GENERAL

1. ALL WORK SHALL MEET OR EXCEED MINIMUM REQUIREMENTS OF THE NATIONAL BUILDING CODE OF CANADA 2015, ASSOCIATED STANDARDS REFERENCED IN THAT CODE, AND LOCAL STANDARDS AND BYLAWS AS APPLICABLE.
2. READ STRUCTURAL DRAWINGS IN CONJUNCTION WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL, DRAWINGS.
3. ALL DIMENSIONS ARE IN METRIC UNITS UNLESS NOTED. VERIFY ALL DIMENSIONS AND ELEVATIONS PRIOR TO CONSTRUCTION AND REPORT ANY DISCREPANCIES TO THE DEPARTMENTAL REPRESENTATIVE BEFORE PROCEEDING. DO NOT SCALE DRAWINGS.
4. REFER TO ARCHITECTURAL, MECHANICAL, AND ELECTRICAL DRAWINGS FOR RECESSES, INSERTS, SLEEVES, ETC, WHICH MUST BE CAST OR FORMED IN THE CAST-IN-PLACE CONCRETE.
5. CONFIRM THE SIZE AND LOCATION OF OPENINGS WITH ARCHITECTURAL, MECHANICAL, AND ELECTRICAL CONTRACTORS. REPORT ANY DISCREPANCIES TO THE DEPARTMENTAL REPRESENTATIVE BEFORE PROCEEDING.
6. THE STRUCTURAL DRAWINGS HEREIN REPRESENT THE FINISHED STRUCTURE. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY GUYING AND BRACING REQUIRED TO ERECT AND HOLD THE STRUCTURE IN PROPER ALIGNMENT UNTIL ALL STRUCTURAL WORK AND CONNECTIONS HAVE BEEN COMPLETED. THE INVESTIGATION, DESIGN, ADEQUACY, AND INSPECTION OF ERECTION BRACING, SHORING, TEMPORARY SUPPORTS, ETC, ARE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
7. DRAWINGS INDICATE GENERAL AND TYPICAL DETAILS OF CONSTRUCTION. WHERE CONDITIONS ARE NOT SPECIFICALLY SHOWN, SIMILAR DETAILS OF CONSTRUCTION SHALL BE USED, SUBJECT TO THE APPROVAL OF THE DEPARTMENTAL REPRESENTATIVE.
8. ALL STRUCTURAL SYSTEMS WHICH ARE TO BE COMPOSED OF COMPONENTS TO BE FIELD ERECTED SHALL BE SUPERVISED BY THE SUPPLIER DURING MANUFACTURING, DELIVERY, HANDLING, STORAGE, AND ERECTION IN ACCORDANCE WITH THE SUPPLIER'S INSTRUCTIONS AND REQUIREMENTS.
9. LOADING APPLIED TO THE STRUCTURE DURING THE PROCESS OF CONSTRUCTION SHALL NOT EXCEED THE SAFE LOAD-CARRYING CAPACITY OF THE STRUCTURAL MEMBERS. DESIGN LOADS ARE INDICATED WITHIN THESE NOTES. DO NOT APPLY CONSTRUCTION LOADS UNTIL STRUCTURAL FRAMING IS PROPERLY CONNECTED AND TEMPORARY BRACING IS IN PLACE.
10. SUBMITTALS:
    1. PROVIDE TO THE DEPARTMENTAL REPRESENTATIVE FOR REVIEW, SUBMITTALS FOR THE FOLLOWING:
       A) SHORING
       B) CONCRETE MIX DESIGNS
       C) CONCRETE AND MASONRY REINFORCING
       D) STRUCTURAL STEEL
       E) METAL DECKING
    2. FULLY DETAIL SHOP DRAWINGS SHOWING ALL INFORMATION NECESSARY FOR FABRICATION AND INSTALLATION IN ACCORDANCE WITH INDUSTRY STANDARDS.
    3. ALL SUBMITTALS SHALL BE IN METRIC UNITS.
    4. DO NOT COMMENCE FABRICATION UNTIL REVIEWED SUBMITTAL HAS BEEN RETURNED. REVIEW OF SUBMITTALS DOES NOT RELIEVE THE CONTRACTOR FROM COMPLIANCE WITH THE CONTRACT DOCUMENTS.
11. NOTIFY THE DEPARTMENTAL REPRESENTATIVE 48 HOURS IN ADVANCE FOR SITE REVIEW OF STRUCTURAL WORK.
12. REPORT TO THE DEPARTMENTAL REPRESENTATIVE ALL WORKS THAT DO NOT COMPLY WITH THE PROJECT REQUIREMENTS AND SUBMIT REMEDIAL WORKS PROPOSAL FOR COMMENT / AGREEMENT. DEFECTIVE WORK AND SUBSTANDARD MATERIALS SHALL BE RECTIFIED SATISFACTORILY OR REMOVED FROM SITE.

DESIGN CRITERIA

1. DESIGN STANDARDS:
   GENERAL: NATIONAL BUILDING CODE OF CANADA, 2015
   CONCRETE: CSA STANDARDS A23.1, A23.2, AND A23.3
   MASONRY: CSA STANDARD S304.1
   STRUCTURAL STEEL: CSA STANDARD S16
2. CLIMATIC DESIGN DATA:
   24 HOUR RAIN (1/50): 103 mm
   GROUND SNOW LOAD (1/50): Ss = 1.4 kPa
   ASSOCIATED RAIN LOAD (1/50): Sr = 0.1 kPa
   HOURLY WIND PRESSURES: q(1/50) = 0.49 kPa
   q(1/10) = 0.38 kPa
3. SEISMIC DESIGN DATA:
   SPECTRAL ACCELERATION: Sa(0.2) = 0.101
   Sa(0.5) = 0.060
   Sa(1.0) = 0.030
   Sa(2.0) = 0.013
   Sa(5.0) = 0.0027
   Sa(10.0) = 0.0013
   PEAK GROUND ACCELERATION: PGA = 0.061
   PEAK GROUND VELOCITY: PGV = 0.043

BORED CONCRETE PILES

1. PILES HAVE BEEN DESIGNED BASED ON THE FOLLOWING ULTIMATE LIMIT STATES DESIGN PARAMETERS:
   ULTIMATE SKIN FRICTION BEARING PRESSURES:
   0 TO 2.0 m BELOW GRADE: 0 kPa
   2.0 m TO 8.0 m BELOW GRADE: 75 kPa
   GREATER THAN 8.0 m BELOW GRADE: 125 kPa
   RESISTANCE FACTOR FOR DEEP FOUNDATIONS: 0.4

RAFT SLABS AND FOOTINGS

1. RAFT SLABS AND FOOTINGS HAVE BEEN DESIGNED BASED ON THE FOLLOWING ULTIMATE LIMIT STATES DESIGN PARAMETERS:
   ULTIMATE BEARING PRESSURE: 300 kPa
   RESISTANCE FACTOR FOR SHALLOW FOUNDATIONS: 0.5
2. EXCAVATE TO UNDISTURBED SOIL. REMOVE ALL ORGANIC AND DELETERIOUS MATERIAL.
3. PROOF-ROLL SUB-GRADE TO DELINEATE ANY SOFT AREAS. SOFT AREAS SHALL BE EXCAVATED AND REPLACED WITH SUITABLE, NON-EXPANSIVE FILL, PLACED AND COMPACTED TO 96 PERCENT OF STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).
4. SUB-GRADE FILL SHOULD CONSIST OF GRANULAR MATERIAL OR NON-EXPANSIVE FINE-GRAINED SOILS, PLACED IN THIN LIFTS (MAXIMUM 150 mm LOOSE). EACH LIFT SHALL BE COMPACTED TO 96 PERCENT OF SPMDD PRIOR TO PLACEMENT OF NEXT LIFT.
5. BENEATH THE SLABS AND FOOTINGS, PROVIDE MINIMUM 200 mm CRUSHED, WELL GRADED, GRANULAR BASE COURSE COMPACTED TO 98 PERCENT OF SPMDD.
6. CAST SLABS AND FOOTINGS ON 0.15 mm POLYETHYLENE SHEETING.
7. DO NOT CAST SLABS OR FOOTINGS ON DESICCATED, FROZEN, OR WET SUB-GRADE OR BASE.
8. DO NOT ALLOW THE SUB-GRADE OR BASE BENEATH THE SLAB OR FOOTING TO FREEZE PRIOR TO, DURING, OR AFTER CONSTRUCTION.

CONCRETE AND MASONRY REINFORCING

1. CONCRETE AND MASONRY REINFORCING WORK SHALL BE IN ACCORDANCE WITH CSA A23.1, CSA S304.1, ACI 315, AND THE RSIC REINFORCING STEEL MANUAL OF STANDARD PRACTICE.
2. ALL REINFORCING TO BE CONTINUOUS. SPLICE ONLY AS DETAILED OR APPROVED BY THE DEPARTMENTAL REPRESENTATIVE. UNLESS DETAILED OTHERWISE, ALL LAP SPLICES SHALL BE CLASS B TENSION SPLICES.
3. WHERE NOT SPECIFICALLY DETAILED, REINFORCING STEEL SHALL BE PROTECTED BY CONCRETE COVER AS FOLLOWS:
   CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH: 75 mm
   OTHERWISE: 40 mm
4. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   REINFORCING STEEL: CSA G30.18, GRADE 400, PLAIN FINISH, DEFORMED BARS
   WELDABLE REINFORCING STEEL: CSA G30.18, GRADE 400W, PLAIN FINISH, DEFORMED BARS
   10M STIRRUPS AND TIES: CSA G30.18, GRADE 300, PLAIN FINISH, DEFORMED BARS
5. WELDING OF REINFORCING SHALL NOT BE DONE WITHOUT APPROVAL OF THE DEPARTMENTAL REPRESENTATIVE. WELDING SHALL CONFORM TO CSA W186, AND WELDER CERTIFICATION MUST BE VALID AND IN FORCE DURING THE CONSTRUCTION PERIOD. PORTIONS OF REINFORCING WHICH HAVE BEEN COLD BENT SHALL NOT BE WELDED.
6. SUBMIT SHOP DRAWINGS TO THE DEPARTMENTAL REPRESENTATIVE FOR REVIEW PRIOR TO FABRICATION.

CAST-IN-PLACE CONCRETE

1. CAST-IN-PLACE CONCRETE WORK SHALL BE IN ACCORDANCE WITH CSA A23.1.
2. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   CEMENT: CSA A3001
   WATER: CSA A23.1/A23.2
   AGGREGATES: CSA A23.1/A23.2
   ADMIXTURES: AIR ENTRAINING ADMIXTURE TO ASTM C260
   CHEMICAL ADMIXTURES TO ASTM C494
   GROUT: PREMIXED, NON-SHRINK, NON-METALLIC GROUT WITH MINIMUM STRENGTH AT 4 DAYS OF 20 MPa, AND AT 28 DAYS OF 40 MPa
3. SUPPLEMENTARY CEMENTING MATERIALS WITH A MAXIMUM OF 20 PERCENT TYPE F FLY ASH REPLACEMENT BY MASS OF TOTAL CEMENTITIOUS MATERIALS, IN ACCORDANCE WITH CSA A3001, IS PERMITTED.
4. THE USE OF ACCELERATING OR SET RETARDING ADMIXTURES DURING HOT AND COLD WEATHER SHALL BE APPROVED BY THE DEPARTMENTAL REPRESENTATIVE. ADMIXTURES CONTAINING CALCIUM CHLORIDE ARE NOT PERMITTED.
5. CONCRETE MIXES SHALL BE DESIGNED TO MEET THE FOLLOWING PERFORMANCE CRITERIA IN ACCORDANCE WITH CSA A23.1 TABLE 5, ALTERNATIVE 1:

TYPE	CEMENT TYPE	MINIMUM COMPRESSIVE STRENGTH (MPa)	MAX W/C RATIO	MAX AGGREGATE SIZE (mm)	AIR CONTENT RANGE (%)	LOCATION
A	HS/HSb	32 AT 28 DAYS	0.45	20	5-8	ALL CONCRETE IN CONTACT WITH THE SUBGRADE SOIL
B	GU/GUb	32 AT 28 DAYS	0.45	20	NATURAL	ALL OTHER CONCRETE

6. SUBMIT CONCRETE MIX DESIGNS TO THE DEPARTMENTAL REPRESENTATIVE FOR REVIEW PRIOR TO COMMENCEMENT OF WORK.
7. ENSURE REINFORCEMENT AND INSERTS ARE NOT DISTURBED DURING CONCRETE PLACEMENT. DO NOT PLACE CONCRETE AGAINST FROZEN GROUND OR IN STANDING WATER.

REINFORCED MASONRY

1. MASONRY WORK SHALL BE IN ACCORDANCE WITH CSA S304.1 AND CSA A371.
2. CELLS CONTAINING REINFORCING SHALL BE COMPLETELY FILLED WITH GROUT IN LIFTS NOT EXCEEDING 2 METERS. CONSOLIDATE GROUT BY VIBRATING DURING POURING.
3. PROVIDE CLEAN-OUT HOLES IN THE BOTTOM COURSE OR ALL CELLS TO BE FILLED WITH GROUT. REMOVE ALL OVERHANGING MORTAR AND DEBRIS FROM INSIDE CELLS PRIOR TO GROUTING.
4. UNLESS INDICATED OTHERWISE, ALL MASONRY SHALL BE LAID IN RUNNING BOND. BOND CORNERS AND INTERSECTIONS OF LOAD BEARING WALLS, PROVIDE CONTROL JOINTS AT INTERSECTIONS OF NON-LOAD BEARING WALLS AND LOAD BEARING WALLS.
5. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   CONCRETE MASONRY UNITS: CSA A165 SERIES, H/20/C/M, 20 MPa MINIMUM COMPRESSIVE STRENGTH
   MORTAR: CSA A179, TYPE S
   GROUT: CSA A179, 20 MPa MINIMUM 28 DAY COMPRESSIVE STRENGTH

STRUCTURAL STEEL

1. DESIGN, FABRICATE, AND ERECT STRUCTURAL STEEL IN ACCORDANCE WITH CSA S16 AND THE CISC CODE OF STANDARD PRACTICE FOR STRUCTURAL STEEL.
2. CONNECTIONS NOT DETAILED ON THE STRUCTURAL DRAWINGS SHALL BE DESIGNED AND DETAILED BY THE STEEL FABRICATOR.
3. WELDING SHALL BE IN ACCORDANCE WITH CSA W59. FABRICATOR TO BE CERTIFIED UNDER DIVISION 1 OR 2.1 OF CSA W47.1 FOR FUSION WELDING OF STEEL STRUCTURES, AND/OR CSA W55.3 FOR RESISTANCE WELDING OF STRUCTURAL COMPONENTS.
4. UNLESS NOTED OTHERWISE ON THE DRAWINGS, BOLTED CONNECTIONS SHALL BE MADE USING A MINIMUM OF 2 – 19 mm DIAMETER BOLTS. BOLTS SHALL BE PRE-TENSIONED BY THE TURN-OF-NUT METHOD IN ACCORDANCE WITH CSA S16.
5. MINIMUM WELDS FOR CONNECTIONS SHALL BE 6 mm FILLET WELDS.
6. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   WIDE FLANGE SECTIONS: CSA G40.21, 350W
   HOLLOW STRUCTURAL SECTIONS: CSA G40.21, 350W, CLASS C
   ALL OTHER SECTIONS: CSA G40.21, 300W
   BARS AND PLATES: CSA G40.21, 300W
   BOLTS, NUTS, AND WASHERS: ASTM A325
   ANCHOR BOLTS: ASTM F1554 GRADE 36
   HEADED STUD ANCHORS: ASTM A108
   WELDING MATERIALS: CSA W48
   HOT DIP GALVANIZING: ASTM A123M, MINIMUM ZINC COATING OF 600 g/m²
7. SUBMIT SHOP DRAWINGS FOR REVIEW PRIOR TO FABRICATION. SHOP DRAWINGS SHOWING CONNECTION DETAILS SHALL BE SEALED BY A QUALIFIED PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF SASKATCHEWAN.

METAL DECKING

1. METAL DECKING WORK SHALL BE IN ACCORDANCE WITH CSA S136 AND CSSBI 10M.
2. WELDING SHALL BE IN ACCORDANCE WITH CSA W59. FABRICATOR TO BE CERTIFIED UNDER DIVISION 1 OR 2.1 OF CSA W47.1 FOR FUSION WELDING OF STEEL STRUCTURES, AND/OR CSA W55.3 FOR RESISTANCE WELDING OF STRUCTURAL COMPONENTS.
3. REINFORCE DECK OPENINGS SMALLER THAN 450 mm IN LENGTH AND WIDTH AS RECOMMENDED BY DECK SUPPLIER.
4. FRAME DECK OPENINGS LARGER THAN 450 mm IN LENGTH OR WIDTH AS DETAILED.
5. MATERIALS SHALL CONFORM TO THE FOLLOWING:
   ZINC-IRON ALLOY (Z) COATED STEEL SHEET: ASTM A653M, STRUCTURAL QUALITY GRADE 230, WITH Z275 COATING.
6. METAL DECKING SHALL CONFORM TO THE FOLLOWING:
   ROOF DECK: 38 mm DEEP PROFILE, MINIMUM 0.91 mm BASE STEEL THICKNESS, WITH INTERLOCKING SIDE LAPS, NON-CELLULAR.
   MINIMUM 3 SPANS CONTINUOUS
7. CONNECTIONS SHALL BE IN ACCORDANCE WITH CSSBI RECOMMENDATIONS:
   AT ALL SUPPORTING STEEL: 19 mm PUDDLE WELDS AT 300 oc (36/4 SUPPORT PATTERN)
   AROUND PERIMETER: 19 mm PUDDLE WELDS AT 300 oc
   SIDE LAPS: #10 SCREWS AT 600 mm oc
8. SUBMIT SHOP DRAWINGS SHOWING ALL DETAILS, MATERIAL SPECIFICATIONS AND DESIGN LOADS. DETAILS TO INCLUDE ANCHORAGE DETAIL, REINFORCING TO OPENINGS, ACCESSORIES AND ATTACHMENTS. SHOP DRAWINGS SHALL BE SEALED BY A QUALIFIED PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF SASKATCHEWAN.

STRUCTURAL ABBREVIATIONS

AAC	ALUMINUM ASSOCIATION ALUMINUM CHANNEL	ID	INSIDE DIAMETER
AAIB	ALUMINUM ASSOCIATION ALUMINUM I BEAM	I/S	INSIDE
ADD	ADDITIONAL	JT	JOINT
ALT	ALTERNATE	LG	LONG
ALUM	ALUMINUM	LLH	LONG LEG HORIZONTAL
A.R.	ANCHOR ROD	LLV	LONG LEG VERTICAL
ARCH	ARCHITECTURAL	LOC	LOCATION
ASC	AMERICAN STANDARD ALUMINUM CHANNEL	LONG.	LONGITUDINAL
ASIB	AMERICAN STANDARD ALUMINUM I BEAM	LP	LOW POINT
		MAX	MAXIMUM
		MECH	MECHANICAL
BGS	BELOW GRADED SURFACE	MID	MID DEPTH
BLDG	BUILDING	MIN	MINIMUM
BLL	BOTTOM LOWER LAYER		
BOT	BOTTOM	(N)	NEW
BPL	BASEPLATE	NIC	NOT IN CONTRACT
BTWN	BETWEEN	NO.	NUMBER
B.U.	BUILT-UP	NS	NEAR SIDE
BUL	BOTTOM UPPER LAYER		
		OC	ON CENTER
C/C	CENTER TO CENTER	OD	OUTSIDE DIAMETER
c.c.	CLEAR COVER	OH	OVERHEAD
CIP	CAST IN PLACE	OPG	OPENING
CJ	CONTROL JOINT	OPP	OPPOSITE
CL	CENTER LINE		
CLR	CLEAR	PCO	PILE CUT-OFF
COL	COLUMN	PROJ	PROJECT
CONC	CONCRETE	PL	PLATE
CONN	CONNECT	PROS	PROCESS
CONST	CONSTRUCTION	PT P	PRESSURE TREATED
CONT	CONTINUOUS	PVC	POLYVINYL CHLORIDE
c/w	COMPLETE WITH		
		REF	REFER
DET	DETAIL	REINF	REINFORCE
DIA	DIAMETER	REQD	REQUIRED
DP	DEEP	r/w	REINFORCE WITH
DWG	DRAWING		
DWL	DOWEL	SECT	SECTION
		SIM	SIMILAR
EA	EACH	SOG	SLAB ON GRADE
EF	EACH FACE	SPEC	SPECIFICATION
EL	ELEVATION	SS	STAINLESS STEEL
ELEC	ELECTRICAL	STIR	STIRRUP
EQ	EQUAL	SYM	SYMMETRICAL
EW	EACH WAY		
(E)	EXISTING	T&B	TOP AND BOTTOM
EXIST	EXISTING	THRU	THROUGH
		TLL	TOP LOWER LAYER
FDN	FOUNDATION	T.O.	TOP OF
FLR	FLOOR	T.O.C.	TOP OF CONCRETE
FS	FAR SIDE	TUL	TOP UPPER LAYER
FTG	FOOTING	TYP	TYPICAL
GA	GAUGE	UNO	UNLESS OTHERWISE NOTED
GALV	GALVANIZED	U/S	UNDERSIDE
GB	GRADE BEAM		
		VEF	VERTICAL EACH FACE
H1E	HOOK 1 END	VERT	VERTICAL
H2E	HOOK 2 ENDS	VIF	VERT INSIDE FACE
HEF	HORIZ EACH FACE	VOF	VERT OUTSIDE FACE
HIF	HORIZ INSIDE FACE		
HK	HOOK	/w	WITH
HOF	HORIZ OUTSIDE FACE	WWM	WELDED WIRE MESH
HORZ	HORIZONTAL	W.P.	WORK POINT
HP	HIGH POINT		

CLASS B TENSION SPLICE

BAR SIZE	FUNCTION	CONCRETE STRENGTH 20MPa	25MPa	30MPa	35MPa	40MPa
10M	TOP	550	510	510	510	510
	OTHER	420	390	390	390	390
15M	TOP	820	740	670	620	580
	OTHER	630	570	520	480	450
20M	TOP	1090	980	890	830	770
	OTHER	840	750	690	640	600
25M	TOP	1710	1530	1390	1290	1210
	OTHER	1310	1170	1070	990	930
30M	TOP	2050	1830	1670	1550	1450
	OTHER	1570	1410	1290	1190	1110
35M	TOP	2390	2130	1950	1800	1690
	OTHER	1840	1640	1500	1390	1300

NOTE:

"TOP" APPLIES TO HORIZONTAL REINFORCEMENT CAST WITH 300mm OR MORE OF CONCRETE BELOW THE BAR

Public Works and Government Services Canada / Travaux publics et Services gouvernementaux Canada

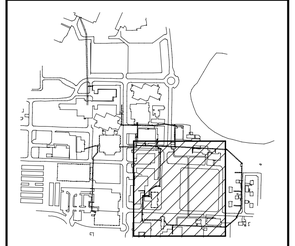
REAL PROPERTY SERVICES
Western Region
SERVICES IMMOBILIERS
Région de l'ouest

TENDER
NOT FOR CONSTRUCTION

PROFESSIONAL ENGINEER SASKATCHEWAN
C.D. KLEMMER
MEMBER - 13579
19/09/30
YR. MN. DAY

ASSOCIATION OF PROFESSIONAL ENGINEERS & GEOSCIENTISTS OF SASKATCHEWAN
CERTIFICATE OF AUTHORIZATION
AECOM Canada Ltd.
NUMBER C1667
PERMISSION TO CONSULT HELD BY:
DISCIPLINE SASK. REG. No. SIGNATURE
STRUCTURAL 13579

Key Plan



Revision	Description	Date
E	Issued For Tender	19/09/30
D	Issued For 99% Review	19/06/21
C	Not Issued	-
B	Not Issued	-
A	Not Issued	-

Client

Public Works and Government Services Canada

Project Title

Tunnel Revitalization

Designed by: C. Klemmer
Drawn by: O. Muaz
Approved by: B. Wolfater
PWGSC Project Manager: J. Dayman

Drawing Title

Package 1 - TBU 43 - Building Structural Notes

Project. no.	Drawing no.	Revision no.
1004259	S1.00	E

PWGSC - A1 - 841X594

0 10 20 30 40 50 60 70 80 90 100mm