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LAMPIRAN

DRILL LOG

HOLE No. P1-1

SHEET 1 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	35	m	ELEVATION	98.317	m						
SITE		SANDARAN KANAN		COORDINATES	X: 78747340 Y: 9402747299	INCLINATION	Vertical	DRILL RIG	Jacro 175								
AVERAGE CORE RECOVERY		99,51 %		DATE	FROM 13-Apr-21 TO 21 April 2021	DRILLED	Basri	LOGGED	Ahmad								
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	CORE SHAPE & JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	DEPTH	
												%	50				%
13-Apr-21	1	98,3				B	II	b	CH			100	100	88	0	1	
	2											100	100	99		2	
	3											100	100	95		3	
	4											100	100	100		4	
	5											100	100	75		5	
15-Apr-21	6	93,3				C	III	c	CM			100	100	100	38,12	6	
	7											100	100	69		7	
	8											100	100	100		8	
	9											100	100	100		9	
	10											100	100	100		10	
16-Apr-21	11	88,3	BREKSI VULKANIK		0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0.1 m, 0.2m, 0.4 m, 1.3 m, 2.9 m, 4.2 m, 6.2 m, 8.4 m, 10.7 m, 11.4 m, 12.8 m, 12.9 m, 15.1 m, 15.4 m, 15.8 m, 18.4 m, 18.6 m, 19.8 m, 20.6 m, 21.1 m, 24.2 m.	B	II	b	CH		4.18 m	100	100	95	30,78	11	
	12											99	97	100		12	
	13											100	100	100		13	
	14											99	99	100		14	
	15											100	100	100		15	
18-Apr-21	16	83,3										100	100	97	7,34	16	
	17											100	100	100		17	
	18											98	98	98		18	
	19											97	97	97		19	
	20											98	98	98		20	
19-Apr-21	21	78,3				B	III	c	CM			100	100	87	4,4	21	
	22											100	100	100		22	
	23											100	100	100		23	
	24											100	100	100		24	
	25											100	100	100		25	
20-Apr-21	26	73,3			25 - 35 m : Batuan segar berwarna hitam keabuan sampai hitam dan dalam keadaan lapuk berwarna cokelat, kekerasan sedang sampai baik, tingkat pelapukan tinggi sampai ringan. Tekstur kristalinitas hipokristalin, granularitas porfirofanitik, bentuk mineral euhedral-subbedral, relasi equigranular. komposisi mineral piroksen, plagioklas dan massa dasar gelas, struktur batuan masif. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Basal. Beberapa kekar: 25.9 m, 27.6 m, 27.9 m, 28.2 m, 28.5 m, 29.5 m, 30.7 m, 31.2 m, 31.7 m, 32.2 m, 33.4 m, 33.7 m, 34.3 m, 34.6 m, 34.8 m	A	I	a	B				100	100	100	0,03	26
	27												100	100	92		27
	28												100	100	97		28
	29												99	99	99		29
	30												99	98	98		30

* R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100 %
 * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
 * DEPTH and Elevation are in meter
 * DIAMETER is in millimeter

DRILL LOG

HOLE No. CH-1

SHEET 1 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	30	m	ELEVATION	27.26	m																									
SITE		SANDARAN KANAN		COORDINATES	X : 787536915 Y : 9402930914	INCLINATION	Vertical		DRILL RIG	Jacro 175																										
AVERAGE CORE RECOVERY		99,36 %		DATE	FROM 28-Apr-21 TO 1 Mei 2021	DRILLED	Basri		LOGGED	Ahmad																										
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	CORE SHAPE & JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	DEPTH																				
												%	%																							
28-Apr-21	1	127,2	BREKSI VULKANIK		0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.	B	III	c	CM	8.84 m	-	100	90	0,01	1																					
	2	95				82	100	88	100			92	100		92	2																				
	3	100				88	100	92	100			92	100		92	3																				
	4	100				92	100	92	100			92	100		92	4																				
	5	100				92	98	96	100			92	100		92	5																				
28-Apr-21	6	122,2				BREKSI VULKANIK		0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.	B			III	c	CM	8.84 m	-	98	96	0,25	6																
	7	100							92			100	92	100			92	100		92	7															
	8	100							98			100	98	100			98	100		98	8															
	9	100							97			100	90	100			90	100		90	9															
	10	100							90			100	90	100			90	100		90	10															
28-Apr-21	11	117,2							BREKSI VULKANIK				0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.	B			III	c	CM	8.84 m	-	99	90	3,87	11											
	12	100												98			100	98	100			98	100		98	12										
	13	100												94			100	94	100			94	100		94	13										
	14	100												98			100	98	100			98	100		98	14										
	15	100												98			100	98	100			98	100		98	15										
30-Apr-21	16	112,2												BREKSI VULKANIK				0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.	B			II	b	CH	8.84 m	-	98	98	1,48	16						
	17	100																	98			100	98	100			98	100		98	17					
	18	100																	95			100	95	100			95	100		95	18					
	19	100																	99			100	99	100			99	100		99	19					
	20	100																	99			100	99	100			99	100		99	20					
30-Apr-21	21	107,2																	BREKSI VULKANIK				0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.	B			II	b	CH	8.84 m	-	100	86	0,38	21	
	22	100																						98			100	98	100			98	100		98	22
	23	100																						89			100	89	100			89	100		89	23
	24	100																						91			100	91	100			91	100		91	24
	25	100																						91			100	91	100			91	100		91	25
1 Mei 2021	26	102,2	BREKSI VULKANIK		0 - 25 m : Batuan dalam keadaan segar berwarna abu-abu kehitaman dan dalam keadaan lapuk berwarna coklat, struktur tidak berlapis, komposisi batuan terdiri atas fragmen, matriks, dan semen. Kekerasan sedang, tingkat pelapukan sedang sampai ringan. Fragmen batuan beku (basal) dan tufa dengan bentuk subangular - angular dengan ukuran fragmen bervariasi yaitu kerakal - berangkal (4 - 64 mm), matriks terdiri dari mineral piroksin dan tufa, serta semen silika berupa debu vulkanik. Struktur batuan berupa vesikuler dan amigdaloidal. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Breksi Vulkanik. Beberapa kekar: 0,6 m, 1,3 m, 3,1 m, 4,6 m, 6,2 m, 8,4 m, 10,7 m, 11,4 m, 12,8 m, 12,9 m, 14,2 m, 15,1 m, 15,4 m, 18,3 m, 18,6 m, 19,8 m, 20,7 m, 21,1 m, 24,2 m, 24,9 m.					B	II													c			CM	8.84 m	-			100	94	0,22	26	
	27	100								94	100													94			100					94	100		94	27
	28	98								82	100													82			100					82	100		82	28
	29	98								78	100													78			100					78	100		78	29
	30	100								68	100													68			100					68	100		68	30
1 Mei 2021	31	97,200				BASAL		25 - 30 m : Batuan segar berwarna hitam keabuan sampai hitam dan dalam keadaan lapuk berwarna coklat, kekerasan sedang, tingkat pelapukan sedang sampai ringan. Tekstur kristalinitas hipokristalin, granularitas porfirofanitik, bentuk mineral euhedral-subhedral, relasi equigranular. komposisi mineral piroksin, plagioklas dan massa dasar gelas, struktur batuan mastik. Berdasarkan ciri fisiknya, maka nama batuan ini adalah Basal. Beberapa kekar: 26,1 m, 27,6 m, 27,9 m, 28,2 m, 28,5 m, 29,6 m.		B	III				b	CH								8.84 m			-					98	82	0,22	31	
	32	98								82	100				82	100																82	100		82	32
	33	98								78	100				78	100																78	100		78	33
	34	100								68	100				68	100																68	100		68	34
	35	100								68	100				68	100																68	100		68	35

* R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindrical cores longer than 10 cm) / (Total core length) x 100 %
 * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
 * DEPTH and Elevation are in meter
 * DIAMETER is in millimeter

DRILL LOG

HOLE No. P2-1

SHEET 1 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	40	m	ELEVATION	8,35	m						
SITE		SANDARAN KANAN		COORDINATES	X : 787497248 Y : 940274774	INCLINATION	Vertical	DRILL RIG	iacro 175								
AVERAGE CORE RECOVERY		81,80 %		DATE	FROM 3 Mei 2021 TO 27 Mei 2021	DRILLED	Basri	LOGGED	Ahmad								
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	DEPTH	
												%	%				
3 Mei 2021	1				0 - 40 m ; Batuan segar berwarna hitam keabuan sampai hitam dan dalam keadaan lapuk berwarna cokelat, kekerasan buruk sampai baik, tingkat pelapukan tinggi sampai ringan. Tekstur kristalinitas hipokristalin, granularitas porfiroafanitik, bentuk mineral euhedral-subhedral, relasi equigranular, komposisi mineral piroksen, plagioklas dan massa dasar. Struktur batuan masif dan amigdaloidal.							88	41	49,57	1		
	2											50	12			2	
	3											25	0			3	
	4					Benulasarkan ciri fisiknya, maka nama batuan ini adalah Basal.	E	V	d	D			50		0		4
	5					Beberapa kekar:							80		0		5
24 Mei 2021	6				11.5 m, 11.8 m, 12.1 m, 13.4 m, 13.9 m, 14.2 m, 14.3 m, 14.4 m, 14.7 m, 15.3 m, 15.6 m, 15.8 m, 16.1 m, 16.2 m, 16.5 m, 16.7 m, 17.1 m, 17.4 m, 17.9 m, 18.2 m, 18.5 m, 19.3 m, 20.5 m, 20.7 m, 21.6 m, 22.8 m, 23.8 m, 24.2 m, 24.6 m, 24.9 m, 25.1 m, 26.6 m, 26.8 m, 27.2 m, 27.4 m, 27.4 m, 27.6 m, 28 m,							20	0	21,13	6		
	7											20	0			7	
	8											15	0			8	
	9											70	0			9	
	10						C	III	d	CL			84		80		10
25 Mei 2021	11		BASALT ANDESITE									60	0	4,47	11		
	12												80		41		12
	13						B	III	c	CM			90		41		13
	14												70		36		14
	15											4.85 m	95		47		15
25 Mei 2021	16											100	82	0,10	16		
	17											100	53			17	
	18					A	II	a	CH			100	48			18	
	19											100	66			19	
	20											100	90			20	
26 Mei 2021	21											98	71	0,35	21		
	22											100	78			22	
	23											100	82			23	
	24											100	71			24	
	25											85	54			25	
26 Mei 2021	26											95	42	0,71	26		
	27											70	23			27	
	28											90	38			28	
	29											85	85			29	
	30											100	37			30	

- * R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100 %
- * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
- * DEPTH and Elevation are in meter
- * DIAMETER is in millimeter

DRILL LOG

HOLE No. P2-1

SHEE' 2 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	40	m	ELEVATION	98	m					
SITE		SANDARAN KANAN		COORDINATES		X : 787497248	Y : 9402747774	INCLINATION	Vertical		DRILL RIG	Jacro 175				
AVERAGE CORE RECOVERY		81,80 %		DATE	FROM	3 Mei 2021	TO	27 Mei 2021	DRILLED	Basri		LOGGED	Ahmad			
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	CORE SHAPE & JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	D E P T H
												%	%			
27 Mei 2021	31			XXXXXX								100	58	0,21	31	
	32			XXXXXX		B	II	b	CH			100	0		32	
	33			XXXXXX								100	60		33	
	34			XXXXXX								100	26		34	
	35			XXXXXX								100	25	35		
	36			XXXXXX								100	50	0,38	36	
	37			XXXXXX								97	15		37	
	38			XXXXXX								100	68		38	
	39			XXXXXX								80	11		39	
	40			XXXXXX								75	24	40		
															41	
															42	
															43	
															44	
															45	
															46	
															47	
															48	
															49	
															50	

- * R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100 %
- * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
- * DEPTH and Elevation are in meter
- * DIAMETER is in millimeter

DRILL LOG

HOLE No. CH-2

SHEET 1 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	40	m	ELEVATION	98.35	m								
SITE		SANDARAN KANAN		COORDINATES		X : 787478120	Y : 9402748174	INCLINATION		Vertical	DRILL RIG	Jacro 175							
AVERAGE CORE RECOVERY		89,18 %		DATE	FROM	28-Apr-21	TO	16 Juni 2021	DRILLED	Basri	LOGGED	Ahmad							
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	CORE SHAPE & JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	DEPTH			
												%	50						
28-Apr-21	1			XXXXXX								20	0			1			
	2			XXXXXX								35	0			2			
	3			XXXXXX		E	V	d	D			70	10	0		3			
	4			XXXXXX								60	0			4			
	5			XXXXXX								50	0			5			
13 Juni 2021	6			XXXXXX								40	0			6			
	7			XXXXXX		C	IV	d	CL			30	0			7			
	8			XXXXXX	0 - 40 m ;							90	24	128,1		8			
	9			XXXXXX	Batuan segar berwarna hitam keabuan sampai hitam dan dalam keadaan lapuk berwarna cokelat, kekerasan buruk sampai baik, tingkat pelapukan tinggi sampai ringan. Tekstur kristalinitas hipokristalin, granularitas porfirofanitik, bentuk mineral euhedral-subhedral, relasi equigranular. komposisi mineral piroksen, plagioklas dan massa dasar. Struktur batuan masif dan amigdaloidal.								85	39			9		
	10			XXXXXX	Berdasarkan ciri fisiknya, maka nama batuan ini adalah Basal.								95	71			10		
	11			XXXXXX	dip kekar rata - rata 30 - 40°		B	III	c	CH			100	37			11		
	12			XXXXXX	Beberapa kekar :								100	60	1,48		12		
	13			XXXXXX	8.7 m, 9.5 m, 10 m, 10.3 m, 10.8 m, 11.1 m, 11.3 m, 11.9 m, 12.1 m, 12.4 m, 12.5 m, 12.7 m, 14.1 m, 14.4 m, 14.8 m, 15.3 m, 15.5 m, 15.7 m, 16.3 m, 16.4 m, 16.6 m, 16.7 m, 16.8 m, 17.1 m, 17.2 m, 17.3 m, 17.5 m, 17.8 m, 18.2 m, 18.9 m, 19.1 m, 19.7 m, 20 m, 20.3 m, 20.6 m, 21.6 m, 21.7 m, 21.8 m, 22.2 m, 22.3 m, 22.4 m, 22.5 m, 23.3 m, 23.4 m, 23.6 m, 23.9 m, 24.6 m, 24.8 m, 25.1 m, 25.9 m, 26.1 m, 27.3 m, 28.7 m, 29 m, 29.8 m, 30 m, 30.1 m, 30.2 m, 30.3 m, 30.4 m, 30.6 m, 30.7 m, 30.8 m, 30.9 m, 31.1 m, 31.2 m, 31.2 m, 31.3 m, 31.4 m, 31.5 m, 31.6 m, 31.7 m, 31.8 m, 31.9 m, 31.1 m, 32.2 m, 32.3 m, 32.4 m, 32.6 m, 32.8 m, 33.1 m, 33.2 m, 33.3 m, 33.6 m, 33.8 m, 34.4 m, 34.5 m, 34.7 m, 34.8 m, 34.9 m, 35.1 m, 35.3 m, 35.4 m, 35.7 m, 35.8 m, 35.9 m, 36.1 m, 36.2 m, 36.3 m, 36.4 m, 36.5 m, 36.6 m, 36.7 m, 36.8 m, 37.2 m, 37.3 m, 37.4 m, 37.5 m, 37.6 m, 37.7 m, 37.8 m, 38.1 m, 38.2 m, 38.3 m, 38.4 m, 38.5 m, 38.6 m, 38.7 m, 38.8 m, 38.9 m, 39.1 m, 39.6 m, 39.7 m, 39.9 m.											100	37		13
	14			XXXXXX									100	78			14		
	15			XXXXXX								14.30 m	100	57			15		
14 Juni 2021	16			XXXXXX								100	96			16			
	17			XXXXXX		A	III	b	CH			95	41	0,17		17			
	18			XXXXXX								100	65			18			
	19			XXXXXX								100	84			19			
	20			XXXXXX								100	89			20			
15 Juni 2021	21			XXXXXX								100	89			21			
	22			XXXXXX								100	100	0,43		22			
	23			XXXXXX								100	100			23			
	24			XXXXXX								100	100			24			
	25			XXXXXX								97	44			25			
15 Juni 2021	26			XXXXXX		A	II	a	CH			100	44			26			
	27			XXXXXX								100	22			27			
	28			XXXXXX								100	35	0,06		28			
	29			XXXXXX								100	37			29			
	30			XXXXXX								100	83			30			

* R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100 %
 * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
 * DEPTH and Elevation are in meter
 * DIAMETER is in millimeter


DRILL LOG

HOLE No. CH 2


SHEET 2 OF 2

PROJECT		BENDUNGAN PAMUKKULU				DEPTH	40	m	ELEVATION	98	m					
SITE		SANDARAN KANAN		COORDINATES		X : 787478120	Y : 9402930914	INCLINATION	Vertical		DRILL RIG	Jacro 175				
AVERAGE CORE RECOVERY		89,18 %		DATE	FROM	28 April 2021	TO	16 Juni 2021	DRILLED	Basri		LOGGED	Ahmad			
DATE	DEPTH (M)	ELEVATION (M)	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	HARDNESS	CORE SHAPE & JOINT INTERVAL	WEATHERING & ALTERATION	ROCK CLASS	BIT AND DIA.	GROUND WATER LEVEL	CORE RECOVERY		R.Q.D.	FIELD PERMEABILITY TEST (K in cm/sec or Lu) GRAPH P - Q	D P T H
												%	50			
16 Juni 2021	31			XXXXXX								100		45	0,1	31
	32			XXXXXX		B	III	c	CM			100		33		32
	33			XXXXXX								100		38		33
	34			XXXXXX								100		43		34
	35			XXXXXX								100		73	35	
	36			XXXXXX								100		64	1,62	36
	37			XXXXXX								100		27		37
	38			XXXXXX								100		12		38
	39			XXXXXX								100		22		39
	40			XXXXXX								100		82	40	
															41	
															42	
															43	
															44	
															45	
															46	
															47	
															48	
															49	
															50	


- * R.Q.D is Rock Quality Designation, R.Q.D. = (Total length of cylindric cores longer than 10 cm) / (Total core length) x 100 %
- * LUGEON VALUE is l/min/m under injection water pressure of 10 kg/cm²
- * DEPTH and Elevation are in meter
- * DIAMETER is in millimeter

Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	P1-1	Depth of Borehole	35 m
Location	STA 0+20	Depth of Rock Core	0 - 35 m
Date of Drilling	13 – 21 April 2021	Total Rock Box	7




Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	P1-1	Depth of Borehole	35 m
Location	STA 0+20	Depth of Rock Core	0 - 35 m
Date of Drilling	13 – 21 April 2021	Total Rock Box	7

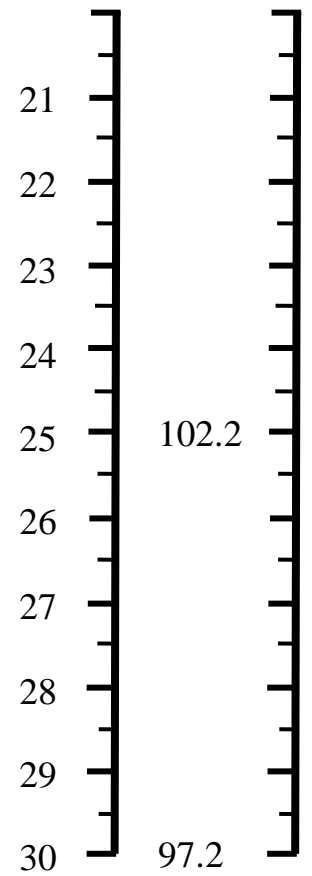



Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	CH - 1	Depth of Borehole	30 m
Location	STA 0+20	Depth of Rock Core	0 ~ 30 m
Date of Drilling	28 April – 1 Mei 2021	Total Rock Box	6




Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	CH - 1	Depth of Borehole	30 m
Location	STA 0+20	Depth of Rock Core	0 ~ 30 m
Date of Drilling	28 April – 1 Mei 2021	Total Rock Box	6

Depth (m) Elv. (m)




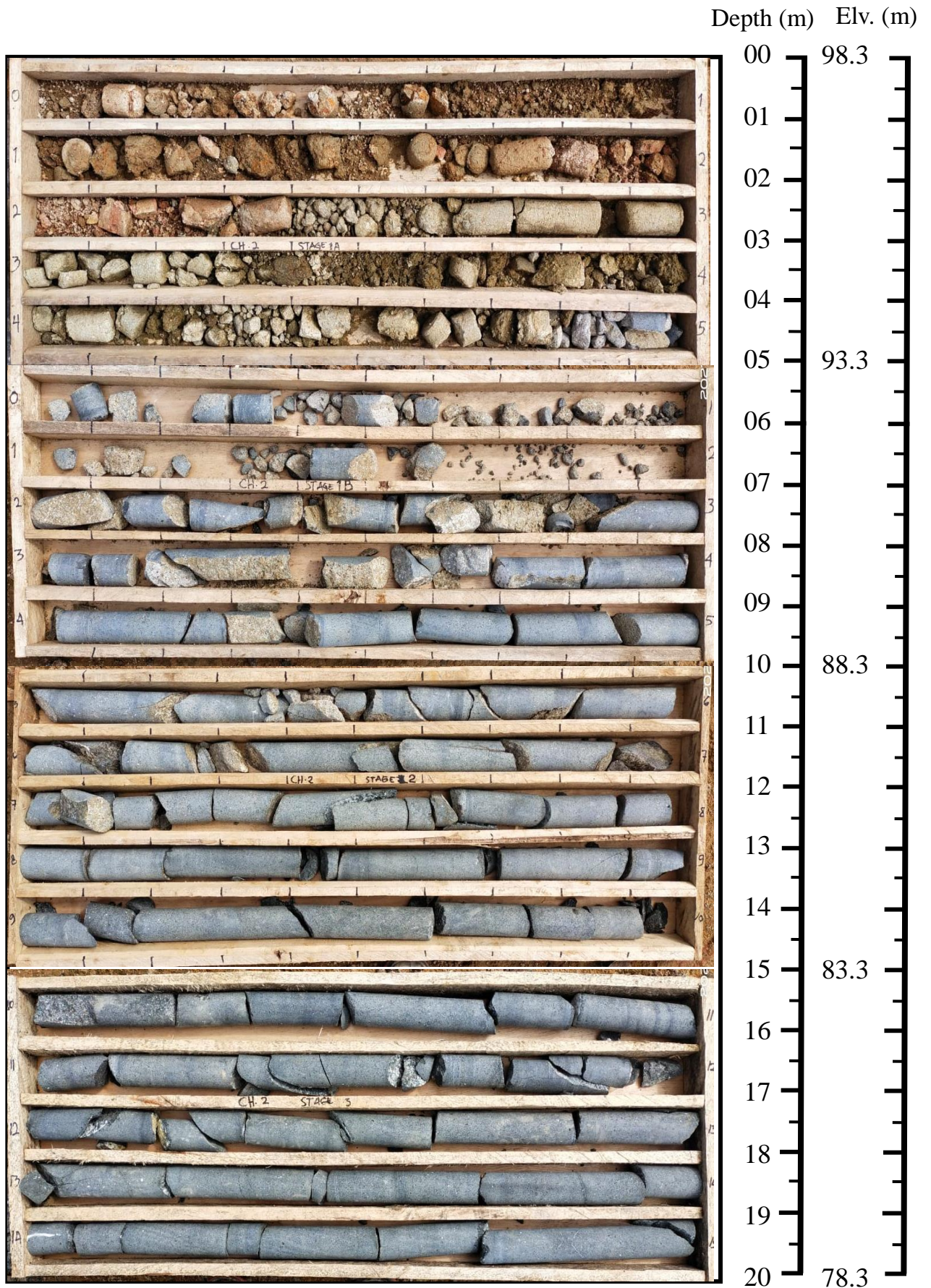
Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	P2 -1	Depth of Borehole	40 m
Location	STA 0+220	Depth of Rock Core	0 ~ 40 m
Date of Drilling	3 - 27 Mei 2021	Total Rock Box	8




Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	P2 -1	Depth of Borehole	40 m
Location	STA 0+220	Depth of Rock Core	0 ~ 40 m
Date of Drilling	3 - 27 Mei 2021	Total Rock Box	8



Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	CH-2	Depth of Borehole	40 m
Location	STA 0+220	Depth of Rock Core	0 ~ 40 m
Date of Drilling	28 April – 16 Juni 2021	Total Rock Box	8



Project	Pamukkulu Dam _ Drilling Investigation		
Borehole No.	CH-2	Depth of Borehole	40 m
Location	STA 0+220	Depth of Rock Core	0 ~ 40 m
Date of Drilling	28 April – 16 Juni 2021	Total Rock Box	8





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HASANUDDIN UNIVERSITY, MAKASSAR**

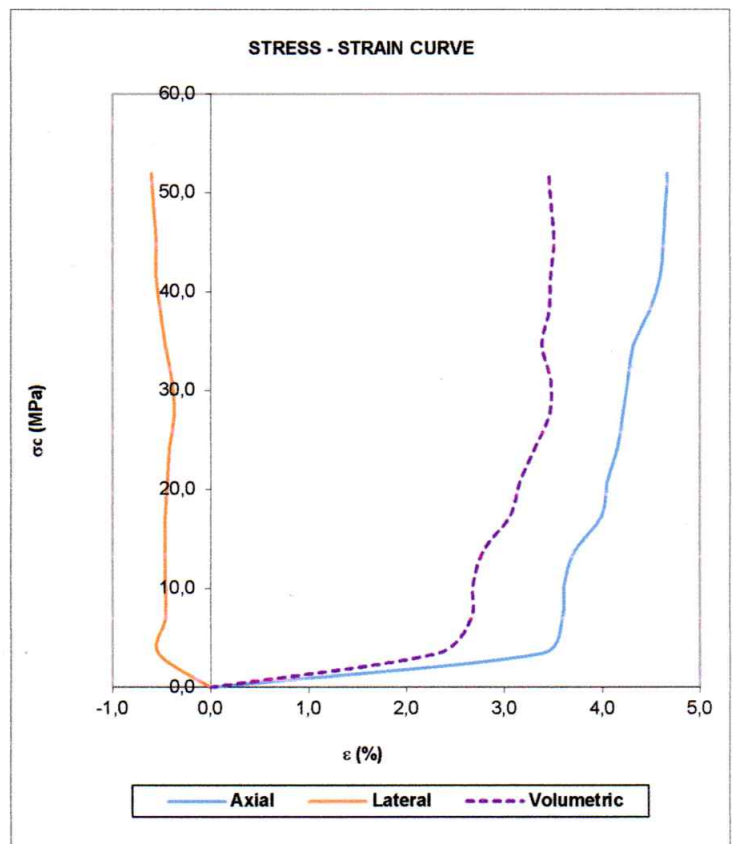
Kampus II Fakultas Teknik Jl. Poros Malino Km. 6 , Gowa 92171, Indonesia.



UNCONFINED COMPRESSIVE STRENGTH TEST

Customer : PT Wijaya Karya Tbk - PT DMT, KSO	Date of Received : 20-Nov-20
Made on behalf of : PT Wijaya Karya Tbk - PT DMT, KSO	Date of Test : 23-Nov-20
Address : Dusun Buttadidia, Kabupaten Takalar	Date of Analysis : 25-Nov-20
Project : Unconfined Compressive Strenght Test	Tested By : Safar dan Mulyawan
Sample Code : Breksi B	Prepared By : Safar
Depth (m) : -	Checked By : Nirmana
Lithology : Breksi	
Diameter : 42,88 mm	
Length : 91,49 mm	

No.	σ_c (MPa)	ϵ Lateral (%)	ϵ Axial (%)	ϵ Volumetric (%)
1	0,00	0,000	0,000	0,000
2	3,46	-0,536	3,388	2,316
3	6,92	-0,466	3,585	2,652
4	10,38	-0,466	3,607	2,674
5	13,84	-0,466	3,716	2,784
6	17,30	-0,466	3,990	3,057
7	20,77	-0,443	4,044	3,158
8	24,23	-0,420	4,154	3,314
9	27,69	-0,373	4,208	3,462
10	31,15	-0,396	4,263	3,470
11	34,61	-0,466	4,318	3,385
12	38,07	-0,513	4,482	3,455
13	41,53	-0,560	4,591	3,471
14	44,99	-0,560	4,624	3,504
15	48,45	-0,583	4,645	3,479
16	51,91	-0,606	4,667	3,455



σ_c (MPa)	51,91
E (MPa)	5106,95
ν	0,21

σ_c = Compressive Strength
 ϵ = Strain
 ν = Poisson's ratio

Approved by

Date : 25-Nov-20



NIRMANA FIORA QAIDAHYANI, S.T., M.T.
Secretary of Laboratory



**LABORATORY OF GEOMECHANICS
DEPARTEMENT OF MINING ENGINEERING
FACULTY OF ENGINEERING
HASANUDDIN UNIVERSITY, MAKASSAR**

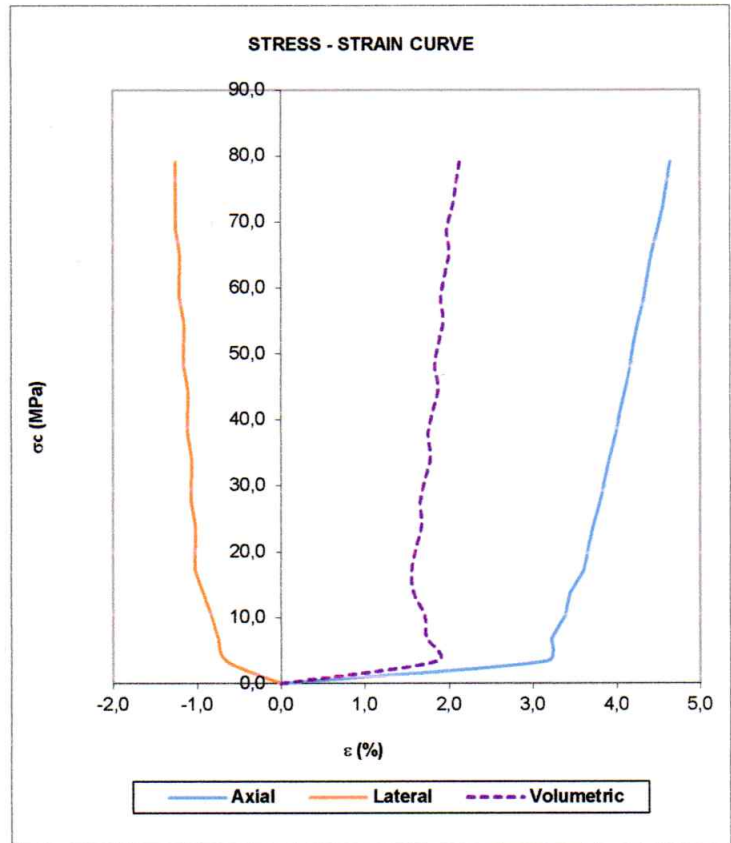
Kampus II Fakultas Teknik Jl. Poros Malino Km. 6 , Gowa 92171, Indonesia.



UNCONFINED COMPRESSIVE STRENGTH TEST

Customer : PT Wijaya Karya Tbk - PT DMT, KSO	Date of Received : 20-Nov-20
Made on behalf of : PT Wijaya Karya Tbk - PT DMT, KSO	Date of Test : 23-Nov-20
Address : Dusun Buttadidia, Kabupaten Takalar	Date of Analysis : 25-Nov-20
Project : Unconfined Compressive Strenght Test	Tested By : Safar dan Mulyawan
Sample Code : Basal	Prepared By : Safar
Depth (m) : -	Checked By : Nirmana
Lithology : Basal	
Diameter : 43,03 mm	
Length : 91,63 mm	

No.	σ_c (MPa)	ϵ Lateral (%)	ϵ Axial (%)	ϵ Volumetric (%)
1	0,00	0,000	0,000	0,000
2	3,44	-0,651	3,165	1,864
3	6,87	-0,744	3,220	1,732
4	10,31	-0,837	3,383	1,710
5	13,75	-0,930	3,438	1,579
6	17,18	-1,023	3,602	1,556
7	20,62	-1,023	3,656	1,611
8	24,06	-1,023	3,722	1,677
9	27,49	-1,069	3,798	1,660
10	30,93	-1,069	3,853	1,715
11	34,37	-1,069	3,918	1,780
12	37,81	-1,116	3,984	1,753
13	41,24	-1,116	4,038	1,807
14	44,68	-1,116	4,104	1,873
15	48,12	-1,162	4,158	1,834
16	51,55	-1,162	4,202	1,878
17	54,99	-1,162	4,256	1,932
18	58,43	-1,208	4,322	1,905
19	61,86	-1,208	4,366	1,949
20	65,30	-1,208	4,420	2,003
21	68,74	-1,255	4,486	1,976
22	72,17	-1,255	4,551	2,041
23	75,61	-1,255	4,595	2,085
24	79,05	-1,255	4,638	2,129



σ_c (MPa)	79,05
E (MPa)	5966,69
ν	0,22

σ_c = Compressive Strength
 ϵ = Strain
 ν = Poisson's ratio

Approved by

Date : 25-Nov-20



NIRMANA FIQRA QAIDAHYANI, S.T., M.T.
 Secretary of Laboratory

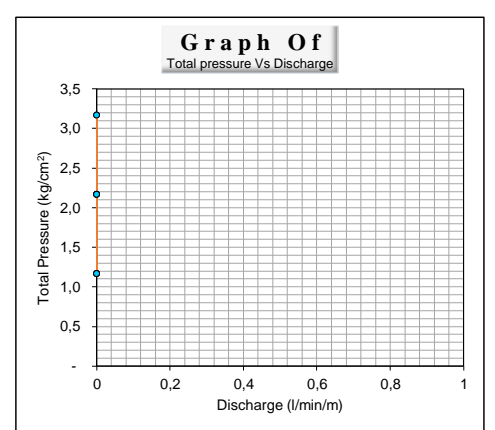
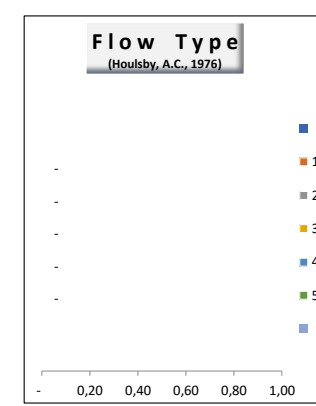
FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 0,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 5,00 meter
DEPTH OF GWL (H2) : 1,38 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787535,843			MAX OF PRESSURE : 3 kg/cm ²
Y : 9402930,822			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,235 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,235 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 11:30 to 11:58 WITA			DATE : 14-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,17	-	-	-	0,0E+00	P= Po + C (h1 + h2 - h3)kg/cm2
2	2,00	-	2,17	-	-	-	0,0E+00	Po= Gauge pressure
3	3,00	-	3,17	-	-	-	0,0E+00	C= Constant (0.1 kg/cm2)
4	2,00	-	2,17	-	-	-	0,0E+00	
5	1,00	-	1,17	-	-	-	0,0E+00	h1= Diff. head (gauge to surface)

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
2	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
3	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
4	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
5	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
6	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
7	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
8	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
9	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
10	817,00	-	817,00	-	817,00	-	817,00	-	817,00	-
Q (l/min)	898,70	0,00	898,70	0,00	898,70	0,00	898,70	0,00	898,70	0,00
Q (l/min/m)		0,00		0,00		0,00		0,00		0,00
Q (cm ³ /sec)		0,00		0,00		0,00		0,00		0,00

AVERAGE : 0,00



Catatan di Lapangan:

$K = \frac{Q}{2 \times (3.14) \times LH} \times Ln \ L/r$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

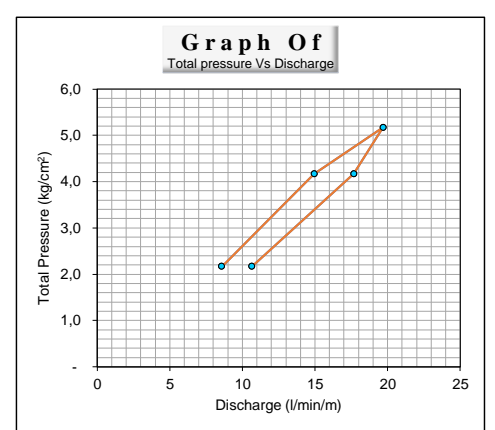
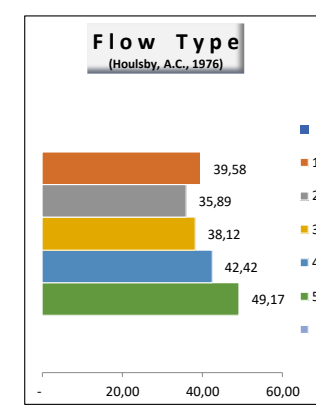
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

The diagram illustrates a borehole test setup. A pump is connected to a well (W) containing a pressure gauge (G). The well is drilled into the ground. Key parameters shown include: H1 (height from gauge to ground surface), H2 (height from ground surface to GWL), D (total depth of the borehole), L (depth of the test section), and d (borehole diameter). The ground surface and GWL (Ground Water Level) are clearly marked.

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2			SHEET : 2 OF 7
			HOLE NO : P1-1 (Pilot Hole)
			STAGE FROM : 5,00 meter
			TO : 10,00 meter
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1	ANGLE FROM VERTICAL : 0 deg.		
LOCATION : TAKALAR - SOUTH OF SULAWESI	DIAMETER OF HOLE (d) : 76 mm		
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN	MAX OF PRESSURE : 5 kg/cm ²		
DEPTH OF GWL (H2) : 1,38 meter	GAUGE from SURFACE (H1) : 0,30 meter		
C (THICK CONCRETE) : 0,00 meter	TESTED BY : Ahmad Syahputra		
X : 787535,843	SUPERVISED BY : Muhamad Ichwanto		
Y : 9402930,822			
Z : 127,235 m.s.l			
Z + C (T. CONCRETE) : 127,235 m.s.l	DATE : 14-Apr-21		
WAKTU : 16:37 to 17:16 WITA			

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	2,00	-	2,17	8,58	715,00	39,58	5,1E-04	P= Po + C (h1 + h2 - h3)kg/cm2	
2	4,00	-	4,17	14,96	1.246,67	35,89	4,6E-04	Po= Gauge pressure	
3	5,00	-	5,17	19,70	1.641,67	38,12	4,9E-04	C= Constant (0.1 kg/cm2)	
4	4,00	-	4,17	17,68	1.473,33	42,42	5,5E-04		
5	2,00	-	2,17	10,66	888,33	49,17	6,4E-04	h1= Diff. head (gauge to surface)	
AVERAGE							41,04		h2= Diff. head (Surface to GWL or to center of test section)
									h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)		
	910,00		447,00		421,00		880,00		793,00		
1	953,00	43,00	523,00	76,00	520,00	99,00	969,00	89,00	846,00	53,00	
2	995,00	42,00	596,00	73,00	620,00	100,00	1055,00	86,00	899,00	53,00	
3	1037,00	42,00	670,00	74,00	717,00	97,00	1144,00	89,00	953,00	54,00	
4	1081,00	44,00	745,00	75,00	815,00	98,00	1233,00	89,00	1005,00	52,00	
5	1126,00	45,00	829,00	84,00	914,00	99,00	1319,00	86,00	1058,00	53,00	
6	1168,00	42,00	896,00	67,00	1012,00	98,00	1409,00	90,00	1112,00	54,00	
7	1210,00	42,00	973,00	77,00	1121,00	109,00	1498,00	89,00	1165,00	53,00	
8	1253,00	43,00	1046,00	73,00	1210,00	89,00	1586,00	88,00	1219,00	54,00	
9	1297,00	44,00	1122,00	76,00	1309,00	99,00	1676,00	90,00	1273,00	54,00	
10	1339,00	42,00	1195,00	73,00	1406,00	97,00	1764,00	88,00	1326,00	53,00	
Q (l / min)	1236,90	42,90	904,20	74,80	1006,50	98,50		88,40		53,30	
Q (l/min/m)		8,58		14,96		19,70		17,68		10,66	
Q (cm ³ /sec)		715,00		1246,67		1641,67		1473,33		888,33	



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

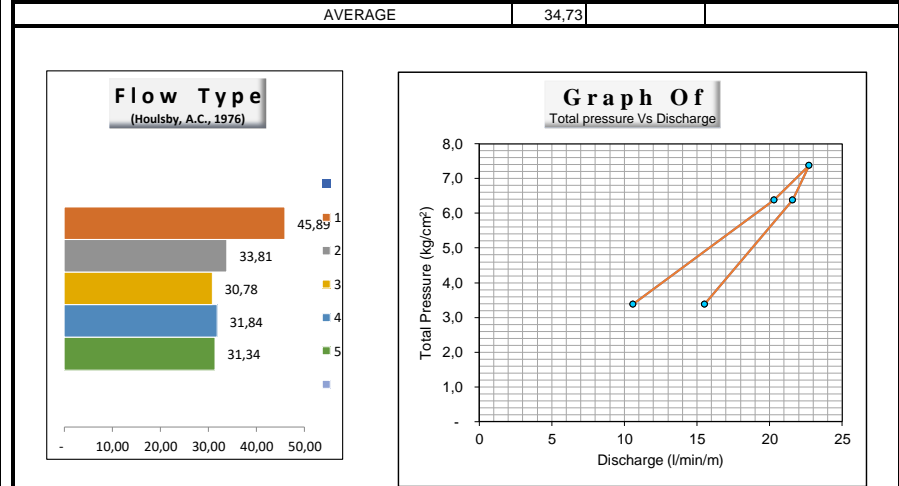
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET	: 3 OF 7
		HOLE NO	: P1-1 (Pilot Hole)
		STAGE FROM	: 10,00 meter
		TO	: 15,00 meter
PROJECT	: PAMUKKULU DAM PROJECT - PAKET-1	ANGLE FROM VERTICAL	: 0 deg.
LOCATION	: TAKALAR - SOUTH OF SULAWESI	DIAMETER OF HOLE (d)	: 76 mm
AREA DESIGNATION	: STA 0+20 - SANDARAN KANAN	MAX OF PRESSURE	: 7 kg/cm ²
DEPTH OF GWL (H2)	: 3,52 meter	GAUGE from SURFACE (H1)	: 0,30 meter
C (THICK CONCRETE)	: 0,00 meter	TESTED BY	: Ahmad Syahputra
X	: 787535,843	SUPERVISED BY	: Muhamad Ichwanto
Y	: 9402930,822		
Z	: 127,235 m.s.l		
Z + C (T. CONCRETE)	: 127,235 m.s.l	DATE	: 16-Apr-21
WAKTU	: 11:35 to 12:29 WITA		

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	3,00	-	3,38	15,52	1.293,33	45,89	5,9E-04	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	6,00	-	6,38	21,58	1.798,33	33,81	4,4E-04	Po= Gauge pressure	
3	7,00	-	7,38	22,72	1.893,33	30,78	4,0E-04	C= Constant (0.1 kg/cm2)	
4	6,00	-	6,38	20,32	1.693,33	31,84	4,1E-04		
5	3,00	-	3,38	10,60	883,33	31,34	4,1E-04	h1= Diff. head (gauge to surface)	
AVERAGE							34,73		h2= Diff. head (Surface to GWL or to center of test section) h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Q (l/min)
	458,00		364,00		494,00		680,00		640,00		
1	551,00	93,00	477,00	113,00	609,00	115,00	783,00	103,00	692,00	52,00	
2	643,00	92,00	589,00	112,00	724,00	115,00	887,00	104,00	744,00	52,00	
3	725,00	82,00	702,00	113,00	835,00	111,00	990,00	103,00	800,00	56,00	
4	807,00	82,00	810,00	108,00	950,00	115,00	1094,00	104,00	853,00	53,00	
5	886,00	79,00	916,00	106,00	1065,00	115,00	1199,00	105,00	907,00	54,00	
6	961,00	75,00	1023,00	107,00	1178,00	113,00	1300,00	101,00	959,00	52,00	
7	1034,00	73,00	1130,00	107,00	1290,00	112,00	1404,00	104,00	1011,00	52,00	
8	1105,00	71,00	1235,00	105,00	1410,00	120,00	1508,00	104,00	1063,00	52,00	
9	1175,00	70,00	1339,00	104,00	1525,00	115,00	1606,00	98,00	1115,00	52,00	
10	1234,00	59,00	1443,00	104,00	1630,00	105,00	1696,00	90,00	1170,00	55,00	
Q	957,90	77,60	1002,80	107,90	1171,00	113,60	1314,70	101,60	995,40	53,00	
Q (l/min/m)		15,52		21,58		22,72		20,32		10,60	
Q (cm ³ /sec)		1293,33		1798,33		1893,33		1693,33		883,33	



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

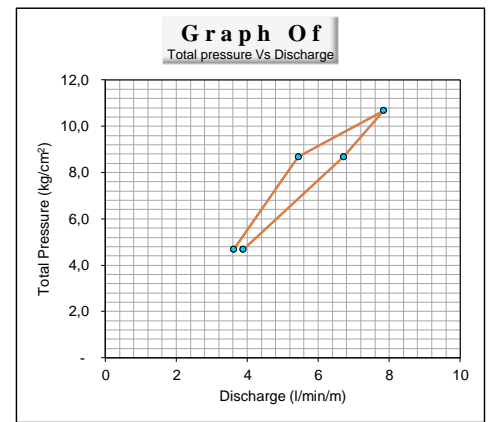
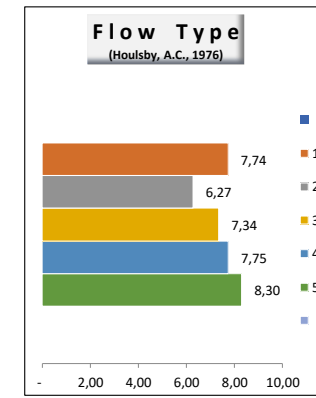
- Q : Debit air yang masuk (cm³/detik)
- P : P₃ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4			SHEET : 4 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 15,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 20,00 meter
DEPTH OF GWL (H2) : 6,44 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787535,843			MAX OF PRESSURE : 10 kg/cm ²
Y : 9402930,822			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,235 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,235 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 11:45 to 12:39 WITA			DATE : 18-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	4,00	-	4,67	3,62	301,33	7,74	1,0E-04	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	8,00	-	8,67	5,44	453,33	6,27	8,1E-05	Po= Gauge pressure
3	10,00	-	10,67	7,84	653,33	7,34	9,5E-05	C= Constant (0.1 kg/cm2)
4	8,00	-	8,67	6,72	560,00	7,75	1,0E-04	
5	4,00	-	4,67	3,88	323,33	8,30	1,1E-04	h1= Diff. head (gauge to surface)
AVERAGE						7,48		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)		(liter)	
	816,00		12,00		300,00		720,00		71,00			
1	846,00	30,00	42,50	30,50	340,00	40,00	755,00	35,00	90,40	19,40		
2	873,20	27,20	70,80	28,30	379,00	39,00	789,00	34,00	109,50	19,10		
3	897,80	24,60	98,20	27,40	418,00	39,00	823,00	34,00	128,40	18,90		
4	917,10	19,30	125,70	27,50	457,00	39,00	856,00	33,00	147,90	19,50		
5	932,50	15,40	152,40	26,70	496,00	39,00	890,00	34,00	167,50	19,60		
6	946,60	14,10	180,00	27,60	534,00	38,00	923,00	33,00	186,70	19,20		
7	959,90	13,30	208,30	28,30	573,00	39,00	957,00	34,00	205,50	18,80		
8	972,80	12,90	235,00	26,70	613,00	40,00	991,00	34,00	225,00	19,50		
9	984,80	12,00	259,00	24,00	653,00	40,00	1024,00	33,00	248,00	23,00		
10	996,80	12,00	284,00	25,00	692,00	39,00	1056,00	32,00	265,00	17,00		
Q (l/min)	1014,35	18,08	166,79	27,20	545,50	39,20	978,40	33,60	184,49	19,40		
Q (l/min/m)		3,62		5,44		7,84		6,72		3,88		
Q (cm ³ /sec)		301,33		453,33		653,33		560,00		323,33		



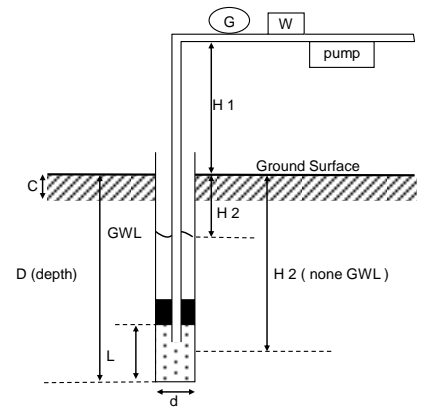
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

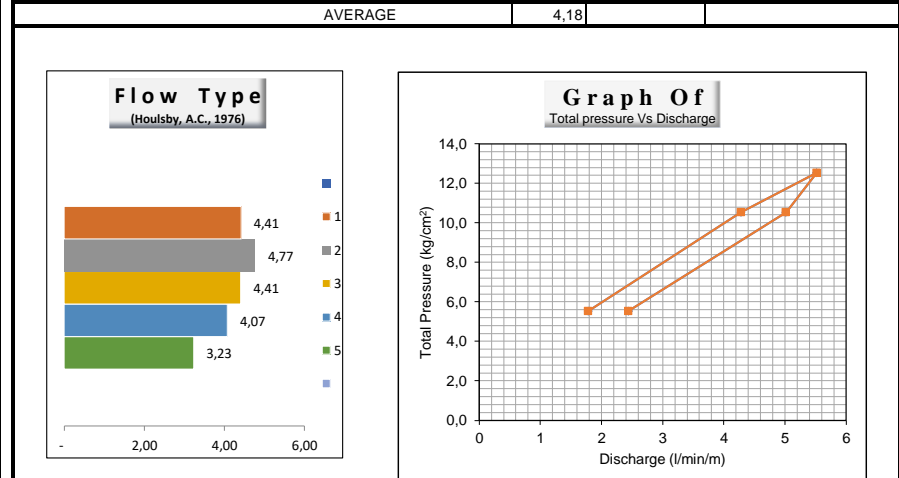


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 5			SHEET : 5 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 14,80 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 25,00 meter
DEPTH OF GWL (H2) : 5,00 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787535,843			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402930,822			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,235 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,235 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 15:40 to 16:45 WITA			DATE : 19-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,53	2,44	415,00	4,41	6,5E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,53	5,02	853,33	4,77	7,1E-05	Po= Gauge pressure
3	12,00	-	12,53	5,52	938,33	4,41	6,5E-05	C= Constant (0.1 kg/cm2)
4	10,00	-	10,53	4,28	728,33	4,07	6,0E-05	
5	5,00	-	5,53	1,79	303,50	3,23	4,8E-05	h1= Diff. head (gauge to surface)
AVERAGE						4,18		h2= Diff. head (Surface to GWL or to center of test section) h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Q (l/min)	Q (l/min/m)
	500,00		802,00		333,00		914,00		310,00			
1	535,00	35,00	862,00	60,00	390,00	57,00	952,00	38,00	326,40	16,40		
2	562,00	27,00	919,00	57,00	448,00	58,00	992,00	40,00	342,00	15,60		
3	586,60	24,60	971,00	52,00	505,00	57,00	1035,00	43,00	357,50	15,50		
4	611,30	24,70	1022,00	51,00	560,00	55,00	1083,00	48,00	374,60	17,10		
5	634,80	23,50	1070,00	48,00	614,00	54,00	1133,00	50,00	393,30	18,70		
6	659,00	24,20	1119,00	49,00	670,00	56,00	1182,00	49,00	412,40	19,10		
7	681,00	22,00	1166,00	47,00	727,00	57,00	1231,00	49,00	431,60	19,20		
8	703,50	22,50	1214,00	48,00	784,00	57,00	1278,00	47,00	450,00	18,40		
9	725,30	21,80	1263,00	49,00	841,00	57,00	1323,00	45,00	471,00	21,00		
10	749,00	23,70	1314,00	51,00	896,00	55,00	1351,00	28,00	492,10	21,10		
Q	694,75	24,90	1172,20	51,20	676,80	56,30	1.247,40	43,70	436,09	18,21		
Q (l/min)												
Q (l/min/m)		2,44		5,02		5,52		4,28		1,79		
Q (cm ³ /sec)		415,00		853,33		938,33		728,33		303,50		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 6**

SHEET : 6 OF 7
HOLE NO : P1-1 (Pilot Hole)
STAGE FROM : 25,00 meter
TO : 30,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 0,70 meter
C (THICK CONCRETE) : 0,00 meter
X : 787535,843
Y : 9402930,822
Z : 127,235 m.s.l
Z + C (T. CONCRETE) : 127,235 m.s.l
WAKTU : 13:20 to 14:23 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 20-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	315,90		317,80		319,50		321,70		323,60	
2	316,00	0,10	318,00	0,20	319,70	0,20	322,00	0,30	323,70	0,10
3	316,00	-	318,10	0,10	319,90	0,20	322,20	0,20	323,90	0,20
4	316,10	0,10	318,30	0,20	320,00	0,10	322,40	0,20	324,10	0,20
5	316,20	0,10	318,40	0,10	320,20	0,20	322,70	0,30	324,30	0,20
6	316,40	0,20	318,70	0,30	320,40	0,20	322,90	0,20	324,60	0,30
7	316,40	-	318,80	0,10	320,50	0,10	323,10	0,20	324,80	0,20
8	316,60	0,20	318,90	0,10	320,70	0,20	323,30	0,20	324,90	0,10
9	316,70	0,10	319,00	0,10	321,00	0,30	323,60	0,30	325,10	0,20
10	316,90	0,20	319,00	-	321,30	0,30	323,80	0,20	325,30	0,20
Q (l/min)	317,10	0,20	319,10	0,10	321,70	0,40	324,10	0,30	325,50	0,20
Q (l/min/m)	348,03	0,12	350,41	0,13	352,49	0,22	355,18	0,24	356,98	0,19
Q (cm ³ /sec)		2,00		2,17		3,67		4,00		3,17

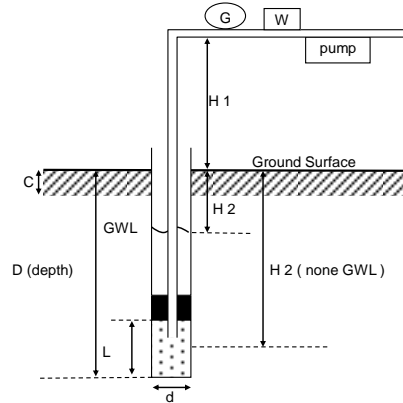
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

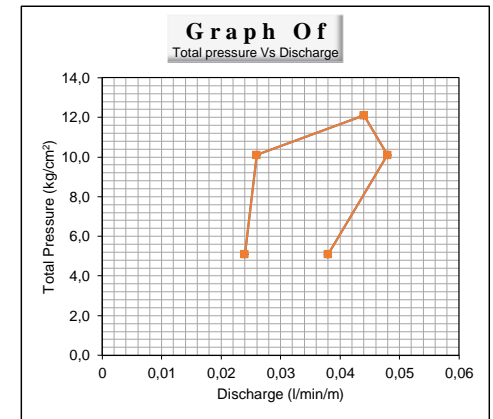
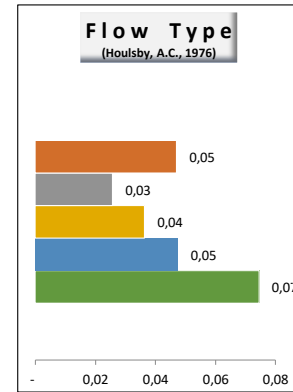
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,10	0,02	2,00	0,05	6,1E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,10	0,03	2,17	0,03	3,3E-07	Po= Gauge pressure
3	12,00	-	12,10	0,04	3,67	0,04	4,7E-07	C= Constant (0.1 kg/cm2)
4	10,00	-	10,10	0,05	4,00	0,05	6,2E-07	
5	5,00	-	5,10	0,04	3,17	0,07	9,6E-07	h1= Diff. head (gauge to surface)

AVERAGE : 0,05

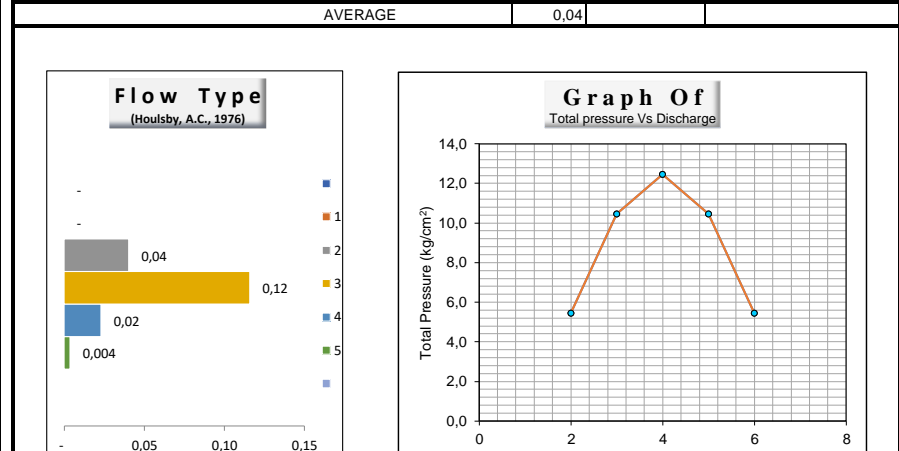


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 7		SHEET : 7 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P1-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 30,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN		TO : 35,00 meter
DEPTH OF GWL (H2) : 4,18 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787535,843	MAX OF PRESSURE : 12 kg/cm ²	
Y : 9402930,822	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 127,235 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 127,235 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 9:00 to 10:15 WITA	DATE : 21-Apr-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	5,00	-	5,45	-	-	-	0,0E+00	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	10,00	-	10,45	0,04	3,50	0,04	5,2E-07	Po= Gauge pressure	
3	12,00	-	12,45	0,14	12,00	0,12	1,5E-06	C= Constant (0.1 kg/cm2)	
4	10,00	-	10,45	0,02	2,00	0,02	3,0E-07		
5	5,00	-	5,45	0,00	0,17	0,004	4,8E-08	h1= Diff. head (gauge to surface)	
AVERAGE							0,04		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)					
	335,00	-	336,10	0,40	338,80	-	345,80	-	346,20	-		
1	335,00	-	336,50	0,20	339,80	1,00	345,90	0,10	346,20	-		
2	335,00	-	336,70	0,20	340,30	0,50	346,00	0,10	346,20	-		
3	335,00	-	337,00	0,10	340,70	0,40	346,20	0,20	346,20	-		
4	335,00	-	337,30	0,30	341,50	0,80	346,40	0,20	346,20	-		
5	335,00	-	337,50	0,20	342,50	1,00	346,60	0,20	346,20	-		
6	335,00	-	337,70	0,20	343,50	1,00	346,70	0,10	346,20	-		
7	335,00	-	337,90	0,20	344,80	1,30	346,80	0,10	346,20	-		
8	335,00	-	338,00	0,10	345,90	1,10	346,90	0,10	346,30	0,10		
9	335,00	-	338,20	0,20	346,00	0,10	347,00	0,10	346,30	-		
10	335,00	-	338,20	0,20	346,00	0,10	347,00	0,10	346,30	-		
Q (l/min)	368,50	0,00	370,98	0,21	376,26	0,72	381,01	0,12	380,84	0,01		
Q (l/min/m)		0,00		0,04		0,14		0,02		0,00		
Q (cm ³ /sec)		0,00		3,50		12,00		2,00		0,17		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

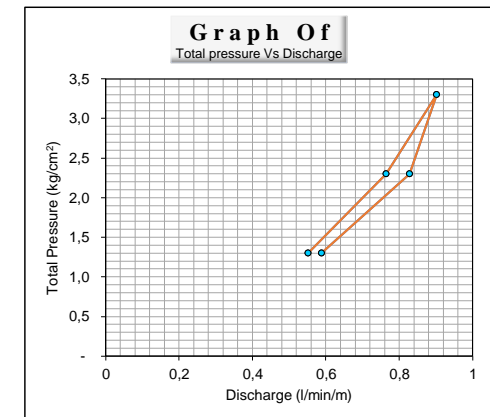
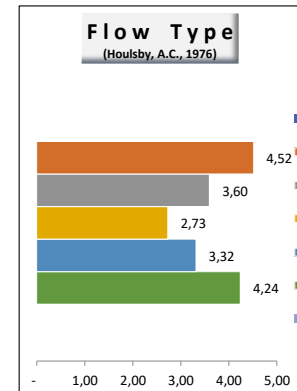
Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 0,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 5,00 meter
DEPTH OF GWL (H2) : 2,72 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787537,717			MAX OF PRESSURE : 3 kg/cm ²
Y : 9402931,75			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,408 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,408 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 10:06 to 11:08 WITA			DATE : 22-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,30	0,59	49,00	4,52	5,8E-05	P= Po + C (h1 + h2 - h3)kg/cm2
2	2,00	-	2,30	0,83	69,00	3,60	4,7E-05	(kgf/cm2)
3	3,00	-	3,30	0,90	75,17	2,73	3,5E-05	Po= Gauge pressure
4	2,00	-	2,30	0,76	63,67	3,32	4,3E-05	C= Constant (0.1 kg/cm2)
5	1,00	-	1,30	0,55	46,00	4,24	5,5E-05	h1= Diff. head (gauge to surface)

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)										
ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	504,00		602,00		670,00		750,00		850,00	
1	506,50	2,50	606,20	4,20	674,60	4,60	754,20	4,20	852,70	2,70
2	509,40	2,90	610,10	3,90	679,80	5,20	757,80	3,60	855,30	2,60
3	512,40	3,00	614,30	4,20	683,70	3,90	761,20	3,40	857,60	2,30
4	515,70	3,30	618,20	3,90	687,90	4,20	765,00	3,80	860,10	2,50
5	519,00	3,30	622,30	4,10	692,50	4,60	768,90	3,90	863,10	3,00
6	522,40	3,40	627,40	5,10	697,10	4,60	772,60	3,70	866,20	3,10
7	525,80	3,40	631,90	4,50	701,80	4,70	775,70	3,10	869,00	2,80
8	529,00	3,20	635,70	3,80	706,40	4,60	779,90	4,20	872,00	3,00
9	531,10	2,10	639,40	3,70	711,00	4,60	784,10	4,20	874,90	2,90
10	533,40	2,30	643,40	4,00	715,10	4,10	788,20	4,10	877,60	2,70
Q (l / min)	570,87	2,94	685,09	4,14	761,99	4,51	845,76	3,82	949,85	2,76
Q (l/min/m)		0,59		0,83		0,90		0,76		0,55
Q (cm ³ /sec)		49,00		69,00		75,17		63,67		46,00

AVERAGE						3,68		
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Catatan di Lapangan:

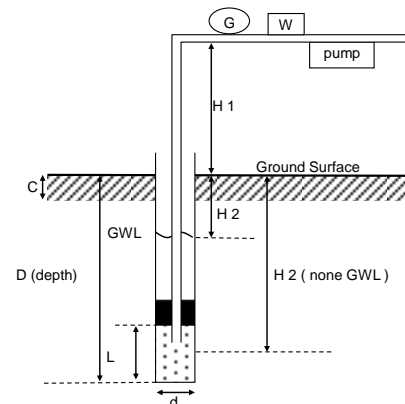
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₂ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 2**

SHEET : 2 OF 6
HOLE NO : P1-2 (Open Hole)
STAGE FROM : 5,00 meter
TO : 10,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 0,30 meter
C (THICK CONCRETE) : 0,00 meter
X : 787537,717
Y : 9402931,75
Z : 127,408 m.s.l
Z + C (T. CONCRETE) : 127,408 m.s.l
WAKTU : 8:54 to 9:12 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 5 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 23-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
1	910,00	-	920,00	0,10	925,00	0,10	932,00	-	936,00	-
2	910,10	0,10	920,10	-	925,20	0,10	932,10	0,10	936,00	-
3	910,10	-	920,20	0,10	925,20	-	932,10	-	936,00	-
4	910,10	-	920,30	0,10	925,30	0,10	932,20	0,10	936,00	-
5	910,20	0,10	920,30	-	925,30	-	932,30	0,10	936,00	-
6	910,20	-	920,40	0,10	925,30	-	932,30	-	936,00	-
7	910,20	-	920,40	-	925,30	-	932,30	-	936,00	-
8	910,20	-	920,40	-	925,30	-	932,30	-	936,00	-
9	910,20	-	920,40	-	925,30	-	932,30	-	936,00	-
10	910,20	-	920,40	-	925,30	-	932,30	-	936,00	-
Q (l/min)	1001,15	0,02	1012,30	0,04	1017,76	0,03		0,03		0,00
Q (l/min/m)		0,00		0,01		0,01		0,01		0,00
Q (cm ³ /sec)		0,33		0,67		0,50		0,50		0,00

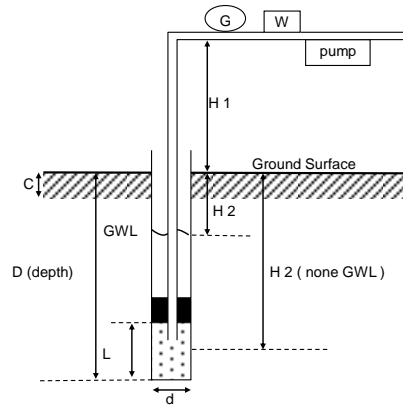
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

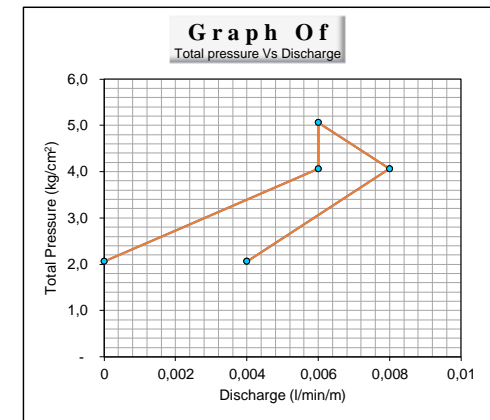
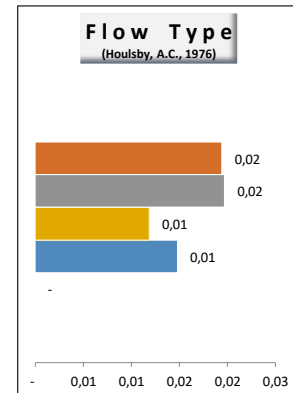
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,06	0,00	0,33	0,02	2,5E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	4,00	-	4,06	0,01	0,67	0,02	2,6E-07	Po= Gauge pressure
3	5,00	-	5,06	0,01	0,50	0,01	1,5E-07	C= Constant (0.1 kg/cm2)
4	4,00	-	4,06	0,01	0,50	0,01	1,9E-07	
5	2,00	-	2,06	-	-	-	0,0E+00	h1= Diff. head (gauge to surface)

AVERAGE

0,01

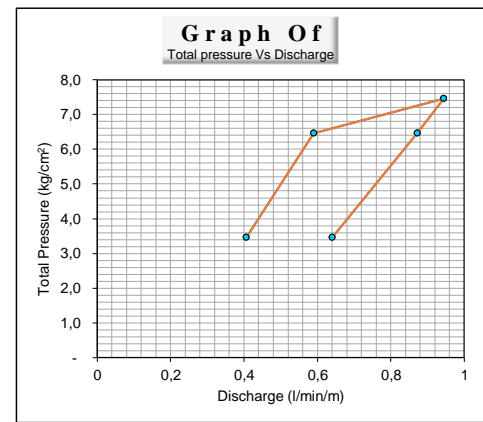
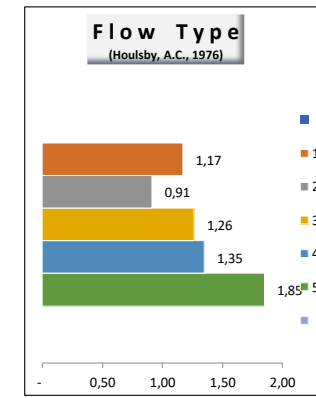


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET : 3 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P1-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 10,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN		TO : 15,00 meter
DEPTH OF GWL (H2) : 4,33 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787537,717	MAX OF PRESSURE : 7 kg/cm ²	
Y : 9402931,75	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 127,408 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 127,408 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 13:28 to 14:43 WITA	DATE : 23-Apr-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	3,00	-	3,46	0,41	33,83	1,17	1,5E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	6,00	-	6,46	0,59	49,17	0,91	1,2E-05	Po= Gauge pressure
3	7,00	-	7,46	0,94	78,67	1,26	1,6E-05	C= Constant (0.1 kg/cm2)
4	6,00	-	6,46	0,87	72,67	1,35	1,7E-05	
5	3,00	-	3,46	0,64	53,33	1,85	2,4E-05	h1= Diff. head (gauge to surface)
AVERAGE						1,31		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)		
1	460,00	1,80	500,00	2,90	554,50	4,50	604,40	4,40	703,20	3,20	
2	461,80	1,80	502,90	2,90	559,40	4,90	608,60	4,20	706,40	3,20	
3	463,60	2,20	508,70	2,90	564,10	4,70	612,90	4,30	709,60	3,20	
4	465,80	1,60	511,60	2,90	568,80	4,70	617,70	4,80	712,80	3,20	
5	467,40	1,80	514,50	2,90	573,40	4,60	621,90	4,20	716,20	3,40	
6	469,20	1,60	517,90	3,40	578,30	4,90	625,80	3,90	719,30	3,10	
7	470,80	2,00	520,80	2,90	582,70	4,40	630,20	4,40	722,40	3,10	
8	472,80	2,80	524,40	3,60	587,60	4,90	634,40	4,20	725,60	3,20	
9	475,60	2,50	527,10	2,70	592,40	4,80	638,90	4,50	728,90	3,30	
10	478,10	2,20	529,50	2,40	597,20	4,80	643,60	4,70	732,00	3,10	
Q (l / min)	516,54	2,03	566,32	2,95	630,84	4,72	683,84	4,36	787,64	3,20	
Q (l/min/m)		0,41		0,59		0,94		0,87		0,64	
Q (cm ³ /sec)		33,83		49,17		78,67		72,67		53,33	



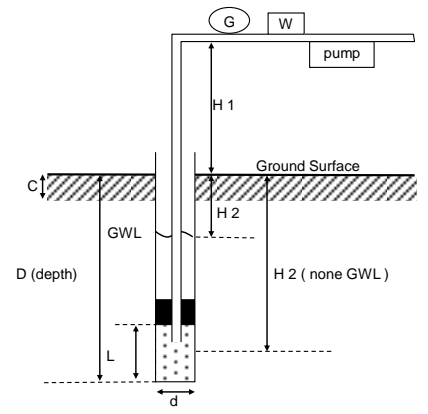
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

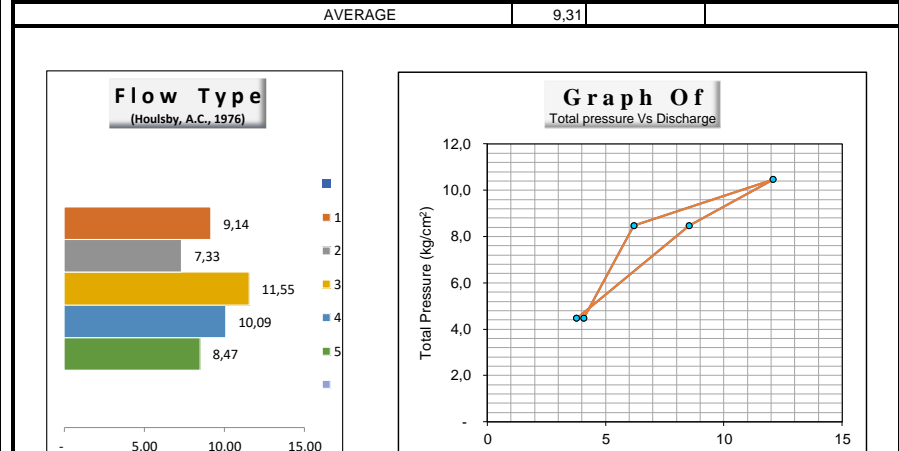


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4		SHEET : 4 OF 6	
		HOLE NO : P1-2 (Open Hole)	
		STAGE FROM : 15,00 meter	
		TO : 20,00 meter	
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		ANGLE FROM VERTICAL : 0 deg.	
LOCATION : TAKALAR - SOUTH OF SULAWESI		DIAMETER OF HOLE (d) : 76 mm	
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN		MAX OF PRESSURE : 10 kg/cm ²	
DEPTH OF GWL (H2) : 4,33 meter		GAUGE from SURFACE (H1) : 0,30 meter	
C (THICK CONCRETE) : 0,00 meter		TESTED BY : Ahmad Syahputra	
X : 787537,717		SUPERVISED BY : Muhamad Ichwanto	
Y : 9402931,75			
Z : 127,408 m.s.l			
Z + C (T. CONCRETE) : 127,408 m.s.l		DATE : 23-Apr-21	
WAKTU : 16:22 to 17:18 WITA			

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	4,00	-	4,46	4,08	340,00	9,14	1,2E-04	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	8,00	-	8,46	6,20	516,67	7,33	9,5E-05	Po= Gauge pressure	
3	10,00	-	10,46	12,08	1.006,67	11,55	1,5E-04	C= Constant (0.1 kg/cm2)	
4	8,00	-	8,46	8,54	711,67	10,09	1,3E-04		
5	4,00	-	4,46	3,78	315,00	8,47	1,1E-04	h1= Diff. head (gauge to surface)	
AVERAGE							9,31		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)		(liter)			
	820,00		100,00		350,00		700,00		200,00			
1	841,00	21,00	131,00	31,00	411,00	61,00	742,00	42,00	220,00	20,00		
2	861,00	20,00	165,00	34,00	470,00	59,00	786,00	44,00	238,00	18,00		
3	882,00	21,00	193,00	28,00	532,00	62,00	826,00	40,00	257,00	19,00		
4	901,00	19,00	224,00	31,00	592,00	60,00	869,00	43,00	275,00	18,00		
5	922,00	21,00	257,00	33,00	650,00	58,00	912,00	43,00	295,00	20,00		
6	942,00	20,00	285,00	28,00	711,00	61,00	952,00	40,00	315,00	20,00		
7	963,00	21,00	317,00	32,00	770,00	59,00	994,00	42,00	333,00	18,00		
8	983,00	20,00	348,00	31,00	830,00	60,00	1037,00	43,00	352,00	19,00		
9	1003,00	20,00	380,00	32,00	891,00	61,00	1080,00	43,00	370,00	18,00		
10	1024,00	21,00	410,00	30,00	954,00	63,00	1127,00	47,00	389,00	19,00		
Q (l/min)	1014,20	20,40	281,00	31,00	716,10	60,40	1002,50	42,70	324,40	18,90		
Q (l/min/m)		4,08		6,20		12,08		8,54		3,78		
Q (cm ³ /sec)		340,00		516,67		1006,67		711,67		315,00		



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

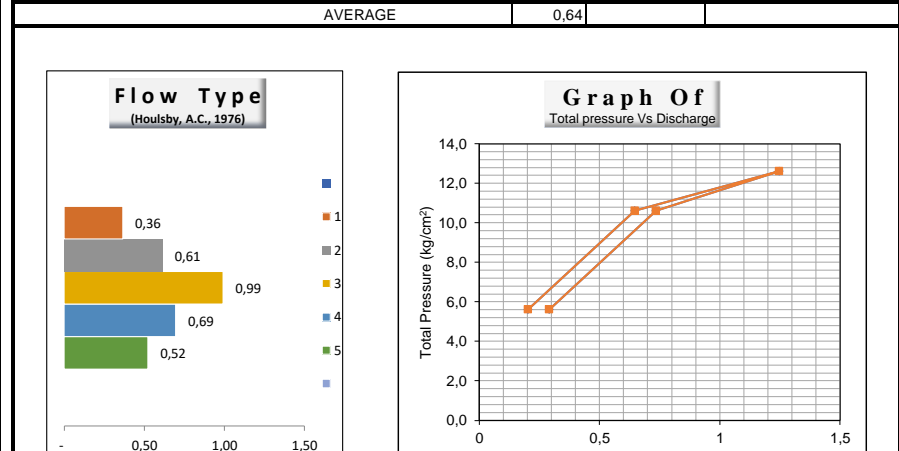
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 5			SHEET : 5 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 20,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 25,00 meter
DEPTH OF GWL (H2) : 5,81 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787537,717			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402931,75			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,408 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,408 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 13:15 to 14:10 WITA			DATE : 24-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	5,00	-	5,61	0,20	17,00	0,36	4,7E-06	P= Po + C (h1 + h2 - h3)kg/cm2	
2	10,00	-	10,61	0,65	54,00	0,61	7,9E-06	Po= Gauge pressure	
3	12,00	-	12,61	1,25	104,00	0,99	1,3E-05	C= Constant (0.1 kg/cm2)	
4	10,00	-	10,61	0,74	61,33	0,69	9,0E-06		
5	5,00	-	5,61	0,29	24,33	0,52	6,7E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,64		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	400,00		600,00		700,00		900,00		100,00			
1	401,00	1,00	603,20	3,20	706,20	6,20	903,70	3,70	101,40	1,40		
2	401,90	0,90	606,70	3,50	712,30	6,10	907,30	3,60	102,70	1,30		
3	402,90	1,00	609,70	3,00	718,60	6,30	910,80	3,50	104,30	1,60		
4	404,00	1,10	612,80	3,10	724,80	6,20	914,40	3,60	105,70	1,40		
5	405,10	1,10	616,10	3,30	731,00	6,20	918,10	3,70	107,10	1,40		
6	406,10	1,00	619,20	3,10	737,10	6,10	921,60	3,50	108,60	1,50		
7	407,00	0,90	622,40	3,20	743,30	6,20	925,30	3,70	110,10	1,50		
8	408,00	1,00	625,60	3,20	749,30	6,00	928,90	3,60	111,50	1,40		
9	409,10	1,10	628,90	3,30	755,80	6,50	932,80	3,90	113,00	1,50		
10	410,20	1,10	632,40	3,50	762,40	6,60	936,80	4,00	114,60	1,60		
Q (l/min)	445,53	1,02	677,70	3,24	804,08	6,24	1.009,97	3,68	117,90	1,46		
Q (l/min/m)												
Q (cm ³ /sec)												



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln L/r \quad \text{cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

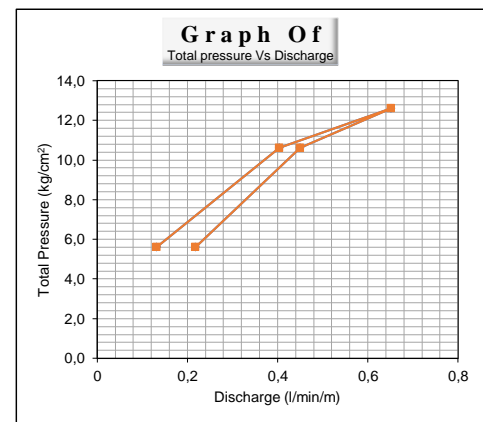
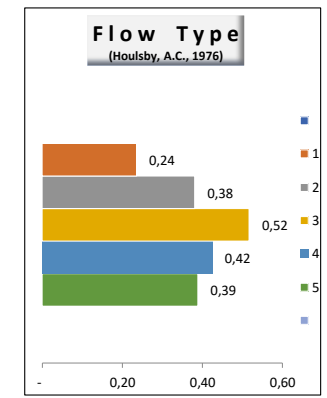
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 6			SHEET : 6 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P1-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 25,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 30,00 meter
DEPTH OF GWL (H2) : 5,81 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787537,717			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402931,75			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,408 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,408 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 16:14 to 17:12 WITA			DATE : 24-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,61	0,13	11,00	0,24	3,0E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,61	0,40	33,67	0,38	4,9E-06	Po= Gauge pressure
3	12,00	-	12,61	0,65	54,33	0,52	6,7E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	10,61	0,45	37,50	0,42	5,5E-06	
5	5,00	-	5,61	0,22	18,17	0,39	5,0E-06	h1= Diff. head (gauge to surface)
AVERAGE						0,39		h2= Diff. head (Surface to GWL or to center of test section) h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)		(liter)			
	315,00		330,00		360,00		420,00		460,00			
1	315,70	0,70	332,20	2,20	363,30	3,30	422,60	2,60	461,00	1,00		
2	316,40	0,70	334,50	2,30	366,60	3,30	424,50	1,90	461,80	0,80		
3	317,00	0,60	336,70	2,20	369,90	3,30	426,70	2,20	462,90	1,10		
4	317,60	0,60	338,70	2,00	372,80	2,90	429,10	2,40	463,80	0,90		
5	318,20	0,60	341,10	2,40	376,00	3,20	431,20	2,10	464,80	1,00		
6	318,90	0,70	343,20	2,10	379,10	3,10	433,20	2,00	465,70	0,90		
7	319,60	0,70	345,40	2,20	382,40	3,30	435,70	2,50	466,60	0,90		
8	320,40	0,80	347,50	2,10	385,60	3,20	438,00	2,30	467,90	1,30		
9	321,00	0,60	349,00	1,50	388,90	3,30	440,10	2,10	469,30	1,40		
10	321,60	0,60	350,20	1,20	392,60	3,70	442,50	2,40	470,90	1,60		
Q (l / min)	350,14	0,66	374,85	2,02	413,72	3,26	474,36	2,25	511,47	1,09		
Q (l/min/m)		0,13		0,40		0,65		0,45		0,22		
Q (cm ³ /sec)		11,00		33,67		54,33		37,50		18,17		



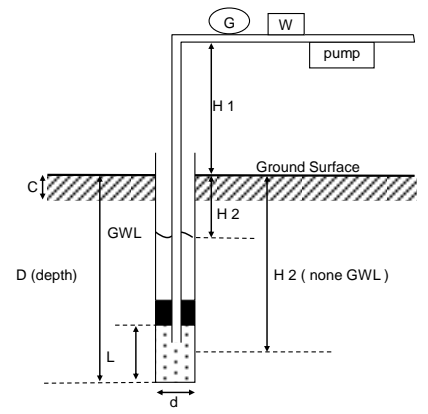
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{L} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 1**

SHEET : 1 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 0,00 meter
TO : 5,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 2,76 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 10:53 to 12:05 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 3 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 25-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
1	250,00	600,00	850,00	50,00	320,00					
2	265,80	15,80	621,70	21,70	880,30	30,30	69,10	19,10	332,60	12,60
3	282,60	16,80	643,60	21,90	911,40	31,10	88,30	19,20	345,70	13,10
4	297,40	14,80	665,50	21,90	939,10	27,70	107,90	19,60	357,40	11,70
5	313,50	16,10	687,30	21,80	968,70	29,60	124,00	16,10	369,10	11,70
6	329,00	15,50	709,10	21,80	998,10	29,40	145,70	21,70	382,50	13,40
7	345,00	16,00	730,60	21,50	1026,40	28,30	164,40	18,70	394,10	11,60
8	360,70	15,70	752,90	22,30	1058,30	31,90	189,50	25,10	406,60	12,50
9	376,60	15,90	774,40	21,50	1087,30	29,00	206,10	16,60	419,40	12,80
10	392,40	15,80	796,20	21,80	1116,70	29,40	223,30	17,20	433,60	14,20
Q (l/min)	408,40	16,00	818,10	21,90	1147,00	30,30	240,60	17,30	444,80	11,20
Q (l/min/m)	362,14	15,84	779,94	21,81	1098,33	29,70	160,89	19,06	420,58	12,48
Q (cm ³ /sec)										

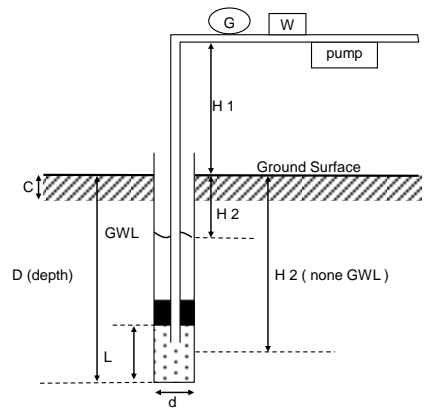
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

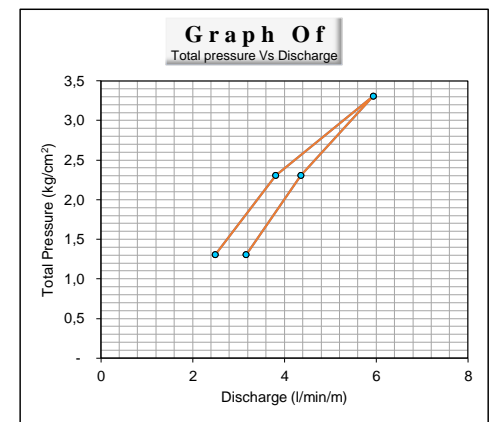
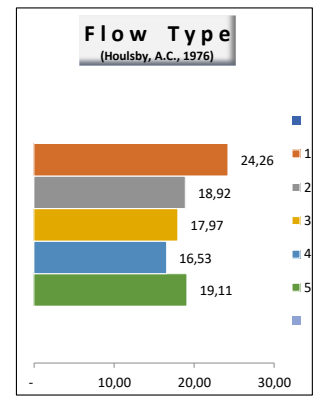
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,31	3,17	264,00	24,26	3,1E-04	P= P ₀ + C (h ₁ + h ₂ - h ₃)/kg/cm ² (kg/cm ²)
2	2,00	-	2,31	4,36	363,50	18,92	2,4E-04	P ₀ = Gauge pressure
3	3,00	-	3,31	5,94	495,00	17,97	2,3E-04	C= Constant (0.1 kg/cm ²)
4	2,00	-	2,31	3,81	317,67	16,53	2,1E-04	
5	1,00	-	1,31	2,50	208,00	19,11	2,5E-04	h ₁ = Diff. head (gauge to surface)

AVERAGE						19,36		
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Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 2**

SHEET : 2 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 5,00 meter
TO : 10,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 5,10 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 10:00 to 10:56 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 5 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 26-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	120,00	-	125,00	0,20	140,50	0,50	232,30	0,30	246,1	0,10
2	120,10	0,10	125,50	0,30	141,20	0,70	232,60	0,30	246,2	0,10
3	120,10	-	125,80	0,30	141,60	0,40	233,00	0,40	246,4	0,20
4	120,20	0,10	126,00	0,20	142,30	0,70	233,40	0,40	246,5	0,10
5	120,20	-	126,30	0,30	143,00	0,70	233,70	0,30	246,6	0,10
6	120,30	0,10	126,50	0,20	143,50	0,50	233,90	0,20	246,8	0,20
7	120,40	0,10	126,70	0,20	144,20	0,70	234,20	0,30	246,9	0,10
8	120,60	0,20	126,90	0,20	144,90	0,70	234,60	0,40	247,0	0,10
9	120,70	0,10	127,00	0,10	145,40	0,50	235,00	0,40	247,1	0,10
10	120,90	0,20	127,10	0,10	145,80	0,40	235,2	0,20	247,2	0,10
Q (l/min)	120,10	0,09	138,80	0,21	157,24	0,58		0,32		0,12
Q (l/min/m)		0,02		0,04		0,12		0,06		0,02
Q (cm ³ /sec)		1,50		3,50		9,67		5,33		2,00

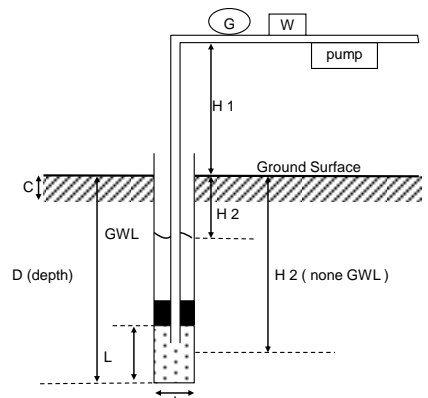
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

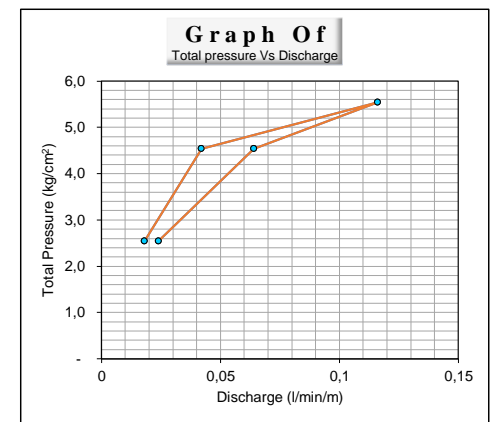
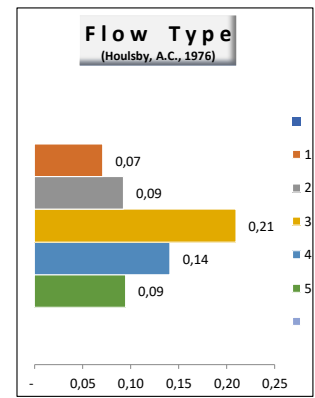
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,54	0,02	1,50	0,07	9,2E-07	P= P ₀ + C (h ₁ + h ₂ - h ₃)kg/cm ² (kg/cm ²)
2	4,00	-	4,54	0,04	3,50	0,09	1,2E-06	P ₀ = Gauge pressure
3	5,00	-	5,54	0,12	9,67	0,21	2,7E-06	C= Constant (0.1 kg/cm ²)
4	4,00	-	4,54	0,06	5,33	0,14	1,8E-06	
5	2,00	-	2,54	0,02	2,00	0,09	1,2E-06	h ₁ = Diff. head (gauge to surface)

AVERAGE						0,12		
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Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 3**

SHEET : 3 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 10,00 meter
TO : 15,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 5,10 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 12:23 to 13:31 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 7 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 26-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	250,00		255,00		265,00		280,00		285,00	
2	250,20	0,20	255,40	0,40	265,70	0,70	280,30	0,30	285,10	0,10
3	250,50	0,30	255,80	0,40	266,40	0,70	280,70	0,40	285,20	0,10
4	250,70	0,20	256,30	0,50	267,00	0,60	281,00	0,30	285,40	0,20
5	250,90	0,20	256,70	0,40	267,80	0,80	281,50	0,50	285,60	0,20
6	251,20	0,30	257,20	0,50	268,50	0,70	281,70	0,20	285,70	0,10
7	251,50	0,30	257,60	0,40	269,30	0,80	281,90	0,20	285,90	0,20
8	251,70	0,20	258,10	0,50	270,00	0,70	282,30	0,40	286,00	0,10
9	251,80	0,10	258,40	0,30	270,50	0,50	282,60	0,30	286,10	0,10
10	252,10	0,30	258,90	0,50	271,20	0,70	282,90	0,30	286,30	0,20
Q	252,30	0,20	259,40	0,50	272,20	1,00	283,30	0,40	286,50	0,20
Q (l/min)	276,29	0,23	282,88	0,44	295,36	0,72	309,82	0,33	314,28	0,15
Q (l/min/m)		0,05		0,09		0,14		0,07		0,03
Q (cm ³ /sec)		3,83		7,33		12,00		5,50		2,50

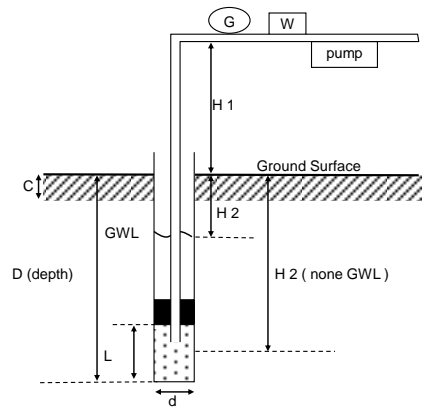
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

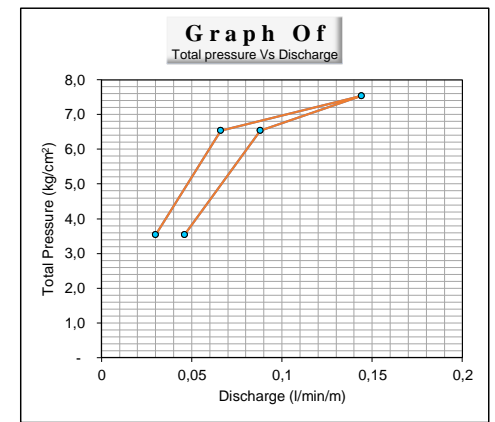
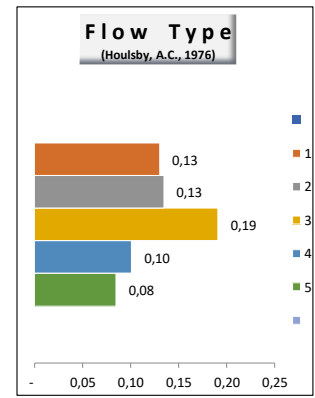
Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	3,00	-	3,54	0,05	3,83	0,13	1,7E-06	P= P ₀ + C (h ₁ + h ₂ - h ₃)kg/cm ² (kg/cm ²)
2	6,00	-	6,54	0,09	7,33	0,13	1,7E-06	P ₀ = Gauge pressure
3	7,00	-	7,54	0,14	12,00	0,19	2,5E-06	C= Constant (0.1 kg/cm ²)
4	6,00	-	6,54	0,07	5,50	0,10	1,3E-06	
5	3,00	-	3,54	0,03	2,50	0,08	1,1E-06	h1= Diff. head (gauge to surface)
AVERAGE							0,13	h2= Diff. head (Surface to GWL or to center of test section)
								h3 = Head loss



Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 4**

SHEET : 4 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 15,00 meter
TO : 20,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 5,10 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 14:34 to 15:42 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 10 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 26-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ 4 (kg/cm ²)	Pembaca-an Flow Meter	P ₂ 8 (kg/cm ²)	Pembaca-an Flow Meter	P ₃ 10 (kg/cm ²)	Pembaca-an Flow Meter	P ₄ 8 (kg/cm ²)	Pembaca-an Flow Meter	P ₅ 4 (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
	820,00		300,00		150,00		300,00		400,00	
1	858,00	38,00	352,00	52,00	248,00	98,00	404,00	104,00	456,00	56,00
2	899,00	41,00	402,00	50,00	350,00	102,00	502,00	98,00	506,00	50,00
3	934,00	35,00	451,00	49,00	444,00	94,00	603,00	101,00	559,00	53,00
4	973,00	39,00	507,00	56,00	542,00	98,00	708,00	105,00	612,00	53,00
5	1011,00	38,00	554,00	47,00	641,00	99,00	812,00	104,00	667,00	55,00
6	1049,00	38,00	606,00	52,00	737,00	96,00	909,00	97,00	718,00	51,00
7	1090,00	41,00	658,00	52,00	835,00	98,00	1013,00	104,00	774,00	56,00
8	1124,00	34,00	708,00	50,00	935,00	100,00	1116,00	103,00	826,00	52,00
9	1162,00	38,00	756,00	48,00	1035,00	100,00	1218,00	102,00	878,00	52,00
10	1202,00	40,00	813,00	57,00	1136,00	101,00	1320,00	102,00	933,00	55,00
Q (l/min)	1112,20	38,20	610,70	51,30	705,30	98,60	890,50	102,00	987,00	53,30
Q (l/min/m)		7,64		10,26		19,72		20,40		10,66
Q (cm ³ /sec)		636,67		855,00		1643,33		1700,00		888,33

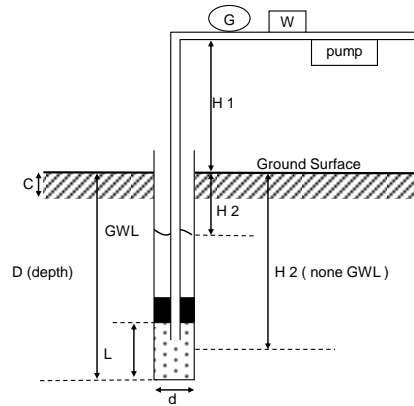
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

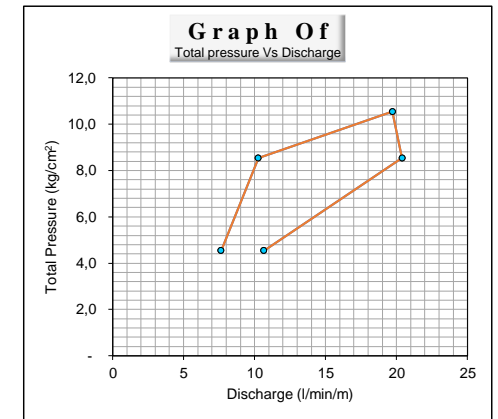
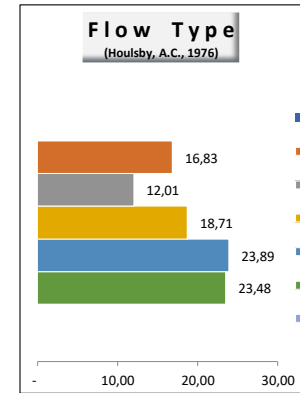
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	4,00	-	4,54	7,64	636,67	16,83	2,2E-04	P= P ₀ + C (h ₁ + h ₂ - h ₃)kg/cm ² (kg/cm ²)
2	8,00	-	8,54	10,26	855,00	12,01	1,6E-04	P= Gauge pressure
3	10,00	-	10,54	19,72	1.643,33	18,71	2,4E-04	C= Constant (0.1 kg/cm ²)
4	8,00	-	8,54	20,40	1.700,00	23,89	3,1E-04	
5	4,00	-	4,54	10,66	888,33	23,48	3,0E-04	h1= Diff. head (gauge to surface)

h2= Diff. head (Surface to GWL or to center of test section)	
h3 = Head loss	

AVERAGE	18,98
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Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 5**

SHEET : 5 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 20,00 meter
TO : 25,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 13,46 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 11:20 to 12:32 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 27-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
	500,00		520,00		560,00		610,00		660,00	
1	500,80	0,80	522,90	2,90	563,20	3,20	614,00	4,00	661,70	1,70
2	501,60	0,80	525,60	2,70	566,50	3,30	617,70	3,70	662,90	1,20
3	502,10	0,50	528,50	2,90	569,90	3,40	621,60	3,90	664,30	1,40
4	503,10	1,00	531,40	2,90	572,90	3,00	625,60	4,00	665,90	1,60
5	504,10	1,00	534,40	3,00	576,10	3,20	629,40	3,80	667,30	1,40
6	505,00	0,90	537,00	2,60	579,30	3,20	633,30	3,90	668,30	1,00
7	505,70	0,70	539,80	2,80	582,60	3,30	637,10	3,80	670,20	1,90
8	506,60	0,90	542,70	2,90	585,90	3,30	641,20	4,10	671,60	1,40
9	507,40	0,80	545,60	2,90	589,00	3,10	644,90	3,70	673,10	1,50
10	508,20	0,80	548,40	2,80	592,40	3,40	648,80	3,90	674,60	1,50
Q (l/min)	554,46	0,82	587,63	2,84	633,78	3,24	692,36	3,88	733,99	1,46
Q (l/min/m)		0,16		0,57		0,65		0,78		0,29
Q (cm ³ /sec)		13,67		47,33		54,00		64,67		24,33

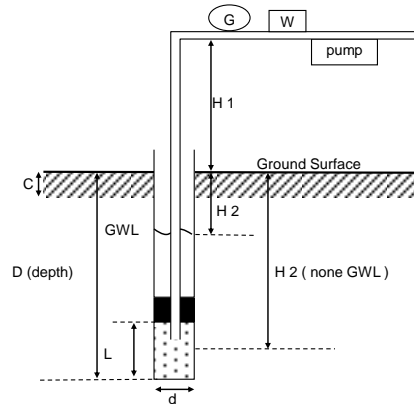
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

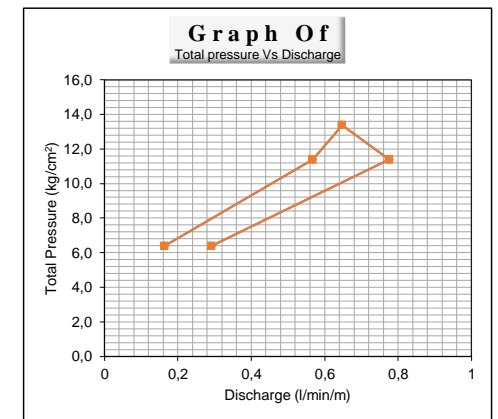
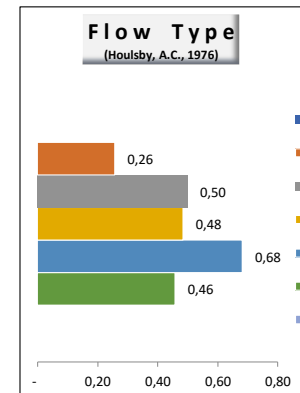
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,38	0,16	13,67	0,26	3,3E-06	P= P ₀ + C (h ₁ + h ₂ - h ₃)kg/cm ² (kg/cm ²)
2	10,00	-	11,38	0,57	47,33	0,50	6,5E-06	P= Gauge pressure
3	12,00	-	13,38	0,65	54,00	0,48	6,3E-06	C= Constant (0.1 kg/cm ²)
4	10,00	-	11,38	0,78	64,67	0,68	8,8E-06	
5	5,00	-	6,38	0,29	24,33	0,46	5,9E-06	h1= Diff. head (gauge to surface)

AVERAGE						0,48		
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Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 6**

SHEET : 6 OF 6
HOLE NO : P1-3 (Open Hole)
STAGE FROM : 25,00 meter
TO : 30,00 meter

PROJECT : PAMUJKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 13,46 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,915
Z : 127,41 m.s.l
Z + C (T. CONCRETE) : 127,410 m.s.l
WAKTU : 14:09 to 15:17 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 27-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
1	200,00		300,00		500,00		800,00		100,00	
2	208,20	8,20	315,10	15,10	524,20	24,20	816,60	16,60	111,10	11,10
3	214,80	6,60	329,20	14,10	548,10	23,90	834,70	18,10	118,60	7,50
4	221,10	6,30	343,80	14,60	572,50	24,40	849,30	14,60	127,50	8,90
5	228,10	7,00	358,40	14,60	596,40	23,90	865,50	16,20	136,70	9,20
6	235,20	7,10	373,20	14,80	621,30	24,90	881,20	15,70	146,60	9,90
7	242,10	6,90	387,60	14,40	644,60	23,30	898,50	17,30	155,20	8,60
8	249,40	7,30	402,10	14,50	668,70	24,10	915,50	17,00	165,40	10,20
9	256,30	6,90	417,30	15,20	693,20	24,50	932,30	16,80	174,40	9,00
10	262,50	6,20	431,40	14,10	716,40	23,20	947,20	14,90	183,80	9,40
10	270,30	7,80	446,50	15,10	740,10	23,70	963,80	16,60	193,20	9,40
Q (l/min)	258,80	7,03	410,46	14,65	682,55	24,01	970,46	16,38	161,25	9,32
Q (l/min/m)		1,41		2,93		4,80		3,28		1,86
Q (cm ³ /sec)		117,17		244,17		400,17		273,00		155,33

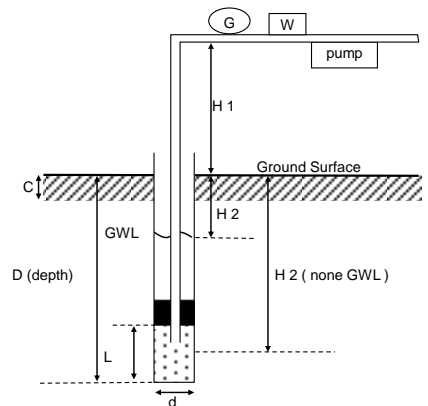
$$K = \frac{Q}{2 \times (3.14) \times L \times H} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

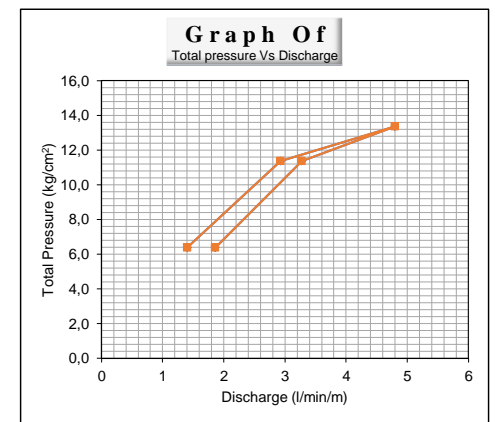
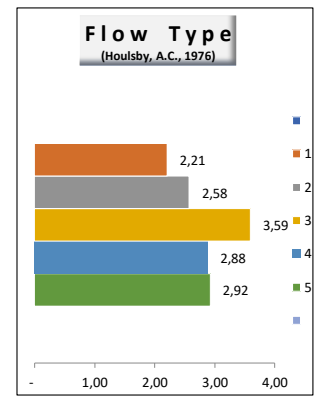
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,38	1,41	117,17	2,21	2,9E-05	P= P ₀ + C (h ₁ + h ₂ - h ₃)/kg/cm ² (kg/cm ²)
2	10,00	-	11,38	2,93	244,17	2,58	3,3E-05	P= Gauge pressure
3	12,00	-	13,38	4,80	400,17	3,59	4,6E-05	C= Constant (0.1 kg/cm ²)
4	10,00	-	11,38	3,28	273,00	2,88	3,7E-05	
5	5,00	-	6,38	1,86	155,33	2,92	3,8E-05	h ₁ = Diff. head (gauge to surface)

AVERAGE						2,83		
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Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 1**

SHEET : 1 OF 6
HOLE NO : CH-1 (Check Hole)
STAGE FROM : 0,00 meter
TO : 5,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 2,26 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,914
Z : 127,261 m.s.l
Z + C (T. CONCRETE) : 127,261 m.s.l
WAKTU : 9:20 to 10:13 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 3 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 28-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	164,70	-	165,70	-	163,30	-	162,20	-	166,00	-
2	164,70	-	165,70	-	163,30	-	162,20	-	166,00	-
3	164,80	0,10	165,80	0,10	163,30	-	162,20	-	166,00	-
4	164,80	-	165,80	-	163,40	0,10	162,20	-	166,00	-
5	164,90	0,10	165,80	-	163,40	-	162,20	-	166,00	-
6	165,00	0,10	165,80	-	163,40	-	162,20	-	166,00	-
7	165,00	-	165,80	-	163,40	-	162,20	-	166,10	0,10
8	165,00	-	165,80	-	163,40	-	162,20	-	166,10	-
9	165,00	-	165,90	0,10	163,40	-	162,20	-	166,10	-
10	165,00	-	165,90	-	163,40	-	162,20	-	166,10	-
Q (l/min)	181,36	0,03	182,37	0,02	179,70	0,01	178,42	0,00	182,64	0,01
Q (l/min/m)		0,01		0,00		0,00		0,00		0,00
Q (cm ³ /sec)		0,50		0,33		0,17		0,00		0,17

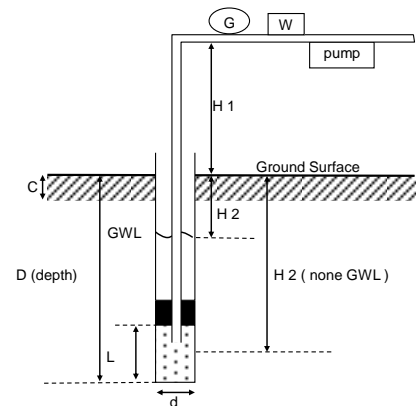
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

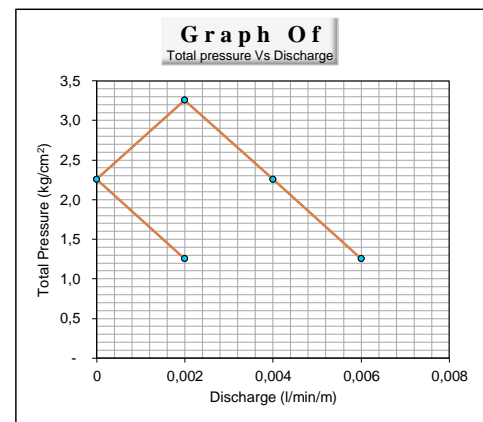
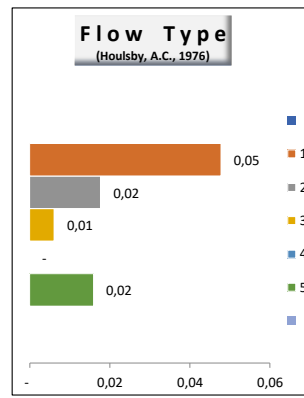
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,26	0,01	0,50	0,05	6,2E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kg/cm2)
2	2,00	-	2,26	0,00	0,33	0,02	2,3E-07	Po= Gauge pressure
3	3,00	-	3,26	0,00	0,17	0,01	8,0E-08	C= Constant (0.1 kg/cm2)
4	2,00	-	2,26	-	-	-	0,0E+00	
5	1,00	-	1,26	0,00	0,17	0,02	2,1E-07	h1= Diff. head (gauge to surface)

AVERAGE : 0,02

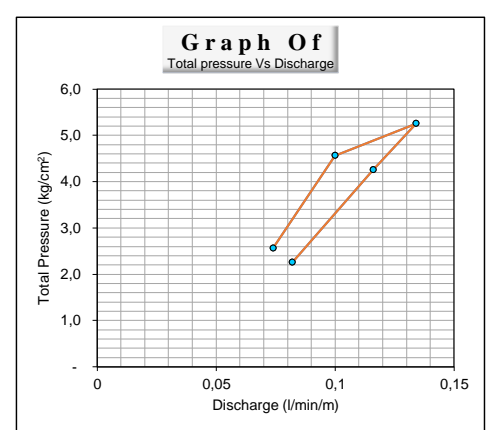
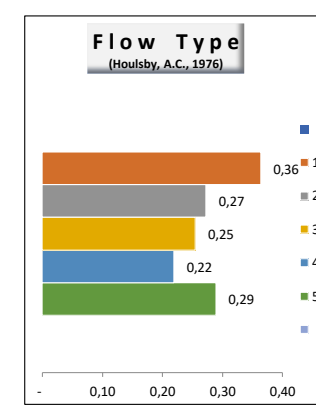


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2			SHEET : 2 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : CH-1 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 5,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 10,00 meter
DEPTH OF GWL (H2) : 2,26 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787536,915			MAX OF PRESSURE : 5 kg/cm ²
Y : 9402930,914			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,261 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,261 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 12:50 to 13:45 WITA			DATE : 28-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,26	0,08	6,83	0,36	4,7E-06	P= Po + C (h1 + h2 - h3)kg/cm2
2	4,00	-	4,26	0,12	9,67	0,27	3,5E-06	Po= Gauge pressure
3	5,00	-	5,26	0,13	11,17	0,25	3,3E-06	C= Constant (0.1 kg/cm2)
4	4,00	-	4,56	0,10	8,33	0,22	2,8E-06	h1= Diff. head (gauge to surface)
5	2,00	-	2,56	0,07	6,17	0,29	3,7E-06	h2= Diff. head (Surface to GWL or to center of test section)
AVERAGE						0,28		h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	P ₂ (kg/cm ²)
	297,70		302,70		308,80		315,60		320,40		
1	298,00	0,30	303,40	0,70	309,70	0,90	316,10	0,50	320,90	0,50	
2	298,40	0,40	304,00	0,60	310,30	0,60	316,60	0,50	321,30	0,40	
3	298,80	0,40	304,60	0,60	310,90	0,60	317,10	0,50	321,60	0,30	
4	299,30	0,50	305,20	0,60	311,60	0,70	317,70	0,60	322,00	0,40	
5	299,70	0,40	305,70	0,50	312,20	0,60	318,10	0,40	322,30	0,30	
6	300,20	0,50	306,20	0,50	312,90	0,70	318,60	0,50	322,60	0,30	
7	300,60	0,40	306,80	0,60	313,50	0,60	319,10	0,50	323,00	0,40	
8	301,00	0,40	307,40	0,60	314,10	0,60	319,60	0,50	323,40	0,40	
9	301,40	0,40	307,90	0,50	314,80	0,70	320,10	0,50	323,70	0,30	
10	301,80	0,40	308,50	0,60	315,50	0,70	320,60	0,50	324,10	0,40	
Q (l / min)	329,69	0,41	336,24	0,58	343,43	0,67	349,92	0,50	354,53	0,37	
Q (l/min/m)		0,08		0,12		0,13		0,10		0,07	
Q (cm ³ /sec)		6,83		9,67		11,17		8,33		6,17	

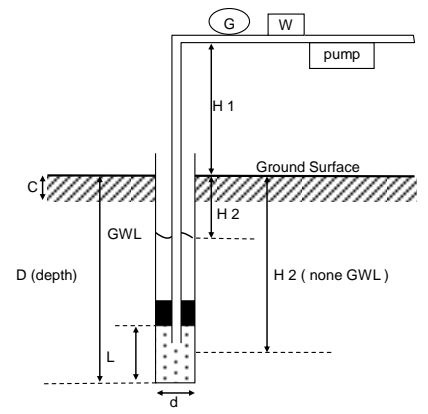


$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

- Keterangan :**
- Q : Debit air yang masuk (cm³/detik)
 - P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
 - P_o : Tekanan yang diizinkan (kg/cm²)
 - H1 : Tinggi pressure gauge dari permukaan lubang (m)
 - H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
 - D : D - (1/2L) (Non GWL) (m)
 - D : Total kedalaman lubang yang di bor (m)
 - L : Kedalaman lubang yang dites (m)
 - C : Tebal Concrete (m)
 - G : Pressure Gauge (kg/cm²)
 - r : Jari-jari lubang bor (mm)

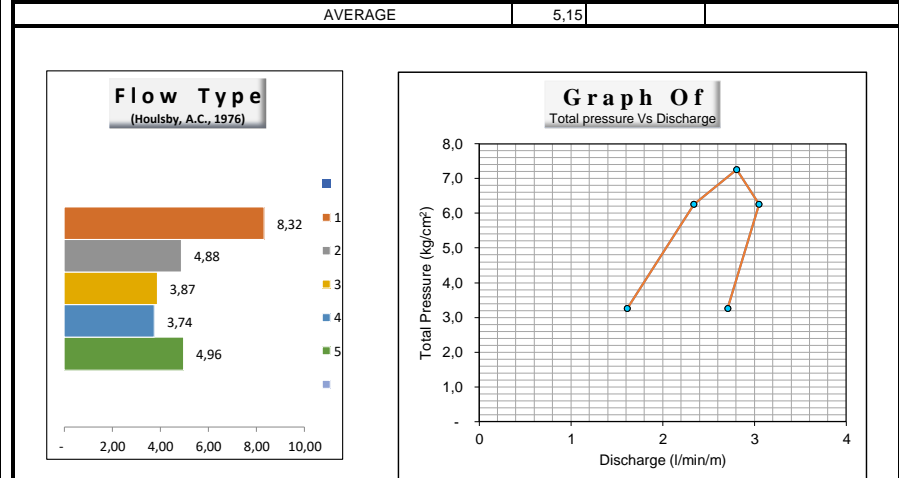


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET : 3 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : CH-1 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 10,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN		TO : 15,00 meter
DEPTH OF GWL (H2) : 2,26 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787536,915		MAX OF PRESSURE : 7 kg/cm ²
Y : 9402930,914		GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,261 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,261 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 15:55 to 16:56 WITA		DATE : 28-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	3,00	-	3,26	2,71	225,83	8,32	1,1E-04	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	6,00	-	6,26	3,05	254,17	4,88	6,3E-05	Po= Gauge pressure
3	7,00	-	7,26	2,81	233,83	3,87	5,0E-05	C= Constant (0.1 kg/cm2)
4	6,00	-	6,26	2,34	195,00	3,74	4,8E-05	
5	3,00	-	3,26	1,61	134,50	4,96	6,4E-05	h1= Diff. head (gauge to surface)
AVERAGE						5,15		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	
	460,00	14,40	723,00	20,40	890,00	14,50	36,00	11,70	170,00	8,40	
1	474,40	14,40	743,40	20,40	904,50	14,50	47,70	11,70	178,40	8,40	
2	488,10	13,70	761,80	18,40	918,90	14,40	59,70	12,00	186,60	8,20	
3	502,00	13,90	778,00	16,20	934,50	15,60	71,40	11,70	194,40	7,80	
4	515,40	13,40	793,40	15,40	949,50	15,00	83,00	11,60	202,90	8,50	
5	528,90	13,50	807,60	14,20	964,20	14,70	94,80	11,80	211,00	8,10	
6	542,20	13,30	822,50	14,90	977,90	13,70	106,40	11,60	218,90	7,90	
7	556,00	13,80	835,10	12,60	991,30	13,40	118,00	11,60	226,90	8,00	
8	569,00	13,00	848,70	13,60	1005,00	13,70	129,70	11,70	234,90	8,00	
9	582,20	13,20	862,00	13,30	1017,20	12,20	141,70	12,00	242,80	7,90	
10	595,50	13,30	875,50	13,50	1030,30	13,10	153,00	11,30	250,70	7,90	
Q (l/min)	581,37	13,55	885,10	15,25	1058,33	14,03	104,14	11,70	231,75	8,07	
Q (l/min/m)		2,71		3,05				2,34		1,61	
Q (cm ³ /sec)		225,83		254,17				195,00		134,50	



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{L} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

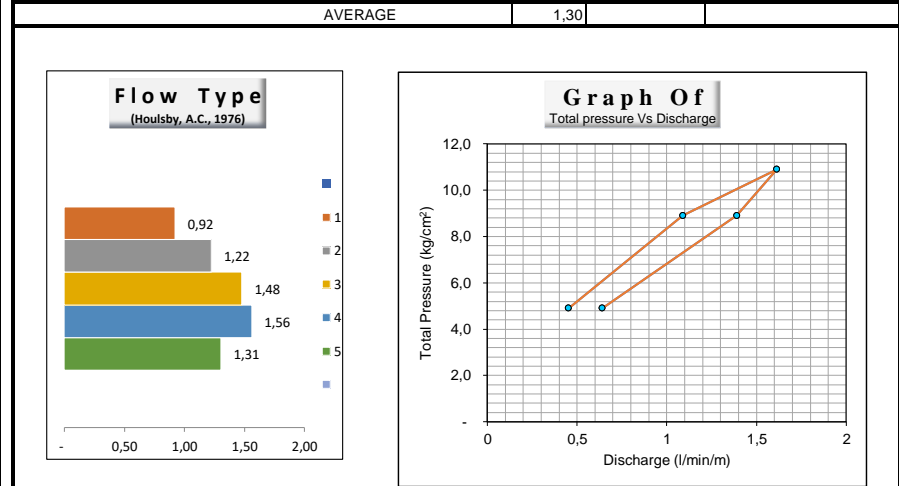
- Q : Debit air yang masuk (cm³/detik)
- P : P₃ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4			SHEET : 4 OF 6
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : CH-1 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 15,00 meter
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN			TO : 20,00 meter
DEPTH OF GWL (H2) : 8,74 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787536,915			MAX OF PRESSURE : 10 kg/cm ²
Y : 9402930,914			GAUGE from SURFACE (H1) : 0,30 meter
Z : 127,261 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 127,261 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:20 to 10:13 WITA			DATE : 30-Apr-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	4,00	-	4,90	0,45	37,67	0,92	1,2E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	8,00	-	8,90	1,09	90,83	1,22	1,6E-05	Po= Gauge pressure
3	10,00	-	10,90	1,61	134,33	1,48	1,9E-05	C= Constant (0.1 kg/cm2)
4	8,00	-	8,90	1,39	115,83	1,56	2,0E-05	
5	4,00	-	4,90	0,64	53,33	1,31	1,7E-05	h1= Diff. head (gauge to surface)
AVERAGE						1,30		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Q (l/min)
	279,20	3,20	304,40	5,80	361,30	7,60	446,10	7,40	518,00	3,20	
1	282,40	3,20	310,20	5,80	368,90	7,60	453,50	7,40	521,20	3,20	
2	284,40	2,00	315,50	5,30	376,60	7,70	460,90	7,40	524,30	3,10	
3	286,30	1,90	320,70	5,20	384,50	7,90	468,00	7,10	527,60	3,30	
4	288,20	1,90	325,90	5,20	391,90	7,40	475,20	7,20	530,90	3,30	
5	290,20	2,00	330,90	5,00	399,70	7,80	482,30	7,10	534,00	3,10	
6	292,20	2,00	335,90	5,00	407,70	8,00	489,80	7,50	537,20	3,20	
7	294,60	2,40	341,40	5,50	416,10	8,40	496,70	6,90	540,40	3,20	
8	297,30	2,70	346,20	4,80	424,30	8,20	503,00	6,30	543,80	3,40	
9	299,80	2,50	353,20	7,00	433,00	8,70	509,20	6,20	547,00	3,20	
10	301,80	2,00	358,90	5,70	441,90	8,90	515,60	6,40	550,00	3,00	
Q (l/min)	319,64	2,26	364,32	5,45	440,59	8,06	530,03	6,95	587,44	3,20	
Q (l/min/m)		0,45		1,09				1,39		0,64	
Q (cm ³ /sec)		37,67		90,83				115,83		53,33	



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 5**

SHEET : 5 OF 6
HOLE NO : CH-1 (Check Hole)
STAGE FROM : 20,00 meter
TO : 25,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 8,74 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,914
Z : 127,261 m.s.l
Z + C (T. CONCRETE) : 127,261 m.s.l
WAKTU : 14:34 to 15:25 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 30-Apr-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Q (l/min)
1	649,20	0,10	651,10	1,50	668,60	2,40	696,20	2,20	721,60	1,60	714,58
2	649,30	-	654,00	1,40	673,30	2,30	698,30	2,10	723,50	1,90	0,03
3	649,30	-	655,40	1,40	675,90	2,60	700,60	2,30	725,40	1,90	0,33
4	649,30	-	657,00	1,60	678,20	2,30	703,00	2,40	727,20	1,80	40,67
5	649,30	-	658,50	1,50	680,70	2,50	705,20	2,20	729,10	1,90	38,50
6	649,50	0,20	660,20	1,70	683,10	2,40	707,60	2,40	731,00	1,90	31,50
7	649,70	0,20	662,00	1,80	685,50	2,40	710,00	2,40	732,90	1,90	
8	650,00	0,30	663,80	1,80	688,00	2,50	712,30	2,30	734,90	2,00	
9	650,30	0,30	665,60	1,80	690,00	2,00	714,60	2,30	736,80	1,90	
10	650,60	0,30	667,40	1,80	693,00	3,00	717,10	2,50	738,90	2,10	
Q (l/min)		0,14	724,76	1,63	748,73	2,44	775,89	2,31	802,13	1,89	
Q (l/min/m)											
Q (cm ³ /sec)		2,33		27,17		40,67		38,50		31,50	

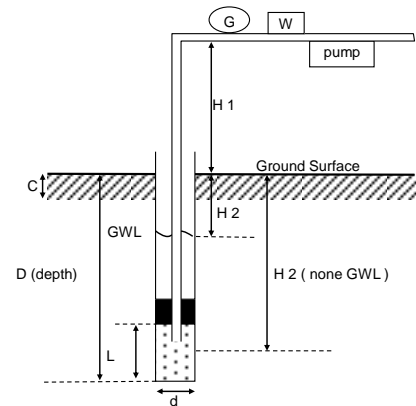
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

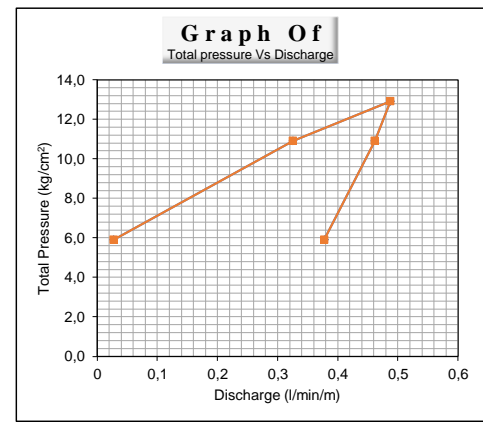
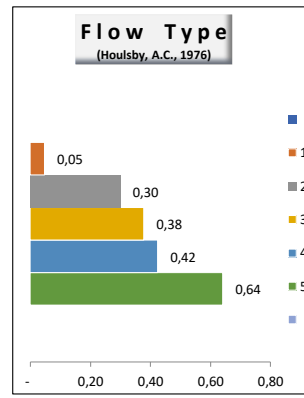
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,90	0,03	2,33	0,05	6,1E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,90	0,33	27,17	0,30	3,9E-06	Po= Gauge pressure
3	12,00	-	12,90	0,49	40,67	0,38	4,9E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	10,90	0,46	38,50	0,42	5,5E-06	
5	5,00	-	5,90	0,38	31,50	0,64	8,3E-06	h1= Diff. head (gauge to surface)

AVERAGE : 0,36



Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 6**

SHEET : 6 OF 6
HOLE NO : CH-1 (Check Hole)
STAGE FROM : 25,00 meter
TO : 30,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+20 - SANDARAN KANAN
DEPTH OF GWL (H2) : 8,84 meter
C (THICK CONCRETE) : 0,00 meter
X : 787536,915
Y : 9402930,914
Z : 127,261 m.s.l
Z + C (T. CONCRETE) : 127,261 m.s.l
WAKTU : 9:06 to 10:21 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 01-May-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)		(liter)		(liter)		(liter)		(liter)	
1	880,10		881,70		887,80		902,60		912,10	
2	880,20	0,10	882,30	0,60	889,20	1,40	903,40	0,80	912,20	0,10
3	880,30	0,10	883,00	0,70	890,40	1,20	904,40	1,00	912,20	-
4	880,40	0,10	883,50	0,50	890,40	-	905,30	0,90	912,30	0,10
5	880,50	0,10	884,00	0,50	891,90	1,50	906,20	0,90	912,30	-
6	880,60	0,10	884,50	0,50	893,20	1,30	907,20	1,00	912,30	-
7	880,70	0,10	885,00	0,50	895,00	1,80	908,30	1,10	912,30	-
8	880,80	0,10	885,80	0,80	897,20	2,20	909,30	1,00	912,40	0,10
9	880,90	0,10	886,30	0,50	899,30	2,10	910,30	1,00	912,50	0,10
10	881,00	0,10	886,90	0,60	901,00	1,70	911,30	1,00	912,60	0,10
10	881,10	0,10	887,40	0,50	902,30	1,30	912,50	1,20	912,60	-
Q (l/min)	968,66	0,10	973,04	0,57	983,77	1,45	998,08	0,99	1003,58	0,05
Q (l/min/m)		0,02		0,11		0,29		0,20		0,01
Q (cm ³ /sec)		1,67		9,50		24,17		16,50		0,83

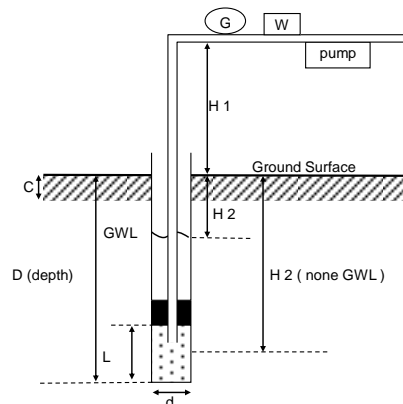
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

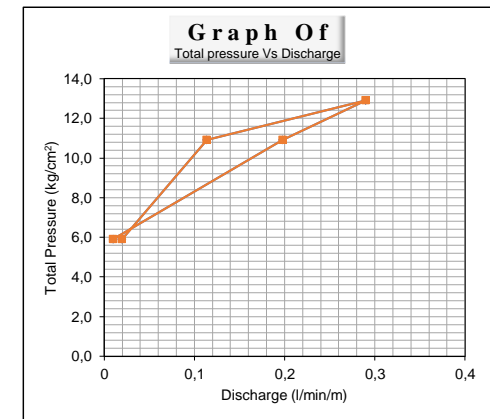
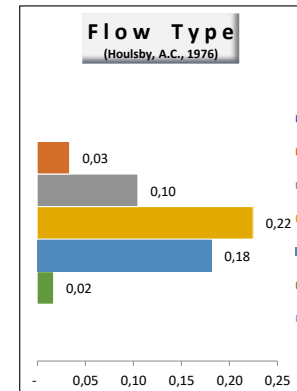
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,91	0,02	1,67	0,03	4,4E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kg/cm2)
2	10,00	-	10,91	0,11	9,50	0,10	1,4E-06	Po= Gauge pressure
3	12,00	-	12,91	0,29	24,17	0,22	2,9E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	10,91	0,20	16,50	0,18	2,3E-06	
5	5,00	-	5,91	0,01	0,83	0,02	2,2E-07	h1= Diff. head (gauge to surface)

AVERAGE : 0,11

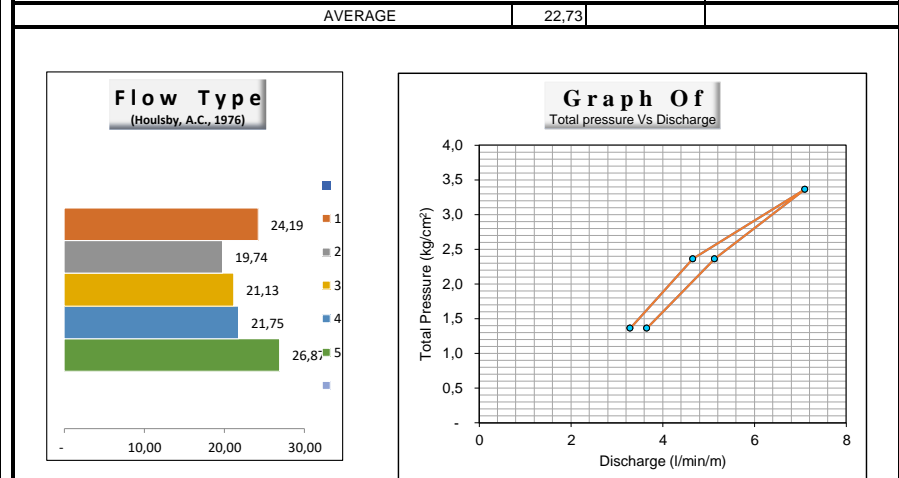


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 5,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 10,00 meter
DEPTH OF GWL (H2) : 3,30 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787477,340			MAX OF PRESSURE : 3 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,317 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,317 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 10:39 to 11:33 WITA			DATE : 23-May-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,36	3,29	274,17	24,19	3,1E-04	P= Po + C (h1 + h2 - h3)kg/cm2
2	2,00	-	2,36	4,66	388,17	19,74	2,6E-04	Po= Gauge pressure
3	3,00	-	3,36	7,10	591,67	21,13	2,7E-04	C= Constant (0.1 kg/cm2)
4	2,00	-	2,36	5,13	427,67	21,75	2,8E-04	h1= Diff. head (gauge to surface)
5	1,00	-	1,36	3,65	304,50	26,87	3,5E-04	h2= Diff. head (Surface to GWL or to center of test section)
AVERAGE						22,73		h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	36,00		207,1		450,0		817,0		85,6			
1	54,80	18,80	230,3	23,20	490,0	40,00	841,8	24,80	104,2	18,60		
2	69,80	15,00	252,6	22,30	527,0	37,00	866,8	25,00	123,9	19,70		
3	86,70	16,90	276,0	23,40	564,0	37,00	890,6	23,80	141,3	17,40		
4	103,00	16,30	299,3	23,30	602,0	38,00	917,3	26,70	159,6	18,30		
5	120,30	17,30	322,6	23,30	633,0	31,00	944,1	26,80	177,7	18,10		
6	138,50	18,20	348,7	26,10	668,0	35,00	970,0	25,90	195,8	18,10		
7	155,50	17,00	370,0	21,30	703,0	35,00	995,4	25,40	214,3	18,50		
8	169,60	14,10	396,3	26,30	737,0	34,00	1023,3	27,90	232,6	18,30		
9	184,50	14,90	416,6	20,30	771,0	34,00	1047,4	24,10	251,0	18,40		
10	200,50	16,00	440,0	23,40	805,0	34,00	1073,6	26,20	268,3	17,30		
Q (l / min)	131,92	16,45	355,95	23,29	695,00	35,50	1038,73	25,66	195,43	18,27		
Q (l/min/m)		3,29		4,66		7,10		5,13		3,65		
Q (cm ³ /sec)		274,17		388,17		591,67		427,67		304,50		



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

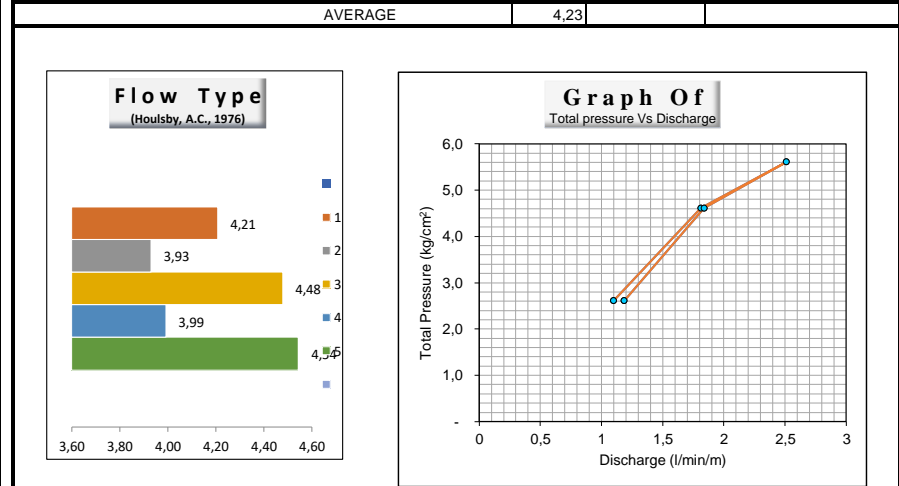
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2		SHEET	: 2 OF 7
		HOLE NO	: P2-1 (Pilot Hole)
		STAGE FROM	: 10,00 meter
		TO	: 15,00 meter
PROJECT	: PAMUKKULU DAM PROJECT - PAKET-1	ANGLE FROM VERTICAL	: 0 deg.
LOCATION	: TAKALAR - SOUTH OF SULAWESI	DIAMETER OF HOLE (d)	: 76 mm
AREA DESIGNATION	: STA 0+220 - SANDARAN KANAN	MAX OF PRESSURE	: 5 kg/cm ²
DEPTH OF GWL (H2)	: 5,80 meter	GAUGE from SURFACE (H1)	: 0,30 meter
C (THICK CONCRETE)	: 0,00 meter	TESTED BY	: Ahmad Syahputra
X	: 787477,340	SUPERVISED BY	: Muhamad Ichwanto
Y	: 9402747,774		
Z	: 98,317 m.s.l		
Z + C (T. CONCRETE)	: 98,317 m.s.l	DATE	: 24-May-21
WAKTU	: 12:18 to 13:12 WITA		

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,61	1,10	91,50	4,21	5,4E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	4,00	-	4,61	1,81	151,00	3,93	5,1E-05	Po= Gauge pressure
3	5,00	-	5,61	2,51	209,33	4,48	5,8E-05	C= Constant (0.1 kg/cm2)
4	4,00	-	4,61	1,84	153,33	3,99	5,2E-05	
5	2,00	-	2,61	1,19	98,83	4,54	5,9E-05	h1= Diff. head (gauge to surface)
AVERAGE							4,23	

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)		
	715,00		773,0		872,4		3,0		99,3		
1	721,80	6,80	782,8	9,80	884,0	11,60	12,3	9,30	104,9	5,60	
2	727,60	5,80	792,1	9,30	897,5	13,50	21,6	9,30	110,7	5,80	
3	733,20	5,60	801,6	9,50	910,9	13,40	30,9	9,30	116,3	5,60	
4	738,70	5,50	810,8	9,20	924,4	13,50	40,1	9,20	122,3	6,00	
5	744,00	5,30	820,0	9,20	937,4	13,00	49,6	9,50	128,5	6,20	
6	749,40	5,40	828,9	8,90	949,6	12,20	58,9	9,30	134,5	6,00	
7	754,70	5,30	838,0	9,10	962,5	12,90	68,2	9,30	140,4	5,90	
8	760,20	5,50	846,4	8,40	975,1	12,60	77,2	9,00	146,4	6,00	
9	764,80	4,60	855,2	8,80	989,3	14,20	86,0	8,80	152,5	6,10	
10	769,90	5,10	863,6	8,40	998,0	8,70	95,0	9,00	158,6	6,10	
Q (l / min)	817,93	5,49	901,24	9,06	1030,11	12,56	54,28	9,20	141,44	5,93	
Q (l/min/m)		1,10		1,81		2,51			1,84	1,19	
Q (cm ³ /sec)		91,50		151,00		209,33			153,33	98,83	



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

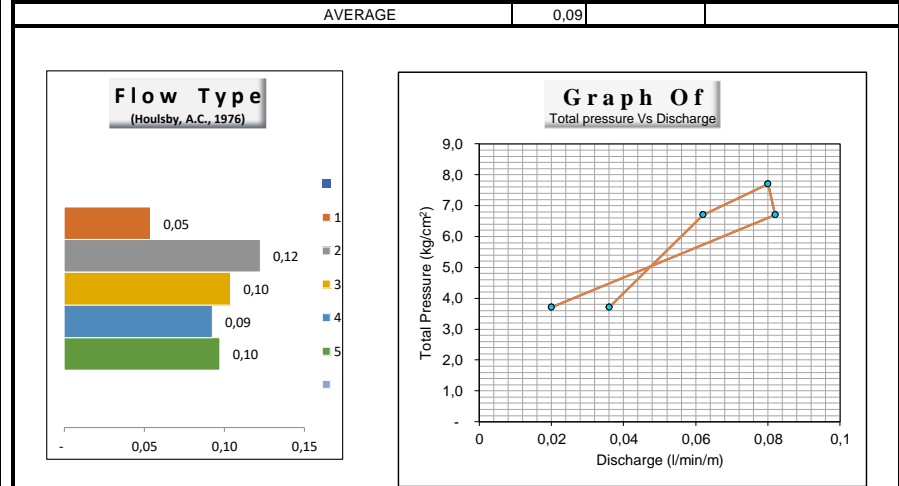
- Q : Debit air yang masuk (cm³/detik)
- P : P₂ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3			SHEET : 3 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 15,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 20,00 meter
DEPTH OF GWL (H2) : 6,75 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787477,340			MAX OF PRESSURE : 7 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,317 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,317 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 10:34 to 11:26 WITA			DATE : 25-May-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	3,00	-	3,71	0,02	1,67	0,05	7,0E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	6,00	-	6,71	0,08	6,83	0,12	1,6E-06	Po= Gauge pressure	
3	7,00	-	7,71	0,08	6,67	0,10	1,3E-06	C= Constant (0.1 kg/cm2)	
4	6,00	-	6,71	0,06	5,17	0,09	1,2E-06		
5	3,00	-	3,71	0,04	3,00	0,10	1,3E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,09		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)		
	161,80	0,10	163,00	0,40	167,30	0,50	171,30	0,30	174,30	0,20	
1	161,90	0,10	163,40	0,40	167,80	0,50	171,60	0,30	174,50	0,20	
2	162,00	0,10	163,90	0,50	168,20	0,40	172,00	0,40	174,70	0,20	
3	162,20	0,20	164,30	0,40	168,60	0,40	172,20	0,20	174,90	0,20	
4	162,30	0,10	164,60	0,30	169,00	0,40	172,50	0,30	175,10	0,20	
5	162,40	0,10	165,00	0,40	169,40	0,40	172,80	0,30	175,20	0,10	
6	162,50	0,10	165,40	0,40	169,80	0,40	173,20	0,40	175,40	0,20	
7	162,60	0,10	165,90	0,50	170,20	0,40	173,50	0,30	175,60	0,20	
8	162,70	0,10	166,30	0,40	170,50	0,30	173,80	0,30	175,80	0,20	
9	162,70	-	166,70	0,40	170,90	0,40	174,10	0,30	175,90	0,10	
10	162,80	0,10	167,10	0,40	171,30	0,40	174,40	0,30	176,10	0,20	
Q (l / min)	178,59	0,10	181,56	0,41	186,30	0,40	190,14	0,31	192,75	0,18	
Q (l/min/m)		0,02		0,08		0,08		0,06		0,04	
Q (cm ³ /sec)		1,67		6,83		6,67		5,17		3,00	



Catatan di Lapangan:

$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₃ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 4**

SHEET : 4 OF 7
HOLE NO : P2-1 (Pilot Hole)
STAGE FROM : 20,00 meter
TO : 25,00 meter

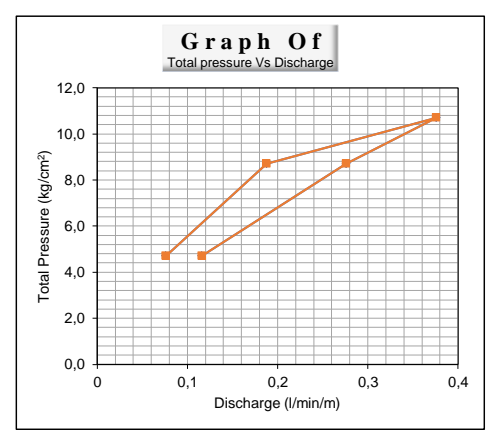
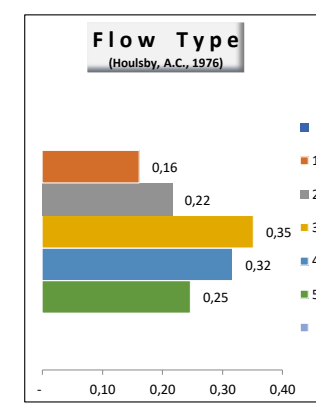
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN
DEPTH OF GWL (H2) : 6,75 meter
C (THICK CONCRETE) : 0,00 meter
X : 787477,34
Y : 9402747,774
Z : 98,317 m.s.l
Z + C (T. CONCRETE) : 98,317 m.s.l
WAKTU : 14:30 to 15:27 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 10 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 25-May-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
	185,50		191,00		201,50		221,50		235,3	
1	185,80	0,30	191,90	0,90	203,00	1,50	222,90	1,40	235,8	0,50
2	186,20	0,40	192,90	1,00	204,90	1,90	224,30	1,40	236,2	0,40
3	186,50	0,30	193,80	0,90	206,90	2,00	225,60	1,30	236,8	0,60
4	186,90	0,40	194,70	0,90	209,00	2,10	227,10	1,50	237,4	0,60
5	187,30	0,40	195,60	0,90	211,00	2,00	228,50	1,40	238,0	0,60
6	187,70	0,40	196,60	1,00	212,70	1,70	230,00	1,50	238,6	0,60
7	188,10	0,40	197,50	0,90	214,50	1,80	231,30	1,30	239,3	0,70
8	188,50	0,40	198,40	0,90	216,40	1,90	232,60	1,30	239,9	0,60
9	188,90	0,40	199,40	1,00	218,30	1,90	234,00	1,40	240,6	0,70
10	189,30	0,40	200,40	1,00	220,30	2,00	235,30	1,30	241,1	0,50
Q	206,07	0,38	215,22	0,94	231,85	1,88	251,31	1,38	261,90	0,58
Q (l/min)										
Q (l/min/m)		0,08		0,19		0,38		0,28		0,12
Q (cm ³ /sec)		6,33		15,67		31,33		23,00		9,67

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	4,00	-	4,71	0,08	6,33	0,16	2,1E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	8,00	-	8,71	0,19	15,67	0,22	2,8E-06	Po= Gauge pressure
3	10,00	-	10,71	0,38	31,33	0,35	4,5E-06	C= Constant (0.1 kg/cm2)
4	8,00	-	8,71	0,28	23,00	0,32	4,1E-06	
5	4,00	-	4,71	0,12	9,67	0,25	3,2E-06	h1= Diff. head (gauge to surface)
								h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss
AVERAGE						0,26		



Catatan di Lapangan:

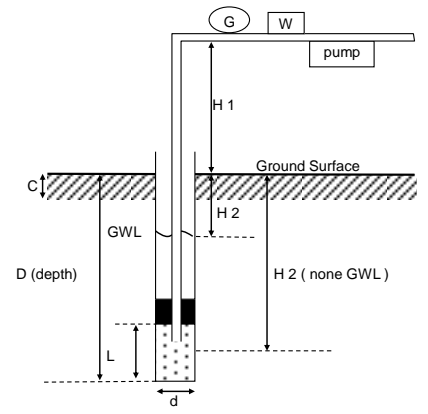
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

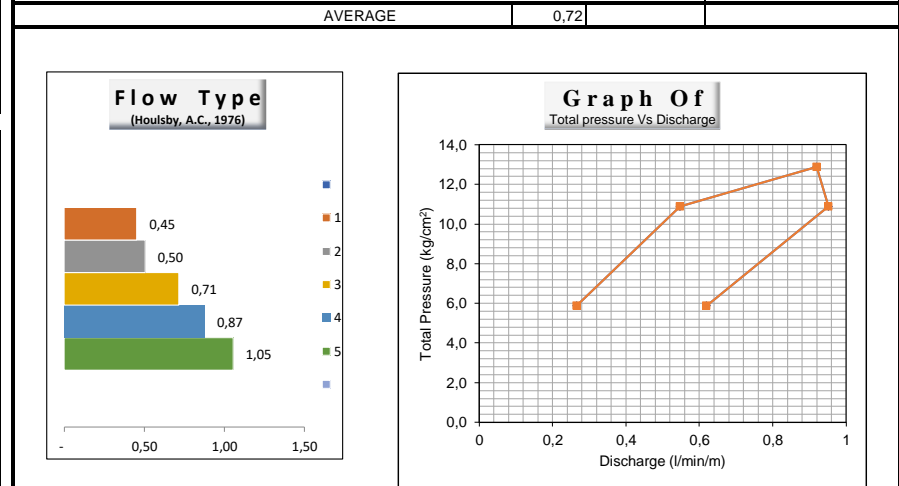
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 5			SHEET : 5 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 25,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 30,00 meter
DEPTH OF GWL (H2) : 8,54 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787477,340			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,317 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,317 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:45 to 10:40 WITA			DATE : 26-May-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,88	0,27	22,17	0,45	5,9E-06	P= Po + C (h1 + h2 - h3)kg/cm2
2	10,00	-	10,88	0,55	45,67	0,50	6,5E-06	Po= Gauge pressure
3	12,00	-	12,88	0,92	76,67	0,71	9,2E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	10,88	0,95	79,33	0,87	1,1E-05	
5	5,00	-	5,88	0,62	51,67	1,05	1,4E-05	h1= Diff. head (gauge to surface)
AVERAGE							0,72	h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)		(liter)			
	247,50		263,50		295,00		344,00		396,10			
1	248,70	1,20	266,20	2,70	299,20	4,20	348,60	4,60	399,30	3,20		
2	249,90	1,20	268,90	2,70	303,50	4,30	353,10	4,50	402,40	3,10		
3	251,20	1,30	271,50	2,60	307,80	4,30	357,90	4,80	405,50	3,10		
4	252,40	1,20	274,20	2,70	312,20	4,40	362,50	4,60	408,70	3,20		
5	253,70	1,30	276,90	2,70	317,00	4,80	367,10	4,60	411,70	3,00		
6	255,00	1,30	279,60	2,70	321,60	4,60	371,90	4,80	414,80	3,10		
7	256,30	1,30	282,30	2,70	326,40	4,80	376,80	4,90	417,90	3,10		
8	257,70	1,40	285,00	2,70	331,00	4,60	381,80	5,00	421,00	3,10		
9	259,20	1,50	287,80	2,80	336,00	5,00	386,80	5,00	424,00	3,00		
10	260,80	1,60	290,90	3,10	341,00	5,00	391,60	4,80	427,10	3,10		
Q (l / min)	279,24	1,33	304,68	2,74	349,07	4,60	404,21	4,76	452,85	3,10		
Q (l/min/m)		0,27		0,55		0,92		0,95		0,62		
Q (cm ³ /sec)		22,17		45,67		76,67		79,33		51,67		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{L} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

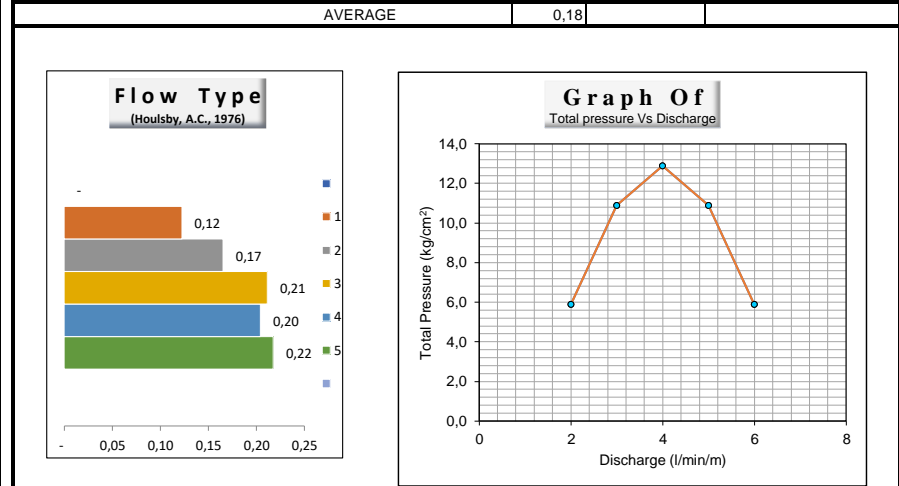
- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 6		SHEET : 6 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 30,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 35,00 meter
DEPTH OF GWL (H2) : 8,54 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787477,340	MAX OF PRESSURE : 12 kg/cm ²	
Y : 9402747,774	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 98,317 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 98,317 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 14:11 to 15:02 WITA	DATE : 26-May-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	5,00	-	5,88	0,07	6,00	0,12	1,6E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	10,00	-	10,88	0,18	15,00	0,17	2,1E-06	Po= Gauge pressure	
3	12,00	-	12,88	0,27	22,67	0,21	2,7E-06	C= Constant (0.1 kg/cm2)	
4	10,00	-	10,88	0,22	18,50	0,20	2,6E-06		
5	5,00	-	5,88	0,13	10,67	0,22	2,8E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,18		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)					
	614,50		618,50		628,10		642,40		653,60			
1	614,90	0,40	619,40	0,90	629,30	1,20	643,40	1,00	654,30	0,70		
2	615,30	0,40	620,20	0,80	630,70	1,40	644,50	1,10	654,80	0,50		
3	615,80	0,50	621,10	0,90	632,00	1,30	645,50	1,00	655,40	0,60		
4	616,20	0,40	622,10	1,00	633,40	1,40	646,70	1,20	656,20	0,80		
5	616,50	0,30	622,90	0,80	634,90	1,50	647,80	1,10	656,70	0,50		
6	616,80	0,30	623,80	0,90	636,20	1,30	648,90	1,10	657,40	0,70		
7	617,20	0,40	624,50	0,70	637,50	1,30	650,00	1,10	658,10	0,70		
8	617,50	0,30	625,50	1,00	639,00	1,50	651,10	1,10	658,70	0,60		
9	617,80	0,30	626,60	1,10	640,30	1,30	652,30	1,20	659,30	0,60		
10	618,10	0,30	627,50	0,90	641,70	1,40	653,50	1,20	660,00	0,70		
Q (l/min)	678,06	0,36	685,21	0,90	698,31	1,36	712,61	1,11	722,45	0,64		
Q (l/min/m)		0,07		0,18		0,27		0,22		0,13		
Q (cm ³ /sec)		6,00		15,00		22,67		18,50		10,67		



Catatan di Lapangan:

$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

The diagram shows a vertical borehole of diameter 'd' and depth 'D'. A pump is connected to the top of the borehole. The ground surface is indicated by a horizontal line. The water level in the borehole is at height 'H1' from the ground surface. The natural ground water level (GWL) is at height 'H2' from the ground surface. The concrete thickness at the bottom of the borehole is 'C'. The length of the section being tested is 'L'. A pressure gauge 'G' is located at the top of the section, and a water meter 'W' is also shown.

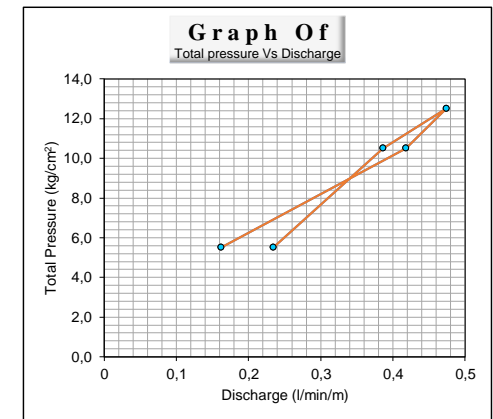
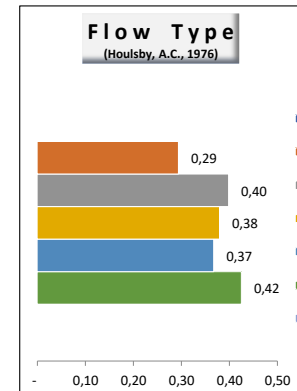
FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 7			SHEET : 7 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-1 (Pilot Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 35,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 40,00 meter
DEPTH OF GWL (H2) : 4,83 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787477,340			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,317 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,317 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:44 to 10:41 WITA			DATE : 27-May-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,51	0,16	13,50	0,29	3,8E-06	P= Po + C (h1 + h2 - h3)kg/cm2
2	10,00	-	10,51	0,42	34,83	0,40	5,1E-06	(kgf/cm2)
3	12,00	-	12,51	0,47	39,50	0,38	4,9E-06	Po= Gauge pressure
4	10,00	-	10,51	0,39	32,17	0,37	4,8E-06	C= Constant (0.1 kg/cm2)
5	5,00	-	5,51	0,23	19,50	0,42	5,5E-06	h1= Diff. head (gauge to surface)

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	720,00		729,00		751,20		776,50		799,30	
1	720,80	0,80	731,10	2,10	753,50	2,30	778,60	2,10	800,50	1,20
2	721,60	0,80	733,30	2,20	755,90	2,40	780,70	2,10	801,80	1,30
3	722,40	0,80	735,40	2,10	758,20	2,30	782,60	1,90	802,90	1,10
4	723,20	0,80	737,60	2,20	760,50	2,30	784,50	1,90	804,10	1,20
5	724,00	0,80	739,70	2,10	762,90	2,40	786,30	1,80	805,30	1,20
6	724,80	0,80	741,70	2,00	765,20	2,30	788,20	1,90	806,50	1,20
7	725,60	0,80	743,80	2,10	767,50	2,30	790,10	1,90	807,60	1,10
8	726,40	0,80	745,90	2,10	770,00	2,50	792,00	1,90	808,80	1,20
9	727,20	0,80	748,00	2,10	772,40	2,40	793,90	1,90	809,90	1,10
10	728,10	0,90	749,90	1,90	774,90	2,50	795,80	1,90	811,00	1,10
Q (l / min)	796,41	0,81	813,54	2,09	839,22	2,37	864,92	1,93	885,77	1,17
Q (l/min/m)		0,16		0,42				0,39		0,23
Q (cm ³ /sec)		13,50		34,83				32,17		19,50

AVERAGE : 0,37



Catatan di Lapangan:

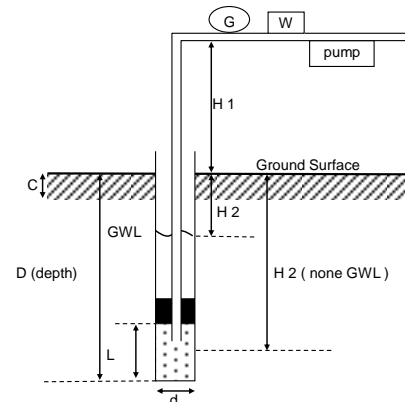
$$K = \frac{Q}{2 \times (3.14) \times L \times H} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

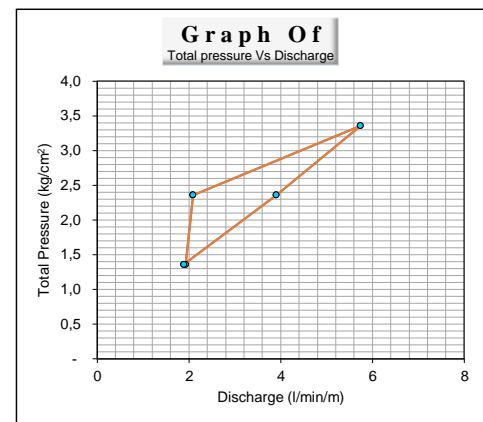
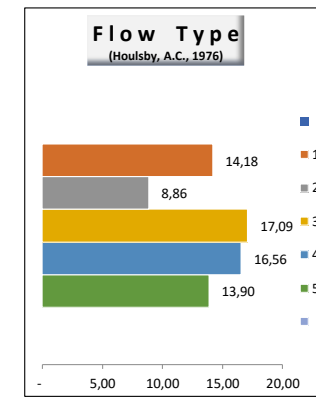


FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 5,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 10,00 meter
DEPTH OF GWL (H2) : 3,27 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 3 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 8:31 to 9:29 WITA			DATE : 03-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,36	1,92	160,33	14,18	1,8E-04	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	2,00	-	2,36	2,09	174,00	8,86	1,1E-04	Po= Gauge pressure
3	3,00	-	3,36	5,74	478,17	17,09	2,2E-04	C= Constant (0.1 kg/cm2)
4	2,00	-	2,36	3,90	325,33	16,56	2,1E-04	
5	1,00	-	1,36	1,89	157,17	13,90	1,8E-04	
AVERAGE						14,12		

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)		(liter)		(liter)		(liter)			
	100,0		230,00		350,00		650,00		900,00			
1	110,3	10,30	240,80	10,80	378,90	28,90	667,20	17,20	909,70	9,70		
2	119,5	9,20	250,90	10,10	406,40	27,50	689,40	22,20	918,20	8,50		
3	127,8	8,30	261,30	10,40	435,60	29,20	709,20	19,80	927,40	9,20		
4	138,4	10,60	271,60	10,30	464,90	29,30	728,40	19,20	937,60	10,20		
5	148,9	10,50	282,50	10,90	492,80	27,90	747,60	19,20	947,10	9,50		
6	157,8	8,90	292,30	9,80	521,60	28,80	767,40	19,80	956,60	9,50		
7	167,9	10,10	302,80	10,50	550,60	29,00	786,90	19,50	965,70	9,10		
8	176,6	8,70	313,50	10,70	578,80	28,20	805,10	18,20	975,40	9,70		
9	186,4	9,80	323,70	10,20	607,60	28,80	824,70	19,60	984,80	9,40		
10	196,2	9,80	334,40	10,70	636,90	29,30	845,20	20,50	994,30	9,50		
Q (l / min)	162,98	9,62	310,38	10,44	542,41	28,69	822,11	19,52	1041,68	9,43		
Q (l/min/m)		1,92		2,09		5,74		3,90		1,89		
Q (cm ³ /sec)		160,33		174,00		478,17		325,33		157,17		

AVERAGE						14,12		
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Catatan di Lapangan:

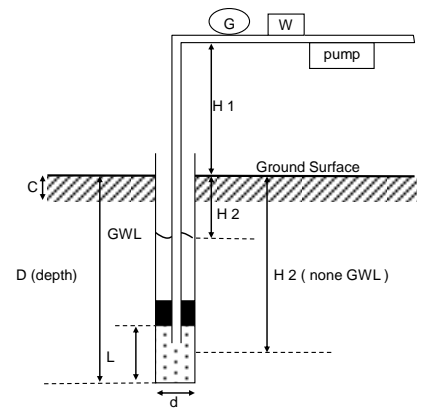
$$K = \frac{Q}{2 \times (3.14) \times L \times H} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

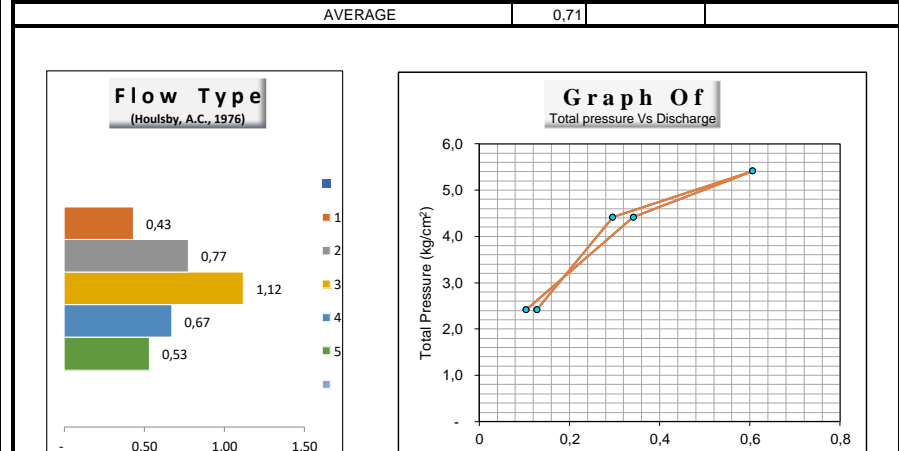
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2		SHEET : 2 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 10,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 15,00 meter
DEPTH OF GWL (H2) : 3,84 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787479,248		MAX OF PRESSURE : 5 kg/cm ²
Y : 9402747,774		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 11:30 to 12:35 WITA		DATE : 03-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,41	0,10	8,67	0,43	5,6E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	4,00	-	4,41	0,34	28,50	0,77	1,0E-05	Po= Gauge pressure
3	5,00	-	5,41	0,61	50,50	1,12	1,4E-05	C= Constant (0.1 kg/cm2)
4	4,00	-	4,41	0,30	24,67	0,67	8,7E-06	h1= Diff. head (gauge to surface)
5	2,00	-	2,41	0,13	10,67	0,53	6,9E-06	h2= Diff. head (Surface to GWL or to center of test section)
AVERAGE						0,71		h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)										
ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter (liter)	P ₂ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₄ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₅ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₄ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₂ (kg/cm ²)
1	40,00	0,70	66,8	1,80	88,4	3,40	121,7	1,70	140,7	0,70
2	41,30	0,60	68,4	1,60	91,1	2,70	122,9	1,20	141,3	0,60
3	41,70	0,40	70,1	1,70	94,2	3,10	124,4	1,50	141,9	0,60
4	42,60	0,90	71,9	1,80	97,1	2,90	125,9	1,50	142,8	0,90
5	43,10	0,50	73,8	1,90	100,3	3,20	127,3	1,40	143,3	0,50
6	43,60	0,50	75,2	1,40	103,2	2,90	128,9	1,60	143,8	0,50
7	44,20	0,60	76,9	1,70	106,2	3,00	130,4	1,50	144,6	0,80
8	44,60	0,40	78,6	1,70	109,5	3,30	132,4	2,00	145,2	0,60
9	44,90	0,30	80,4	1,80	112,6	3,10	133,5	1,10	145,7	0,50
10	45,20	0,30	82,1	1,70	115,3	2,70	134,8	1,30	146,4	0,70
Q (l/min)	47,19	0,52	80,92	1,71	110,29	3,03	140,22	1,48	157,57	0,64
Q (l/min/m)		0,10		0,34		0,61		0,30		0,13
Q (cm ³ /sec)		8,67		28,50		50,50		24,67		10,67



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

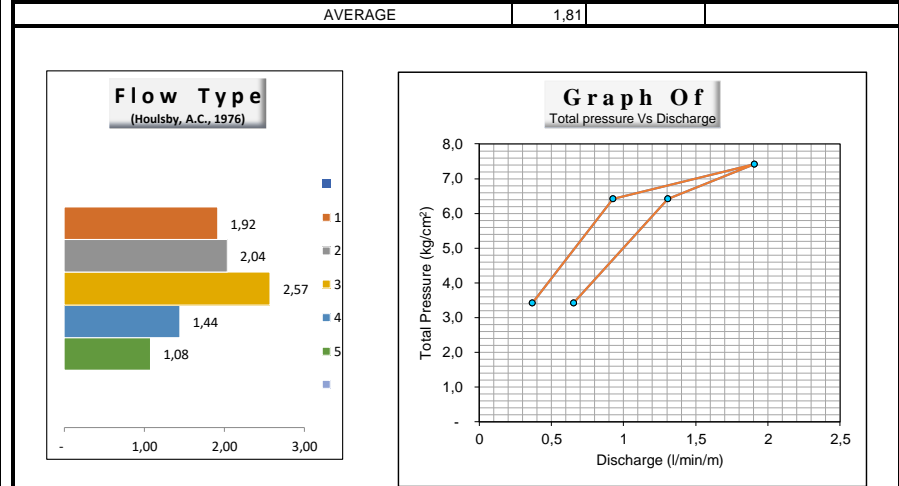
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET : 3 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 15,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 20,00 meter
DEPTH OF GWL (H2) : 3,84 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787479,248		MAX OF PRESSURE : 7 kg/cm ²
Y : 9402747,774		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 16:03 to 17:09 WITA		DATE : 03-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	3,00	-	3,41	0,65	54,50	1,92	2,5E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	6,00	-	6,41	1,31	108,83	2,04	2,6E-05	Po= Gauge pressure	
3	7,00	-	7,41	1,91	158,83	2,57	3,3E-05	C= Constant (0.1 kg/cm2)	
4	6,00	-	6,41	0,93	77,17	1,44	1,9E-05		
5	3,00	-	3,41	0,37	30,67	1,08	1,4E-05	h1= Diff. head (gauge to surface)	
AVERAGE							1,81		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)		
	150,00		200,00		280,00		400,00		460,00		
1	154,20	4,20	208,10	8,10	289,30	9,30	404,70	4,70	461,90	1,90	
2	156,80	2,60	213,20	5,10	299,10	9,80	409,50	4,80	463,20	1,30	
3	159,90	3,10	219,60	6,40	308,70	9,60	413,80	4,30	465,40	2,20	
4	163,10	3,20	226,20	6,60	317,10	8,40	418,60	4,80	467,30	1,90	
5	166,30	3,20	232,70	6,50	327,60	10,50	423,20	4,60	469,00	1,70	
6	169,60	3,30	238,20	5,50	337,70	10,10	427,90	4,70	470,80	1,80	
7	173,00	3,40	245,70	7,50	345,70	8,00	432,50	4,60	472,50	1,70	
8	176,20	3,20	252,30	6,60	356,30	10,60	436,90	4,40	474,40	1,90	
9	179,50	3,30	258,70	6,40	365,90	9,60	441,20	4,30	476,30	1,90	
10	182,70	3,20	265,30	6,60	375,30	9,40	446,30	5,10	478,40	2,10	
Q (l/min)	183,13	3,27	256,00	6,53	360,27	9,53	465,46	4,63	515,92	1,84	
Q (l/min/m)		0,65		1,31		1,91		0,93		0,37	
Q (cm ³ /sec)		54,50		108,83		158,83		77,17		30,67	



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

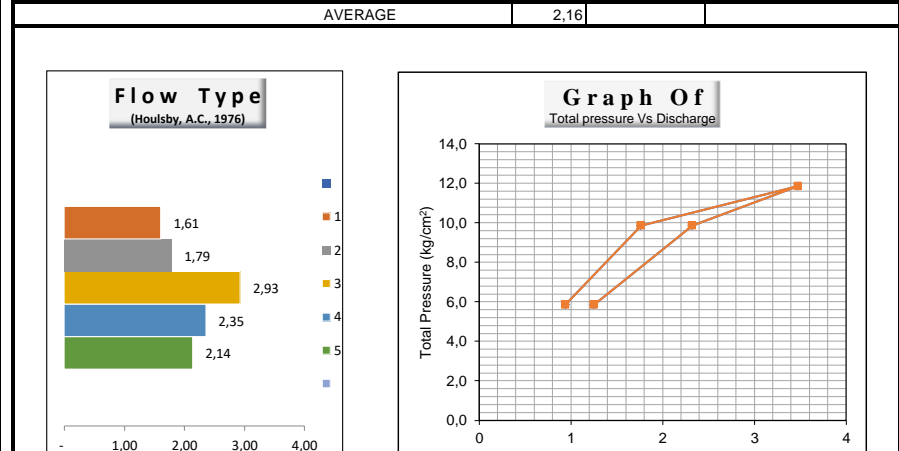
- Q : Debit air yang masuk (cm³/detik)
- P : P₃ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4		SHEET : 4 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 20,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 25,00 meter
DEPTH OF GWL (H2) : 18,30 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787479,248		MAX OF PRESSURE : 10 kg/cm ²
Y : 9402747,774		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:40 to 10:46 WITA		DATE : 04-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	4,00	-	5,86	0,94	78,50	1,61	2,1E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	8,00	-	9,86	1,76	147,00	1,79	2,3E-05	Po= Gauge pressure
3	10,00	-	11,86	3,48	289,67	2,93	3,8E-05	C= Constant (0.1 kg/cm2)
4	8,00	-	9,86	2,32	193,50	2,35	3,0E-05	
5	4,00	-	5,86	1,25	104,33	2,14	2,8E-05	h1= Diff. head (gauge to surface)
AVERAGE							2,16	

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Q (l/min)
	185,00	4,50	240,00	8,90	200,00	18,40	380,00	12,10	500,00	6,40	
1	189,50	4,70	257,10	8,20	234,60	16,20	403,50	11,40	512,9	6,50	
2	194,20	4,90	266,30	9,20	252,10	17,50	414,80	11,30	518,7	5,80	
3	199,10	4,10	275,20	8,90	269,50	17,40	426,00	11,20	525,0	6,30	
4	203,20	5,40	284,00	8,80	285,90	16,40	438,10	12,10	530,9	5,90	
5	208,60	4,70	292,50	8,50	304,30	18,40	449,60	11,50	537,5	6,60	
6	213,30	4,60	301,60	9,10	320,60	16,30	461,60	12,00	543,8	6,30	
7	217,90	4,40	310,40	8,80	340,10	19,50	472,90	11,30	551,2	7,40	
8	222,30	5,00	319,60	9,20	356,60	16,50	484,40	11,50	556,9	5,70	
9	227,30	4,80	328,20	8,60	373,80	17,20	496,10	11,70	562,6	5,70	
10	232,10	4,71	312,38	8,82	315,59	17,38	481,91	11,61	584,59	6,26	
Q (l/min)	229,25	4,71	312,38	8,82	315,59	17,38	481,91	11,61	584,59	6,26	
Q (l/min/m)		0,94		1,76		3,48		2,32		1,25	
Q (cm ³ /sec)		78,50		147,00		289,67		193,50		104,33	



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{Lr} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

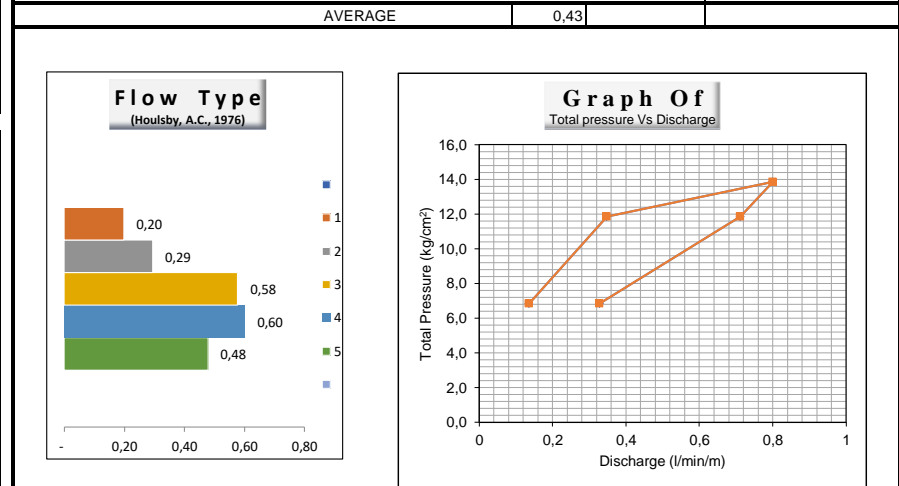
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 5			SHEET : 5 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 25,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 30,00 meter
DEPTH OF GWL (H2) : 18,30 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 14:23 to 15:18 WITA			DATE : 04-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,86	0,14	11,33	0,20	2,6E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	11,86	0,35	29,00	0,29	3,8E-06	Po= Gauge pressure
3	12,00	-	13,86	0,80	66,67	0,58	7,5E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	11,86	0,71	59,33	0,60	7,8E-06	h1= Diff. head (gauge to surface)
5	5,00	-	6,86	0,33	27,33	0,48	6,2E-06	h2= Diff. head (Surface to GWL or to center of test section)
AVERAGE						0,43		h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Q (l/min)	Q (l/min/m)
	250,00	0,60	270,00	1,80	295,00	4,30	340,00	3,56	380,00	1,60		
1	250,60	0,60	271,80	1,80	299,30	4,30	343,56	3,56	381,60	1,60	278,78	0,68
2	251,30	0,70	273,60	1,80	303,10	3,80	347,30	3,74	383,40	1,80	306,59	1,74
3	252,20	0,90	275,30	1,70	306,30	3,20	350,80	3,50	384,90	1,50	4,00	3,93,65
4	252,70	0,50	276,90	1,60	311,50	5,20	354,30	3,50	386,90	2,00	3,56	3,427,08
5	253,50	0,80	278,50	1,60	315,30	3,80	357,80	3,50	388,20	1,30	1,64	
6	254,20	0,70	280,50	2,00	319,60	4,30	361,40	3,60	389,90	1,70		
7	254,80	0,60	282,30	1,80	323,50	3,90	364,90	3,50	391,50	1,60		
8	255,50	0,70	283,90	1,60	327,50	4,00	368,50	3,60	393,20	1,70		
9	256,20	0,70	285,70	1,80	331,40	3,90	372,30	3,80	394,80	1,60		
10	256,80	0,60	287,40	1,70	335,00	3,80	375,60	3,30	396,40	1,60		
Q (l/min)												
Q (l/min/m)												
Q (cm ³ /sec)												



$$K = \frac{Q}{2 \times (3.14) \times LH} \times Ln \frac{Lr}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

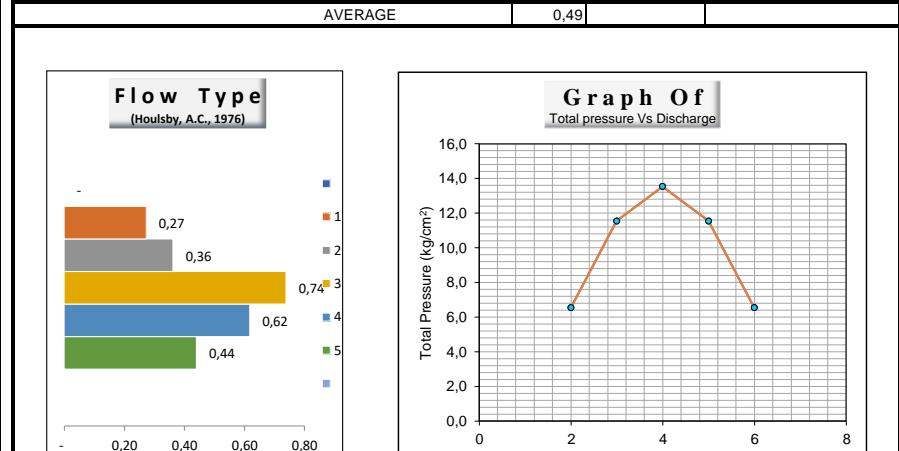
- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 6			SHEET : 6 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 30,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 35,00 meter
DEPTH OF GWL (H2) : 15,10 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:28 to 10:24 WITA			DATE : 05-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	5,00	-	6,54	0,18	14,83	0,27	3,5E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	10,00	-	11,54	0,42	34,83	0,36	4,7E-06	Po= Gauge pressure	
3	12,00	-	13,54	1,00	83,33	0,74	9,6E-06	C= Constant (0.1 kg/cm2)	
4	10,00	-	11,54	0,71	59,33	0,62	8,0E-06		
5	5,00	-	6,54	0,29	24,00	0,44	5,7E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,49		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)			
	350,00		370,00		395,00		440,00		480,00			
1	350,60	0,60	371,80	1,80	399,30	4,30	443,56	3,56	481,60	1,60		
2	351,30	0,70	373,60	1,80	403,10	3,80	447,30	3,74	483,40	1,80		
3	352,20	0,90	375,30	1,70	406,30	3,20	450,80	3,50	484,90	1,50		
4	352,70	0,50	376,90	1,60	411,50	5,20	454,30	3,50	486,90	2,00		
5	353,50	0,80	378,50	1,60	415,30	3,80	457,80	3,50	488,20	1,30		
6	354,20	0,70	380,50	2,00	419,60	4,30	461,40	3,60	489,90	1,70		
7	354,80	0,60	382,30	1,80	423,50	3,90	464,90	3,50	491,50	1,60		
8	355,50	0,70	383,90	1,60	427,50	4,00	468,50	3,60	493,20	1,70		
9	356,20	0,70	385,70	1,80	431,40	3,90	472,30	3,80	494,80	1,60		
10	358,90	2,70	390,90	5,20	445,00	13,60	475,60	3,30	494,40	(0,40)		
Q (l/min)	388,99	0,89	416,94	2,09	457,75	5,00	503,65	3,56	536,88	1,44		
Q (l/min/m)		0,18		0,42		1,00		0,71		0,29		
Q (cm ³ /sec)		14,83		34,83		83,33		59,33		24,00		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

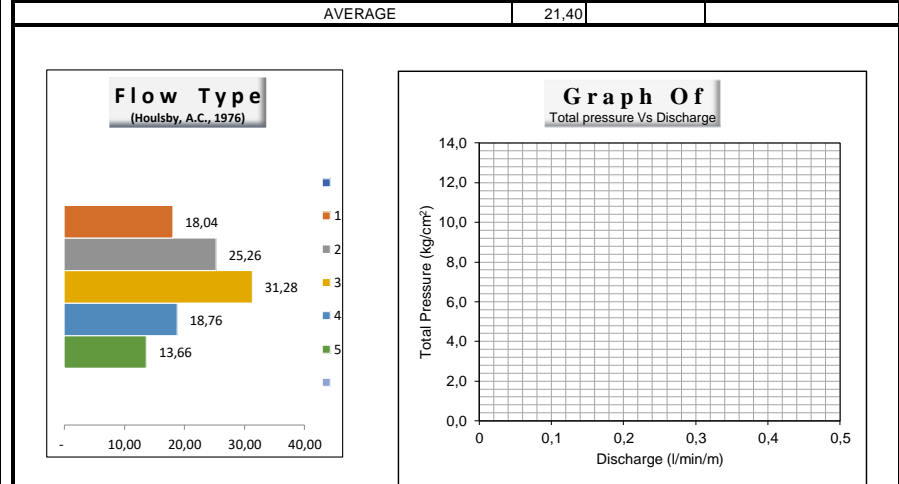
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 7			SHEET : 7 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-2 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 35,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 40,00 meter
DEPTH OF GWL (H2) : 19,10 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 14:14 to 15:12 WITA			DATE : 05-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,94	12,52	1.043,33	18,04	2,3E-04	P= Po + C (h1 + h2 - h3)kg/cm2
2	10,00	-	11,94	30,16	2.513,33	25,26	3,3E-04	Po= Gauge pressure
3	12,00	-	13,94	43,60	3.633,33	31,28	4,0E-04	C= Constant (0.1 kg/cm2)
4	10,00	-	11,94	22,40	1.866,67	18,76	2,4E-04	
5	5,00	-	6,94	9,48	790,00	13,66	1,8E-04	h1= Diff. head (gauge to surface)
AVERAGE						21,40		h2= Diff. head (Surface to GWL or to center of test section)
								h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)			
	100,00		100,00		100,00		100,00		100,00			
1	167,00	67,00	252,00	152,00	315,00	215,00	212,00	112,00	150,00	50,00		
2	225,00	58,00	406,00	154,00	534,00	219,00	329,00	117,00	194,00	44,00		
3	289,00	64,00	547,00	141,00	744,00	210,00	438,00	109,00	245,00	51,00		
4	340,00	51,00	704,00	157,00	964,00	220,00	539,00	101,00	288,00	43,00		
5	412,00	72,00	859,00	155,00	1189,00	225,00	665,00	126,00	332,00	44,00		
6	472,00	60,00	1002,00	143,00	1412,00	223,00	778,00	113,00	386,00	54,00		
7	537,00	65,00	1154,00	152,00	1621,00	209,00	885,00	107,00	432,00	46,00		
8	596,00	59,00	1303,00	149,00	1844,00	223,00	997,00	112,00	476,00	44,00		
9	657,00	61,00	1453,00	150,00	2065,00	221,00	1108,00	111,00	523,00	47,00		
10	726,00	69,00	1608,00	155,00	2280,00	215,00	1220,00	112,00	574,00	51,00		
Q (l / min)	452,10	62,60	938,80	150,80	1306,80	218,00	727,10	112,00	370,00	47,40		
Q (l/min/m)		12,52		30,16		43,60		22,40		9,48		
Q (cm ³ /sec)		1043,33		2513,33		3633,33		1866,67		790,00		



$K = \frac{Q}{2 \times (3.14) \times LH} \times Ln \ L/r$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

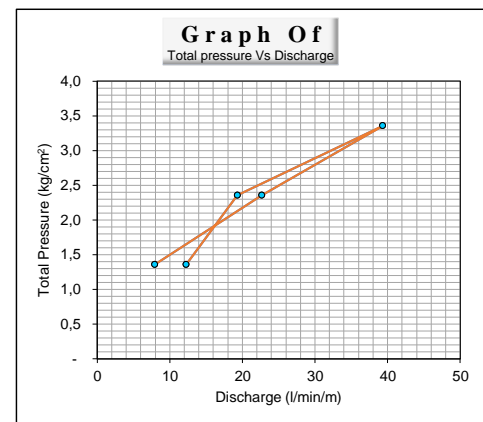
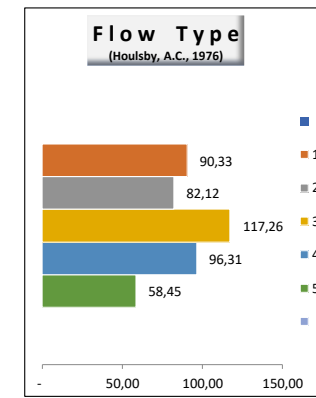
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 5,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 10,00 meter
DEPTH OF GWL (H2) : 3,25 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 3 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 8:31 to 9:29 WITA			DATE : 03-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	1,00	-	1,36	12,24	1.020,00	90,33	1,2E-03	P= Po + C (h1 + h2 - h3)kg/cm2
2	2,00	-	2,36	19,34	1.611,67	82,12	1,1E-03	kgf/cm2
3	3,00	-	3,36	39,34	3.278,33	117,26	1,5E-03	Po= Gauge pressure
4	2,00	-	2,36	22,68	1.890,00	96,31	1,2E-03	C= Constant (0.1 kg/cm2)
5	1,00	-	1,36	7,92	660,00	58,45	7,6E-04	h1= Diff. head (gauge to surface)
AVERAGE						88,89		h2= Diff. head (Surface to GWL or to center of test section)
								h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)		
	100,0	800,00	0,00	100,00	300,00						
1	165,0	65,00	895,00	95,00	196,00	196,00	209,00	109,00	341,00	41,00	
2	229,0	64,00	993,00	98,00	387,00	191,00	326,00	117,00	378,00	37,00	
3	283,0	54,00	1086,00	93,00	588,00	201,00	430,00	104,00	418,00	40,00	
4	344,0	61,00	1180,00	94,00	784,00	196,00	552,00	122,00	454,00	36,00	
5	401,0	57,00	1282,00	102,00	986,00	202,00	665,00	113,00	492,00	38,00	
6	465,0	64,00	1374,00	92,00	1160,00	174,00	778,00	113,00	537,00	45,00	
7	528,0	63,00	1478,00	104,00	1324,00	164,00	893,00	115,00	577,00	40,00	
8	589,0	61,00	1568,00	90,00	1568,00	244,00	1004,00	111,00	616,00	39,00	
9	660,0	71,00	1664,00	96,00	1734,00	166,00	1112,00	108,00	653,00	37,00	
10	712,0	52,00	1767,00	103,00	1967,00	233,00	1234,00	122,00	696,00	43,00	
Q (l / min)	447,60	61,20	1408,70	96,70	1069,40	196,70	730,30	113,40	546,20	39,60	
Q (l/min/m)		12,24		19,34		39,34		22,68		7,92	
Q (cm ³ /sec)		1020,00		1611,67		3278,33		1890,00		660,00	



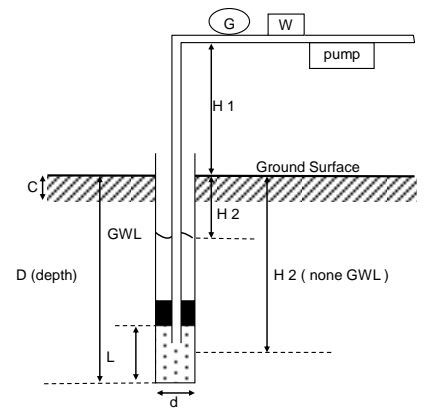
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

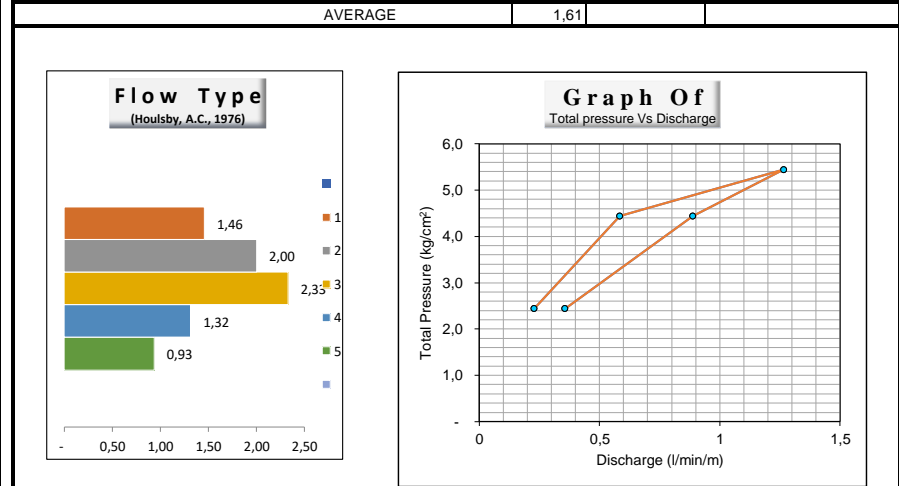


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2		SHEET : 2 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 10,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 15,00 meter
DEPTH OF GWL (H2) : 4,10 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787479,248	MAX OF PRESSURE : 5 kg/cm ²	
Y : 9402747,774	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 98,352 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 98,352 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 11:30 to 12:35 WITA	DATE : 03-Jun-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,44	0,36	29,67	1,46	1,9E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	4,00	-	4,44	0,89	74,00	2,00	2,6E-05	Po= Gauge pressure
3	5,00	-	5,44	1,27	105,50	2,33	3,0E-05	C= Constant (0.1 kg/cm2)
4	4,00	-	4,44	0,58	48,67	1,32	1,7E-05	
5	2,00	-	2,44	0,23	19,00	0,93	1,2E-05	h1= Diff. head (gauge to surface)
AVERAGE						1,61		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)		
	40,00		60,0		110,0		200,0		235,0		
1	41,90	1,90	64,6	4,60	116,7	6,70	203,2	3,20	236,1	1,10	
2	43,70	1,80	68,8	4,20	122,2	5,50	205,8	2,60	237,2	1,10	
3	45,50	1,80	73,4	4,60	128,9	6,70	208,6	2,80	238,6	1,40	
4	47,00	1,50	77,3	3,90	135,1	6,20	211,7	3,10	239,3	0,70	
5	48,90	1,90	82,5	5,20	141,7	6,60	214,6	2,90	240,7	1,40	
6	50,70	1,80	86,6	4,10	147,9	6,20	217,2	2,60	241,6	0,90	
7	52,40	1,70	91,1	4,50	154,3	6,40	220,4	3,20	242,9	1,30	
8	54,20	1,80	95,4	4,30	160,1	5,80	223,1	2,70	244,1	1,20	
9	56,10	1,90	99,8	4,40	166,3	6,20	226,4	3,30	245,3	1,20	
10	57,80	1,70	104,4	4,60	173,3	7,00	229,2	2,80	246,4	1,10	
Q (l/min)	53,82	1,78	90,39	4,44	155,65	6,33	236,02	2,92	264,72	1,14	
Q (l/min/m)		0,36		0,89				0,58		0,23	
Q (cm ³ /sec)		29,67		74,00				48,67		19,00	



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

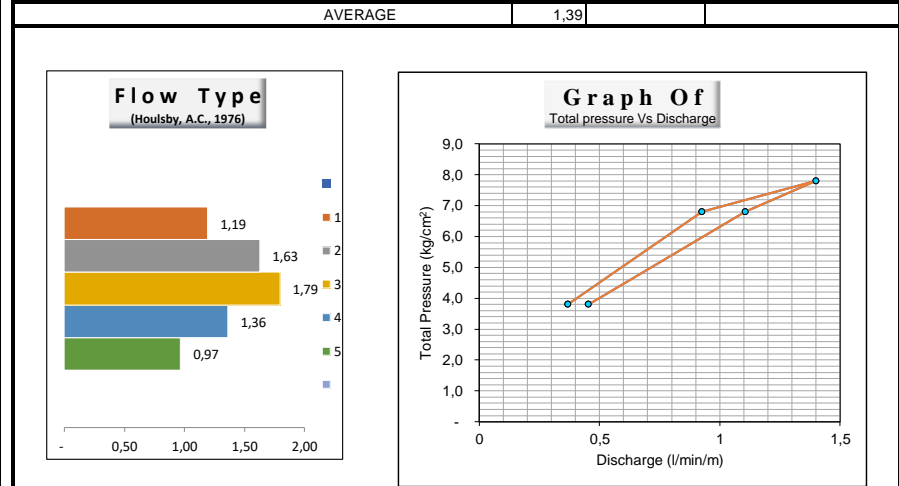
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET : 3 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 15,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 20,00 meter
DEPTH OF GWL (H2) : 7,70 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787479,248		MAX OF PRESSURE : 7 kg/cm ²
Y : 9402747,774		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 16:03 to 17:09 WITA		DATE : 03-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	3,00	-	3,80	0,45	37,83	1,19	1,5E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	6,00	-	6,80	1,11	92,17	1,63	2,1E-05	Po= Gauge pressure
3	7,00	-	7,80	1,40	116,67	1,79	2,3E-05	C= Constant (0.1 kg/cm2)
4	6,00	-	6,80	0,93	77,17	1,36	1,8E-05	
5	3,00	-	3,80	0,37	30,67	0,97	1,3E-05	h1= Diff. head (gauge to surface)
AVERAGE						1,39		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₇ (kg/cm ²)	Pembaca-an Flow Meter	P ₆ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)		
	150,00		180,00		250,00		375,00		430,00		
1	152,40	2,40	184,20	4,20	257,80	7,80	379,90	4,90	431,40	1,40	
2	154,40	2,00	191,10	6,90	264,10	6,30	384,50	4,60	433,90	2,50	
3	156,80	2,40	196,40	5,30	272,00	7,90	388,10	3,60	435,50	1,60	
4	159,10	2,30	202,60	6,20	278,20	6,20	393,20	5,10	437,30	1,80	
5	161,10	2,00	207,90	5,30	285,10	6,90	398,10	4,90	439,20	1,90	
6	163,60	2,50	213,20	5,30	292,50	7,40	402,60	4,50	441,20	2,00	
7	165,80	2,20	218,90	5,70	299,30	6,80	407,90	5,30	442,30	1,10	
8	168,20	2,40	224,80	5,90	306,30	7,00	412,10	4,20	444,70	2,40	
9	170,70	2,50	229,70	4,90	313,70	7,40	416,90	4,80	446,70	2,00	
10	172,70	2,00	235,30	5,60	320,00	6,30	421,30	4,40	448,40	1,70	
Q (l/min)	177,48	2,27	228,41	5,53	313,90	7,00	437,96	4,63	483,06	1,84	
Q (l/min/m)		0,45		1,11		1,40		0,93		0,37	
Q (cm ³ /sec)		37,83		92,17		116,67		77,17		30,67	



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

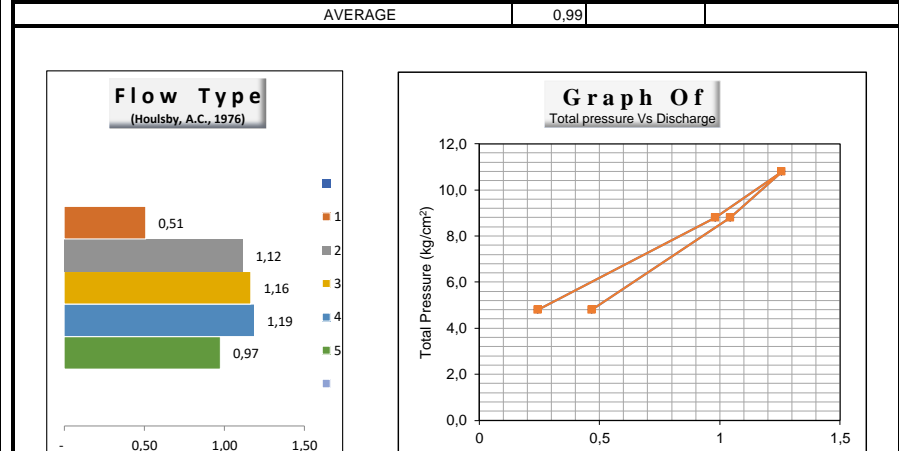
- Q : Debit air yang masuk (cm³/detik)
- P : P₃ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4			SHEET : 4 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 20,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 25,00 meter
DEPTH OF GWL (H2) : 7,70 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 10 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:40 to 10:46 WITA			DATE : 04-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	4,00	-	4,80	0,24	20,33	0,51	6,6E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	8,00	-	8,80	0,98	81,83	1,12	1,4E-05	Po= Gauge pressure	
3	10,00	-	10,80	1,26	104,83	1,16	1,5E-05	C= Constant (0.1 kg/cm2)	
4	8,00	-	8,80	1,04	87,00	1,19	1,5E-05		
5	4,00	-	4,80	0,47	39,00	0,97	1,3E-05	h1= Diff. head (gauge to surface)	
AVERAGE							0,99		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₈ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)		
	520,00	1,40	540,00	4,90	600,00	6,80	675,00	5,50	740,00	2,40		
1	521,40	1,40	544,90	4,90	606,80	6,80	680,50	5,50	742,4	2,40		
2	522,40	1,00	548,80	3,90	612,60	5,80	685,10	4,60	744,9	2,50		
3	523,60	1,20	554,70	5,90	618,50	5,90	690,30	5,20	747,1	2,20		
4	524,70	1,10	559,30	4,60	625,10	6,60	695,90	5,60	749,7	2,60		
5	526,50	1,80	564,50	5,20	631,50	6,40	701,30	5,40	751,2	1,50		
6	527,30	0,80	569,50	5,00	637,40	5,90	706,70	5,40	754,1	2,90		
7	528,50	1,20	573,40	3,90	644,10	6,70	711,10	4,40	756,4	2,30		
8	529,70	1,20	579,20	5,80	650,30	6,20	716,70	5,60	758,8	2,40		
9	531,20	1,50	584,20	5,00	656,90	6,60	721,90	5,20	761,1	2,30		
10	532,20	1,00	589,10	4,90	662,90	6,00	727,20	5,30	763,4	2,30		
Q (l/min)	578,75	1,22	620,76	4,91	694,61	6,29	771,17	5,22	826,91	2,34		
Q (l/min/m)		0,24		0,98		1,26		1,04		0,47		
Q (cm ³ /sec)		20,33		81,83		104,83		87,00		39,00		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 5**

SHEET : 5 OF 7
HOLE NO : P2-3 (Open Hole)
STAGE FROM : 25,00 meter
TO : 30,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN
DEPTH OF GWL (H2) : 7,70 meter
C (THICK CONCRETE) : 0,00 meter
X : 787479,248
Y : 9402747,774
Z : 98,352 m.s.l
Z + C (T. CONCRETE) : 98,352 m.s.l
WAKTU : 14:23 to 15:18 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 04-Jun-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
1	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
2	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
3	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
4	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
5	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
6	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
7	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
8	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
9	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
10	820,00	-	821,00	-	822,00	-	823,00	-	824,00	-
Q (l/min)	902,00	0,00	903,10	0,00	904,20	0,00	905,30	0,00	906,40	0,00
Q (l/min/m)		0,00		0,00		0,00		0,00		0,00
Q (cm ³ /sec)		0,00		0,00		0,00		0,00		0,00

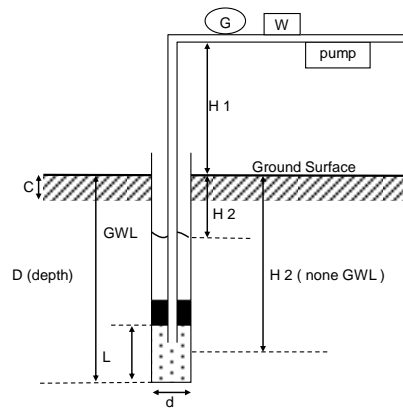
$$K = \frac{Q}{2 \times (3.14) \times LH} \times Ln \frac{Lr}{L} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

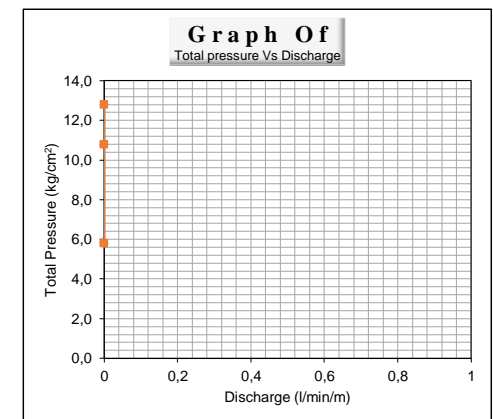
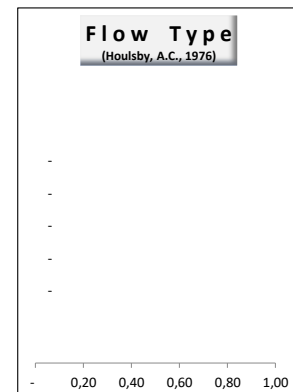
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,80	-	-	-	0,0E+00	P= Po + C (h1 + h2 - h3)kg/cm2 (kg/cm2)
2	10,00	-	10,80	-	-	-	0,0E+00	Po= Gauge pressure
3	12,00	-	12,80	-	-	-	0,0E+00	C= Constant (0.1 kg/cm2)
4	10,00	-	10,80	-	-	-	0,0E+00	
5	5,00	-	5,80	-	-	-	0,0E+00	h1= Diff. head (gauge to surface)

AVERAGE : 0,00

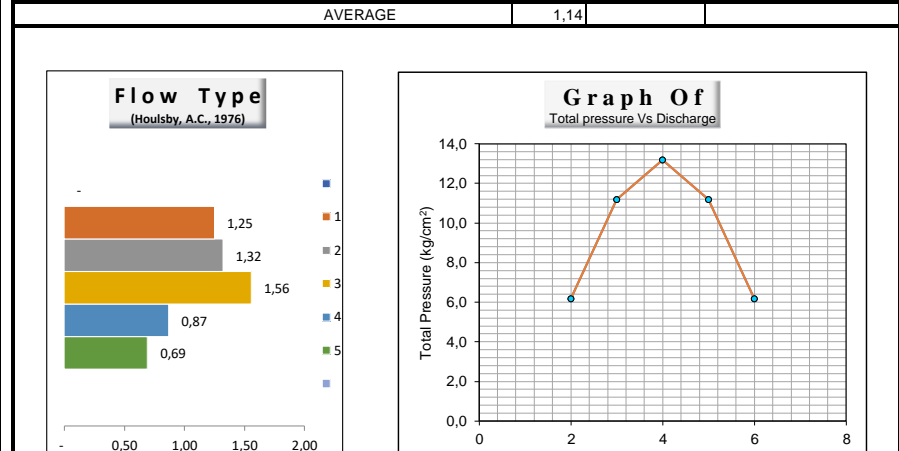


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 6		SHEET : 6 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 30,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 35,00 meter
DEPTH OF GWL (H2) : 11,45 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787479,248		MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:28 to 10:24 WITA		DATE : 05-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,18	0,77	64,33	1,25	1,6E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	11,18	1,48	123,17	1,32	1,7E-05	Po= Gauge pressure
3	12,00	-	13,18	2,05	170,83	1,56	2,0E-05	C= Constant (0.1 kg/cm2)
4	10,00	-	11,18	0,97	81,00	0,87	1,1E-05	
5	5,00	-	6,18	0,43	35,67	0,69	9,0E-06	h1= Diff. head (gauge to surface)
AVERAGE						1,14		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	350,00		395,00		480,00		600,00		650,00			
1	353,90	3,90	402,70	7,70	492,20	12,20	604,80	4,80	653,10	3,10		
2	357,50	3,60	409,00	6,30	500,50	8,30	609,10	4,30	654,60	1,50		
3	361,60	4,10	417,20	8,20	510,20	9,70	614,50	5,40	656,40	1,80		
4	365,40	3,80	424,50	7,30	521,10	10,90	619,90	5,40	658,90	2,50		
5	369,00	3,60	431,90	7,40	531,20	10,10	624,00	4,10	660,50	1,60		
6	373,10	4,10	439,30	7,40	541,20	10,00	629,20	5,20	662,80	2,30		
7	377,10	4,00	446,10	6,80	551,70	10,50	634,10	4,90	665,80	3,00		
8	380,80	3,70	454,40	8,30	562,00	10,30	638,20	4,10	667,20	1,40		
9	384,80	4,00	461,50	7,10	573,10	11,10	643,70	5,50	669,20	2,00		
10	388,60	3,80	468,90	7,40	582,50	9,40	648,60	4,90	671,40	2,20		
Q (l/min)	406,18	3,86	475,05	7,39	584,57	10,25	686,61	4,86	726,99	2,14		
Q (l/min/m)		0,77		1,48		2,05		0,97		0,43		
Q (cm ³ /sec)		64,33		123,17		170,83		81,00		35,67		



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

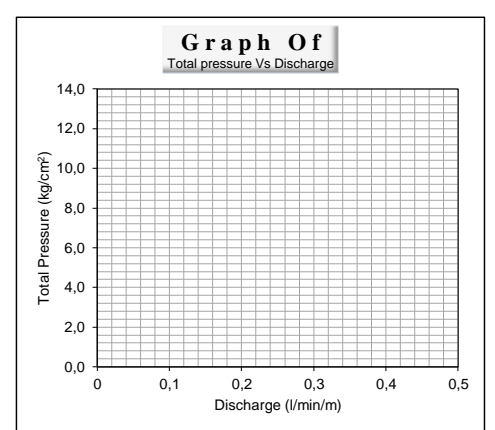
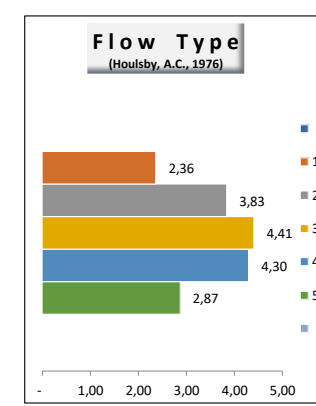
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 7			SHEET : 7 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : P2-3 (Open Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 35,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 40,00 meter
DEPTH OF GWL (H2) : 11,45 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787479,248			MAX OF PRESSURE : 12 kg/cm ²
Y : 9402747,774			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,352 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,352 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 14:14 to 15:12 WITA			DATE : 05-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,18	1,46	121,67	2,36	3,1E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	11,18	4,28	357,00	3,83	5,0E-05	Po= Gauge pressure
3	12,00	-	13,18	5,80	483,67	4,41	5,7E-05	C= Constant (0.1 kg/cm2)
4	10,00	-	11,18	4,80	400,00	4,30	5,6E-05	
5	5,00	-	6,18	1,77	147,50	2,87	3,7E-05	h1= Diff. head (gauge to surface)
AVERAGE						3,55		h2= Diff. head (Surface to GWL or to center of test section)
								h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	(liter)		(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)			
	100,00		190,00		440,00		850,00		150,00			
1	109,20	9,20	212,30	22,30	469,00	29,00	872,10	22,10	159,10	9,10		
2	115,30	6,10	235,60	23,30	498,30	29,30	898,40	26,30	167,20	8,10		
3	121,90	6,60	254,20	18,60	525,10	26,80	923,10	24,70	175,40	8,20		
4	129,70	7,80	272,60	18,40	556,20	31,10	946,90	23,80	183,20	7,80		
5	136,70	7,00	297,10	24,50	589,30	33,10	971,20	24,30	193,10	9,90		
6	143,90	7,20	319,40	22,30	618,10	28,80	996,30	25,10	201,60	8,50		
7	151,20	7,30	339,80	20,40	643,20	25,10	1016,20	19,90	210,50	8,90		
8	158,00	6,80	362,90	23,10	674,10	30,90	1043,20	27,00	218,80	8,30		
9	165,70	7,70	382,60	19,70	701,20	27,10	1066,60	23,40	227,40	8,60		
10	173,00	7,30	404,20	21,60	730,20	29,00	1090,00	23,40	238,50	11,10		
Q (l / min)	150,46	7,30	327,07	21,42	644,47	29,02	1067,40	24,00	212,48	8,85		
Q (l/min/m)		1,46		4,28		5,80		4,80		1,77		
Q (cm ³ /sec)		121,67		357,00		483,67		400,00		147,50		



Catatan di Lapangan:

$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{L}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

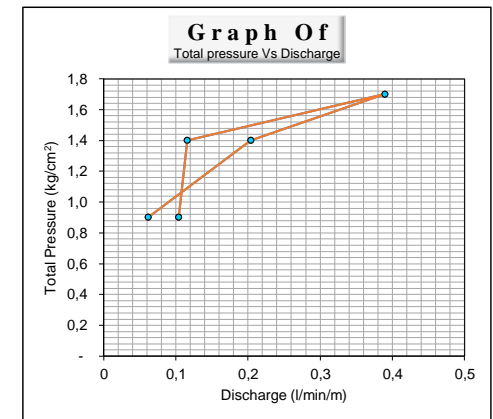
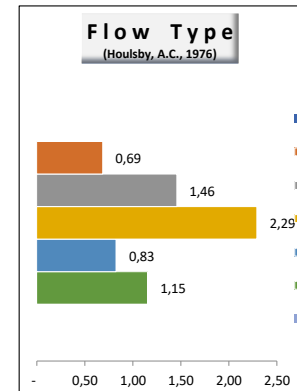
FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 1			SHEET : 1 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : CH-2 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 5,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 10,00 meter
DEPTH OF GWL (H2) : 3,71 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787478,120			MAX OF PRESSURE : 1,3 kg/cm ²
Y : 9402748,174			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,356 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,356 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 15:48 to 16:48 WITA			DATE : 11-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	0,50	-	0,90	0,06	5,17	0,69	8,9E-06	P= Po + C (h1 + h2 - h3)kg/cm2
2	1,00	-	1,40	0,20	17,00	1,46	1,9E-05	Po= Gauge pressure
3	1,30	-	1,70	0,39	32,50	2,29	3,0E-05	C= Constant (0.1 kg/cm2)
4	1,00	-	1,40	0,12	9,67	0,83	1,1E-05	
5	0,50	-	0,90	0,10	8,67	1,15	1,5E-05	

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter (liter)	P _{0,5} (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₁ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P _{1,3} (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₁ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P _{0,5} (kg/cm ²)
	490,00	0,40	495,00	1,00	510,00	1,90	535,00	0,60	545,00	0,60
1	490,40	0,40	496,00	1,20	511,90	1,80	536,40	0,80	546,30	0,70
2	490,60	0,20	497,20	0,90	513,70	1,90	537,30	0,90	546,90	0,60
3	491,30	0,30	499,10	1,00	517,60	2,00	538,00	0,70	547,30	0,40
4	491,50	0,20	500,20	1,10	519,40	1,80	538,80	0,60	547,40	0,10
5	491,90	0,40	501,30	1,10	521,70	2,30	539,10	0,50	548,00	0,60
6	492,10	0,20	502,20	0,90	523,50	1,80	539,70	0,60	548,70	0,70
7	492,50	0,40	503,10	0,90	525,60	2,10	540,20	0,50	549,20	0,50
8	492,80	0,30	504,20	1,10	527,50	1,90	540,70	0,50	549,60	0,40
9	493,10	0,30	505,20	1,00	529,50	2,00	540,80	0,10	550,20	0,60
10	540,72	0,31	550,16	1,02	571,60	1,95	592,14	0,58	602,42	0,52
Q (l/min)										
Q (l/min/m)		0,06		0,20		0,39		0,12		0,10
Q (cm ³ /sec)		5,17		17,00		32,50		9,67		8,67

AVERAGE : 1,28



Catatan di Lapangan:

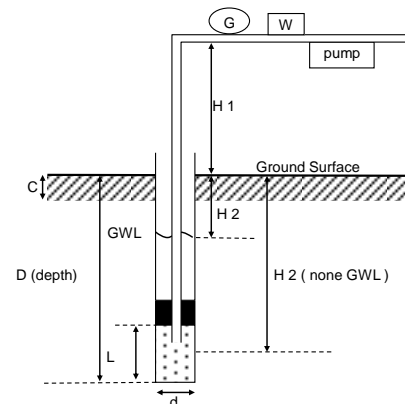
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

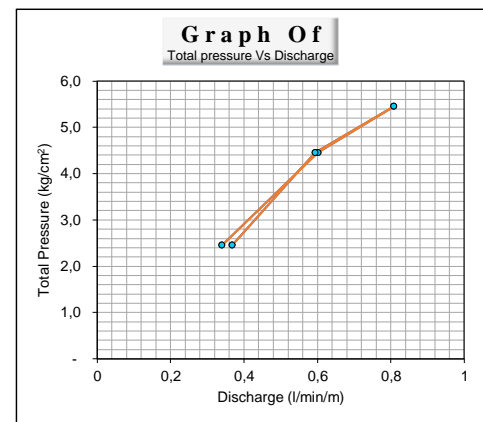
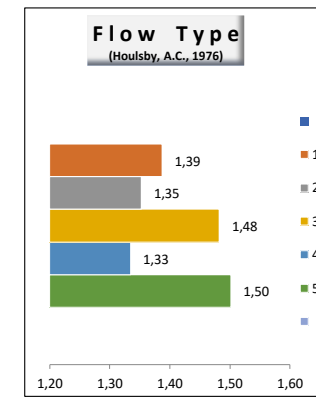


FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 2			SHEET : 2 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1			HOLE NO : CH-2 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI			STAGE FROM : 10,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN			TO : 15,00 meter
DEPTH OF GWL (H2) : 4,21 meter			ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter			DIAMETER OF HOLE (d) : 76 mm
X : 787478,120			MAX OF PRESSURE : 5 kg/cm ²
Y : 9402748,174			GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,356 m.s.l			TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,356 m.s.l			SUPERVISED BY : Muhamad Ichwanto
WAKTU : 13:16 to 14:08 WITA			DATE : 13-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	2,00	-	2,45	0,34	28,33	1,39	1,8E-05	P= Po + C (h1 + h2 - h3)kg/cm2
2	4,00	-	4,45	0,60	50,17	1,35	1,8E-05	(kgf/cm2)
3	5,00	-	5,45	0,81	67,33	1,48	1,9E-05	Po= Gauge pressure
4	4,00	-	4,45	0,59	49,50	1,33	1,7E-05	C= Constant (0.1 kg/cm2)
5	2,00	-	2,45	0,37	30,67	1,50	1,9E-05	h1= Diff. head (gauge to surface)

AVERAGE						1,41		
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WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₁ (kg/cm ²)	Pembaca-an Flow Meter	P ₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₃ (kg/cm ²)	Pembaca-an Flow Meter	P ₄ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	P ₂ (kg/cm ²)	
	(liter)		(liter)		(liter)		(liter)		(liter)			
	128,20	1,90	147,00	3,20	178,00	3,90	219,20	3,00	249,50	1,80		
1	130,10	1,90	150,20	3,20	181,90	3,90	222,20	3,00	251,30	1,80		
2	132,10	2,00	153,10	2,90	186,10	4,20	225,10	2,90	253,10	1,80		
3	133,80	1,70	156,00	2,90	190,30	4,20	228,00	2,90	255,00	1,90		
4	135,50	1,70	159,00	3,00	194,40	4,10	230,90	2,90	256,90	1,90		
5	137,20	1,70	161,90	2,90	198,40	4,00	233,70	2,80	258,80	1,90		
6	138,70	1,50	164,90	3,00	202,40	4,00	236,60	2,90	250,60	(8,20)		
7	140,20	1,50	168,00	3,10	206,40	4,00	233,60	(3,00)	262,40	11,80		
8	142,00	1,80	171,00	3,00	210,30	3,90	242,60	9,00	264,20	1,80		
9	143,70	1,70	174,10	3,10	214,40	4,10	245,80	3,20	266,10	1,90		
10	145,20	1,50	177,10	3,00	218,40	4,00	248,90	3,10	267,90	1,80		
Q (l / min)	150,67	1,70	178,23	3,01	218,10	4,04	256,66	2,97	283,58	1,84		
Q (l/min/m)		0,34		0,60		0,81		0,59		0,37		
Q (cm ³ /sec)		28,33		50,17		67,33		49,50		30,67		



Catatan di Lapangan:

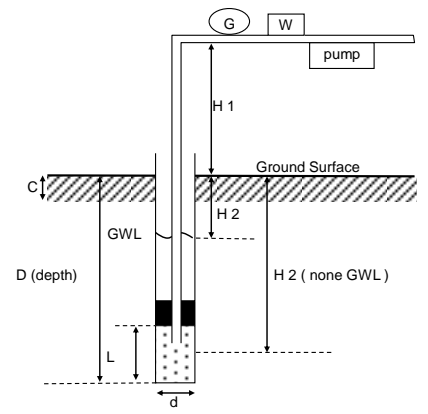
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{P} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

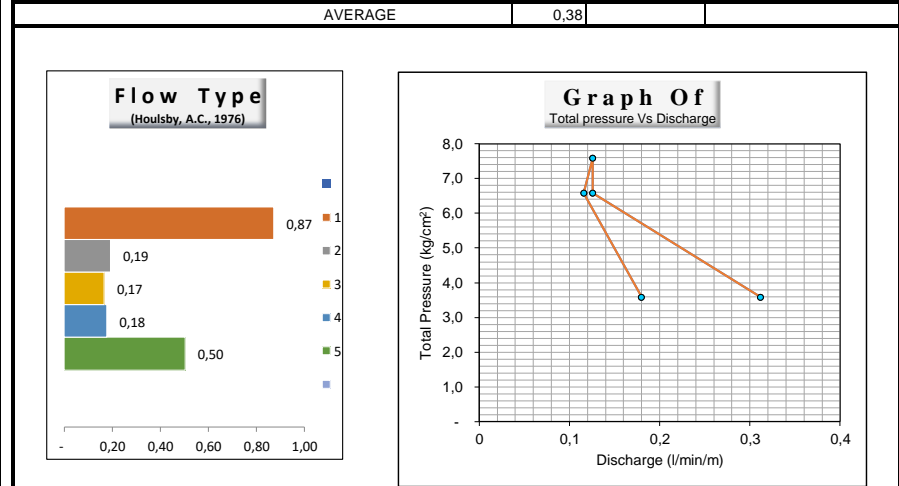
- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 3		SHEET : 3 OF 7		
		HOLE NO : CH-2 (Check Hole)		
		STAGE FROM : 15,00 meter		
		TO : 20,00 meter		
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		ANGLE FROM VERTICAL : 0 deg.		
LOCATION : TAKALAR - SOUTH OF SULAWESI		DIAMETER OF HOLE (d) : 76 mm		
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		MAX OF PRESSURE : 7 kg/cm ²		
DEPTH OF GWL (H2) : 5,50 meter		GAUGE from SURFACE (H1) : 0,30 meter		
C (THICK CONCRETE) : 0,00 meter		TESTED BY : Ahmad Syahputra		
X : 787478,120		SUPERVISED BY : Muhamad Ichwanto		
Y : 9402748,174				
Z : 98,356 m.s.l				
Z + C (T. CONCRETE) : 98,356 m.s.l		DATE : 14-Jun-21		
WAKTU : 8:00 to 8:56 WITA				

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	3,00	-	3,58	0,31	26,00	0,87	1,1E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	6,00	-	6,58	0,13	10,50	0,19	2,5E-06	Po= Gauge pressure	
3	7,00	-	7,58	0,13	10,50	0,17	2,2E-06	C= Constant (0.1 kg/cm2)	
4	6,00	-	6,58	0,12	9,67	0,18	2,3E-06		
5	3,00	-	3,58	0,18	15,00	0,50	6,5E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,38		h2= Diff. head (Surface to GWL or to center of test section)
									h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)											
ELAPSED TIME min	PRESSURE										
	Pembaca-an Flow Meter (liter)	P ₃ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₆ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₇ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₆ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₃ (kg/cm ²)	
	331,20		347,60		354,70		362,30		368,20		
1	332,70	1,50	348,30	0,70	355,50	0,80	362,90	0,60	368,90	0,70	
2	334,30	1,60	348,90	0,60	356,10	0,60	363,50	0,60	369,80	0,90	
3	336,10	1,80	349,60	0,70	356,80	0,70	364,00	0,50	370,70	0,90	
4	337,60	1,50	350,20	0,60	357,50	0,70	364,60	0,60	371,60	0,90	
5	339,30	1,70	350,90	0,70	358,10	0,60	365,20	0,60	372,60	1,00	
6	340,90	1,60	351,50	0,60	358,60	0,50	365,80	0,60	373,50	0,90	
7	342,50	1,60	352,10	0,60	359,20	0,60	366,40	0,60	374,40	0,90	
8	344,00	1,50	352,70	0,60	359,80	0,60	367,00	0,60	375,30	0,90	
9	345,40	1,40	353,30	0,60	360,40	0,60	367,60	0,60	376,20	0,90	
10	346,80	1,40	353,90	0,60	361,00	0,60	368,10	0,50	377,20	1,00	
Q (l/min)	373,08	1,56	385,90	0,63	393,77	0,63	401,74	0,58	409,84	0,90	
Q (l/min/m)		0,31		0,13		0,13		0,12		0,18	
Q (cm ³ /sec)		26,00		10,50		10,50		9,67		15,00	



Catatan di Lapangan:

$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L/r}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

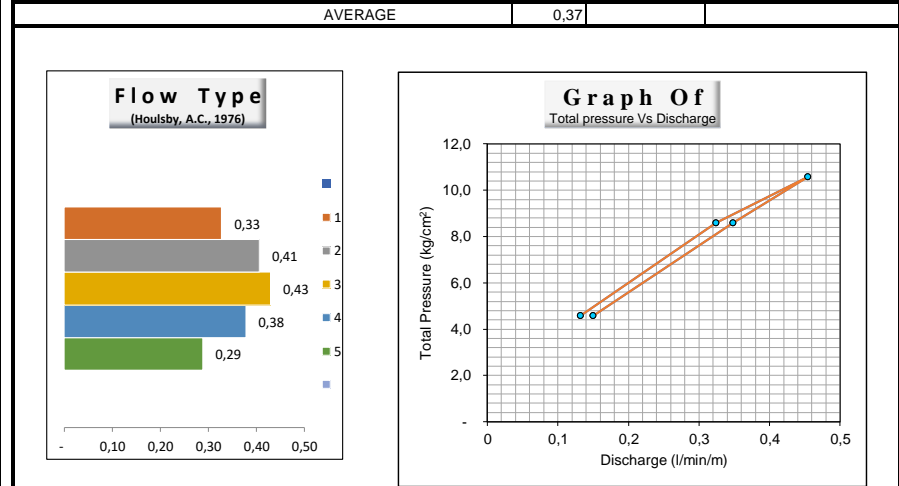
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H1 + H2 + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 4		SHEET : 4 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : CH-2 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 20,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 25,00 meter
DEPTH OF GWL (H2) : 5,50 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787478,120	MAX OF PRESSURE : 10 kg/cm ²	
Y : 9402748,174	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 98,356 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 98,356 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 13:50 to 14:42 WITA	DATE : 14-Jun-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS	
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)				
1	4,00	-	4,58	0,15	12,50	0,33	4,2E-06	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)	
2	8,00	-	8,58	0,35	29,00	0,41	5,2E-06	Po= Gauge pressure	
3	10,00	-	10,58	0,45	37,83	0,43	5,6E-06	C= Constant (0.1 kg/cm2)	
4	8,00	-	8,58	0,32	27,00	0,38	4,9E-06		
5	4,00	-	4,58	0,13	11,00	0,29	3,7E-06	h1= Diff. head (gauge to surface)	
AVERAGE							0,37		h2= Diff. head (Surface to GWL or to center of test section)
									h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)										
ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter (liter)	P ₄ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₈ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₈ (kg/cm ²)	Pembaca-an Flow Meter (liter)	P ₄ (kg/cm ²)
	286,30	0,80	295,00	1,70	315,00	2,20	339,00	1,80	356,00	0,70
1	287,10	0,80	296,70	1,70	317,20	2,20	340,80	1,80	356,70	0,70
2	287,80	0,70	298,60	1,90	319,40	2,20	342,60	1,80	357,40	0,70
3	288,50	0,70	300,40	1,80	321,50	2,10	344,30	1,70	358,00	0,60
4	289,20	0,70	302,00	1,60	323,70	2,20	345,90	1,60	358,70	0,70
5	289,60	0,40	303,70	1,70	326,00	2,30	347,50	1,60	359,40	0,70
6	290,50	0,90	305,40	1,70	328,30	2,30	349,00	1,50	360,10	0,70
7	291,20	0,70	307,10	1,70	330,60	2,30	350,50	1,50	360,80	0,70
8	292,10	0,90	308,70	1,60	333,20	2,60	352,10	1,60	361,40	0,60
9	292,90	0,80	310,50	1,80	335,50	2,30	353,60	1,50	362,00	0,60
10	293,80	0,90	312,40	1,90	337,70	2,20	355,20	1,60	362,60	0,60
Q (l/min)	318,90	0,75	334,05	1,74	358,81	2,27	382,05	1,62	395,31	0,66
Q (l/min/m)		0,15		0,35		0,45		0,32		0,13
Q (cm ³ /sec)		12,50		29,00		37,83		27,00		11,00



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

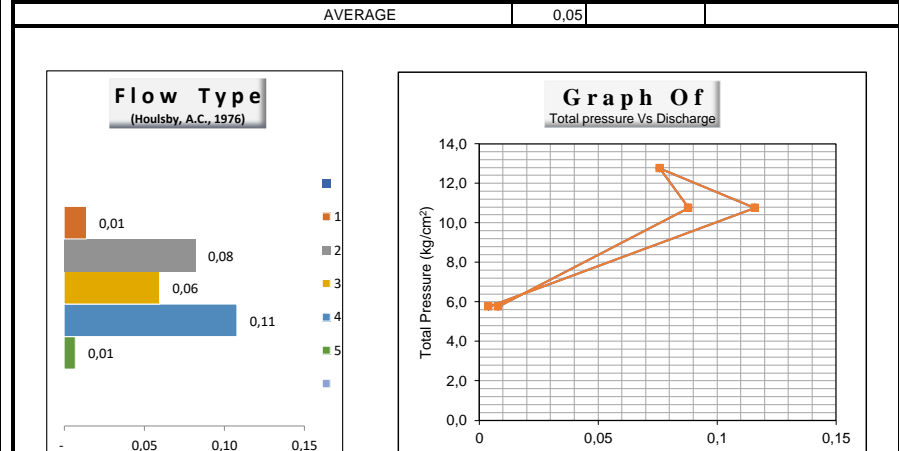
- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 5		SHEET : 5 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : CH-2 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 25,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 30,00 meter
DEPTH OF GWL (H2) : 7,30 meter	ANGLE FROM VERTICAL : 0 deg.	
C (THICK CONCRETE) : 0,00 meter	DIAMETER OF HOLE (d) : 76 mm	
X : 787478,12	MAX OF PRESSURE : 12 kg/cm ²	
Y : 9402748,174	GAUGE from SURFACE (H1) : 0,30 meter	
Z : 98,356 m.s.l	TESTED BY : Ahmad Syahputra	
Z + C (T. CONCRETE) : 98,356 m.s.l	SUPERVISED BY : Muhamad Ichwanto	
WAKTU : 9:38 to 10:33 WITA	DATE : 15-Jun-21	

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,76	0,01	0,67	0,01	1,8E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,76	0,09	7,33	0,08	1,1E-06	Po= Gauge pressure
3	12,00	-	12,76	0,08	6,33	0,06	7,7E-07	C= Constant (0.1 kg/cm2)
4	10,00	-	10,76	0,12	9,67	0,11	1,4E-06	
5	5,00	-	5,76	0,00	0,33	0,01	9,0E-08	h1= Diff. head (gauge to surface)
AVERAGE						0,05		h2= Diff. head (Surface to GWL or to center of test section)
								h3= Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)		
	827,70	-	828,60	-	833,30	-	837,30	-	843,20	-		
1	827,70	-	829,20	0,60	833,90	0,60	837,70	0,40	843,20	-		
2	827,70	-	829,20	-	834,30	0,40	838,00	0,30	843,20	-		
3	827,70	-	830,10	0,90	834,60	0,30	838,50	0,50	843,20	-		
4	827,70	-	830,60	0,50	835,00	0,40	839,00	0,50	843,20	-		
5	827,70	-	830,90	0,30	835,20	0,20	839,60	0,60	843,20	-		
6	827,80	0,10	831,40	0,50	835,40	0,20	840,30	0,70	843,30	0,10		
7	827,90	0,10	831,90	0,50	835,70	0,30	841,00	0,70	843,30	-		
8	827,90	-	832,40	0,50	836,00	0,30	841,70	0,70	843,40	0,10		
9	828,00	0,10	832,80	0,40	836,50	0,50	842,40	0,70	843,40	-		
10	828,10	0,10	833,00	0,20	837,10	0,60	843,10	0,70	843,40	-		
Q (l/min)	910,59	0,04	914,01	0,44	918,70	0,38	923,86	0,58	927,60	0,02		
Q (l/min/m)		0,01		0,09		0,08		0,12		0,00		
Q (cm ³ /sec)		0,67		7,33		6,33		9,67		0,33		



$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{L}{r}$ cm/sec

$LU = \frac{10 \times Q}{P \times L}$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P_o + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P_o : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

Catatan di Lapangan:

**FIELD PERMEABILITY TEST
TRIAL GROUTING
IN BORE HOLE
STAGE - 6**

SHEET : 6 OF 7
HOLE NO : CH-2 (Check Hole)
STAGE FROM : 30,00 meter
TO : 35,00 meter

PROJECT : PAMUKKULU DAM PROJECT - PAKET-1
LOCATION : TAKALAR - SOUTH OF SULAWESI
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN
DEPTH OF GWL (H2) : 7,30 meter
C (THICK CONCRETE) : 0,00 meter
X : 787478,120
Y : 9402748,174
Z : 98,356 m.s.l
Z + C (T. CONCRETE) : 98,356 m.s.l
WAKTU : 14:37 to 15:33 WITA

ANGLE FROM VERTICAL : 0 deg.
DIAMETER OF HOLE (d) : 76 mm
MAX OF PRESSURE : 12 kg/cm²
GAUGE from SURFACE (H1) : 0,30 meter
TESTED BY : Ahmad Syahputra
SUPERVISED BY : Muhamad Ichwanto
DATE : 15-Jun-21

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)

ELAPSED TIME min	PRESSURE									
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)
	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	(liter)	
1	457,40	0,20	459,00	0,50	464,30	-	471,30	0,40	475,80	-
2	457,70	0,10	465,00	5,50	465,40	1,10	472,10	0,40	475,90	0,10
3	457,80	0,10	469,60	4,60	466,00	0,60	471,40	(0,70)	475,90	-
4	458,00	0,20	461,20	(8,40)	466,60	0,60	471,80	0,40	476,00	0,10
5	458,20	0,20	461,70	0,50	467,30	0,70	473,30	1,50	478,10	2,10
6	458,30	0,10	462,20	0,50	468,00	0,70	473,70	0,40	476,10	(2,00)
7	458,40	0,10	462,70	0,50	468,70	0,70	474,20	0,50	476,10	-
8	458,50	0,10	463,20	0,50	468,40	(0,30)	474,60	0,40	476,30	0,20
9	458,60	0,10	463,60	0,40	470,20	1,80	475,10	0,50	476,50	0,20
10	458,60	-	464,00	0,40	470,90	0,70	475,50	0,40	476,60	0,10
Q (l/min)	503,91	0,12	509,17	0,50	514,01	0,66	520,47	0,42	523,91	0,08
Q (l/min/m)		0,02		0,10		0,13		0,08		0,02
Q (cm ³ /sec)		2,00		8,33		11,00		7,00		1,33

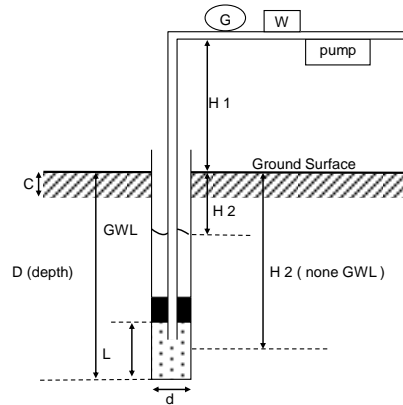
$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{L} \text{ cm/sec}$$

$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

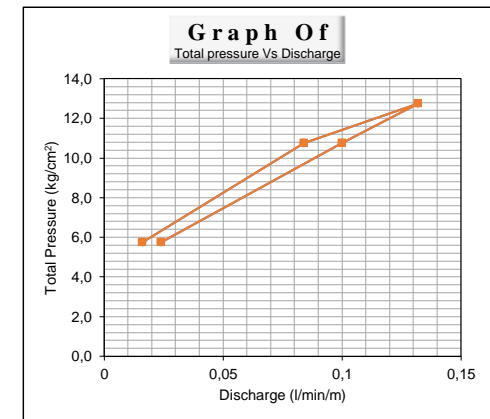
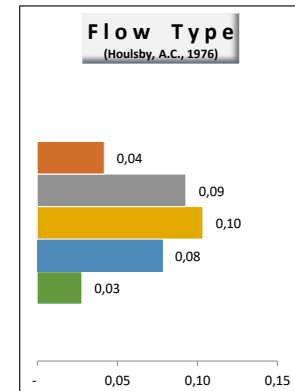
Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₅ + (0.1(H1 + H2 + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H1 : Tinggi pressure gauge dari permukaan lubang (m)
- H2 : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : D - (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)



NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	5,76	0,02	2,00	0,04	5,4E-07	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	10,76	0,10	8,33	0,09	1,2E-06	Po= Gauge pressure
3	12,00	-	12,76	0,13	11,00	0,10	1,3E-06	C= Constant (0.1 kg/cm2)
4	10,00	-	10,76	0,08	7,00	0,08	1,0E-06	
5	5,00	-	5,76	0,02	1,33	0,03	3,6E-07	h1= Diff. head (gauge to surface)

AVERAGE : 0,07

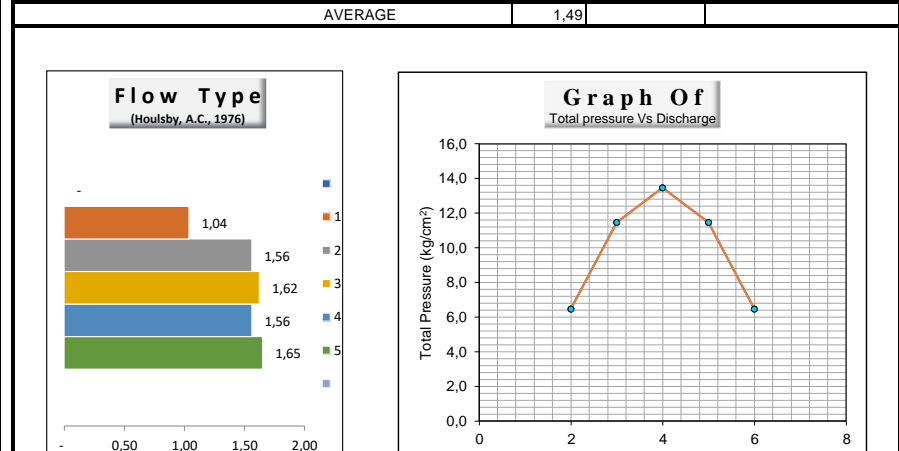


Catatan di Lapangan:

FIELD PERMEABILITY TEST TRIAL GROUTING IN BORE HOLE STAGE - 7		SHEET : 7 OF 7
PROJECT : PAMUKKULU DAM PROJECT - PAKET-1		HOLE NO : CH-2 (Check Hole)
LOCATION : TAKALAR - SOUTH OF SULAWESI		STAGE FROM : 35,00 meter
AREA DESIGNATION : STA 0+220 - SANDARAN KANAN		TO : 40,00 meter
DEPTH OF GWL (H2) : 14,30 meter		ANGLE FROM VERTICAL : 0 deg.
C (THICK CONCRETE) : 0,00 meter		DIAMETER OF HOLE (d) : 76 mm
X : 787478,120		MAX OF PRESSURE : 12 kg/cm ²
Y : 9402748,174		GAUGE from SURFACE (H1) : 0,30 meter
Z : 98,356 m.s.l		TESTED BY : Ahmad Syahputra
Z + C (T. CONCRETE) : 98,356 m.s.l		SUPERVISED BY : Muhamad Ichwanto
WAKTU : 9:42 to 10:46 WITA		DATE : 16-Jun-21

NO	PRESSURE			DISCHARGE (Q)		LUGEON VALUE (L U)	k (cm/sec)	REMARKS
	P gauge (kg/cm ²)	Head Loss (kg/cm ²)	P total (kg/cm ²)	l/min/m	(cm ³ /sec)			
1	5,00	-	6,46	0,67	55,83	1,04	1,3E-05	P= Po + C (h1 + h2 - h3)kg/cm2 (kgf/cm2)
2	10,00	-	11,46	1,79	149,00	1,56	2,0E-05	Po= Gauge pressure
3	12,00	-	13,46	2,19	182,17	1,62	2,1E-05	C= Constant (0.1 kg/cm2)
4	10,00	-	11,46	1,79	149,17	1,56	2,0E-05	
5	5,00	-	6,46	1,07	88,83	1,65	2,1E-05	h1= Diff. head (gauge to surface)
AVERAGE						1,49		h2= Diff. head (Surface to GWL or to center of test section)
								h3 = Head loss

WATER INJECTED INTO HOLE IN TESTING PERIOD (READ FROM WATER METERS IN LITERS)												
ELAPSED TIME min	PRESSURE											
	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₂ (kg/cm ²)	Pembaca-an Flow Meter	P ₁₀ (kg/cm ²)	Pembaca-an Flow Meter	P ₅ (kg/cm ²)	Q (l/min)	Q (l/min/m)
	501,00	3,00	543,50	9,00	647,00	11,50	771,00	9,00	890,00	5,60		
1	504,00	3,00	552,50	9,00	658,50	11,50	780,00	9,00	895,60	5,60		
2	507,10	3,10	560,90	8,40	669,60	11,10	789,00	9,00	901,00	5,40		
3	510,30	3,20	569,10	8,20	680,40	10,80	898,30	109,30	907,00	6,00		
4	513,30	3,00	577,00	7,90	691,30	10,90	807,60	(90,70)	911,60	4,60		
5	516,30	3,00	584,80	7,80	702,10	10,80	816,70	9,10	101,78	(809,82)		
6	519,70	3,40	594,30	9,50	712,90	10,80	825,60	8,90	922,30	820,52		
7	523,50	3,80	603,80	9,50	724,10	11,20	834,30	8,70	927,70	5,40		
8	527,30	3,80	613,50	9,70	734,90	10,80	843,10	8,80	933,00	5,30		
9	530,90	3,60	623,20	9,70	745,70	10,80	851,80	8,70	938,10	5,10		
10	534,50	3,60	632,90	9,70	756,30	10,60	860,50	8,70	943,30	5,20		
Q	568,79	3,35	645,55	8,94	772,28	10,93	907,79	8,95	927,14	5,33		
Q (l/min)												
Q (l/min/m)												
Q (cm ³ /sec)												



$$K = \frac{Q}{2 \times (3.14) \times LH} \times \ln \frac{Lr}{r} \text{ cm/sec}$$

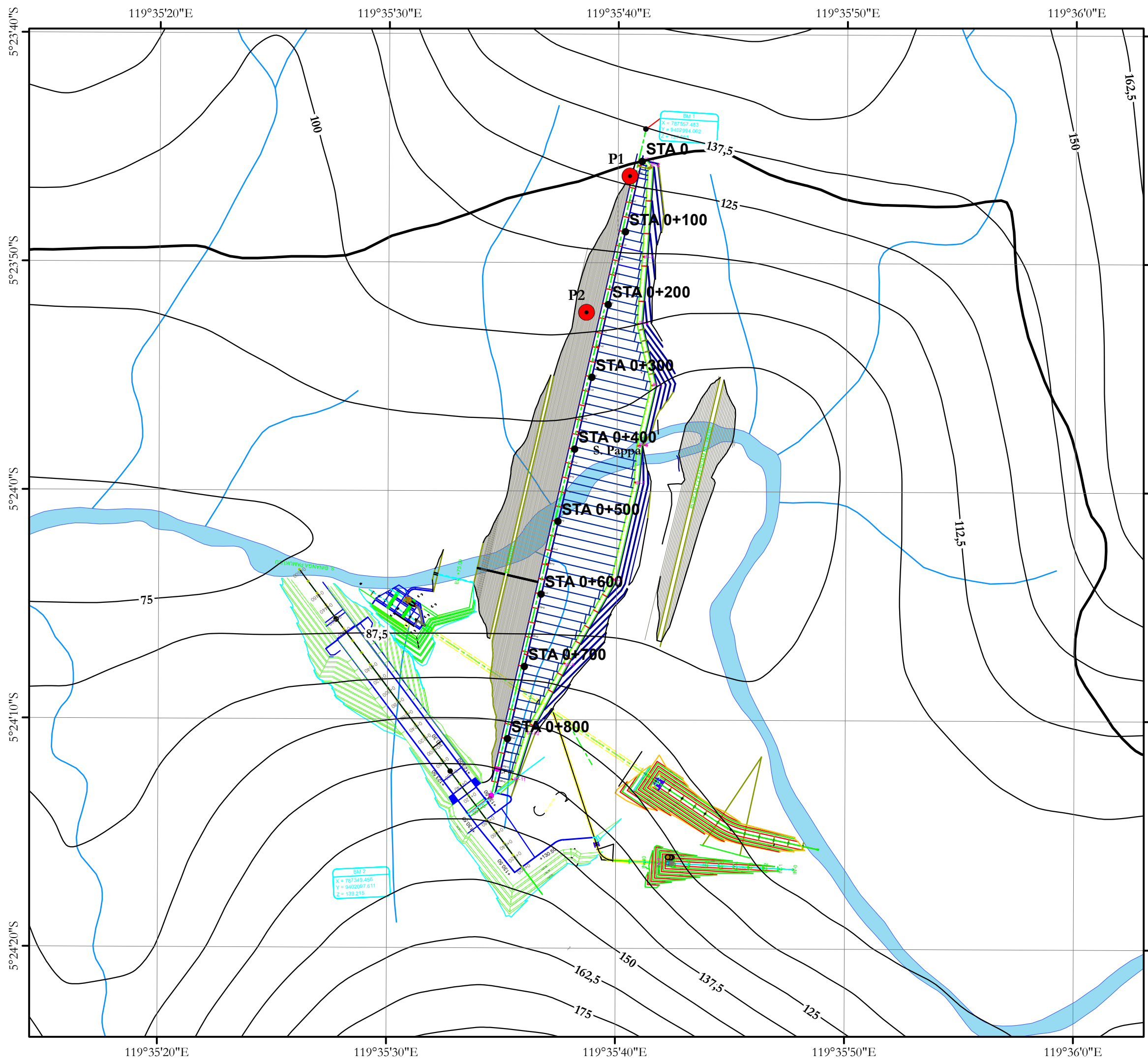
$$LU = \frac{10 \times Q}{P \times L}$$

Sumber : SNI 2411:2008

Keterangan :

- Q : Debit air yang masuk (cm³/detik)
- P : P₀ + (0.1(H₁ + H₂ + C)) (kg/cm²)
- P₀ : Tekanan yang diizinkan (kg/cm²)
- H₁ : Tinggi pressure gauge dari permukaan lubang (m)
- H₂ : Ground water level (tinggi muka air tanah pada lubang) (m)
- D : (1/2L) (Non GWL) (m)
- D : Total kedalaman lubang yang di bor (m)
- L : Kedalaman lubang yang dites (m)
- C : Tebal Concrete (m)
- G : Pressure Gauge (kg/cm²)
- r : Jari-jari lubang bor (mm)

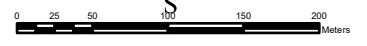
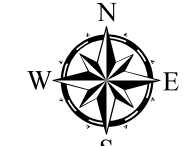
Catatan di Lapangan:



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN
 RISET DAN TEKNOLOGI
 UNIVERSITAS HASANUDDIN
 FAKULTAS TEKNIK
 DEPARTEMEN TEKNIK GEOLOGI
 PROGRAM STUDI TEKNIK GEOLOGI

PETA TITIK BOR

DESA KALE KOMARA
 KECAMATAN POLONGBANGKENG UTARA
 KABUPATEN TAKALAR
 PROVINSI SULAWESI SELATAN



SKALA 1 : 5.000
 IK : 12,5 M

OLEH:
 AHMAD SYAHPUTRA
 D611 16 017

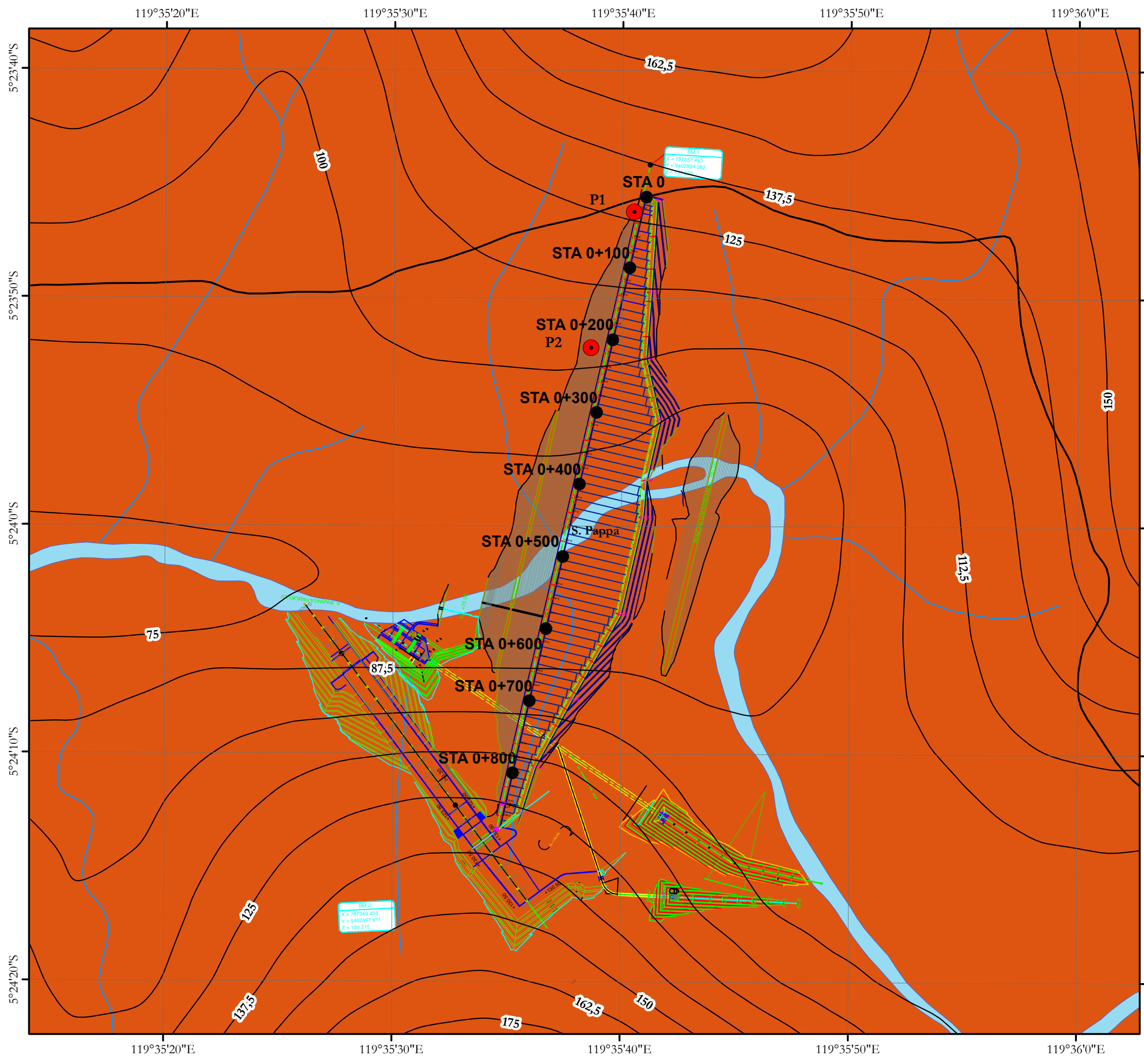
MAKASSAR
 2022

KETERANGAN:

- | | | | |
|--|-------------------|--|----------------|
| | : Kontur | | : Jalan |
| | : Sungai Utama | | : Sungai Kecil |
| | : Titik Bor | | : STA 0+200 |
| | : Denah Bendungan | | |

PETA ADMINISTRASI

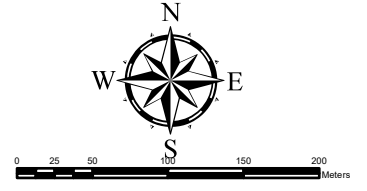




KEMENTERIAN PENDIDIKAN, KEBUDAYAAN
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PETA GEOMORFOLOGI

DESA KALE KOMARA
 KECAMATAN POLONGBANGKENG UTARA
 KABUPATEN TAKALAR
 PROVINSI SULAWESI SELATAN



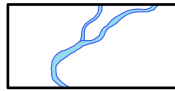


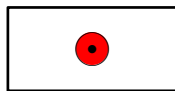

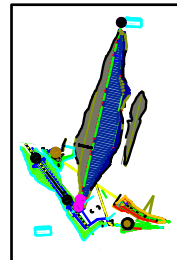


SKALA 1 : 5.000
 IK : 12,5 M

OLEH:
 AHMAD SYAHPUTRA
 D611 16 017

MAKASSAR
 2022

KETERANGAN:

-  : Satuan Geomorfologi Perbukitan Denudasional
-  : Kontur
-  : Sungai Utama
-  : Sungai Kecil
-  : Jalan
-  : Titik Bor
-  : Stasiun As Bendungan
-  : Denah Bendungan

PETA ADMINISTRASI



119°35'30"E

119°35'40"E

119°35'50"E

5°23'50"S

5°23'50"S

5°24'0"S

5°24'0"S

5°24'10"S

5°24'10"S

119°35'30"E

119°35'40"E

119°35'50"E

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN
RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
FAKULTAS TEKNIK
DEPARTEMEN TEKNIK GEOLOGI
PROGRAM STUDI TEKNIK GEOLOGI

PETA GEOLOGI

DESA KALE KOMARA
KECAMATAN POLONGBANGKENG UTARA
KABUPATEN TAKALAR
PROVINSI SULAWESI SELATAN




SKALA 1 : 3000
IK : 12,5 M

OLEH:
AHMAD SYAHPUTRA
D611 16 017

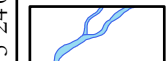
MAKASSAR
2022

KETERANGAN:

 : Breksi Vulkanik

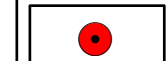
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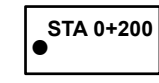
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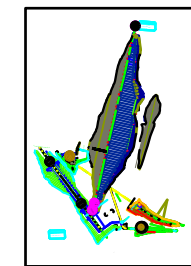
 : Sungai Utama

 : Sungai Kecil

 : Jalan

 : Titik Bor

 : Stasiun As Bendungan

 : Denah Bendungan

PETA ADMINISTRASI

