS-8768C (TB2)
- 3 — COVFD21-TB2-3/COHTCP06-TB1510-13 — 1
- 4 — COVFD21-TB2-4/COHTCP06-TB1510-14 — 2

CO-YS-8765F
- 31 — COVFD21-TB2-31/COHTCP06-TB1510-15 — 3
- 32 — COVFD21-TB2-32/COHTCP06-TB1510-16 — 4

CO-YS-8765G
- 33 — COVFD21-TB2-33/COHTCP06-TB1510-18 — 5
- 34 — COVFD21-TB2-34/COHTCP06-TB1510-19 — 6

CO-YS-8765H
- 35 — COVFD21-TB2-35/COHTCP06-TB1510-20 — 7
- 36 — COVFD21-TB2-36/COHTCP06-TB1510-21 — 8

CO-YS-8765J
- 37 — COVFD21-TB2-37/COHTCP06-TB1510-22 — 9
- 38 — COVFD21-TB2-38/COHTCP06-TB1510-23 — 10

CO-YS-8765K
- 29 — COVFD21-TB2-29/COHTCP06-TB1510-24 — 11
- 30 — COVFD21-TB2-30/COHTCP06-TB1510-25 — 12

CO-YS-8765L
- 39 — COVFD21-TB2-39/COHTCP06-TB1510-26 — 13
- 40 — COVFD21-TB2-40/COHTCP06-TB1510-27 — 14

CO-YS-8765M
- 41 — COVFD21-TB2-41/COHTCP06-TB1510-28 — 15
- 42 — COVFD21-TB2-42/COHTCP06-TB1510-29 — 16

CO-UA-8794
- 54 — COVFD21-TB2-54/COHTCP06-TB1510-30 — 17
- 55 — COVFD21-TB2-55/COHTCP06-TB1510-31 — 18

CO-YS-8765A
- 56 — COVFD21-TB2-56/COHTCP06-TB1510-32 — 19
- 57 — COVFD21-TB2-57/COHTCP06-TB1510-33 — 20

PART OF CABLE CO-C-2704

PART OF CABLE CO-C-2710

CO-HTCP-06 TB-1510

1 COSWGR01-2TA1-7/COHTCP06-TB1510-1	1	TB1510-2/R15-S10-1	
2 COSWGR01-2TA1-8/COHTCP06-TB1510-2	2		
3 COSWGR01-2TA1-1/COHTCP06-TB1510-3	3	TB1510-4/R15-S10-2	
4 COSWGR01-2TA1-2/COHTCP06-TB1510-4	4		
5 COSWGR01-2TA2-25/COHTCP06-TB1510-5	5	TB1510-6/R15-S10-3	
6 COSWGR01-2TA2-26/COHTCP06-TB1510-6	6		
7 COSWGR01-2TA2-27/COHTCP06-TB1510-7	7	TB1510-8/R15-S10-4	
8 COSWGR01-2TA2-28/COHTCP06-TB1510-8	8		
9 COSWGR01-2TA2-29/COHTCP06-TB1510-9	9	TB1510-10/R15-S10-5	
10 COSWGR01-2TA2-30/COHTCP06-TB1510-10	10		
11 COSWGR01-2TA2-16/COHTCP06-TB1510-11	11	TB1510-12/R15-S10-6	
12 COSWGR01-2TA2-17/COHTCP06-TB1510-12	12		
1 COVFD21-TB2-3/COHTCP06-TB1510-13	13	TB1510-14/R15-S10-7	
2 COVFD21-TB2-4/COHTCP06-TB1510-14	14		
3 COVFD21-TB2-31/COHTCP06-TB1510-15	15	TB1510-16/R15-S10-8	
4 COVFD21-TB2-32/COHTCP06-TB1510-16	16		
	17	TB1510-17/R15-S10-9	
5 COVFD21-TB2-33/COHTCP06-TB1510-18	18	TB1510-19/R15-S10-10	
6 COVFD21-TB2-34/COHTCP06-TB1510-19	19		
7 COVFD21-TB2-35/COHTCP06-TB1510-20	20	TB1510-21/R15-S10-11	
8 COVFD21-TB2-36/COHTCP06-TB1510-21	21		
9 COVFD21-TB2-37/COHTCP06-TB1510-22	22	TB1510-23/R15-S10-12	
10 COVFD21-TB2-38/COHTCP06-TB1510-23	23		
11 COVFD21-TB2-29/COHTCP06-TB1510-24	24	TB1510-25/R15-S10-13	
12 COVFD21-TB2-30/COHTCP06-TB1510-25	25		
13 COVFD21-TB2-39/COHTCP06-TB1510-26	26	TB1510-27/R15-S10-14	
14 COVFD21-TB2-40/COHTCP06-TB1510-27	27		
01 15 COVFD21-TB2-41/COHTCP06-TB1510-28	28	TB1510-29/R15-S10-15	
16 COVFD21-TB2-42/COHTCP06-TB1510-29	29		
17 COVFD21-TB2-54/COHTCP06-TB1510-30	30	TB1510-31/R15-S10-16	
18 COVFD21-TB2-55/COHTCP06-TB1510-31	31		
19 COVFD21-TB2-56/COHTCP06-TB1510-32	32	TB1510-33/R15-S10-17	
20 COVFD21-TB2-57/COHTCP06-TB1510-33 01	33		
	34	TB1510-34/R15-S10-18	
		0VDC	+24VDC

DISCRETE INPUT MODULE (IC694MDL660)
RACK-15, SLOT-10

1	INPUT-1	CO-UA-8765 BOOSTER PUMP VFD, CO-VFD-21 CO-MFR-21, CO-SWGR-01 HEALTH STATUS ALARM
2	INPUT-2	CO-YS-8765P BOOSTER PUMP VFD, CO-VFD-21 CO-MFR-21, CO-SWGR-01 TRIP STATUS
3	INPUT-3	CO-YS-8765B BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR RACK OUT STATUS
4	INPUT-4	CO-YS-8765C BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR BLOWN FUSE STATUS
5	INPUT-5	CO-YS-8765D BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
6	INPUT-6	CO-YS-8765E BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR CLOSED STATUS
7	INPUT-7	CO-HS-8768C BOOSTER PUMP VFD, CO-VFD-21 ESD HAND SWITCH STATUS
8	INPUT-8	CO-YS-8765F BOOSTER PUMP VFD, CO-VFD-21 READY TO RUN
9	COM	COMMON (INPUT 1-8)
10	INPUT-9	CO-YS-8765G BOOSTER PUMP VFD, CO-VFD-21 RUN INDICATION
11	INPUT-10	CO-YS-8765H BOOSTER PUMP VFD, CO-VFD-21 ALARM INDICATION
12	INPUT-11	CO-YS-8765J BOOSTER PUMP VFD, CO-VFD-21 FAULT INDICATION
13	INPUT-12	CO-YS-8765K BOOSTER PUMP VFD, CO-VFD-21 SPEED DEMAND IN LOCAL
14	INPUT-13	CO-YS-8765L BOOSTER PUMP VFD, CO-VFD-21 BLOWER FAN FAIL
15	INPUT-14	CO-YS-8765M BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR CLOSE REQUEST STATUS
16	INPUT-15	CO-UA-8794 BOOSTER PUMP VFD, CO-VFD-21 CO-MFR-BPM-21, HEALTH STATUS ALARM
17	INPUT-16	CO-YS-8765A BOOSTER PUMP VFD, CO-VFD-21 CO-MFR-BPM-21, TRIP STATUS ALARM
18	COM	COMMON (INPUT 9-16)

CONTINUES ON DWG. 4663-05-03-SC-519

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. PART OF HARDWIRED ESD STRING. SEE DRAWING 4663-05-03-SC-006.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   - 4663-06-00-03-703 CO-TANK-21 AREA
   - 4663-06-00-03-706 CO-TANK-22 AREA
   - 4663-06-00-03-709 CO-TANK-23 AREA
   - 4663-06-00-03-712 CO-TANK-24 AREA
   - 4663-06-00-03-715 CO-TANK-25 AREA
   - 4663-06-00-03-718 CO-TANK-26 AREA
   - 4663-06-00-03-721 CO-TANK-27 AREA
   - 4663-06-00-03-724 CO-TANK-28 AREA
   - 4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   - 4663-06-00-03-748 CO-BOOSTER PUMP AREA
   - 4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0148
UEL# 2012016-1EF-CLD-000-0148-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-04-22	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	BEM	TAE	KHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER ALBERTA — JAMES DOOLEY — REGISTERED

2014-APR-24

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/15 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)

SCALE N.T.S. | DRAWING No 4663-05-03-SC-518 | REV 01

TIME - DESIGNFILE

TC_A1_BR.DWG 594X841

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO–VES–21)

TERMINAL CONTROL PANEL (CO–HTCP–06)

CONTINUES ON DWG. 4663–05–03–SC–518

CO–HTCP–06 TB–1510 — 0VDC / +24VDC

CO–YS–8665A — CO ASH 8665A
- NC — COASH8665A–NC/COHTCP06–TB1510–35 1 — CO–C–2961 — 1 COASH8665A–NC/COHTCP06–TB1510–35 — 35 — TB1510–36/R15–S10–19
- COM — COASH8665A–COM/COHTCP06–TB1510–36 2 — 2 COASH8665A–COM/COHTCP06–TB1510–36 — 36
- L — COASH8665A–L/COUACP03–28L 1 — CO–P–2920
- N — COASH8665A–N/COUACP03–28N 2 — NOTE 5

CO–YS–8665B — CO ASH 8665B
- NC — COASH8665B–NC/COHTCP06–TB1510–37 1 — CO–C–2962 — 1 COASH8665B–NC/COHTCP06–TB1510–37 — 37 — TB1510–38/R15–S10–20
- COM — COASH8665B–COM/COHTCP06–TB1510–38 2 — 2 COASH8665B–COM/COHTCP06–TB1510–38 — 38
- L — COASH8665B–L/COASH8665A–L 1 — CO–P–2921
- N — COASH8665B–N/COASH8665A–N 2 — NOTE 5

CO–YS–8665C — CO ASH 8665C
- NC — COASH8665C–NC/COHTCP06–TB1510–39 1 — CO–C–2963 — 1 COASH8665C–NC/COHTCP06–TB1510–39 — 39 — TB1510–40/R15–S10–21
- COM — COASH8665C–COM/COHTCP06–TB1510–40 2 — 2 COASH8665C–COM/COHTCP06–TB1510–40 — 40
- L — COASH8665C–L/COASH8665B–L 1 — CO–P–2922
- N — COASH8665C–N/COASH8665B–N 2 — NOTE 5

CO–YS–8665D — CO ASH 8665D
- NC — COASH8665D–NC/COHTCP06–TB1510–41 1 — CO–C–2964 — 1 COASH8665D–NC/COHTCP06–TB1510–41 — 41 — TB1510–42/R15–S10–22
- COM — COASH8665D–COM/COHTCP06–TB1510–42 2 — 2 COASH8665D–COM/COHTCP06–TB1510–42 — 42

CO–YS–8665E — CO ASH 8665E
- NC — COASH8665E–NC/COHTCP06–TB1510–43 1 — CO–C–2965 — 1 COASH8665E–NC/COHTCP06–TB1510–43 — 43 — TB1510–44/R15–S10–23
- COM — COASH8665E–COM/COHTCP06–TB1510–44 2 — 2 COASH8665E–COM/COHTCP06–TB1510–44 — 44

CO–YS–8665F — CO ASH 8660F
- NC — COASH8665F–NC/COHTCP06–TB1510–45 1 — CO–C–2966 — 1 COASH8665F–NC/COHTCP06–TB1510–45 — 45 — TB1510–46/R15–S10–24
- COM — COASH8665F–COM/COHTCP06–TB1510–46 2 — 2 COASH8665F–COM/COHTCP06–TB1510–46 — 46

CO–YS–8665A
- NC — COYS8665A–NC/TB1510–47 1 — CO–C–2770 — 1 COYS8665A–NC/COHTCP06–TB1510–47 — 47 — TB1510–48/R15–S10–25
- COM — COYS8665A–COM/TB1510–48 2 — 2 COYS8665A–COM/COHTCP06–TB1510–48 — 48

CO–YS–8665B
- NC — COYS8665B–NC/TB1510–49 1 — CO–C–2771 — 1 COYS8665B–NC/COHTCP06–TB1510–49 — 49 — TB1510–50/R15–S10–26
- COM — COYS8665B–COM/TB1510–50 2 — 2 COYS8665B–COM/COHTCP06–TB1510–50 — 50

— 51 — TB1510–51/R15–S10–27

CO–TCMP–03

CO–YS–8665C TB–AUX
- 1 — COTCMP03–TBAUX–1/COHTCP06–TB1510–52 1 — CO–C–2730 — 1 COTCMP03–TBAUX–1/COHTCP06–TB1510–52 — 52 — TB1510–53/R15–S10–28
- 2 — COTCMP03–TBAUX–2/COHTCP06–TB1510–53 2 — 2 COTCMP03–TBAUX–2/COHTCP06–TB1510–53 — 53

CO–YS–8665D TB–AUX
- 3 — COTCMP03–TBAUX–3/COHTCP06–TB1510–54 3 — 3 COTCMP03–TBAUX–3/COHTCP06–TB1510–54 — 54 — TB1510–55/R15–S10–29
- 4 — COTCMP03–TBAUX–4/COHTCP06–TB1510–55 4 — 4 COTCMP03–TBAUX–4/COHTCP06–TB1510–55 — 55

CO–YS–8665E TB–AUX
- 5 — COTCMP03–TBAUX–5/COHTCP06–TB1510–56 5 — 5 COTCMP03–TBAUX–5/COHTCP06–TB1510–56 — 56 — TB1510–57/R15–S10–30
- 6 — COTCMP03–TBAUX–6/COHTCP06–TB1510–57 6 — 6 COTCMP03–TBAUX–6/COHTCP06–TB1510–57 — 57

COYS8665F-PS1-17/COHTCP06-TB1510-58

CO–YS–8665F — COHTCP06–~~TBAUX–1~~/COHTCP06–TB1510–58 1 — 1 COTCMP03–TBAUX–1/COHTCP06–TB1510–58 — 58 — TB1510–59/R15–S10–31
COHTCP06–~~TBAUX–2~~/COHTCP06–TB1510–59 2 — 2 COTCMP03–TBAUX–2/COHTCP06–TB1510–59 — 59

PS-1-14

PS-2-13

CO–CP–21–5

COYS8665F-PS-13/COHTCP06-TB1510-59

CO–YS–8666A TB–1A
- 53 — COCP215–TB1A–53/COHTCP06–TB1510–60 1 — CO–C–2860 — 1 COCP215–TB1A–53/COHTCP06–TB1510–60 — 60 — TB1510–61/R15–S10–32
- 54 — COCP215–TB1A–54/COHTCP06–TB1510–61 2 — 2 COCP215–TB1A–54/COHTCP06–TB1510–61 — 61

CO–YS–8666B TB–1A
- 47 — COCP215–TB1A–47/COHTCP06–TB1510–62 3 — 3 COCP215–TB1A–47/COHTCP06–TB1510–62 — 62 — TB1510–63/R15–S10–33
- 48 — COCP215–TB1A–48/COHTCP06–TB1510–63 4 — 4 COCP215–TB1A–48/COHTCP06–TB1510–63 — 63

CO–YS–8666C TB–1A
- 50 — COCP215–TB1A–50/COHTCP06–TB1510–64 5 — 5 COCP215–TB1A–50/COHTCP06–TB1510–64 — 64 — TB1510–65/R15–S10–34
- 51 — COCP215–TB1A–51/COHTCP06–TB1510–65 6 — 6 COCP215–TB1A–51/COHTCP06–TB1510–65 — 65

01

CO–VFD–21

CO–YS–8765N TB2
- 45 — COVFD21–TB2–45/COHTCP06–TB1510–66 21 — PART OF CABLE CO–C–2710 — 21 COVFD21–TB2–45/COHTCP06–TB1510–66 — 66 — TB1510–67/R15–S10–35
- 46 — COVFD21–TB2–46/COHTCP06–TB1510–67 22 — 22 COVFD21–TB2–46/COHTCP06–TB1510–67 — 67

— 68 — TB1510–68/R15–S10–36

TO TBDC 4663–05–03–SC–503 POWER SUPPLY
- 0VDC — TBDC(–)–7/TB1510–68
- +24VDC — TBDC(+)–7/TB1510–66

DISCRETE INPUT MODULE (IC694MDL660) RACK–15, SLOT–10

19	INPUT–17	CO–ASH–8665A CO–VES–21, SMOKE DETECTOR ALARM STATUS
20	INPUT–18	CO–ASH–8665B CO–VES–21, SMOKE DETECTOR ALARM STATUS
21	INPUT–19	CO–ASH–8665C CO–VES–21, SMOKE DETECTOR ALARM STATUS
22	INPUT–20	CO–ASH–8665D CO–VES–21, HEAT DETECTOR ALARM STATUS
23	INPUT–21	CO–ASH–8665E CO–VES–21, HEAT DETECTOR ALARM STATUS
24	INPUT–22	CO–ASH–8665F CO–VES–21, HEAT DETECTOR ALARM STATUS
25	INPUT–23	CO–YS–8665A CO–VES–21, INTRUSION ALARM STATUS
26	INPUT–24	CO–YS–8665B CO–VES–21, INTRUSION ALARM STATUS
27	COM	COMMON (INPUT 17–24)
28	INPUT–25	CO–YS–8665C CO–TCMP–03, 24VDC TROUBLE ALARM STATUS
29	INPUT–26	CO–YS–8665D CO–TCMP–03, 12VDC TROUBLE ALARM STATUS
30	INPUT–27	CO–YS–8665E CO–TCMP–03, SW1221 (CONTROL) & SW1231 (RIO) TROUBLE
31	INPUT–28	CO–YS–8665F CO–HTCP–06, 24VDC TROUBLE ALARM STATUS
32	INPUT–29	CO–YS–8666A CO–VES–21, HVAC CONTROLLER (CO–CP–21–5) CONTROL POWER STATUS
33	INPUT–30	CO–YS–8666B CO–VES–21, HVAC (CO–HVAC–21–5) MALFUNCTION ALARM STATUS
34	INPUT–31	CO–YS–8666C CO–VES–21, HVAC (CO–HVAC–21–6 MALFUNCTION ALARM STATUS
35	INPUT–32	CO–YS–8765N BOOSTER PUMP VFD, CO–VFD–21 DRIVE OVER TORQUE LIMIT STATUS ALARM
36	COM	COMMON (INPUT 25–32)

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130–KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. INSTRUMENT REQUIRES EXTERNAL 120VAC POWER. SEE DRAWING 4663–06–02–07–002.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663–06–00–03–703 CO–TANK–21 AREA
   4663–06–00–03–706 CO–TANK–22 AREA
   4663–06–00–03–709 CO–TANK–23 AREA
   4663–06–00–03–712 CO–TANK–24 AREA
   4663–06–00–03–715 CO–TANK–25 AREA
   4663–06–00–03–718 CO–TANK–26 AREA
   4663–06–00–03–721 CO–TANK–27 AREA
   4663–06–00–03–724 CO–TANK–28 AREA
   4663–06–00–03–745 CO–VALVE MANIFOLD AREA
   4663–06–00–03–748 CO–BOOSTER PUMP AREA
   4663–09–01–004 BLDGS CO–EES–21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

REFERENCE DRAWINGS

DRAWING No	TITLE
–	

REVISION

REV No	DATE	DESCRIPTION
00	2014–03–07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014–04–11	RE–ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	JAP	PLR	MHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER JAMES DOCKER CANADA 2014-APR-11

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

SDN# 25472–130–J5–0000–P0149
UEL# 2012016–1EF–CLD–000–0149–01

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO–HTCP–06, PLC–11/15 SLOT 10
DISCRETE INPUT
I/O WIRING DIAGRAM (SHEET 2 OF 2)

SCALE N.T.S. | DRAWING No 4663–05–03–SC–519 | REV 01

TIME——DESIGNFILE

TC_A1_BR.DWG 594X841

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CO-SWGR-01

CO-UA-8785 1TA1
7 COSWGR01-1TA1-7/C0HTCP06-TB1511-1 1
8 COSWGR01-1TA1-8/C0HTCP06-TB1511-2 2

CO-YS-8785P
1 COSWGR01-1TA1-1/C0HTCP06-TB1511-3 3
2 COSWGR01-1TA1-2/C0HTCP06-TB1511-4 4

CO-YS-8785B 1TA2
25 COSWGR01-1TA2-25/C0HTCP06-TB1511-5 5
26 COSWGR01-1TA2-26/C0HTCP06-TB1511-6 6

CO-YS-8785C
27 COSWGR01-1TA2-27/C0HTCP06-TB1511-7 7
28 COSWGR01-1TA2-28/C0HTCP06-TB1511-8 8

CO-YS-8785D
29 COSWGR01-1TA2-29/C0HTCP06-TB1511-9 9
30 COSWGR01-1TA2-30/C0HTCP06-TB1511-10 10

CO-YS-8785E
16 COSWGR01-1TA2-16/C0HTCP06-TB1511-11 11
17 COSWGR01-1TA2-17/C0HTCP06-TB1511-12 12

CO-VFD-23

CO-HS-8788C TB2
3 C0VFD23-TB2-3/C0HTCP06-TB1511-13 1
4 C0VFD23-TB2-4/C0HTCP06-TB1511-14 2

CO-YS-8785F
31 C0VFD23-TB2-31/C0HTCP06-TB1511-15 3
32 C0VFD23-TB2-32/C0HTCP06-TB1511-16 4

CO-YS-8785G
33 C0VFD23-TB2-33/C0HTCP06-TB1511-18 5
34 C0VFD23-TB2-34/C0HTCP06-TB1511-19 6

CO-YS-8785H
35 C0VFD23-TB2-35/C0HTCP06-TB1511-20 7
36 C0VFD23-TB2-36/C0HTCP06-TB1511-21 8

CO-YS-8785J
37 C0VFD23-TB2-37/C0HTCP06-TB1511-22 9
38 C0VFD23-TB2-38/C0HTCP06-TB1511-23 10

CO-YS-8785K
29 C0VFD23-TB2-29/C0HTCP06-TB1511-24 11
30 C0VFD23-TB2-30/C0HTCP06-TB1511-25 12

CO-YS-8785L
39 C0VFD23-TB2-39/C0HTCP06-TB1511-26 13
40 C0VFD23-TB2-40/C0HTCP06-TB1511-27 14

CO-YS-8785M
41 C0VFD23-TB2-41/C0HTCP06-TB1511-28 15
42 C0VFD23-TB2-42/C0HTCP06-TB1511-29 16

CO-UA-8784
54 C0VFD23-TB2-54/C0HTCP06-TB1511-30 17
55 C0VFD23-TB2-55/C0HTCP06-TB1511-31 18

CO-YS-8785A
56 C0VFD23-TB2-56/C0HTCP06-TB1511-32 19
57 C0VFD23-TB2-57/C0HTCP06-TB1511-33 20

PART OF CABLE CO-C-2706

PART OF CABLE CO-C-2712

CO-HTCP-06 TB-1511

1 COSWGR01-1TA1-7/C0HTCP06-TB1511-1
2 COSWGR01-1TA1-8/C0HTCP06-TB1511-2 — 1,2 — TB1511-2/R15-S11-1
3 COSWGR01-1TA1-1/C0HTCP06-TB1511-3
4 COSWGR01-1TA1-2/C0HTCP06-TB1511-4 — 3,4 — TB1511-4/R15-S11-2
5 COSWGR01-1TA2-25/C0HTCP06-TB1511-5
6 COSWGR01-1TA2-26/C0HTCP06-TB1511-6 — 5,6 — TB1511-6/R15-S11-3
7 COSWGR01-1TA2-27/C0HTCP06-TB1511-7
8 COSWGR01-1TA2-28/C0HTCP06-TB1511-8 — 7,8 — TB1511-8/R15-S11-4
9 COSWGR01-1TA2-29/C0HTCP06-TB1511-9
10 COSWGR01-1TA2-30/C0HTCP06-TB1511-10 — 9,10 — TB1511-10/R15-S11-5
11 COSWGR01-1TA2-16/C0HTCP06-TB1511-11
12 COSWGR01-1TA2-17/C0HTCP06-TB1511-12 — 11,12 — TB1511-12/R15-S11-6
1 C0VFD23-TB2-3/C0HTCP06-TB1511-13
2 C0VFD23-TB2-4/C0HTCP06-TB1511-14 — 13,14 — TB1511-14/R15-S11-7
3 C0VFD23-TB2-31/CCHTCP06-TB1511-15
4 C0VFD23-TB2-32/C0HTCP06-TB1511-16 — 15,16 — TB1511-16/R15-S11-8
17 — TB1511-17/R15-S11-9
5 C0VFD23-TB2-33/C0HTCP06-TB1511-18
6 C0VFD23-TB2-34/C0HTCP06-TB1511-19 — 18,19 — TB1511-19/R15-S11-10
7 C0VFD23-TB2-35/C0HTCP06-TB1511-20
8 C0VFD23-TB2-36/C0HTCP06-TB1511-21 — 20,21 — TB1511-21/R15-S11-11
9 C0VFD23-TB2-37/C0HTCP06-TB1511-22
10 C0VFD23-TB2-38/C0HTCP06-TB1511-23 — 22,23 — TB1511-23/R15-S11-12
11 C0VFD23-TB2-29/C0HTCP06-TB1511-24
12 C0VFD23-TB2-30/C0HTCP06-TB1511-25 — 24,25 — TB1511-25/R15-S11-13
13 C0VFD23-TB2-39/C0HTCP06-TB1511-26
14 C0VFD23-TB2-40/C0HTCP06-TB1511-27 — 26,27 — TB1511-27/R15-S11-14
01
15 C0VFD23-TB2-41/C0HTCP06-TB1511-28
16 C0VFD23-TB2-42/C0HTCP06-TB1511-29 — 28,29 — TB1511-29/R15-S11-15
17 C0VFD23-TB2-54/C0HTCP06-TB1511-30
18 C0VFD23-TB2-55/C0HTCP06-TB1511-31 — 30,31 — TB1511-31/R15-S11-16
19 C0VFD23-TB2-56/C0HTCP06-TB1511-32
20 C0VFD23-TB2-57/C0HTCP06-TB1511-33 — 32,33 — TB1511-33/R15-S11-17
34 — TB1511-34/R15-S11-18

0VDC +24VDC

DISCRETE INPUT MODULE (IC694MDL660)
RACK-15, SLOT-11

1	INPUT-1	CO-UA-8785 BOOSTER PUMP VFD, CO-VFD-23 CO-MFR-23, CO-SWGR-01 FAULT STATUS ALARM
2	INPUT-2	CO-YS-8785P BOOSTER PUMP VFD, CO-VFD-23 CO-MFR-23, CO-SWGR-01 TRIP STATUS
3	INPUT-3	CO-YS-8785B BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR RACK OUT STATUS
4	INPUT-4	CO-YS-8785C BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR BLOWN FUSE STATUS
5	INPUT-5	CO-YS-8785D BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
6	INPUT-6	CO-YS-8785E BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR CLOSED STATUS
7	INPUT-7	CO-HS-8788C BOOSTER PUMP VFD, CO-VFD-23 ESD HAND SWITCH STATUS
8	INPUT-8	CO-YS-8785F BOOSTER PUMP VFD, CO-VFD-23 READY TO RUN
9	COM	COMMON (INPUT 1-8)
10	INPUT-9	CO-YS-8785G BOOSTER PUMP VFD, CO-VFD-23 RUN INDICATION
11	INPUT-10	CO-YS-8785H BOOSTER PUMP VFD, CO-VFD-23 ALARM INDICATION
12	INPUT-11	CO-YS-8785J BOOSTER PUMP VFD, CO-VFD-23 FAULT INDICATION
13	INPUT-12	CO-YS-8785K BOOSTER PUMP VFD, CO-VFD-23 SPEED DEMAND IN LOCAL
14	INPUT-13	CO-YS-8785L BOOSTER PUMP VFD, CO-VFD-23 BLOWER FAN FAIL
15	INPUT-14	CO-YS-8785M BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR CLOSE REQUEST
16	INPUT-15	CO-UA-8784 BOOSTER PUMP VFD, CO-VFD-23 CO-MFR-BPM-23, HEALTH STATUS ALARM
17	INPUT-16	CO-YS-8785A BOOSTER PUMP VFD, CO-VFD-23 CO-MFR-BPM-23, TRIP STATUS ALARM
18	COM	COMMON (INPUT 9-16)

CONTINUES ON DWG. 4663-05-03-SC-521

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. PART OF HARDWIRED ESD STRING. SEE DRAWING 4663-05-03-SC-006.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0150
UEL# 2012016-1EF-CLD-000-0150-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
01	2014-04-22	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA PRHO 2014-APR-24

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHANAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/15 SLOT 11
DISCRETE INPUT
I/O WIRING DIAGRAM (SHEET 1 OF 2)

SCALE N.T.S. | DRAWING No 4663-05-03-SC-520 | REV 01

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TIME — DESIGNFILE

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CONTINUES ON DWG. 4663-05-03-SC-520

CO-SWGR-01

CO-YS-8650A — 1M — CJ-11 — COSWGR01-1M-CJ11/COHTCP06-TB1511-35 — 1
CJ-12 — COSWGR01-1M-CJ12/COHTCP06-TB1511-36 — 2

CO-YS-8650B — CJ-9 — COSWGR01-1M-CJ9/COHTCP06-TB1511-37 — 3
CJ-10 — COSWGR01-1M-CJ10/COHTCP06-TB1511-38 — 4

CO-YS-8650C — RA-11 — COSWGR01-1M-RA11/COHTCP06-TB1511-39 — 5
RA-12 — COSWGR01-1M-RA12/COHTCP06-TB1511-40 — 6

CO-YS-8650D — CL-9 — COSWGR01-1M-CL9/COHTCP06-TB1511-41 — 7
CL-10 — COSWGR01-1M-CL10/COHTCP06-TB1511-42 — 8

CO-HS-8650 — CL-3 — COSWGR01-1M-CL3/COHTCP06-TB1511-43 — 9
CL-4 — COSWGR01-1M-CL4/COHTCP06-TB1511-44 — 10

CO-YS-8650E — 1MCL — 7 — COSWGR01-1MCL-7/COHTCP06-TB1511-45 — 11
8 — COSWGR01-1MCL-8/COHTCP06-TB1511-46 — 12

△02

PART OF CABLE CO-C-2701

1	COSWGR01-1M-CJ11/COHTCP06-TB1511-35	35			
2	COSWGR01-1M-CJ12/COHTCP06-TB1511-36	36	TB1511-36/R15-S11-19	19	INPUT-17 — CO-YS-8650A CO-SWGR-01, MAIN BREAKER CLOSED STATUS
3	COSWGR01-1M-CJ9/COHTCP06-TB1511-37	37			
4	COSWGR01-1M-CJ10/COHTCP06-TB1511-38	38	TB1511-38/R15-S11-20	20	INPUT-18 — CO-YS-8650B CO-SWGR-01, MAIN BREAKER OPEN STATUS
5	COSWGR01-1M-RA11/COHTCP06-TB1511-39	39			
6	COSWGR01-1M-RA12/COHTCP06-TB1511-40	40	TB1511-40/R15-S11-21	21	INPUT-19 — CO-YS-8650C CO-SWGR-01, ALARM STATUS (CONTROL POWER △02)
7	COSWGR01-1M-CL9/COHTCP06-TB1511-41	41			
8	COSWGR01-1M-CL10/COHTCP06-TB1511-42	42	TB1511-42/R15-S11-22	22	INPUT-20 — CO-YS-8650D CO-SWGR-01, PHASE SEQUENCE REVERSAL ALARM STATUS
9	COSWGR01-1M-CL3/COHTCP06-TB1511-43	43			
10	COSWGR01-1M-CL4/COHTCP06-TB1511-44	44	TB1511-44/R15-S11-23	23	INPUT-21 — CO-HS-8650 CO-SWGR-01, ARC FLASH NORMAL/ MAINTENANCE MODE SWITCH STATUS
11	COSWGR01-1MCL7/COHTCP06-TB1511-45	45			
12	COSWGR01-1MCL8/COHTCP06-TB1511-46	46	TB1511-46/R15-S11-24	24	INPUT-22 — CO-YS-8650E CO-NGR-01, MEDIUM VOLTAGE NGR HEALTH STATUS
		47			
		48	TB1511-48/R15-S11-25	25	INPUT-23 — SPARE △02
		49			
		50	TB1511-50/R15-S11-26	26	INPUT-24 — SPARE
		51	TB1511-51/R15-S11-27	27	COM — COMMON (INPUT 17-24)
		52			
		53	TB1511-53/R15-S11-28	28	INPUT-25 — CO-YS-8650H UTILITY TRANSFER TRIP CIRCUIT HEALTHY △02
		54			
		55	TB1511-55/R15-S11-29	29	INPUT-26 — SPARE
		56			
		57	TB1511-57/R15-S11-30	30	INPUT-27 — SPARE
		58			
		59	TB1511-59/R15-S11-31	31	INPUT-28 — SPARE
		60			
		61	TB1511-61/R15-S11-32	32	INPUT-29 — SPARE
		62			
		63	TB1511-63/R15-S11-33	33	INPUT-30 — SPARE
		64			
		65	TB1511-65/R15-S11-34	34	INPUT-31 — SPARE
		66			
		67	TB1511-67/R15-S11-35	35	INPUT-32 — CO-YS-8785N BOOSTER PUMP VFD, CO-VFD-23 DRIVE OVER TORQUE LIMIT STATUS ALARM
		68	TB1511-68/R15-S11-36	36	COM — COMMON (INPUT 25-32)

0VDC +24VDC

CO-HTCP-06 TB-1511

CO-IJB-50

TB1 — 5 — C0IJB50-TB1-5/C0HTCP06-TB1511-52 — 1
6 — C0IJB50-TB1-6/C0HTCP06-TB1511-53 — 2
2C SPARE

△02

CO-C-2716

1 C0IJB50-TB1-5/C0HTCP06-TB1511-52
2 C0IJB50-TB1-6/C0HTCP06-TB1511-53
2C SPARE

CO-VFD-23

CO-YS-8785N — TB2 — 45 — COVFD23-TB2-45/C0HTCP06-TB1511-66 — 21
46 — COVFD23-TB2-46/C0HTCP06-TB1511-67 — 22

PART OF CABLE CO-C-2712

21 COVFD23-TB2-45/C0HTCP06-TB1511-66
22 COVFD23-TB2-46/C0HTCP06-TB1511-67

TO TBDC 4663-05-03-SC-503 POWER SUPPLY

0VDC — TBDC(-)-8/TB1511-68
+24VDC — TBDC(+)-8/TB1511-66

DISCRETE INPUT MODULE (IC694MDL660)
RACK-15, SLOT-11

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHIT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. PART OF HARDWIRED ESD STRING. SEE DRAWING 4663-05-03-SC-XXX.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-708 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL .

SDN# 25472-130-J5-0000-P0151
UEL# 2012016-1EF-CLD-000-0151-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-04-24	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
02	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE
2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEERS ALBERTA NIMA ROHANI

FOR REV 02 ONLY 2015-APR-27

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		05

CO-HTCP-06, PLC-11/15 SLOT 11 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 2 OF 2)

SCALE	DRAWING No	REV
N.T.S.	4663-05-03-SC-521	02

TC_A1_BR.DWG 594X841

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

FIELD

DISCRETE OUTPUT MODULE (IC694MDL740) RACK-15, SLOT-12

+24VDC INPUT	DC+	1	R15-S12-1/TB1512-1
CO-YA-8765A BOOSTER PUMP VFD, CO-VFD-21 START COMMAND	OUTPUT-1	2	R15-S12-2/TB1512-2
CO-YA-8765B BOOSTER PUMP VFD, CO-VFD-21 STOP COMMAND	OUTPUT-2	3	R15-S12-3/TB1512-4
CO-YA-8765C BOOSTER PUMP VFD, CO-VFD-21 FAULT RESET COMMAND	OUTPUT-3	4	R15-S12-4/TB1512-6
CO-YA-8765D BOOSTER PUMP VFD, CO-VFD-21 BLOWER FAN RE-START COMMAND	OUTPUT-4	5	R15-S12-5/TB1512-8
CO-YA-8765E BOOSTER PUMP VFD, CO-VFD-21 INPUT CONTACTOR CLOSE COMMAND	OUTPUT-5	6	R15-S12-6/TB1512-10
SPARE	OUTPUT-6	7	R15-S12-7/TB1512-12
CO-YA-8665B FIRE BEACON (RED) LOCATED ON EXTERIOR OF CO-VES-21 COMMAND	OUTPUT-7	8	R15-S12-8/TB1512-14
SPARE	OUTPUT-8	9	R15-S12-9/TB1512-16
COMMON (INPUT 1-8)	COM	10	R15-S12-10/TB1512-18
+24VDC INPUT	DC+	11	R15-S12-11/TB1512-20
CO-YA-8785A BOOSTER PUMP VFD, CO-VFD-23 START COMMAND	OUTPUT-9	12	R15-S12-12/TB1512-21
CO-YA-8785B BOOSTER PUMP VFD, CO-VFD-23 STOP COMMAND	OUTPUT-10	13	R15-S12-13/TB1512-23
CO-YA-8785C BOOSTER PUMP VFD, CO-VFD-23 FAULT RESET COMMAND	OUTPUT-11	14	R15-S12-14/TB1512-25
CO-YA-8785D BOOSTER PUMP VFD, CO-VFD-23 BLOWER FAN RE-START COMMAND	OUTPUT-12	15	R15-S12-15/TB1512-27
CO-YA-8785E BOOSTER PUMP VFD, CO-VFD-23 INPUT CONTACTOR CLOSE COMMAND	OUTPUT-13	16	R15-S12-16/TB1512-29
CO-YA-8666 CO-VES-21, HVAC CONTROLLER (CO-CP-21-5) TRIP COMMAND	OUTPUT-14	17	R15-S12-17/TB1512-31
CO-YA-8650 CO-SWGR-01, MAIN BREAKER SHUNT TRIP COMMAND	OUTPUT-15	18	R15-S12-18/TB1512-33
SPARE	OUTPUT-16	19	R15-S12-19/TB1512-35
COMMON (INPUT 9-16)	1-COM	20	R15-S12-20/TB1512-37

CO-HTCP-06 TB-1512

TB1512-1 … TB1512-37

TB-RLY-1: RL01 (TB1512-2/TBRLY1-RL01-A1, TB1512-3/TBRLY1-RL01-A2) … RL16 (TB1512-35/TBRLY1-RL16-A1, TB1512-36/TBRLY1-RL16-A2)

TB-AUX: TBRLY1-RL07-11/TBAUX-1, TBRLY1-RL07-14/TBAUX-6

NOTE 6 — TB-AUX 1, 6, 11 — UACP03-2L, UACP03-2N

TO TBDC 4663-05-03-SC-403 POWER SUPPLY

0VDC — TBDC(-)9/TB1512-37

+24VDC — TBDC(+)9/TB1512-20

PART OF CABLE CO-C-2721 — COVFD21-TB2-7/COHTCP06-TBRLY1-RL01-11 … COVFD21-TB2-14/COHTCP06-TBRLY1-RL04-14 → CO-VFD-21 TB2 (CO-YA-8765A, CO-YA-8765B, CO-YA-8765C, CO-YA-8765D)

PART OF CABLE CO-C-2821 — COVFD21-2TA2-38/COHTCP06-TBRLY1-RL05-11, COVFD21-2TA2-39/COHTCP06-TBRLY1-RL05-14 → CO-MVC-21 2A-TA2 (CO-YA-8765E)

CO-C-2761 — COYA8665B-1/COHTCP06-TBAUX-6, COYA8665B-3/COHTCP06-TBAUX-11 → CO-YA-8665B (RED)

PART OF CABLE CO-C-2723 — COVFD23-TB2-7/COHTCP06-TBRLY1-RL09-11 … COVFD23-TB2-14/COHTCP06-TBRLY1-RL12-14 → CO-VFD-23 TB2 (CO-YA-8785A, CO-YA-8785B, CO-YA-8785C, CO-YA-8785D)

PART OF CABLE CO-C-2823 — COVFD23-1TA2-38/COHTCP06-TBRLY1-RL13-11, COVFD23-1TA2-39/COHTCP06-TBRLY1-RL13-14 → CO-MVC-23 1TA2 (CO-YA-8785E)

CO-C-2863 — COCP215-TB3A-22/COHTCP06-TBRLY1-RL14-11, COCP215-TB3A-24/COHTCP06-TBRLY1-RL14-14 → CO-CP-21-5 TB3A (CO-YA-8666) (01)

PART OF CABLE CO-C-2700 — COSWGR01-1M-RA3/COHTCP06-TBRLY1-RL15-11, COSWGR01-1M-RA4/COHTCP06-TBRLY1-RL15-14 → CO-SWGR-01 1M RA-3, RA-4 (CO-YA-8650)

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-00-01-004 BLDGS CO-EES-21, 22, AND VES 21
6. FOR TB-AUX TERMINAL BLOCK DETAIL SEE DRAWING 4663-05-03-SC-501.

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0152
UEL# 2012016-1EF-CLD-000-0152-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-04-11	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	JAP	PLR	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA 2014-APR-11

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/15 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-05-03-SC-522 | REV 01

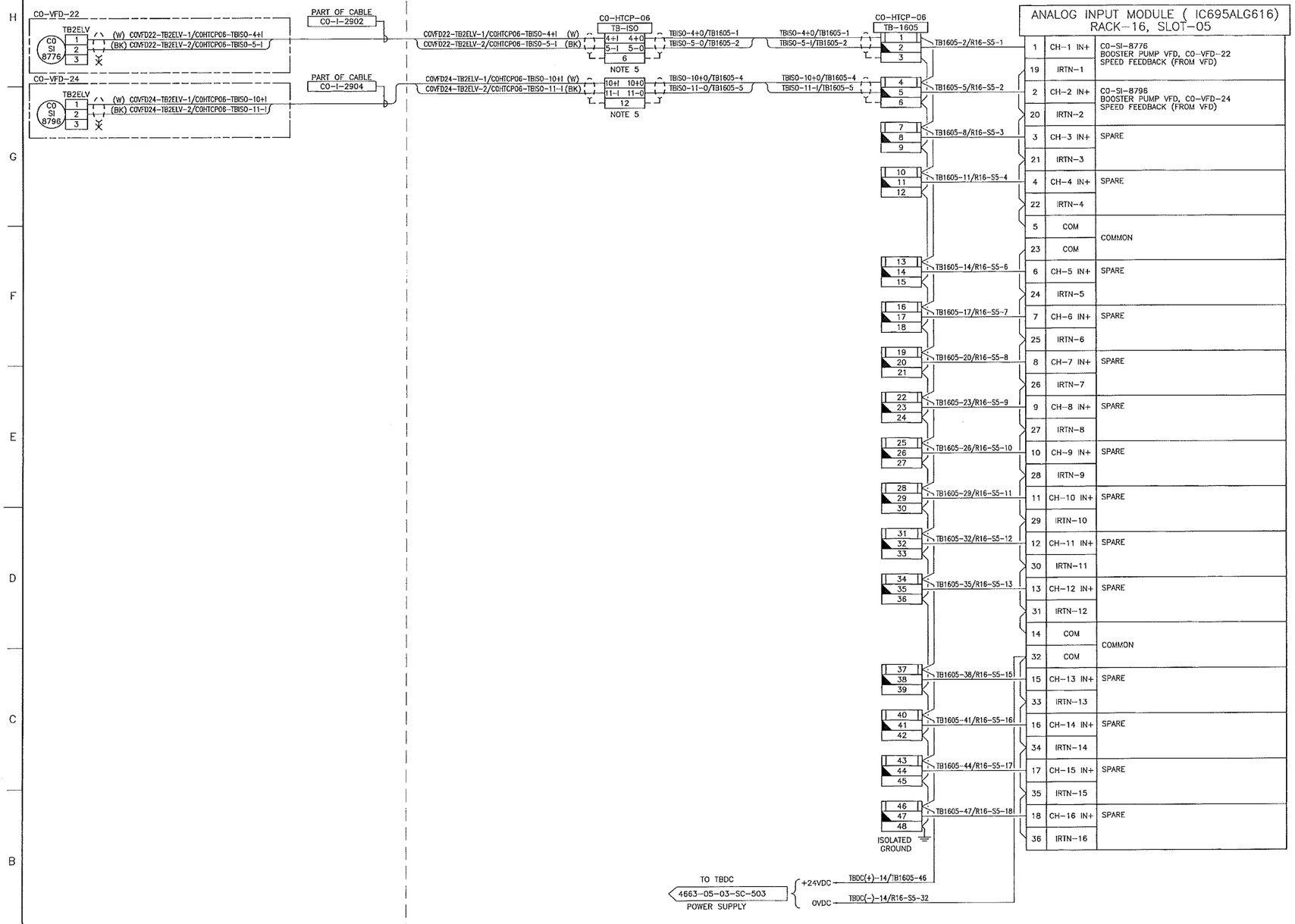
TIME — DESIGNFILE

TC_A1_BR.DWG 594X841

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)



NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSH11".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. TB-ISO IS FOR SIGNAL ISOLATORS USED TO ISOLATE REMOTE POWERED VFD SPEED FEEDBACK SIGNALS.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-05-00-03-703 CO-TANK-21 AREA
   4663-05-00-03-706 CO-TANK-22 AREA
   4663-05-00-03-709 CO-TANK-23 AREA
   4663-05-00-03-712 CO-TANK-24 AREA
   4663-05-00-03-715 CO-TANK-25 AREA
   4663-05-00-03-718 CO-TANK-26 AREA
   4663-05-00-03-721 CO-TANK-27 AREA
   4663-05-00-03-724 CO-TANK-28 AREA
   4663-05-00-03-745 CO-VALVE MANIFOLD AREA
   4663-05-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0153
UEL# 2012016-1EF-CLD-000-0153-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER JAMES DOODY ALBERTA

2014-MAR-12

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663	CHAINAGE:	DISCIPLINE # 05

CO-HTCP-06, PLC-11/16 SLOT 05 ANALOG INPUT - SINGLE ENDED I/O WIRING DIAGRAM

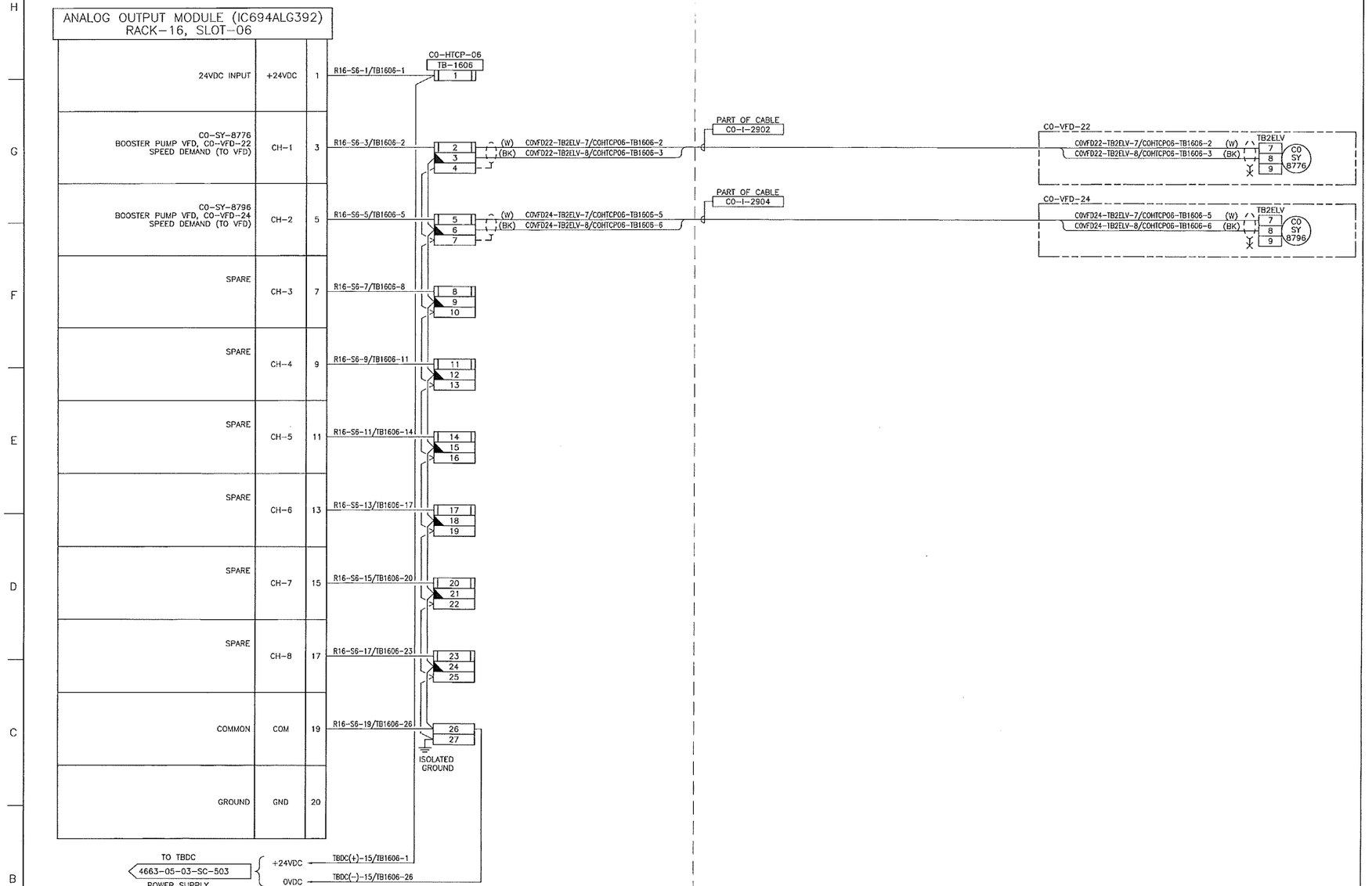
SCALE N.T.S.	DRAWING No 4663-05-03-SC-525	REV 00

TC_A1_BR.DWG 594X841

TIME DESIGNFILE

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21) | FIELD

TERMINAL CONTROL PANEL (CO-HTCP-06)



NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-00-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0154
UEL# 2012016-1EF-CLD-000-0154-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2014-MAR-7

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver
upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		05

CO-HTCP-06, PLC-11/16 SLOT 06 ANALOG OUTPUT I/O WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-05-03-SC-526	00

TIME---DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CO-SWGR-01

CO-UA-8775 2TB1
- 7 COSWGR01-2TB1-7/COHTCP06-TB1610-1 1
- 8 COSWGR01-2TB1-8/COHTCP06-TB1610-2 2

CO-YS-8775P
- 1 COSWGR01-2TB1-1/COHTCP06-TB1610-3 3
- 2 COSWGR01-2TB1-2/COHTCP06-TB1610-4 4

CO-YS-8775B 2TA3
- 25 COSWGR01-2TA3-25/COHTCP06-TB1610-5 5
- 26 COSWGR01-2TA3-26/COHTCP06-TB1610-6 6

CO-YS-8775C
- 27 COSWGR01-2TA3-27/COHTCP06-TB1610-7 7
- 28 COSWGR01-2TA3-28/COHTCP06-TB1610-8 8

CO-YS-8775D
- 29 COSWGR01-2TA3-29/COHTCP06-TB1610-9 9
- 30 COSWGR01-2TA3-30/COHTCP06-TB1610-10 10

CO-YS-8775E
- 16 COSWGR01-2TA3-16/COHTCP06-TB1610-11 11
- 17 COSWGR01-2TA3-17/COHTCP06-TB1610-12 12

CO-VFD-22

CO-HS-8778C TB2
- 3 COVFD22-TB2-3/COHTCP06-TB1610-13 1
- 4 COVFD22-TB2-4/COHTCP06-TB1610-14 2

CO-YS-8775F
- 31 COVFD22-TB2-31/COHTCP06-TB1610-15 3
- 32 COVFD22-TB2-32/COHTCP06-TB1610-16 4

CO-YS-8775G
- 33 COVFD22-TB2-33/COHTCP06-TB1610-18 5
- 34 COVFD22-TB2-34/COHTCP06-TB1610-19 6

CO-YS-8775H
- 35 COVFD22-TB2-35/COHTCP06-TB1610-20 7
- 36 COVFD22-TB2-36/COHTCP06-TB1610-21 8

CO-YS-8775J
- 37 COVFD22-TB2-37/COHTCP06-TB1610-22 9
- 38 COVFD22-TB2-38/COHTCP06-TB1610-23 10

CO-YS-8775K
- 29 COVFD22-TB2-29/COHTCP06-TB1610-24 11
- 30 COVFD22-TB2-30/COHTCP06-TB1610-25 12

CO-YS-8775L
- 39 COVFD22-TB2-39/COHTCP06-TB1610-26 13
- 40 COVFD22-TB2-40/COHTCP06-TB1610-27 14

CO-YS-8775M
- 41 COVFD22-TB2-41/COHTCP06-TB1610-28 15
- 42 COVFD22-TB2-42/COHTCP06-TB1610-29 16

CO-UA-8774
- 54 COVFD22-TB2-54/COHTCP06-TB1610-30 17
- 55 COVFD22-TB2-55/COHTCP06-TB1610-31 18

CO-YS-8775A
- 56 COVFD22-TB2-56/COHTCP06-TB1610-32 19
- 57 COVFD22-TB2-57/COHTCP06-TB1610-33 20

PART OF CABLE CO-C-2705

PART OF CABLE CO-C-2711

CO-HTCP-06 TB-1610

1 COSWGR01-2TB1-7/COHTCP06-TB1610-1	1	TB1610-2/R16-S10-1
2 COSWGR01-2TB1-8/COHTCP06-TB1610-2	2	
3 COSWGR01-2TB1-1/COHTCP06-TB1610-3	3	TB1610-4/R16-S10-2
4 COSWGR01-2TB1-2/COHTCP06-TB1610-4	4	
5 COSWGR01-2TA3-25/COHTCP06-TB1610-5	5	TB1610-6/R16-S10-3
6 COSWGR01-2TA3-26/COHTCP06-TB1610-6	6	
7 COSWGR01-2TA3-27/COHTCP06-TB1610-7	7	TB1610-8/R16-S10-4
8 COSWGR01-2TA3-28/COHTCP06-TB1610-8	8	
9 COSWGR01-2TA3-29/COHTCP06-TB1610-9	9	TB1610-10/R16-S10-5
10 COSWGR01-2TA3-30/COHTCP06-TB1610-10	10	
11 COSWGR01-2TA3-16/COHTCP06-TB1610-11	11	TB1610-12/R16-S10-6
12 COSWGR01-2TA3-17/COHTCP06-TB1610-12	12	
1 COVFD22-TB2-3/COHTCP06-TB1610-13	13	TB1610-14/R16-S10-7
2 COVFD22-TB2-4/COHTCP06-TB1610-14	14	
3 COVFD22-TB2-31/COHTCP06-TB1610-15	15	TB1610-16/R16-S10-8
4 COVFD22-TB2-32/COHTCP06-TB1610-16	16	
	17	TB1610-17/R16-S10-9
5 COVFD22-TB2-33/COHTCP06-TB1610-18	18	TB1610-19/R16-S10-10
6 COVFD22-TB2-34/COHTCP06-TB1610-19	19	
7 COVFD22-TB2-35/COHTCP06-TB1610-20	20	TB1610-21/R16-S10-11
8 COVFD22-TB2-36/COHTCP06-TB1610-21	21	
9 COVFD22-TB2-37/COHTCP06-TB1610-22	22	TB1610-23/R16-S10-12
10 COVFD22-TB2-38/COHTCP06-TB1610-23	23	
11 COVFD22-TB2-29/COHTCP06-TB1610-24	24	TB1610-24/R16-S10-13
12 COVFD22-TB2-30/COHTCP06-TB1610-25	25	
13 COVFD22-TB2-39/COHTCP06-TB1610-26	26	TB1610-27/R16-S10-14
14 COVFD22-TB2-40/COHTCP06-TB1610-27	27	
01		
15 COVFD22-TB2-41/COHTCP06-TB1610-28	28	TB1610-29/R16-S10-15
16 COVFD22-TB2-42/COHTCP06-TB1610-29	29	
17 COVFD22-TB2-54/COHTCP06-TB1610-30	30	TB1610-31/R16-S10-16
18 COVFD22-TB2-55/COHTCP06-TB1610-31	31	
19 COVFD22-TB2-56/COHTCP06-TB1610-32	32	TB1610-33/R16-S10-17
20 COVFD22-TB2-57/COHTCP06-TB1610-33	33	
	34	TB1610-34/R16-S10-18

0VDC +24VDC

DISCRETE INPUT MODULE (IC694MDL660)
RACK-16, SLOT-10

1	INPUT-1	CO-UA-8775 BOOSTER PUMP VFD, CO-VFD-22 CO-MFR-22, CO-SWGR-01 HEALTH STATUS ALARM
2	INPUT-2	CO-YS-8775P BOOSTER PUMP VFD, CO-VFD-22 CO-MFR-22, CO-SWGR-01 TRIP STATUS
3	INPUT-3	CO-YS-8775B BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR RACK OUT STATUS
4	INPUT-4	CO-YS-8775C BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR BLOWN FUSE STATUS
5	INPUT-5	CO-YS-8775D BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
6	INPUT-6	CO-YS-8775E BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR CLOSED STATUS
7	INPUT-7	CO-HS-8778C BOOSTER PUMP VFD, CO-VFD-22 ESD HAND SWITCH STATUS
8	INPUT-8	CO-YS-8775F BOOSTER PUMP VFD, CO-VFD-22 READY TO RUN
9	COM	COMMON (INPUT 1-8)
10	INPUT-9	CO-YS-8775G BOOSTER PUMP VFD, CO-VFD-22 RUN INDICATION
11	INPUT-10	CO-YS-8775H BOOSTER PUMP VFD, CO-VFD-22 ALARM INDICATION
12	INPUT-11	CO-YS-8775J BOOSTER PUMP VFD, CO-VFD-22 FAULT INDICATION
13	INPUT-12	CO-YS-8775K BOOSTER PUMP VFD, CO-VFD-22 SPEED DEMAND IN LOCAL
14	INPUT-13	CO-YS-8775L BOOSTER PUMP VFD, CO-VFD-22 BLOWER FAN FAIL
15	INPUT-14	CO-YS-8775M BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR CLOSE REQUEST
16	INPUT-15	CO-UA-8774 BOOSTER PUMP VFD, CO-VFD-22 CO-MFR-BPM-22, HEALTH STATUS ALARM
17	INPUT-16	CO-YS-8775A BOOSTER PUMP VFD, CO-VFD-22 CO-MFR-BPM-22 TRIP STATUS
18	COM	COMMON (INPUT 9-16)

CONTINUES ON DWG. 4663-05-03-SC-534

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. PART OF HARDWIRED ESD STRING. SEE DRAWING 4663-05-03-SC-006.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   - 4663-06-00-03-703 CO-TANK-21 AREA
   - 4663-06-00-03-706 CO-TANK-22 AREA
   - 4663-06-00-03-709 CO-TANK-23 AREA
   - 4663-06-00-03-712 CO-TANK-24 AREA
   - 4663-06-00-03-715 CO-TANK-25 AREA
   - 4663-06-00-03-718 CO-TANK-26 AREA
   - 4663-06-00-03-721 CO-TANK-27 AREA
   - 4663-06-00-03-724 CO-TANK-28 AREA
   - 4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   - 4663-06-00-03-748 CO-BOOSTER PUMP AREA
   - 4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0155
UEL# 2012016-1EF-CLD-000-0155-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-04-22	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY RRR 2014-Apr-24

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/16 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)

SCALE N.T.S. | DRAWING No 4663-05-03-SC-533 | REV 01

TMC DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CONTINUES ON DWG. 4663-05-03-SC-533

CO-VFD-22

CO-YS-8775N TB2
- 45 — COVFD22-TB2-45/COHTCP06-TB1610-35 — 21
- 46 — COVFD22-TB2-46/COHTCP06-TB1610-36 — 22

CO-SWGR-01

CO-UA-8655 3TA1
- 7 — COSWGR01-3TA1-7/COHTCP06-TB1610-37 — 1
- 8 — COSWGR01-3TA1-8/COHTCP06-TB1610-38 — 2

CO-YS-8655N
- 1 — COSWGR01-3TA1-1/COHTCP06-TB1610-39 — 3
- 2 — COSWGR01-3TA1-2/COHTCP06-TB1610-40 — 4

CO-YS-8655P 3TA2
- 25 — COSWGR01-3TA2-25/COHTCP06-TB1610-41 — 5
- 26 — COSWGR01-3TA2-26/COHTCP06-TB1610-42 — 6

CO-YS-8655Q
- 27 — COSWGR01-3TA2-27/COHTCP06-TB1610-43 — 7
- 28 — COSWGR01-3TA2-28/COHTCP06-TB1610-44 — 8

CO-YS-8655R
- 29 — COSWGR01-3TA2-29/COHTCP06-TB1610-45 — 9
- 30 — COSWGR01-3TA2-30/COHTCP06-TB1610-46 — 10

CO-YS-8655S
- 16 — COSWGR01-3TA2-16/COHTCP06-TB1610-47 — 11
- 17 — COSWGR01-3TA2-17/COHTCP06-TB1610-48 — 12

01

CO-C-2711

CO-C-2708

01

CO-SWGR-01

CO-UA-8655 3TB1
- 7 — COSWGR01-3TB1-7/COHTCP06-TB1610-52 — 1
- 8 — COSWGR01-3TB1-8/COHTCP06-TB1610-53 — 2

CO-YS-8655N
- 1 — COSWGR01-3TB1-1/COHTCP06-TB1610-54 — 3
- 2 — COSWGR01-3TB1-2/COHTCP06-TB1610-55 — 4

CO-YS-8655P 3TA3
- 25 — COSWGR01-3TA3-25/COHTCP06-TB1610-56 — 5
- 26 — COSWGR01-3TA3-26/COHTCP06-TB1610-57 — 6

CO-YS-8655Q
- 27 — COSWGR01-3TA3-27/COHTCP06-TB1610-58 — 7
- 28 — COSWGR01-3TA3-28/COHTCP06-TB1610-59 — 8

CO-YS-8655R
- 29 — COSWGR01-3TA3-29/COHTCP06-TB1610-60 — 9
- 30 — COSWGR01-3TA3-30/COHTCP06-TB1610-61 — 10

CO-YS-8655S
- 16 — COSWGR01-3TA3-16/COHTCP06-TB1610-62 — 11
- 17 — COSWGR01-3TA3-17/COHTCP06-TB1610-63 — 12

01

CO-C-2709

01

TO TBDC 4663-05-03-SC-503 POWER SUPPLY
- 0VDC — TBDC(-)-16/TB1610-68
- +24VDC — TBDC(+)-16/TB1610-66

0VDC +24VDC

CO-HTCP-06 TB-1610

21 COVFD22-TB2-45/COHTCP06-TB1610-35	35	TB1610-36/R16-S10-19	19	INPUT-17
22 COVFD22-TB2-46/COHTCP06-TB1610-36	36			
1 COVFD22-3TA1-7/COHTCP06-TB1610-37	37	TB1610-38/R16-S10-20	20	INPUT-18
2 COVFD22-3TA1-8/COHTCP06-TB1610-38	38			
3 COSWGR01-3TA1-1/COHTCP06-TB1610-39	39	TB1610-40/R16-S10-21	21	INPUT-19
4 COSWGR01-3TA1-2/COHTCP06-TB1610-40	40			
5 COSWGR01-3TA2-25/COHTCP06-TB1610-41	41	TB1610-42/R16-S10-22	22	INPUT-20
6 COSWGR01-3TA2-26/COHTCP06-TB1610-42	42			
7 COSWGR01-3TA2-27/COHTCP06-TB1610-43	43	TB1610-44/R16-S10-23	23	INPUT-21
8 COSWGR01-3TA2-28/COHTCP06-TB1610-44	44			
9 COSWGR01-3TA2-29/COHTCP06-TB1610-45	45	TB1610-46/R16-S10-24	24	INPUT-22
10 COSWGR01-3TA2-30/COHTCP06-TB1610-46	46			
11 COSWGR01-3TA2-16/COHTCP06-TB1610-47	47	TB1610-48/R16-S10-25	25	INPUT-23
12 COSWGR01-3TA2-17/COHTCP06-TB1610-48	48			
	49	TB1610-50/R16-S10-26	26	INPUT-24
	50			
	51	TB1610-51/R16-S10-27	27	COM
1 COSWGR01-3TB1-7/COHTCP06-TB1610-52	52	TB1610-53/R16-S10-28	28	INPUT-25
2 COSWGR01-3TB1-8/COHTCP06-TB1610-53	53			
3 COSWGR01-3TB1-1/COHTCP06-TB1610-54	54	TB1610-55/R16-S10-29	29	INPUT-26
4 COSWGR01-3TB1-2/COHTCP06-TB1610-55	55			
5 COSWGR01-3TA3-25/COHTCP06-TB1610-56	56	TB1610-57/R16-S10-30	30	INPUT-27
6 COSWGR01-3TA3-26/COHTCP06-TB1610-57	57			
7 COSWGR01-3TA3-27/COHTCP06-TB1610-58	58	TB1610-59/R16-S10-31	31	INPUT-28
8 COSWGR01-3TA3-28/COHTCP06-TB1610-59	59			
9 COSWGR01-3TA3-29/COHTCP06-TB1610-60	60	TB1610-61/R16-S10-32	32	INPUT-29
10 COSWGR01-3TA3-30/COHTCP06-TB1610-61	61			
11 COSWGR01-3TA3-16/COHTCP06-TB1610-62	62	TB1610-63/R16-S10-33	33	INPUT-30
12 COSWGR01-3TA3-17/COHTCP06-TB1610-63	63			
	64	TB1610-65/R16-S10-34	34	INPUT-31
	65			
	66	TB1610-67/R16-S10-35	35	INPUT-32
	67			
	68	TB1610-68/R16-S10-36	36	COM

DISCRETE INPUT MODULE (IC694MDL660)
RACK-16, SLOT-10

19	CO-YS-8775N BOOSTER PUMP VFD, CO-VFD-11 DRIVE OVER TURQUE LIMIT STATUS ALARM
20	CO-UA-8655 STATION TRANSFORMER, CO-T-11 CO-MFR-11,CO-SWGR-01 FAULT STATUS ALARM
21	CO-YS-8655N STATION TRANSFORMER, CO-T-11 CO-MFR-11, CO-SWGR-01 TRIP STATUS 01
22	CO-YS-8655P STATION TRANSFORMER, CO-T-11 INPUT CONTACTOR RACK OUT STATUS
23	CO-YS-8655Q STATION TRANSFORMER, CO-T-11 INPUT CONTACTOR BLOWN FUSE STATUS
24	CO-YS-8655R STATION TRANSFORMER, CO-T-11 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
25	CO-YS-8655S STATION TRANSFORMER, CO-T-11 INPUT CONTACTOR CLOSED STATUS
26	SPARE
27	COMMON (INPUT 17-24)
28	CO-UA-8658 STATION TRANSFORMER, CO-T-12 CO-MFR-12, CO-SWGR-01 FAULT STATUS ALARM
29	CO-YS-8658N STATION TRANSFORMER, CO-T-12 CO-MFR-12 CO-SWGR-01
30	CO-YS-8658P STATION TRANSFORMER, CO-T-12 INPUT CONTACTOR RACK OUT STATUS 01
31	CO-YS-8658Q STATION TRANSFORMER, CO-T-12 INPUT CONTACTOR BLOWN FUSE STATUS
32	CO-YS-8658R STATION TRANSFORMER, CO-T-12 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
33	CO-YS-8658S STATION TRANSFORMER, CO-T-12 INPUT CONTACTOR CLOSED STATUS
34	SPARE
35	SPARE
36	COMMON (INPUT 25-32)

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   - 4663-06-00-03-703 CO-TANK-21 AREA
   - 4663-06-00-03-706 CO-TANK-22 AREA
   - 4663-06-00-03-709 CO-TANK-23 AREA
   - 4663-06-00-03-712 CO-TANK-24 AREA
   - 4663-06-00-03-715 CO-TANK-25 AREA
   - 4663-06-00-03-718 CO-TANK-26 AREA
   - 4663-06-00-03-721 CO-TANK-27 AREA
   - 4663-06-00-03-724 CO-TANK-28 AREA
   - 4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   - 4663-06-00-03-748 CO-BOOSTER PUMP AREA
   - 4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

- FUSED TERMINAL WITH 250mA FUSE.
- DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0156
UEL# 2012016-1EF-CLD-000-0156-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
01	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT — PERMIT/ ENG. APPROVAL — DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 99880

For Rev 01 only 2015-APR-23

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, and Geoscientists of Alberta

REV. NO. — DATE — PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		05

CO-HTCP-06, PLC-11/16 SLOT 10
DISCRETE INPUT
I/O WIRING DIAGRAM (SHEET 2 OF 2)

SCALE	DRAWING No	REV
N.T.S.	4663-05-03-SC-534	01

TC_A1_BR.DWG 594X841

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CO-SWGR-01

CO-UA-8795 1TB1
- 7 COSWGR01-1TB1-7/COHTCP06-TB1611-1 1
- 8 COSWGR01-1TB1-8/COHTCP06-TB1611-2 2

CO-YS-8795P
- 1 COSWGR01-1TB1-1/COHTCP06-TB1611-3 3
- 2 COSWGR01-1TB1-2/COHTCP06-TB1611-4 4

CO-YS-8795B 1TA3
- 25 COSWGR01-1TA3-25/COHTCP06-TB1611-5 5
- 26 COSWGR01-1TA3-26/COHTCP06-TB1611-6 6

CO-YS-8795C
- 27 COSWGR01-1TA3-27/COHTCP06-TB1611-7 7
- 28 COSWGR01-1TA3-28/COHTCP06-TB1611-8 8

CO-YS-8795D
- 29 COSWGR01-1TA3-29/COHTCP06-TB1611-9 9
- 30 COSWGR01-1TA3-30/COHTCP06-TB1611-10 10

CO-YS-8795E
- 16 COSWGR01-1TA3-16/COHTCP06-TB1611-11 11
- 17 COSWGR01-1TA3-17/COHTCP06-TB1611-12 12

CO-VFD-24

CO-HS-8798C TB2
- 3 COVFD24-TB2-3/COHTCP06-TB1611-13 1
- 4 COVFD24-TB2-4/COHTCP06-TB1611-14 2

CO-YS-8795F
- 31 COVFD24-TB2-31/COHTCP06-TB1611-15 3
- 32 COVFD24-TB2-32/COHTCP06-TB1611-16 4

CO-YS-8795G
- 33 COVFD24-TB2-33/COHTCP06-TB1611-18 5
- 34 COVFD24-TB2-34/COHTCP06-TB1611-19 6

CO-YS-8795H
- 35 COVFD24-TB2-35/COHTCP06-TB1611-20 7
- 36 COVFD24-TB2-36/COHTCP06-TB1611-21 8

CO-YS-8795J
- 37 COVFD24-TB2-37/COHTCP06-TB1611-22 9
- 38 COVFD24-TB2-38/COHTCP06-TB1611-23 10

CO-YS-8795K
- 29 COVFD24-TB2-29/COHTCP06-TB1611-24 11
- 30 COVFD24-TB2-30/COHTCP06-TB1611-25 12

CO-YS-8795L
- 39 COVFD24-TB2-39/COHTCP06-TB1611-26 13
- 40 COVFD24-TB2-40/COHTCP06-TB1611-27 14

CO-YS-8795M
- 41 COVFD24-TB2-41/COHTCP06-TB1611-28 15
- 42 COVFD24-TB2-42/COHTCP06-TB1611-29 16

CO-UA-8794
- 54 COVFD24-TB2-54/COHTCP06-TB1611-30 17
- 55 COVFD24-TB2-55/COHTCP06-TB1611-31 18

CO-YS-8795A
- 56 COVFD24-TB2-56/COHTCP06-TB1611-32 19
- 57 COVFD24-TB2-57/COHTCP06-TB1611-33 20

PART OF CABLE CO-C-2707

PART OF CABLE CO-C-2713

CO-HTCP-06 TB-1611

1 COSWGR01-1TB1-7/COHTCP06-TB1611-1	1	TB1611-2/R16-S11-1
2 COSWGR01-1TB1-8/COHTCP06-TB1611-2	2	
3 COSWGR01-1TB1-1/COHTCP06-TB1611-3	3	TB1611-4/R16-S11-2
4 COSWGR01-1TB1-2/COHTCP06-TB1611-4	4	
5 COSWGR01-1TA3-25/COHTCP06-TB1611-5	5	TB1611-6/R16-S11-3
6 COSWGR01-1TA3-26/COHTCP06-TB1611-6	6	
7 COSWGR01-1TA3-27/COHTCP06-TB1611-7	7	TB1611-8/R16-S11-4
8 COSWGR01-1TA3-28/COHTCP06-TB1611-8	8	
9 COSWGR01-1TA3-29/COHTCP06-TB1611-9	9	TB1611-10/R16-S11-5
10 COSWGR01-1TA3-30/COHTCP06-TB1611-10	10	
11 COSWGR01-1TA3-16/COHTCP06-TB1611-11	11	TB1611-12/R16-S11-6
12 COSWGR01-1TA3-17/COHTCP06-TB1611-12	12	
1 COVFD24-TB2-3/COHTCP06-TB1611-13	13	TB1611-14/R16-S11-7
2 COVFD24-TB2-4/COHTCP06-TB1611-14	14	
3 COVFD24-TB2-31/COHTCP06-TB1611-15	15	TB1611-16/R16-S11-8
4 COVFD24-TB2-32/COHTCP06-TB1611-16	16	
	17	TB1611-17/R16-S11-9
5 COVFD24-TB2-33/COHTCP06-TB1611-18	18	TB1611-19/R16-S11-10
6 COVFD24-TB2-34/COHTCP06-TB1611-19	19	
7 COVFD24-TB2-35/COHTCP06-TB1611-20	20	TB1611-21/R16-S11-11
8 COVFD24-TB2-36/COHTCP06-TB1611-21	21	
9 COVFD24-TB2-37/COHTCP06-TB1611-22	22	TB1611-23/R16-S11-12
10 COVFD24-TB2-38/COHTCP06-TB1611-23	23	
11 COVFD24-TB2-29/COHTCP06-TB1611-24	24	TB1611-24/R16-S11-13
12 COVFD24-TB2-30/COHTCP06-TB1611-25	25	
13 COVFD24-TB2-39/COHTCP06-TB1611-26	26	TB1611-27/R16-S11-14
14 COVFD24-TB2-40/COHTCP06-TB1611-27	27	
01 15 COVFD24-TB2-41/COHTCP06-TB1611-28	28	TB1611-29/R16-S11-15
16 COVFD24-TB2-42/COHTCP06-TB1611-29	29	
17 COVFD24-TB2-54/COHTCP06-TB1611-30	30	TB1611-31/R16-S11-16
18 COVFD24-TB2-55/COHTCP06-TB1611-31	31	
19 COVFD24-TB2-56/COHTCP06-TB1611-32	32	TB1611-33/R16-S11-17
20 COVFD24-TB2-57/COHTCP06-TB1611-33	33	
	34	TB1611-34/R16-S11-18

0VDC +24VDC

CONTINUES ON DWG. 4663-05-03-SC-536

DISCRETE INPUT MODULE (IC694MDL660)
RACK-16, SLOT-11

1	INPUT-1	CO-UA-8795 BOOSTER PUMP VFD, CO-VFD-24 CO-MFR-24, CO-SWGR-01 HEALTH STATUS ALARM
2	INPUT-2	CO-YS-8795P BOOSTER PUMP VFD, CO-VFD-24 CO-MFR-24, CO-SWGR-01 TRIP STATUS
3	INPUT-3	CO-YS-8795B BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR RACK OUT STATUS
4	INPUT-4	CO-YS-8795C BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR BLOWN FUSE STATUS
5	INPUT-5	CO-YS-8795D BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR LOSS OF CONTROL VOLTAGE STATUS
6	INPUT-6	CO-YS-8795E BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR CLOSED STATUS
7	INPUT-7	CO-HS-8798C BOOSTER PUMP VFD, CO-VFD-24 ESD HAND SWITCH STATUS
8	INPUT-8	CO-YS-8795F BOOSTER PUMP VFD, CO-VFD-24 READY TO RUN
9	COM	COMMON (INPUT 1-8)
10	INPUT-9	CO-YS-8795G BOOSTER PUMP VFD, CO-VFD-24 RUN INDICATION
11	INPUT-10	CO-YS-8795H BOOSTER PUMP VFD, CO-VFD-24 ALARM INDICATION
12	INPUT-11	CO-YS-8795J BOOSTER PUMP VFD, CO-VFD-24 FAULT INDICATION
13	INPUT-12	CO-YS-8795K BOOSTER PUMP VFD, CO-VFD-24 SPEED DEMAND IN LOCAL
14	INPUT-13	CO-YS-8795L BOOSTER PUMP VFD, CO-VFD-24 BLOWER FAN FAIL
15	INPUT-14	CO-YS-8795M BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR CLOSE REQUEST
16	INPUT-15	CO-UA-8795 BOOSTER PUMP VFD, CO-VFD-24 CO-MFR-BPM-24 HEALTH STATUS ALARM
17	INPUT-16	CO-YS-8795A BOOSTER PUMP VFD, CO-VFD-24 CO-MFR-BPM-24 TRIP STATUS
18	COM	COMMON (INPUT 9-16)

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. PART OF HARDWIRED ESD STRING. SEE DRAWING 4663-05-03-SC-006.
6. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   - 4663-06-00-03-703 CO-TANK-21 AREA
   - 4663-06-00-03-706 CO-TANK-22 AREA
   - 4663-06-00-03-709 CO-TANK-23 AREA
   - 4663-06-00-03-712 CO-TANK-24 AREA
   - 4663-06-00-03-715 CO-TANK-25 AREA
   - 4663-06-00-03-718 CO-TANK-26 AREA
   - 4663-06-00-03-721 CO-TANK-27 AREA
   - 4663-06-00-03-724 CO-TANK-28 AREA
   - 4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   - 4663-06-00-03-748 CO-BOOSTER PUMP AREA
   - 4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0157
UEL# 2012016-1EF-CLD-000-0157-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2014-04-22	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
2197104	BEM	TAE	HHM	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODS 9 0 2014-APR-24

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.

PERMIT NUMBER: P 5508

The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/16 SLOT 11 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 1 OF 2)

SCALE N.T.S. | DRAWING No 4663-05-03-SC-535 | REV 01

TIME---DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

FIELD

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21)

TERMINAL CONTROL PANEL (CO-HTCP-06)

CONTINUES ON DWG. 4663-05-03-SC-535

CO-VFD-24

CO-YS-8795N TB2
45 COVFD24-TB2-45/COHTCP06-TB1611-35 21
46 COVFD24-TB2-46/COHTCP06-TB1611-36 22

PART OF CABLE CO-C-2713

21 COVFD24-TB2-45/COHTCP06-TB1611-35
22 COVFD24-TB2-46/COHTCP06-TB1611-36

0VDC +24VDC

CO-HTCP-06 TB-1611

DISCRETE INPUT MODULE (IC694MDL660) RACK-16, SLOT-11

35/36	TB1611-36/R16-S11-19	19	INPUT-17	CO-YS-8795N BOOSTER PUMP VFD, CO-VFD-24 DRIVE OVER TORQUE LIMIT STATUS ALARM
37/38	TB1611-38/R16-S11-20	20	INPUT-18	SPARE
39/40	TB1611-40/R16-S11-21	21	INPUT-19	SPARE
41/42	TB1611-42/R16-S11-22	22	INPUT-20	SPARE
43/44	TB1611-44/R16-S11-23	23	INPUT-21	SPARE
45/46	TB1611-46/R16-S11-24	24	INPUT-22	SPARE
47/48	TB1611-48/R16-S11-25	25	INPUT-23	SPARE
49/50	TB1611-50/R16-S11-26	26	INPUT-24	SPARE
51	TB1611-51/R16-S11-27	27	COM	COMMON (INPUT 17-24)
52/53	TB1611-53/R16-S11-28	28	INPUT-25	SPARE
54/55	TB1611-55/R16-S11-29	29	INPUT-26	SPARE
56/57	TB1611-57/R16-S11-30	30	INPUT-27	SPARE
58/59	TB1611-59/R16-S11-31	31	INPUT-28	SPARE
60/61	TB1611-61/R16-S11-32	32	INPUT-29	SPARE
62/63	TB1611-63/R16-S11-33	33	INPUT-30	SPARE
64/65	TB1611-65/R16-S11-34	34	INPUT-31	SPARE
66/67	TB1611-67/R16-S11-35	35	INPUT-32	SPARE
68	TB1611-68/R16-S11-36	36	COM	COMMON (INPUT 25-32)

TO TBDC 4663-05-03-SC-503 POWER SUPPLY

0VDC → TBDC(-)-17/TB1611-68

+24VDC → TBDC(+)-17/TB1611-66

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

FUSED TERMINAL WITH 250mA FUSE.

DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0158
UEL# 2012016-1EF-CLD-000-0158-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER JAMES DOOD ALBERTA

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

2014-MAR-7

REV. NO. | DATE | PERMIT NUMBER:

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

TransCanada — in business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-HTCP-06, PLC-11/16 SLOT 11 DISCRETE INPUT I/O WIRING DIAGRAM (SHEET 2 OF 2)

SCALE N.T.S. | DRAWING No 4663-05-03-SC-536 | REV 00

TIME — DESIGNFILE

TC_A1_BR.DWG 594x841

ELECTRICAL EQUIPMENT SHELTER (CO-VES-21) | FIELD

TERMINAL CONTROL PANEL (CO-HTCP-06)

DISCRETE OUTPUT MODULE (IC694MDL740) RACK-16, SLOT-12

CO-HTCP-06 TB-1612

+24VDC INPUT	DC+	1	R16-S12-1/TB1612-1	1
CO-YA-8775A BOOSTER PUMP VFD, CO-VFD-22 START COMMAND	OUTPUT-1	2	R16-S12-2/TB1612-2	2
				3
CO-YA-8775B BOOSTER PUMP VFD, CO-VFD-22 STOP COMMAND	OUTPUT-2	3	R16-S12-3/TB1612-4	4
				5
CO-YA-8775C BOOSTER PUMP VFD, CO-VFD-22 FAULT RESET COMMAND	OUTPUT-3	4	R16-S12-4/TB1612-6	6
				7
CO-YA-8775D BOOSTER PUMP VFD, CO-VFD-22 BLOWER FAN RE-START COMMAND	OUTPUT-4	5	R16-S12-5/TB1612-8	8
				9
CO-YA-8775E BOOSTER PUMP VFD, CO-VFD-22 INPUT CONTACTOR CLOSE COMMAND	OUTPUT-5	6	R16-S12-6/TB1612-10	10
				11
SPARE	OUTPUT-6	7	R16-S12-7/TB1612-12	12
				13
SPARE	OUTPUT-7	8	R16-S12-8/TB1612-14	14
				15
SPARE	OUTPUT-8	9	R16-S12-9/TB1612-16	16
				17
COMMON (INPUT 1-8)	COM	10	R16-S12-10/TB1612-18	18
				19
+24VDC INPUT	DC+	11	R16-S12-11/TB1612-20	20
CO-YA-8795A BOOSTER PUMP VFD, CO-VFD-24 START COMMAND	OUTPUT-9	12	R16-S12-12/TB1612-21	21
				22
CO-YA-8795B BOOSTER PUMP VFD, CO-VFD-24 STOP COMMAND	OUTPUT-10	13	R16-S12-13/TB1612-23	23
				24
CO-YA-8795C BOOSTER PUMP VFD, CO-VFD-24 FAULT RESET COMMAND	OUTPUT-11	14	R16-S12-14/TB1612-25	25
				26
CO-YA-8795D BOOSTER PUMP VFD, CO-VFD-24 BLOWER FAN RE-START COMMAND	OUTPUT-12	15	R16-S12-15/TB1612-27	27
				28
CO-YA-8795E BOOSTER PUMP VFD, CO-VFD-24 INPUT CONTACTOR CLOSE COMMAND	OUTPUT-13	16	R16-S12-16/TB1612-29	29
				30
SPARE	OUTPUT-14	17	R16-S12-17/TB1612-31	31
				32
SPARE	OUTPUT-15	18	R16-S12-18/TB1612-33	33
				34
SPARE	OUTPUT-16	19	R16-S12-19/TB1612-35	35
				36
COMMON (INPUT 9-16)	1-COM	20	R16-S12-20/TB1612-37	37

TO TBDC 4663-05-03-SC-403 POWER SUPPLY

- 0VDC — TBDC(-)18/TB1612-37
- +24VDC — TBDC(+)18/TB1612-20

TB-RLY-2

TB1612-2/TBRLY2-RL17-A1	RL17	COVFD22-TB2-7/COHTCP06-TBRLY2-RL17-11	1	PART OF CABLE CO-C-2722	CO-VFD-22 TB2 7 — CO-YA-8775A
TB1612-3/TBRLY2-RL17-A2		COVFD22-TB2-8/COHTCP06-TBRLY2-RL17-14	2		TB2 8 — CO-YA-8775A
TB1612-4/TBRLY2-RL18-A1	RL18	COVFD22-TB2-9/COHTCP06-TBRLY2-RL18-11	3		TB2 9 — CO-YA-8775B
TB1612-5/TBRLY2-RL18-A2		COVFD22-TB2-10/COHTCP06-TBRLY2-RL18-14	4		TB2 10 — CO-YA-8775B
TB1612-6/TBRLY2-RL19-A1	RL19	COVFD22-TB2-11/COHTCP06-TBRLY2-RL19-11	5		TB2 11 — CO-YA-8775C
TB1612-7/TBRLY2-RL19-A2		COVFD22-TB2-12/COHTCP06-TBRLY2-RL19-14	6		TB2 12 — CO-YA-8775C
TB1612-8/TBRLY2-RL20-A1	RL20	COVFD22-TB2-13/COHTCP06-TBRLY2-RL20-11	7		TB2 13 — CO-YA-8775D
TB1612-9/TBRLY2-RL20-A2		COVFD22-TB2-14/COHTCP06-TBRLY2-RL20-14	8		TB2 14 — CO-YA-8775D
TB1612-10/TBRLY2-RL21-A1	RL21	COVFD22-2TA3-38/COHTCP06-TBRLY2-RL21-11	1	PART OF CABLE CO-C-2822	CO-MVC-22 2TA3 38 — CO-YA-8775E
TB1612-11/TBRLY2-RL21-A2		COVFD22-2TA3-39/COHTCP06-TBRLY2-RL21-14	2		2TA3 39 — CO-YA-8775E
TB1612-12/TBRLY2-RL22-A1	RL22				
TB1612-13/TBRLY2-RL22-A2					
TB1612-14/TBRLY2-RL23-A1	RL23				
TB1612-15/TBRLY2-RL23-A2					
TB1612-16/TBRLY2-RL24-A1	RL24				
TB1612-17/TBRLY2-RL24-A2					
TB1612-21/TBRLY2-RL25-A1	RL25	COVFD24-TB2-7/COHTCP06-TBRLY2-RL25-11	1	PART OF CABLE CO-C-2724	CO-VFD-24 TB2 7 — CO-YA-8795A
TB1612-22/TBRLY2-RL25-A2		COVFD24-TB2-8/COHTCP06-TBRLY2-RL25-14	2		TB2 8 — CO-YA-8795A
TB1612-23/TBRLY2-RL26-A1	RL26	COVFD24-TB2-9/COHTCP06-TBRLY2-RL26-11	3		TB2 9 — CO-YA-8795B
TB1612-24/TBRLY2-RL26-A2		COVFD24-TB2-10/COHTCP06-TBRLY2-RL26-14	4		TB2 10 — CO-YA-8795B
TB1612-25/TBRLY2-RL27-A1	RL27	COVFD24-TB2-11/COHTCP06-TBRLY2-RL27-11	5		TB2 11 — CO-YA-8795C
TB1612-26/TBRLY2-RL27-A2		COVFD24-TB2-12/COHTCP06-TBRLY2-RL27-14	6		TB2 12 — CO-YA-8795C
TB1612-27/TBRLY2-RL28-A1	RL28	COVFD24-TB2-13/COHTCP06-TBRLY2-RL28-11	7		TB2 13 — CO-YA-8795D
TB1612-28/TBRLY2-RL28-A2		COVFD24-TB2-14/COHTCP06-TBRLY2-RL28-14	8		TB2 14 — CO-YA-8795D
TB1612-29/TBRLY2-RL29-A1	RL29	COVFD24-1TA3-38/COHTCP06-TBRLY2-RL29-11	1	PART OF CABLE CO-C-2824	CO-MVC-24 1TA3 38 — CO-YA-8795E
TB1612-30/TBRLY2-RL29-A2		COVFD24-1TA3-39/COHTCP06-TBRLY2-RL29-14	2		1TA3 39 — CO-YA-8795E
TB1612-31/TBRLY2-RL30-A1	RL30				
TB1612-32/TBRLY2-RL30-A2					
TB1612-33/TBRLY2-RL31-A1	RL31				
TB1612-34/TBRLY2-RL31-A2					
TB1612-35/TBRLY2-RL32-A1	RL32				
TB1612-36/TBRLY2-RL32-A2					

NOTES:

1. ALL INSTRUMENT TAG NUMBERS SHOWN IN THIS DRAWING SHALL BE PREFIXED BY "130-KSHTT".
2. SPARE WIRES SHALL BE COILED, MARKED AND TAPED.
3. WIRES MUST BE PREPARED TO ALLOW WIRE NUMBER SLEEVES TO BE APPLIED AT BOTH TERMINATION ENDS.
4. PANEL VENDOR SHALL SUPPLY, INSTALL, MARK AND TERMINATE ALL INTERNAL WIRING.
5. FOR INSTRUMENT LOCATIONS REFER TO INSTRUMENT LOCATION PLAN DWGS OR SAFETY PLAN DWG LISTED BELOW:
   4663-06-00-03-703 CO-TANK-21 AREA
   4663-06-00-03-706 CO-TANK-22 AREA
   4663-06-00-03-709 CO-TANK-23 AREA
   4663-06-00-03-712 CO-TANK-24 AREA
   4663-06-00-03-715 CO-TANK-25 AREA
   4663-06-00-03-718 CO-TANK-26 AREA
   4663-06-00-03-721 CO-TANK-27 AREA
   4663-06-00-03-724 CO-TANK-28 AREA
   4663-06-00-03-745 CO-VALVE MANIFOLD AREA
   4663-06-00-03-748 CO-BOOSTER PUMP AREA
   4663-09-00-01-004 BLDGS CO-EES-21, 22, AND VES 21

LEGEND:

- FUSED TERMINAL WITH 250mA FUSE.
- DISCONNECT TEST TERMINAL

SDN# 25472-130-J5-0000-P0159
UEL# 2012016-1EF-CLD-000-0159-01

REFERENCE DRAWINGS

DRAWING No	TITLE
-	

REVISION

REV No	DATE	DESCRIPTION
00	2014-03-07	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA — JAMES DOOLEY — 2014-MAR-12

PERMIT/ ENG. APPROVAL — DATE

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO.	DATE	PERMIT NUMBER:

TransCanada — In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		05

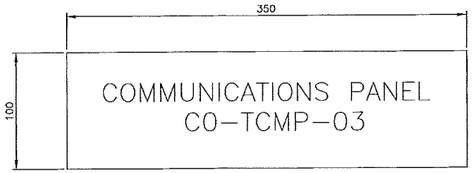
CO-HTCP-06, PLC-11/16 SLOT 12 DISCRETE OUTPUT - STATIC I/O WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-05-03-SC-537	00

TIMESTAMP — DESIGNFILE

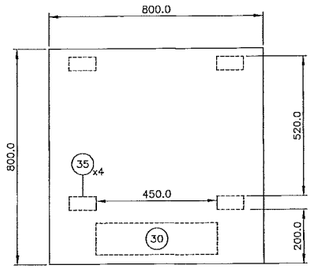
TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

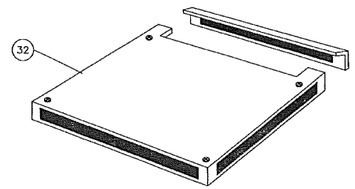


LAMACOID NAMEPLATE
BLACK LETTERING ON WHITE
BACKGROUND (LETTERING 20mm HIGH)
NP1

DETAIL 1
SCALE N.T.S.



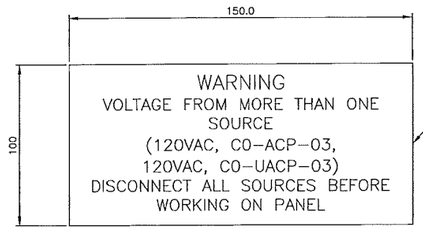
TOP VIEW
SCALE N.T.S



ROOF PLATE
SCALE N.T.S

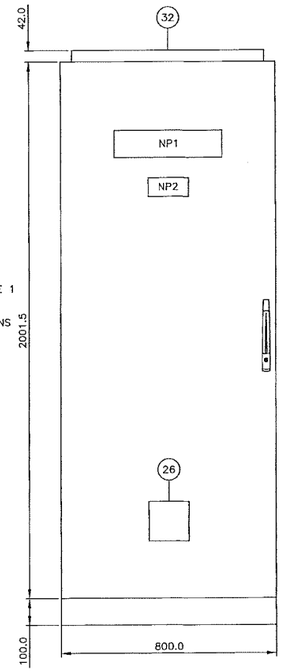
NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE NOTED.
2. FRONT DOOR SHALL BE PROVIDED WITH NAMEPLATE AND WARNING AS SHOWN.
5. PANEL VENDOR TO FINALIZE PANEL LAYOUT.
6. BILL OF MATERIAL SHOWN ON DWG 4663-04-03-PA-202.

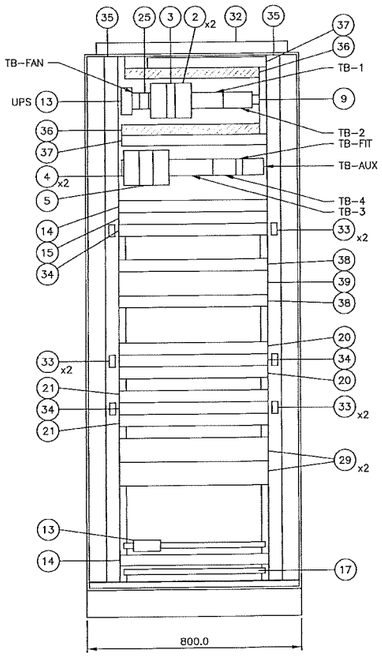


LAMACOID NAMEPLATE
WHITE LETTERING ON RED BACKGROUND
(WARNING LETTERING TO BE 6mm HIGH,
THE REST OF LETTERING TO BE 4.8mm HIGH)
NP2

DETAIL 2
SCALE N.T.S.

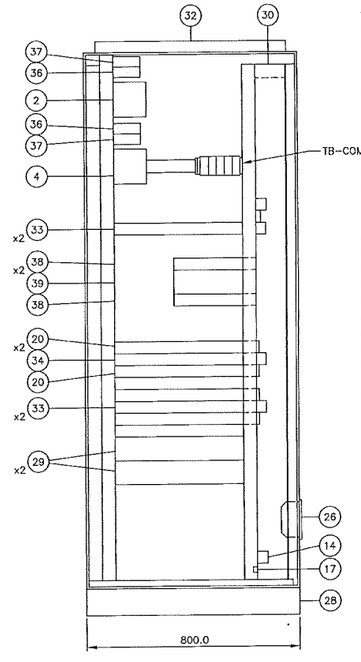


FRONT VIEW
SCALE N.T.S



FRONT VIEW
(DOOR REMOVED)

01



RIGHT SIDE
(INSIDE WALL)

SDN# 25472-130-TO-0000-P0201
UEL# 2012016-1EF-CAB-000-0301-01

REFERENCE DRAWINGS	
DRAWING No	TITLE
4663-04-03-PA-202	KHTT COMMUNICATION PANEL CO-TCMP-03 BILL OF MATERIAL

REVISION			APPROVAL						
REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
01	2013-11-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	MAF	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DODD ALBERTA
2013-NOV-20

REV. NO. | DATE

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

PERMIT NUMBER:

TransCanada
in business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 04

KHTT COMMUNICATION PANEL CO-TCMP-03 (CO-VES-21) PANEL LAYOUT

SCALE 1:10 | DRAWING No 4663-04-03-PA-201 | REV 01

TIME DESIGNFILE

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS

CO-VES-21

CO-TCMP-03

SCADA SWITCH
KP-HRDSY-SW1201

BUSINESS SWITCH
KP-HRDSY-SW1211

CONS

100 BASET

SFP

SW1201-1/PP1-R1
SW1201-2/PP1-R2
SW1201-3/PP1-R3
SW1201-4/PP1-R4
SW1201-5/PP1-R5
SW1201-6/PP1-R6
SW1201-7/PP1-R7
SW1201-8/PP1-R8
SW1201-9/PP1-R9
SW1201-10/PP1-R10
SW1201-11/PP1-R11
SW1201-12/PP1-R12
SW1201-13/PP1-R13
SW1201-13/PP1-R14
SW1201-15/PP1-R15
SW1201-16/PP1-R16

SW1201-SFP21-TX/FPP0003A-4
SW1201-SFP21-RX/FPP0003A-3
SW1201-SFP22-RX/FPP0003B-4
SW1201-SFP22-TX/FPP0003B-3

CO-FPP-0003A
CO-FPP-0003B

4663-04-00-LY-002

REAR FRONT

NOTE 1, 2

CO-CS-2720 CO-MFR-BPM-21
CO-CS-2721 CO-VFD-21
CO-CS-2722 CO-MFR-21
CO-CS-2735 CO-MFR-B-01
CO-CS-2723 CO-MFR-BPM-22
CO-CS-2724 CO-VFD-22
CO-CS-2725 CO-MFR-22
CO-CS-2736 CO-MFR-B-02
CO-CS-2726 CO-MFR-BPM-23
CO-CS-2727 CO-VFD-23
CO-CS-2728 CO-MFR-23
CO-CS-2729 CO-MFR-BPM-24
CO-CS-2730 CO-VFD-24
CO-CS-2731 CO-MFR-24
CO-CS-2737 CO-MFR-T-11
CO-CS-2738 CO-MFR-T-12

SW1211-6/PP1-20R

IP PHONE
FOR OCCASIONAL WORKSTATION CONNECTION

RJ-45
P/P #1

SW1211-21/PP1-21R
SW1211-22/PP1-22R
SW1211-23/PP1-23R

SW1211-SFP21-TX/FPP0003A-4
SW1211-SFP21-RX/FPP0003A-3
SW1211-SFP22-RX/FPP0003B-4
SW1211-SFP22-TX/FPP0003B-3

NOTES:

1. BY EES VENDOR.
2. CAT 6 STRAIGHT THROUGH CABLE.

LEGEND:

- FIBER OPTIC (FOR THIS DWG)
- FIBER OPTIC PATCH CORD (FOR THIS DWG)
- COPPER WIRE (FOR THIS DWG)
- SURGE ARRESTOR
- SM SINGLE-MODE
- MM MULTI-MODE
- CO-CS-XXXX CABLE TAG
- XXXX-XX-XX-XX-XXX FROM/TO ARROW

ABBREVIATIONS:

CCTV	– CLOSED CIRCUIT TELEVISION
EES	– ELECTRICAL EQUIPMENT SHELTER
FPP	– FIBER PATCH PANEL
HMI	– HUMAN MACHINE INTERFACE
HTCP	– HARDISTY TERMINAL CONTROL PANEL
P/P	– PATCH PANEL
PLC	– PROGRAMMABLE LOGIC CONTROLLER
SCADA	– SUPERVISORY CONTROL AND DATA ACQUISITION
TCMP	– TERMINAL COMMUNICATION PANEL

SDN# 25472-130-170-0000-P0085
UEL# 2012016-1EF-EWD-000-0085-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-04-00-LY-002	HARDISTY KHTT TERMINAL FIBER OPTIC WIRING DIAGRAM

REVISION

REV No.	DATE	DESCRIPTION
00	2014-02-12	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA JAMES DOOLEY 2014-FEB-12

PERMIT/ ENG. APPROVAL

DATE

PERMIT TO PRACTICE
UPSIDE ENGINEERING LTD.
PERMIT NUMBER: P 5508
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

REV. NO. | DATE | PERMIT NUMBER:

TransCanada
In business to deliver

upside Engineering Ltd.

KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 04

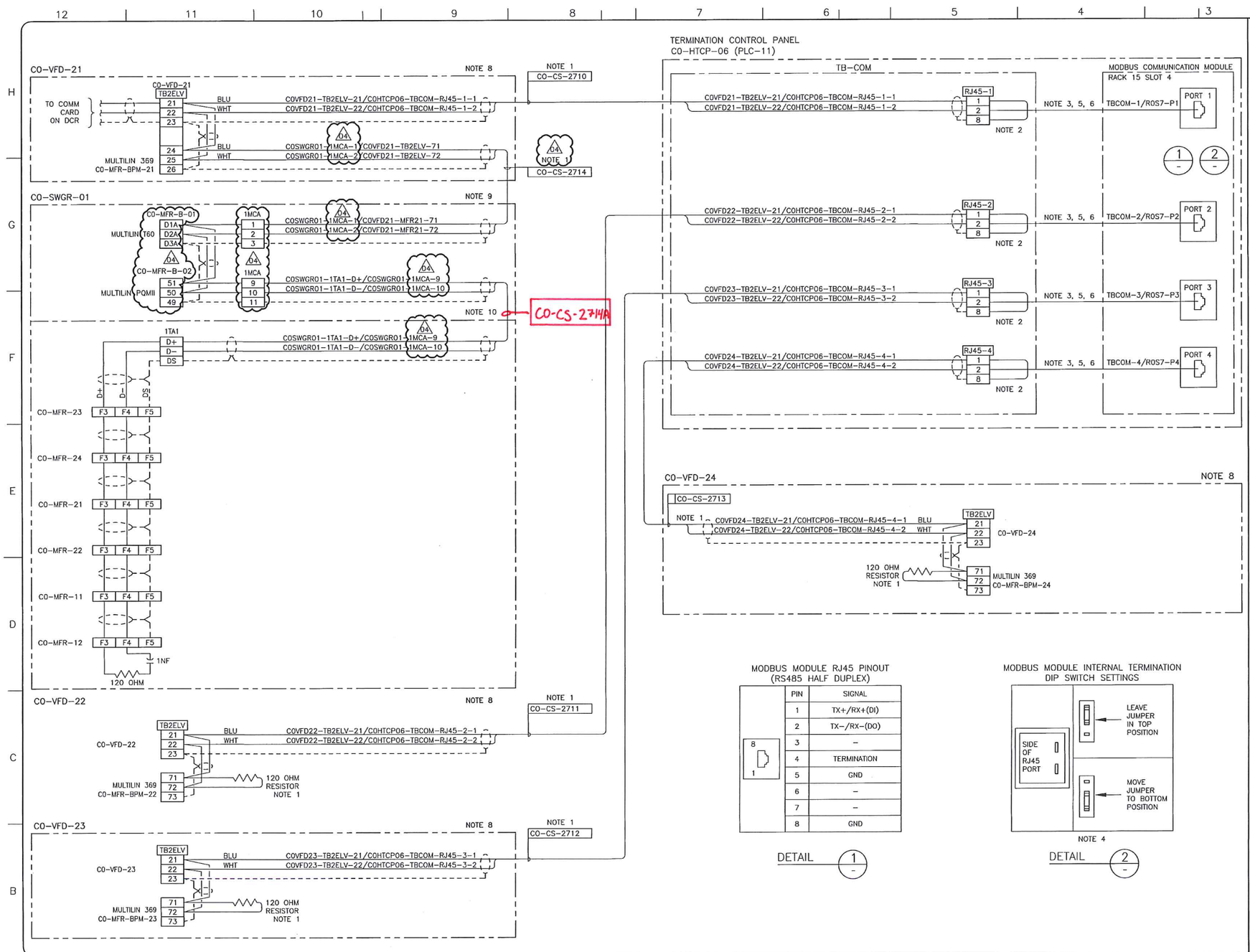
KHTT COMMUNICATION PANELS
CO-TCMP-03 (CO-VES-21)
COMMUNICATIONS WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-04-00-WD-085 | REV 00

TIME: DESIGNFILE:

TC_A1_BR.DWG 594X841

CADD DRAWING: DO NOT MAKE MANUAL REVISIONS



NOTES:

1. BY EES VENDOR.
2. RJ-45 TERMINAL BLOCK WITH SCREWED TERMINALS ON FIELD SIDE & RJ CONNECTOR ON TERMINAL PLC SIDE.
3. CAT 6 STRAIGHT THROUGH CABLE WITH RJ-45 CONNECTOR ON BOTH ENDS.
4. TO ENABLE 120 OHM TERMINATION RESISTOR FOR RJ-45 MODBUS PORT.
5. BY PANEL VENDOR.
6. CABLE TO BE TAGGED AT BOTH ENDS WHEN INSTALLED BETWEEN DEVICES IN SAME PANEL.
7. BY EQUIPMENT VENDOR.
8. REFER TO SIEMENS DWG. ASE32776090A-5 (BECHTEL SDN# 25472-130-V1A-EW2-P0014).
9. REFER TO SIEMENS DWG. MVS13-30130433-100SC01C1 (BECHTEL SDN# 25472-130-V1A-ES00-P0001).
10. REFER TO SIEMENS DWG. MVC13-30130433-100SC05C1 (BECHTEL SDN# 25472-130-V1A-ES00-P0013).

MODBUS COMMUNICATION MODULE PORT ASSIGNMENTS:

PORT 1 – CO-VFD-21, CO-SWGR-01 (BAUD RATE = 19.2K, PARITY EVEN)
PORT 2 – CO-VFD-22 (BAUD RATE = 19.2K, PARITY EVEN)
PORT 3 – CO-VFD-23 (BAUD RATE = 19.2K, PARITY EVEN)
PORT 4 – CO-VFD-24 (BAUD RATE = 19.2K, PARITY EVEN)

ABBREVIATIONS:

MEWS	– MEASUREMENT ENGINEERING WORKSTATION
FOC	– FIBER OPTIC CONVERTOR
HMI	– HUMAN MACHINE INTERFACE
M/TCP	– MODBUS TRANSMISSION PROTOCOL
SCADA	– SUPERVISORY CONTROL AND DATA ACQUISITION
SYB	– SYBERVISOR
TKM	– TANKMASTER
MB	– METERBANK
PLC	– PROGRAMMABLE LOGIC CONTROLLER
FBM	– FIELD BUS MODEM
RTG	– REMOTE TANK GAUGE
FCU	– FIELD COMMUNICATION UNIT
MFR	– MULTI-FUNCTION RELAY
MM	– MULTI-MODE
P/P	– PATCH PANEL
PLS	– PROGRAMMABLE LOGIC SOLVER
CCTV	– CLOSED CIRCUIT TELEVISION
EES	– ELECTRICAL EQUIPMENT SHELTER
MCC	– MOTOR CONTROL CENTER
TCP	– TERMINAL CONTROL PANEL
TCMP	– TERMINAL COMMUNICATION PANEL
BPM	– BOOSTER PUMP MOTOR
B	– POWER QUALITY METER
FPP	– FIBER PATCH PANEL
TCP/IP	– TRANSMISSION CONTROL PROTOCOL/INTERNET PROTOCOL
ESB	– ELECTRICAL SERVICE BUILDING
GE/SRTP	– GENERAL ELECTRIC/SECURE REAL TIME TRANSFER PROTOCOL
HE	– HARDISTY EAST
KVM	– KEYBOARD, VIDEO AND MOUSE
ILO	– INTEGRATED LIGHT OUT
FW	– FIREWALL

LEGEND:

——— COPPER WIRE
– – – – – – FIBER OPTIC
** EXISTING EQUIPMENT OR CONNECTION

SDN# 25472-130-J1-0000-P0086
UEL# 2012016-1EF-CSY-000-0086-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-06-02-03-001	CO-VES-21 ELECTRICAL EQUIPMENT LAYOUT AND FLOOR CUT-OUTS

REVISION

REV No	DATE	DESCRIPTION	PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
01	2013-11-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	RQC	DMC	SRL	JED	DCB	UPSIDE
02	2014-02-12	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	JIM	DMC	SRL	JED	DCB	UPSIDE
03	2014-04-23	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	PRG	TAE	HHM	JED	DCB	UPSIDE
04	2015-04-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)	2197104	EDK	MTM	NJR	VMA	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT | PERMIT/ ENG. APPROVAL | DATE

PROFESSIONAL ENGINEER ALBERTA NIMA ROHANI 99060 2015-04-23
FOR REV 04 ONLY

PERMIT TO PRACTICE UPSIDE ENGINEERING LTD.
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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 05

CO-VES-21
MODBUS RS485 NETWORK (CO-VES-21) INTERCONNECTING WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-05-00-SC-086 | REV 04

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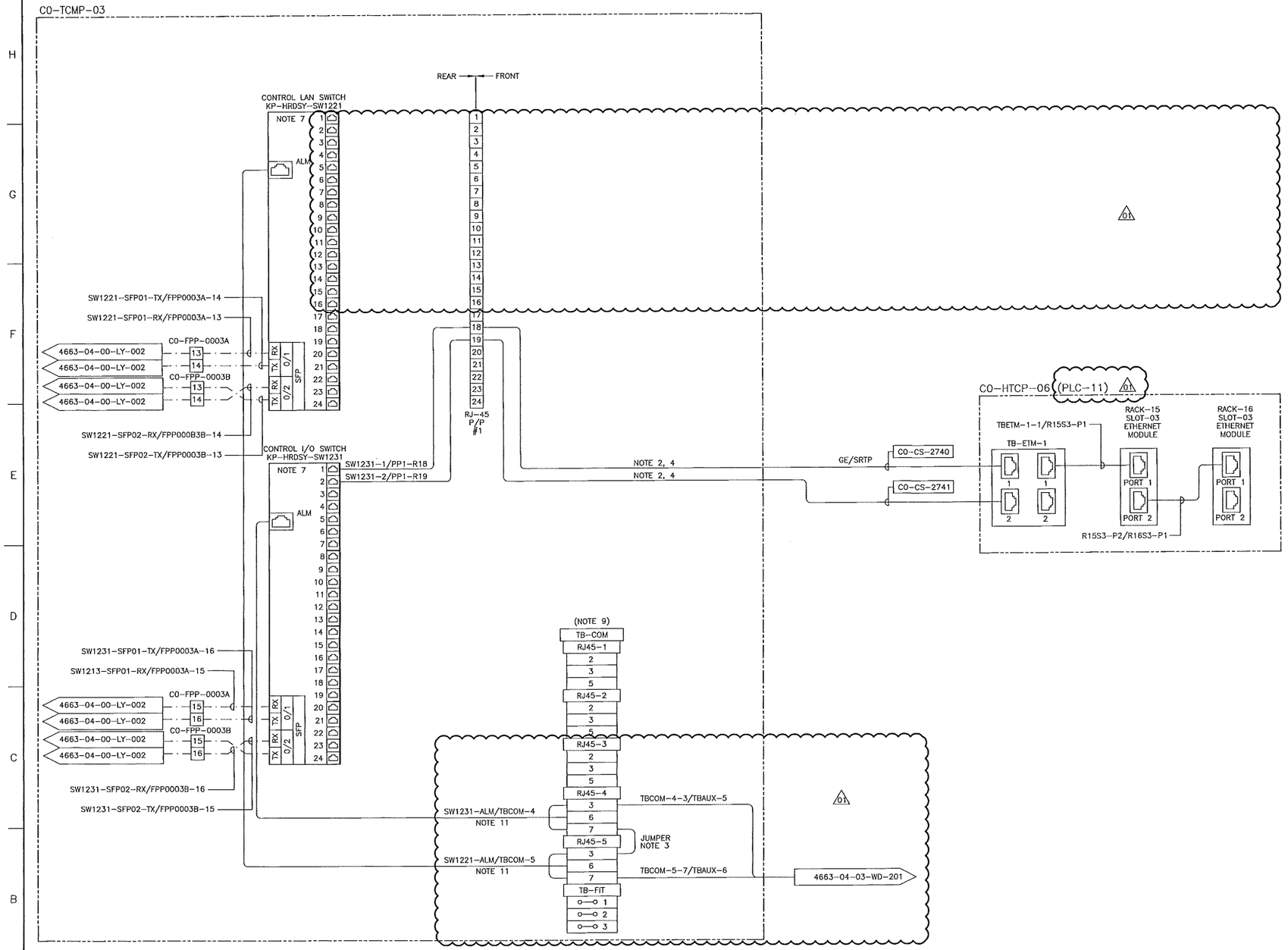

NOTES:

1. NOT USED.
2. BY EES VENDOR.
3. BY PANEL VENDOR.
4. CAT 6 STRAIGHT THROUGH CABLE.
5. NOT USED.
6. WIRING INTERNAL TO PANELS/CABINETS IS COMPLETED BY 6.
7. PORTS 1-24 ARE 100 BASE T.
8. NOT USED.
9. SCREW TERMINALS ON FIELD SIDE, RJ45 SOCKET ON OTHER.
10. NOT USED.
11. CABLE TO BE TAGGED AT BOTH ENDS WHEN INSTALLED BETWEEN DEVICES IN SAME PANEL.

LEGEND:

- FIBER OPTIC
- FIBER OPTIC PATCH CORD
- COPPER WIRE

ABBREVIATIONS:

MEWS	– MEASUREMENT ENGINEERING WORKSTATION
FOC	– FIBRE OPTIC CONVERTOR
HMI	– HUMAN MACHINE INTERFACE
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TCMP	– TERMINAL COMMUNICATION PANEL
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HE	– HARDISTY EAST
KVM	– KEYBOARD, VIDEO AND MOUSE
ILO	– INTEGRATED LIGHT OUT
FW	– FIREWALL

SDN# 25472-130-J1-0000-P0085
UEL# 2012016-1EF-CSY-000-0085-01

REFERENCE DRAWINGS

DRAWING No	TITLE
4663-04-00-LY-002	HARDISTY KHTT TERMINAL FIBER OPTIC WIRING DIAGRAM
4663-05-03-SC-519	CO-HTCP-06, PLC-11/15 SLOT 10 DISCRETE INPUT I/O WIRING DIAGRAM

REVISION

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2013-11-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
2197104	RQC	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PERMIT/ ENG. APPROVAL

DATE

PROFESSIONAL ENGINEER ALBERTA JAMES DOODY 2013-NOV-20

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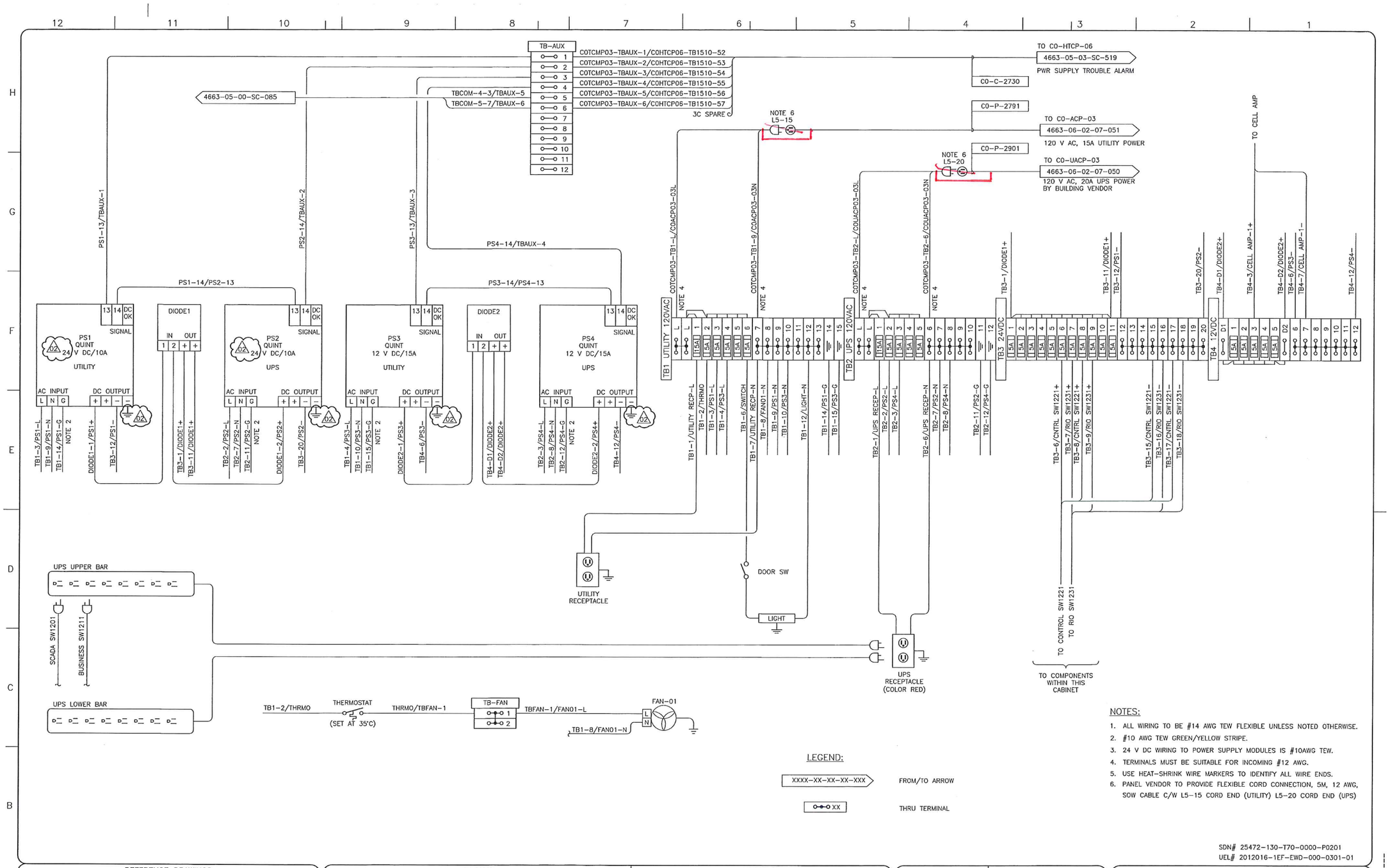
KEYSTONE HARDISTY TANK TERMINAL

FIA #	CHAINAGE:	DISCIPLINE #
4663		05

HARDISTY KHTT TERMINAL
CO-VES-21
CONTROL SYSTEM WIRING DIAGRAM

SCALE	DRAWING No	REV
N.T.S.	4663-05-00-SC-085	01

TIME ---------- DESIGNFILE



LEGEND:

XXXX-XX-XX-XX-XXX — FROM/TO ARROW

XX — THRU TERMINAL

NOTES:

1. ALL WIRING TO BE #14 AWG TEW FLEXIBLE UNLESS NOTED OTHERWISE.
2. #10 AWG TEW GREEN/YELLOW STRIPE.
3. 24 V DC WIRING TO POWER SUPPLY MODULES IS #10AWG TEW.
4. TERMINALS MUST BE SUITABLE FOR INCOMING #12 AWG.
5. USE HEAT-SHRINK WIRE MARKERS TO IDENTIFY ALL WIRE ENDS.
6. PANEL VENDOR TO PROVIDE FLEXIBLE CORD CONNECTION, 5M, 12 AWG, SOW CABLE C/W L5-15 CORD END (UTILITY) L5-20 CORD END (UPS)

SDN# 25472-130-T70-0000-P0201
UEL# 2012016-1EF-EWD-000-0301-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2013-10-03	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
01	2013-11-20	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)
02	2014-02-12	RE-ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	SKC	DMC	SRL	JED	DCB	UPSIDE
2197104	MAF	DMC	SRL	JED	DCB	UPSIDE
2197104	BEM	DMC	SRL	JED	DCB	UPSIDE
			SRL	JED	DCB	

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER ALBERTA — JAMES DOODY — 2014-FEB-12

REV. NO. 02 | DATE | PERMIT NUMBER:

PERMIT/ ENG. APPROVAL

DATE

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KEYSTONE HARDISTY TANK TERMINAL

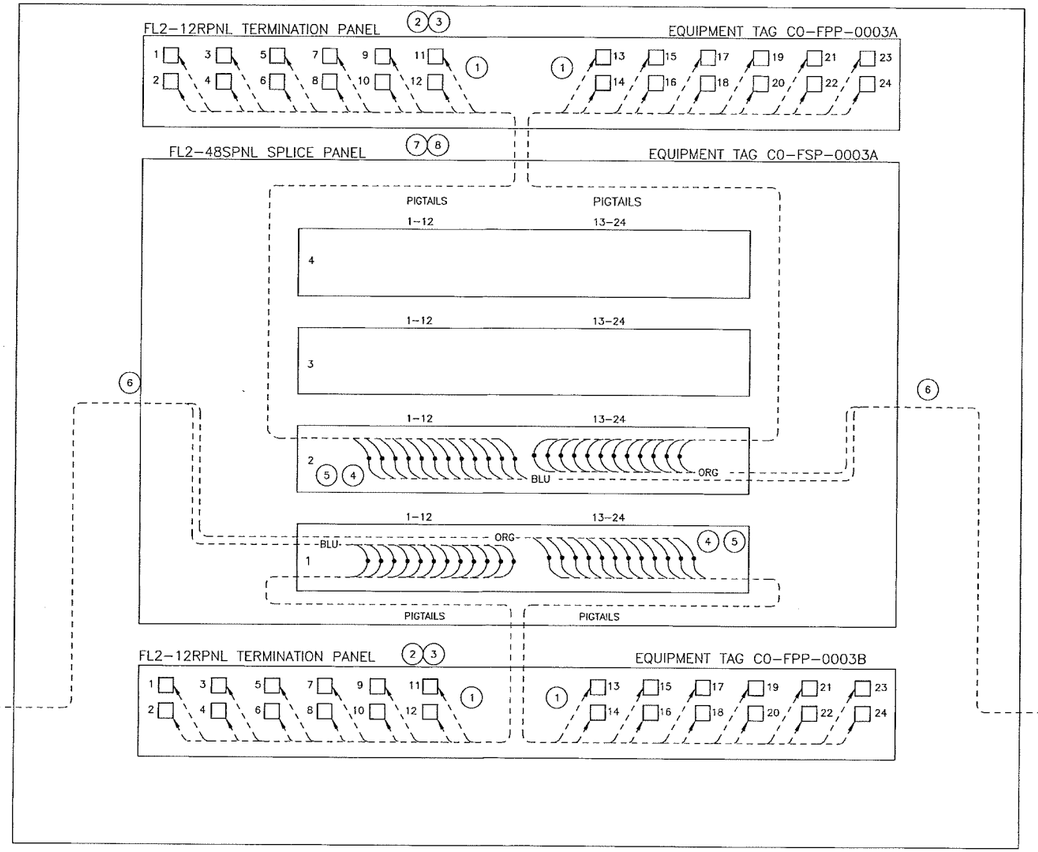
FIA # 4663 | CHAINAGE: | DISCIPLINE # 04

KHTT COMMUNICATION PANEL CO-TCMP-03 (CO-VES-21) POWER DISTRIBUTION WIRING DIAGRAM

SCALE N.T.S. | DRAWING No 4663-04-03-WD-201 | REV 02

TIME — DESIGNFILE

TC_A1_BR.DWG 594X841



EQUIPMENT IDENTIFICATION LIST			
ITEM	MFR	PART #	DESCRIPTION
1	TE	FL2-6P8SC605R	6-PAK PLUG-IN WITH LC CONNECTORS
2	TE	FL2-12RPNL	12 PORT PATCH PANEL
3	TE	FL2-FLMT175	1RU FLUSH MOUNT KIT
4	TE	FST-DRS24-HS	SPLICE WHEEL 24 FIBER
5	TE	FST-ACC001	SPLICE PROTECTORS
6	TE	FL2-ACC007	CABLE CLAMP KIT
7	TE	FL2-48SPNL2	48 PORTS SPLICE PANEL
8	TE	FL2-FLMT0350	2RU FLUSHMOUNT KIT

NOTES:

1. MANUFACTURER TYCO ELECTRONICS ABBREVIATED TO "TE".
2. PANEL VENDOR TO SUPPLY ALL MATERIALS, SHIP LOOSE PANEL MATERIALS WHICH REQUIRE SITE INSTALLATION.

LEGEND:

- FIBER OPTIC LC TYPE BULKHEAD CONNECTION
- FIBER OPTIC FUSION SPLICE (MULTIMODE)
- FIBER OPTIC FUSION SPLICE (SINGLEMODE)
- SINGLEMODE FIBER OR CABLE
- MULTIMODE FIBER OR CABLE

FIBER OPTIC CABLE COLOUR CODE		
ACR	STRAND/TUBE COLOR	TUBE/STRAND #
BLU	BLUE	1
ORG	ORANGE	2
GRN	GREEN	3
BRN	BROWN	4
SLT	SLATE	5
WHT	WHITE	6
RED	RED	7
BLK	BLACK	8
YLW	YELLOW	9
VLT	VIOLET	10
PNK	PINK (ROSE)	11
AQU	AQUA	12

SDN# 25472-130-T70-0000-P0210
UEL# 2012016-1EF-EWD-000-0210-01

REFERENCE DRAWINGS

DRAWING No	TITLE

REVISION

REV No	DATE	DESCRIPTION
00	2014-02-12	ISSUED FOR CONSTRUCTION (UEL PROJ. #2012016)

APPROVAL

PROJECT CODE	DRAFTER	DRAFTING CHECKER	DESIGNER	DESIGN CHECKER	PROJECT MANAGER	COMPANY
2197104	JIM	DMC	SRL	JED	DCB	UPSIDE

PROFESSIONAL ENGINEER/RPT

PROFESSIONAL ENGINEER JAMES DOODY 2014-FEB-12

PERMIT/ ENG. APPROVAL

DATE

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KEYSTONE HARDISTY TANK TERMINAL

FIA # 4663 | CHAINAGE: | DISCIPLINE # 04

HARDISTY KHTT TERMINAL
C0-FPP-0003A/B (C0-VES-21)
FIBER OPTIC CONNECTION DIAGRAM

SCALE N.T.S. | DRAWING No 4663-04-03-WD-210 | REV 00

TIME ---- DESIGNFILE

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