Tuper Steel Pipe Piles with Quick Connection

We transform steel,
and steel transforms you.

Tuper

Tuper

Over 50 years transforming steel and conducting solutions.

Tuper has great capacity to transform steel into solutions for several applications.

- **One of the largest** steel processors in Brazil
- **826 thousand tons** of productive capacity
- **3 industrial plants** of 120 thousand m² in total
- **Over 20 distribution centers** nationwide

Acting in line with global trends in technologies, processes and standards.
Commitment to quality in all stages of the production process, starting with rigorous analyses of the mechanical and chemical properties of raw material, to ensure delivery of the product according to specification required by the project.
Partnership with national and international universities and leading technology companies worldwide.

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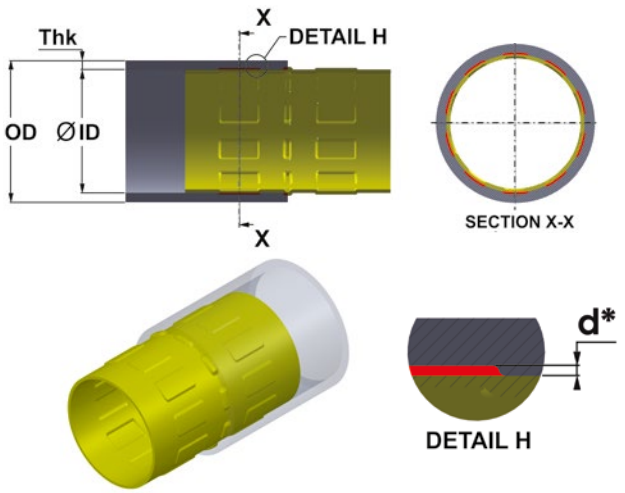
TUPER STEEL PIPE PILES WITH QUICK CONNECTION

Tuper steel pipe piles use an innovative joint concept - quick connect couplings - eliminating the need for welding and thus speeding up the driving process.

Piles are manufactured of carbon steel with a minimum yield strength of 310 MPa and comply with the requirements of ASTM A252: 2019 - Grade 3.

Tuper Quick Connection brings features that make the site work economical and efficient when reducing the pile driving time and increasing productivity. This result is achieved because a custom-designed coupling is used in the pile joint, which is easy to handle and is manufactured according to high precision dimensional tolerances that create a reliable interface strength. During pile driving, once pipe pile and coupling are positioned and aligned, the connection occurs by interface forces created from the energy of the pile driver's hit, so the hammer is recommended to have a mass of 2.5 tons or greater. The loads are transferred through direct contact with the pipe pile inner surface and high friction – "cold weld" type – generated when compressing the coupling. Compression is fully transmitted, while bending and tensile stresses have had their rupture limits determined through tests. At the designer's discretion, pipe piles that use the Quick Connection and will be filled with concrete can be reinforced with rebars. The couplings are supplied in three sizes, one for each pile diameter: 219 mm (8-5/8"), 244 mm (9-5/8") and 339 mm (13-3/8"), for any wall thickness.



Load tests were carried out on distinct types of soil, alternating the pile driving depth values.

COMPETITIVE ADVANTAGES

- Weld-free, eliminating the need for equipment and welders;
- Reduction in pile driving time, increasing the productivity (up to 2 times faster);
- Only 2 workers required in the driving process;
- Possibility of use in geothermal systems;
- High base resistance;
- Possibility of withstanding higher loads when compared to other types of piles;
- Symetrical inertia;
- Allows site work to continue on rainy days;
- Great depths and the ability to outbreak compact soil layers;
- Greater safety of the joint due to its cold quick connection and larger contact area.

GEOMETRIC PROPERTIES

PIPE PILE			GEOMETRIC PROPERTIES OF TUPER PIPE PILE'S CROSS SECTION									
			Full section, no corrosion									
Ø	Thick.	Weight	Internal Ø	Flat Area	Concrete Area	Steel Area	External Perim.	Inertia	Resist. Module	Turning Radius	Local Buckling	
D	t		d	A	A_c	A'_s	U	$I_x = I_y$	$W_x = W_y$	r	D'/t'	Q
mm	mm	kg/m	mm	cm²	cm²	cm²	cm	cm⁴	cm³	cm	-	-
Ø 219 (8-5/8")	6,35	33,3	206,4	377	335	42,4	69	2.403	219	7,53	35	1,00
	8,00	41,6	203,1	377	324	53,1	69	2.960	270	7,47	27	1,00
	9,50	49,1	200,1	377	314	62,6	69	3.442	314	7,42	23	1,00
	11,20	57,4	196,7	377	304	73,2	69	3.964	362	7,36	20	1,00
	12,50	63,7	194,1	377	296	81,1	69	4.345	397	7,32	18	1,00
Ø 244 (9-5/8")	6,35	37,3	231,8	469	422	47,5	77	3.370	276	8,42	39	1,00
	8,00	46,7	228,5	469	410	59,4	77	4.159	340	8,37	31	1,00
	9,50	55,1	225,5	469	399	70,1	77	4.848	397	8,31	26	1,00
	11,20	64,4	222,1	469	387	82,1	77	5.596	458	8,26	22	1,00
	12,50	71,5	219,5	469	378	91,1	77	6.146	503	8,21	20	1,00
Ø 339 (13-3/8")	6,35	52,2	327,0	906	840	66,5	107	9.240	544	11,79	53	1,00
	8,00	65,4	323,7	906	823	83,4	107	11.472	675	11,73	42	1,00
	9,50	77,4	320,7	906	808	98,5	107	13.442	791	11,68	36	1,00
	11,20	90,7	317,3	906	791	115,6	107	15.609	919	11,62	30	1,00
	12,50	100,9	314,7	906	778	128,5	107	17.220	1.014	11,58	27	1,00

PIPE PILE			GEOMETRIC PROPERTIES OF TUPER PIPE PILE'S CROSS SECTION					
			Reduced by corrosion = 1 mm					
Ø	Thick.	Weight	Steel Area	Inertia	Resist. Module	Turning Radius	Local Buckling	
D	t		A'_s	$I_x = I_y$	$W_x = W_y$	r	D'/t'	Q
mm	mm	kg/m	cm²	cm⁴	cm³	cm	-	-
Ø 219 (8-5/8")	6,35	33,3	35,6	1.996	184	7,49	41	1,00
	8,00	41,6	46,2	2.552	235	7,43	31	1,00
	9,50	49,1	55,7	3.035	280	7,38	26	1,00
	11,20	57,4	66,3	3.556	328	7,32	21	1,00
	12,50	63,7	74,3	3.937	363	7,28	19	1,00
Ø 244 (9-5/8")	6,35	37,3	39,9	2.803	231	8,39	45	1,00
	8,00	46,7	51,8	3.593	296	8,33	35	1,00
	9,50	55,1	62,5	4.281	353	8,28	29	1,00
	11,20	64,4	74,4	5.030	415	8,22	24	1,00
	12,50	71,5	83,4	5.579	460	8,18	21	1,00
Ø 339 (13-3/8")	6,35	52,2	55,9	7.715	457	11,75	63	1,00
	8,00	65,4	72,7	9.946	589	11,69	48	1,00
	9,50	77,4	87,9	11.916	706	11,64	40	1,00
	11,20	90,7	104,9	14.084	834	11,58	33	1,00
	12,50	100,9	117,9	15.695	929	11,54	29	1,00

PIPE PILE			GEOMETRIC PROPERTIES OF TUPER PIPE PILE'S CROSS SECTION					
			Reduced by corrosion = 1.5 mm					
Ø	Thick.	Weight	Steel Area	Inertia	Resist. Module	Turning Radius	Local Buckling	
D	t		A'_s	$I_x = I_y$	$W_x = W_y$	r	D'/t'	Q
mm	mm	kg/m	cm²	cm⁴	cm³	cm	-	-
Ø 219 (8-5/8")	6,35	33,3	32,2	1.796	166	7,47	45	1,00
	8,00	41,6	42,8	2.353	218	7,41	33	1,00
	9,50	49,1	52,3	2.835	262	7,36	27	1,00
	11,20	57,4	62,9	3.357	311	7,31	22	1,00
	12,50	63,7	70,9	3.738	346	7,26	20	1,00
Ø 244 (9-5/8")	6,35	37,3	36,1	2.525	209	8,37	50	1,00
	8,00	46,7	48,0	3.314	275	8,31	37	1,00
	9,50	55,1	58,7	4.003	332	8,26	30	1,00
	11,20	64,4	70,6	4.751	394	8,20	25	1,00
	12,50	71,5	79,6	5.301	439	8,16	22	1,00
Ø 339 (13-3/8")	6,35	52,2	50,6	6.962	414	11,73	69	1,00
	8,00	65,4	67,4	9.193	546	11,68	52	1,00
	9,50	77,4	82,6	11.164	663	11,62	42	1,00
	11,20	90,7	99,6	13.331	792	11,57	35	1,00
	12,50	100,9	112,6	14.942	888	11,52	31	1,00

PIPE PILE			GEOMETRIC PROPERTIES OF TUPER PIPE PILE'S CROSS SECTION					
			Reduced by corrosion = 2 mm					
Ø	Thick.	Weight	Steel Area	Inertia	Resist. Module	Turning Radius	Local Buckling	
D	t		A'_s	$I_x = I_y$	$W_x = W_y$	r	D'/t'	Q
mm	mm	kg/m	cm²	cm⁴	cm³	cm	-	-
Ø 219 (8-5/8")	6,35	33,3	28,8	1.600	149	7,45	49	1,00
	8,00	41,6	39,4	2.156	200	7,40	36	1,00
	9,50	49,1	48,9	2.639	245	7,34	29	1,00
	11,20	57,4	59,5	3.160	294	7,29	23	1,00
	12,50	63,7	67,5	3.541	329	7,24	20	1,00
Ø 244 (9-5/8")	6,35	37,3	32,3	2.250	187	8,35	55	1,00
	8,00	46,7	44,2	3.040	253	8,29	40	1,00
	9,50	55,1	54,9	3.728	310	8,24	32	1,00
	11,20	64,4	66,8	4.477	372	8,18	26	1,00
	12,50	71,5	75,9	5.026	418	8,14	23	1,00
Ø 339 (13-3/8")	6,35	52,2	45,3	6.216	370	11,72	77	0,984
	8,00	65,4	62,1	8.447	503	11,66	56	1,00
	9,50	77,4	77,3	10.418	621	11,61	45	1,00
	11,20	90,7	94,4	12.585	750	11,55	36	1,00
	12,50	100,9	107,3	14.196	846	11,50	32	1,00

STEEL PIPE PILE FILLED WITH CONCRETE

Tuper steel pipe piles can be filled with concrete to increase their structural load capacity, offering an economic advantage over regular steel piles and reducing design-related risks. The gains in structural strength begin at +50% for 244 mm piles and reach a gain of +100% in 339 mm piles (6,5 mm wall).

Filling the pipe piles with concrete also provides other advantages, such as the possibility of adding internal reinforcement elements to withstand high tensile stresses (resulting from bending moment or design boundary conditions), ease of connection with the blocks and reduction in the puncturing effect between block and pipe pile. The concrete-filled steel pipe piles that showed better economic viability are the thinner ones, i.e., those starting at the thickness of 6,35 mm (1/4"), which showed good driving performance during tests and were technically approved. In specific cases of compact soil layers - which have to be broken through - high driving forces may arise, but this is overcome easily by slightly increasing the wall thickness to 8,0 mm, e.g.

The filled piles must be driven with the leading end closed to ensure there is a gain of resistance in this point and, consequently, an increase in geotechnical capacity. Another positive aspect is that the driving and concreting activities can be done separately at the site, thus eliminating some logistical setbacks caused by simultaneous operations.

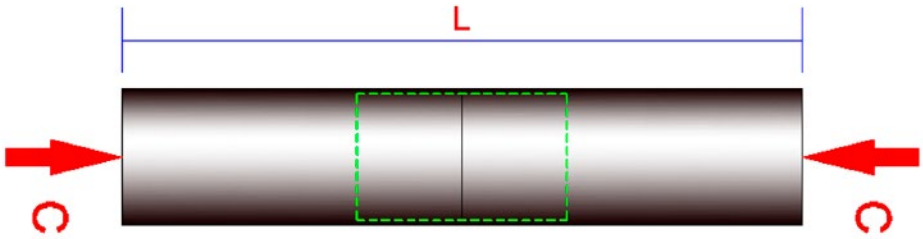
ALLOWABLE LOAD (tf) Theoretical weight (kg/m)	Steel Pipe, F_y = 310 MPa			Steel Pipe 310 MPa + Concrete 30 MPa			Steel Pipe 310 MPa + Concrete 40 MPa		
	Ø219	Ø244	Ø339	Ø219	Ø244	Ø339	Ø219	Ø244	Ø339
6,35	**66**	**74**	**104**	**110**	**130**	**215**	**125**	**148**	**251**
	33,3	37,3	52,2	33,3+80	37,3+101	52,2+202	33,3+80	37,3+101	52,2+202
8,00	**85**	**95**	**134**	**128**	**150**	**243**	**142**	**167**	**278**
	41,3	46,3	64,9	41,2+78	46,3+98	64,9+198	41,2+78	46,3+98	64,9+198
9,50	**104**	**116**	**164**	**145**	**169**	**271**	**159**	**186**	**305**
	49,2	55,2	77,5	49,2+75	55,1+96	77,5+194	49,2+75	55,1+96	77,5+194
11,20	**123**	**138**	**195**	**163**	**189**	**300**	**176**	**206**	**334**
	57,4	64,4	90,7	57,4+73	64,4+93	90,7+190	57,4+73	64,4+93	90,7+190
12,50	**138**	**155**	**219**	**177**	**205**	**322**	**190**	**221**	**355**
	63,7	71,5	100,9	63,7+71	71,5+90	100,9+186	63,7+71	71,5+90	100,9+186

Values calculated for axial compression, under the following conditions:
I) Assumed safety factor = 1.65
II) Corrosion thickness = 1,0 mm
III) Steel yield limit of 310 MPa
Load capacity only valid for fully driven piles.

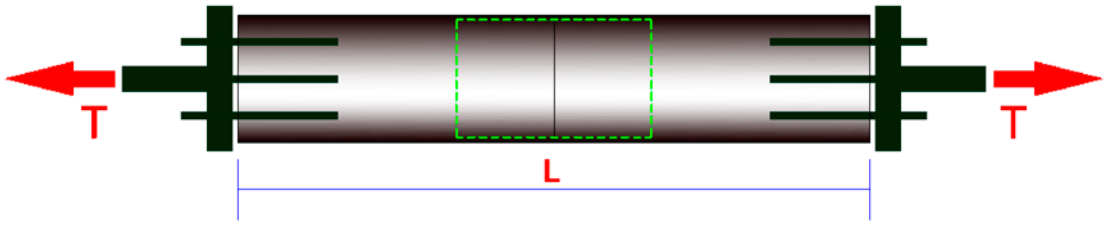
Load capacity of piles filled with concrete according to Annex P of NBR 8800 for mixed structures.
The concrete consumption per meter of Tuper steel pipe pile is:
Ø 219 = consumption of 0,033 m³/m
Ø 244 = consumption of 0,042 m³/m
Ø 339 = consumption of 0,084 m³/m

The use of steel pipe piles in geothermal heat exchange systems is an environmental friendly technology that reduces energy consumption in temperature controlled buildings and applications where heating/cooling water is desired.

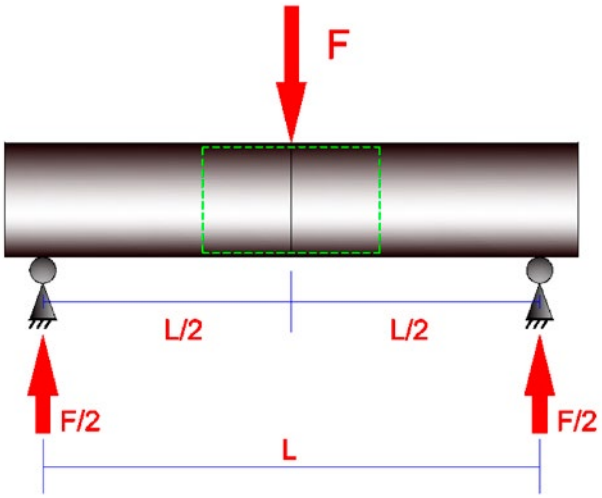
JOINT TESTS



COMPRESSION							
Laboratory	PILE Type	Pile: OD x t (mm)	TEST RESULTS [kN]		Maximum allowable load on the manufacturer's chart		Test load / Manufacturer's Allowable
			Sample 1	Sample 2	tf	(kN)	
IPT LEME	Steel pipe	244 x 9,50	3374	3289	116	1138	2,89
		339 x 6,30	2190	2243	104	1020	2,15
		339 x 9,50	4081	4516	164	1609	2,54
	Steel pipe + concrete 30MPa	244 x 9,50	5047	5200	169	1658	3,04
		339 x 6,30	5198	5159	215	2109	2,45



TENSION				
Laboratory	PILE Type	Pile: OD x t (mm)	Results (kN)	
			Sample 1	Sample 2
IPT LEME	Steel pipe	244 x 9,50	312	249
		339 x 6,30	265	174
		339 x 9,50	420	436
	Steel pipe + concrete 30MPa	244 x 9,50	420	464
		339 x 6,30	411	377



BENDING						
Laboratory	PILE Type	Pile: OD x t (mm)	RESULTS OF THE CALCULATED BENDING [kN*m]			
			Bending at the start of deformation		Maximum Bending Strength	
			Sample 1	Sample 2	Sample 1	Sample 2
IPT LEME	Steel pipe	244 x 9,50	50	80	89	92
		339 x 6,30	51	46	87	88
		339 x 9,50	87	94	112	108
	Steel pipe + concrete 30MPa	244 x 9,50	76	60	186	186
		339 x 6,30	110	77	177	202

Laboratory	PILE Type	Pile: OD x t (mm)	Allowable load on the manufacturer's chart		2% of allowable load	Load "F" applied in the Bending	
						Lowest result	Highest result
			tf	kN	kN	kN	kN
IPT LEME	Steel pipe	244 x 9,50	116	1138	23	274	283
		339 x 6,30	104	1020	20	266	272
		339 x 9,50	164	1609	32	333	390
	Steel pipe + concrete 30MPa	244 x 9,50	169	1658	33	572	572
		339 x 6,30	215	2109	42	545	621

Aforementioned results refer to the ultimate/break load. For the tests, no internal reinforcement was used in addition to concrete-filled samples.

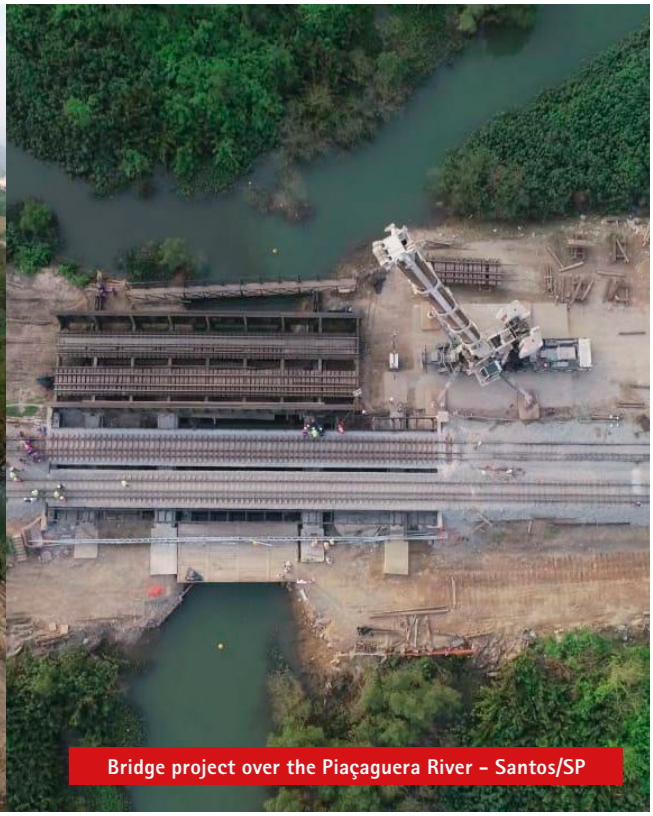
Note: all aforementioned loads were calculated according to the method determined by the Brazilian Standards ABNT NBR 6122 and ABNT NBR 8800. Equivalent Standards used in other countries may differ in methodology.

PORTFOLIO

Tuper steel pipe piles can be applied in various projects such as in foundation of residential and commercial buildings, warehouses of any size, bridges and several infrastructure projects.

Ranges of piles that have been already installed are as follows:

PIPES	Ø 219 mm | Ø 244 mm | Ø 339 mm
MOBILIZED LOAD	50 - 350 tf
DEPTHS	8 to 84m



Bridge project over the Piaçaguera River – Santos/SP

Logistics Warehouse – Santos Port – Santos/SP

Innovation center in sustainable construction – USP/CICS – São Paulo/SP

Logistics Warehouse – Santos Port – Santos/SP

Pulp and Paper Industry – São Paulo/SP

50 anos

TUPER S.A.

Av. Prefeito Ornith Bollmann, 1441

CEP 89288-900 ▪ São Bento do Sul ▪ SC ▪ Brazil

Phone: +55 47 3631 5000

tuper@tuper.com.br

tuper.com.br

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