

Section C	Vaults
ES54 C0	
C0-01	Table of Contents
C0-02	General Notes
ES54 C1	
	Precast
C1-01	Through-Type Single Access - Withdrawn 2024-12-20
C1-02	Pull-and-Splice-Type Single Access
C1-03	T-Type Double Access
C1-04	4-Way-Type Double Access
C1-05	Through-Type Double Access
ES54 C2	
	Cast-in-Place
C2-01	Through-Type Double Access
C2-03	T-Type Double Access
C2-04	4-Way-Type Double Access

Scope

This section covers the installation of several types of medium voltage primary vaults.

Through Type Single Access

This is the original BC Hydro through type vault, also known as the C1 manhole, which is substantially unchanged from the previous version. The installation practice remains the same, including the duct window rebar details, two hairpin pulling irons, two ground rods and chimney, as shown in the C1-01 standard. An improved cast-iron frame comes with six flutes and hold-down nuts for optional blast-proofing, by installing six anchor rods and two puzzle bolts.

Pull and Splice Type Single Access

This is the original BC Hydro pull and splice type vault, also known as the C2 manhole. Like the C1 manhole, it is substantially unchanged from the previous version. The installation practice remains the same, including the duct window rebar details, two hairpin pulling irons, and two ground rods and chimney, as shown in the C1-02 standard. An improved cast-iron frame comes with six flutes and hold-down nuts for optional blast-proofing, by installing six anchor rods and two puzzle bolts.

Through Type Double Access

This is the new and improved BC Hydro through type double access vault, based on the original C1 manhole. Design improvements were made in response to many requests received from BC Hydro crew, Operations and Work Methods, for improved safety and BC Hydro crew restricted access.

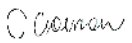
Design improvements include: double access for reduced congestion; integrated ground or concrete-encased ground electrodes; internally bonded rebar for equipotential surfaces; precast pulling irons; precast duct windows with 5" diameter DB2 duct terminators, and white painted walls and ceiling for improved visibility, as shown in the C1-05 standard.

This improved through type double access vault has no provisions for sidewall duct entry – for such applications designers shall use either a 4-way or T-type vault.

T-Type and 4-Way Double Access

These are new BC Hydro precast type double access vaults, based on the original cast-in-place construction standards, developed for improved quality control and project scheduling. Design improvements include: double access for reduced congestion; increased ceiling height; integrated ground or concrete-encased ground electrodes; internally bonded rebar for equipotential surfaces; precast pulling irons; precast 5" diameter DB2 duct terminators; threaded inserts for rebar connection, and white painted walls and ceiling for improved visibility, as shown in the C1-03 and C1-04 standards.

REVISIONS: R1-ADDED SECTION THROUGH NECK GROUTING DETAIL AND BURIAL DEPTH. OCT '18 CC

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	VAULTS GENERAL NOTES	
DISTRIBUTION STANDARDS  BC Hydro		ISSUED: OCT 2018 REPLACES: MAR 2016 ORIGINALLY ISSUED: MAR 2016		PAGE 1 OF 3	ES54 C0-02.01
					R 1

Cast-in-Place Vaults

Cast-in-place vaults shall be selected only for retrofits where a precast option is not feasible. They were designed to be consistent with the improvements in the new precast vaults.

Installation

Standard vaults are designed for horizontal installation with the floor leveled and walls plumb. An inclination will result in the development of a gravity force component that acts on the vault in the direction of the incline and may cause vault sliding instability in an open excavation. In addition, the vault middle joint is a gravity type connection with a keyway designed to transfer lateral forces acting in the plane of the joint. If the vault is installed inclined, any horizontal forces (i.e. seismic) may separate the joints.

The vault neck shall be built at plumb, and shall be made of precast concrete riser rings, or an equivalent material acceptable to BC Hydro. The precast rings shall be grouted inside, outside and between units as necessary to achieve a neat even finish. Specifically, 25 mm of grout shall be placed between the cast-iron frame and precast concrete riser so that the two sit flush (Figure 1 shows vertical section through the neck). The cast-iron frame and cover shall sit over the vault neck along the entire circumference, and shall be aligned with the finished grade.

The duct bank may follow the finished grade and terminate into 5 degree or 11.25 degree bends, for coupling into 1.5 metre-long horizontal sections extending from the vault.

Burial Depth and Finished Grade Adjustments

Refer to ES54 U1-01 for burial depth requirements and more information on finished grade adjustments.

Load Duty

These vaults are designed for roadway duty, as specified in Section U1, and are therefore suitable for installation in all public vehicular traffic areas.

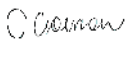
Clearance to Other Structures

To allow displacement during earthquakes, a minimum 300 mm clearance shall be provided between vaults and other structures. Excavation too close to other structures may affect the stability of their foundations and shall be designed by a Professional Engineer.

Duct Terminators

The new type vaults are equipped with 20 duct terminators in 4 horizontal x 5 vertical configurations. The vaults are designed for maximum 4 x 4 feeder duct bank configuration. An additional row of duct terminators is designed above the duct bank and is intended for any fibre optic, communication and service cables that may be installed at a later date.

REVISIONS: R1- ADDED SECTION THROUGH NECK GROUTING DETAIL AND BURIAL DEPTH. OCT '18 CC

DESIGNED  C CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	VAULTS GENERAL NOTES	
DISTRIBUTION STANDARDS  BC Hydro		ISSUED: OCT 2018 REPLACES: MAR 2016 ORIGINALLY ISSUED: MAR 2016		PAGE 2 OF 3	ES54 C0-02.02
				R 1	

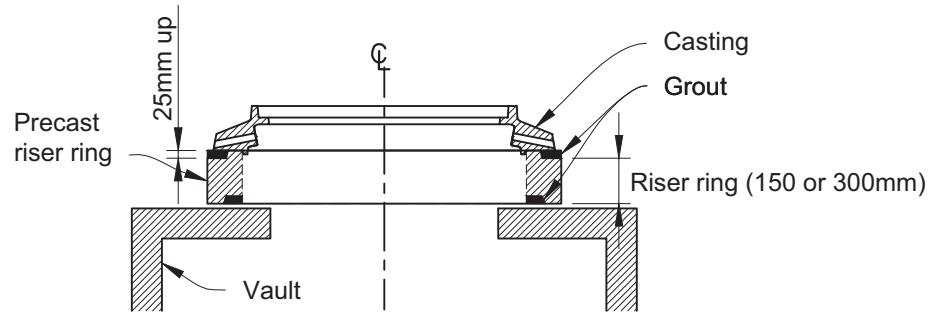
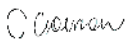
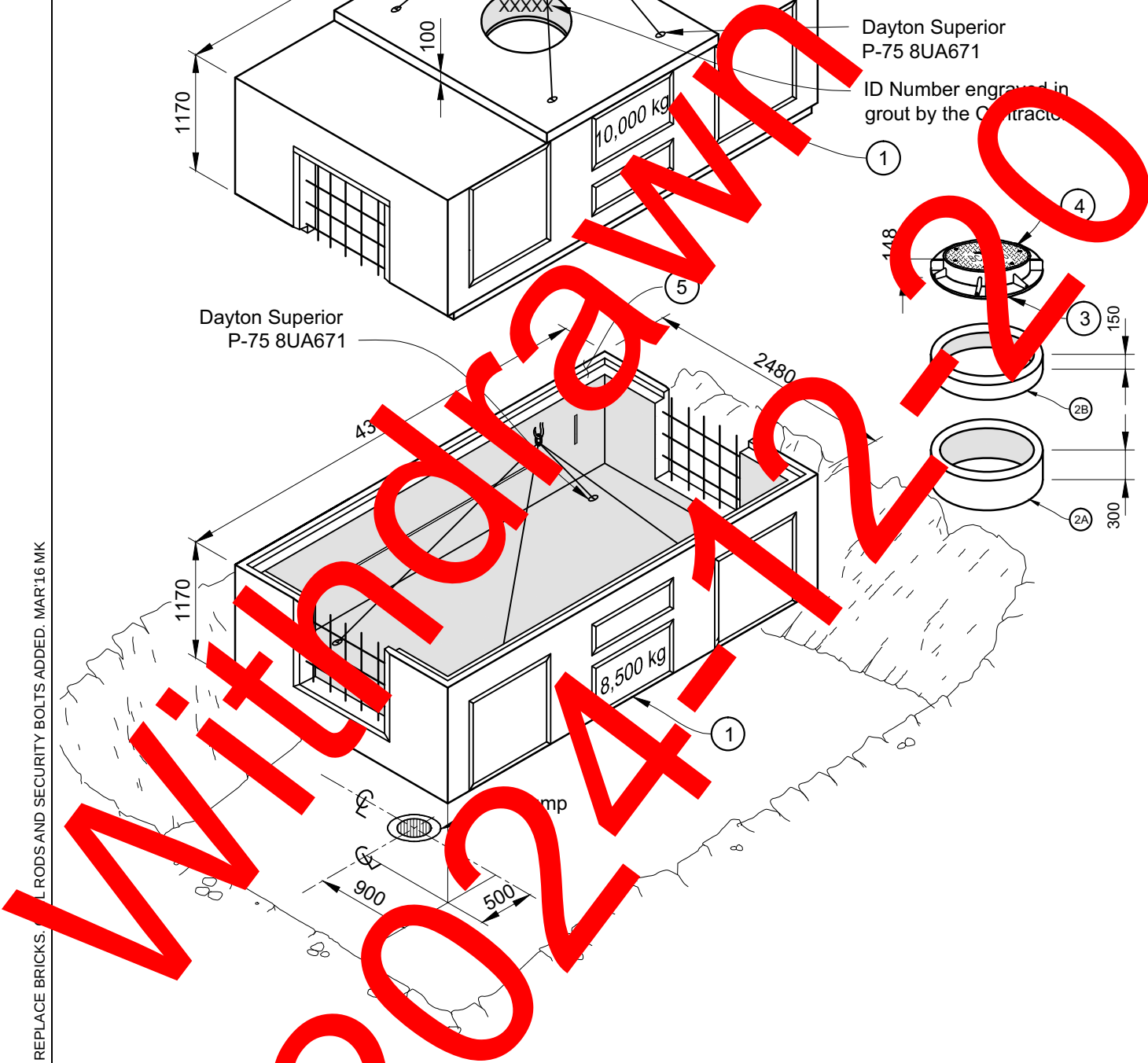


Figure 1: Vertical section through the neck

REVISIONS: R1- ADDED SECTION THROUGH NECK GROUTING DETAIL AND BURIAL DEPTH. OCT '18 CC

DESIGNED  C CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	VAULTS GENERAL NOTES	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: MAR 2016 ORIGINALLY ISSUED: MAR 2016		PAGE 3 OF 3	ES54 C0-02.03
					R 1

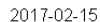


REVISIONS: R.6 - RISER RING

ENGINEER OF RECORD

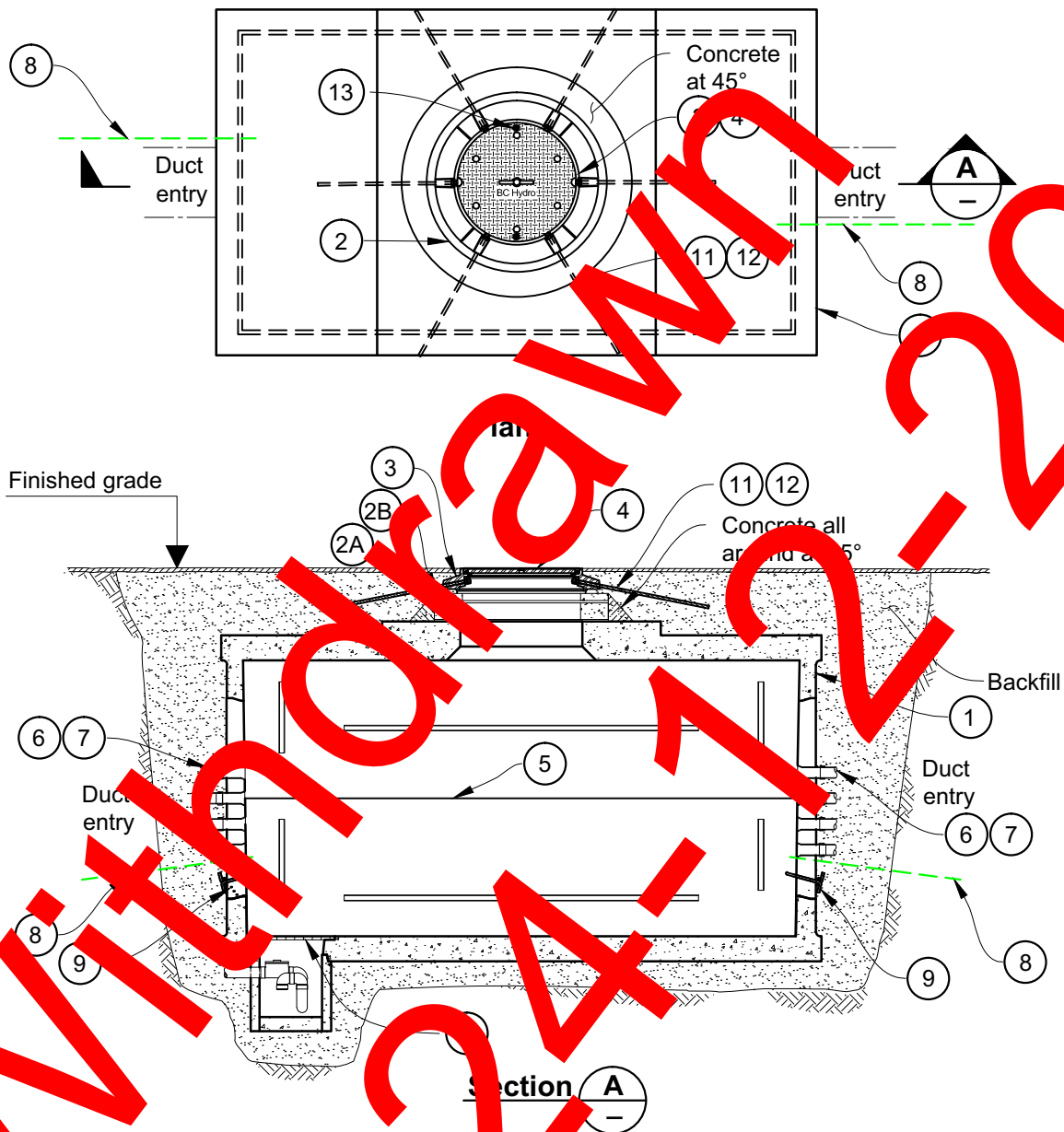

F. DENNER

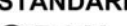
ISSUED: MAR 2016
REPLACES: JUN 2012
ORIGINALLY
ISSUED: MAR 1980



R	6
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REVISIONS: R.6 - RISER RINGS REPLACE BRICKS. L. RODS AND SECURITY BOLTS ADDED. MAR'16 MK



DESIGNED  M. KELVIN	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNER	ENGINEER OF RECORD  2017-02-15	PRECAST VAULTS THROUGH TYPE, SINGLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: MAR 2016 REPLACES: JUN 2012 ORIGINALLY ISSUED: MAR 1980		PAGE 2 OF 3	ES54 C1-01.02
					R 6

Notes

1. Installation shall comply with C0-02.
2. Drainage shall comply with Section G.
3. Pulling irons shall comply with H1-06.02.
4. Duct installation shall comply with H1-06.01.
5. Grounding shall comply with R3-01.
6. Excavation and backfilling shall comply with W1-01.

Bill of Material

Item	Description	Catalogue ID	Quantity	Supplied By
1	Precast vault	400-0403	1	BC Hydro
2A	300 mm riser ring	700000	1	BC Hydro
2B	150 mm riser ring	97000964	1 or more (as required)	BC Hydro
3	Cast-iron frame – roadway duty	400-0401	1	BC Hydro
4	Cast-iron cover – roadway duty	400-0411	1	BC Hydro
5	Vault joint sealant	141-1346	3 rolls	BC Hydro
6	75 mm duct plugs	401-0197	As required	Contractor
	100 mm duct plugs	96021457		Contractor
	125 mm duct plugs	96021459		BC Hydro or Contractor
7	75 mm bell ends	401-0183	As required	Contractor
	100 mm bell ends	96021454		Contractor
	125 mm bell ends	96021455		BC Hydro or Contractor
8	Ground rod	420-1093	2	BC Hydro
9	Pulling iron	420-0916	2	BC Hydro
10	Surge cover	400-0426	1	BC Hydro
11*	Ø ¾" x 6000 mm coil rod, B-12 Dayton Superior	N/A	6	Contractor
12*	Ø 1" coil nut, B-12 Dayton Superior	N/A	12	Contractor
13	Ø ½" x 12" 13 TPI S/S security bolt	005248	2	BC Hydro

*Items 11 and 12 are optional, specified by Designer.

References Standards

ES53 B13-03	Vault Size for Stacked 100 A Fibrow Splices
ES53 C10-02	Vault Riser Details
ES54 H1-01	Grounding of Concrete Vaults with External Ground Electrodes
ES54 H2-06	Duct Entry Details for Vaults and Boxes
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 Section G	Drainage Assemblies
ES54 W1	Excavation and Backfill

DESIGNED

RECOMMENDED

ACCEPT

ENGINEER OF RECORD

M. KELVIN

L. STEVANOVIĆ

F. DENNER



PRECAST VAULTS THROUGH TYPE, SINGLE ACCESS

**DISTRIBUTION
STANDARDS**
BC Hydro

ISSUED: MAR 2016
REPLACES: JUN 2012
ORIGINALLY
ISSUED: MAR 1980

PAGE 3
OF 3

ES54 C1-01.03

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6

Application

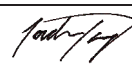
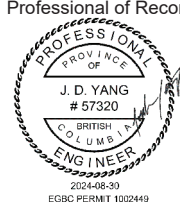
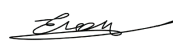
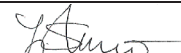
This standard provides installation details for single access pull-and-splice-type vaults.

Revision Notes

Added *Application* and *Revision Notes* sections. Removed ground rod and pulling iron from *Items Required*, updated items 2A, 7, and 11, and added item 12. Updated *References*. Removed previous notes 4 about pulling irons, 5 about grounding, and 7 about maximum vault capacity. Added new note 4. Updated masses, dimensions, sump location, and lifting mechanism in Figure 1 due to a change in manufacturer. Updated Figure 2 plan view to remove ground rods and add internal grounding, and Figure 2 section view to remove ground rods and add ground plates, integral ground loop, and Ufer ground. Substantive changed content is marked by green vertical revision lines in the left margin. This standard released concurrently with Standards and Equipment Advisory Information Bulletin 2024-026 *Revised ES54 C1 Precast Vault Standards*.

Items Required

Item	Description	Material no.	Quantity	Supplied by
1	Precast vault	400-0479	1	BC Hydro
2A	300 mm riser ring	9700 0965	1 or more as required	BC Hydro
2B	150 mm riser ring	9700 0964	1 or more as required	BC Hydro
3	Sidewalk duty cast iron frame	400-0401	1	BC Hydro
4	Sidewalk duty cast iron cover	400-0411	1	BC Hydro
5	Vault joint sealant	141-1346	As required	BC Hydro
6	75 mm duct plugs	401-0197	As required	Contractor
	100 mm duct plugs	9602 1457	As required	Contractor
	125 mm duct plugs	9602-1459	As required	BC Hydro or contractor
7	75 mm to 125 mm duct adapter	N/A	As required	Contractor
	100 mm to 125 mm duct adapter			
8	Sump cover	400-0426	1	BC Hydro
9*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior (optional, specified by designer)	N/A	6	Contractor
10*	Ø ¾" coil nut, B-13 Dayton Superior (optional, specified by designer)	N/A	12	Contractor
11	Ø ½" x 3" 13 TPI s/s security bolt	9600 5248	2	BC Hydro
12	15M rebar, 1500 mm long, threaded to ½" – 13 NC, 1" engagement	N/A	32	Contractor
*Items 9 and 10 are optional, specified by the designer				

Designed: J. Yang, P. Eng		Professional of Record 	Precast Vaults Pull-and-Splice-Type Single Access	
Checked: E. Eliasov, P. Eng				
Reviewed: L. Stevanovic, P. Eng			DISTRIBUTION STANDARDS 	ES54 C1-02 R3
Approved: H. Giesbrecht, P. Eng				
		Issued: 2024-09-03 Effective: 2024-09-03		

References

BC Hydro Distribution Standards

ES54 C0-02	Vaults General Notes
ES54 section G	Drainage Assemblies
ES54 H1-06	General Trenching Details Duct Entry Details
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 R3-02	Grounding of Concrete Vaults with Internal Ground Electrode
ES54 U1-01	Finished Grade Adjustment and Access
ES54 W1-01	Construction Materials Excavation and Backfill

Notes

1. Installation shall comply with ES54 C0-02.
2. Drainage shall comply with ES54 section G.
3. Duct installation shall comply with ES54 H1-06.
4. Finished grade adjustment shall comply with ES54 U1-01.
5. Excavation and backfill shall comply with ES54 W1-01.

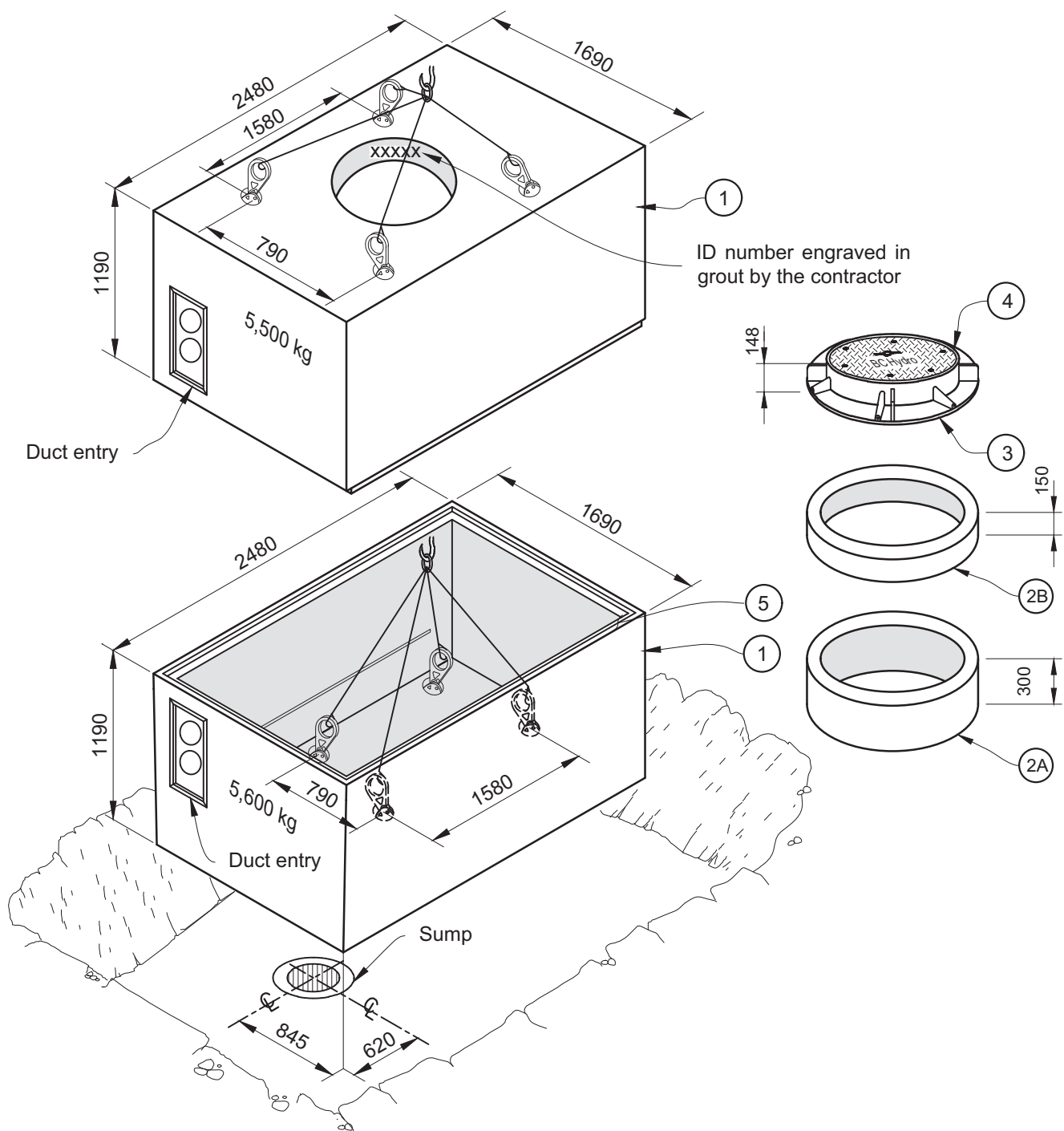


Figure 1 – Precast vault pull and splice type installation details

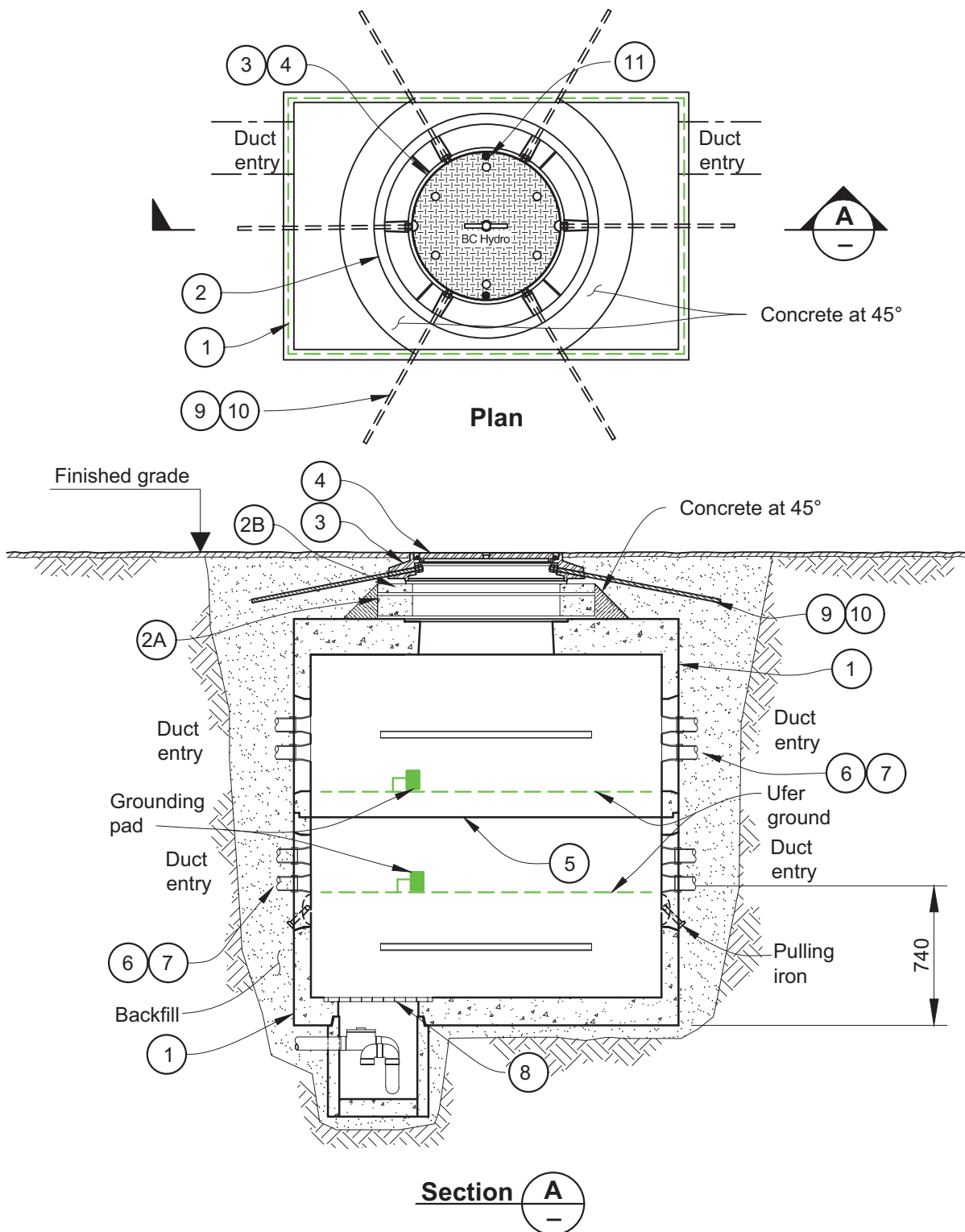


Figure 2 – Precast vault plan and section views

Application

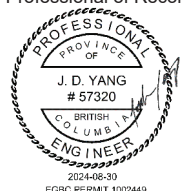
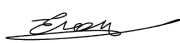
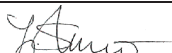
This standard provides installation details for the double access T-type vault.

Revision Notes

Added *Application* and *Revision Notes* sections. Changed quantities of items 2A, 2B, 7, and 8 in *Items Required*. Updated *References*. Removed note about installations complying with ES54 C0-02 and note about pulling iron complying with ES54 H1-06. Added new note 3. Updated Figure 1 due to a change in manufacturer to change weights, dimensions, sump location, and lifting mechanism to incorporate manufacturers' lifting clutches. Updated Figure 2 to reflect appropriate configuration of duct terminators. Substantive changed content is marked by green vertical revision lines in the left margin. This standard released concurrently with Standards and Equipment Advisory Information Bulletin 2024-026 *Revised ES54 C1 Precast Vault Standards*.

Items Required

Item	Description	Material no.	Quantity	Supplied by
1	Precast vault	9601 9852	1	BC Hydro
2A	300 mm riser ring	9700 0965	1 or more as required	BC Hydro
2B	150 mm riser ring	9700 0964	1 or more as required	BC Hydro
3	Roadway duty cast iron frame	400-0401	2	BC Hydro
4	Roadway duty cast iron cover	400-0411	2	BC Hydro
5	Vault joint sealant	141-1346	As required	BC Hydro
6	Sump cover	400-0426	1	BC Hydro
7*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	12	Contractor
8*	Ø ¾" coil nut, B-13 Dayton Superior	N/A	24	Contractor
9	Ø ½" x 3" 13 TPI S/S security bolt	9600 5248	4	BC Hydro
10	15M rebar, 1500 mm long, threaded to ½" – 13 NC, 1" engagement	N/A	36	Contractor
*Items 7 and 8 are optional, specified by the designer				

Designed: J. Yang, P. Eng		Professional of Record 	Precast Vaults T-Type Double Access	
Checked: E. Eliasov, P. Eng				
Reviewed: L. Stevanovic, P. Eng			DISTRIBUTION STANDARDS 	ES54 C1-03 R1
Approved: H. Giesbrecht, P. Eng				
		Issued: 2024-09-03 Effective: 2024-09-03		

References

BC Hydro Distribution Standards

ES54 section G	Drainage Assemblies
ES54 H1-06	General Trenching Details Duct Entry Details
ES54 R3-02	Grounding of Concrete Vaults with Internal Ground Electrode
ES54 U1-01	Finished Grade Adjustment and Access
ES54 W1-01	Construction Materials Excavation and Backfill

Notes

1. Drainage shall comply with ES54 section G.
2. Duct installation shall comply with ES54 H1-06.
3. Finished grade adjustment shall comply with ES54 U1-01.
4. Excavation and backfill shall comply with ES54 W1-01.
5. Maximum vault capacity is 12 circuits. Top row of ducts is provided for taps to customers and third-party fibre.

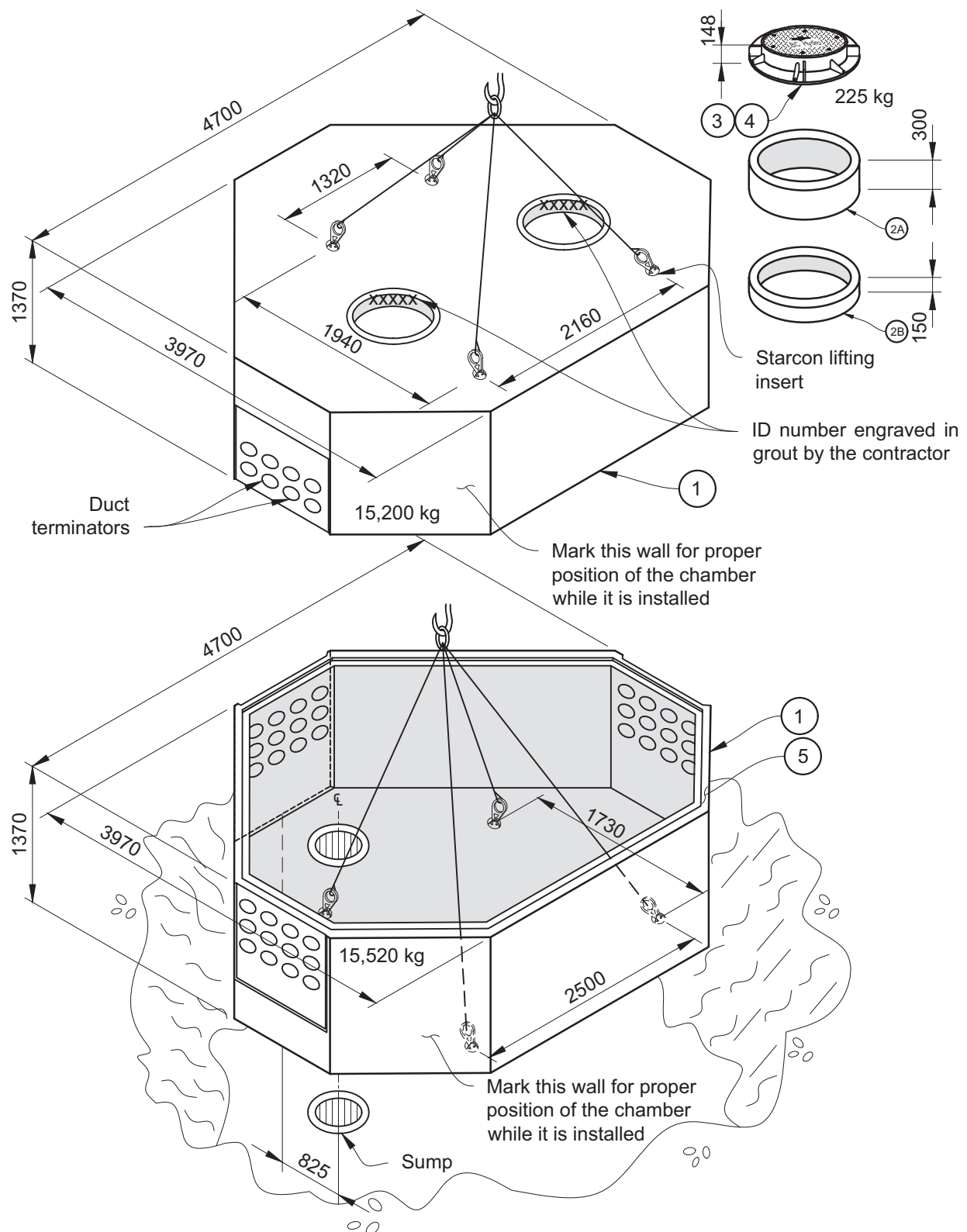


Figure 1 – Precast double-access T-type vault

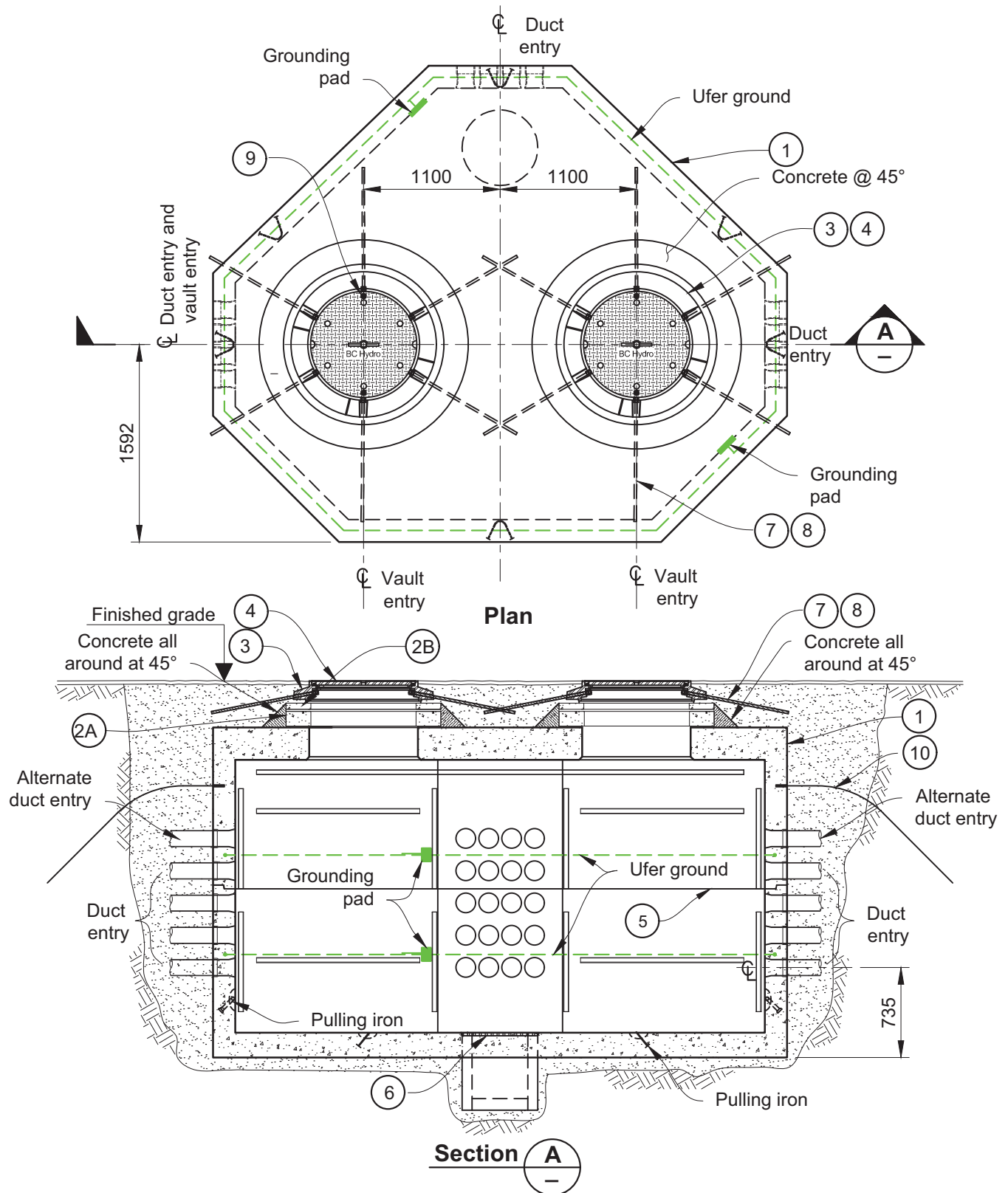


Figure 2 – Precast vault plan and section views

Application

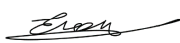
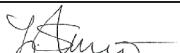
This standard provides installation details for the double access 4-way vault.

Revision Notes

Added *Application* and *Revision Notes* sections. Changed quantities of items 2A, 2B, 7, and 8 in *Items Required*. Updated *References*. Removed note about installations complying with ES54 C0-02 and note about pulling iron complying with ES54 H1-06. Added new note 3. Updated Figure 1 due to a change in manufacturer to change weights, dimensions, sump location, and lifting mechanism to incorporate manufacturers' lifting clutches. Updated Figure 2 to reflect appropriate configuration of duct terminators. Substantive changed content is marked by green vertical revision lines in the left margin. This standard released concurrently with Standards and Equipment Advisory Information Bulletin 2024-026 *Revised ES54 C1 Precast Vault Standards*.

Items Required

Item	Description	Material no.	Quantity	Supplied by
1	Precast vault	9601 9862	1	BC Hydro
2A	300 mm riser ring	9700 0965	1 or more as required	BC Hydro
2B	150 mm riser ring	9700 0964	1 or more as required	BC Hydro
3	Roadway duty cast iron frame	400-0401	2	BC Hydro
4	Roadway duty cast iron cover	400-0411	2	BC Hydro
5	Vault joint sealant	141-1346	As required	BC Hydro
6	Sump cover	400-0426	1	BC Hydro
7*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	12	Contractor
8*	Ø ¾" coil nut, B-13 Dayton Superior	N/A	24	Contractor
9	Ø ½" x 3" 13 TPI S/S security bolt	9600 5248	4	BC Hydro
10	15M rebar, 1500 mm long, threaded to ½" – 13 NC, 1" engagement	N/A	48	Contractor
*Items 7 and 8 are optional, specified by the designer				

Designed: J. Yang, P. Eng			Precast Vaults 4-Way-Type Double Access	
Checked: E. Eliasov, P. Eng				
Reviewed: L. Stevanovic, P. Eng			DISTRIBUTION STANDARDS 	ES54 C1-04 R1
Approved: H. Giesbrecht, P. Eng				
		Issued: 2024-09-03 Effective: 2024-09-03		

References

BC Hydro Distribution Standards

ES54 section G	Drainage Assemblies
ES54 H1-06	General Trenching Details Duct Entry Details
ES54 R3-02	Grounding of Concrete Vaults with Internal Ground Electrode
ES54 U1-01	Finished Grade Adjustment and Access
ES54 W1-01	Construction Materials Excavation and Backfill

Notes

1. Drainage shall comply with ES54 section G.
2. Duct installation shall comply with ES54 H1-06.
3. Finished grade adjustment shall comply with ES54 U1-01.
4. Excavation and backfill shall comply with ES54 W1-01.
5. Maximum vault capacity is 12 circuits. Top row of ducts is provided for taps to customers and third-party fibre.

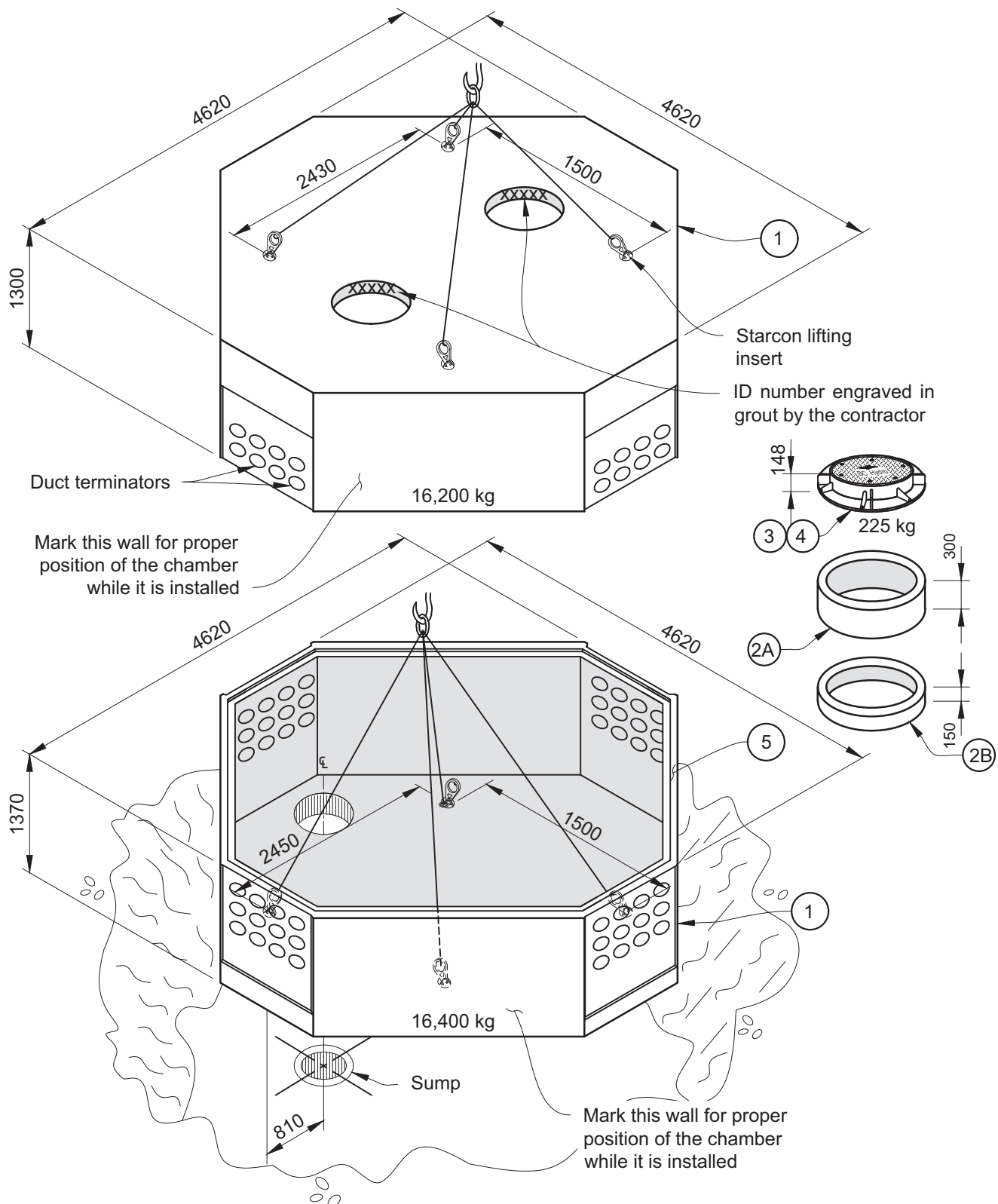


Figure 1 – Precast double-access 4-way vault

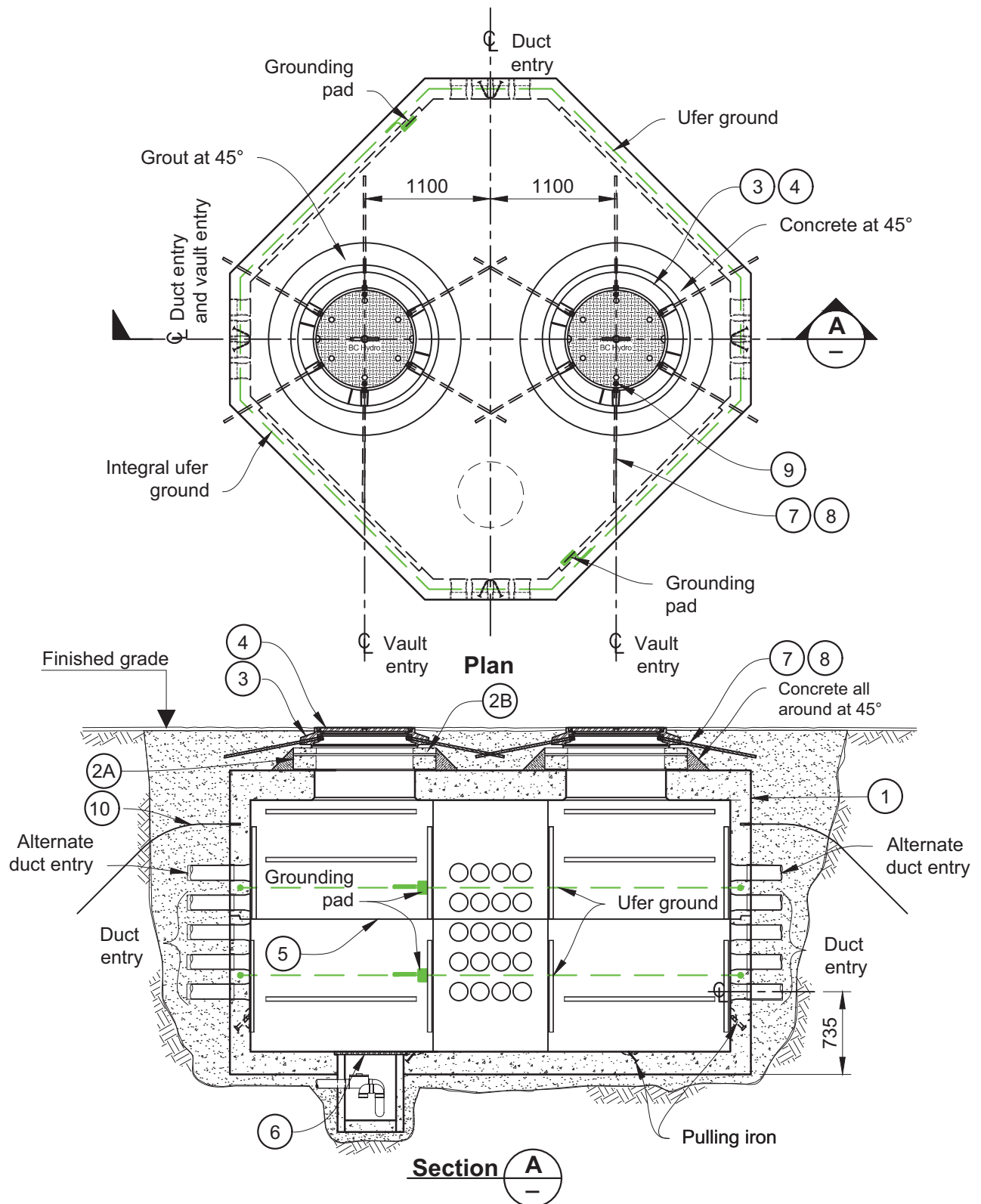


Figure 2 – Precast vault plan and section views

Application

This standard provides installation details for through-type double access precast vaults.

Revision Notes

Updated figures 1 and 2 due to a change in manufacturer: removed buoyancy wing, changed sump location, changed weight, and minor dimensional changes. Added *Application* and *Revision Notes* sections. Updated list of reference standards. April 2023, Jordan Yang.

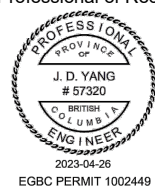
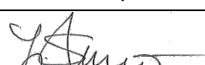
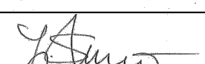
Items Required

Item	Description	Material number	Quantity	Supplied by
1	Precast vault	96022513	1	BC Hydro
2A	300 mm riser ring	97000965	2	BC Hydro
2B	150 mm riser ring	97000964	2 or more (as required)	BC Hydro
3	Cast-iron frame – roadway duty	400-0401	2	BC Hydro
4	Cast-iron cover – roadway duty	400-0411	2	BC Hydro
5	Vault joint sealant	141-1346	As required	BC Hydro
6	Sump cover	400-0426	1	BC Hydro
7 ¹	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	12	Contractor
8 ¹	Ø ¾" coil nut, B-13 Dayton Superior	N/A	24	Contractor
9	Ø ½" x 3" 13 TPI S/S security bolt	96005248	4	BC Hydro
10	15M rebar, 1500 mm long, threaded NC	N/A	48	Contractor
Note 1: Optional, specified by designer				

References

BC Hydro Distribution Standards

ES54 C0-02	Vaults General Notes
ES54 section G	Drainage Assemblies
ES54 H1-06	General Trenching Details Duct Entry Details
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 U1-01	Finished Grade Adjustment and Access
ES54 W1-01	Construction Materials Excavation and Backfill

Designed: J. Yang, P. Eng		Professional of Record 	Precast Vaults Through-Type Double Access	
Checked: L. Stevanovic, P. Eng				
Reviewed: L. Stevanovic, P. Eng			DISTRIBUTION STANDARDS 	ES54 C1-05 R2
Approved: H. Giesbrecht, P. Eng				
		Issued: April 2023 Effective: April 2023		

Notes

1. Installation shall comply with ES54 C0-02. Top and bottom sections shall be installed in an orientation that grounding plates line up vertically.
2. Drainage shall comply with ES54 section G.
3. Pulling irons shall comply with ES54 H1-06.
4. Duct installation shall comply with ES54 H1-06.
5. Finished grade adjustment shall comply with ES54 U1-01.
6. Excavation and backfilling shall comply with ES54 W1-01.
7. Maximum vault capacity is 16 ducts for 12 circuits and 4 neutrals. Top row of ducts is provided for taps to customers and third-party fibre.

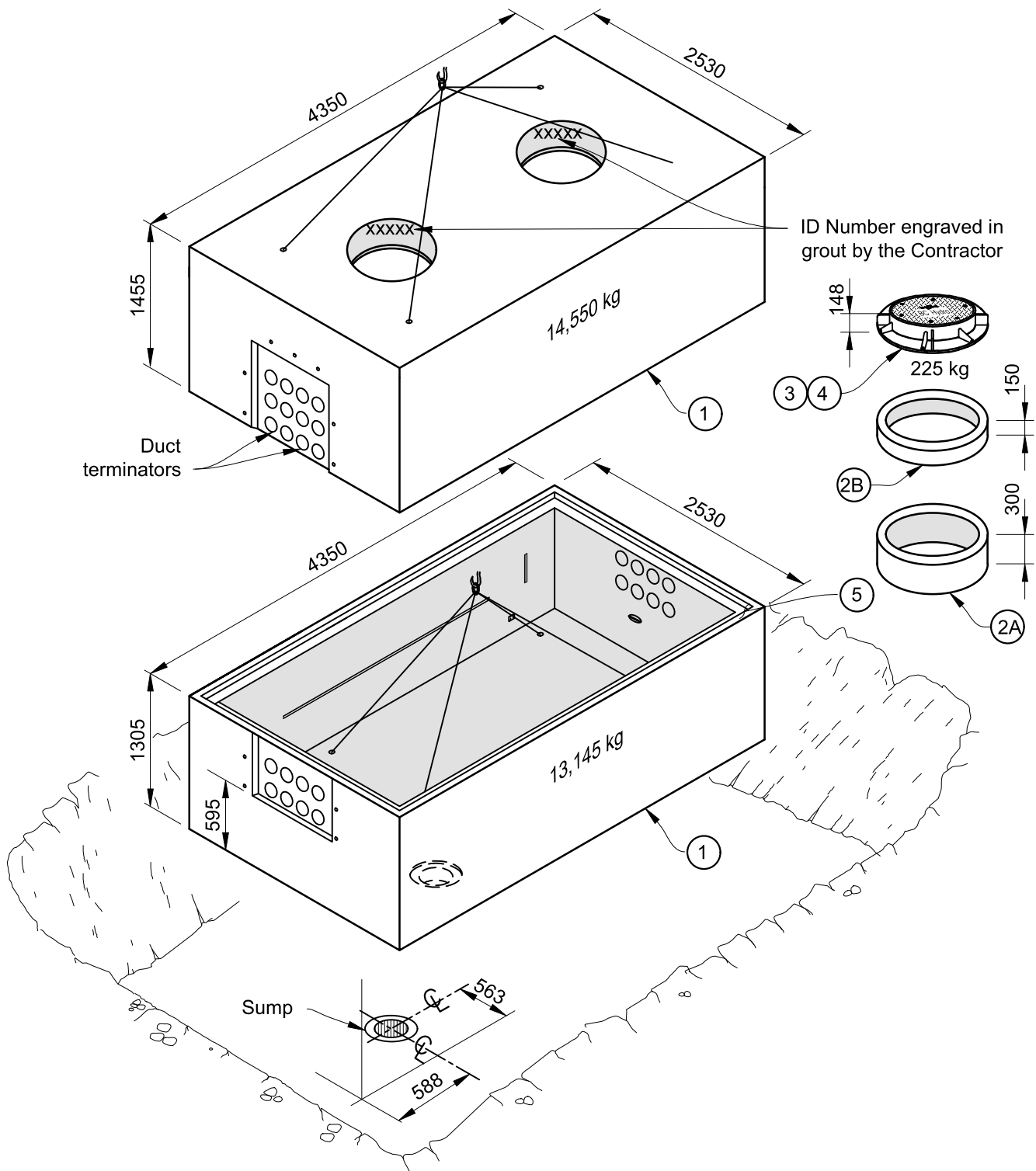


Figure 1 – Through-type double access precast vault

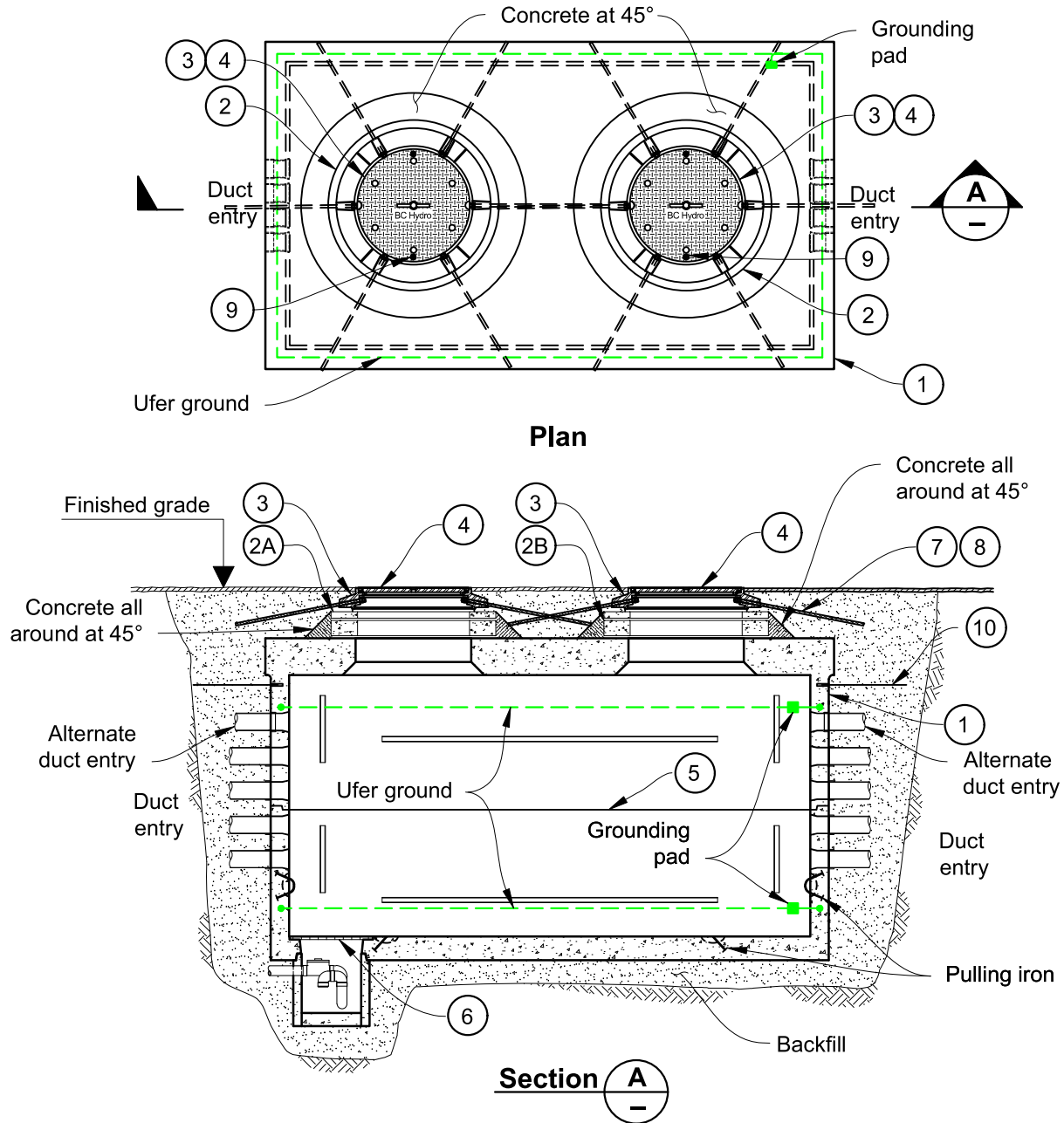
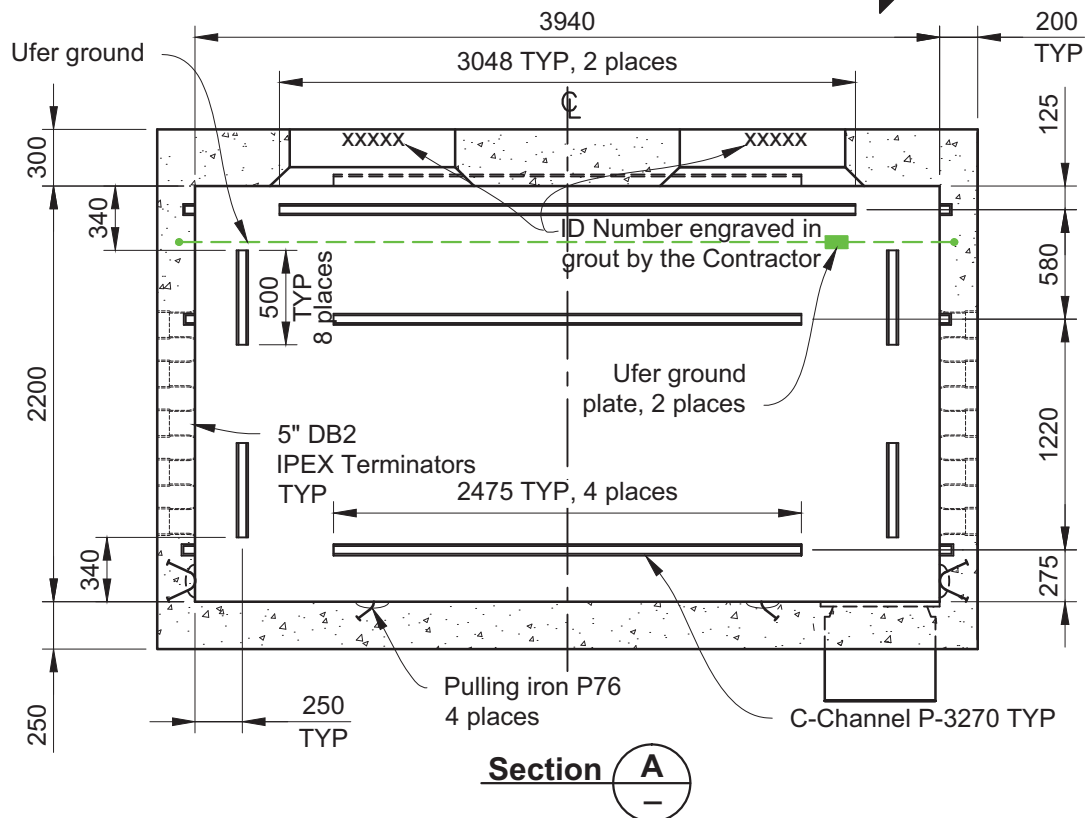
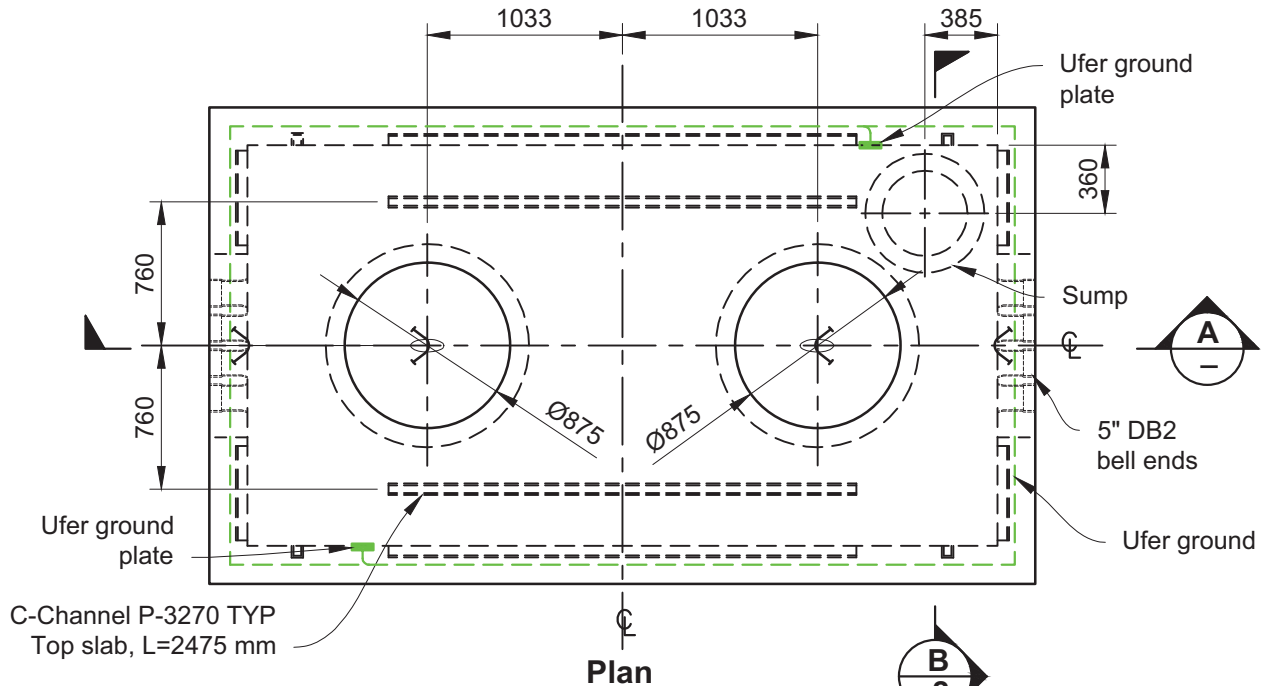
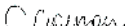


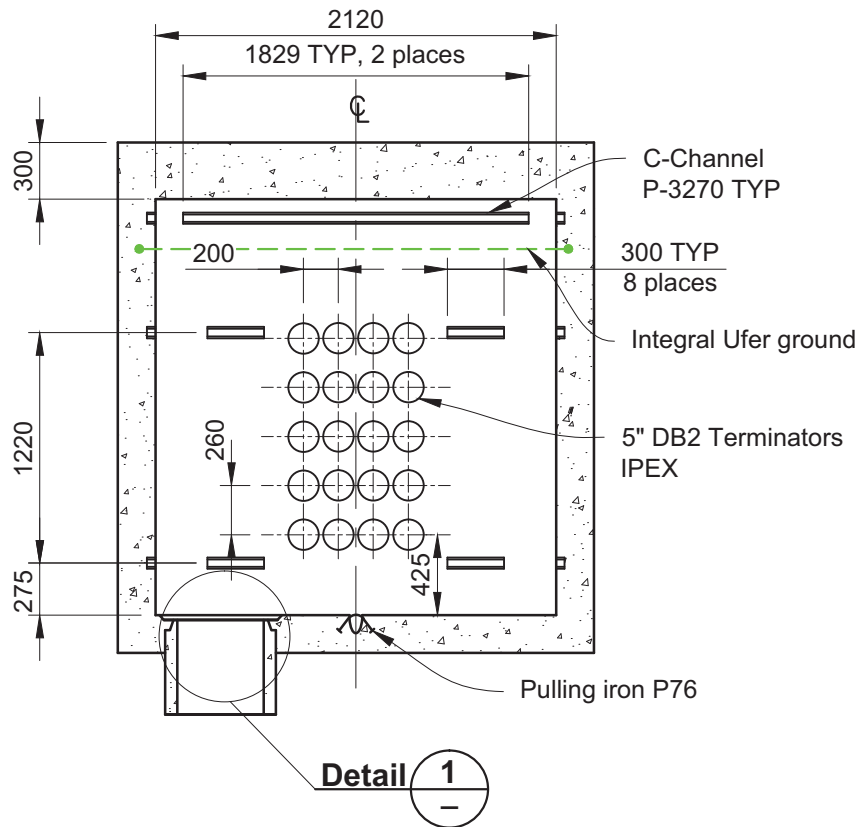
Figure 2 – Through-type double access precast vault plan view



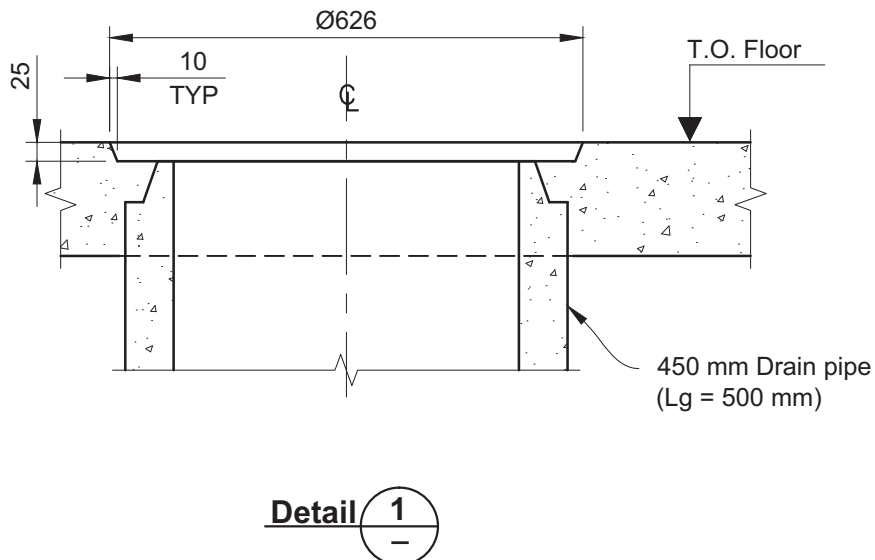
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT				
DISTRIBUTION STANDARDS 	ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980			PAGE 1 OF 8	ES54 C2-01.01	^R 7

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

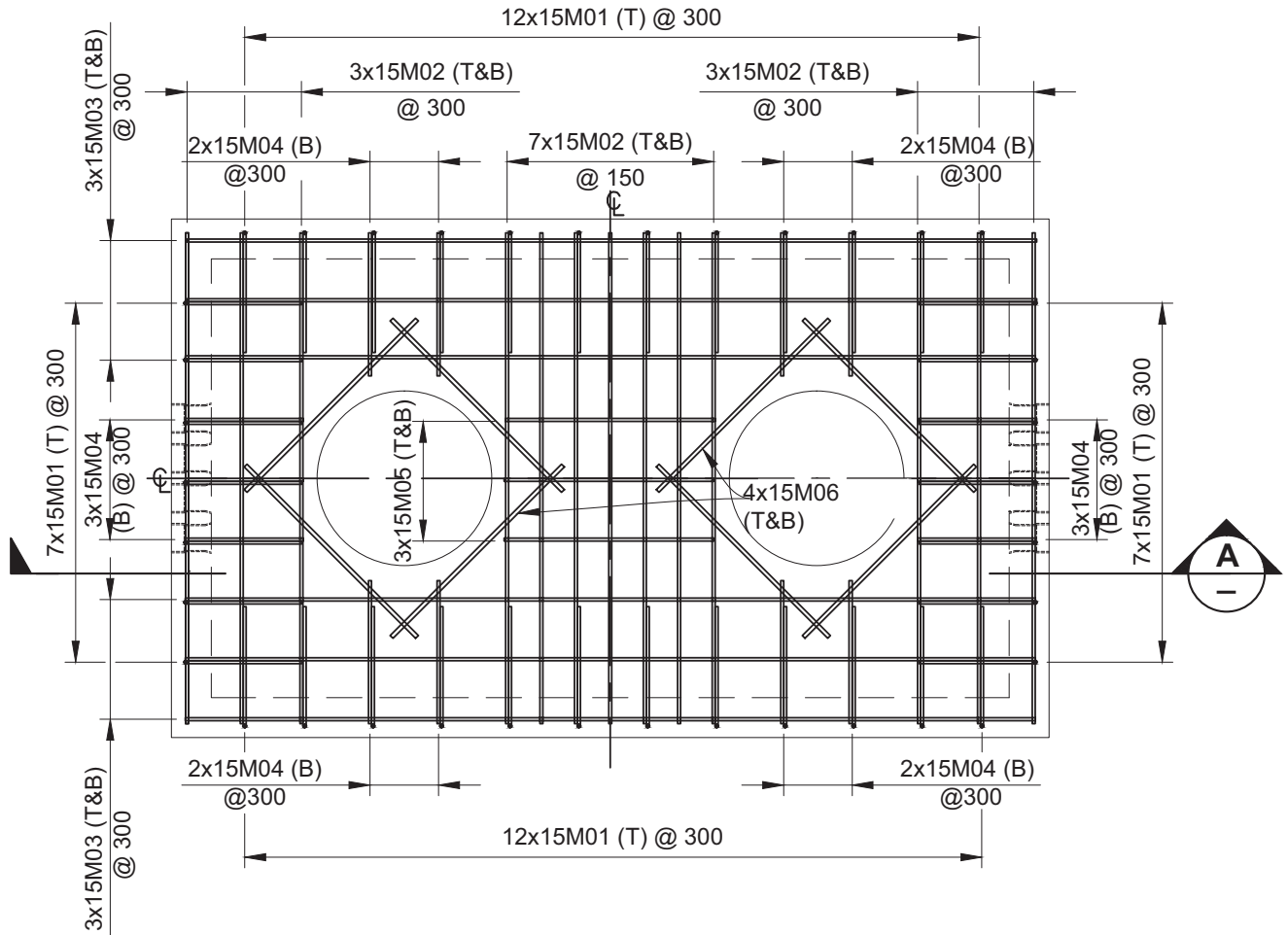


Section B
1

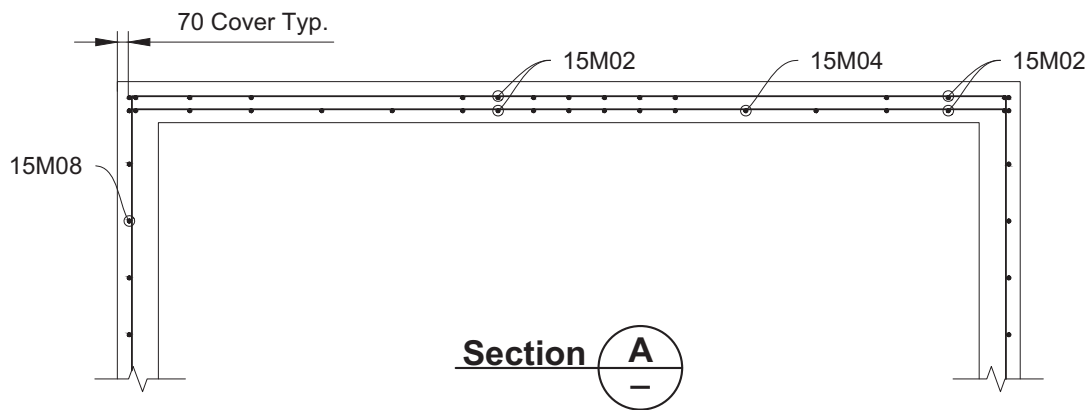


DESIGNED <i>C. Crowson</i> C. CROWSON	RECOMMENDED <i>L. Stevanovic</i> L. STEVANOVIC	ACCEPTED <i>F. Dennert</i> F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 	ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 2 OF 8	ES54 C2-01.02	R 7

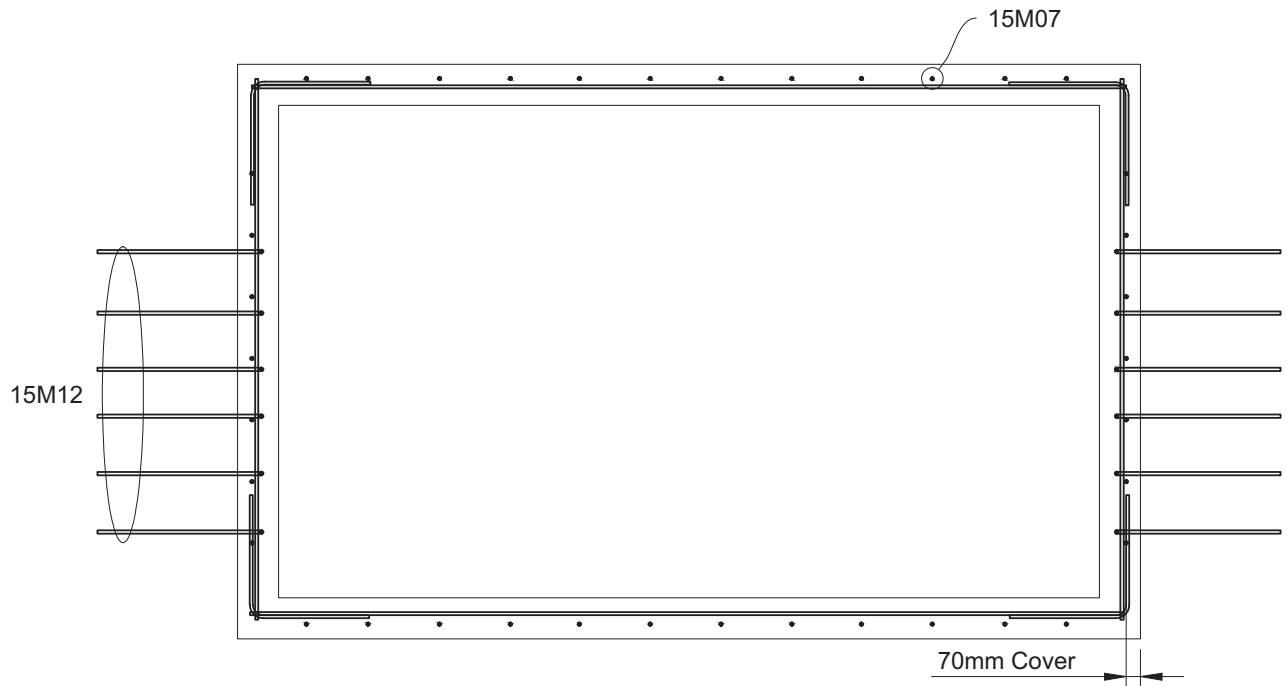
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS



**Roof Slab Reinforcement
Top View**



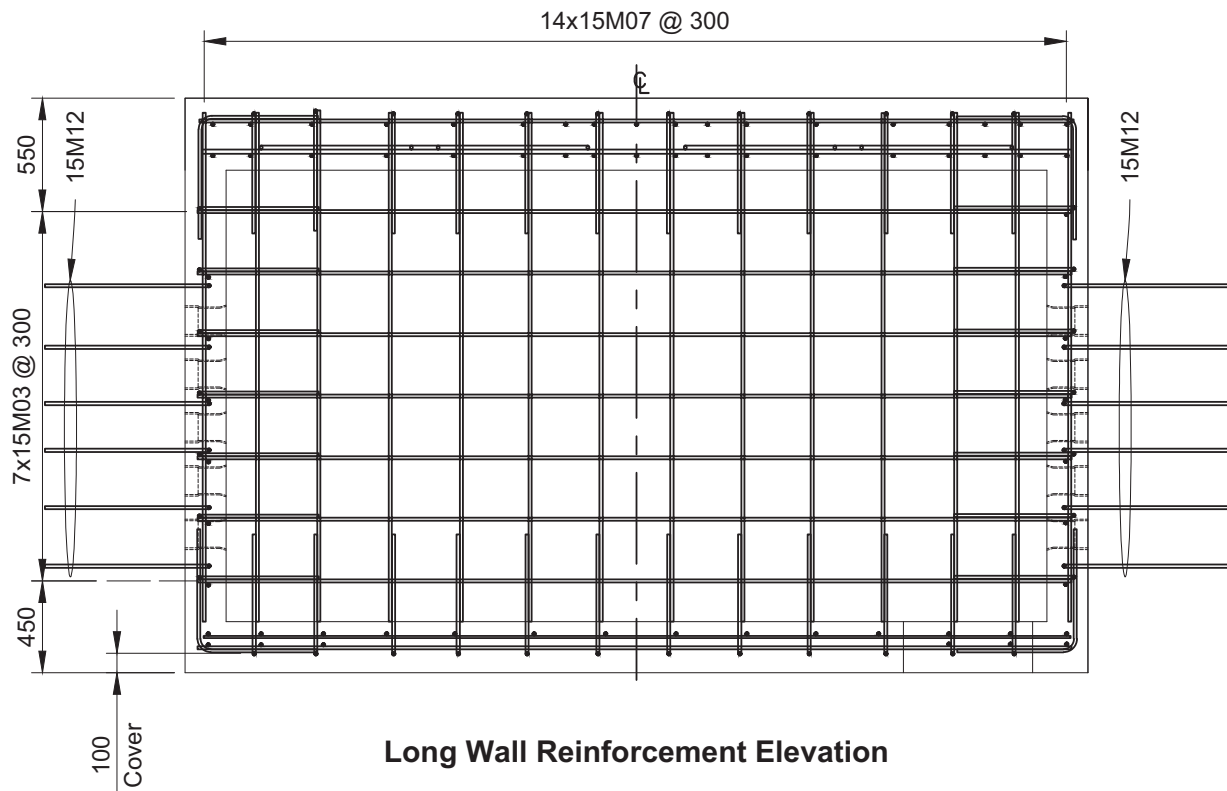
DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT				
DISTRIBUTION STANDARDS 	ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980			PAGE 3 OF 8	ES54 C2-01.03	^R 7



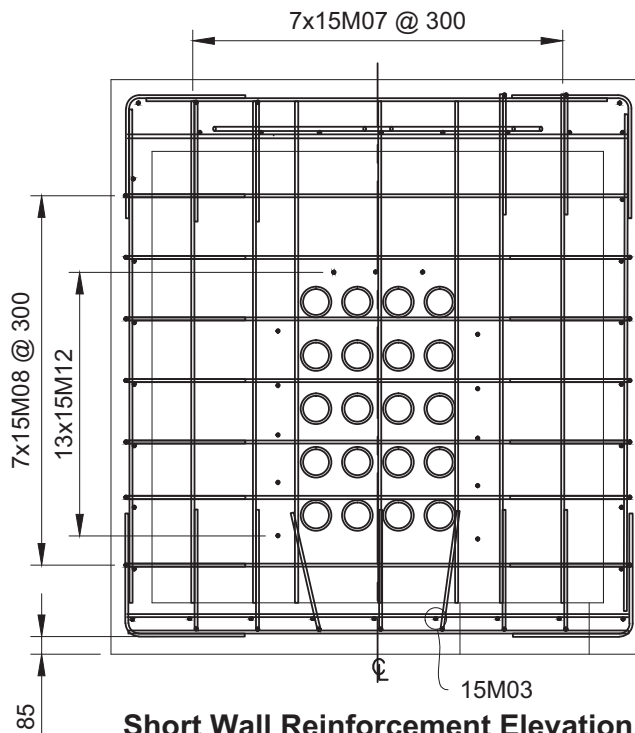
Walls Reinforcement Top View

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS  BC Hydro		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 4 OF 8	ES54 C2-01.04
					^R 7



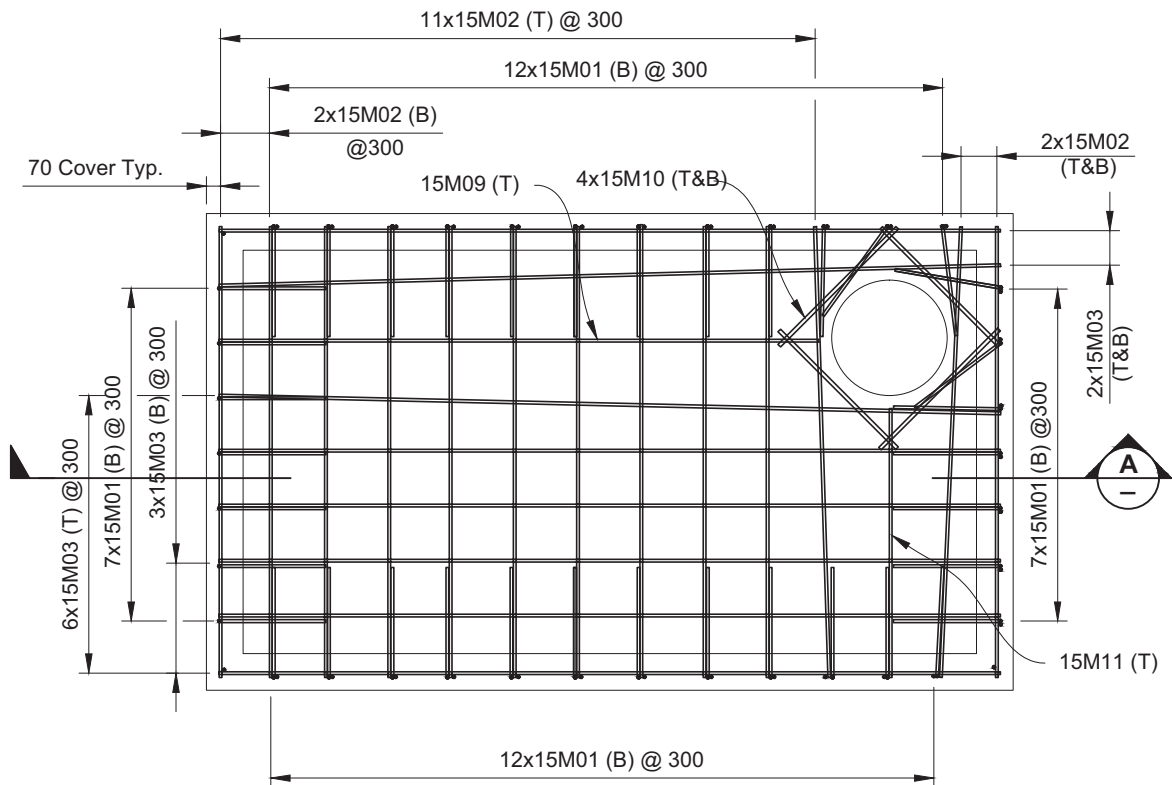
Long Wall Reinforcement Elevation



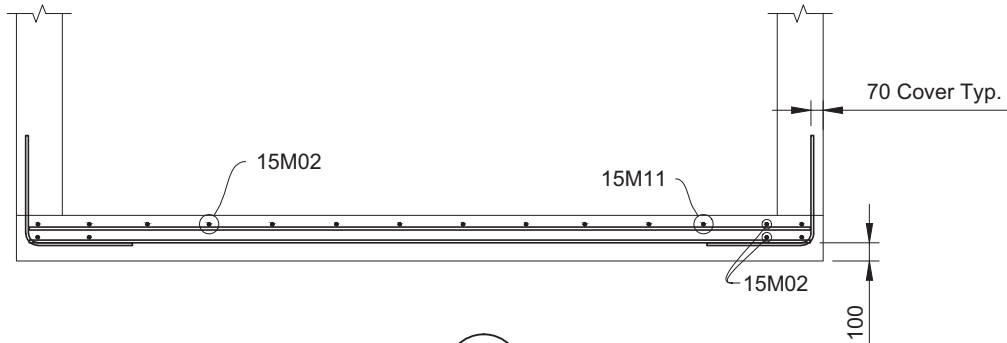
Short Wall Reinforcement Elevation

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT		PAGE 5 OF 8	ES54 C2-01.05	^R 7
DISTRIBUTION STANDARDS		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				
						



**Floor Slab Reinforcement
Top View**

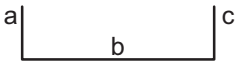
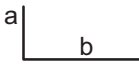
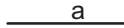


Section A

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 6 OF 8	ES54 C2-01.06
					^R 7

Rebar Chart				
Mark	Qty.	Type	L [mm]	Dim [mm]
15M01	76	L - Bar	1400	a = 700, b = 700
15M02	36	I - Bar	2400	a = 2400
15M03	39	I - Bar	4200	a = 4200
15M04	14	I - Bar	600	a = 600
15M05	3	I - Bar	1050	a = 1050
15M06	16	I - Bar	1200	a = 1200
15M07	42	I - Bar	2450	a = 2450
15M08	14	U - Bar	3800	a = c = 700, b = 2400
15M09	1	I - Bar	3260	a = 3260
15M010	8	I - Bar	900	a = 900
15M011	1	I - Bar	1400	a = 1400
15M012	26	L - Bar	1600	a = 800, b = 800

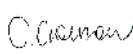
U - bar

L - bar

I - bar

Notes

1. Inside walls and ceiling shall be painted with two coats of white concrete paint, Cloverdale Towerthon or approved equivalent.
2. Installation shall comply with C0-02.
3. Excavation and backfilling shall comply with W1-01.
4. Drainage shall comply with Section G.
5. Pulling iron shall comply with H1-06.02.
6. Duct bank installation shall comply with H1-06.01.
7. Grounding shall comply with R3-02.
8. Concrete shall be CSA A23.1, Class of Exposure C-1, $f_c' = 35\text{MPa}$.
9. Reinforcement shall be CSA G30.18, $F_y = 400\text{MPa}$.
10. PVC Waterstop shall be installed in construction joints.
11. Abbreviations: T - top; B - bottom; T&B - top and bottom.

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS  BC Hydro		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 7 OF 8	ES54 C2-01.07
					R 7

Bill of Material

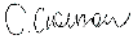
Item	Description	Catalogue ID	Quantity	Supplied By
1A	300 mm riser ring	97000965	2	BC Hydro
1B	150 mm riser ring	97000964	2 or more	BC Hydro
2	Cast-iron frame – roadway duty	400-0401	2	BC Hydro
3	Cast-iron cover – roadway duty	400-0411	2	BC Hydro
4	Vault joint sealant	141-1346	As required	BC Hydro
5	Sump cover	400-0426	1	BC Hydro
6*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	6	Contractor
7*	Ø ¾" coil nut, B-13 Dayton Superior	N/A	12	Contractor
8	Ø ½" x 3" 13 TPI S/S security bolt	96005248	4	BC Hydro
9	Pulling iron P76 Dayton Superior 8UA671 galvanized	N/A	2	Contractor
10	Duct terminator	N/A	40	Contractor
11	Integral grounding electrode	N/A	2	Contractor

*Items 6 and 7 are optional, specified by Designer.

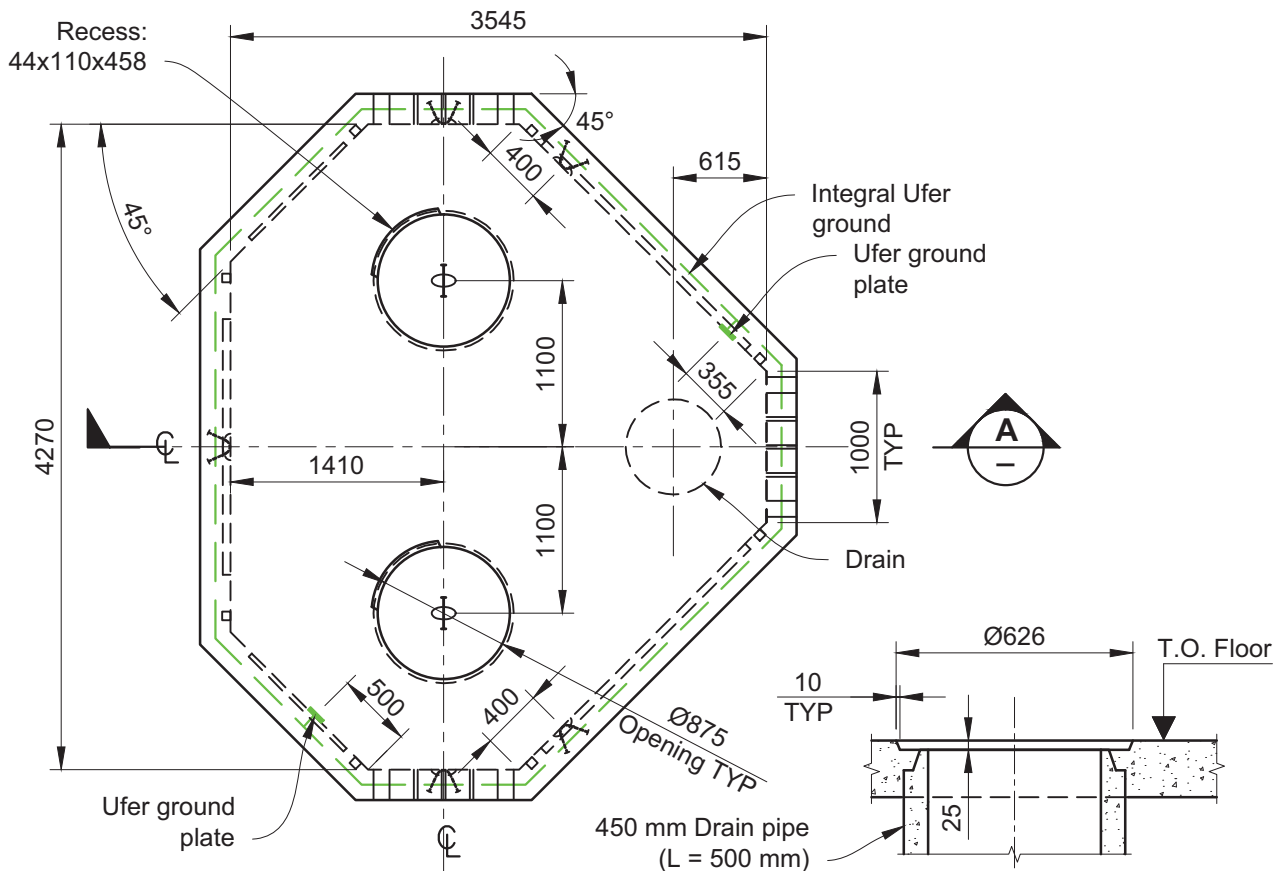
Reference Standards

ES53 B13-03	Vault Size for Stacked 600 A Elbow Splices
ES53 C10-02	Vault Racking Details
ES54 C0-02	General Notes
ES54 Section G	Drainage Assemblies
ES54 H1-06.04	General Trenching Details, Duct Entry Details
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 R3-02	Grounding of Concrete Vaults with Internal Ground Electrode
ES54 W1	Excavation and Backfill

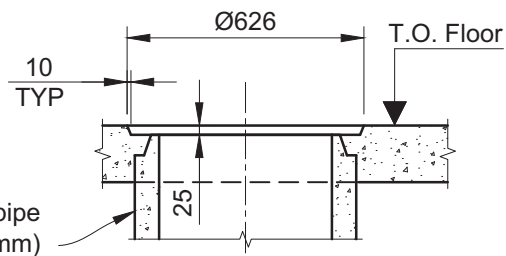
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS THROUGH TYPE, DOUBLE ACCESS		PAGE 8 OF 8	ES54 C2-01.08	R 7
DISTRIBUTION STANDARDS 				ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				

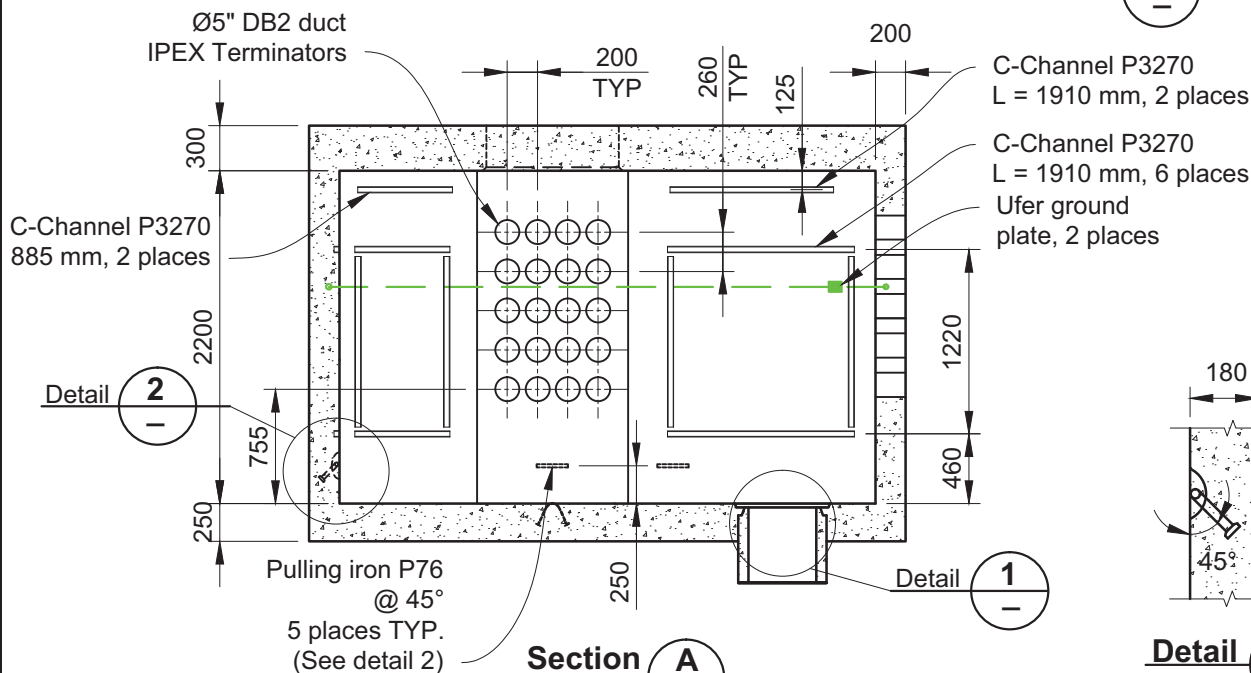
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS



Plan



Detail 1



Section A



Detail 2

DESIGNED	RECOMMENDED	ACCEPTED
<i>C. Crowson</i>	<i>H. Stevanovic</i>	<i>F. Dennert</i>
C. CROWSON	L. STEVANOVIĆ	F. DENNERT
DISTRIBUTION STANDARDS	ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980	
BC Hydro		

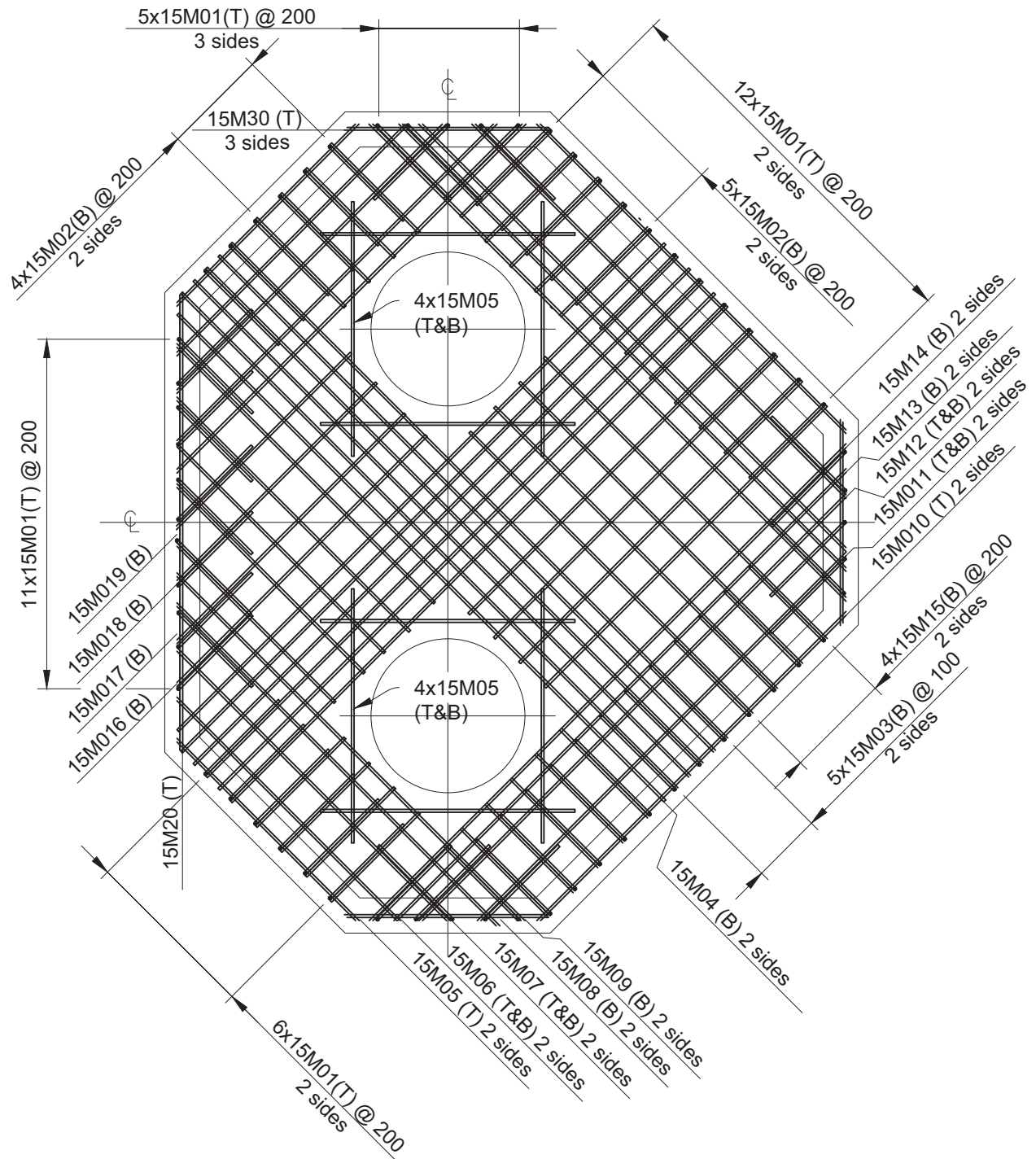


CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS

PAGE 1
OF 7

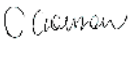
ES54 C2-03.01

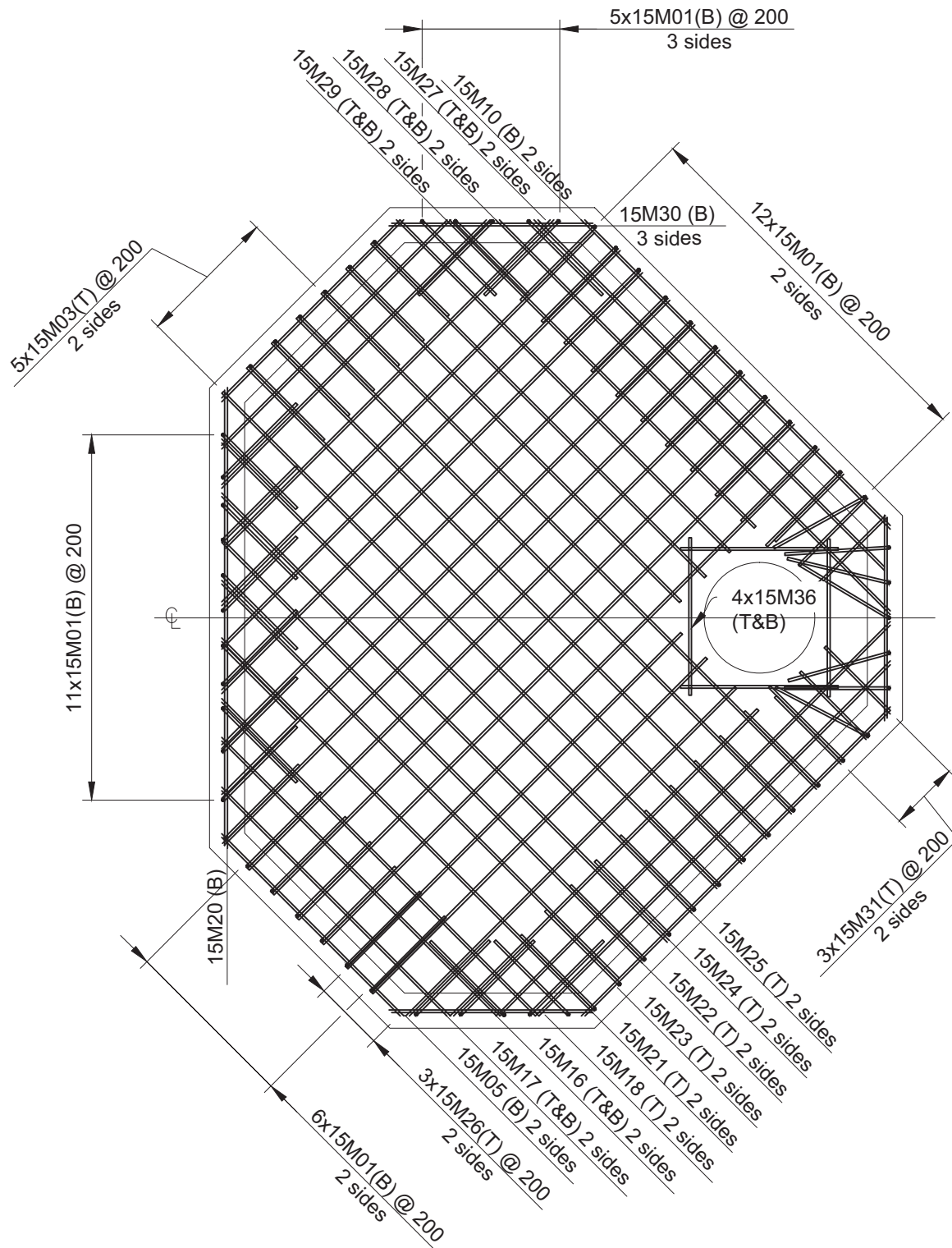
R
7



**Roof Slab Reinforcement
Top View**

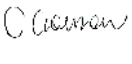
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 2 OF 7	ES54 C2-03.02
					R 7

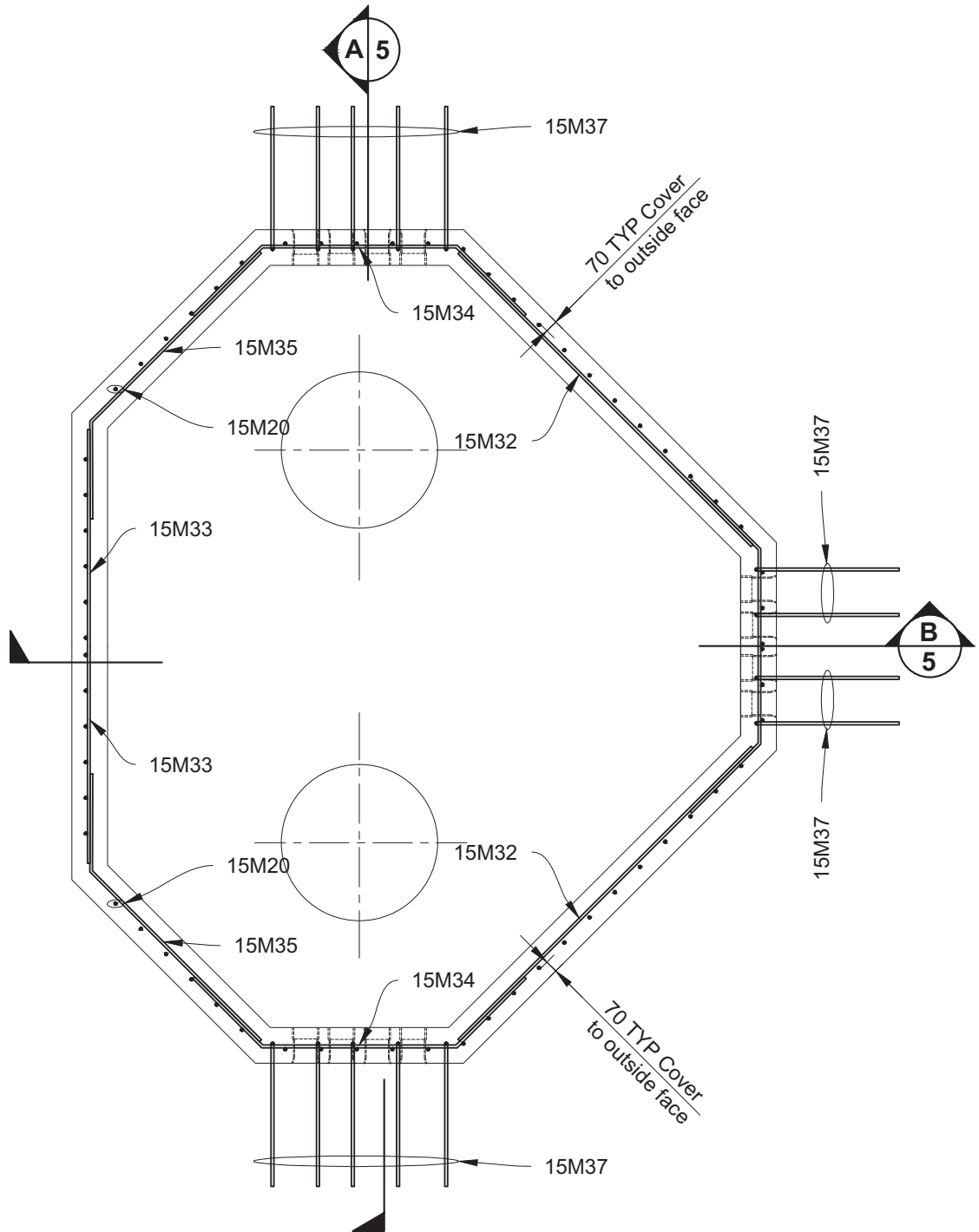


**Floor Slab Reinforcement
Top view**

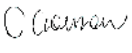
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

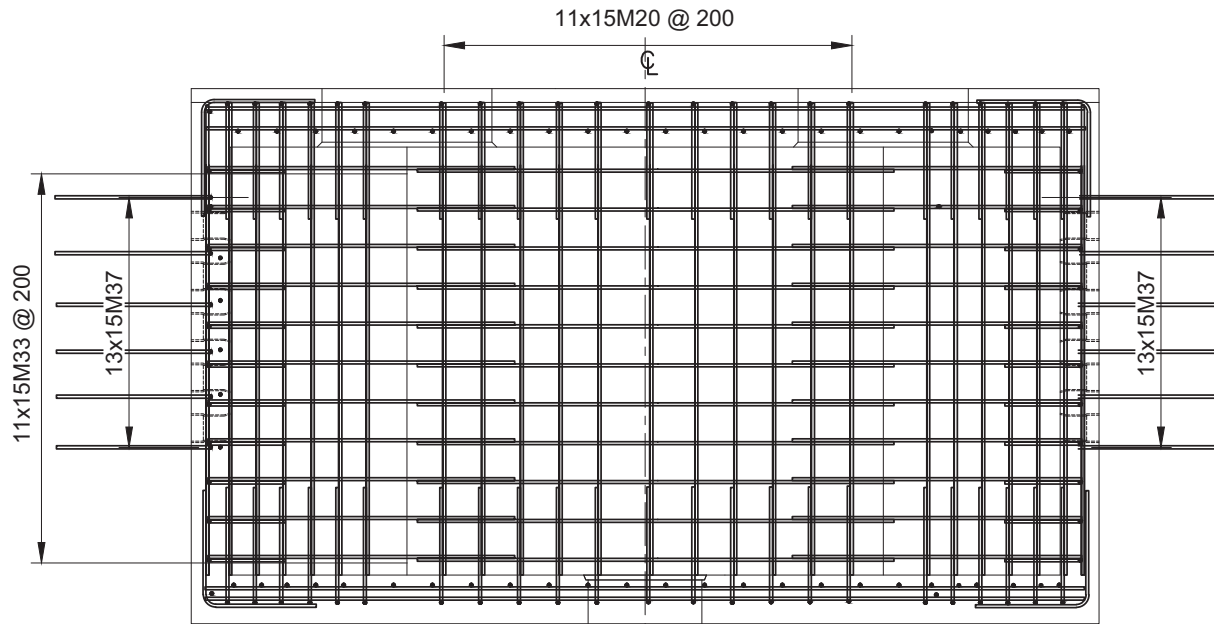
DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 3 OF 7	ES54 C2-03.03
					R 7

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

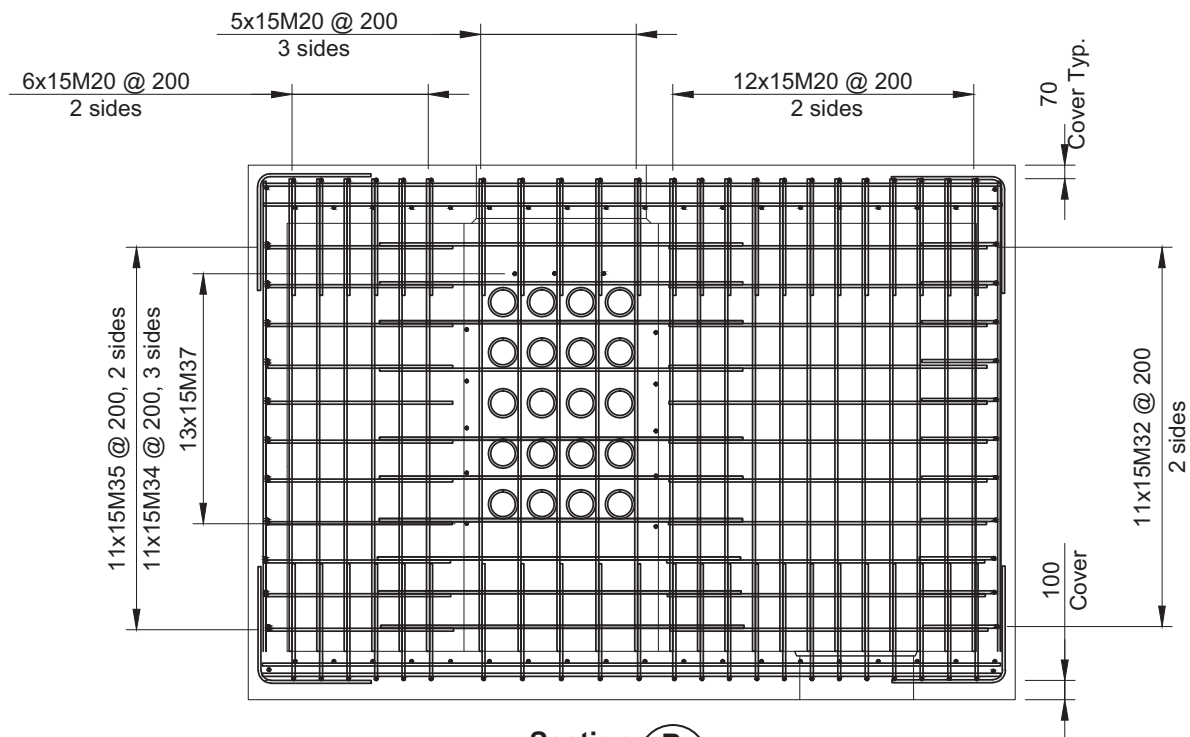


Wall Reinforcement
Top view

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  2018-10-30	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 4 OF 7	ES54 C2-03.04
					R 7

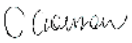


Section **A**
4

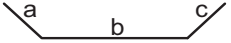
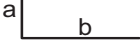


Section **B**
4

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  2018-10-30	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 5 OF 7	ES54 C2-03.05
					^R 7

Rebar Chart				
Mark	Qty.	Type	L [mm]	Dim [mm]
15M01	124	L - Bar	1400	a = 700, b = 700
15M02	18	I - Bar	710	a = 710
15M03	20	I - Bar	3980	a = 3980
15M04	2	I - Bar	3910	a = 3910
15M05	12	I - Bar	1435	a = 1435
15M06	4	I - Bar	1765	a = 1765
15M07	4	I - Bar	2165	a = 2165
15M08	2	I - Bar	2565	a = 2565
15M09	2	I - Bar	2765	a = 2765
15M10	4	I - Bar	2458	a = 2458
15M11	4	I - Bar	2935	a = 2935
15M12	4	I - Bar	3405	a = 3405
15M13	2	I - Bar	3610	a = 3610
15M14	2	I - Bar	3805	a = 3805
15M15	16	I - Bar	2270	a = 2270
15M16	5	I - Bar	2210	a = 2210
15M17	5	I - Bar	1810	a = 1810
15M18	3	I - Bar	1610	a = 1610
15M19	1	I - Bar	1410	a = 1410
15M20	64	I - Bar	2445	a = 2445
15M21	2	I - Bar	2985	a = 2985
15M22	2	I - Bar	3385	a = 3385
15M23	2	I - Bar	3185	a = 3185
15M24	2	I - Bar	3585	a = 3585
15M25	2	I - Bar	3785	a = 3785
15M26	6	I - Bar	2680	a = 2680
15M27	4	I - Bar	2745	a = 2745
15M28	4	I - Bar	3175	a = 3175
15M29	4	I - Bar	2465	a = 2465
15M30	6	I - Bar	1150	a = 1150
15M31	6	I - Bar	540	a = 540
15M32	22	I - Bar	2320	a = 2320
15M33	11	I - Bar	2430	a = 2430
15M34	33	┘ - Bar	4480	a = c = 700, b=1080
15M35	22	┘ - Bar	2040	a = 700, b=1340
15M36	8	I - Bar	900	900
15M37	39	L - Bar	1600	a = 800, b=800


V - bar
L - bar
I - bar

Notes

1. Inside walls and ceiling shall be painted with two coats of white concrete paint, Cloverdale Tower-thon or approved equivalent.
2. Installation shall comply with C0-02.
3. Excavation and backfilling shall comply with W1-01.
4. Drainage shall comply with Section G.
5. Pulling irons shall comply with H1-06.02.

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 6 OF 7	ES54 C2-03.06
					R 7

Notes, contd.

6. Duct bank installation shall comply with H1-06.01.
7. Grounding shall comply with R3-02.
8. Concrete shall be CSA A23.1, Class of Exposure C-1, $f_c' = 35\text{MPa}$.
9. Reinforcement shall be CSA G30.18, $F_y = 400\text{MPa}$.
10. PVC Waterstop shall be installed in construction joints.
11. Abbreviations: T - top; B - bottom; T&B - top and bottom.

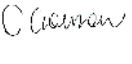
Bill of Material

Item	Description	Catalogue ID	Quantity	Supplied By
1A	300 mm riser ring	97000965	2	BC Hydro
1B	150 mm riser ring	97000964	2 or more	BC Hydro
2	Cast-iron frame – roadway duty	400-0401	2	BC Hydro
3	Cast-iron cover – roadway duty	400-0411	2	BC Hydro
4	Vault joint sealant	141-1346	As required	BC Hydro
5	Sump cover	400-0426	1	BC Hydro
6*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	6	Contractor
7*	Ø ¾" coil nut, B-13 Dayton Superior	N/A	12	Contractor
8	Ø ½" x 3" 13 TPI S/S security bolt	96005248	4	BC Hydro
9	Pulling iron P76 Dayton Superior 8UA671 galvanized	N/A	2	Contractor
10	Duct terminator	N/A	60	Contractor
11	Integral grounding electrode	N/A	2	Contractor

*Items 6 and 7 are optional, specified by Designer.

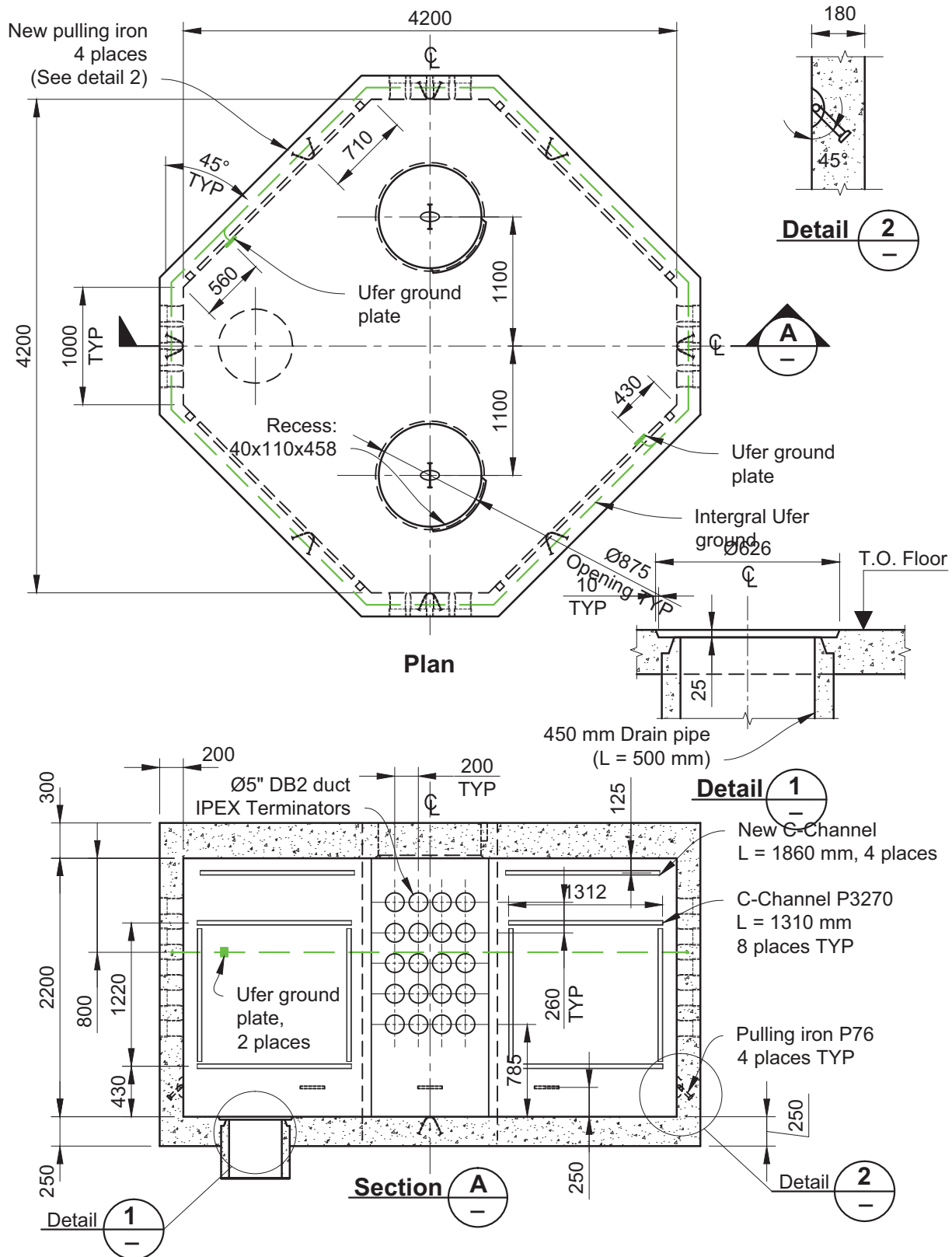
Reference Standards

ES53 B13-03	Vault Size for Stacked 600 A Elbow Splices
ES53 C10-02	Vault Racking Details
ES54 C0-02	General Notes
ES54 Section G	Drainage Assemblies
ES54 H1-06.04	General Trenching Details, Duct Entry Details
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 R3-02	Grounding in Concrete Vaults with Internal Ground Electrode
ES54 W1	Excavation and Backfill

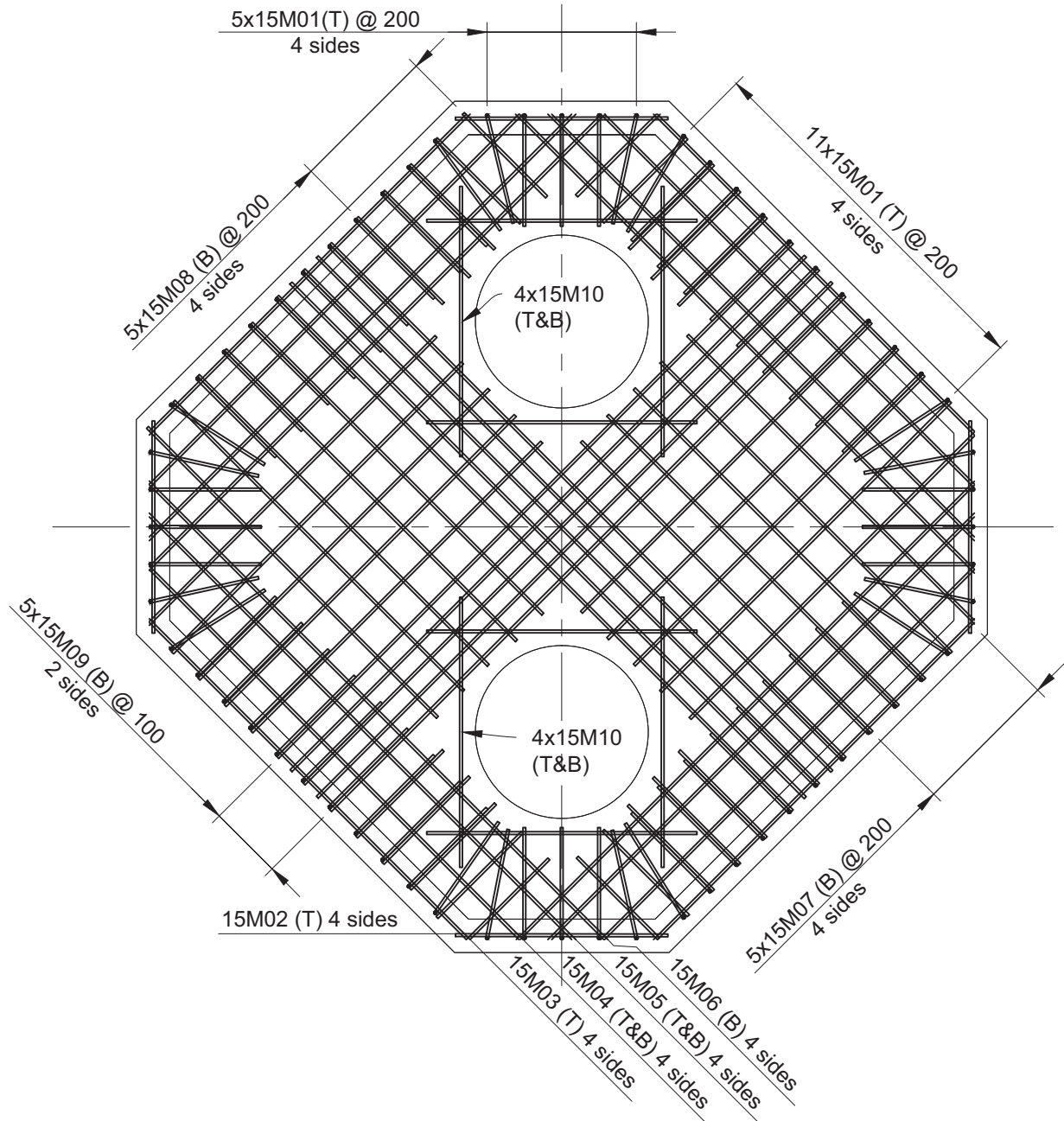
DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER	CAST-IN-PLACE VAULTS T-TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 7 OF 7	ES54 C2-03.07
					R 7

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS



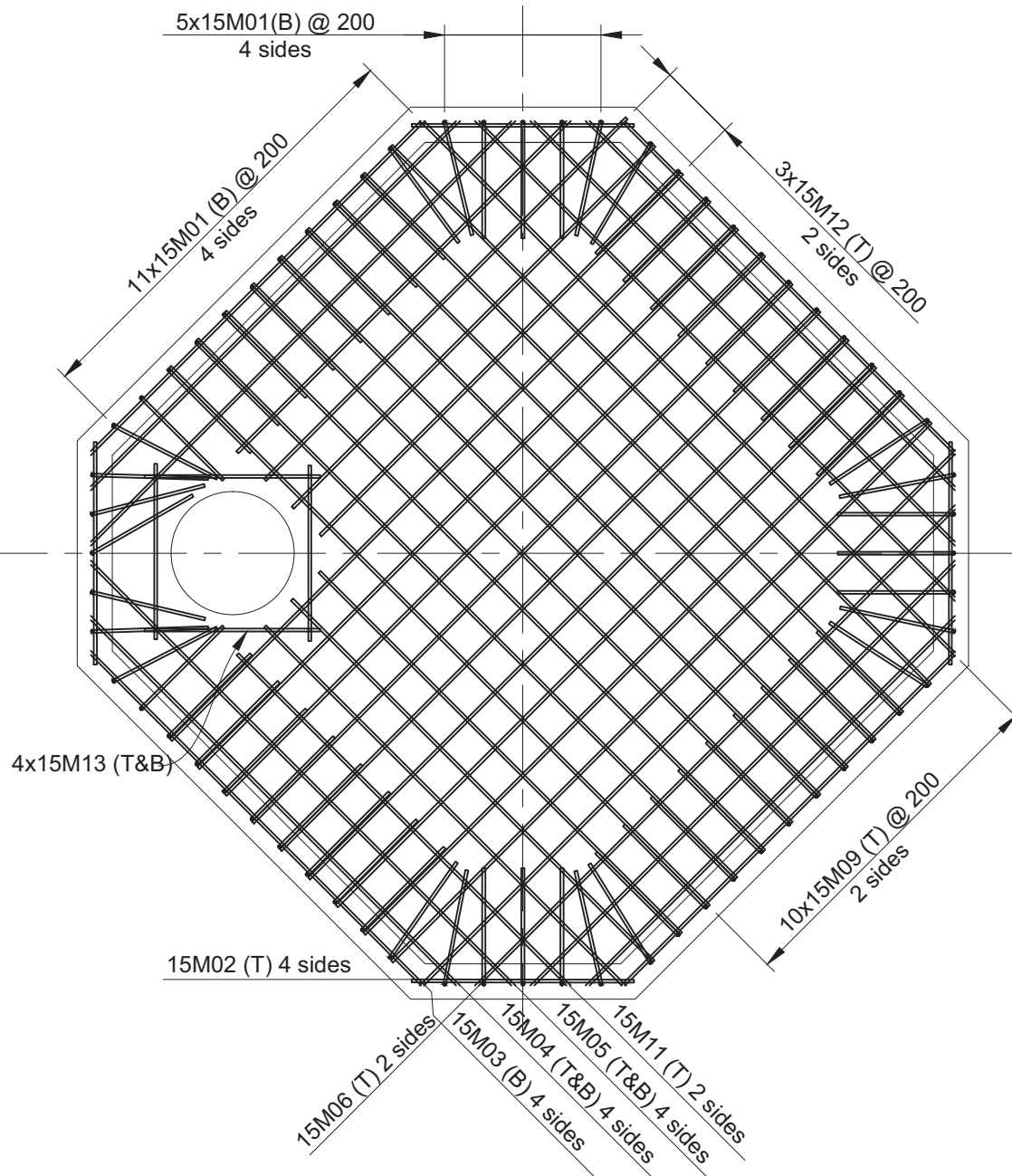
DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT		PAGE 1 OF 6	ES54 C2-04.01	R 7
DISTRIBUTION STANDARDS		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				
						



**Roof Slab Reinforcement
Top View**

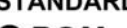
REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

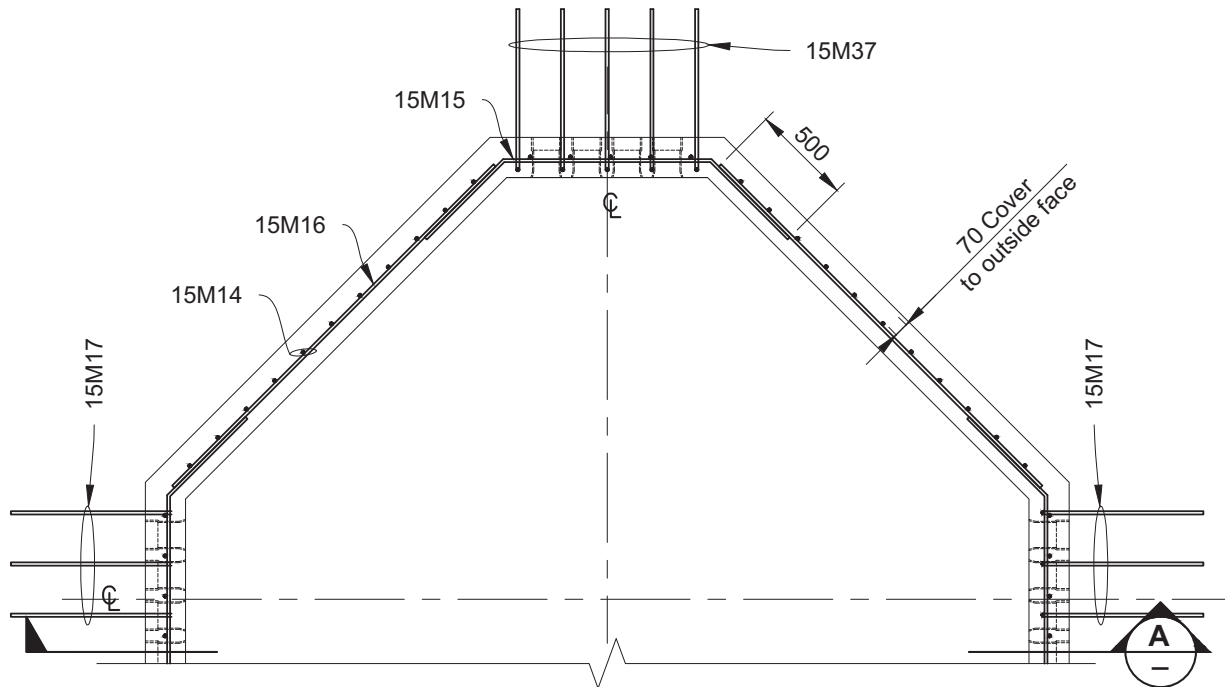
DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 2 OF 6	ES54 C2-04.02
					^R 7



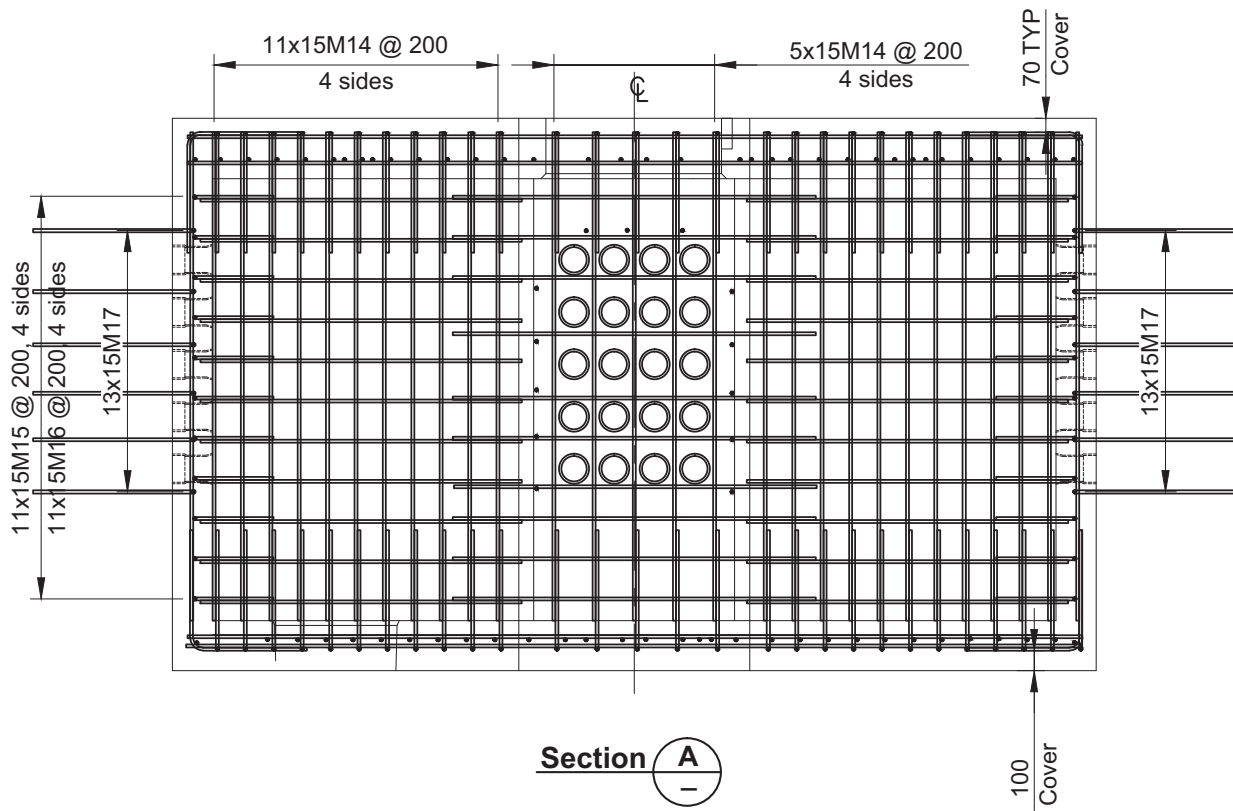
**Floor Slab Reinforcement
Top View**

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C. E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS	
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980		PAGE 3 OF 6	ES54 C2-04.03
					^R 7



Wall Reinforcement
Top View

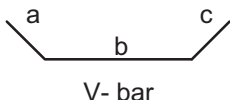
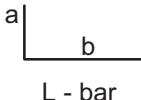
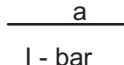


Section A

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT		PAGE 4 OF 6	ES54 C2-04.04	R 7
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				

Rebar Chart				
Mark	Qty.	Type	L [mm]	Dim [mm]
15M01	128	L - Bar	1400	a = 700, b = 700
15M02	8	I - Bar	1130	a = 1130
15M03	8	I - Bar	2400	a = 2400
15M04	16	I - Bar	2800	a = 2800
15M05	16	I - Bar	3200	a = 3200
15M06	6	I - Bar	3440	a = 3440
15M07	20	I - Bar	2200	a = 2200
15M08	20	I - Bar	640	a = 640
15M09	30	I - Bar	3890	a = 3890
15M010	16	I - Bar	1400	a = 1400
15M011	2	I - Bar	2390	a = 2390
15M012	6	I - Bar	2620	a = 2620
15M013	8	I - Bar	900	a = 900
15M014	64	I - Bar	2430	a = 2430
15M015	44	V - Bar	2530	a = c = 700, b = 1130
15M016	44	I - Bar	2260	a = 2260
15M017	52	I - Bar	1600	a = 800, b = 800

V - bar L - bar I - bar

Notes

1. Inside walls and ceiling shall be painted with two coats of white concrete paint, Cloverdale Towerthon or approved equivalent.
2. Installation shall comply with C0-02.
3. Excavation and backfilling shall comply with W1-01.
4. Drainage shall comply with Section G.
5. Pulling iron shall comply with H1-06.02.
6. Duct bank installation shall comply with H1-06.01.
7. Grounding shall comply with R3-02.
8. Concrete shall be CSA A23.1, Class of Exposure C-1, $f_c' = 35\text{MPa}$.
9. Reinforcement shall be CSA G30.18, $F_y = 400\text{MPa}$.
10. PVC Waterstop shall be installed in construction joints.
11. Abbreviations: T - top; B - bottom; T&B - top and bottom.

DESIGNED	RECOMMENDED	ACCEPTED	ENGINEER OF RECORD	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS		
						
C. CROWSON	L. STEVANOVIC	F. DENNERT		PAGE 5 OF 6	ES54 C2-04.05	^R 7
DISTRIBUTION STANDARDS 		ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				

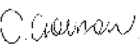
Bill of Material

Item	Description	Catalogue ID	Quantity	Supplied By
1A	300 mm riser ring	97000965	2	BC Hydro
1B	150 mm riser ring	97000964	2 or more	BC Hydro
2	Cast-iron frame – roadway duty	400-0401	2	BC Hydro
3	Cast-iron cover – roadway duty	400-0411	2	BC Hydro
4	Vault joint sealant	141-1346	As required	BC Hydro
5	Sump cover	400-0426	1	BC Hydro
6*	Ø ¾" x 1000 mm coil rod, B-12 Dayton Superior	N/A	6	Contractor
7*	Ø ¾" coil nut, B-13 Dayton Superior	N/A	12	Contractor
8	Ø ½" x 3" 13 TPI S/S security bolt	96005248	4	BC Hydro
9	Pulling iron P76 Dayton Superior 8UA671 galvanized	N/A	2	Contractor
10	Duct terminator	N/A	80	Contractor
11	Integral grounding electrode	N/A	2	Contractor

*Items 6 and 7 are optional, specified by Designer.

Reference Standards

ES53 B13-03	Vault Size for Stacked 600 A Elbow Splices
ES53 C10-02	Vault Racking Details
ES54 C0-02	Vaults, General Notes
ES54 Section G	Drainage Assemblies
ES54 H1-06	General Trenching Details, Duct Entry Details
ES54 H3-01	Duct Window in Concrete Vaults and Boxes
ES54 R3-02	Grounding in Concrete Vaults with Internal Ground Electrode
ES54 W1	Excavation and Backfill

DESIGNED  C. CROWSON	RECOMMENDED  L. STEVANOVIC	ACCEPTED  F. DENNERT	ENGINEER OF RECORD  C.E. CROWSON #45713 BRITISH COLUMBIA ENGINEER 2018-10-30	CAST-IN-PLACE VAULTS 4-WAY TYPE, DOUBLE ACCESS	PAGE 6 OF 6	ES54 C2-04.06	R 7	
DISTRIBUTION STANDARDS 				ISSUED: OCT 2018 REPLACES: AUG 2016 ORIGINALLY ISSUED: MAR 1980				

REVISIONS: R.7 - BARS ADDED AROUND OPENINGS, 2 BILL OF MATERIAL ITEMS ADDED. OCT '18 LS