

TECHNICAL MEMO

To Ms. Leslie Carter, Administrator Deep Bay Improvement District	From Chris Pogson, P.Eng., Project Manager
Re 4891 Thompson Clark West Future Right-of-Way Review	Date July 28, 2021

As per our conversation dated July 28, 2021, McElhanney Ltd. (McE) has undertaken a review of the potential future Right-of-Way (ROW) width required for maintenance and future replacement of the existing 200mm asbestos cement watermain located on 4891 Thompson Clark West.

This memorandum summarizes the results of our assessment and provides comments and recommendations for consideration.

1. Background

The District is currently in negotiations with the landowner of 4891 Thompson Clark West, to secure rights on an unsecured portion of watermain. In addition, the District would like to expand an existing right-of-way to facilitate maintenance activities on the existing watermain and ultimately future replacement.

A site reconnaissance was carried out by Chris Pogson, P.Eng. of McE with permission of the homeowner, on October 1, 2020. Representatives from the client, Regional District of Nanaimo (RDN) and the property owners George & Joanne Cousineau were in attendance.

The purpose of the site reconnaissance was to meet the homeowner and review concerns of an adjacent slope and drainage issues. In addition, existing and future watermain alignments, construction constraints, and general site topography were discussed.

2. GENERAL COMMENTS

Utility ROW widths vary depending on a wide variety of factors. For single utilities, ROW's are generally defined at the time construction and based on the governing jurisdictions standards (i.e. provincial or local government requirements). Standards tend to typically vary between 3.0m to 6.0m in width, centered over the utility.

However, in all cases ROW widths should be sufficient to permit open excavation with side slopes and access for construction equipment's in accordance with WorkSafeBC regulations, without impacting adjacent structures.

In some cases, temporary ROW's and easements are utilized in conjunction with permanent ones during construction.

3. ESTIMATED ROW WIDTH

We have estimated the proposed ROW width based on the following considerations:

- Conventional cut and cover construction;
- Standard excavating equipment (EX120 class excavator);
- Existing site topography (including creek crossing); and,
- Existing and future watermain horizontal alignment and depth below ground.

Without the use of temporary working ROW's or Easements, the width of ROW will be governed by the construction and service equipment requirements. As such, below are the minimum requirements for an industry standard excavator:

- 1) Hitachi Super EX120-V Class, undercarriage width = 2.59m (using 600mm track gauge)
- 2) Hitachi Super EX120-V Class, with standard boom. Load radius = 4.0m
- 3) Hitachi Super EX120-V Class, Rear Swing Radius = 2.13m.

Based on the above the minimum ROW width should be: $4.0\text{m} + 2.13\text{m} = \mathbf{6.13\text{m}}$.

4. DISCUSSION

The following comments are provided for consideration:

- 1) The minimum ROW width should be in the order of 6.13m in width.
- 2) The ROW should be centered over the existing utility, for ease of maintenance.
- 3) Temporary Working ROW's or Easements should be considered to minimize permanent ROW widths and property encumbrance.



5. Limitations

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The factual data, interpretations, suggestions, recommendations and opinions expressed in this document pertain to the specific project, site conditions, design objective, development and purpose described to McE by the Client and/or their design consultants, and are not applicable to any other project or site location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

6. Closure

We trust this meets the District needs, however please do not hesitate to contact me directly should you have any further questions or concerns.

Regards,
McElhanney Ltd.



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Specifications: EX120

Service Refill Capacities

	US gal	Liters	Imp gal
Fuel tank	66.1	250.0	55.0
Engine coolant	4.9	18.4	4.0
Engine oil	4.3	16.2	3.6
Swing mechanism	0.8	3.2	0.7
Travel final drive device (each side)	0.9	3.5	0.8
Hydraulic system	35.4	134.0	29.5
Hydraulic tank	18.2	69.0	15.2

Bucket Selection Chart

Bucket capacity indicated is SAE heaped.

Material (loose weight)	General-Purpose Bucket*		Heavy-Duty Bucket*	
3,400 - 3,100 lb/yd³ (2 020 - 1 840 kg/m³) Sand and gravel, wet Sand, wet	0.63 yd ³	0.5 m ³	0.50 yd ³	0.4 m ³
2,900 - 2,550 lb/yd³ (1 720 - 1 510 kg/m³) Sand and gravel, dry Sand, moist Rock, granite, blasted and broken Clay, wet Earth, wet Limestone, broken or crushed Earth, dry	0.75 yd ³ 0.75 yd ³ 0.63-0.88 yd ³ 0.75 yd ³ 0.75 yd ³ 0.50-0.75 yd ³ 0.63-0.75 yd ³	0.6 m ³ 0.6 m ³ 0.5-0.7 m ³ 0.6 m ³ 0.6 m ³ 0.4-0.6 m ³ 0.5-0.6 m ³	0.63 yd ³ 0.63 yd ³ 0.50-0.75 yd ³ 0.63 yd ³ 0.63 yd ³ 0.50-0.63 yd ³ 0.63 yd ³	0.5 m ³ 0.5 m ³ 0.4-0.6 m ³ 0.5 m ³ 0.5 m ³ 0.4-0.5 m ³ 0.5 m ³
2,500 - 2,100 lb/yd³ (1 480 - 1 250 kg/m³) Clay, dry Sand, dry Shale Earth, loam Caliche	0.63-0.88 yd ³ 0.88 yd ³ 0.88 yd ³ 0.88 yd ³ 0.63-0.88 yd ³	0.5-0.7 m ³ 0.7 m ³ 0.7 m ³ 0.7 m ³ 0.5-0.7 m ³	0.75 yd ³ 0.75 yd ³ 0.75 yd ³ 0.75 yd ³ 0.50-0.75 yd ³	0.6 m ³ 0.6 m ³ 0.6 m ³ 0.6 m ³ 0.4-0.6 m ³
1,780 - 1,170 lb/yd³ (1 050 - 690 kg/m³) Coal Topsoil Peat, wet	1.25 yd ³ 1.38 yd ³ 1.75 yd ³	1.0 m ³ 1.1 m ³ 1.3 m ³	- - -	- - -
950 - 700 lb/yd³ (560 - 420 kg/m³) Cinders Peat, dry Wood chips	2.00 yd ³ 2.75 yd ³ 3.25 yd ³	1.5 m ³ 2.1 m ³ 2.5 m ³	- - -	- - -

* Contact your Hitachi dealer for optimum, bucket and attachment selections. These recommendations are for general conditions and average use. Larger buckets may be possible for flat and level operations, less compacted materials, and volume loading applications such as mass excavation applications in ideal conditions. Smaller buckets are recommended for adverse conditions such as off-level applications and uneven surfaces.

Buckets

Capacity		Width		No. of teeth	Weight	Recommendation EX120		
PCSA heaped	CECE heaped	Without side cutters	With side cutters			6' 11" (2.10 m) arm	8' 3" (2.52 m) arm	9' 11" (3.01 m) arm
0.25 yd ³ (0.19 m ³)	0.17 m ³	18" (450 mm)	22" (550 mm)	3	530 lb (240 kg)	●	●	●
0.39 yd ³ (0.30 m ³)	0.25 m ³	23" (580 mm)	28" (700 mm)	3	620 lb (280 kg)	●	●	●
0.52 yd ³ (0.40 m ³)	0.33 m ³	27" (680 mm)	31" (800 mm)	4	730 lb (330 kg)	●	●	●
0.60 yd ³ (0.46 m ³)	0.40 m ³	33" (850 mm)	38" (970 mm)	5	840 lb (380 kg)	●	●	◆
0.72 yd ³ (0.55 m ³)	0.45 m ³	35" (890 mm)	40" (1 010 mm)	5	880 lb (400 kg)	●	●	◆*
0.77 yd ³ (0.59 m ³)	0.50 m ³	37" (950 mm)	42" (1 070 mm)	5	900 lb (410 kg)	●	◆	-
0.86 yd ³ (0.66 m ³)	0.55 m ³	41" (1 030 mm)	-	5	900 lb (410 kg)	■	-	-
1 0.72 yd ³ (0.55 m ³)	0.45 m ³	35" (890 mm)	40" (1 010 mm)	5	1,010 lb (460 kg)	●	●	◆
2 0.72 yd ³ (0.55 m ³)	0.45 m ³	35" (890 mm)	40" (1 010 mm)	5	1,080 lb (490 kg)	●	●	◆
3 0.72 yd ³ (0.55 m ³)	0.45 m ³	35" (890 mm)	40" (1 010 mm)	5	1,040 lb (470 kg)	●	●	◆
*1 0.77 yd ³ (0.59 m ³)	0.50 m ³	37" (950 mm)	42" (1 070 mm)	5	1,060 lb (480 kg)	●	◆	-
V-Type bucket: 0.46 yd ³ (0.35 m ³ : CECE heaped)				3	820 lb (370 kg)	◆	◆	◆
One point ripper				1	710 lb (320 kg)	✘	✘	-
Clamshell bucket: 0.39 yd ³ (0.30 m ³ : CECE heaped), Width 22" (560 mm)				6	1,520 lb (690 kg)	●	●	-
Slope-finishing blade: Width-39" (1 000 mm), Length-63" (1 600 mm)					950 lb (430 kg)	◆	◆	◆

* With 28" (700 mm) shoes only

*1 Reinforced bucket

*2 Level-pin-reinforced bucket

*3 H-bucket

Backhoe Attachments

Boom and arms are of welded, box-section design.

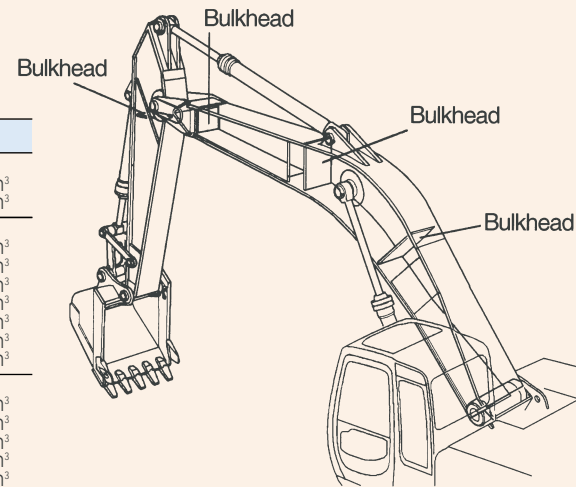
Boom length: 15' 1" (4.60 m)

Arms available in lengths: 6' 11" (2.10 m)

8' 3" (2.52 m)

9' 11" (3.01 m)

Bucket is of welded steel structure. Side clearance adjustment mechanism provided on the bucket joint bracket.



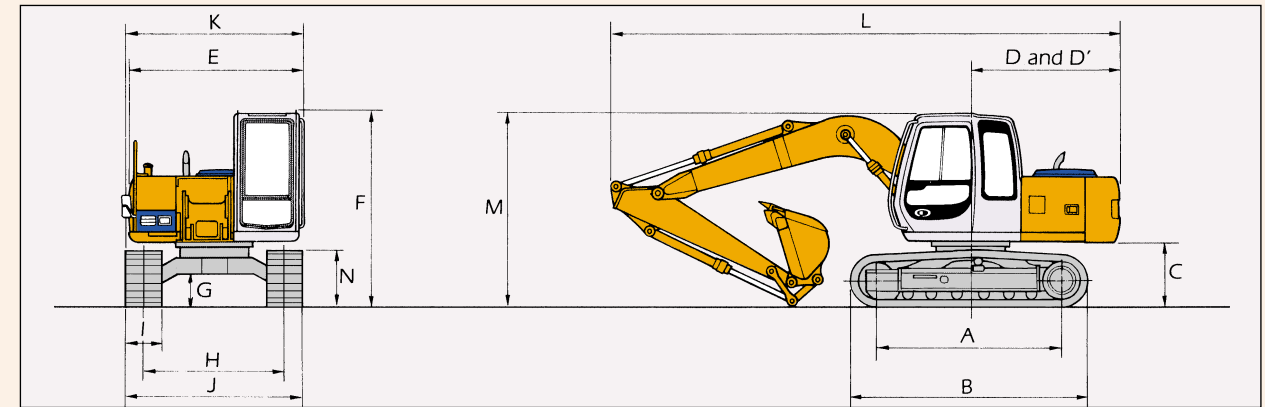
Reinforced Front Attachment

Bulkheads are provided inside the front attachment to resist torsion and thickened plates are used in areas subject to stress concentration for added durability in tough operations.

Specifications: EX120

BACKHOE EX120

Dimensions



		EX120			
A	Distance between tumblers	9'5" (2 880 mm)			
B	Undercarriage length	11'9" (3 580 mm)			
*C	Counterweight clearance	2'11" (890 mm)			
D	Rear-end swing radius	7'0" (2 130 mm)			
D'	Rear-end length	6'11" (2 100 mm)			
E	Overall width of upperstructure	8'1" (2 460 mm)			
F	Overall height of cab	8'11" (2 720 mm)			
*G	Min. ground clearance	1'5" (440 mm)			
H	Track gauge	6'6" (1 990 mm)			
I	Track shoe width	G 20" (500 mm)	G 24" (600 mm)	G 28" (700 mm)	F 20" (510 mm)
J	Undercarriage width	8'2" (2 490 mm)	8'6" (2 590 mm)	8'10" (2 690 mm)	8'2" (2 500 mm)
K	Overall width	8'2" (2 500 mm)	8'6" (2 590 mm)	8'10" (2 690 mm)	8'2" (2 500 mm)
L	Overall length				
	With 6'11" (2.10 m) arm	24'10" (7 570 mm)			
	With 8'3" (2.52 m) arm	24'10" (7 580 mm)			
	With 9'11" (3.01 m) arm	24'11" (7 590 mm)			
M	Overall height of boom				
	With 6'11" (2.10 m) arm	8'5" (2 570 mm)			
	With 8'3" (2.52 m) arm	8'10" (2 680 mm)			
	With 9'11" (3.01 m) arm	**8'9" (2 670 mm)			
N	Track height				
	With triple grouser shoes	2'7" (790 mm)			

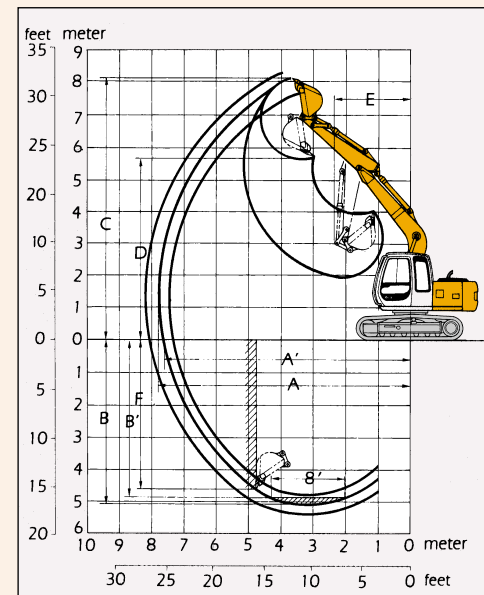
*Excluding track shoe lug

** This dimension is shown in the transportation hole position of the arm

G: Triple grouser shoe

F: Flat shoe

Working Ranges



		EX120		
Arm length		6'11" (2.10 m)	8'3" (2.52 m)	9'11" (3.01 m)
A	Max. digging reach	25'11" (7 900 mm)	27'2" (8 270 mm)	28'8" (8 740 mm)
A'	Max. digging reach (on ground)	25'6" (7 770 mm)	26'8" (8 140 mm)	28'3" (8 620 mm)
B	Max. digging depth	16'11" (5 160 mm)	18'3" (5 570 mm)	19'11" (6 060 mm)
B'	Max. digging depth (8° level)	16'2" (4 920 mm)	17'7" (5 360 mm)	19'3" (5 880 mm)
C	Max. cutting height	27'5" (8 350 mm)	28'1" (8 550 mm)	29'2" (8 880 mm)
D	Max. dumping height	19'6" (5 940 mm)	20'2" (6 140 mm)	21'3" (6 470 mm)
E	Min. swing radius	7'7" (2 310 mm)	7'8" (2 330 mm)	8'6" (2 590 mm)
F	Max. vertical wall	15'3" (4 640 mm)	16'5" (5 010 mm)	18'0" (5 480 mm)
Bucket digging force	ISO	20,100 lbf (9 100 kgf)		
	SAE: PCSA	17,600 lbf (8 000 kgf)		
Arm crowd force	ISO	15,000 lbf (6 800 kgf)	13,400 lbf (6 100 kgf)	11,900 lbf (5 400 kgf)
	SAE: PCSA	14,600 lbf (6 600 kgf)	13,000 lbf (5 900 kgf)	11,700 lbf (5 300 kgf)

Excluding track shoe lug

