

	<p style="text-align: center;">PROYECTO:</p> <p style="text-align: center;">DISEÑO ESTRUCTURAL SALIDAS TUBERÍA SISTEMA CONDENSACIÓN DT SAN FRANCISCO.</p>	
<p>FECHA DE REVISION</p> <p>ENERO DEL 2023</p>	<p style="text-align: center;">MEMORIAS DE CALCULO TABLESTACAS</p> <p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>ELABORO: A. MERLANO</p> <p>REVISO: K. MATTOS</p> <p>APROBO: J. PORTO</p>

BUZ-SER-DT-001-2022
MEMORIAS DE CALCULO TABLESTACAS

Rev.	Fecha:	Descripción / Emitido Para:	Cambios realizados
A	15/01/2023	Elaboración del documento/ Emitido para comentarios	

	<p style="text-align: center;">PROYECTO:</p> <p style="text-align: center;">DISEÑO ESTRUCTURAL SALIDAS TUBERÍA SISTEMA CONDENSACIÓN DT SAN FRANCISCO.</p>	
<p>FECHA DE REVISION</p> <p>ENERO DEL 2023</p>	<p style="text-align: center;">MEMORIAS DE CALCULO TABLESTACAS</p> <p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>ELABORO: A. MERLANO</p> <p>REVISO: K. MATTOS</p> <p>APROBO: J. PORTO</p>

1. DATOS GENERALES

CIUDAD: Cartagena de Indias

UBICACIÓN: Centro de Convenciones

TIPO DE MURO: Tablestacado en Voladizo

TIPO Y LONGITUD TABLESTACAS: AZ19-700 L=8m

USO PROYECTADO: Obras de protección

2. SOLUCION ESTRUCTURAL

La colocación del tablestacado tiene como objetivo la estabilización de la orilla del parqueadero del Centro de Convenciones Cartagena de Indias, por donde saldrán las tuberías del sistema de condensación del Hotel San Francisco. El sistema esta compuesto por elementos metálicos en acero estructural descritos por el Steel Foundation Solutions General Catalogue 2021 como "AZ19-700". A partir de las propiedades de los materiales, niveles de agua y parámetros geotécnicos obtenidos del estudio de suelo (LFO 16536-1 Recomendaciones de cimentación redes distrito de energía San Francisco Investments de abril del 2021), se determinaron los diagramas de presiones, momento máximo de diseño y deflexiones y longitud de la tablestaca, respecto al F.S con la colocación de una sobrecarga de 10kN/m².

3. DESCRIPCION GENERAL DEL SOFTWARE UTILIZADO

SPW911 es una herramienta de diseño y análisis para muros de contención de tablestacas y pilotes en voladizo y apuntalados. También se pueden modelar excavaciones escalonadas utilizando tablestacas. Se incluyen bases de datos editables por el usuario para clientes, suelos, tablestacas, pilotes soldados, revestimiento y puntales. Se pueden definir excavaciones multicapa, con diferentes suelos a cada lado de la excavación. Diferentes modelos de presión (Rankine, Coulomb, etc.), modelos de penetración de tablestacas (tierra libre/fija, etc.) y cálculos del factor de seguridad (presión neta/bruta, Burland-Potts) brindan a los usuarios un control completo sobre un diseño. Se pueden modelar cargas superficiales, cimientos y terrenos en pendiente o irregulares. SPW911 puede calcular las posiciones óptimas de los marcos de soporte y se pueden seleccionar puntales inclinados y/o anclajes al suelo.

	PROYECTO: DISEÑO ESTRUCTURAL SALIDAS TUBERÍA SISTEMA CONDENSACIÓN DT SAN FRANCISCO.	
	MEMORIAS DE CALCULO TABLESTACAS BUZ-SER-DT-001-2022	
FECHA DE REVISION ENERO DEL 2023		

4. TABLAESTACA PARQUEADERO CENTRO DE CONVENCIONES

Para el diseño de la tablestaca es necesario conocer las características de los elementos estructurales a utilizar y las características del suelo obtenidos del estudio geotécnico realizado en campo. A continuación, se expondrá los parámetros utilizados:

De acuerdo con “Steel Foundation Solutions- General Catalogue 2021” de Arcelor Mittal las dimensiones son las siguientes:

Tablestacas AZ19-700



Section	Width	Height	Thickness	Sectional area	Mass	Moment of inertia	Elastic section modulus	Static moment	Plastic section modulus	Class ¹⁾								
	b	h	t	s	cm ² /m	single pile kg/m	wall kg/m ²	cm ⁴ /m	cm ³ /m	cm ³ /m								
AZ 19-700	700	421	9.5	9.5	146	80.0	114	39380	1870	1105	2206	2	2	2	3	3	3	3

Grado del acero

Steel grades of sheet pile sections

Steel grade EN 10248	Min. yield strength R _{eH} MPa	Min. tensile strength R _m MPa	Min. elongation L ₀ =5.65√S ₀ %	Chemical composition ¹⁾ (% max)					
				C	Mn	Si	P	S	N ^{2),3)}
S 240 GP	240	340	26	0.25	-	-	0.055	0.055	0.011
S 270 GP	270	410	24	0.27	-	-	0.055	0.055	0.011
S 320 GP	320	440	23	0.27	1.70	0.60	0.055	0.055	0.011
S 355 GP	355	480	22	0.27	1.70	0.60	0.055	0.055	0.011
S 390 GP	390	490	20	0.27	1.70	0.60	0.050	0.050	0.011
S 430 GP	430	510	19	0.27	1.70	0.60	0.050	0.050	0.011

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<p>FECHA DE REVISIÓN</p> <p>ENERO DEL 2023</p>	<p style="text-align: center;">MEMORIAS DE CALCULO TABLESTACAS</p> <p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>ELABORO: A. MERLANO</p> <p>REVISO: K. MATTOS</p> <p>APROBO: J. PORTO</p>

4.1 PROPIEDADES DE LA TABLESTACA

Parametro	AZ19-700	UNIDAD
Area	203	cm ² /m
Masa	160	kg/m ²
Momento de Inercia	55130	cm ⁴
Z (Modulo de Seccion Elastica)	2620	cm ³
Fluencia del Acero	430	MPa
Esfuerzo de Trabajo*	279.5	MPa
Momento Maximo Resistente**	732	kN*m/m
* El esfuerzo de Trabajo es el 65% de la fluencia del acero		
** El Momento Maximo resistente se obtiene como $M=f*Z$		

Debido a que se encuentre una estructura adyacente se colocara una sobrecarga lineal de 10 kN/m².

5. DISEÑO DE LA TABLAESTACA

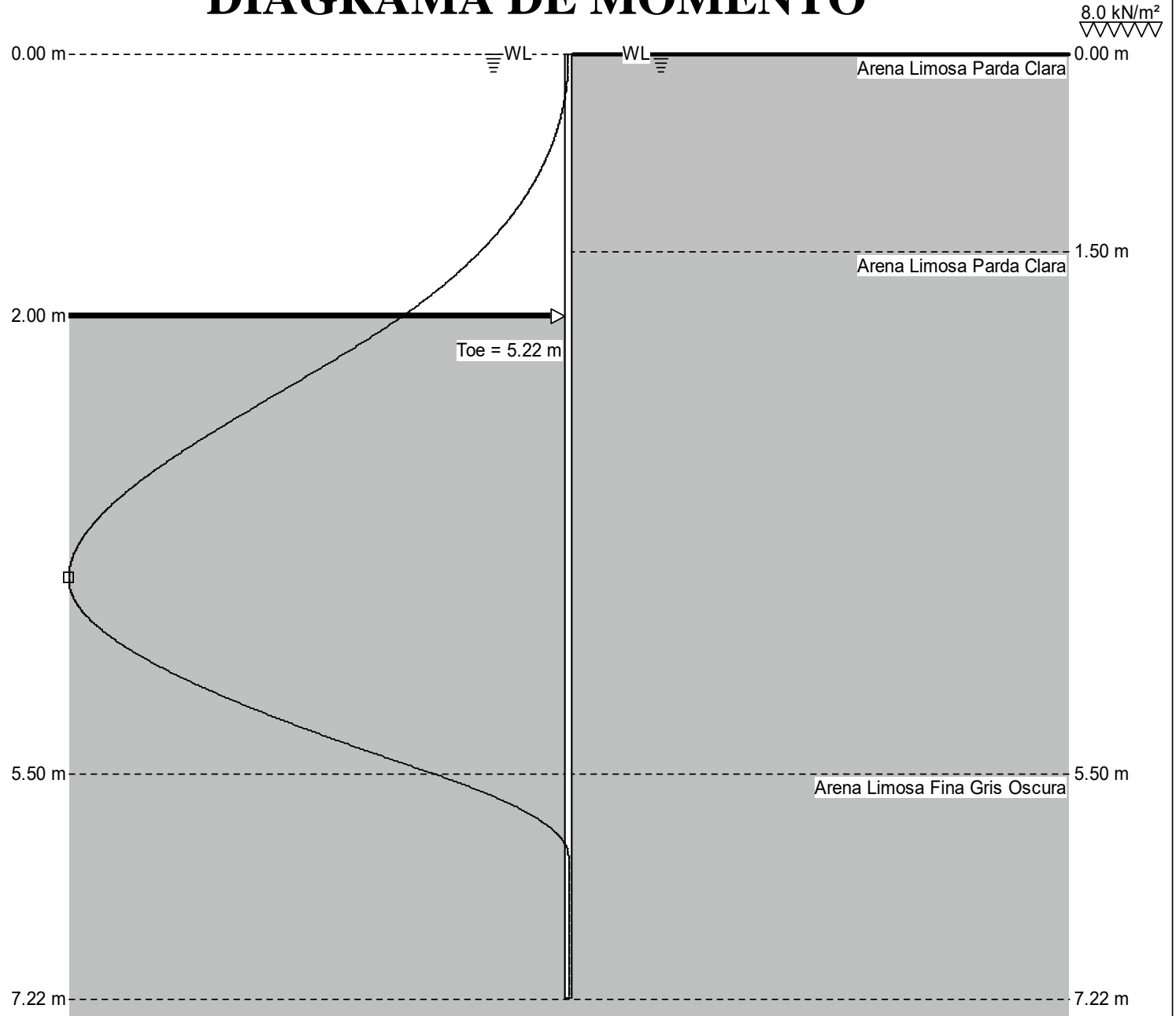
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	<p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>APROBO: J. PORTO</p>

5.1 DISEÑO PARA NIVEL DE AGUAS MAXIMAS

Client: AZ19-700 S430
 Page: 1
 Date: 5.1.23
 Sheet: AZ19-700 S430GP
 Pressure: Rankine
 FOS: 2.0
 Toe: Cantilever

Maximum	d (m)
□ 23.7 kNm/m	4.01

DIAGRAMA DE MOMENTO



Client: AZ19-700 S430

Page: 1

Date: 5.1.23

Sheet: AZ19-700 S430GP

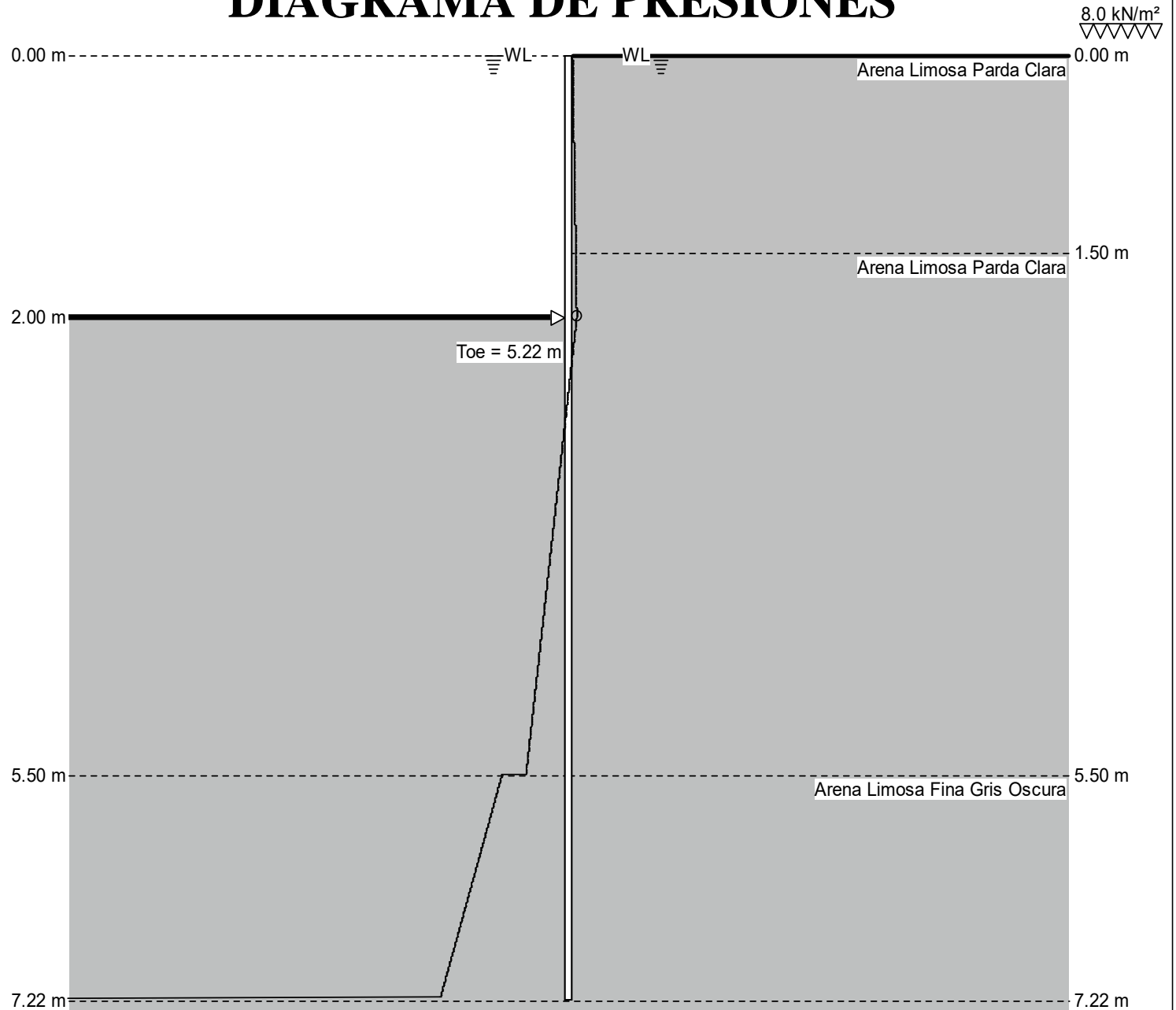
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

Maximum	d (m)
○ 6.0 kN/m ²	2.00

DIAGRAMA DE PRESIONES



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Client: AZ19-700 S430

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Sheet: AZ19-700 S430GP

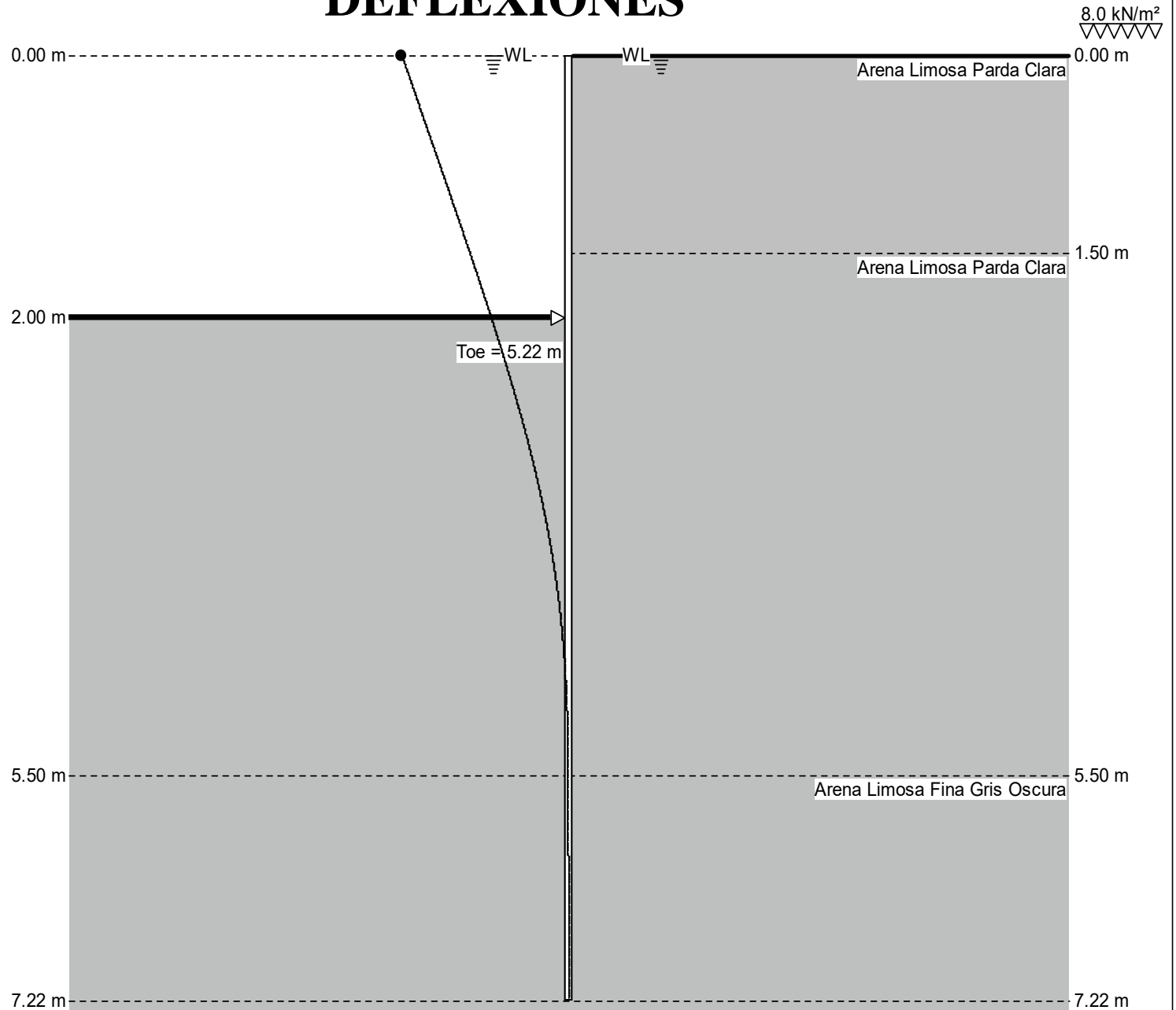
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

Maximum	d (m)
● 2.1 mm	0.00

DEFLEXIONES



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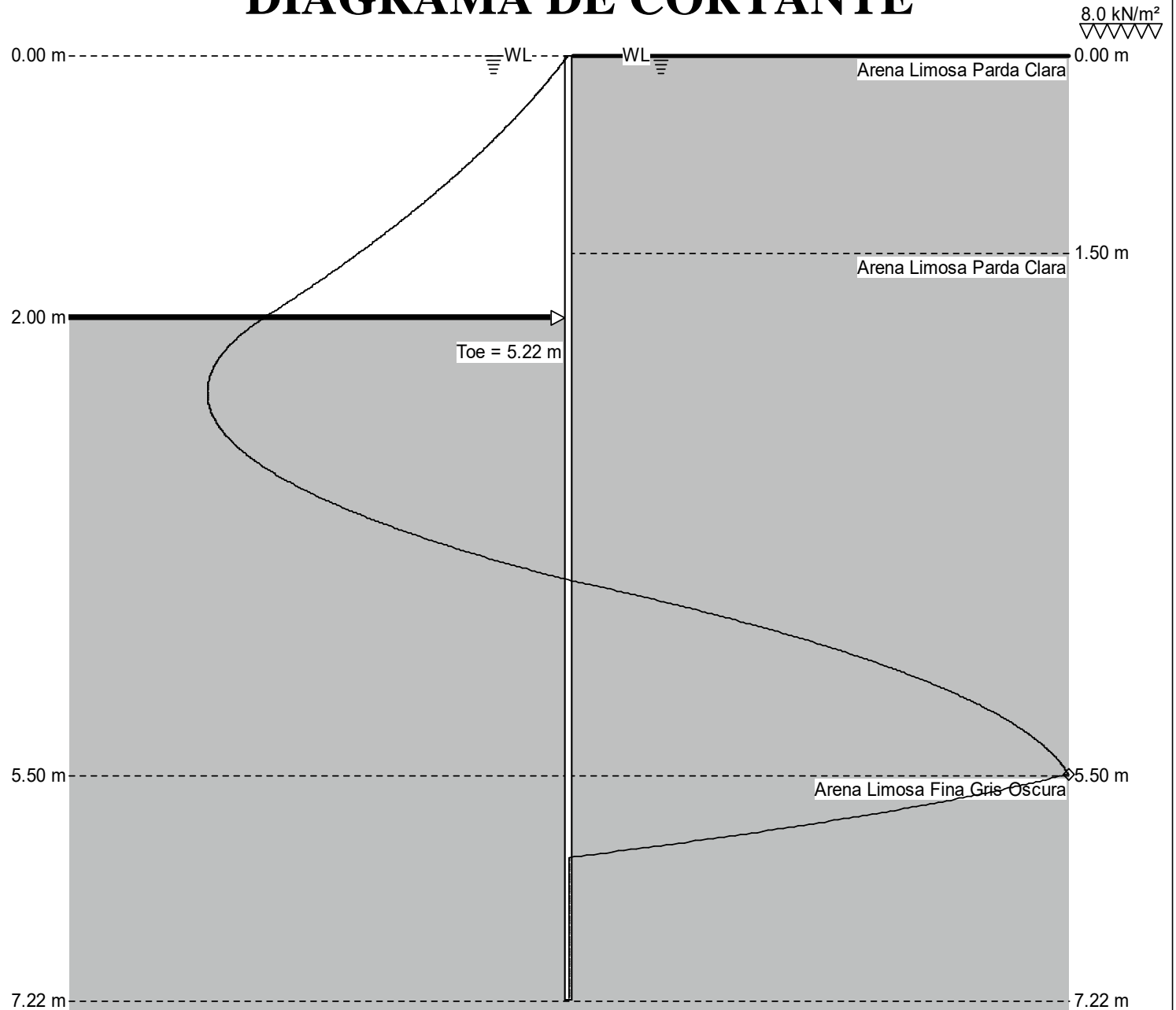
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
◇	14.7 kN/m	5.50

DIAGRAMA DE CORTANTE



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Client: AZ19-700 S430
 Page: 2
 Date: 5.1.23
 Sheet: AZ19-700 S430GP
 Pressure: Rankine
 FOS: 2.0
 Toe: Cantilever

Input Data

Depth Of Excavation = 2.00 m Depth Of Active Water = 0.00 m Water Density = 10.00 kN/m³
 Surcharge = 8.0 kN/m² Depth Of Passive Water = 0.00 m Minimum Fluid Density = 5.00 kN/m³

Soil Profile

Depth (m)	Soil Name	γ (kN/m ³)	γ' (kN/m ³)	C (kN/m ²)	C_a (kN/m ²)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
1.50	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
5.50	Arena Limosa Fina Gris Oscura	17.50	7.50	0.0	0.0	35.0	23.3	0.27	0.00	3.70	0.00
17.50	Arena Limosa Gris Oscura	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00

Solution

Sheet

Sheet Name	I (cm ⁴ /m)	E (kN/m ²)	Z (cm ³ /m)	f (N/mm ²)	Maximum Bending Moment (kNm/m)	Upstand (m)	Toe (m)	Pile Length (m)
AZ19-700 S430GP	55130.0	2.1E+08	2620.0	279.0	731.0	0.00	5.22	7.22

Maxima

	Maximum	Depth
Bending Moment	23.7 kNm/m	4.01 m
Deflection	2.1 mm	0.00 m
Pressure	6.0 kN/m ²	2.00 m
Shear Force	14.7 kN/m	5.50 m

AZ19-700 S430GP

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Client: AZ19-700 S430

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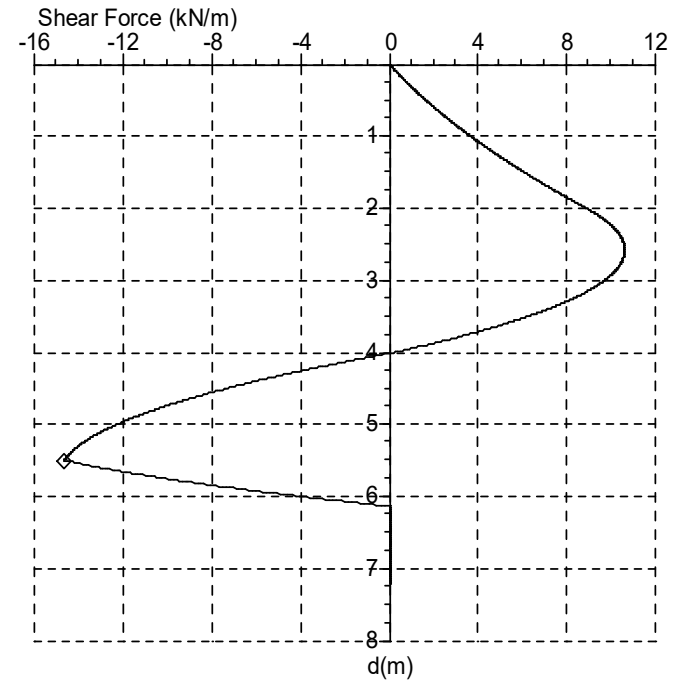
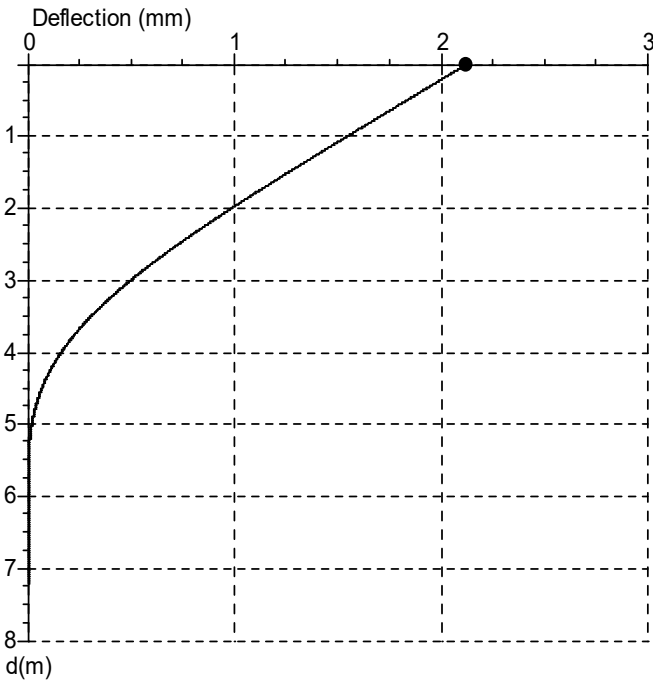
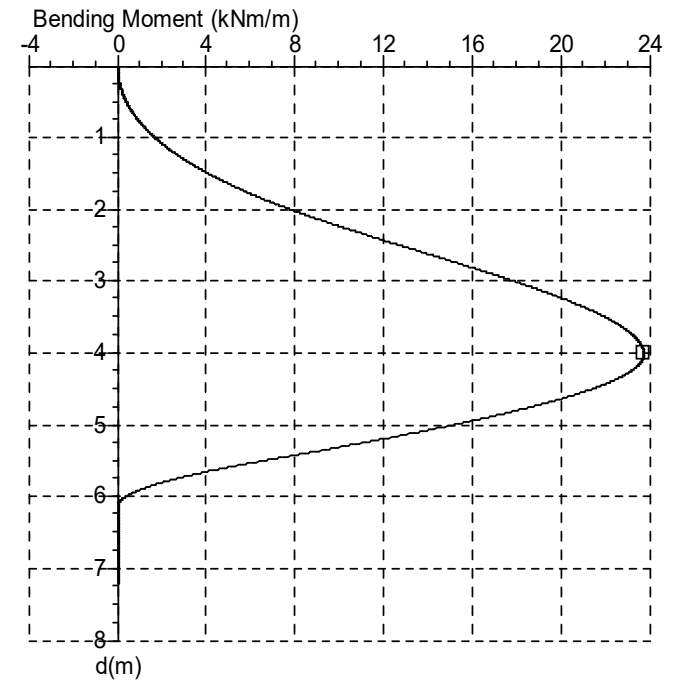
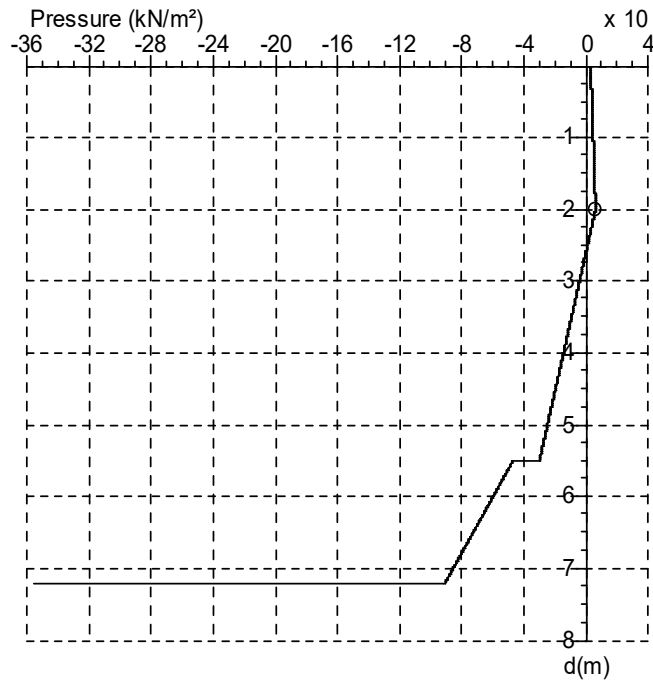
Sheet: AZ19-700 S430GP

Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
○	6.0 kN/m ²	2.00
□	23.7 kNm/m	4.01
◇	14.7 kN/m	5.50
●	2.1 mm	0.00



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Client: AZ19-700 S430
Page: 4
Date: 5.1.23
Sheet: AZ19-700 S430GP
Pressure: Rankine
FOS: 2.0
Toe: Cantilever

depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)
0.00	2.9	0.0	2.1	0.0	2.43	1.5	12.0	0.8	10.5	4.85	-23.5	17.3	0.0	-11.1
0.06	3.0	0.0	2.1	0.2	2.49	0.9	12.6	0.7	10.6	4.92	-24.2	16.3	0.0	-11.7
0.13	3.1	0.0	2.0	0.4	2.56	0.2	13.3	0.7	10.6	4.98	-24.8	15.4	0.0	-12.1
0.19	3.2	0.1	2.0	0.6	2.62	-0.4	14.0	0.7	10.6	5.05	-25.5	14.4	0.0	-12.6
0.26	3.3	0.1	2.0	0.8	2.68	-1.1	14.7	0.6	10.5	5.11	-26.2	13.3	0.0	-13.1
0.32	3.4	0.2	1.9	1.0	2.75	-1.8	15.4	0.6	10.5	5.17	-26.8	12.3	0.0	-13.4
0.38	3.5	0.2	1.9	1.2	2.81	-2.4	16.0	0.6	10.3	5.24	-27.5	11.2	0.0	-13.8
0.45	3.6	0.3	1.9	1.4	2.87	-3.1	16.7	0.6	10.2	5.30	-28.1	10.2	0.0	-14.0
0.51	3.7	0.4	1.8	1.7	2.94	-3.7	17.3	0.5	10.0	5.37	-28.8	9.0	0.0	-14.3
0.57	3.8	0.5	1.8	1.9	3.00	-4.4	17.9	0.5	9.7	5.43	-29.4	7.8	0.0	-14.5
0.64	3.9	0.6	1.8	2.2	3.07	-5.0	18.5	0.5	9.4	5.49	-30.1	6.7	0.0	-14.7
0.70	4.0	0.8	1.7	2.4	3.13	-5.7	19.1	0.4	9.1	5.56	-30.8	5.5	0.0	-13.7
0.77	4.1	0.9	1.7	2.7	3.19	-6.3	19.7	0.4	8.7	5.62	-31.5	4.4	0.0	-12.6
0.83	4.2	1.1	1.6	2.9	3.26	-7.0	20.2	0.4	8.2	5.69	-32.2	3.5	0.0	-11.5
0.89	4.3	1.3	1.6	3.2	3.32	-7.7	20.7	0.4	7.8	5.75	-32.9	2.6	0.0	-10.1
0.96	4.4	1.5	1.6	3.5	3.39	-8.3	21.2	0.3	7.3	5.81	-33.6	1.9	0.0	-8.8
1.02	4.5	1.8	1.5	3.8	3.45	-9.0	21.6	0.3	6.7	5.88	-34.3	1.2	0.0	-7.2
1.09	4.6	2.0	1.5	4.1	3.51	-9.6	22.1	0.3	6.1	5.94	-35.0	0.7	0.0	-5.5
1.15	4.7	2.3	1.5	4.3	3.58	-10.3	22.5	0.3	5.5	6.00	-35.7	0.3	0.0	-3.9
1.21	4.8	2.6	1.4	4.7	3.64	-10.9	22.8	0.3	4.8	6.07	-36.4	0.1	0.0	-2.0
1.28	4.9	2.9	1.4	4.9	3.71	-11.6	23.1	0.2	4.1	6.13	-37.1	0.0	0.0	-0.2
1.34	5.0	3.2	1.3	5.3	3.77	-12.3	23.3	0.2	3.3	6.20	-37.8	0.0	0.0	0.0
1.41	5.1	3.6	1.3	5.6	3.83	-12.9	23.5	0.2	2.5	6.26	-38.5	0.0	0.0	0.0
1.47	5.2	3.9	1.3	5.9	3.90	-13.6	23.6	0.2	1.7	6.32	-39.2	0.0	0.0	0.0
1.53	5.3	4.3	1.2	6.3	3.96	-14.2	23.7	0.2	0.8	6.39	-39.9	0.0	0.0	0.0
1.60	5.3	4.7	1.2	6.6	4.02	-14.9	23.7	0.2	-0.2	6.45	-40.6	0.0	0.0	0.0
1.66	5.5	5.1	1.2	6.9	4.09	-15.6	23.7	0.1	-1.3	6.52	-41.3	0.0	0.0	0.0
1.72	5.6	5.6	1.1	7.3	4.15	-16.2	23.5	0.1	-2.3	6.58	-42.0	0.0	0.0	0.0
1.79	5.6	6.0	1.1	7.6	4.22	-16.9	23.3	0.1	-3.4	6.64	-42.7	0.0	0.0	0.0
1.85	5.7	6.6	1.1	8.0	4.28	-17.6	23.0	0.1	-4.4	6.71	-43.4	0.0	0.0	0.0
1.92	5.9	7.1	1.0	8.4	4.34	-18.2	22.6	0.1	-5.2	6.77	-44.1	0.0	0.0	0.0
1.98	5.9	7.6	1.0	8.8	4.41	-18.9	22.2	0.1	-6.2	6.84	-44.8	0.0	0.0	0.0
2.04	5.5	8.2	1.0	9.1	4.47	-19.5	21.7	0.1	-6.9	6.90	-45.5	0.0	0.0	0.0
2.11	4.9	8.8	0.9	9.5	4.54	-20.2	21.1	0.1	-7.8	6.96	-46.2	0.0	0.0	0.0
2.17	4.2	9.4	0.9	9.7	4.60	-20.9	20.4	0.1	-8.5	7.03	-46.9	0.0	0.0	0.0
2.24	3.5	10.0	0.9	10.0	4.66	-21.5	19.7	0.0	-9.2	7.09	-47.6	0.0	0.0	0.0
2.30	2.9	10.6	0.8	10.2	4.73	-22.2	18.9	0.0	-9.9	7.15	-48.3	0.0	0.0	0.0
2.36	2.2	11.3	0.8	10.4	4.79	-22.8	18.2	0.0	-10.5	7.22	-49.0	0.0	0.0	0.0

AZ19-700 S430GP

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	<p style="text-align: center;">PROYECTO:</p> <p style="text-align: center;">DISEÑO ESTRUCTURAL SALIDAS TUBERÍA SISTEMA CONDENSACIÓN DT SAN FRANCISCO.</p>	
<p>FECHA DE REVISION</p> <p>ENERO DEL 2023</p>	<p style="text-align: center;">MEMORIAS DE CALCULO TABLESTACAS</p>	<p>ELABORO: A. MERLANO</p>
		<p>REVISO: K. MATTOS</p>
	<p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>APROBO: J. PORTO</p>

5.2 DISEÑO PARA NIVEL DE AGUAS MINIMAS

Client: AZ19-700 S430

Page: 1

Date: 5.1.23

Sheet: AZ19-700 S430GP

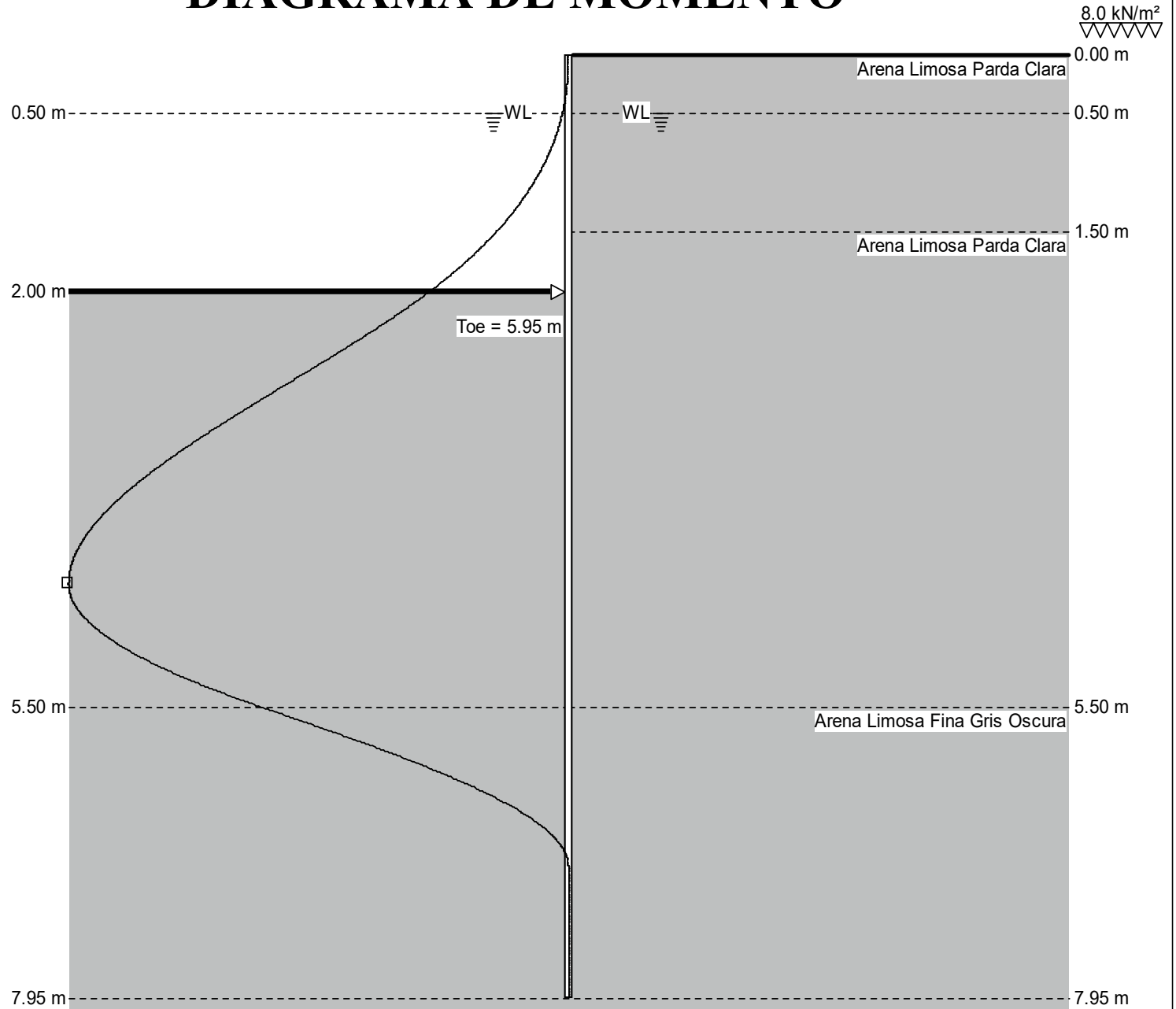
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
□	38.1 kNm/m	4.46

DIAGRAMA DE MOMENTO



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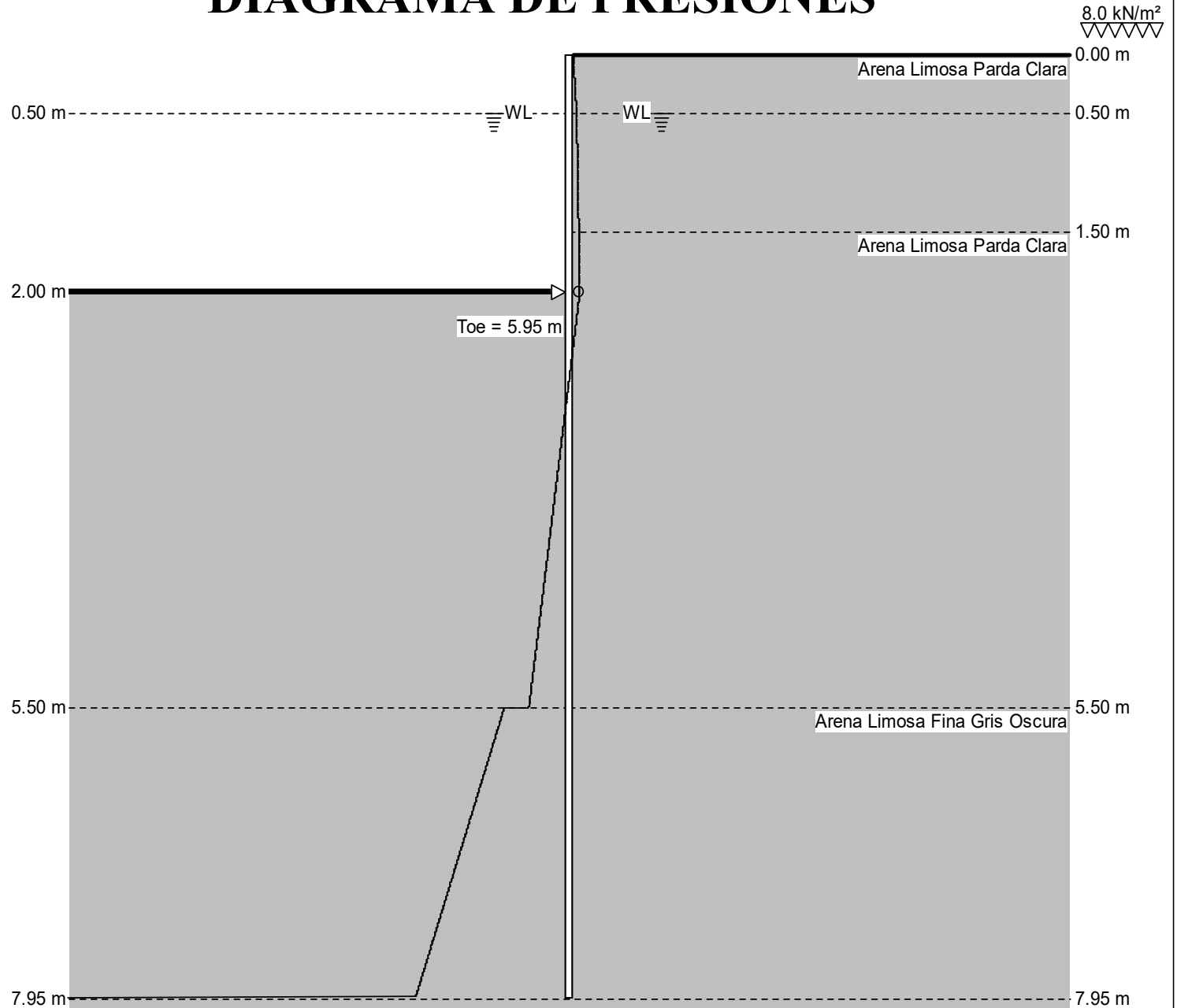
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
○	7.8 kN/m ²	2.00

DIAGRAMA DE PRESIONES



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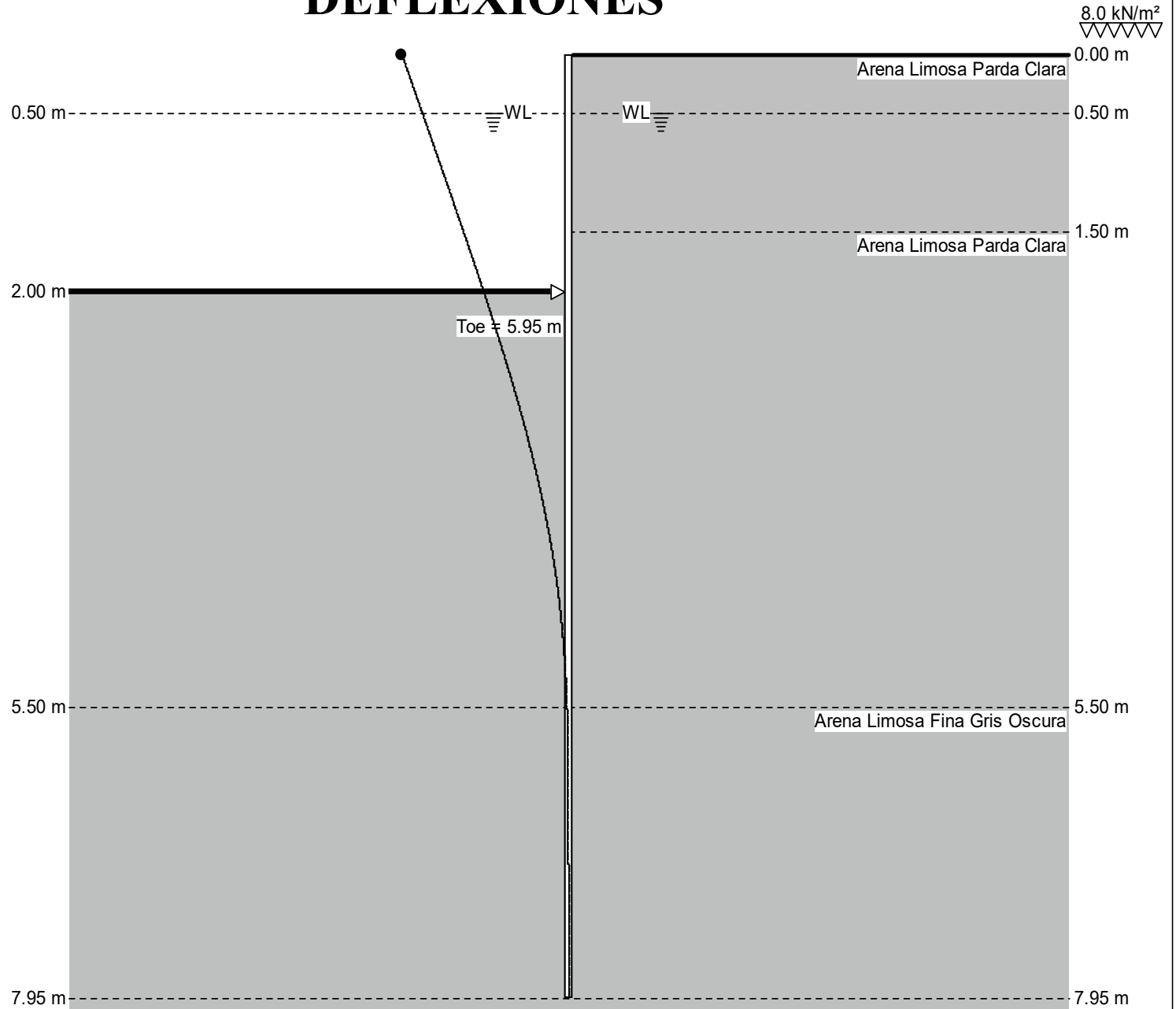
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

Maximum	d (m)
● 4.1 mm	0.00

DEFLEXIONES



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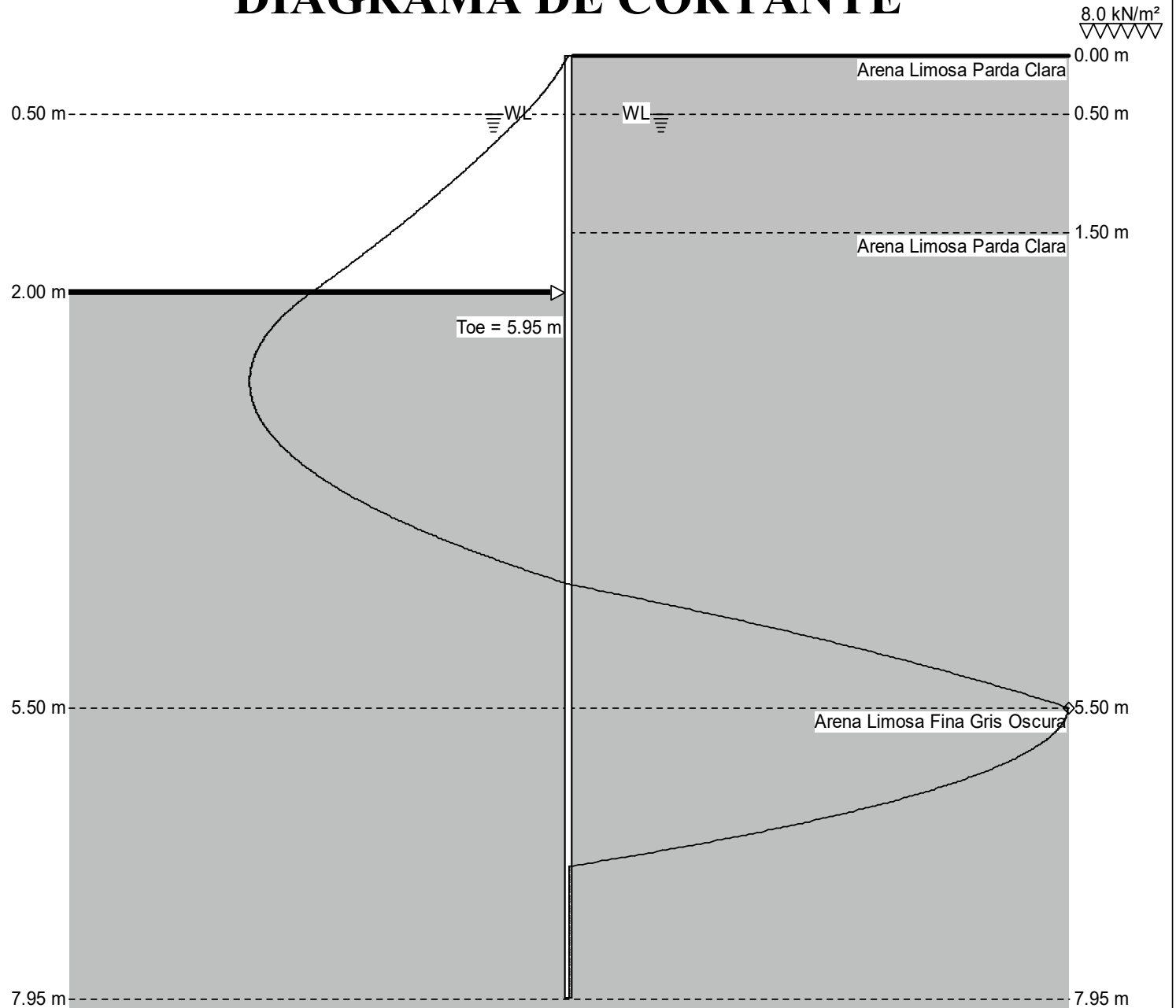
Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
◇	23.4 kN/m	5.50

DIAGRAMA DE CORTANTE



AZ19-700 S430GP

SPW911, v2.40

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Client: AZ19-700 S430
 Page: 2
 Date: 5.1.23
 Sheet: AZ19-700 S430GP
 Pressure: Rankine
 FOS: 2.0
 Toe: Cantilever

Input Data

Depth Of Excavation = 2.00 m Depth Of Active Water = 0.50 m Water Density = 10.00 kN/m³
 Surcharge = 8.0 kN/m² Depth Of Passive Water = 0.50 m Minimum Fluid Density = 5.00 kN/m³

Soil Profile

Depth (m)	Soil Name	γ (kN/m ³)	γ' (kN/m ³)	C (kN/m ²)	C_a (kN/m ²)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
1.50	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
5.50	Arena Limosa Fina Gris Oscura	17.50	7.50	0.0	0.0	35.0	23.3	0.27	0.00	3.70	0.00
17.50	Arena Limosa Gris Oscura	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00

Solution

Sheet

Sheet Name	I (cm ⁴ /m)	E (kN/m ²)	Z (cm ³ /m)	f (N/mm ²)	Maximum Bending Moment (kNm/m)	Upstand (m)	Toe (m)	Pile Length (m)
AZ19-700 S430GP	55130.0	2.1E+08	2620.0	279.0	731.0	0.00	5.95	7.95

Maxima

	Maximum	Depth
Bending Moment	38.1 kNm/m	4.46 m
Deflection	4.1 mm	0.00 m
Pressure	7.8 kN/m ²	2.00 m
Shear Force	23.4 kN/m	5.50 m

AZ19-700 S430GP

SPW911, v2.40

Client: AZ19-700 S430

Page: 3

Date: 5.1.23

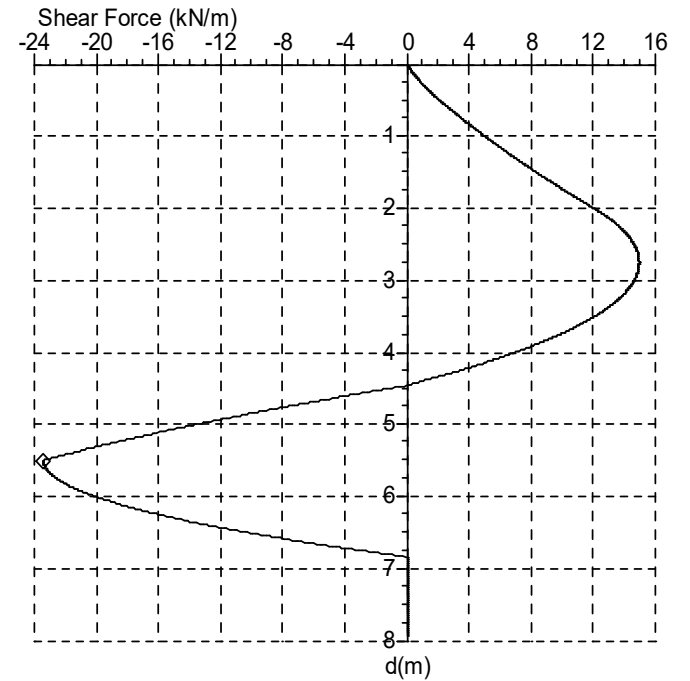
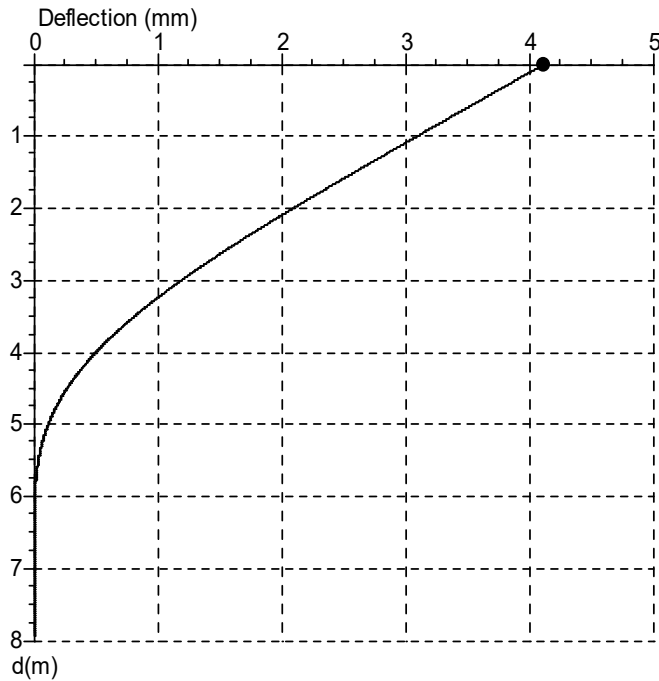
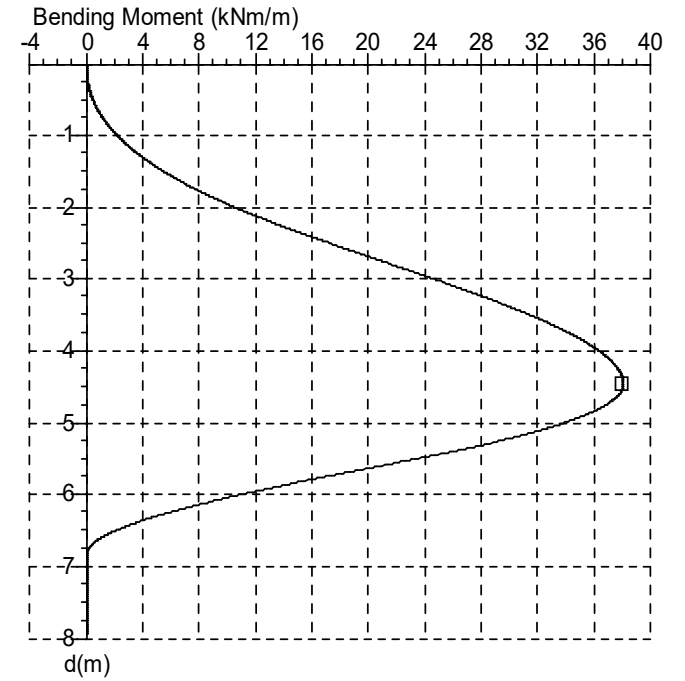
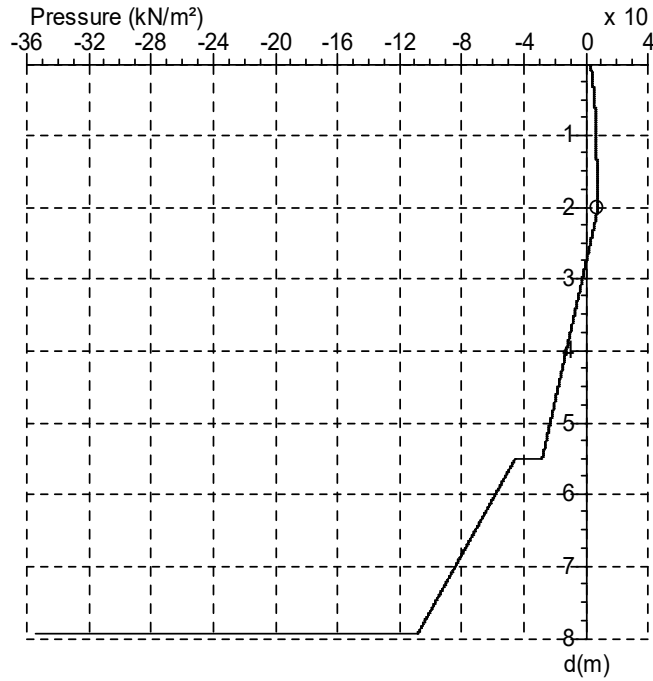
Sheet: AZ19-700 S430GP

Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
○	7.8 kN/m ²	2.00
□	38.1 kNm/m	4.46
◇	23.4 kN/m	5.50
●	4.1 mm	0.00



AZ19-700 S430GP

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Date: 5.1.23
Sheet: AZ19-700 S430GP
Pressure: Rankine
FOS: 2.0
Toe: Cantilever

depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m ²)	M (kNm/m)	D (mm)	F (kN/m)
0.00	2.9	0.0	4.1	0.0	2.67	0.8	19.9	1.5	14.9	5.35	-26.8	27.2	0.1	-20.7
0.07	3.3	0.0	4.0	0.2	2.74	0.1	20.9	1.4	14.9	5.42	-27.5	25.4	0.0	-22.0
0.14	3.6	0.0	4.0	0.5	2.81	-0.6	22.0	1.3	14.9	5.49	-28.2	23.8	0.0	-23.2
0.21	4.0	0.1	3.9	0.7	2.89	-1.3	23.0	1.3	14.9	5.56	-47.3	21.8	0.0	-23.4
0.28	4.3	0.1	3.8	1.0	2.96	-2.1	24.1	1.2	14.7	5.63	-49.1	19.9	0.0	-23.2
0.35	4.7	0.2	3.7	1.3	3.03	-2.8	25.1	1.2	14.6	5.70	-50.8	18.2	0.0	-22.9
0.42	5.1	0.3	3.7	1.7	3.10	-3.5	26.1	1.1	14.4	5.77	-52.7	16.4	0.0	-22.4
0.49	5.4	0.4	3.6	2.0	3.17	-4.3	27.1	1.1	14.1	5.84	-54.4	14.7	0.0	-21.9
0.56	5.6	0.6	3.5	2.4	3.24	-5.0	28.0	1.0	13.8	5.91	-56.3	13.0	0.0	-21.2
0.63	5.7	0.8	3.5	2.9	3.31	-5.7	29.0	0.9	13.4	5.98	-58.2	11.3	0.0	-20.3
0.70	5.8	1.0	3.4	3.2	3.38	-6.5	30.0	0.9	12.9	6.05	-59.9	9.8	0.0	-19.4
0.77	5.9	1.2	3.3	3.7	3.45	-7.1	30.8	0.8	12.5	6.12	-61.8	8.3	0.0	-18.3
0.84	6.0	1.5	3.2	4.1	3.52	-7.9	31.7	0.8	11.9	6.19	-63.6	6.8	0.0	-17.0
0.91	6.1	1.8	3.2	4.5	3.59	-8.7	32.6	0.7	11.3	6.26	-65.4	5.6	0.0	-15.8
0.99	6.2	2.1	3.1	4.9	3.66	-9.3	33.3	0.7	10.8	6.33	-67.2	4.4	0.0	-14.2
1.06	6.3	2.5	3.0	5.4	3.73	-10.1	34.1	0.7	10.0	6.40	-68.9	3.4	0.0	-12.7
1.13	6.4	2.9	3.0	5.8	3.80	-10.8	34.7	0.6	9.4	6.47	-70.8	2.4	0.0	-11.0
1.20	6.5	3.3	2.9	6.3	3.87	-11.5	35.3	0.6	8.5	6.54	-72.7	1.6	0.0	-9.0
1.27	6.6	3.8	2.8	6.7	3.94	-12.3	35.9	0.5	7.7	6.62	-74.4	1.0	0.0	-7.2
1.34	6.8	4.3	2.7	7.2	4.01	-13.0	36.4	0.5	6.9	6.69	-76.3	0.5	0.0	-5.0
1.41	6.9	4.8	2.7	7.7	4.08	-13.7	36.9	0.5	5.9	6.76	-78.0	0.2	0.0	-2.9
1.48	7.0	5.3	2.6	8.2	4.15	-14.5	37.3	0.4	4.9	6.83	-79.9	0.0	0.0	-0.5
1.55	7.1	5.9	2.5	8.7	4.22	-15.1	37.6	0.4	3.9	6.90	-81.7	0.0	0.0	0.0
1.62	7.2	6.5	2.5	9.2	4.29	-15.9	37.8	0.4	2.7	6.97	-83.4	0.0	0.0	0.0
1.69	7.3	7.2	2.4	9.7	4.36	-16.6	38.0	0.3	1.7	7.04	-85.3	0.0	0.0	0.0
1.76	7.4	7.9	2.3	10.2	4.43	-17.3	38.1	0.3	0.4	7.11	-87.2	0.0	0.0	0.0
1.83	7.5	8.6	2.3	10.7	4.50	-18.1	38.0	0.3	-1.3	7.18	-88.9	0.0	0.0	0.0
1.90	7.6	9.4	2.2	11.3	4.57	-18.8	37.9	0.2	-3.1	7.25	-90.8	0.0	0.0	0.0
1.97	7.7	10.2	2.1	11.8	4.64	-19.5	37.6	0.2	-5.0	7.32	-92.5	0.0	0.0	0.0
2.04	7.4	11.1	2.0	12.3	4.72	-20.3	37.1	0.2	-6.9	7.39	-94.4	0.0	0.0	0.0
2.11	6.6	12.0	2.0	12.9	4.79	-21.0	36.5	0.2	-8.5	7.46	-96.2	0.0	0.0	0.0
2.18	5.9	12.8	1.9	13.3	4.86	-21.7	35.7	0.2	-10.3	7.53	-98.0	0.0	0.0	0.0
2.25	5.2	13.8	1.8	13.7	4.93	-22.4	34.9	0.1	-11.8	7.60	-99.8	0.0	0.0	0.0
2.32	4.5	14.7	1.8	14.0	5.00	-23.2	33.9	0.1	-13.5	7.67	-101.7	0.0	0.0	0.0
2.39	3.7	15.8	1.7	14.3	5.07	-23.9	32.7	0.1	-15.1	7.74	-103.4	0.0	0.0	0.0
2.46	3.0	16.8	1.7	14.5	5.14	-24.6	31.6	0.1	-16.5	7.81	-105.3	0.0	0.0	0.0
2.53	2.3	17.8	1.6	14.7	5.21	-25.3	30.2	0.1	-18.0	7.88	-107.0	0.0	0.0	0.0
2.60	1.5	18.8	1.5	14.8	5.28	-26.0	28.8	0.1	-19.3	7.95	-354.5	0.0	0.0	0.0

AZ19-700 S430GP

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Client: AZ19-700 S430
 Page: 2
 Date: 5.1.23
 Sheet: AZ19-700 S430GP
 Pressure: Rankine
 FOS: 2.0
 Toe: Cantilever

Input Data

Depth Of Excavation = 2.00 m Depth Of Active Water = 0.50 m Water Density = 10.00 kN/m³
 Surcharge = 8.0 kN/m² Depth Of Passive Water = 0.50 m Minimum Fluid Density = 5.00 kN/m³

Soil Profile

Depth (m)	Soil Name	γ (kN/m ³)	γ' (kN/m ³)	C (kN/m ²)	C_a (kN/m ²)	ϕ (°)	δ (°)	K_a	K_{ac}	K_p	K_{pc}
0.00	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
1.50	Arena Limosa Parda Clara	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00
5.50	Arena Limosa Fina Gris Oscura	17.50	7.50	0.0	0.0	35.0	23.3	0.27	0.00	3.70	0.00
17.50	Arena Limosa Gris Oscura	14.30	4.30	0.0	0.0	28.0	18.6	0.36	0.00	2.76	0.00

Solution

Sheet

Sheet Name	I (cm ⁴ /m)	E (kN/m ²)	Z (cm ³ /m)	f (N/mm ²)	Maximum Bending Moment (kNm/m)	Upstand (m)	Toe (m)	Pile Length (m)
AZ19-700 S430GP	55130.0	2.1E+08	2620.0	279.0	731.0	0.00	5.95	7.95

Maxima

	Maximum	Depth
Bending Moment	38.1 kNm/m	4.46 m
Deflection	4.1 mm	0.00 m
Pressure	7.8 kN/m ²	2.00 m
Shear Force	23.4 kN/m	5.50 m

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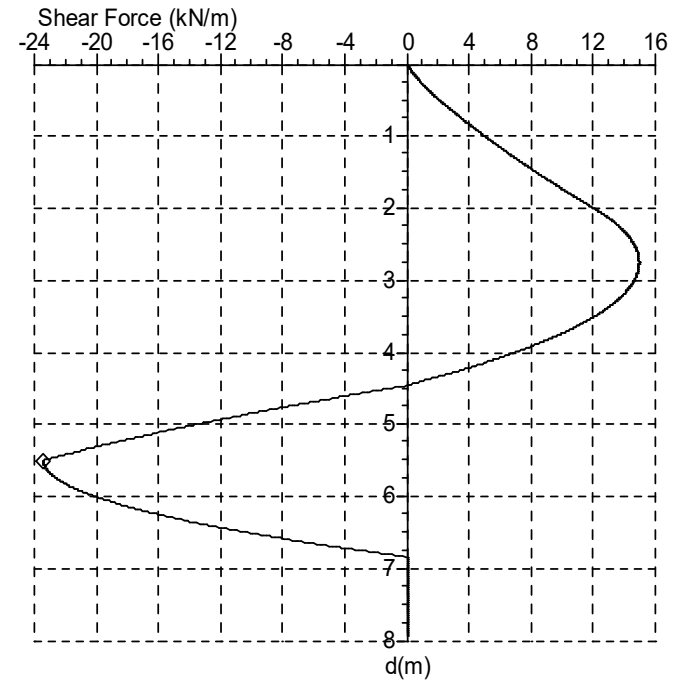
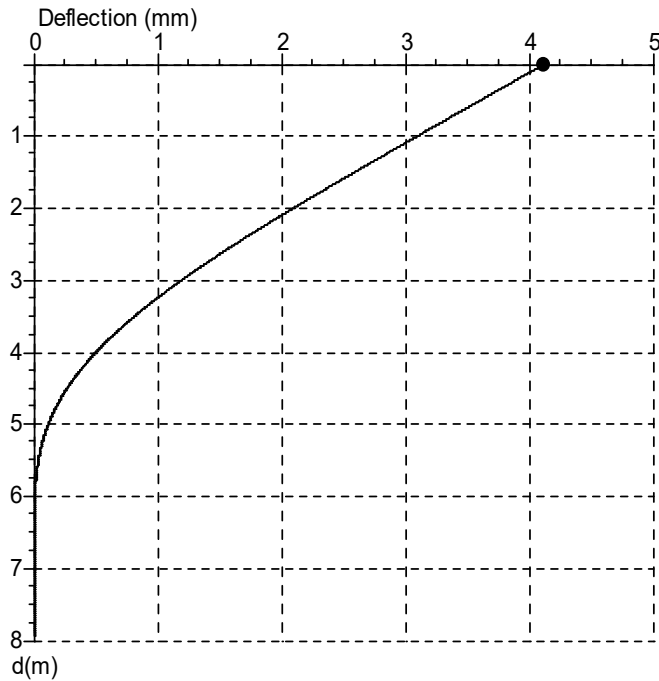
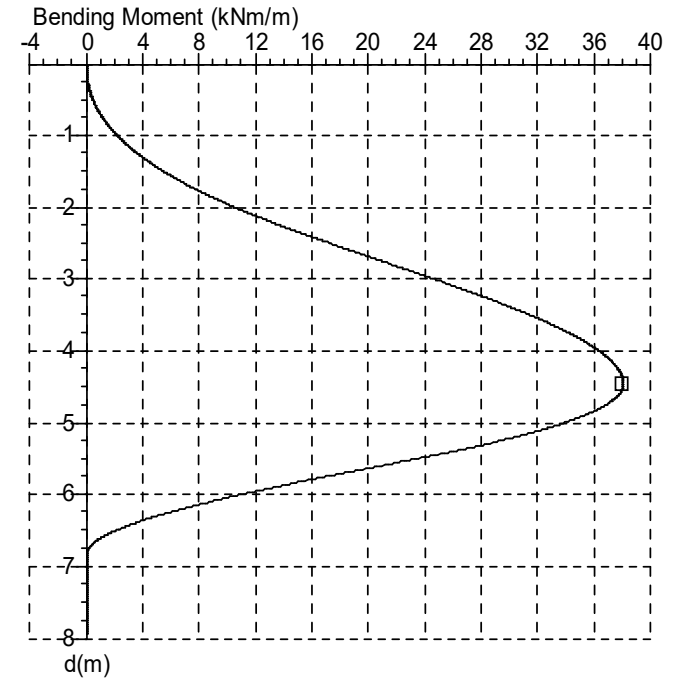
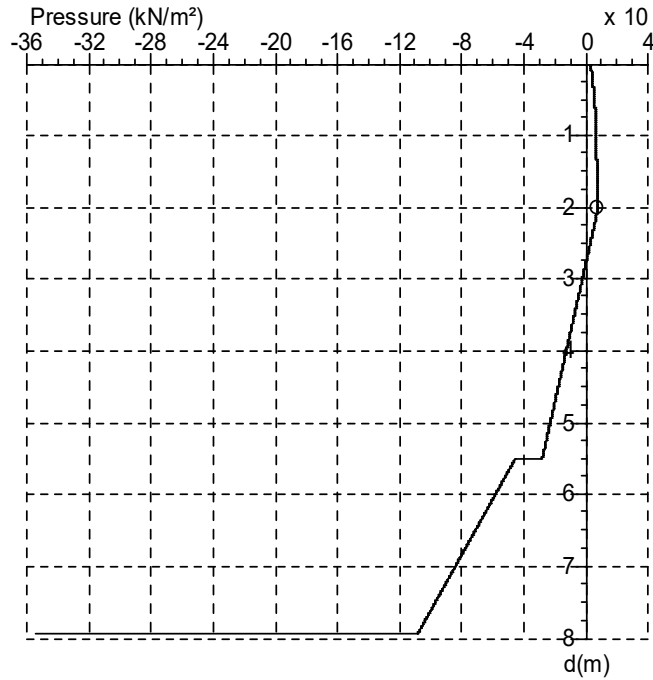
Sheet: AZ19-700 S430GP

Pressure: Rankine

FOS: 2.0

Toe: Cantilever

	Maximum	d (m)
○	7.8 kN/m ²	2.00
□	38.1 kNm/m	4.46
◇	23.4 kN/m	5.50
●	4.1 mm	0.00



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Client: AZ19-700 S430
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Date: 5.1.23
Sheet: AZ19-700 S430GP
Pressure: Rankine
FOS: 2.0
Toe: Cantilever

depth (m)	P (kN/m²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m²)	M (kNm/m)	D (mm)	F (kN/m)	depth (m)	P (kN/m²)	M (kNm/m)	D (mm)	F (kN/m)
0.00	2.9	0.0	4.1	0.0	2.67	0.8	19.9	1.5	14.9	5.35	-26.8	27.2	0.1	-20.7
0.07	3.3	0.0	4.0	0.2	2.74	0.1	20.9	1.4	14.9	5.42	-27.5	25.4	0.0	-22.0
0.14	3.6	0.0	4.0	0.5	2.81	-0.6	22.0	1.3	14.9	5.49	-28.2	23.8	0.0	-23.2
0.21	4.0	0.1	3.9	0.7	2.89	-1.3	23.0	1.3	14.9	5.56	-47.3	21.8	0.0	-23.4
0.28	4.3	0.1	3.8	1.0	2.96	-2.1	24.1	1.2	14.7	5.63	-49.1	19.9	0.0	-23.2
0.35	4.7	0.2	3.7	1.3	3.03	-2.8	25.1	1.2	14.6	5.70	-50.8	18.2	0.0	-22.9
0.42	5.1	0.3	3.7	1.7	3.10	-3.5	26.1	1.1	14.4	5.77	-52.7	16.4	0.0	-22.4
0.49	5.4	0.4	3.6	2.0	3.17	-4.3	27.1	1.1	14.1	5.84	-54.4	14.7	0.0	-21.9
0.56	5.6	0.6	3.5	2.4	3.24	-5.0	28.0	1.0	13.8	5.91	-56.3	13.0	0.0	-21.2
0.63	5.7	0.8	3.5	2.9	3.31	-5.7	29.0	0.9	13.4	5.98	-58.2	11.3	0.0	-20.3
0.70	5.8	1.0	3.4	3.2	3.38	-6.5	30.0	0.9	12.9	6.05	-59.9	9.8	0.0	-19.4
0.77	5.9	1.2	3.3	3.7	3.45	-7.1	30.8	0.8	12.5	6.12	-61.8	8.3	0.0	-18.3
0.84	6.0	1.5	3.2	4.1	3.52	-7.9	31.7	0.8	11.9	6.19	-63.6	6.8	0.0	-17.0
0.91	6.1	1.8	3.2	4.5	3.59	-8.7	32.6	0.7	11.3	6.26	-65.4	5.6	0.0	-15.8
0.99	6.2	2.1	3.1	4.9	3.66	-9.3	33.3	0.7	10.8	6.33	-67.2	4.4	0.0	-14.2
1.06	6.3	2.5	3.0	5.4	3.73	-10.1	34.1	0.7	10.0	6.40	-68.9	3.4	0.0	-12.7
1.13	6.4	2.9	3.0	5.8	3.80	-10.8	34.7	0.6	9.4	6.47	-70.8	2.4	0.0	-11.0
1.20	6.5	3.3	2.9	6.3	3.87	-11.5	35.3	0.6	8.5	6.54	-72.7	1.6	0.0	-9.0
1.27	6.6	3.8	2.8	6.7	3.94	-12.3	35.9	0.5	7.7	6.62	-74.4	1.0	0.0	-7.2
1.34	6.8	4.3	2.7	7.2	4.01	-13.0	36.4	0.5	6.9	6.69	-76.3	0.5	0.0	-5.0
1.41	6.9	4.8	2.7	7.7	4.08	-13.7	36.9	0.5	5.9	6.76	-78.0	0.2	0.0	-2.9
1.48	7.0	5.3	2.6	8.2	4.15	-14.5	37.3	0.4	4.9	6.83	-79.9	0.0	0.0	-0.5
1.55	7.1	5.9	2.5	8.7	4.22	-15.1	37.6	0.4	3.9	6.90	-81.7	0.0	0.0	0.0
1.62	7.2	6.5	2.5	9.2	4.29	-15.9	37.8	0.4	2.7	6.97	-83.4	0.0	0.0	0.0
1.69	7.3	7.2	2.4	9.7	4.36	-16.6	38.0	0.3	1.7	7.04	-85.3	0.0	0.0	0.0
1.76	7.4	7.9	2.3	10.2	4.43	-17.3	38.1	0.3	0.4	7.11	-87.2	0.0	0.0	0.0
1.83	7.5	8.6	2.3	10.7	4.50	-18.1	38.0	0.3	-1.3	7.18	-88.9	0.0	0.0	0.0
1.90	7.6	9.4	2.2	11.3	4.57	-18.8	37.9	0.2	-3.1	7.25	-90.8	0.0	0.0	0.0
1.97	7.7	10.2	2.1	11.8	4.64	-19.5	37.6	0.2	-5.0	7.32	-92.5	0.0	0.0	0.0
2.04	7.4	11.1	2.0	12.3	4.72	-20.3	37.1	0.2	-6.9	7.39	-94.4	0.0	0.0	0.0
2.11	6.6	12.0	2.0	12.9	4.79	-21.0	36.5	0.2	-8.5	7.46	-96.2	0.0	0.0	0.0
2.18	5.9	12.8	1.9	13.3	4.86	-21.7	35.7	0.2	-10.3	7.53	-98.0	0.0	0.0	0.0
2.25	5.2	13.8	1.8	13.7	4.93	-22.4	34.9	0.1	-11.8	7.60	-99.8	0.0	0.0	0.0
2.32	4.5	14.7	1.8	14.0	5.00	-23.2	33.9	0.1	-13.5	7.67	-101.7	0.0	0.0	0.0
2.39	3.7	15.8	1.7	14.3	5.07	-23.9	32.7	0.1	-15.1	7.74	-103.4	0.0	0.0	0.0
2.46	3.0	16.8	1.7	14.5	5.14	-24.6	31.6	0.1	-16.5	7.81	-105.3	0.0	0.0	0.0
2.53	2.3	17.8	1.6	14.7	5.21	-25.3	30.2	0.1	-18.0	7.88	-107.0	0.0	0.0	0.0
2.60	1.5	18.8	1.5	14.8	5.28	-26.0	28.8	0.1	-19.3	7.95	-354.5	0.0	0.0	0.0

AZ19-700 S430GP

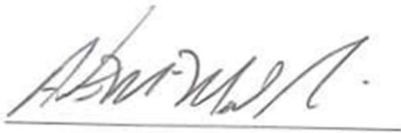
SPW911, v2.40

	<p style="text-align: center;">PROYECTO:</p> <p style="text-align: center;">DISEÑO ESTRUCTURAL SALIDAS TUBERÍA SISTEMA CONDENSACIÓN DT SAN FRANCISCO.</p>	
<p>FECHA DE REVISION</p> <p>ENERO DEL 2023</p>	<p style="text-align: center;">MEMORIAS DE CALCULO TABLESTACAS</p> <p style="text-align: center;">BUZ-SER-DT-001-2022</p>	<p>ELABORO: A. MERLANO</p> <p>REVISO: K. MATTOS</p> <p>APROBO: J. PORTO</p>

6. CONCLUSION

A partir de los resultados expuestos previamente se llegó a la siguiente conclusión:

La tablestaca AZ19-700 de 8 m de longitud presenta una deformación máxima de 4.1mm para el caso de aguas mínimas y 2.1mm para el caso de aguas máximas en la parte superior de la tablestaca. Dicha deformación se encuentra dentro un rango aceptable y por tanto no representa un inconveniente para la vida útil de la tablestaca. Es importante destacar que dicha tablestaca tiene un factor de seguridad de 2 contra la rotación del elemento en su zona más baja y por tanto su aplicación como obra de protección es aceptable y fiable.



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