

DOCUMENT Nº3

COST ESTIMATION

CURSO 2016-2017

TITULACIÓN: GRADO EN INGENIERÍA CIVIL

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1. INTRODUCTION

The purpose of the following document is an approximate cost estimate for the site preparation, supplies and construction of the two footbridges in Cuenca. For this aim the costs presented in the document “Base de precios de referencia de la dirección general de carreteras” from January 2016 were adopted in order to obtain an accurate assessment.

In addition, this document defines the scope of the project and its economic value.

The document is divided into a price list, a quantity take-off and a cost estimation.

2. PRICE LIST

PARAGRAPH 01: EARTHWORKS

CODE	DESCRIPTION	UNIT	COST PER UNIT in €
U1	GRUBBING AND TERRAIN CLEARANCE	m ²	0,58
	Grubbing and terrain clearance with mechanical equipment, including stump clearance, uprooting, loading and transport to a disposal site up to 60km away		
	FIFTY-EIGHT CENTS		
U2	EXCAVATION OF THE FOUNDATION DITCH	m ³	6,63
	Excavation of the foundation ditch with mechanical equipment of any type of soil, considering ditches and foundations up to 6m deep and up to 3m wide, including trench shoring system, drainage during the execution, clearance of the detachments, loading and transport to a designated place up to 10km away		
	SIX EUROS AND SIXTY-THREE CENTS		
U3	ROCKFILL DAM	m ³	32,85
	200/400 kg rockfill dam used for drainage elements, fluvial protection, foundations for walls and other structures		
	THIRTY-TWO EUROS AND EIGHTY-FIVE CENTS		
U4	FILL-IN WITH THE EXCAVATED SOIL	m ³	1,09
	Embankment or fill-in with soil originated from the excavation, including spreading, moistening, leveling, compaction, finishing and refining the slopes		
	ONE EURO AND NINE CENTS		

PARAGRAPH 02: CRANES

CODE	DESCRIPTION	UNIT	COST PER UNIT in €
U5	CRANE 1	h	400
	Liebherr LTM 1300 6.2, including rental, operation, approx. price		
	FOUR HUNDRED EUROS		

CODE	DESCRIPTION	UNIT	COST PER UNIT in €	SUBPARAGRAPH 03.2: DRAINAGE			
U6	CRANE 2 Liebherr LTM 1070 4.2, including rental, operation, approx. price TWO HUNDRED EUROS	h	200	CODE	DESCRIPTION	UNIT	COST PER UNIT in €
PARAGRAPH 03: FOUNDATIONS				U11	DRAINAGE PIPE PVC drainage pipe with 150mm diameter, on a 10cm sand bed, up to 25cm fill-in with sand above the pipe, including placement and installation THIRTEEN EUROS AND FIFTY CENTS	m	13,50
SUBPARAGRAPH 03.1: FOOTINGS				U12	FILL-IN WITH FILTER MATERIAL Fill-in of the ditch for drainage with granular material type silica gravel with 20 to 40mm grain size and polypropylene filter with a minimum weight of 80g/m ² , for all permeabilities TWENTY-ONE EUROS AND EIGHT CENTS	m ³	21,08
U7	BLINDING CONCRETE Blinding concrete HL-150 for foundations slabs or small works including placing on site FIFTY-ONE EUROS AND SEVENTY-TWO CENTS	m ³	51,72				
U8	STRUCTURAL CONCRETE HA-25 Structural concrete HA-25 for foundations, piling, retaining walls, bearing plates and pavements, including production, transport, pouring, vibrating and curing EIGHTY-EIGHT EUROS AND TWELVE CENTS	m ³	88,12				
U9	FORMWORK Formwork for hidden elements and its subsequent removal including cleaning, moistening, application of release agent and additional elements contributing to its stability and adequate execution TWENTY-SIX EUROS AND THIRTY CENTS	m ²	26,30				
U10	REINFORCEMENTS Ribbed steel reinforcing bars B500 S, for loose reinforcements, including cutting, bending, overlaps installation, cropping, tying with annealed wires and placing of separators NINETY-FOUR CENTS	kg	0,94				

PARAGRAPH 04: ABUTMENTS				PARAGRAPH 05: METAL STRUCTURE			
CODE	DESCRIPTION	UNIT	COST PER UNIT in €	CODE	DESCRIPTION	UNIT	COST PER UNIT in €
U13	STRUCTURAL CONCRETE HA-25	m ³	92,47	U18	STRUCTURAL STEEL	kg	3,02
	Structural concrete HA-25 for piles, abutments, beams, decks, slabs, walls and framing, including production, transport, pouring, vibrating and curing				Structural, laminated steel S355 J2G3 in sheets, including cutting, bending, welding, transport, placing on site, anti-corrosion protection, full installation		
	NINETY-TWO EUROS AND FORTY-SEVEN CENTS				THREE EUROS AND TWO CENTS		
U14	SUPPORT BEARING	dm ³	27,69				
	Neoprene rubber support bearing pads (standard, anchored or embossed), exchangeable, along with full installation, including leveling of the supports with special high resistant, self-leveling mortar						
	TWENTY-SEVEN EUROS AND SIXTY-NINE CENTS						
U15	ANCHOR BOLTS	kg	1,63				
	Steel anchor bolts S 275 JR, including supply, nut, counter nut, washers and installation						
	ONE EURO AND SIXTY-THREE CENTS						
U16	FORMWORK	m ²	26,30				
	Formwork for hidden elements and its subsequent removal including cleaning, moistening, application of release agent and additional elements contributing to its stability and adequate execution						
	TWENTY-SIX EUROS AND THIRTY CENTS						
U17	REINFORCEMENTS	kg	0,94				
	Ribbed steel reinforcing bars B500 S, for loose reinforcements, including cutting, bending, overlaps installation, cropping, tying with annealed wires and placing of separators						
	NINETY-FOUR CENTS						

PARAGRAPH 06: BRIDGE ACCESSORIES AND FINISHING			
SUBPARAGRAPH 06.1: BRIDGE ACCESSORIES			
CODE	DESCRIPTION	UNIT	COST PER UNIT in €
U19	EXPANSION JOINT	m	30,63
	Sealed expansion joint with watertight elastic ribbon, including installation		
	THIRTY EUROS AND SIXTY-THREE CENTS		
U20	HANDRAIL	m	25,16
	Handrail out of pine timber with 40x95mm profile, varnished, with metal supports for fixation, including installation		
	TWENTY-FIVE EUROS AND SIXTEEN CENTS		
U21	TIMBER DECKING	m ²	22,57
	Labor, cutting, coating, screws, installation		
	TWENTY-TWO EUROS AND FIFTY-SEVEN CENTS		
U22	TIMBER SLATS	unit	5,10
	Pine timber slats 9,5x2,1x300cm, treated and brushed		
	FIVE EUROS AND TEN		
U23	TIMBER BEAMS	unit	10,96
	Pine timber beams 9x9x200cm, treated and brushed		
	TEN EUROS AND NINETY-SIX CENTS		
U24	STEEL POST	m	133,92
	Railing post, stainless steel AISI 304, including welding, installation		
	ONE HUNDRED THIRTY-THREE EUROS AND NINETY-TWO CENTS		
U25	STEEL CABLE	m	1,20
	Cable for railing, stainless steel, 4mm diameter		
	ONE EURO TWENTY CENTS		

CODE	DESCRIPTION	UNIT	COST PER UNIT in €
U26	CABLE TERMINAL	unit	3,87
	Cable terminal, stainless steel, fit for 4mm cables		
	THREE EUROS AND EIGHTY-SEVEN CENTS		
U27	STEEL SUPPORT	unit	3,67
	Stainless steel load bearing supports, including welding and screwing		
	THREE EUROS AND SIXTY-SEVEN CENTS		
SUBPARAGRAPH 06.2: EMBANKMENTS			
U28	EMBANKMENT WITH POWDERED STONE	m ²	5,53
	Embankment with powdered stone, including supply, spreading, leveling, compaction		
	FIVE EUROS AND FIFTY-THREE CENTS		
U29	ROLLER-STAMPED CONCRETE	m ²	24,28
	Roller-stamped concrete HM-20/B/20/I, including production, installation, curing		
	TWENTY-FOUR EUROS AND TWENTY-EIGHT CENTS		
U30	COBBLESTONE	m ²	65,34
	Cobblestone with natural stones, with dimensions 8x8x5cm, on a sand bed, including leveling, compaction, installation		
	SIXTY-FIVE EUROS AND THIRTY-FOUR CENTS		
U31	CURB	m	21,45
	Concrete curb with dimensions 20x14cm, including concrete, installation		
	TWENTY-ONE EUROS AND FORTY-FIVE CENTS		

3. QUANTITY TAKE-OFF

The following quantities were estimated for each bridge separately:

PARAGRAPH 01: EARTHWORKS				
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U1	GRUBBING AND TERRAIN CLEARANCE	m ²		
			Island:	30m*10m
			Northern part:	25m*20m
			Southern part:	15m*15m
				Σ = 1025
U2	EXCAVATION OF THE FOUNDATION DITCH	m ³		
	Footbridge 2		4m*4m*3,5m*2	112
	Footbridge 1		3,5m*3,5m*3,5m*2	85,75
U3	ROCKFILL DAM	m ³		
	Footbridge 2		Northern riverbank:	(b*h*l)/2
			Southern riverbank:	(2m*4m*8m)/2
				32
				32
				Σ = 64
			Access for the crane:	200
				200
	Footbridge 1		Northern riverbank:	(b*h*l)/2
			Southern riverbank:	(2m*4m*8m)/2
				32
				32
				Σ = 64
U4	FILL-IN WITH THE EXCAVATED SOIL	m ³		
	Footbridge 2		82	82
	Footbridge 1		55,75	55,75

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY	
	Island		60	60	
PARAGRAPH 02: CRANES					
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY	
U5	CRANE 1	h			
			Operating hours:	8	8
U6	CRANE 2	h			
			Operating hours:	8	8
PARAGRAPH 03: FOUNDATIONS					
SUBPARAGRAPH 32.1: FOOTINGS					
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY	
U7	BLINDING CONCRETE	m³			
	Footbridge 2		3,5m*3,5m*0,1m*2	2,45	
	Footbridge 1		3,5m*3,5m*0,1m*2	2,45	
U8	STRUCTURAL CONCRETE HA-25	m³			
	Footbridge 2		30	30	
	Footbridge 1		30	30	

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U9	FORMWORK	m ²		
	Footbridge 2		53	53
	Footbridge 1		53	53
U10	REINFORCEMENTS	kg		
	Footbridge 2		650	650
	Footbridge 1		650	650

SUBPARAGRAPH 03.2: DRAINAGE

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U11	DRAINAGE PIPE	m		
	Footbridge 2		Northern foundation: Southern foundation:	4 4 Σ = 8
	Footbridge 1		Northern foundation: Southern foundation:	4 4 Σ = 8
U12	FILL-IN WITH FILTER MATERIAL	m ³		
	Footbridge 2		13,9	13,9
	Footbridge 1		13,9	13,9

PARAGRAPH 04: ABUTMENTS				
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U13	STRUCTURAL CONCRETE HA-25	m ³		
	Footbridge 2		2,3	2,3
	Footbridge 1		2,3	2,3
U14	SUPPORT BEARING	dm ³		
	Footbridge 2		2*2,31	4,62
	Footbridge 1		2*2,31	4,62
U15	ANCHOR BOLTS	kg		
	Footbridge 2		Northern foundation: Southern foundation:	2,4 2,4 Σ = 4,8
	Footbridge 1		Northern foundation: Southern foundation:	2,4 2,4 Σ = 4,8
U16	FORMWORK	m ²		
	Footbridge 2		20	20
	Footbridge 1		20	20
U17	REINFORCEMENTS	kg		
	Footbridge 2		60	60
	Footbridge 1		60	60

PARAGRAPH 05: METAL STRUCTURE				
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U18	STRUCTURAL STEEL	kg		
	Footbridge 2		Outer steel sheet: 4,296m ³ *7850kg/m ³ Transverse profiles and stiffening: 1,22m ³ *7850kg/m ³	33723,6 9626,06 Σ = 43349,66
	Footbridge 1		Outer steel sheet: 1,767m ³ *7850kg/m ³ Transverse profiles and stiffening: 0,194m ³ *7850kg/m ³	13868,56 1521,33 Σ = 15389,89

PARAGRAPH 06: BRIDGE ACCESSORIES AND FINISHING				
SUBPARAGRAPH 06.1: BRIDGE ACCESSORIES				
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U19	EXPANSION JOINT	m		
	Footbridge 2		On both ends: 2m*2	4
	Footbridge 1		On both ends: 2m*2	4
U20	HANDRAIL	m		
	Footbridge 2		33m*2	66
	Footbridge 1		16m*2	32
U21	TIMBER DECKING	m ²		
	Footbridge 2		33m*2m	66
	Footbridge 1		16m*2m	32

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U22	TIMBER SLATS	unit		
	Footbridge 2		209	209
	Footbridge 1		105	105
U23	TIMBER BEAMS	unit		
	Footbridge 2		66	66
	Footbridge 1		32	32
U24	STEEL POST	m		
	Footbridge 2		28	28
	Island		10	10
	Footbridge 1		20	20
U25	STEEL CABLE	m		
	Footbridge 2		500	500
	Island		100	100
	Footbridge 1		200	200
U26	CABLE TERMINAL	unit		
	Footbridge 2		56	56
	Island		14	14

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
	Footbridge 1		28	28
U27	STEEL SUPPORTS	unit		
	Footbridge 2		264	264
	Footbridge 1		128	128

SUBPARAGRAPH 06.2: EMBANKMENTS				
CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
U28	EMBANKMENT WITH POWDERED STONE	m ²		
	Footbridge 2		2,3m*2,5m	5,75
	Island		14m*2,3m	32,2
	Footbridge 1		2,3m*14m	32,2
U29	ROLLER-STAMPED CONCRETE	m ²		
	Footbridge 2		1m*2,3m*2	4,6
	Footbridge 1		1m*2,3m*2	4,6
U30	COBBLESTONE	m ²		
	Footbridge 2		16,5	16,5

CODE	DESCRIPTION	UNIT	MEASURING	QUANTITY
	Footbridge 1		16,5	16,5
U31	CURB	m		
	Footbridge 2		4,5	4,5
	Island		33	33
	Footbridge 1		26,5	26,5

4. COST ESTIMATION

With the previous price list and quantity take-off the following cost estimation was made:

PARAGRAPH 01: EARTHWORKS							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U1	GRUBBING AND TERRAIN CLEARANCE	m ²	650	375	0,58	377	217,5
U2	EXCAVATION OF THE FOUNDATION DITCH	m ³	112	85,75	6,63	742,56	568,53
U3	ROCKFILL DAM	m ³	264	64	32,85	8672,4	2102,4
U4	FILL-IN WITH THE EXCAVATED SOIL	m ³	112	85,75	1,09	122,08	93,47
						9914,04	2981,9
						12895,94	

PARAGRAPH 02: CRANE							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U5	CRANE	h	8	-	400	3200	-
U6	CRANE	h	-	8	200	-	1600
						3200	1600
						4800	

PARAGRAPH 03: FOUNDATIONS							
SUBPARAGRAPH 03.1: FOOTINGS							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U7	BLINDING CONCRETE	m ³	2,45	2,45	51,72	126,72	126,72
U8	STRUCTURAL CONCRETE HA-25	m ³	30	30	88,12	2643,6	2643,6
U9	FORMWORK	m ²	53	53	26,30	1393,9	1393,9
U10	REINFORCEMENTS	kg	650	650	0,94	611	611
						4775,22	4775,22
						9550,44	

SUBPARAGRAPH 03.2: DRAINAGE							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U11	DRAINAGE PIPE	m	8	8	13,50	108	108
U12	FILL-IN WITH FILTER MATERIAL	m ³	13,9	13,9	21,08	293,02	293,02
						401,02	401,02
						802,04	

PARAGRAPH 04: ABUTMENTS							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U13	STRUCTURAL CONCRETE HA-25	m ³	2,3	2,3	92,47	212,68	212,68
U14	SUPPORT BEARING	dm ³	4,62	4,62	27,69	127,93	127,93
U15	ANCHOR BOLTS	kg	4,8	4,8	1,63	7,83	7,83
U16	FORMWORK	m ²	20	20	26,30	526	526
U17	REINFORCEMENTS	kg	60	60	0,94	56,4	56,4
						930,84	930,84
						1861,68	

PARAGRAPH 05: METAL STRUCTURE							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U18	STRUCTURAL STEEL	kg	43349,66	15389,89	3,02	130915,97	46477,47
						130915,97	46477,47
						177393,44	

PARAGRAPH 06: BRIDGE ACCESSORIES AND FINISHING							
SUBPARAGRAPH 06.1: BRIDGE ACCESSORIES							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U19	EXPANSION JOINT	m	4	4	30,63	122,52	122,52
U20	HANDRAIL	m	66	32	25,16	1660,56	805,12

U21	TIMBER DECKING	m ²	66	32	22,57	1489,62	722,24
U22	TIMBER SLATS	unit	209	105	5,10	1065,9	535,5
U23	TIMBER BEAMS	unit	66	32	10,96	723,36	350,72
U24	STEEL POST	m	33	15	133,92	4419,36	2008,8
U25	STEEL CABLE	m	550	250	1,20	660	300
U26	CABLE TERMINAL	unit	63	35	3,87	243,81	135,45
U27	STEEL SUPPORT	unit	264	128	3,67	968,88	469,76
						11354,01	5450,11
						16804,12	

SUBPARAGRAPH 06.2: EMBANKMENTS							
CODE	DESCRIPTION	UNIT	QUANTITY		COST IN €	ESTIMATION	
			Bridge 2	Bridge 1		Bridge 2	Bridge 1
U28	EMBANKMENT WITH POWDERED STONE	m ³	21,85	48,3	5,53	120,83	267,099
U29	ROLLER-STAMPED CONCRETE	m ³	4,6	4,6	24,28	111,688	111,688
U30	COBBLESTONE	m ²	16,5	16,5	65,34	1078,11	1078,11
U31	CURB	m	21	43	21,45	450,45	922,35
						1761,08	2279,25
						4040,33	

Summarizing all paragraphs:

	Bridge 2	Bridge 1	TOTAL
PARAGRAPH 01: EARTHWORKS			
	9914,04	2981,9	12895,94
PARAGRAPH 02: CRANE			
	3200	1600	4800
PARAGRAPH 03: FOUNDATIONS			
	4775,22	4775,22	9550,44
PARAGRAPH 04: ABUTMENTS			
	930,84	930,84	1861,68
PARAGRAPH 05: METAL STRUCTURE			
	130915,97	46477,47	177393,44
PARAGRAPH 06: BRIDGE ACCESSORIES AND FINISHING			
	13115,09	7729,36	20844,45
	162851,16	64494,79	227345,95

Considering the taxes:

TOTAL of material execution:	227345,95 €
13% Overhead expenses	29554,98 €
6% Trade income tax	13640,78 €
	43195,76 €
TOTAL cost estimation without VAT:	270541,71 €
21% VAT:	56813.76 €
TOTAL COST ESTIMATION:	327355,47 €

The estimated costs for the execution of the designed footbridges are approximately THREE HUNDRED THIRTY THOUSAND EUROS.