Field Permeability Test
Falling Head Test

Project	Railway Double Track, Notog Tunnel, Banyumas	Date	31-Dec-16
Hole No.	**B-3**	Soil Type	
Depth (m)	0.00 - 5.00 M	Tested By	Jumadi

Depth of Test	(cm)	500	Depth of Casing	(cm)	130
Length of Test Section (L)	(cm)	370	Length of Casing	(cm)	150
Stage No		1	High of Casing from Top to Ground Surface	(cm)	20
Ground Water Level	(m)	2.0	Radius of Casing (R)	(cm)	3.70
Cross Section Area of Casing	(cm2)	43.01	Radius of Hole (r)	(cm)	2.80

TEST RECORD

No.	Time	Reading		Head of Water		Elapsed Time	Coef. of Permeability	Remarks
		H_1	H_2	H_1	H_2	(t_2 - t_1)	(k)	
	(Minutes)	(cm)		(cm)		(Second)	(cm/sec)	
1	1' 8"	0.0	15.0	200	185.0	68	1.03E-04	
2	1' 50"	0.0	15.0	200	185.0	110	6.39E-05	
3	2' 40"	0.0	15.0	200	185.0	160	4.39E-05	
4	3' 45"	0.0	15.0	200	185.0	225	3.12E-05	
5	4' 40"	0.0	15.0	200	185.0	280	2.51E-05	
6								
7								
8								
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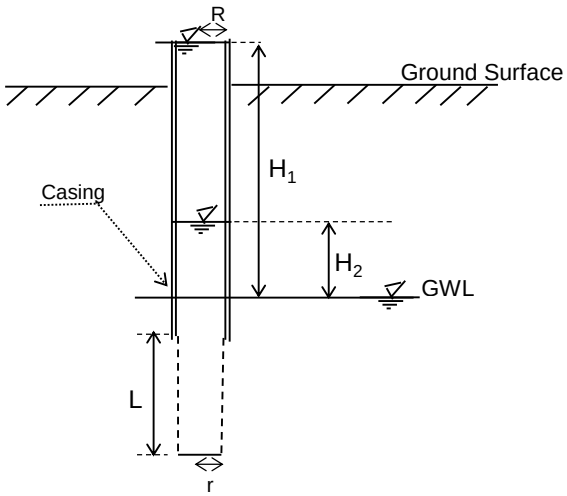
19								
20								
							5.35E-05	



$$k = \frac{(2.3)^2 R^2}{2L(t_2 - t_1)} \log\left(\frac{L}{r}\right) \log\left(\frac{H_1}{H_2}\right)$$

if L > 8r

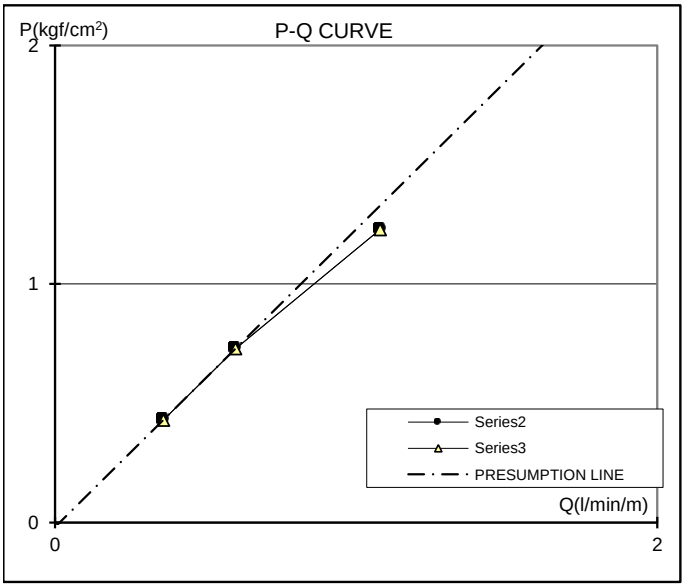
Where :

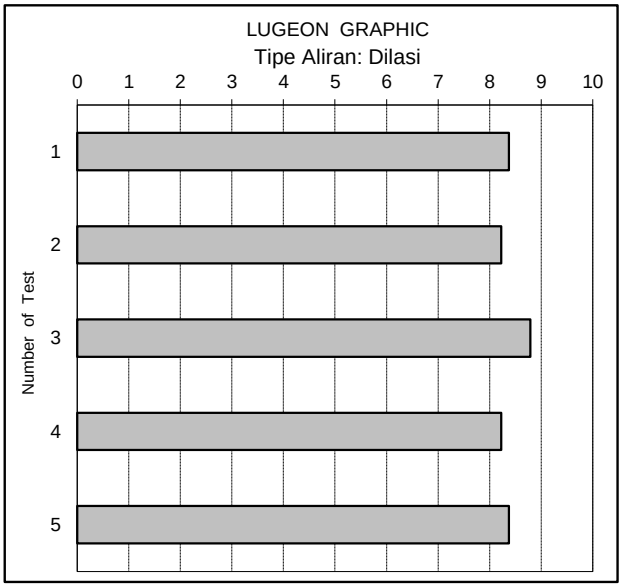
k :Coef. of Permeability (cm/sec)
R :Radius of Casing (cm)
r :Radius of Hole (cm)
H_1:Head of Water (Initial Reading)(cm)
H_2:Head of Water (Final Reading)(cm)
L :Length of Test Section (cm)

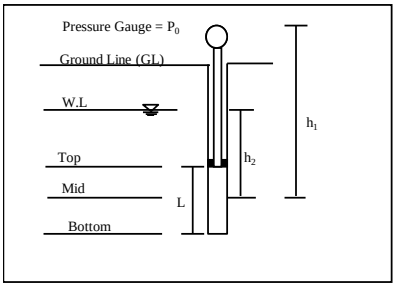
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**2**	DEPTH OF TEST	5.00 ~ 10.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	01-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.30
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							7.80
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							5.50

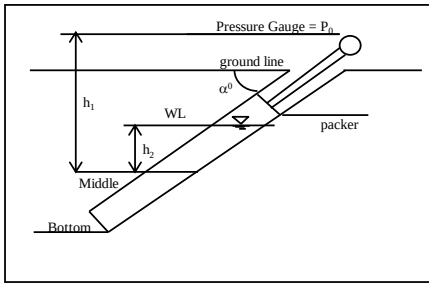
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
0.20	2.30	0.23	0.00	0.00	0.43	3.0	2.0	2.0	1.0	1.0	1.80	0.36	8.38	1.08E-04
0.50	2.30	0.23	0.00	0.00	0.73	4.0	4.0	4.0	3.0	3.0	3.60	0.60	8.22	1.06E-04
1.00	2.30	0.23	0.02	0.00	1.23	6.0	6.0	5.0	5.0	5.0	5.40	1.08	8.79	1.14E-04
0.50	2.30	0.23	0.00	0.00	0.73	4.0	4.0	3.0	2.0	2.0	3.00	0.60	8.22	1.06E-04
0.20	2.30	0.23	0.00	0.00	0.43	2.0	2.0	2.0	1.0	2.0	1.80	0.36	8.38	1.08E-04







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **8.02**

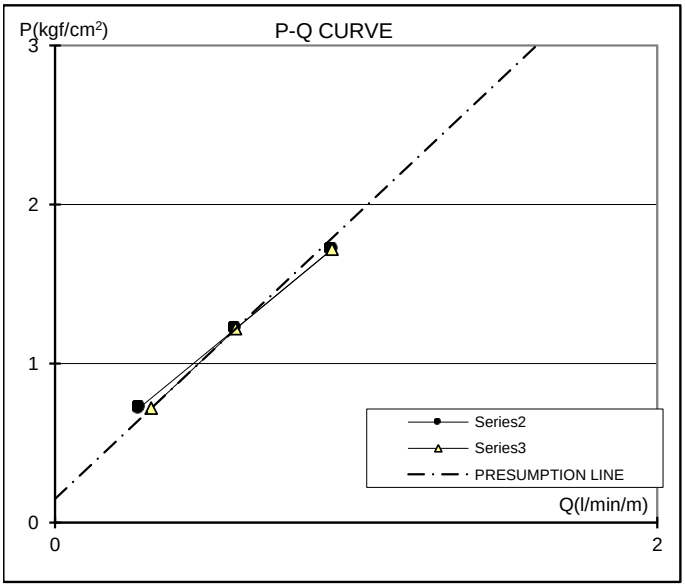
CRITICAL PRES. = **0.73** kgf/cm^2

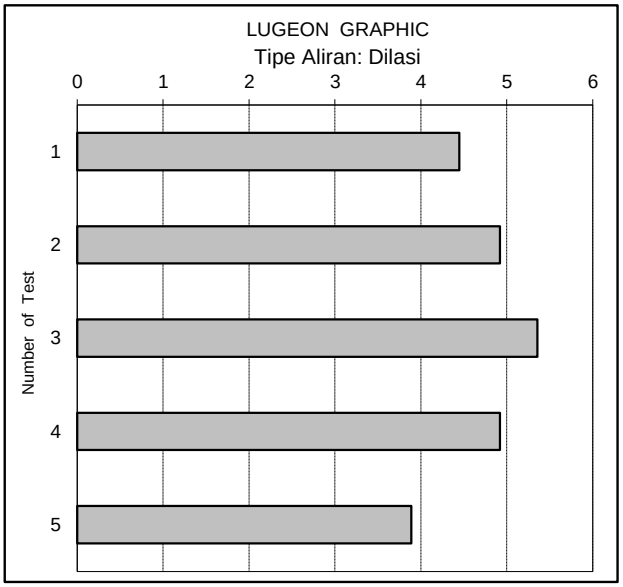
COEF. PERMEA. = **1.06E-04** cm/sec

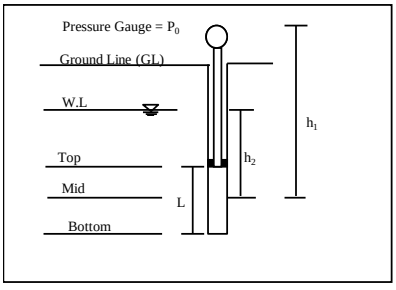
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**3**	DEPTH OF TEST	10.00 ~ 15.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	01-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.20
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							12.70
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							10.50

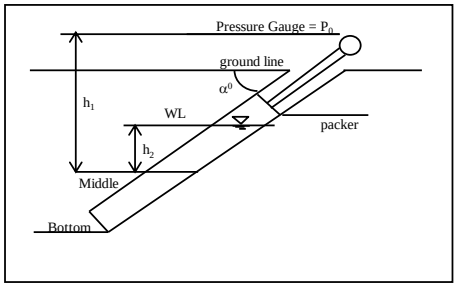
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
0.50	2.20	0.22	0.00	0.00	0.72	2.0	2.0	2.0	1.0	1.0	1.60	0.32	4.45	5.75E-05
1.00	2.20	0.22	0.01	0.00	1.22	4.0	4.0	3.0	3.0	3.0	3.40	0.60	4.92	6.37E-05
1.50	2.20	0.22	0.02	0.00	1.72	5.0	5.0	5.0	4.0	4.0	4.60	0.92	5.35	6.93E-05
1.00	2.20	0.22	0.01	0.00	1.22	4.0	3.0	3.0	2.0	3.0	3.00	0.60	4.92	6.37E-05
0.50	2.20	0.22	0.00	0.00	0.72	2.0	2.0	1.0	1.0	1.0	1.40	0.28	3.89	5.03E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **5.52**

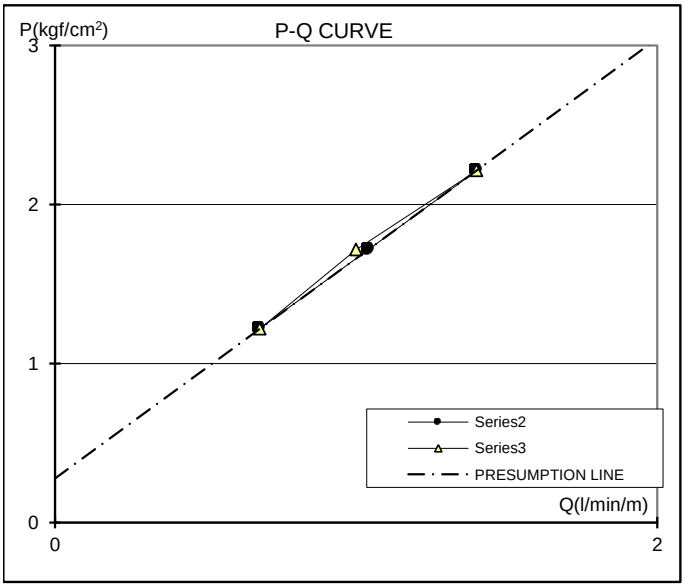
CRITICAL PRES. = **1.22** kgf/cm^2

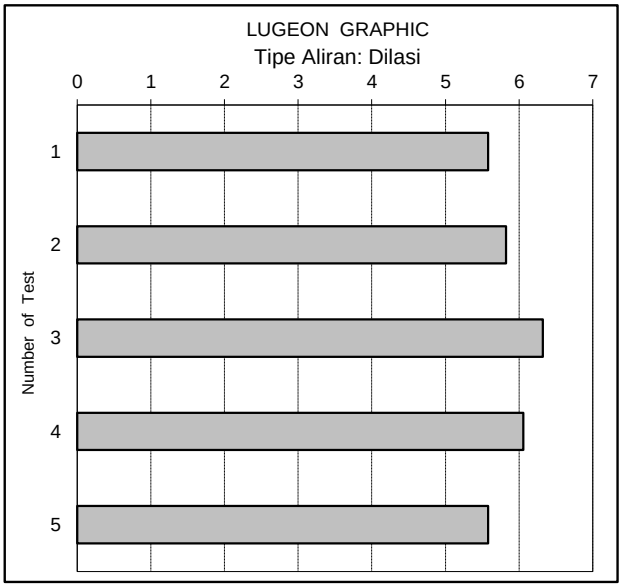
COEF. PERMEA. = **6.37E-05** cm/sec

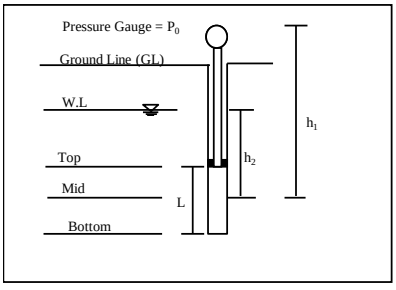
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**4**	DEPTH OF TEST	15.00 ~ 20.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	02-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.20
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							17.70
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							15.50

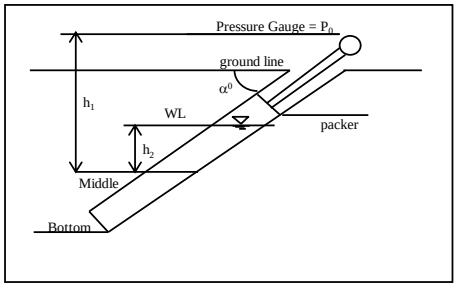
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
1.00	2.20	0.22	0.01	0.00	1.22	4.0	4.0	3.0	3.0	3.0	3.40	0.68	5.58	7.22E-05
1.50	2.20	0.22	0.03	0.00	1.72	7.0	6.0	6.0	6.0	5.0	6.00	1.00	5.82	7.54E-05
2.00	2.20	0.22	0.06	0.01	2.21	8.0	8.0	7.0	6.0	6.0	7.00	1.40	6.32	8.18E-05
1.50	2.20	0.22	0.03	0.00	1.72	6.0	6.0	5.0	5.0	4.0	5.20	1.04	6.06	7.84E-05
1.00	2.20	0.22	0.01	0.00	1.22	4.0	4.0	3.0	3.0	3.0	3.40	0.68	5.58	7.22E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **7.03**

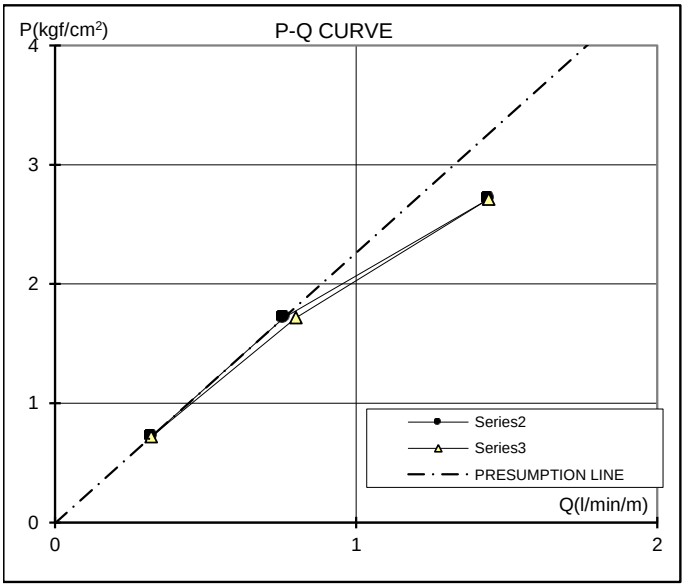
CRITICAL PRES. = **1.72** kgf/cm^2

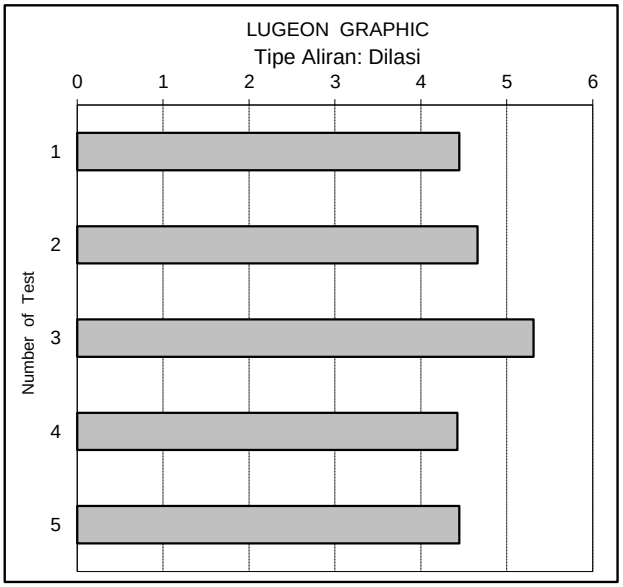
COEF. PERMEA. = **7.84E-05** cm/sec

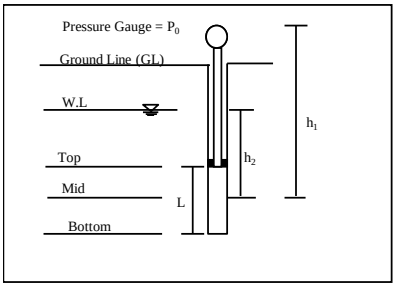
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**5**	DEPTH OF TEST	20.00 ~ 25.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	02-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.20
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							22.70
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							20.50

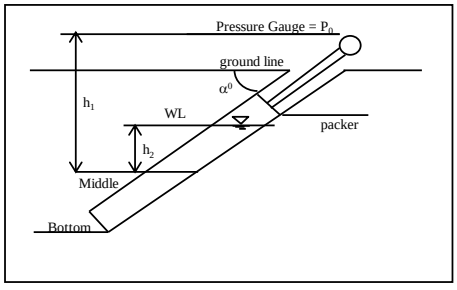
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
0.50	2.20	0.22	0.00	0.00	0.72	2.0	2.0	2.0	1.0	1.0	1.60	0.32	4.45	5.76E-05
1.50	2.20	0.22	0.03	0.00	1.72	5.0	5.0	5.0	4.0	4.0	4.60	0.80	4.66	6.03E-05
2.50	2.20	0.22	0.08	0.01	2.71	7.0	8.0	8.0	7.0	6.0	7.20	1.44	5.31	6.87E-05
1.50	2.20	0.22	0.02	0.00	1.72	5.0	4.0	4.0	3.0	3.0	3.80	0.76	4.42	5.73E-05
0.50	2.20	0.22	0.00	0.00	0.72	2.0	2.0	2.0	1.0	1.0	1.60	0.32	4.45	5.76E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **4.41**

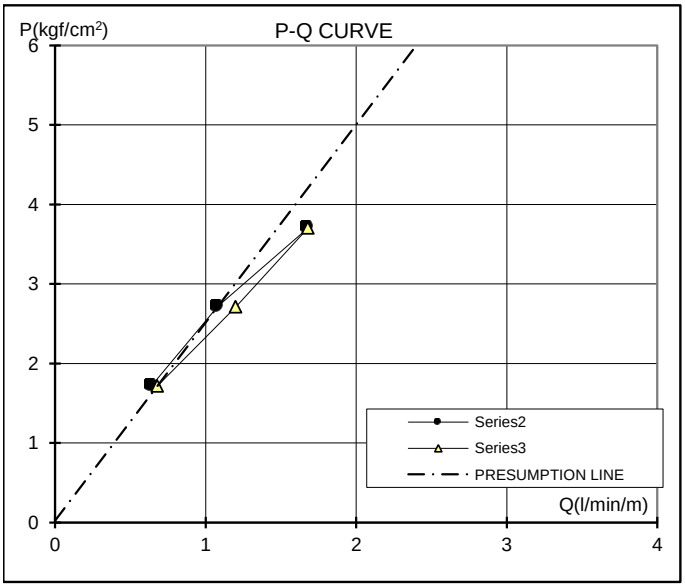
CRITICAL PRES. = **1.72** kgf/cm^2

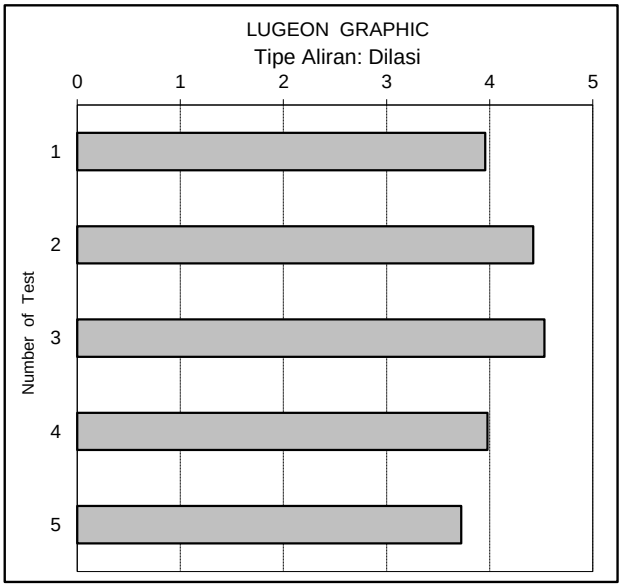
COEF. PERMEA. = **5.73E-05** cm/sec

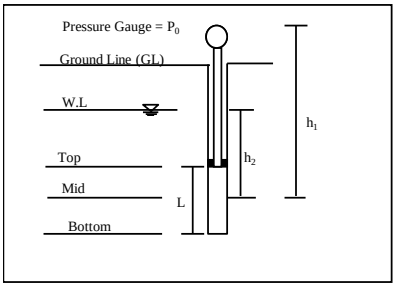
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**6**	DEPTH OF TEST	25.00 ~ 30.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	03-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.20
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							27.70
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							25.50

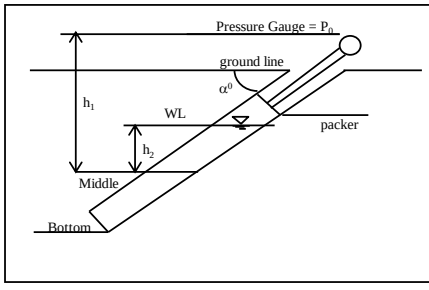
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
1.50	2.20	0.22	0.02	0.00	1.72	4.0	4.0	3.0	3.0	3.0	3.40	0.68	3.96	5.12E-05
2.50	2.20	0.22	0.07	0.01	2.71	6.0	5.0	5.0	5.0	6.0	5.40	1.20	4.42	5.73E-05
3.50	2.20	0.22	0.14	0.01	3.71	9.0	9.0	8.0	8.0	8.0	8.40	1.68	4.53	5.87E-05
2.50	2.20	0.22	0.06	0.01	2.71	6.0	6.0	5.0	5.0	5.0	5.40	1.08	3.98	5.15E-05
1.50	2.20	0.22	0.02	0.00	1.72	4.0	4.0	3.0	3.0	2.0	3.20	0.64	3.73	4.82E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **4.00**

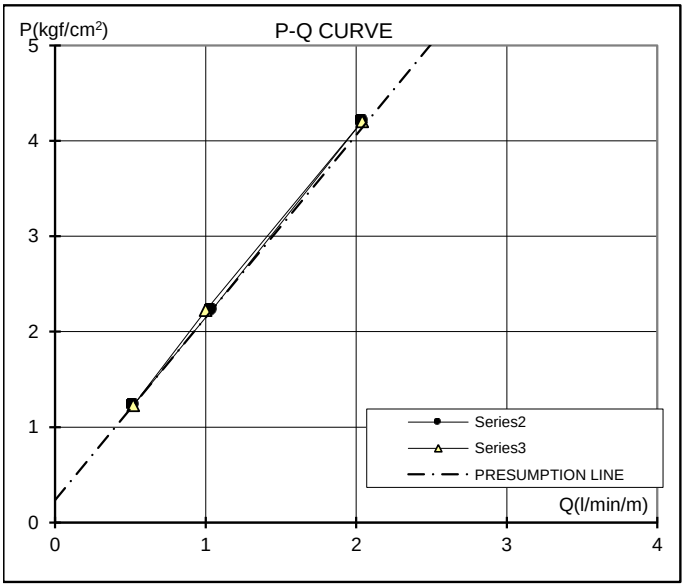
CRITICAL PRES. = **2.71** kgf/cm^2

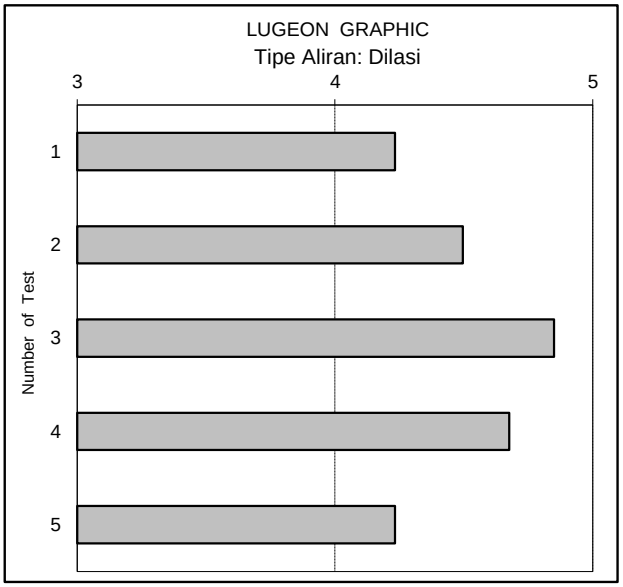
COEF. PERMEA. = **5.15E-05** cm/sec

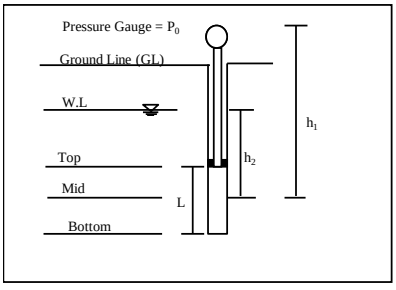
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**7**	DEPTH OF TEST	30.00 ~ 35.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	03-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.30
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							32.80
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							30.50

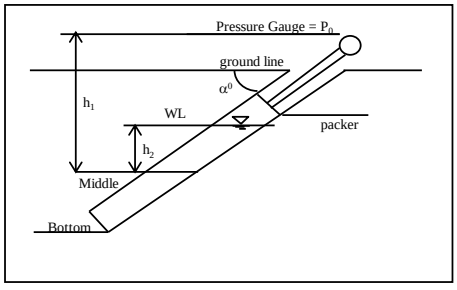
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
1.00	2.30	0.23	0.02	0.00	1.23	3.0	3.0	3.0	2.0	2.0	2.60	0.52	4.23	5.48E-05
2.00	2.30	0.23	0.06	0.01	2.22	6.0	6.0	5.0	6.0	5.0	5.60	1.00	4.50	5.82E-05
4.00	2.30	0.23	0.24	0.02	4.21	11.0	11.0	10.0	10.0	9.0	10.20	2.04	4.85	6.28E-05
2.00	2.30	0.23	0.06	0.01	2.22	6.0	6.0	5.0	5.0	4.0	5.20	1.04	4.68	6.05E-05
1.00	2.30	0.23	0.02	0.00	1.23	3.0	3.0	3.0	2.0	2.0	2.60	0.52	4.23	5.48E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **5.10**

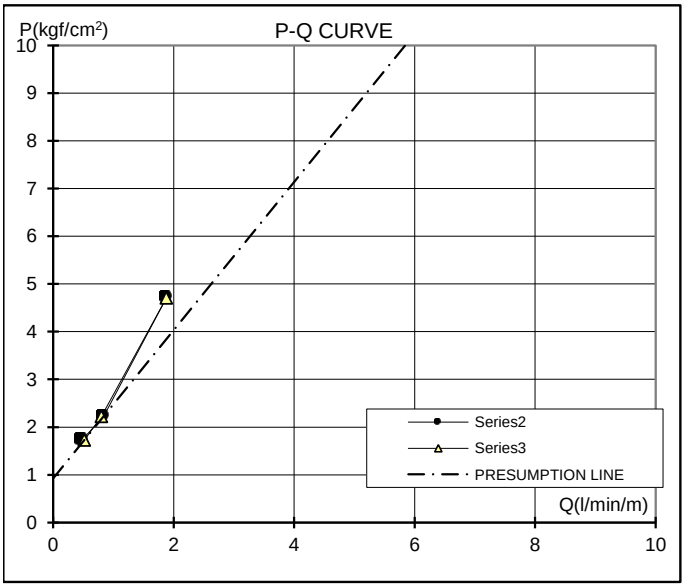
CRITICAL PRES. = **2.22** kgf/cm^2

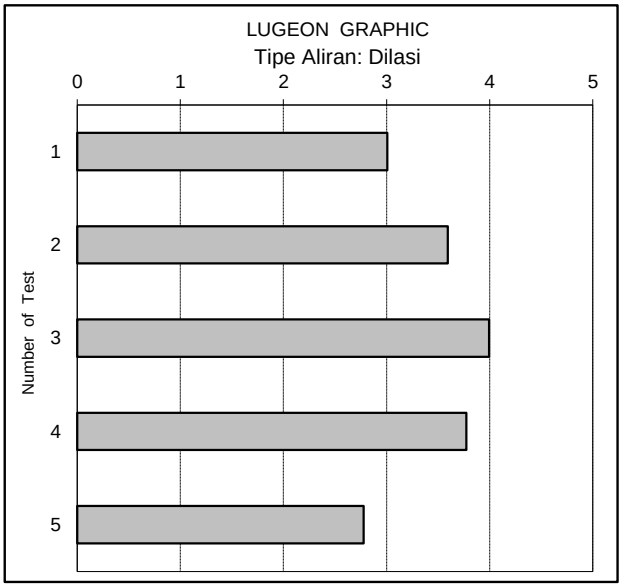
COEF. PERMEA. = **6.05E-05** cm/sec

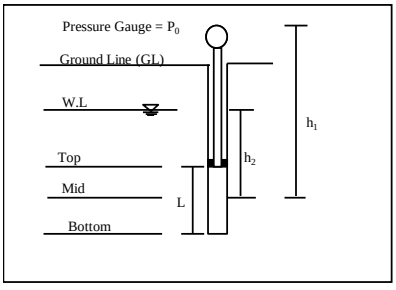
LUGEON TEST RESULT

PROJECT	**Railway Double Track, Notog Tunnel, Banyumas**					HOLE NUMBER	**B-3**
STAGE NUMBER	**8**	DEPTH OF TEST	35.00 ~ 40.00 m			SECTION LENGTH (m)	5.00
HOLE DIAMETER (cm)	7.6	PACKER TYPE	Mechanic	DATE	04-Jan-17	WATER LEVEL (GL.m)	-2.00
INCLINATION (º)	90	THE HEIGHT OF THE PRESSURE GAUGE FROM GROUND					0.30
h1 : THE LENGTH BETWEEN THE PRESSURE GAUGE AND THE MIDDLE POINT OF TEST SECTION							37.80
h2 : THE LENGTH BETWEEN THE GROUND WATER LEVEL AND THE MIDDLE POINT OF TEST SECTION							35.50

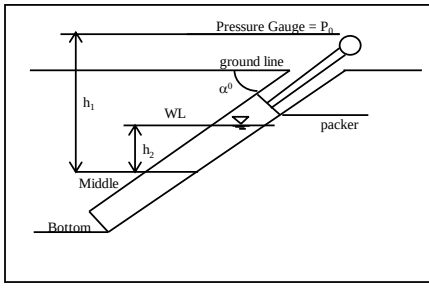
PRESSURE OF THE GAUGE	INITIAL HEAD		HEAD LOSS		ACTUAL PRESSURE	WATER DISCHARGE						UNIT DISCHARGE	LUGEON	COEFFICIENT OF PERMEABILITY
Po	(h1 - h2)		(h3)		P	Q(L/min)						QU	(Lu)	(k)
(kgf/cm^2)	(m)	(kgf/cm^2)	(m)	(kgf/cm^2)	(kgf/cm^2)	1	2	3	4	5	AVERAGE	(l/min/m)		(cm/sec)
1.50	2.30	0.23	0.02	0.00	1.73	4.0	3.0	2.0	2.0	2.0	2.60	0.52	3.01	3.89E-05
2.00	2.30	0.23	0.04	0.00	2.23	6.0	6.0	5.0	5.0	4.0	5.20	0.80	3.59	4.65E-05
4.50	2.30	0.23	0.23	0.02	4.71	10.0	10.0	9.0	9.0	9.0	9.40	1.88	3.99	5.17E-05
2.00	2.30	0.23	0.05	0.00	2.23	5.0	4.0	4.0	4.0	4.0	4.20	0.84	3.77	4.89E-05
1.50	2.30	0.23	0.02	0.00	1.73	3.0	3.0	2.0	2.0	2.0	2.40	0.48	2.78	3.59E-05







VERTICAL POSITION



INCLINATED POSITION

LUGEON VALUE = **5.84**

CRITICAL PRES. = **2.23** kgf/cm^2

COEF. PERMEA. = **4.89E-05** cm/sec