

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXEC. TIME (*) (days)	R E M A R K S	
Hydroelectric Power Plant TIMPAGRANDE (Catanzaro) ITALY E.N.E.L.	1976	DE LIETO S.p.A.	DEGRADED GRANITE	124	2,13	90°	0,05	14	Penstock	
Oil Pipeline "Spluga" CASARGO (Como) ITALY S.N.A.M.	1977 "	SNAM PROGETTI	HARD GNEISS	84 93	1,55 1,55	60° 60°	0,3 0,25	5 10	Pipeline by-pass Varrone river	
Hydroelectric Power Plant ALBI (Catanzaro) ITALY	1977	SICALF S.p.A.	CRACK GRANITE	59 21	2,44 2,44	90° 90°	0 0	7 (°) 4	Water Supply Shafts (°) pilot hole start to 45 m. deep.into	
	1978	SELI S.r.l.	with QUARTZ. BANKS	208	2,13	90°	1,2	47	Penstock Penstock	
Hydroelectric Power Plant RIDRACOLI (Forlì) ITALY CONSORZIO ACQUE PER LE PROV.DI FORLI' E RAVENNA	1978 "	Association COGEFAR LODIGIANI C.M.C.	MARL and SANDSTONE	93 61	2,13 1,84	90° 90°	0,06 0	8 4	Inlet Sluice Shafts	
Hydroelectric Power Plant EDOLO (Brescia) ITALY E.N.E.L. Venezia	1978	CHINI & TEDESCHI	HARD SCHIST	91	2,13	90°	0	13	Surge Shaft	
	1978	ICOMECC	MICASCHIST	70	2,13	90°	0	8	Surge Shaft	
	1981		40	3,05	36°	0	(1) 25	Distributor Shaft 4x		
	1980		10	2,44	90°	0	(1) 2	10- (1) time for all		
	1978	FARSURA S.p.A.	MICASCHIST	321	2,13	46°	(1) 8,75	37	Penstock (1) devia- tion for crossover in degraded schist with bedding near the bore angle (2) following by hole-opener a di- rectional hole (3) drilling by mud and hole-opener. Casing first 57 m.	
	1979			313	2,13	47°	(2) 0	56		
	"			231	2,13	45°	4	32		
	"			147	2,13	48°	0,4	28		
	1980		(3)	SCHISTS	97	1,55	47°	0		45
	"		66		1,55	49°	0	14		
"	252		1,55		47°	1,45	46			
"	114		1,55		47°	0,25	12			
1981	"	80	1,55	47°	0	9				
"	"	96	1,55	47°	0	11				
Limestone Quarry SEDRINA (Bergamo) ITALY	1987	GHISALBERTI S.p.A.	LIMESTONE	145	3,68	74°	0,6	25	Rock blasted	
			70	3,68	74°	0	12	stocking well		
	1980	INDUSTRIALE CALCE S.p.A.	LIMESTONE	99	3,68	73°	0	27	Rock blasted stocking well	
Public Passenger Lift S. Devote Sq.-MONTECARLO PUBLIC WORKS P.to MONACO	1982	MARIOTTI	JURASSIC LIMESTONE	67	2,13	90°	0	9	Elevator shaft	
Municipal Water System CATANZARO - ITALY C A S M E Z	1980	DE LIETO S.p.A.	GRANITE	28	2,44	90°	0	6	Spillway Shaft	
Uranium Mines VALVEDELLO (Sondrio) ITALY NOVAZZA (Bergamo) ITALY	1980	CARIBONI S.p.A.	CONGLOMERATE	185	2,44	66°	2,28	28	Elevator Shaft	
	1982		HARD GNEISS- IGNIMBRITE	106	2,44	73°	0,9	19	Ventilation Shaft	
	1982	SIMUR	CONGLOMERATE	80	2,44	61°	0	22	Ore mined stocking	
Pyrite Mine CAMPANO (Grosseto) ITALY S O L M I N E	1980	SOLMINE S.p.A.	SANDSTONE	78	2,44	90°	0	4	Well for waste	
	1981		108	1,84	90°	0	13	Well for waste		
	"		100	3,68	90°	0	25	Elevator shaft		
	1987		184	1,05	90°	0,07	24	Cable, Compressed air		
"	"	241	1,05	90°	0,11	13	pumping pipeline			
Limestone Quarry CESANA B.ZA (Como) ITALY CEMENTERIA MERONE	1981	CARIBONI S.p.A.	LIMESTONE	195	2,44	67°	0,15	17	Rockblasted Stocking well	
TOTAL REAMED SHAFT'S LENGHT m. 										
4.357										
(*) from pilot hole start to reaming end only										

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Mine of Mixed Sulfides MONTEPONI (Cagliari) ITALY S A M I M	1982	SAMIM S.p.A.	DOLOMITE	365	3,68	90°	(1) 0	56	Lift ventilation shaft (1) following dia.4" directional hole by hole opener dia.12-1/4"
Hydroelectric Power Plant BRAULIO (Sondrio) ITALY A.E.M. Milano	1981	GIROLA S.p.A.	LIMESTONE	166	2,13	43°	1,2	20	Penstock
Mixed Sulfides Mine FENICE CAPANNE (Grosseto) IT S A M I M	1981 " " " 1982 " 1983 1985	SAMIM S.p.A.	CHALCOPYRITE MARL CLAY with QUARTZITE CLAY FLAKED CHALCOPYRITE MARL	63 42 79 90 63 68 233	2,13 2,44 2,13 *0,38 2,13 2,13 1+1,5	60° 90° 45° 57° 58° 53° 90°	0 0 0,12 0,5 0,6 0 0	8 5 19 ° 7 17 13 11	Ore casting, ventilation and pumping wells ° pilot hole only, with hole-opener dia. 15"
Hydraulic Plant DAM of HAMMAM MESKOUTINE (Guelma) - ALGERIA MINISTRY OF WATER	1982 " " " " " " "	Association COGEFAR ITALSTRADE RECCHI	MARL and SANDSTONE (38) (41) (40) (33) (33) bracking nb. Pilot hole only.	40 66 24 66 11 11 11 48	2,44 2,44 2,44 2,44 2,44 2,44 2,44 2,44	90° 59° 90° 50° 90° 90° 90° 90°	0 0 0 0 0 0 0 0	7 18 6 21 7 4 3 4 5	Penstock intake Open spillway shaft Stair shaft Open spillway shaft Rescue and adit shaft Foundation plints for valves chamber
Hydroelectric Power Plant SOLARINO (Siracusa) ITALY E.N.E.L.	1984 " 1986 " " " " " " " " "	Association ASTALDI DI PENTA LODIGIANI CALDART	WHITE LIMESTONE	55 21 54 36 36 10 10 33 33 69 12 10 70	4,22 2,13 2,13 1,55 1,55 1,53 1,53 1,53 1,53 2,13 1,55 1,55 1,55	90° 90° 77° 40° 38° 90° 90° 37° 35° 90° 90° 90° 90°	0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 2 5 4 4 1 1 4 7 3 2 1 4	Escape shaft Pumping station shaft Ventilation shaft Distributor shaft 1 Distributor shaft 2 Turbine shaft 1 Turbine shaft 2 Distributor shaft 3 Distributor shaft 4 Surge shaft Turbine shaft 3 Turbine shaft 4 Surge shaft
Stone Quarry for Aggregate BAGNI DI LUCCA (Pistoia) ITALY CAVE TANA	1982 "	CAVE TANA S.r.l.	LIMESTONE	37 107	0,31 3,68	40° 70°	0 0	2 18	Pumping hole rock blasted stocking well
Hydroelectric Power Plant SANTA SOFIA (Forli) ITALY E.N.E.L.	1983 "	SELI S.r.l./ CHINI & TE- DESCHI S.p.A	MARL and SANDSTONE	96 220	2,13 3,68	90° 47°	0 0	13 45	Surge shaft Penstock
Hydroelectric Power Plant VALGRISANCHE (Aosta) ITALY E.N.E.L.	1983 "	BETTI S.p.A.	HARD SCHISTS	72 96	2,44 2,44	90° 90°	(1) 1,1 0,4	11 12	Penstock (1) bedding near the bore angle
Hydraulic Plant for Water Supply SINNI river (Matera) ITALY C A S M E Z	1983 " "	LODIGIANI S.p.A.	MARL and VERY HARD QUARTZ- SANDSTONE	42 24 28	3,68 3,68 3,68	90° 90° 90°	0 0 0	11 8 7	Surge shaft
Hydraulic Plant for Water Supply Acquedotto CAMPANO - CASMEZ S.PIETRO INFINE (Caserta) ITALY	1985	COGEFAR S.p.A.	DOLOMITE	108	1,55	90°	0	13	Ventilation shaft
TOTAL REAMED SHAFT'S LENGHT m. 7.093									(*) from pilot hole start to reaming end only

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Hydroelectric Power Plant M'TERA - TANZANIA T A N E S C O	1985	COGEFAR S.p.A.	HARD GRANITE	105	1,34	90°	0	10	Penstock 1	
	"			107	1,34	90°	0	13	Penstock 2	
	"			115	1,34	90°	0	11	Lift, cable, shaft	
	"			207	0,27	90°	0	6	Airing hole	
	"			205	3,05	90°	0,3	50	Ventilation shaft	
	"			23	1,34	90°	0	5	Weeled gate shaft 2	
	"			23	2,44	90°	0	5	Weeled gate shaft 1	
	"			33	1,34	90°	0	8	Draft shaft 1	
	"			33	1,34	90°	0	7	Draft shaft 2	
	"			15	2,44	90°	0	4	Surge shaft 1	
"	15	2,44	90°	0	5	Surge shaft 2				
Improvement "FUORE" fiord FUORE (Napoli) ITALY C A S M E Z	1985	RECCHI S.p.A.	LIMESTONE	77	1,55/1	48°	0	19	Reaming start under- water for undersea water pipeline	
Hydroelectric Power Plant CENCENIGHE (Belluno) ITALY E.N.E.L.	1987	CALDART S.p.A.	MARL and SANDSTONE	270	2,13	57°	0	(1) 17	Penstock (1) Reaming only	
Hydroelectric Power Plant PRESENZANO (Caserta) ITALY E.N.E.L.	1985	DE LIETO S.p.A.	LIMESTONE	50	2,13	90°	0	10	Surge shaft 1	
	"			33	2,13	45°	0	6	Penstock 1	
	"			50	2,13	90°	0	10	Surge shaft 2	
	"			35	2,13	45°	0	5	Penstock 2	
Railway Tunnel PRATO ISARCO (Bolzano) ITALY FERROVIE DELLO STATO	1986	Association C.O.M.E.R.	RED PORPHYRY	37	2,44	90°	0	10	Railway ventilation shaft	
	"			37	2,44	90°	0	9		
Hydroelectric Power Plant PALAZZO II° MORMANNO (CS) IT E.N.E.L.	1987	DI PENTA SECOL	LIMESTONE	48	1,84	90°	0	5	Penstock	
Hydraulic Plant ARCICHIARO DAM (Campobasso) IT C A S M E Z	1987	COSTANZO S.p.A.	LIMESTONE	90	1,55	90°	0	8	Penstock	
Hydraulic Plant METRAMO DAM (Reggio Calabria) IT C A S M E Z	1987	RODIO S.p.A.	LIMESTONE	68	1,55	90°	0	7	Penstock	
	"			30	1,55	45°	0	5		
Hydroelectric Power Plant ALTO LINDOSO - PORTUGAL E. D. P.	1988	TORNO S.p.A.	GRANITE TWO MICAS	336	1,84	90°	2,8	40	Bus-bar shaft	
	"			324	1,84	90°	4,9	28	Penstock 1	
	"			321	1,84	90°	1,5	34	Penstock 2	
	1989			67	3,68	90°	0	11	Pumping shaft	
	"			50	2,44	90°	0	8	Surge chamber shaft	
	"			150	3,41	90°	0	25	Air discharging shaft	
Hydroelectric Power Plant MONTE REALE VALCELLINA (Pordenone) ITALY E.N.E.L.	1989	COGEFAR S.p.A.	LIMESTONE	30	2,13	90°	0	6	(67) the numbers (88) bracking are (62) the lenght of (86) the pilot only	
	"			41	2,13	45°	0	8		
	"			30	2,13	90°	0	6		
	"			42	2,13	45°	0	8		
Gas pipeline PRIMOLANO (Vicenza) ITALY S.N.A.M.	1989	SICIM S.p.A.	WHITE LIMESTONE	365	1,84	76°50'	3	24	Gas Pipeline shaft	
	"			15	1,07	14°	0	5		
Limestone Quarry SEDRINA (Bergamo) ITALY	1989	GHISALBERTI S.p.A.	LIMESTONE	29	3,68	78°	0	6	Rock stocking well	
	1990			30	3,68	73°	0	6		
	"			17	3,68	90°	0	7		
	"			29	2,13	90°	0	3		
	"			29	2,13	90°	0	3		
	"			58	0,27	90°	0	2		Cables hole
	"			38	2,13	90°	0	5		
	"			15	2,13	90°	0	2		
"	92	0,27	84°	0	4	Cables hole				
TOTAL REAMED SHAFT'S LENGHT m.				10.906						
									(*) from pilot hole start to reaming end only	

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Hydraulic Pumping Plant S. STEFANO (Napoli) ITALY MUNICIPAL WATER SYSTEM	1989	ITALO DELLA MORTE S.p.A.	POZZULANA and TUFT	94	3,05	90°	0	10	Pumping shaft
Storage tank BEER - SHEVA	1989	Ing.Nino FERRARI S.p.A.	WHITE LIMESTONE	51	3,41	90°	0	7	Ventilation shaft
Lift shaft AMALFI (Salerno) ITALY GRAND HOTEL EXCELSIOR	1990	GRAND HOTEL EXCELSIOR	LIMESTONE	66	3,05	90°	0,05	16	Lift for beach
Rock-fill Quarry CARPANE' (Vicenza) ITALY GRANUL.DOLOM.PEROGLIO SRL	1990	GRANUL.DOLOM. PEROGLIO S.r.l.	LIMESTONE	224	3,68	90°	0	38	Rock stocking well
Hydraulic Plant METRAMO DAM (Reggio Calabria) IT C A S M E Z	1990	Joint Vent. FE.LO.VI.	GRANITE	50	1,55	90°	0	5	Inlet sluice shaft
Gas Pipe Line S.SALVO-VASTOGIRARDI CARUNCHIO, COLLE D'ALBERO MONTE S.NICOLA (Chieti) ITALY S.N.A.M.	1991 " "	SAIPEM ITALIANA S.p.A.	LIMESTONE	61 46 65	1,55 1,55 1,84	3,5° 42° 39,5°	0,024 0 0	4 3 5	Pipe line tunnel Pipe line shaft Pipe line shaft
Hydraulic Plant VODO (Belluno) ITALY E.N.E.L.	1990	PICCIN S.p.A.	MARL and SANDSTONE	25	2,13	90°	0	5	Service shaft
Channel Tunnel Manche DOVER (Kent) ENGLAND TRANSMANCHE-LINK	1991	T M L	CHALK	109	1,55	90°	0	8	Ventilation shaft
Hydraulic Plant DAM OF BLUFI (Palermo) ITALY REGIONE SICILIA	1991	ASTALDI	SOFT MARL	54	1,84	90°	0	3	Surge shaft
Frejus Highway VAL DI SUSA (Torino) ITALY C.A.F.	1991 " 1992	CONSORZIO AUTOSTRADA FREJUS	HARD SCHIST	149 311 [108]	2,44 2,44	90° 90°	0 18 (1) [4]	12 20 [8]	(1) deviation for crossover in degraded schist with bedding near the bore angle
Hydroelectric Power Station RIVA DEL GARDA (Trento) ITALY E.N.E.L.	1989 1991 "	DEL FAVERO S.p.A.	LIMESTONE	20 39 42	2,13 2,13 2,13	90° 90° 90°	0 0 0	5 4 6	Service shaft Blasting-rock well Surge shaft
Hydroelectric Power Plant S.GIACOMO AL VOMANO (Teramo) IT E.N.E.L.	1990 1991 " " " " " 1992 1993 1993 1994	Joint Vent. S.GIACOMO " " " " " " " "	MARL and LIMESTONE	95 253 310 309 307 23 44 253 310 309 307 36	2,44 1,84 1,84 1,84 1,84 1,84 1,84 5,95 5,95 5,95 5,95 3,05	90° 90° 90° 90° 90° 70° 90° 90° 90° 90° 90° 90°	0 0 0 0 0 0 0 0 0 0 0 0,06	10 15+8+5 9+3+13 11+6+14 16+5+16 3 4 4	Surge shaft Penstock shaft (DDS) " Cable lift shaft (DDS) " Service shaft Reversible machine s. Sinking shafts by DOWN HOLE REAMER
Hydraulic Plant VAL D'ULTIMO DAM (Bolzano) IT E.N.E.L.	1992	P.A.C.	SCHIST	60	1,53	90°	0	5	Inlet Sluice Shaft
Shaft for Building MONTECARLO - P.to MONACO	1992	ITALCAVE S.p.A.	LIMESTONE	26	3,41	90°	0	6	Building foundation shaft
Improvement "Furore" Fiord AMALFI (Salerno) ITALY C A S M E Z	1992 1994	RECCHI S.p.A.	LIMESTONE	246 110	1,34 1,34	90° 90°	0,9 0,4	35 28	Water pipe line
TOTAL REAMED SHAFT'S LENGHT m. 15.309									(*) from pilot hole start to reaming end only

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Hydroelectric Power Plant BERKE DAM PROJECT - TURCHIA CUKUROVA ELECTRIK A.S.	1993	ITALSTRADE S.p.A.	LIMESTONE	84	2,44	90°	0	7	Surge shaft
	"			119	1,84	90°	0	7	Penstock shaft 1
	"			122	1,84	90°	0	6	Penstock shaft 2
	"			122	1,84	90°	0	8	Penstock shaft 3
	1994			56	1,84	90°	0	4	Spillway shaft
	"			54	0,27	90°	0,15	3	Pendulum shaft
	"			55	0,27	90°	0,12	3	Pendulum shaft
	"			29	0,27	90°	0	2	Pendulum shaft
"	55	0,27	90°	0	3	Pendulum shaft			
Gas Pipe Line ARMA DI TAGGIA (Imperia) ITALY S.N.A.M.	1993	SALCIS	LIMESTONE	43	1,00	28°	0	4	Gas pipeline
Limestone Quarry SEDRINA (Bergamo) ITALY	1993	GHISALBERTI S.p.A.	LIMESTONE	93	3,68	75°	0	12	Rock stocking well
	1994			94	3,68	84°	0	8	
	"			36	0,27	77,5°	0	2	Cable hole
Limestone Quarry ISOLA DELLE FEMMINE (Palermo) IT ITALCEMENTI INGEGNERIA	1994	CEMENTERIE ITALIANE S.p.A.	LIMESTONE	125	1,00	90°	0	9	Cable shaft
	"			130	3,68	90°	0	16	Rock stocking well
	"			110	3,68	90°	0	9	"
	"			209	1,00	90°	0	14	Cable shaft
	1995			118	1,00	90°	0	8	Cable shaft
	"			203	3,68	90°	0	23	Rock stocking well
Hydroelectric Plant COGOLO (Trento) ITALY E.N.E.L.	1994	DE LIETO S.p.A.	SCHIST	47	2,13	15,5°	0,5	7	Surge chamber shaft
	"			49	3,13	90°	0	7	"
	"			35	6,12	90°	0	5	"
	1995			225	2,13	45°	0,15	18	With D.D.S.
Gas Pipe Line VALLE MONDA (Rieti) ITALY S.N.A.M.	1994	SICIM S.p.A.	LIMESTONE	185	2,44	45°	3	12	Gas pipe line
Metro de Bilbao BILBAO - SPAIN	1994	AGROMAN	MARL	39	5,10	90°	0	7	Lifts and ventilation
	"			49	5,10	90°	0	7	underground station
	"			50	5,10	90°	0	7	shafts
	"			49	5,10	90°	0	7	
Hydraulic Plant TERMINI IMERESE (Palrmo) ITALY	1994	J.V. S.LEONARDO	LIMESTONE	54	2,13	90°	0	6	
Gas Pipe Line MADDALONI (Caserta) ITALY S.N.A.M.	1995	GHIZZONI S.p.A.	LIMESTONE	58	1,55	41°	0	5	By pass
Surge chamber shaft CLEUSON DIXANCE (Sion) CH J.V. LED (Losinger SA)	1995	Consortium LED	MICASCHIST	191	1,83	90°	1,5	12	Surge chamber shaft
	"			185	1,83	90°	0,6	9	
Gas Pipe Line FAEDO (Trento) ITALY S.N.A.M.	1995	SALCIS S.p.A.	LIMESTONE	229	1,83	71°	1,6	11	Pipe line shaft
Hydroelectric Plant RICOBAYO (Zamora) SPAIN IBERDROLA S.A.	1996	FERROVIAL	GRANITE	24	2,44	90°	0	3	Gate shaft
	"			25	2,44	90°	0	3	
	"			76	2,44	45°	0	8	Penstock shaft
	"			97	4,07	90°	0	10	Cable shaft
	"			92	4,07	90°	0	10	Lift shaft
GAS PIPE LINE MARRADI (Firenze) ITALY S.N.A.M.	1996	A.T.I. SICIM UNIONE	MARL SANDSTONE	83	1,80	4,11°	0,3	9	Pipe line shafts
	"			114	1,80	7,23°	0,2	12	
	"			148	1,80	3,26°	0,15	13	
	"			113	1,80	8,5°	0,25	8	
	"			106	1,80	9,2°	0,2	9	

TOTAL REAMED SHAFT'S LENGHT m.

19.484

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Hydroelectric Plant DOMEÑO (Valencia) - A361SPAIN IBERDROLA S.A.	1996	CUBIERTAS S.A.	LIMESTONE	139	3,41	60°	1,7	10	Penstock shaft
Limestone Quarry CIVIDATE CAMUNO (Brescia) IT	1996	VERALDI	LIMESTONE	77	3,05	73°	0	9	Rock stocking well
Tunnel ventilation shaft SOMPORT (Jaca) SPAIN ERSOM UTE	1996	ENTRECANALES Y TAVORA	LIMESTONE MARL	213	6,12/ 4,78	90°	3	31	Change the reamer after first 60 m. for broken rock
OIL PIPE LINE QUINCINETTO (Aosta) ITALY S.N.A.M.	1996	TRE COLLI S.p.A.	GNEIS	126	1,00	0,67°	0,2	14	Pipe line shaft
Hydroelectric Plant BARCIS (Pordenone) ITALY ENEL VENEZIA	1996	SELI S.p.A.	WHITE LIMESTONE	15	3,05	90°	0	3	Shaft for sinking
Limestone Quarry SEDRINA (Bergamo) ITALY	1996 1997 " "	GHISALBERTI S.p.A.	LIMESTONE	140 19 29 30	4,50 3,68 3,05 3,05	16° 90° 90° 90°	0 0 0 0	19 5 6 5	Conveiors shaft Rock stocking well Rock stocking well
Hydroelectric Plant MONCION - REP.DOMINICANA	1997 " "	AGROMAN S.A.	MARL AND SANDSTONE	90 97	5,45 4,07/ 2,44	90° 90°	0,5 0,6	13 11	Gate shaft Surge chamber shaft
Limestone Quarry LAVAGNA (Genova) ITALY SOC. FRANTOIO del TIGULLIO	1997	SOC. FRANTOIO TIGULLIO	LIMESTONE	85	3,72	75°	0,2	15	Rock stocking well
Calcium Quarry VIPITENO (Bolzano) ITALY OMYA S.p.A.	1997 " "	OMYA S.p.A.	CALCIUM	33 37 37	2,44 2,44 2,44	90° 90° 90°	0 0 0	5 5 5	Rock stocking well
T.G.V. MARSEILLE - FRANCE S.N.C.F.	1997	CAMPENON BERNARD	LIMESTONE	90	2,44	90°	0	10	Ventilation shaft
Undgrd. Railway station SAN REMO (Imperia) ITALY FF.SS. - ITALY	1997 " 1998 " " "	FIORONI S.p.A.	SANDSTONE/ MARL	40 80 82 83 82 82	4,07 4,07 0,31 0,31 0,31 0,31	90° 90° 68,5° 70° 68° 70°	0 0 0,15 0,07 0,05 0,02	4 6 2 2 2 2	Ventilation shafts Water & cables pipelines " " "
Hydraulic Project "Chiascio" PIANELLO (Perugia) ITALY ENTE IRRIGUO UMBRO-TOSCANO	1997	DE LIETO S.p.A.	MARL & SANDSTONE	80	2,44	90°	0,05	8	Airing hole
Hydroelectric Plant COGOLO (Trento) ITALY E.N.E.L. Venezia	1997 1998	QUADRIO & CURZIO S.p.A.	SCHIST	245 248	0,28 1,30	40° 43°	4 0,35	5 6,5+4+13	Inspection hole Piloting by DDS
Limestone Quarry SEDRINA (Bergamo) ITALY	1998	GHISALBERTI S.p.A.	LIMESTONE	95	3,05	90°	0	13	Stocking shaft
Calcium Mine VIPITENO (Bolzano) ITALY OMYA S.p.A.	1998 " "	OMYA S.p.A.	CALCIUM	12 14 12	3,05 3,05 3,05	90° 90° 90°	0 0 0	3 4 3	Rock stocking well
OIL PIPE LINE SAN RHEMY (Aosta) ITALY S.N.A.M.	1998	TRE COLLI S.p.A.	MICASCHIST	247	1,06	48°	2,5	20	Pipe line shaft
Hydroelectric Power Plant PIEVE VERGONTE (Verbania) IT E.N.E.L. Torino	1998 1999 "	DE LIETO S.p.A.	GNEISS	396 370 20	3,68 3,05 3,05	45° 45° 31°	9,19 12,02 0	41 35 8	Discharge shaft Penstock shaft Penstock shaft

TOTAL REAMED SHAFT'S LENGHT m.

22.927

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Talc Mine PRALI (Torino) ITALY LUZENAC - VALCHISONE S.p.A.	1998 1999	LUZENAC VALCHISONE S.p.A.	QUARTZ MICASCHIST	276	3,05	90°	1,35	49	Ventilation and safety exite shaft
Villa Germania Project BOLZANO - ITALY WIPPTALER BAU AG	1998	WIPPTALER BAU AG	PORPHIRY	87	4,50	38°	0,36	16	Private rack-lift shaft
Minas Aguas Tenidas VALDELAMUSA (Huelva) SPAIN INSERSA	1998	INSERSA	SLATE & SANDSTONE	277	2,44	84,5°	4,2	21	Ventilation shaft
Railway tunnel FI-PI FIRENZE SIGNA - ITALY VIENNE COSTRUZIONI S.r.l.	1998	VIENNE COSTRUZIONI S.r.l.	SILT ROCK & SANDSTONE	73	2,44	90°	0,12	7	Ventilation shaft
Limestone Mine TAVERNOLA (Bergamo) ITALY LAFARGE - ADRIASEBINA	1999	LAFARGE ADRIASEBINA	LIMESTONE	64	0,66	37,6°	0,1	9	Pipe line shaft
Minas Aguas Tenidas VALDELAMUSA (Huelva) SPAIN INSERSA	1999	INSERSA	SLATE & SANDSTONE	73	2,44	84,5	0	6	Ventilation shaft
Limestone Quarry TEPETZINGO - MEXICO Cementos MOCTEZUMA S.A.	1999	Cementos MOCTEZUMA S.A.	LIMESTONE	140	4,73	76°	0,3	15	Rock stocking well
Metro de Bilbao BARAKALDO - SPAIN U.T.E. ANSIO	1999	AGROMAN	MARL	181 (n.12)	3,68	90°	0	45	Lifts and ventilation underground station shafts
Gas Pipeline DN 48" VAL FORMAZZA-CRODO (VB) IT S.N.A.M.	1999	BONATTI S.p.A.	GRANITE	77 134 80 124 77 147 84 210	1,84 1,84 1,84 1,84 1,84 1,84 1,84 1,84	0,40° 0,43° 5,96° 1,15° 26,56° 16,17° 3,75° 0,43°	0,15 3 0,08 1,3 0,06 8,4 0,16 0 + DDS	12 18 11 28 17 21 17 48	Pipe line shaft
Calcium Mine VIPITENO (Bolzano) ITALY OMYA S.p.A.	1999 2000	OMYA S.p.A.	CALCIUM	204 154	2,44 2,44	49,5° 64°	0 0	16 14	Ventilation shaft Ventilation shaft
Railway Tunnel BO-FI Loc. POGGIOLO (Bologna) ITALY C.A.V.E.T.	1999	C.A.V.E.T.	MARL & SANDSTONE	55	3,05	73,8°	0	6	Ventilation shaft
Hydroelectric Power Plant SUSA (Torino) ITALY AEM - TORINO	1999 2000 " 2002	PONT VENTOUX S.c.r.l.	SCHIST	280 22 13 66	3,82 1,55 1,55 3,05	90° 23° 50° 90°	3,2 0 0	18 (#) 4 3 9	Penstock shaft (#) Not considered drilling piloting time by DDS cable shaft cable shaft Ventilation shaft
Limestone Quarry Cava MA.CO - LUCCA (ITALY) UNICEM S.p.A.	1999	UNICEM S.p.A.	FLYSH	117	3,68	64°	0	15	Rock stocking well
Sewerage Esine-Breno BRENO (Brescia) ITALY GIUDICI S.p.A.	1999	GIUDICI S.p.A.	LIMESTONE	80 80	1,06 1,06	0,25° 0,34°	0,05 0,5	19 8	Sewerage shaft
Submarine DC Power lines OTRANTO (Lecce) ITALY E.N.E.L.	1999	PIRELLI S.p.A.	LIMESTONE	65 30 39 96	0,28 0,28 0,38 0,28	2,5° 2,5° 2,5° 2,5°	0,3 0,2 0,2 0,5	1 1 2 2	Cables holes

TOTAL REAMED SHAFT'S LENGHT m.

26.329

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Acqueduct "Astico" THIENE (Vicenza) ITALY IRCES S.r.l.	1999	IRCES S.r.l.	DOLOMITE	113	0,28	23,2	0,1	3	Water pipeline shafts
	2000			114	1,06	24°	0,07	14	
	"			140	2,13	13,6°	0,95	22	
Gas Pipeline DN 750 Calco - Piantedo CALOLZIOCORTE (I) S.N.A.M.	2000	GHIZZONI S.p.A.	MARL & SANDST.	154	1,32	20,70°	1,5	12 (#)	Pipe line shaft (#) Not considered drilling piloting time by DDS
Limestone Quarry MADDALENI SESTO A MORIANO (Lucca) ITALY BUZZI Group	2000	BUZZI S.p.A.	LIMESTONE	104	3,68	75°	0	16	Rock stocking well
RIO NARCEA GOLD MINE BELMONTE DE MIRANDA Asturias - SPAIN	2000	UTE - INCE	GNEISS	113	1,84	90°	0,5	12	Ventilation shaft
	2001			91	1,84	90°	0,2	12	
				90	1,84	90°			
Lötschberg - Basisline Fystertellä Shaft-GOPPENSTEIN(CH) BLS AlpTransit AG	2000	ATF Fensterstollen Ferden	GNEISS	335	4,38	90°	0,47	43 (#)	Ventilation shaft (#) Last upper 140 ml. by drilling & blasting
Railway Tunnel BO-FI Loc. VAGLIA (Firenze) ITALY C.A.V.E.T.	2000	C.A.V.E.T.	MARL & SANDSTONE	160	4,38	90°	1,1	15	Ventilation shaft
Hydroelectric Power Plant PIEVE VERGONTE (Verbania) IT E.N.E.L. Torino	2000	DE LIETO S.p.A.	GNEISS	60	1,55	45°	0,2	13	Penstock shaft
Sewerage Gressoney I T. - S.J. GRESSONEY LA TRINITE' (Aosta) IT Regione Autonoma Val d'Aosta	2000	ISAF S.r.l.	CALC SCHIST	130	1,84	0,65°	1,2	17	Sewerage By pass
Gas Pipeline DN 42" Bernalda - Br. MASSAFRA (Taranto) ITALY S.N.A.M.	2000	NACAP	TUFF	74	1,84	30,57°	1,6	18	Pipe line shaft
Ventilation Power House Città di LECCO - ITALY Provincia di Lecco	2000	VIENNE COSTRUZIONI	MARL	26	2,44	90°	0	5	Rock stocking well
Graver Plant MONTEVALERIO (Livorno) ITALY SALES S.a.s	2000	SALES S.a.s	LIMESTONE	60	4,38	75°	0,3	9	Rock stocking well
National Way Ventilation shafts NATURNO (Bolzano) ITALY Provincia Autonoma di Bolzano	2001	PIZZAROTTI S.p.A.	GNEISS	32	2,44	90°	0	7	Ventilation shaft
				31	2,44	90°	0	5	Ventilation shaft
New transit Custom Italy - CH Dogana di ORIA (Como) ITALY A.N.A.S.	2001	Cossi S.p.A.	LIMESTONE	25	1,84	90°	0	6	Ventilation shaft
Calcium Mine TAMBRE D'ALPAGO (Belluno) IT I.M.A. S.r.l.	2001	I.M.A. S.r.l.	CALCIUM	70	3,05	75°	0	9	Rock stocking well
Gas Pipeline DN 500 BZ-Brix-Brun PRATO ISARCO (Bolzano) ITALY	2001	TRE COLLI S.p.A.	PORPHYRY	38	1,06	2,3°	0	7	Pipeline shaft
				318	1,06	2,3°	6,3 (#)	27	Pipeline by PDM+MWD Directional Drilling
Gas Pipeline DN 750 CALESTANO (Parma) ITALY S.N.A.M.	2001	SICIM S.p.A.	MARL	186	1,55	52,77°	0,80	18	Pipeline shaft
Pumping Station Imp. Sollev. del Flumendosa (Cagliari) ITALY E.A.F.	2001	IMPREGILO S.p.A.	SCHIST	25	3,05	90°	0	4	Pumping shafts
				25	2,74			3	
				25	2,74			5	
				25	2,74			4	
				25	2,74			4	
TOTAL REAMED SHAFT'S LENGHT m.				28.916				() from pilot hole start to reaming end only	

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVI- TION (m.)	EXECUT. TIME (*) (days)	R E M A R K S
Hydroelectric Power plant RUIVAES (Braga) PORTUGAL CPPE S.A.	2001	SOMAGUE-MSF- MOTA	GRANITE	402	4,50	90°	0,13	51	Pilot Hole by RVDS Upper surge chamber shaft
	2002	SOMAGUE-MSF- MOTA	GRANITE	54	5,76	90°	0	20	Lower surge chamber shaft
Railway Tunnel BO-FI LOC. RATICOSA (Firenze) ITALY C.A.V.E.T.	2001	C.A.V.E.T.	MARL/LIMESONE	154 150	0,31 3,68	90° 90°	0,15	5 13	Gas detecting shaft Ventilation shaft
Limestone Quarry MOLAZZANA (Lucca) ITALY FASSA S.p.A.	2001	FASSA S.p.A.	LIMESTONE	90	3,68	70°	0,17	17	Rock stocking well
River Diversion VIGANELLO - LUGANO - CH VIGANELLO MUNICIPALITY	2002	FLAVIO RIVA SA	MICASHIST	63	1,06	23°	0	11	River diversion shaft
Limestone Quarry TETTI BAVA (Cuneo) ITALY FASSA S.p.A.	2002	FASSA S.p.A.	LIMESTONE	104	3,68	70°	0	21	Rock stocking well
Carbonate Quarry COSTIOLO (Bergamo) ITALY	2002	UNICALCE S.p.A.	CALCIUM CARBONATE	105	3,05	90°	0	15	Rock stocking well
<i>Commessa 2002/01</i> SNAM Oil Pipeline DN 400 GIGNOD (Aosta)- ITALY	2002	TRE COLLI S.p.A.	PORPHIRY	45	1,06	90°	0	4	Oil pipe line shaft
<i>Commessa 2002/03</i> Limestone Quarry "NAFARRONDO" BILBAO - SPAGNA	2002	NORTUNEL	LIMESTONE	160	4,38	73°	0,8	20	Rock stocking well
<i>Commessa 2002/06</i> Sewerage Plant PESCHICI (Foggia) ITALY PESCHICI MUNICIPALITY	2002	LMD	SOFT LIMESTONE	75	0,66	45°	0,3	4	Discharging hole
<i>Commessa 2002/04</i> Submerse water pipeline PUNTA BACOLI (Napoli) ITALY ACQUEDOTTO CAMPANO	2002	RESEARCH SRL	LIMESTONE	42	0,77	23°	0	2	Water's submarine pipeline
<i>Commessa 2002/02</i> Limestone Quarry S.ROSALIA (Caserta) ITALY CEMENTI MOCCIA	2002	CEMENTI MOCCIA	WHITE LIMESTONE	105	3,68	75°	0	12	Rock stocking well
Gas pipeline DN750 CALESTANO (Parma) ITALY Snam	2002	SICIM	MARL & LIMESTONE	183	1,55	52,77°	1,2	19	Gas pipe line shaft
<i>Commessa 2002/12</i> Sewerage Plant TREMOSINE sul Garda (Brescia) IT CONSORZIO GARDA UNO	2002	J oint Venture I.C.B. Srl -	LIMESTONE	147 20	0,66 0,66	75,4° 81°	0,2 unap.	11 2	Drein Trunk line shafts
<i>Commessa 2002/07</i> River Preit diversion CANOSIO (Cuneo) ITALY CONDOTTE S.p.A.	2002	IDREG PIEMONTE	LIMESTONE	421	2,13	5,4°	7	49*	Tunel for Hydro pipeline
<i>Commessa 2002/10</i> Mina de Boinas & Carles RIO NARCEA GOLD MINE ASTURIAS - SPAIN	2002	INSERSA S.A.	GRANITE	98 140	1,84 2,44	82°	unap. unap.	18 26	Ventilation shafts

TOTAL REAMED SHAFT'S LENGHT m.

31.472

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVI- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Comessa 2002/09 Limestone Quarry CEMENTO MOCTEZUMA, STAB. CERRITOS - MEXICO	2002	CEMENTOS MOCTEZUMA	LIMESTONE	85	4,38	75°	unap.	12	Rock stocking well
Comessa 2002/11 Rivers Diversion RIO LUPO E RIO ARCHETTI Genova Municipality - ITALY	2002	COSSI S.p.A.	SHIST	41 33	1,84 1,84	85° 85°	unap. unap.	5 4	River's diversion shafts
Comessa 2003/01 Basalt Quarry OFITAS DE RIGOITA EN ERRIGOITI - SPAIN	2003	IDOM	BASALT	140	4,09	70°	2,35	16	Rock stocking well
Comessa 2003/02 Underground station METRO SESTAO Bilbao - SPAIN	2003	UTE METRO SESTAO	MARL	9 9 11 11	3,68	90°	unap.	5 5 3 5	Ventilation shaft
Comessa 2003/09 Railway Proyect EUSCOTREN Ute Variante Sur S.Sebastian - SPAIN	2003	ALTUNA Y URIA S.A.	SANDSTONE MARL	42 25	5,10 5,10	90°	unap.	11	Ventilation shaft
Comessa 2003/07 PERFORACION ORIZONTAL COLECTOR Ambles Avila - SPAIN	2003	DRAGADOS	GRANITE	50 25	1,06 1,06	3%	unap.	9 5	Sewage tunnel
Comessa 2003/06 SNAM Gas pipeline DN750 Pontremoli-Parma Gravagna - ITALY	2003	SICIM	MARL & LIMESTONE	188	1,32	28,17°	18	27	Gas pipe line shaft
Comessa 2003/03 National way Ventilation Shaft S.GIACOMO Bronzolo (BZ)	2003	SOC. ITALIANA PER CONDOTTE D'ACQUA	QURTZ- PORPHIRY ROCK	205	4,38	90°	1,8	29	Ventilation shaft
Comessa 2003/11 POZOS DE ASCENSORES Estacion RENFE de la Peña BILBAO - SPAIN	2003	TECSA S.A.	LUTITAS GRISES	14 17	3,68 3,68	90° 90°	unap. unap.	4 4	Lifting shafts
Comessa 2003/12 Ventilation Shaft Kristallina Mine - Racines (BZ) OMYA	2003	OMYA	CALCIUM	186	2,44	55°	unap.	18	Rock stocking well
Comessa 2003/16 Gas Pipeline by-pass National Way S.S. 45 (GE) Snam	2003	TRE COLLI Spa	LIMESTONE	18	1,06	45°	0	4	Gas pipe line shaft
Comessa 2003/18 Limestone Quarry ROASCHIA (CN)	2003	BUZZI UNICEM SPA	LIMESTONE	135	4,09	65°	unap.	16	Rock stocking well shaft
Comessa 2003/17 MINA DE BELMONTE Rio Narcea Gold Mine Oviedo (E)	2003 2004 2004	INSERSA S.A.	GRANITE	297 99 79	2,74 1,52 2,44	81° 69° 73,5°	unap. unap. unap.	60 15 16	Ventilation shafts Cables shaft Rock stocking well shaft Cables shaft
Comessa 2003/05 Hydro Pumping Project JÚCAR – VINALOPÓ Valencia - SPAIN	2004	UTE Jucan Vinalopò	LIMESTONE DOLOMITE	101 199	2, 44 2, 44	90° 90	0,15 0,42	9 16	Pumping shafts Pumping shafts

TOTAL REAMED SHAFT'S LENGHT m.

33.492

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	REMARKS	
Comessa 2003/15 Discharging Shaft ISOLA DI CAPRI Municipality of Capri (NA)	2004	MARINO LAVORI SpA	LIMESTONE	57	1,06	55°	unap.	5	Water's submarine pipeline	
Comessa 2003/10 Hydro Pumping Project BASSO FLUMENDOSA ENTE AUTONOMO FLUMENDOSA	2004	IGECO	PORPHIRY	67 67	3,08	90°	unap.	11 8	Surges chamber shafts	
Comessa 2004/01 Sewerage Pipeline CONSORZIO GARDA UNO Moniga del Garda (BS)	2004	I.C.B. srl	LIMESTONE	48	1,06	18,7°	unap.	9	Discharging shaft	
Comessa 2004/02 VERMA Gate Shaft Premadio Power Plant A.E.M. Spa	2004	SELI Spa	METAPHILLITICS ROCS	26 18	2,13	90°	0,8	4 5	Penstok shaft	
Comessa 2004/03 Hydroelectric Project S.Giacomo di Fraele (SO) A.E.M. Spa	2004	COSSI Costruzioni Spa	LIMESTONE	39	2,13	90°	unap.	4	Adit shaft	
Comessa 2004/04 Hydroelectric Project Porlezza (CO) Elettrowatt	2004	MOLINA COSTRUZIONI	LIMESTONE	113	1,05	57° 12'	unap.	8	Penstok shaft	
Comessa 2004/05 Carbonate Quarry COSTIOLO (BG) - Italy	2004	UNICALCE S.p.A.	LIMESTONE	95	5,46	75°	0,4	18	Rock stocking well shaft	
Comessa 2004/07 Limestone Quarry SO.GE.MA. Riofreddo (Roma)	2004	SO.GE.MA.	LIMESTONE	87	3,68	75°	unap.	8	Rock stocking well shaft	
Comessa 2004/08 Ventilation Shaft of Perama. Schistos, near Piraeus - Grece	2004	THEMELI S.A	LIMESTONE	188	1,06	90°	1,5	8	Railway tunnel safety chamber	
Comessa 2002/08 Ventilation shafts "MENTA" Dam - Cardeto (RC) Italy REG. CALABRIA Ass. LL.PP	2004	SELI Spa	GNEISS/ SCHIST	70	1,32	90°	0,15	7	Gate shaft	
Comessa 2004/09 Railway Tunel BO-FI Vent. Tunel Pianoro (BO) Italy	2004	C.A.V.E.T.	SILTOSE MARLS	38	4,09	90°	0,15	6	Ventilation of interconnection tunnels	
Comessa 2004/12 Underground stations METRO BILBAO Line Sestao-Portugalete SPAIN	2004 2005	UTE METRO PORTUGALETE	CAYULEA	14 15 15 15 21 21 17 11 11 11	3,68	90°	unap. unap. unap. unap. unap. unap. unap. unap. unap. unap.	5 5 5 6 7 6 9 4 6 5	Lifting shaft ventilation shaft	
TOTAL REAMED SHAFT'S LENGHT m.				34.554				(*) from pilot hole start to reaming end only		

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	R E M A R K S
Comessa 2004/13 Limestone Quarry Cori (LT) - ITALY	2004	E.P.L.E.S.	LIMESTONE	159	3,68	69,3°	unap.	21	Rock stocking well shaft
Comessa 2005/01 Level Connections Mines "Kristallina & Pratone" Vipiteno (BZ) - ITALY	2005	O M Y A SPA	CRYSTALLINE MARBLE	58 12 33 23 225 225 216	4,38 1,55 1,55 4,38 0,275 1,55 2,13	90° 70° 90° 61° 85° 85° 85°	unap. unap. unap. unap. 3,2 5,88 2,20	10 4 4 5 5 21 18	Rock stocking well shaft // // // // // // Ventilation shaft
Comessa 2005/03 Cementary Plant Brembilla (BG) - ITALY	2005	UNICALCE SPA	LIMESTONE	30 20	3,68 3,68	90°	unap.	10	Rock stocking well shaft
Comessa 2005/04 Limestone Quarry Caneva (PN) - ITALY	2005	C P S Srl	LIMESTONE	64	4,08	70°	unap.	9	Rock stocking well shaft
Comessa 2005/05 Miniera Ca' Bianca Tavernola (BG) - ITALY	2005	LAFARGE ADRIASEBINA	LIMESTONE	29	3,05	90°	unap.	8	Dropping shaft
Comessa 2005/06 Alaiz Quarry Pamplona - SPAIN	2005	ALAIZ S.A.	LIMESTONE	210	4,74	70°	unap.	32	Rock stocking well shaft
Comessa 2005/07 Tunnel Vomp Terfens Vomperbach - AUSTRIA	2005	ARGE TUNNEL VOMP-TERFENS	DOLOMITE	107	1,55	90°	unap.	8	Ventilation shaft
Comessa 2005/08 Quarry "Monfranco" Roaschia (CN) - ITALY	2005	BUZZI UNICEM SpA	LIMESTONE	83	4,09	70°	unap.	11	Rock stocking well shaft
Comessa 2005/09 Rainfalls shaft Monte di Procida (NA) - ITALY	2005	Euro Co.Ge.I. S.r.l.	POZZOLANA	40	0,66	62,63°	unap.	5	Rain water draining shft
Comessa 2005/10 Mine de "La Perelle" St.Laurent de Pont - Grenoble (F)	2005	CIMENT VICAT	LIMESTONE	189	2,44	45°-50°	unap.	19	Rock stocking well shaft
Comessa 2005/12 Hydroelectric plan Clavalitè FENIS (AO) - ITALY	2005	B.G.F. Srl	CALCSCHIST	458	1,84	45°	8mt	37	Penstok shaft
Comessa 2005/14 Cementary Plant Brembilla (BG) - ITALY	2005	UNICALCE SPA	LIMESTONE	52	pil 11"	45°	unap.	3	Cables' Hole
Comessa 2005/15 Variante di Valico Pozzi di areazione	2005	TODINI (ex Risalto)	SILTOSE MARLS	76	1,06	0,9°	delete work		Connection hole between to tunnels
Comessa 2005/16 Underground Garage VILLA LINDA (BG) - ITALY	2005	LAMA IMMOBILIARE	FLYSH	10 18 14 13	1,84 1,84 1,84 3,68	90° 90° 90° 90°	0	10 8 8 13	Emergency exit shaft Ventilation shaft // //
Comessa 2006/02 Hydro Power Plant BRISOGNE (AO) - ITALY	2007	F.LLI RONC SRL	MICASCHIST	580	1,84	90°	0,18	58	Pilot hole by RVDS Penstok shaft
Comessa 2006/03 Ciordia Quarry Pamplona - SPAIN	2005	LAZARO ECHEVARRIA S.A.	LIMESTONE	118	4,07	70°	unap.	12	Rock stocking well shaft //
Comessa 2006/04 Malegno sewerage Brescia - ITALY	2006	F.LLI FURLONI SRL	LIMESTONE	29	1,06	40°	unap.	4	Sewerage shaft //

TOTAL REAMED SHAFT'S LENGHT m.

37.644

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Comessa 2006/05 Cementary Plant Cava Costiolo (BG) - ITALY	2006	UNICALCE SPA	LIMESTONE	109	3,05	90°	unap.	14	Slot shaft
Comessa 2006/06 Sewer tratement plant Como lake - Colonno - ITALY	2006	F.lli BIACCHI S.a.S	LIMESTONE	20	1,55	0°	unap.	16	Submerged shaft for pipes line.
Comessa 2006/07 SANTURZI Station Metro Bilbao Bilbao - SPAIN	2006	UTE METRO SANTURZI	(2p.)	24	3,68	90°	unap.	7	Lifting shaft ventilation shaft
			(2p.)	24	//	//	unap.	7	
	2007		(2p.)	22	//	//	unap.	7	
			(2p.)	22	//	//	unap.	5	
			(2p.)	19	//	//	unap.	5	
(2p.)	26	//	//	unap.	5				
Comessa 2006/08 Apario Quarry Lemona - Bizkaia - SPAIN	2006	CEMENTOS LEMONA	LIMESTONE	154 60	4,38 2,44	72°	unap. unap.	22 7	Rock Stocking
Comessa 2006/09 Connection tunnel Domodossola - ITALY	2006	S.ANDREA- DESENO SRL	GRANITE	670	0,66	4°	0,15	59	Directional drilling Pilot hole by PDM+MWD
Comessa 2006/10 New Penstock conduct ENEL - Usseglio (TO) - ITALY	2006	BETTI Spa	METAMORFICS BASALT	264	3,68	45°	unap.	32	
Comessa 2006/13 Beles Multipurpose Project ETHIOPIA	2006	SALINI Spa	ALTERNATED	81	1,84	90°	unap.	5	Surge shaft
			BASALT AND	262	1,84	90°	1,40	18	Penstock shaft
			TUFF ROCKS	277	1,84	90°	unap.	33	Cables shaft
Comessa 2006/14 Tunnel de San Pedro Colmenar Viejo - Madrid - SPAIN	2006	UTE SAN PEDRO	ORTOGNEISS	120	3,05	90°	0,07	11	Ventilation Shaft
Comessa 2006/15 Val Noci Dam Genova - ITALY	2008	GENOVA ACQUE	LIMESTONE	38	3,05	90°	unap.	9	Spillway shaft
Comessa 2006/16 Hydroelectric Project Val Passiria - ITALY	2007	INGENIEURBURO	SCHIST	220	2,74	90°	0,06	17	Penstock Shaft by RVDS
				50	1,84	90°	unap.	8	Surge Shaft
Comessa 2006/17 Estacion Renfe - Miribilla Bilbao - SPAIN	2006	UTE ESTACION MIRIBILLA	HARD	35	3,5	90°	unap.	10	Ventilation Shaft
			MARL	29	6,12	90°	unap.	12	Escape Shaft
Comessa 2006/18 Système de production eau pot. Commun.té d'Annency - FRANCE	2006	CAMPENON BERNARD	LIMESTONE	65	3,05	40°	unap.	9	
Comessa 2007/02 Cementary Plant Brembilla (BG) - ITALY	2007	UNICALCE SPA	LIMESTONE	95	pil 11"	90°	unap.	5	Pilot hole
	2008			24	3,05	90	unap.	5	
	2008			89	3,05	90°	unap.	8	
				89	3,05	90°	unap.	8	
Comessa 2007/03 Cantera de Salinas Astrurias - SPAIN	2007	CANTERAS ARROJO	CONGLOMERATE	55	2,13	72°	unap.	7	Inclined shaft
Comessa 2007/04 Galleria Vedeggio-Casarate LUGANO - SWISS	2007	Consorzio MARTI c/o Mancini & Marti SA	SCHIST	96	4,09	90°	unap.	9	Ventilation Shaft
Comessa 2007/05 Rio Laque Quarry S. Saverino Marche (MC) - ITALY	2007	UNIONCAVE SRL	LIMESTONE	130	3,68	72°	unap.	20	Rock stocking well shaft
Comessa 2007/06 Costiolo Quarry Brembilla (BG) - ITALY	2007	UNICALCE SpA	LIMESTONE	107	3,05	90°	unap.	17	Rock stocking well shaft
TOTAL REAMED SHAFT'S LENGHT m.									(*) from pilot hole start to reaming end only
40.920									

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
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Commissa 2007/06 Costiolo Quarry Brembilla (BG) - ITALY	2007	UNICALCE SpA	LIMESTONE	107	3,05	90°	unap.	17	Rock stocking well shaft
Commissa 2007/07 Limestone Quarry Roccavione (CN) - ITALY	2007	PREVE COSTRUZIONI SPA	LIMESTONE	110	3,68	90°	unap.	18	Rock stocking well shaft
Commissa 2007/08 Limestone Quarry Vipiteno (BZ) - ITALY	2007	OMYA	LIMESTONE	180	2,4	90°	not detected	14	Ventilation
Commissa 2007/09 Hydroelectric Plant Pontebba- (UD) ITALY	2007	IDROELETTRICA del PRAMOLLO Srl	DOLOMITIE	104	1,06	36,3°	unap.	15	Sub-horizontal drilling
Commissa 2007/10 Limestone quarry TAIWAN	2008	LUCKY CEMENT	LIMESTONE	384	4,09	90°	0,60	60	Rock stocking well shaft
Commissa 2007/11 HUNOSA Coal Mine Mieres - Asturias - SPAIN	2008	PROMINOR 2003	MARL	78	3,68	90°	unap.	34	Rock stocking well shaft
Commissa 2008/01 Limestone Quarry Carpene di S. Nazario (VI) ITALY	2008	GRANULATI DOLOMITICI PEROGLIO	LIMESTONE	190	3,41	72°	unap.	20	Rock stocking well shaft
Commissa 2008/02 Limestone Quarry Gavardo (BS) ITALY	2008	FASSA SpA	LIMESTONE	110	3,68	70°	unap.	13	Rock stocking well shaft
Commissa 2008/03 Hydroelectric Plant Picote - PORTUGAL	2008	UTE MSF - OPCA	GRANITE	170	5,1	90°	0,04	23	Cables & Ventilation Pilot Hole by RVDS
Commissa 2008/04 Veracruz Quarry MEXICO	2008	CEMENTOS MOCTEZUMA	LIMESTONE	130	4,38	70°	0,01	13	Rock stocking well shaft
Commissa 2008/06 Tapovan H.E. Project INDIA	2008	PATEL ENGINEERING LTD	QUARTZ, MICA, GNEISSES	145	2,13	90°	1,8	11	Surge Chamber Shaft
Commissa 2008/09 Limestone Quarry Palazzago (BG) - ITALY	2008	ITALCEMENTI SPA	LIMESTONE	180	4,09	75°	1,80	25	Rock stocking well shaft
Commissa 2008/10 Tunnel SS 12 Bronzolo - Bolzano Bolzano - ITALY	2011	OBEROSLER CAV. PIETRO SPA	PORPHYRY	275	4,74	90°	0,013	43	Pilot Hole by RVDS Ventilation shaft
Commissa 2008/12 Nukazgan Mine KAZAKHSTAN	2008	HERRENKNECHT AG	GRANODIORITE QUARTZDIORITE	144 280	4,50 4,50	90° 90°	1,4 2,1	18 46	Ventilation shaft Ventilation shaft
Commissa 2008/14 Loaharinag Pala H.E. Project INDIA	2008	PATEL ENGINEERING LTD	AUGEN GNEISSES, QUARTZ MICA GNEISSES	123	2,13	90°	2,5	9	Surge Chamber Shaft
Commissa 2009/01 F.lli Negro Snc Chiampo (VI) - ITALY	2009	F.LLI NEGRO SNC	LIMESTONE	134	3,09	90°	unap.	10	Rock stocking well shaft
Commissa 2009/02 EWR Energie AG Schattenhalb Meiringen - SWISS	2009	THYSSEN SCHACHTBAU GMBH	CLAY SCHIST SANDSTONE LIMESTONE	280	3,05	52°-54°	-15,76 down -3,12 left	35	Penstock Shaft

TOTAL REAMED SHAFT'S LENGHT m.

44.044

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVI- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Commissa 2009/03 Socarl Quarry (chez SBCT) Lourdes - FRANCE	2009	SOCARL (chez SBCT)	LIMESTONE	153	1,84	80,5°	1,5	17	Rock stocking well shaft
Commissa 2009/04 Pan Asia Corporation TAIWAN	2009	PAN ASIA CORPORATION	SLAB ROCK	107	1,55	47°	2,3 right	9	Penstock Shaft
Commissa 2009/05		BEC	DIORITE,		1,84 &				Surge Chamber Shaft

Amenagement du Rizzanese Corse - FRANCE	2009	FRERES SA	GRANODIORITE	70	2,44	90°	0,02	12	Pilot Hole by RVDS
Commissa 2009/08 Mina Farallon Negro ARGENTINA	2009	PANEDILE ARGENTINA SAICFel	MONZONITE	265	1,55	65°-70°	unap.	18	Ventilation shaft
	2009			250	1,55	65°-70°	unap.	18	Ventilation shaft
	2010			235	1,55	65°-70°	unap.	14	Ventilation shaft
	2010			250	1,55	65°-70°	unap.	14	Ventilation shaft
	2010			160	1,55	65°-70°	unap.	10	Ventilation shaft
	2010			73	1,55	65°-70°	unap.	4	Only pilot hole
	2010			107	1,55	65°-70°	unap.	7	Ventilation shaft
	2010			100	1,55	65°-70°	unap.	5	Ventilation shaft
	2010			210	1,55	65°-70°	unap.	12	Ventilation shaft
	2010			210	1,55	65°-70°	unap.	11	Ventilation shaft
	2010			190	1,55	65°-70°	unap.	16	Ventilation shaft
	2010			105	1,55	65°-70°	unap.	4	Only pilot hole
Commissa 2009/09 Cementary Plant Cava Costiolo (BG) - ITALY	2009	UNICALCE SPA	LIMESTONE	100	3,05	90°	unap.	17	Slot shaft
Commissa 2009/10 Projekt Linthal 2015KW Limmern - CH	2010	ARGE Kraftwerk Limmern	LIMESTONE	259	4,38	45°	unap.	33	Inclined shaft
Commissa 2010/02 Chimenea de Equilibrio Ute Sant Just - Barcellona - SPAIN	2010	UTE TUNEL SANT JUST	Pizarras Negra	80	1,84	90°	unap.	7	Penstock Shaft
Commissa 2010/05 Ocelli Quarry Vicoforte (CN) - ITALY	2010	OCELLI SNC	LIMESTONE	100	3,68	70°	unap.	18	Rock stocking well shaft
Commissa 2010/06 Ute Metro Kabiezes Bilbao - ESPANA	2010	UTE METRO KABIEZES	CAYULEA	7	3,68	90°	unap.	4	Ventilation shaft
				20	3,68	90°	unap.	4	
				20	3,68	90°	unap.	7	
				8	3,68	90°	unap.	6	
				10	3,68	90°	unap.	3	
				10	3,68	90°	unap.	3	
Commissa 2010/08 Proyecto Hidroelectrico Palomino Rep. DOMINICANA	2010	CONSTRUCTORA NORBERTO ODEBRECHT	Turbidita carbonata Sedimentary rock	254	4,50	90°	0,65	36	S. Chamber & Penstock Collaps of the Shaft Pilot Hole by RVDS
Commissa 2010/13 Project Vianden LUXEMBURG	2010	ARGE Erweiterung LOS 1	SHALE ROCK	280	5,46	90°	0,075	43	Pilot by RVDS Penstock shaft
Commissa 2010/14 "Chiascio" Gallery Valfabbrica (Pg) - ITALY	2011	ENTE IRRIGUO UMBRO TOSCANO	LIMESTONE	264	2,44	90°	0,8	34	Pilot Hole by RVDS Ventilation shaft
Commissa 2010/15 Pedestrian by-pass Valico BO-FI - ITALY	2010	TODINI COSTRUZIONI	Marl	46	4,50	sub-horiz.	0,25	16	Pedestrian by-pass
	2011	GENERALI SPA	Marl	14	4,50	sub-horiz.		4	

TOTAL REAMED SHAFT'S LENGHT m.

47.999

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVI- TION (m.)	EXECUT. TIME (*) (days)	REMARKS
Commissa 2010/16 Mirador Turistic in Ranero Bitzkaia - Bilabo - ESPANA	2010	ZANJADORAS Y DESMONTE, S.A.	Dolomia compact	28	3,05	90°	unap.	5	Lift shaft
Commissa 2010/17 Gas-pipeline Velebit-Prezid - CROATIA	2010	DALEKOVOD j.s.c.	Limestone rock	100	1,06	63°	0,05	8	Gas Pipeline bypass
Commissa 2010/18 "Calce San Pellegrino" Quarry Narni (Tr) - ITALY	2011	CALCE SAN PELLEGRINO SPA	Limestone rock	154	3,68	70°	unap.	18	Rock stocking well shaft
Commissa 2010/21 Gibe III - Hydroelectric Project ETHIOPIA	2011	SALINI COSTRUTTORI ETHIOPIA	Basalt	107	1,84	90°	unap.	12	Gate shaft
				104	1,84	90°	unap.	11	Gate shaft
				99	1,84	90°	unap.	10	Surge shaft
				101	1,84	90°	unap.	14	Surge shaft
				105	1,84	90°	unap.	11	Penstock shaft

				102	1,84	90°	unap.	10	Penstock shaft	
Comessa 2010/22 Proyecto Euskotren Tramo Loiola-Herrera San Sebastian - ESPANA	2011	UTE LOIOLA HERRERA	Caliza-margosa	32 31 31 33	5,10 5,10 3,68 3,68	90° 90° 90° 90°	unap. unap. unap. unap.	6 7 4 5	Ventilation shaft Ventilation shaft Ventilation shaft Ventilation shaft	
Comessa 2011/01 Metropolitan Interceptor Algeri ALGERIA	2011	TODINI S.p.A.	Marl Lime	206 74 88	1,84 1,84 1,84	58,5° 51° 59°	unap. unap. unap.	24 7 10	discharging shaft discharging shaft discharging shaft	
Comessa 2011/05 Renforco de Potencia de Vendanova VENDANOVA III PORTUGAL	from 2011 to 2013	ACE RENF. POT. BAR. DE VENDANOVA III	Granite	63 84 350 360 82	2,44 2,44 2,44 5,46 3,68	90° 90° 90° 90° 90°	unap. unap. unap. unap. unap.	7 13 86 90 10		
Comessa 2011/06 ALMINA - Mina de Alentejo Aljustrel PORTUGAL	2011	0	Siltite & Ryolite	205 156	4,09 4,09	90° 90°	unap. unap.	21 36	Ventilation shaft Ventilation shaft	
Comessa 2011/07 ANAS - S.S. 340 Regina Valsolda (CO) - ITALIA	2011	ICG2 S.p.A.	Limestone	130	4,09	90°	unap.	24	Ventilation shaft	
Comessa 2011/10 MONT BLANC Torino Hut - Helbronner Peak Courmayeur - ITALY	2011	CORDEE MONT BLANC	Granite	77	1,84	90°	unap.	14	Lift Shaft	
Comessa 2011/11 Cementary Plant Cava Costiolo (BG) - ITALY	2011	UNICALCE SPA	LIMESTONE	100	3,05	90°	unap.	13	Slot shaft	
Comessa 2011/13 E-werk Muhlbach Rio Pusteria (BZ) ITALY	2011	OBEROSLER S.p.A.	Granite	431 431	1,84 1,55	90° 90°	unap. unap.	44 32	Both Pilot Hole by RVDS Penstock shaft Penstock shaft	
Comessa 2012/03 Lewa Srl Solda - Stelvio (Bz) ITALY	2012	MAIR JOSEF & CO. KG	Calcescisti	124	1,55	51,46°	1,4	15	Penstock shaft	
TOTAL REAMED SHAFT'S LENGHT m.									51.987	(*) from pilot hole start to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXEC. TIME (*) (days)	REMARKS
Comessa 2012/05 Impregilo-Ohl Proyecto HPP El Quimbo COLOMBIA	2012	IMPREGILO-OHL	Conglomerates, sandstones and argillites	100 100	1,84 1,84	90° 90°	unap. unap.	6 5	Penstock shaft Penstock shaft
Comessa2012/06 Oderbrecht AH Cambambe ANGOLA	2012 2013	CONSTRUCTORA NORBERTO ODERBRECHT	Gresosas y conglomeraticas	67 67 67 67	1,84 1,84 1,84 1,84	90° 90° 90° 90°	unap. unap. unap. unap.	10 8 7 10	Penstock shaft
Comessa 2012/07 Mina Farallon Negro Catamarca ARGENTINA	2013	PANEDILE	MONZONITE	230 280 60 130	1,55 1,55 1,55 1,55	65°-70° 65°-70° 65°-70° 65°-70°	unap. unap. unap. unap.	11 19 8 11	ventilation shaft ventilation shaft ventilation shaft Ventilation shaft
Comessa2012/08 Hydroelectric plan Barragem de Foz do Tua PORTUGAL	2013	BARRAGEM DE FOZ TUA	Granite	35 39 28 23	2,44 2,44 2,44 2,44	90° 90° 90° 90°	unap. unap. unap. unap.	7 8 5 6	Penstock shaft
Comessa 2012/09 Nurrage-Arrubiu dam Nurri-Oroli (Ca) - ITALY ITALY	2013	LIS SRL	Compact Porhyroid	77 171 160	1,32 1,32 1,32	90° 36,67° 43,16°	unap. unap. unap.	11 20 23	Shaft Penstock shaft Penstock shaft
Comessa 2012/10 Ponte del Costone Quarry Casnigo (Bg) ITALY	2013	UNICALCE SPA	Limestone	215	3,41	70°	unap.	13	Rock stocking well shaft
Comessa 2013/07 Rodoreto Mine Prati (To) ITALY	2013	IMERY'S TALC ITALY SPA	Gnaiss	45,00	2,74	40,78°	unap.	13	Ventilation / exit shaft
Comessa 2013/08 Ulu Jelai Hydroelectric Project MALAYSIA	2013 2014	SALINI MALAYSIA SND. BHD.	Granite	17,00 17,00 337,00	1,84 1,84 1,84	90° 90° 90°	unap. unap. unap.	5 4 56	slot shaft slot shaft Surge + Power shaft
TOTAL REAMED SHAFT'S LENGHT m.									(*) from pilot hole start to reaming end only
									54.319

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXEC. TIME (*) (days)	R E M A R K S
Comessa 2013/10 Brennero tunnel - A22 highway Mules (Bz) ITALY	2013	CONSORZIO BRENNERO 2011 SCARL	Granite	47,50	1,84	90°	unap.	17	Ventilation shaft
Comessa2014/03 Slot 9 Cava Costiolo Ubiale Clanezzo (Bg) ITALY	2014	UNICALCE SPA	Limestone	90,00	3,05	90°	unap.	20	Slot shaft
Comessa 2014/05 Hydroelectric plant Bressanone loc. Naz-Sciavezz/Fortezza (Bz) ITALY	2014	SAVINI COSTRUZIONI SRL	Granite	42,00	1,52	65°	unap.	4	Shaft
Comessa 2014/06 Collector Algeri ALGERIA	2014	TODINI COSTRUZIONI GENERALI SRL	Marl Lime	196,61 81,00	1,52 1,84	63° 62°	unap. unap.	13 6	discharging shaft discharging shaft
Comessa 2014/08 Railway Apricena (Fg) ITALY	2014	ACMAR ScpA	Limestone	70,00 70,00	2,13 2,13	90° 90°	unap. unap.	6 7	Ventilation shaft Ventilation shaft
Comessa2014/09 SNAM RETE GAS Pipeline Pentone- Fossato Serralta (CZ) ITALY	2014	SICILSALDO SPA	Lic sandy and granite	44,45 186,00 137,50 77,50	0,66 0,66 0,66 0,66	46° 45° 45° 45°	unap. 7 5 1,3	2 13 9 5	Gas pipeline shaft Gas pipeline shaft Gas pipeline shaft Gas pipeline shaft
Comessa2014/10 Obervermuntwerk II Project Partenen AUSTRIA	2014 2015	ARGE BAU OVW II	Gneiss	273,00 110,00 19,00	3,05 3,05 3,05	90° 48° 90°	0,17 1,20 --	21 11 4	surge shaft inclined shaft
Comessa2014/11 Viterbo City ITALY	2015	TREVI SPA	Tuffaceous	18,00 18,00	3,13 3,13	90° 90°	unap. unap.	3 3	Elevator shaft Elevator shaft
Comessa2015/01 Kristallina Mine Vipiteno (Bz) ITALY	2015	OMYA SPA	Carbonate	200,00	12 1/4"	80°/85°	1	17	Only pilot hole
Comessa2015/04 Martina Mine Casazza (Bg) ITALY	2015	NICEM SRL	Limestone	115,00	3,05	90°	0,9	14	Vertical shaft
Comessa2015/05 Conduite Forcée de Passy Passy FRANCE	2015	VCF TP LYON	alternace de schistes cristallins (named gneiss) et quartzites	190,00	3,05	90°	0,38	23	Penstock

TOTAL REAMED SHAFT'S LENGHT m.

56.305

(*) from pilot hole start
to reaming end only

RAISE BORING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	DEVIA- TION (m.)	EXEC. TIME (*) (days)	REMARKS
Comessa2015/06 Dimaro ITALY	2015	COGEIS SPA	Dolomia	400,00 150,00	1,42 1,42	4,50% 4,50%	0 0	12 9	Pilot Hole - Penstock Reaming - Penstock
Comessa2015/09 Hydroelectric plant "Gabiet" Gressoney (Ao) ITALY	2015	CONSORZIO CONDUITE GABIET	serpentine and prasinites average fractured	110,00 140,00	2,44 1,84	23-36° 23-29°	4,00 n.p.	14 20	Penstock
Comessa2016/01 Châble-du-Midi Villeneuve SWITZERLAND	2016	CARRIERS D'ARVEL S.A.	Siliceous Limestone rocks	290,00	3,68	60°	n.p.	36	Mucking shaft
Comessa2016/04 Los condores CHILE	2016	FERROVIAL AGROMAN CHILE S.A.	Tobas Volcánicas y Brechas	-		90°	project cancelled		Penstock Shaft
Comessa2016/07 Snam Rete Gas Votaggio (AI) Italy	2016	A.t.i. SICILSADO SPA NUOVA GHIZZONI	Conglomerati litoidi	20,00 17,00 22,50 22,00	1,52 1,52 1,52 1,52	50,60° 48,99° 50,47° 48°	n.p. n.p. n.p. n.p.	5 5 5 5	Inclined shaft Inclined shaft Inclined shaft Inclined shaft
Comessa2016/09 Cava Graina Ossimo e Malegno (Bs) Italy	2016	EDILQUATTRO SRL	Limestone	270,00	3,09	75°	3,24	20	Mucking shaft
Comessa2016/10 Cava Monte tondo Riolo Terme (RA) Italy	2016	SAINT-GOBAIN PPC ITALIA S.p.A.	Gypsum	41,50	3,05	79,00%	n.p.	15	Mucking shaft
Comessa2016/11 slot 10 Cava Costiolo Ubiale (Bg) Italy	2016	UNICALCE SPA	Limestone	100	3,05	90°	n.p.		Slot shaft
Comessa2016/12 Pozzo Finestra Vallemme Votaggio (AL) Italy	2017	COCIV High speed /high capacity rail Milan-Genoa	Claystone	217	1,84	90°	1,20	70	Ventilation
Comessa 2016/13 Rodoreto Mine Prati (To) ITALY	2016	IMERYS TALC ITALY SPA	Gneiss	56,00	2,74	41	unap.	19	Ventilation / exit shaft
Comessa 2016/15 Alto Maipo Hydroelectric Project Alto Maipo CHILE	2016	Strabag AG	VOLCANIC ROCKS	160,76 134,31 152,61	5,00 5,00 3,50	vertical vertical vertical	unap. unap. 0,46	41 48 19	IN EXECUTION
Comessa 2016/16 Rio Fereggiano by pass Genova ITALY	2017	PAC SPA	Limestone	70,00	1,32	vertical	0,59	15	Ventilation shaft
TOTAL REAMED SHAFT'S LENGHT m.									(*) from pilot hole start to reaming end only

58.678

Commissa 2017/01 Cantera de Punta Lucero Bilbao Spagna	2017	Excavaciones Viuda de Sainz, S.A	LIMESTONE	182,70	4,09	65°	0,59	27	Mucking shaft
Commissa 2017/03 Raise Boring Programm Olympias Mine Greece	2017	Hellas Gold S.A.	Gneisses Pegmatites Marbles						IN EXECUTION
Commissa 2017/04 Ventilation shaft Tunnel Blessberg Sigmungsburg Germany	2017	Zublin AG	Sandstone	51,80	3,05	VERT	0,04	13	Ventilation shaft
Commissa 2017/05 Barrage du Gage Lac D'Issarles France	2017	Campenon Bernard Regions	Granite	32,26 20,77	1,06 1,06	VERT 58,70°	unap. unap.	5 6	Aerators
Commissa 2017/06 Ventilation shaft Tunnel Silberberg Großbreitenbach Germany	2017	Zublin AG	Sandstone	110,00	3,05	VERT	unap.	17	Ventilation shaft
Commissa 2017/07 Gas Pipeline for Saipem Pavullo-Sermazzoni (MO) Italy	2017	Ge.Co. Condotte	flysh	114,00	0,66	33°	5,74	10	Ventilation shaft
Commissa 2017/09 Quarry Torreon - Calidra Mexico	2017	BM	limestone	170,00	4,09	75°	0,60	60	Mucking shaft
Commissa 2017/13 Penstock Shaft Fellital - Gurntellen - Uri SWITZERLAND	2017	KW Fellitobel AG	Migmatite Granite	179,00	1,15	54°	10,00	30	penstock
Commissa2018/04 Slot 11 Cava Costiolo Ubiale Clanezzo (Bg) ITALY	2018	UNICALCE SPA	Limestone	96,70	3,05	90°	unap.	20	Slot shaft
Commissa2018/06 HPP Sant'Antonio Oberbozen (BZ) ITALY	2018	OBEROSLER	vulcanic rocks	523,00	3,05	90°	in execution		Penstock shaft
Commissa 2018/17 Rio Fereggiano by pass Genova ITALY	2018	PAC SPA	Limestone	38,50 25,00 90,00 50,00	3,05 2,44 1,05 3,41	vertical vertical vertical vertical	unap. in execution in execution in execution	10	Access shaft Intake Shaft Ventilation shaft Intake Shaft
Commissa2018/01 HPP Maisonettes Avisse (AO) ITALY	2018	MAISONETTES SRL	Micashist	310,00	1,55	90°	planned autumn 2018		Penstock shaft
TOTAL REAMED SHAFT'S LENGHT m.				60.672					(*) from pilot hole start to reaming end only

PILOT HOLES VERTICAL AND INCLINED BY RAISE BORING MACHINE WITH DIRECTIONAL STEERING TOOLS

Project n.	Project	Depth (m)	Inclin. (degree)	Dia		Drilling (Days)	Year work	Contractor	Rock type	Divergency	
				(m)	(inc)					(m)	(%)
	Cables/lift Upper	254	90°	0,215	8 1/2"	14	1992	Hydro-Electric S.Giacomo al Vomano (ITALY)	Limestone and Marl *last 12 m. only	0,07	0,028%
	Cables/lift Lower	308	90°	0,215	8 1/2"	17	1992			0,2	0,065%
	Penstock Shaft Upper	308,5	90°	0,215	8 1/2"	10	1992			0,07	0,023%
	Penstock Shaft Lower	302,5	90°	0,215	8 1/2"	18	1992			(0,6)*÷0,05	(0,2)÷0,016
	Pressure Shaft upper	225	45°	0,311	12 1/4"	7	1995	ENEL HEP- Pejo (ITALY) DE LIETO S.p.A.	Bad Schist	0,15	0,067%
	Pressure Shaft lower	250	43°	0,311	12 1/4"	7	1998	ENEL HEP- Pejo (ITALY) DE LIETO S.p.A.		0,34	0,136%
	Penstock Shaft	280	90°	0,311	12 1/4"	11	1999	ENEL HEP- Susa (ITALY) PONT VENTOUX S.c.a.r.l.	Schist	3,2	1,143%
	Ventilation Shaft	335	90°	0,349	13 3/4"	21	2000	ATF LOTCHBERG for BLS Alptransit AG Ferden (CH)	Gneiss	0,47	0,140%
	Gas pipeline SNAM	318	2,3°	0,311	12 1/4"	14	2001	TRE COLLI S.p.A. - ITALY	Porphyry	6,3	1,981%
	Surge shaft HEP Vendanova II	402	90°	0,349	13 3/4"	12	2001	J.V. SOMAGUE-MSF-MOTA - PORTUGAL	Granite	0,12	0,030%
<i>Commissa 2006/09</i>	Crossing Hole	670	4°	0,311	12 1/4"	30	2006	St. Andrea Deseno S.r.l.	Granite	0,15	0,022%
<i>Commissa 2006/02</i>	Penstock Shaft	580	90°	0,311	12 1/4"	58	2007	Hydro- Brissogne- F.LLI RONC SRL (ITALY)	Misachist	0,18	0,031%
<i>Commissa 2006/16</i>	Penstock Shaft	220	90°	0,311	12 1/4"	17	2007	Hydro- Val Passiria - INGENIEURBURO (ITALY)	Schist	0,06	0,027%
<i>Commissa 2008/03</i>	Cables & Ventilation	170	90°	0,349	13 3/4"	23	2008	Hydro- Picote - UTE MSF - OPCA (PORTUGAL)	Granite	0,04	0,024%
<i>Commissa 2009/05</i>	Surge Chamber Shaft	70	90°	0,311	12 1/4"	12	2009	Rizzanese HEP - Corse - BEC FRERES (FRANCE)	Diorite-	0,02	0,029%
<i>Commissa 2010/08</i>	Surge-Penstock Shaft	254	90°	0,349	13 3/4"	11	2010	Palomino HEP - ODEBRECHT Rep. Dominicana	Sedimentary	0,65	0,256%
<i>Commissa 2010/13</i>	Penstock Shaft	280	90°	0,381	15"	14	2010	Vianden HEP - ARGE ERVAITERUNG - LUXEMBURG	Shale	0,075	0,027%
<i>Commissa 2008/10</i>	Ventilation Shaft	275	90°	0,349	13 3/4"	9	2010	Tunnel SS 12 OBEROSLER S.p.A. - ITALY	Porphyry	0,13	0,047%
<i>Commissa 2010/14</i>	Ventilation Shaft	264	90°	0,311	12 1/4"	8	2011	ENTE IRRIGUO UMBRO-TOSCANO - ITALY.	Limestone	0,8	0,303%
<i>Commissa 2011/13</i>	Penstock Shaft	438	90°	0,311	12 1/4"	17	2011/2012	EISACKWERK RIO PUSTERIA S.r.l. - ITALY	Granite	0,05	0,011%
<i>Commissa 2011/13</i>	Penstock Shaft	438	90°	0,311	12 1/4"	13	2012	EISACKWERK RIO PUSTERIA S.r.l. - ITALY	Granite	0,05	0,011%
<i>Commissa 2012/09</i>	Shaft	77	90°	0,311	12 1/4"	4	2012	LIS SRL - ITALY	Granite	un.	un.
<i>Commissa 2013/08</i>	Surge + Power shaft	337	90°	0,311	12 1/4"	56	2014	SALINI MALAYSIA SND. BHD.	Granite	un.	un.
<i>Commissa 2014/10</i>	Penstock Shaft	273	90°	0,349	13 3/4"	21	2015	ARGE BAU OVW II	Gneiss	0,17	0,062%
<i>Commissa 2015/01</i>	Water Drainage shaft	200	80°	0,311	12 1/4"	17	2015	OMYA SpA	Dolomite and Moraine	1	0,500%
<i>Commissa 2015/05</i>	Penstock Shaft	190	90°	0,349	13 3/4"	23	2015	VCF TP LYON	Gneiss and quartzites	0,38	0,200%
<i>Commissa 2015/06</i>	Penstock shaft	400	4,50%	0,311	12 1/4"	23	2015	COGEIS SPA	Dolomite and Moraine	un.	un.
<i>Commissa 2016/15</i>	Penstock Shaft	164	90°	0,381	15"	41	2017	STRABAG AG	Volcánicas y Brechas	un.	un.
<i>Commissa 2016/15</i>	Penstock Shaft	134	90°	0,381	15"	48	2017	STRABAG AG	Volcánicas y Brechas	un.	un.
<i>Commissa 2016/12</i>	Ventilation Shaft	217	90°	0,311	12 1/4"	70	2017	COCIV - Vallemme Tunnel	Claystone	1,2	0,553%
<i>Commissa 2017/04</i>	Ventilation Shaft	56	90°	0,311	12 1/4"	3	2016	ZUBLIN AG - Blessberg tunnel	Sandstone	0,04	0,071%
<i>Commissa 2017/04</i>	Ventilation Shaft	110	90°	0,311	12 1/4"	4	2016	ZUBLIN AG - Silberberg tunnel	Sandstone	0,02	0,018%
<i>Commissa2018/06</i>	Penstock shaft	523	90°	0,349	13 3/4"		2018	OBEROSLER - EISACKWERK. OBERBOZEN - ITALY	vulcanic rocks	in execution	

TOTAL DRILLED m. 9.323

PROJECT	Hydroelectric power plant Penstock shaft Timpagrande (CZ) ITALY Year: 1976	PURCHASER	E.N.E.L.
		CONTRACTOR	DE LIETO S.p.A.
		ROCK TYPE	DEGRADED GRANITE
WORKS DESCRIPTION			
		<p>- Sinking vertical shaft 124 m deep from Ø 2,13 m, previously reamed by Raise Boring Machine, to diameter Ø 6,50 m</p> <p style="text-align: right;">TOT. MINED ROCK cu.m. 3.900</p>	
WORKING SYSTEM			
		<ul style="list-style-type: none"> - Drilling, blasting, scaling and mucking from the top to the bottom and evacuation through Raise Borer hole by air-water lance; - Laying electro-welded net, steel centerings, rock bolts and shotcrete; - Concreting by self-lifting form 	
EQUIPEMENTS USED			
		<ul style="list-style-type: none"> - Stationary gantry crane with two winches: one for goods and one for passengers lift; - Jumbo drill rig with two booms and air rock drill; - Dry shotcreting machine. 	

PROJECT	Hydroelectric power plant - Concrete Dam Inlet sluice shaft	PURCHASER	CONSORZIO ACQUE NERE PER PROVINCE DI FORLI' - RAVENNA
	Ridracoli (FO) - ITALY	CONTRACTOR	COGEFAR - LODIGIANI - C.M.C.
	Year: 1978	ROCK TYPE	MARL - SANDSTONE
WORKS DESCRIPTION			
<p>- Sinking vertical shaft 93 m deep from Ø 2,13 m, previously reamed by Raise Boring Machine, to diameter Ø 6,00 m, starting from the tunnel and cutting the raise boring hole to 10 m below the top.</p> <p style="text-align: right;">TOT. MINED ROCK cu.m. 2.051</p>			
WORKING SYSTEM			
<p>- Drilling, blasting, scaling and mucking from the top to the bottom and evacuation through Raise Borer hole by air-water lance;</p> <p>- Laying electro-welded net, steel centerings, rock bolts and shotcrete;</p>			
EQUIPEMENTS USED			
<p>- Stationary gantry crane with two winches: one for goods and one for passengers lift;</p> <p>- Jumbo drill rig with two booms and air rock drill.</p>			

PROJECT	Hydraulic plant - Dam of Hammam Meskoutine Penstock and spillway shafts Guelma - ALGERIA	PURCHASER	MINISTRY OF WATER
	Year: 1982	CONTRACTOR	COGEFAR - ITALSTRADE - RECCHI
		ROCK TYPE	MARL - SANDSTONE
WORKS DESCRIPTION			
<p>- <u>Penstock intake</u> Sinking vertical shaft 40 m deep from Ø 2,44 m, previously reamed by Raise Boring Machine, to diameter Ø 5,00 m.</p> <p>- <u>Two open spillway shafts</u> Sinking inclined shafts, previously reamed to Ø 2,44 m by Raise Borer Machine, starting vertically from the top with a mean diameter of 16 m and arriving to the bottom with a diameter of 12 m and an inclination of 50° (following the shape of a horn). Mean length 70 m.</p> <p style="text-align: right;">TOT. MINED ROCK cu.m. 19.396</p>			
WORKING SYSTEM			
<p>- From the top to the bottom drilling, blasting, scaling, mucking with excavator; - Laying steel centerings, electro-welded net , rock bolts and shotcrete (first lining); steel centerings, armour-plating and concreting (second lining).</p>			
EQUIPEMENTS USED			
<p>- Stationary tower jib crane, crawler air rock drill, excavator, welding machine, wet shotcreting machine.</p>			

PROJECT	Hydroelectric power plant	PURCHASER	E.N.E.L.
	Surge shafts	CONTRACTOR	DE LIETO S.p.A.
	Presenzano (CE)-ITALY	ROCK TYPE	LIMESTONE
	Year: 1985		
WORKS DESCRIPTION			
<p>- Sinking vertical shaft 50 m deep from Ø 2,13 m, previously reamed by Raise Boring Machine, to diameter Ø 16,00 m</p> <p style="text-align: right;">TOT. MINED ROCK cu.m. 19.750</p>			
WORKING SYSTEM			
<p>- From the top to the bottom drilling, blasting, scaling, mucking with excavator through Raise Borer hole;</p> <p>- Laying electro-welded net, steel centerings, rock bolts and shotcreting.</p>			
EQUIPEMENTS USED			
<p>- Overhead travelling gantry crane 14 tons capacity, 17 m rail gauge;</p> <p>- Air crawler rock drill;</p> <p>- Escavator;</p> <p>- Dry shotcreting machine.</p>			

PROJECT	Hydroelectric power plant	PURCHASER	TANESCO
	Various shafts	CONTRACTOR	COGEFAR S.p.A.
	M'tera - TANZANIA	ROCK TYPE	HARD GRANITE
	Year: 1985		
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - <u>Penstock shafts</u>: Sinking two vertical shafts 107 m deep from Ø 1,30 m, previously reamed by Raise Boring Machine, to three different diameters; from top: 1) final diameter Ø 5,80 m, length 21 m; 2) final diameter Ø 7,40 m, length 9,50 m; 3) final diameter Ø 4,00 m, length 76,5 m. TOT. MINED ROCK cu.m. 4.048 - <u>Cables, lift shaft</u>: Sinking vertical shaft 115 m deep from Ø 1,30 m, previously reamed by Raise Boring Machine, to rectangular section of 3,60 x 2,40 m. TOT. MINED ROCK cu.m. 1.588 - <u>Weeled gate shaft</u>: Sinking vertical shaft 23 m deep from two holes with diameters of Ø 1,30 m and Ø 2,44 m, previously reamed by Raise Boring Machine, to rectangular section of 13,60 x 2,60 m. TOT. MINED ROCK cu.m. 834 - <u>Draft shafts</u>: Underground sinking of two vertical shafts 33 m deep from Ø 1,30 m, previously reamed by Raise Boring Machine, to an elliptical section of 19,20 sq.m. TOT. MINED ROCK cu.m. 1.220 - <u>Surge shafts</u>: Underground sinking of two vertical shafts 15 m deep from Ø 2,44 m, previously reamed by Raise Boring Machine, to Ø 8,00 m. TOT. MINED ROCK cu.m. 1.550 - <u>Intake tunnel 1 and 2</u>: Tunnelling between two parallel shafts. TOT. MINED ROCK cu.m. 1.538 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom drilling, blasting, scaling, mucking with excavator through Raise Borer hole; - Laying electro-welded net, steel centerings, rock bolts and shotcreting. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 4 tons capacity, 6 m rail gauge, with two electric winches: one for goods and one for passengers lift; - Jumbo drill rig with two booms and air rock drills; - Air-crawler rock drill and truck loader. 			

PROJECT	Hydroelectric power plant Various shafts	PURCHASER	ELECTRICIDADE DE PORTUGAL
	Alto Lindoso PORTUGAL Year: 1988/89	CONTRACTOR	TORNO S.p.A.
		ROCK TYPE	HARD GRANITE
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - <u>Cables, lift, ventilation shaft</u> Sinking vertical shaft 335 m deep from Ø 1,80 m, previously reamed by Raise Boring Machine, to diameter Ø 7,80 m TOT. MINED ROCK cu.m. 16.200 - <u>Penstock shaft</u> Sinking vertical shaft 330 m deep from Ø 1,80 m, previously reamed by Raise Boring Machine, to diameter Ø 7,00 m TOT. MINED ROCK cu.m. 26.300 - <u>Cooling room, drainage tunnel, penstock intakes</u> Tunnelling between shafts TOT. MINED ROCK cu.m. 1.500 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom drilling, blasting, scaling, mucking through Raise Borer hole by specific excavator; - Laying electro-welded net and bolts where necessary; shotcreting all surfaces. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 8 tons capacity, 7 m rail gauge with two electric radio remote controlled winches: one for goods and one for personnel; - Electro-hydraulic jumbo drill rig with two independent booms and hydraulic rock drills; - Two excavators; - Standard shotcreting pump and in-shaft pump for particular addittivate shotcrete; - Electric hoist for power cable; - Containerised workshop. 			

PROJECT	Locarno underground by-pass road Ventilation shaft	PURCHASER	DIPARTIMENTO PUBBLICHE COSTRUZIONI TICINO
	Locarno-SWITZERLAND	CONTRACTOR	CONSORZIO GALLERIA DI LOCARNO
	Year:	ROCK TYPE	SCHIST - GNEISS
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking vertical shaft 370 m deep from Ø 2,44 m, previously reamed by Raise Boring Machine, to final diameter Ø 6,60 m TOT. MINED ROCK cu.m. 11.000 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling, blasting, scaling and mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Laying electro-welded net and bolts; shotcreting all surfaces; - Waterproofing the wall by plastic covering; - Final concreting by self-lifting slip form. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 6+8 tons capacity, 7 m rail gauge with four hydraulic radio controlled winches: three for working platform and one for personnel; - Electro-hydraulic jumbo-platform drill rig with two independent booms and hydraulic rock drills; - Hydraulic excavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop. 			

PROJECT	Cels Tunnel - Frejus highway Ventilation shaft	PURCHASER	S.I.T.A.F. S.p.A.
	Val di Susa (TO) - ITALY	CONTRACTOR	INC. COSTRUZIONI GENERALI S.p.A.
	Year: 1991	ROCK TYPE	SCHIST
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking vertical shaft 311 m deep from Ø 2,44 m, previously reamed by Raise Boring Machine, to final diameter Ø 11,00 m TOT. MINED ROCK cu.m. 28.100 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling, blasting, scaling and mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Lining the wall by steel rib and electro-welded net bolted to the rock and shotcreting all surfaces; - Final concreting by self-lifting slip form. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 8 tons capacity, 7 m rail gauge with two electric radio remote controlled winches: one for goods and one for personnel; - Electro-hydraulic jumbo drill rig with one boom and hydraulic rock drill; - Two excavators; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for power cable; - Containerised workshop. 			

PROJECT	Hydroelectric Power Plant Surge and reversible machine shafts S. Giacomo al Vomano (TE) - ITALY Year: 1992/94	PURCHASER	E.N.E.L.
		CONTRACTOR	CONSORZIO S. GIACOMO
		ROCK TYPE	MARL AND LIMESTONE
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - <u>Surge shaft</u> Sinking vertical shaft 95 m deep from Ø 2,44 m, previously reamed by Raise Boring Machine, to final diameter Ø 20 m for the first 70 m, then to Ø 8 m for the last 25 m. TOT. MINED ROCK cu.m. 23.250 - <u>Reversible machine shaft</u> From underground Power House, sinking vertical shaft 55 m deep from Ø 1,84 m, previously reamed by Raise Boring Machine, to final diameter Ø 16,60 m TOT. MINED ROCK cu.m. 13.680 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling, blasting, scaling and mucking through Raise Borer hole by excavator from the top to the bottom; - Layering steel centerings, rock bolts, shotcreting, scaffolding and concreting. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 24 tons capacity, 20 m rail gauge; - Air crawler rock drill and hydraulic jumbo with one boom; - Escavators with bucket and hydraulic hammer; - Wet shotcreting pump. 			

PROJECT	Hydroelectric Power Plant Cable/lift and penstock shafts S. Giacomo al Vomano (TE) - ITALY Year: 1992/94	PURCHASER	E.N.E.L.
		CONTRACTOR	CONSORZIO S. GIACOMO
		ROCK TYPE	MARL AND LIMESTONE
WORKS DESCRIPTION			
<p>- <u>Cable/lift shaft</u> Sinking vertical shaft 610 m deep in two sections of 308+302 m from Ø 1,84 m, previously reamed by Raise Boring Machine, to final diameter Ø 5,95. TOT. MINED ROCK cu.m. 15.500</p> <p>- <u>Penstock shaft</u> Sinking vertical shaft 566 m deep in two sections of 254+312 m from Ø 1,84 m, previously reamed by Raise Boring Machine, to final diameter Ø 5,95. TOT. MINED ROCK cu.m. 14.400</p>			
WORKING SYSTEM			
<p>- Down hole reaming to final diameter; - Shotcreting and lining the wall by 14 steel panels per meter, each bolted to the rock by resined steel anchor bolts 2,5 m long.</p>			
EQUIPEMENTS USED			
<p>- Raise Boring Machine 83 RM-DC with Ø12 7/8" drill pipes and Ø 5,95 m down reamer 370 tons heavy; - Two levels platform equipped at the upper level with drilling and bolting machine and at the lower level with shotcreting machine, travelling into the shaft by a couple of electric on-board radio controlled hoists; - Elevator for goods and personnel travelling into the shaft at variable speed 0÷60 m/min by an electro-hydraulic on-board radio controlled hoist; - Steel structures to support the equipments in shaft and to cover the shaft; - Electric hoist for electric multipolar power cable.</p>			

PROJECT	New development of limestone quarry	PURCHASER	CEMENTERIE SICILIANE S.p.A.
	ISOLA DELLE FEMMINE (PA) - ITALY	CONTRACTOR	CEMENTERIE SICILIANE S.p.A.
	Year: 1995	ROCK TYPE	LIMESTONE
WORKS DESCRIPTION			
<p>- Sinking vertical shaft 50 m deep from Ø 3,68, previously reamed by Raise Boring Equipment, to final Ø 8 m.</p> <p style="text-align: right;">TOT. MINED ROCK cu.m. 2.600</p>			
WORKING SYSTEM			
<p>- Drilling and blasting, scaling, mucking through the Raise Borer hole by specific jumbo drilling machine and excavator.</p> <p>- Lining the wall by rock bolts and shotcreting all surfaces.</p>			
EQUIPEMENTS USED			
<p>- Overhead travelling gantry crane 8 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: one for goods and one for personnel;</p> <p>- Electro-hydraulic jumbo drilling machine with one boom and hydraulic rock drill;</p> <p>- Excavator;</p> <p>- Shotcreting pump for wet shotcrete;</p> <p>- Electric hoist for power cable;</p> <p>- Containerised workshop.</p>			

PROJECT	Hydroelectric Plant Various shafts	PURCHASER	E.N.E.L. VENEZIA
	Cogolo (TN) - ITALY	CONTRACTOR	DE LIETO S.p.A.
	Year: 1994/95	ROCK TYPE	SCHIST
WORKS DESCRIPTION			
<p>- <u>Penstock shaft:</u> Lining all the length of 45° inclined shaft 225 m deep, previously reamed to Ø 2,13 m, by spraying wet premixed and polipropilene fibres reinforced concrete and then laying steel panels, each bolted to the rock.</p> <p>- <u>Surge shaft:</u> Lining all the length of 84 m deep vertical shaft, reamed by Raise Boring Equipment in two different size (diameter Ø 3,13 m for the upper 49 m and diameter Ø 6,12 m for the last 35 m), by spraying wet premixed and polipropilene fibres reinforced concrete and then laying steel panels, each bolted to the rock.</p>			
WORKING SYSTEM			
<p>- From the top to the bottom laying manually steel panels to the wall from a working platform, bolting each one to the rock and spraying wet shotcrete.</p>			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Radio remote controlled hydraulic hoist 6 tons lifting capacity, variable speed; - Railway steel platform; - Special platforms that allow to work in Ø 6 m shaft arriving from Ø 3 m shaft; - Wet shotcreting pump; - Hand all powered drilling machine. 			

PROJECT	Tunnel de Somport Ventilation shaft	PURCHASER	MINISTERIO DE FOMENTO
	Jaca - SPAIN	CONTRACTOR	ERSOM - UTE
	Year: 1996	ROCK TYPE	LIMESTONE - MARL
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking vertical shaft 213 m deep from Ø 4,78 m, already reamed by Raise Boring Equipment, to Ø 7 m final excavation; - Waterproofing; - Final concreting. <p style="text-align: right;">TOT. MINED ROCK cu.m. 4.373</p>			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling, blasting, scaling, mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; - Waterproofing the wall by plastic covering; - Final concrete lining by self-lifting slip form. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform with total lifting capacity of 11 tons and one for personnel lift with 6 tons capacity; - Electro-hydraulic jumbo-platform drilling rig with two independent booms and hydraulics rock drills and hydraulic excavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; - Self-lifting slip form. 			

PROJECT	New underground Railway Station Ventilation shafts	PURCHASER	FERROVIE DELLO STATO
	S. Remo (IM) - ITALY	CONTRACTOR	FIORONI S.p.A.
	Year: 1997	ROCK TYPE	SANDSTONE - MARL
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Shotcreting, steel lining and bolting two vertical shafts Ø 4,07 m, 40 m and 80 m deep; - Final concrete lining. 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom shotcreting and steel lining the walls; - From the bottom to the top concreting to final diameter Ø 3,40 m. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Radio remote controlled hydraulic hoist 6 tons lifting capacity; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Self-lifting slip form. 			

PROJECT	Hydraulic plant "Chiascio" Airing hole Pianello (PG) - ITALY Year: 1997	PURCHASER	ENTE IRRIGUO UMBRO - TOSCANO
		CONTRACTOR	DE LIETO S.p.A.
		ROCK TYPE	MARL - SANDSTONE
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Lining all the length of 80 m deep vertical shaft, already reamed by Raise Boring Equipment to final size of Ø 2,44 m, by laying steel panels, bolting each one to the wall and spraying wet shotcrete. 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom bolting the rock, laying the panels and spraying wet shotcrete. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Radio remote controlled hydraulic hoist 6 tons lifting capacity, variable speed; - Hanging steel platform; - Special platforms that allow to work in Ø 2,44 m vertical shaft; - Wet shotcreting pump; - Hand drilling machine. 			

PROJECT	Talc Mine Ventilation and safety exit shaft Prali (TO) - ITALY Year: 1998/99	PURCHASER	LUZENAC VALCHISONE S.p.A.
		CONTRACTOR	LUZENAC VALCHISONE S.p.A.
		ROCK TYPE	QUARTZ - MICASCHIST
WORKS DESCRIPTION			
		<ul style="list-style-type: none"> - Lining all the length of vertical shaft 276 m deep, already reamed to Ø 3,05 m, by laying steel panels, each one bolted to the rock wall, shotcreting wet concrete and installing steel structure for safety exit. 	
WORKING SYSTEM			
		<ul style="list-style-type: none"> - From the top to the bottom laying manually the steel panels to the wall from a working platform, bolting each one to the rock, spraying wet shotcrete and lifting and transporting the steel structure into the shaft. 	
EQUIPEMENTS USED			
		<ul style="list-style-type: none"> - Radio remote controlled hydraulic hoist 6 ton. lifting capacity, variable speed; - Hanging steel platform; - Special platforms that allow to work in Ø 3,05 m vertical shaft; - Wet shotcreting pump; - Hand drilling machine. 	

PROJECT	Hydroelectric power plant Discharge and penstock shaft Pieve Vergonte (VB) ITALY Year: 1998/99	PURCHASER	E.N.E.L. TORINO
		CONTRACTOR	DE LIETO S.p.A.
		ROCK TYPE	GNEISS
WORKS DESCRIPTION			
<p>- <u>Discharge shaft:</u> Lining all the length of 396 m deep 45° inclined shaft, already reamed by Raise Boring Equipment, to final size of Ø 3,68 m, by bolting the wall and laying wire net and spraying wet shotcrete. Installation of safety steel stairs</p> <p>- <u>Penstock shaft:</u> Lining all the length of 370 m deep 45° inclined shaft, already reamed by Raise Boring Equipment, to final size of Ø 3,05 m, by bolting the wall and laying wire net and spraying wet shotcrete.</p>			
WORKING SYSTEM			
<p>- From the top to the bottom bolting the rock, laying wire net and spraying wet shotcrete. - Lifting and transporting the steel structure into the shaft.</p>			
EQUIPEMENTS USED			
<p>- Radio remote controlled hydraulic hoist 6 tons lifting capacity, variable speed; - Railway steel platform; - Special platforms that allow to work in Ø 3,05 m and Ø 3,68 m inclined shaft; - Wet shotcreting pump; - Hand drilling machine.</p>			

PROJECT	Railway Tunnel Bologna-Firenze "TAV" Ventilation shaft Loc. Poggiolo (BO) ITALY	PURCHASER	FERROVIE DELLO STATO
	Year: 1999	CONTRACTOR	C.A.V.E.T.
		ROCK TYPE	SANDSTONE - MARL
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Lining all the length of 55 m deep 73,8° inclined shaft, already reamed by Raise Boring Equipment, to final size of Ø 3,05 m, by laying steel panels, each bolted to the rock wall, and spraying wet shotcrete. 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom by laying manually the steel panels to the wall from a working platform, bolting each one to the rock and spraying wet shotcrete. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Radio remote controlled hydraulic hoist 6 tons lifting capacity, variable speed; - Railway steel platform; - Special platforms that allow to work in Ø 3,05 m inclined shaft; - Wet shotcreting pump; - Hand drilling machine. 			

PROJECT	Lötschberg - Basisline Ventilation shaft Goppenstein - Ferden SWITZERLAND Year: 2000	PURCHASER	B.L.S. AlpTransit AG
		CONTRACTOR	ATF - Arge Fensterstollen Ferden
		ROCK TYPE	SERITICGNEISS AND SCHIST
WORKS DESCRIPTION		<ul style="list-style-type: none"> - Sinking the upper 144 m of the shaft by drilling and blasting from Ø 2,44 to final Ø 5 m diameter; - Lining the lower 197 m Ø 4,38 m of the shaft, already reamed by Raise Boring Equipment, by bolting, laying wire net and shotcreting. <p style="text-align: right;">TOT. MINED ROCK cu.m. 4.373</p>	
WORKING SYSTEM		<ul style="list-style-type: none"> - Drilling and blasting, scaling, mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; - Waterproofing the wall by plastic covering; - Final concreting by self-lifting slip form. 	
EQUIPEMENTS USED		<ul style="list-style-type: none"> - Overhead travelling gantry crane 30+5 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Electro-hydraulic jumbo-platform drilling rig with two independent booms and hydraulics rock drills and hydraulic excavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; - Self-lifting slip form. 	

PROJECT	Railway Tunnel Bologna-Firenze "TAV" Ventilation shaft "Vaglia Tunnel" Loc. Vaglia (FI) ITALY Year: 2000	PURCHASER	FERROVIE DELLO STATO
		CONTRACTOR	C.A.V.E.T.
		ROCK TYPE	SANDSTONE - MARL
WORKS DESCRIPTION			
		- Shotcreting, steel lining and bolting vertical shaft Ø 4,38 m, 160 m deep.	
WORKING SYSTEM			
		- From the top to the bottom steel lining and shotcreting the walls.	
EQUIPEMENTS USED			
		<ul style="list-style-type: none"> - Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 	

PROJECT	Railway Tunnel Bologna-Firenze "TAV" Ventilation shaft "RATICOSA" Tunnel Loc. Castelvecchio (FI) ITALY Year: 2001	PURCHASER	FERROVIE DELLO STATO
		CONTRACTOR	C.A.V.E.T.
		ROCK TYPE	SANDSTONE - MARL
WORKS DESCRIPTION			
		- Shotcreting, steel lining and bolting vertical shaft Ø 3,68 m, 160 m deep.	
WORKING SYSTEM			
		- From the top to the bottom steel lining and shotcreting the walls.	
EQUIPEMENTS USED			
		<ul style="list-style-type: none"> - Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 	

PROJECT	Conveyor Tunnel "Monte Giglio-Colle Pedrino" Interceptor Shaft Loc. Pontida (BG)	PURCHASER	ITALCEMENTI S.P.A.
	ITALY Year: 2003-2004	CONTRACTOR	ITALCEMENTI S.P.A.
		ROCK TYPE	MARL-LIMESTONE
WORKS DESCRIPTION			
- Excavation of a vertical Blinde shaft Ø 8,00 m 55 m deep, by jet-grouting of the top gage collar shaft, excavating the first			
WORKING SYSTEM			
- Jet-grouting the top 18 m gage collar of the shaft, excavating the first part by excavator, than by drilling and blasting. Lining the full surface of the wall by steel archs, wire mesch and shotcrete			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 30+5 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Skipp structure and bucket 4 mc capacity lifted by radio controlled hoist 20 ton lifting capacity - Kamo excavator - Electro-hydraulic jumbo drill-rig with two indipendent booms and hydraulics rock drills; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; 			

PROJECT	Enerpass Hydroelectric Power plant Surge Shaft S. Martino I.P. (BZ) ITALY Year: 2007	PURCHASER	ENERPASS
		CONTRACTOR	ENERPASS
		ROCK TYPE	GNEISS AND SCHIST
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking the upper 42 m of the shaft by drilling and blasting from Ø 1,84 to final Ø 9,2 m diameter; - first Lining Ø 8,80 m by bolting, laying wire net and shotcreting and final - final Lining Ø 8,00 m by metallic covering sp. 10 mm and concrete C 20/25 <p style="text-align: right;">TOT. MINED ROCK cu.m. 2.800</p>			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling and blasting, scaling, mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; - Final lining with steel covering and concrete behind 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 20+5 tons capacity, 9,5 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Electro-hydraulic jumbo-platform drilling rig with two independent booms and hydraulics rock drills and hydraulic excavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; 			

ECT	Enerpass Hydroelectric Power plant Penstock Shaft	PURCHASER	ENERPASS

PROJ	EDS.MG DEL F. CABELL S. Martino I.P. (B2) ITALY	Srl CONTRACTOR	ENERPASS	SINKING SHAFT DIVISION
	Year: 2007	ROCK TYPE	GNEISS AND SCHIST	
WORKS DESCRIPTION				
<ul style="list-style-type: none"> - Shotcreting, steel lining and bolting vertical shaft Ø 2,74 m, 220 m deep. - installing steel pipes φ 2,20 m for penstock 				
WORKING SYSTEM				
<ul style="list-style-type: none"> - From the top to the bottom steel lining and shotcreting the walls. - From the bottom to the top, installing 6,5 m long pipes and welding. 				
EQUIPEMENTS USED				
<ul style="list-style-type: none"> - Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 				

PROJECT	Salini Costruttori - Beles Multi Purpose Project - Etiopia Penstock Shaft Beles ETIOPIA Comessa 2006/13 Year: 2007-2008	PURCHASER	ETHIOPIAN ELECTRIC POWER CORPORATION
		CONTRACTOR	SALINI COSTRUTTORI
		ROCK TYPE	BASALT
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking the 272 m of the shaft by drilling and blasting from Ø 1,84 to final Ø 8,00 m diameter; - first Lining Ø 7,80 m by bolting, laying wire net and shotcreting and final <p style="text-align: right;">TOT. MINED ROCK cu.m. 11.300</p>			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling and blasting, scaling, mucking through Raise Borer hole by specific drilling machine and escavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 20+5 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Electro-hydraulic jumbo-platform drilling rig with two indipendent booms and hydraulics rock drills and hydraulic escavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; - Kamo Escavator; 			

T	Salini Costruttori - Beles Multi Purpose Project - Etiopia	PURCHASER	ETHIOPIAN ELECTRIC POWER CORPORATION

PROJEC	ED. MACCABELLI MACCABELL Cable Shaft Beles ETIOPIA <i>Comessa 2006/13</i> Year: 2007-2008	Srl	SINKING SHAFT DIVISION		
		CONTRACTOR	SALINI COSTRUTTORI		
		ROCK TYPE	BASALT		
WORKS DESCRIPTION			Times	gg	average
- Sinking the 287 m of the shaft by drilling and blasting from Ø 1,84 to final Ø 6,80 m diameter; - first Lining Ø 6,60 m by bolting, laying wire net and shotcreting and final - Final concrete lining by self-lifting slip form. TOT. MINED ROCK cu.m. 7.350			Gantry Crane Inst. frm 5.10 to14.1	10	
			Sink 251,40m Ø 6,80m 14.10-8.2.	92	2,73
			Slip Form inst. from 14.3 to 28.3.2	14	
			Concr. 261,87m Ø 5,50m 29.3-14.	59	4,44
WORKING SYSTEM					
- Drilling and blasting, scaling, mucking through Raise Borer hole by specific drilling machine and escavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; - Final concrete lining by self-lifting slip form.					
EQUIPEMENTS USED					
- Overhead travelling gantry crane 20+5 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Electro-hydraulic jumbo-platform drilling rig with two indipendent booms and hydraulics rock drills and hydraulic escavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; - Kamo Escavator;					

PROJECT	Galleria Vedeggio-Cassate Pozzo di Ventilazione Lugano (CH) SVIZZERA <i>Comessa 2007/04</i> Year: 2007-2008	PURCHASER	REPUBBLICA E CANTONE TICINO, DIPARTIMENTO DEL TERRITORIO
		CONTRACTOR	CONSORZIO MARTI
		ROCK TYPE	SCHIST

WORKS DESCRIPTION

- Lining the full surface of the wall by steel arches, wire mesh and shotcrete, vertical shaft Ø 4,09 m, 96 m deep.

WORKING SYSTEM

- From the top to the bottom steel lining and shotcreting the walls.

EQUIPEMENTS USED

- Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab;
- Hanging steel platform;
- Wet shotcreting pump;
- Hand drilling machine;
- Containerised workshop.

PROJECT	Manutenzione straordinaria Diga Val Noci	PURCHASER	MEDITERRANEA DELLE ACQUA
	Pozzo per sfioratore a calice	CONTRACTOR	MEDITERRANEA DELLE ACQUA
	Montoggio (GE) ITALIA <i>Commessa 2006/15</i> Year: 2008	ROCK TYPE	DOLOMIA
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Lining the full surface of the wall by wire mesh and shotcrete, vertical shaft Ø 3,05 m, 36 m deep. - Final concrete lining by self-lifting slip form to Ø2,35 m. 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom steel lining and shotcreting the walls. - Final concrete lining by self-lifting slip form to Ø2,35 m. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - 7 tons capacity wheel crane; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 			

PROJECT	Razel Penstock shaft Corsica France <i>Comessa 2009/05</i> Year: 2009	PURCHASER	EDF
		CONTRACTOR	RAZEL
		ROCK TYPE	SCHIST
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Sinking the 70 m of the shaft by drilling and blasting from Ø 1,84 to final Ø 7,00 m diameter; - first Lining Ø 7,00 m by bolting, laying wire net and shotcreting and final <p style="text-align: right;">TOT. MINED ROCK cu.m. 2.700</p>			
WORKING SYSTEM			
<ul style="list-style-type: none"> - Drilling and blasting, scaling, mucking through Raise Borer hole by specific drilling machine and excavator from the top to the bottom; - Lining the wall by bolting, wire net and shotcreting all surfaces; 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 30+5 tons capacity, 7 m rail gauge with four hydraulic radio remote controlled winches: three for working platform 5 tons each one and one for personnel 3 tons lifting capacity; - Electro-hydraulic jumbo-platform drilling rig with two independent booms and hydraulics rock drills and hydraulic excavator; - Shotcreting pump and equipments for wet shotcrete; - Electric hoist for in-shaft movable power cable; - Containerised workshop; - Kamo Escavator; 			

		PURCHASER	UTE TUNEL SANT JUST
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EDILMAC DEI F.LLI MACCABELL

Srl

SINKING SHAFT DIVISION

Penstock shaft**Barcelona - Spagna****Comessa 2010/02****Year: 2010**

CONTRACTOR

AIGÜES TER LLOBREGAT

ROCK TYPE

PIZARRAS NEGRA

WORKS DESCRIPTION

- Drilling n. 1 vertical shaft with RBM equipment; top Ø 2,44 m and bottom Ø 1,84 m, 80 m deep.
- Sinking shaft with explosive shot to reach top Ø 7,40 m and bottom Ø 6,00
- Final concrete lining

WORKING SYSTEM

- From the top to the bottom steel lining and shotcreting the walls.
- Final concrete lining by self-lifting slip form

EQUIPEMENTS USED

- Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab;
- Hanging steel platform;
- Wet shotcreting pump;
- Hand drilling machine;
- Containerised workshop.

PROJECT	Palomino - Rep. Dominicana <i>Comessa 2010/08</i> Year: 2010	PURCHASER	CONSTRUCTORA NORBERTO ODEBRECHT, S.A.
		CONTRACTOR	CORPORACION DOMINICANA DE EMPRESAS ELECTRICAS ESTATALES
		ROCK TYPE	TURBIDITA CARBONATA + SEDIMENTARY ROCK
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - BLIND SHAFT EXCAVATION: total lenght 371 m - upper part (50m), excavation at 11 m diameter - lower part (321 m), excavation at 4,50 m diameter - Final concrete lining by self-lifting slip form to bottom Ø 3,50 m and top Ø 10,40 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom first lining with shotcrete, rockbolts, wire mash and steel ribs where required. - Final concrete lining by self-lifting slip form 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab; - skipp for mucking - Wet shotcreting pump; - jumbo; - drilling machines - slipform - Containerised workshop. 			

PROJECT	Variante S.S. 12 "Bronzolo-Bolzano" Lotto Galleria Laives <i>Commessa 2008/10</i> Year: 2011	PURCHASER	OBEROSLER CAV. PIETRO SPA
		CONTRACTOR	PROVINCIA AUTONOMA DI BOLZANO - ALTO ADIGE
		ROCK TYPE	PORPHYRIES
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Drilling n. 1 vertical shaft with RBM equipment; reaming Ø 4,74 m, 275 m deep. - First Lining by bolting, laying wire net - Final concrete lining by shotcreting (15 cm) 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom steel lining and shotcreting the walls. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Raise Boring Machine - Overhead travelling gantry crane 7 tons capacity - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 			

PROJECT	s.s. 340 REGINA Cressogno - Albogasio (Co) <i>Commessa 2011/07</i> Year: 2011/2012	PURCHASER	REGINA S.C.A.R.L.
		CONTRACTOR	ANAS SPA
		ROCK TYPE	LAMINATED LIMESTONE
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Drilling n. 1 vertical shaft with RBM equipment; reaming Ø 4,09 m, 134 m deep. - First Lining by bolting, laying wire net - Final concrete lining by shotcreting (15 cm) 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom steel lining and shotcreting the walls. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Raise Boring Machine - Overhead travelling gantry crane 7 tons capacity - Drilling machine Ripamonti; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 			

PROJECT	AH CAMBAMBE, KWANZA NORTE Angola <i>Comessa 2012/06</i> Year: 2012	PURCHASER	CONSTRUCTORA NORBERTO ODEBRECHT, S.A. - SUCURSAL ANGOLA
		CONTRACTOR	
		ROCK TYPE	GREGORAS Y CONGLOMERATICAS
WORKS DESCRIPTION			
<ul style="list-style-type: none"> - Drilling n. 4 vertical shaft with RBM equipment; reaming Ø 1,84 m, 67 m deep. - Sinking shaft with explosive shot - Final concrete lining by self-lifting slip form to bottom Ø 8,50 m and top Ø 8,50 			
WORKING SYSTEM			
<ul style="list-style-type: none"> - From the top to the bottom steel lining and shotcreting the walls. - Final concrete lining by self-lifting slip form to Ø 7,70 m. 			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane 7 tons capacity, 8 m rail gauge with two electric radio remote controlled winches: one for working platform, one for lifting cab; - Hanging steel platform; - Wet shotcreting pump; - Hand drilling machine; - Containerised workshop. 			

PROJECT	Colle Pedrino Quarry Italy Year: 2012	PURCHASER	ITALCEMENTI
		CONTRACTOR	ITALCEMENTI
		ROCK TYPE	LIMESTONE ROCKS
WORKS DESCRIPTION			
<p>- Sinking shaft with explosive shot an 73° inclined shaft from 4 meter to 6 meters in diameter</p>			
WORKING SYSTEM			
<p>- Shaft sinking from the top to the bottom and lining of the walls.</p>			
EQUIPEMENTS USED			
<ul style="list-style-type: none">- Special cable hoist;- Safety lift for the operators- Hanging steel platform;- Wet shotcreting pump;- Drilling machine, spider excavator, crane 40 tons- Containerised workshop.			

PROJECT	ULU JELAI HYDROELECTRIC PROJECT Malaysia <i>Commessa 2013/08</i> Year: 2013	PURCHASER	SALINI MALAYSIA SND. BHD.		
		CONTRACTOR	TENAGA NASIONAL BERHAD		
		ROCK TYPE	GRANITE ROCKS		
WORKS DESCRIPTION			Sinking and Reinforcement & S	Days	m/D
<ul style="list-style-type: none"> - Drilling n. 1 vertical shaft with RBM equipment; reaming Ø 1,84 m, 337 m deep. - Sinking shaft with explosive shot - Final concrete lining by self-lifting slip form to bottom Ø 6,50 m , Ø 7,50 and top Ø 16,50 			inst cant. 13.5-18.6.2014	35	
			Upper shaft 35m D.16,5m 23.6-19	85	0,41
			Lower Shaft 173m D.7,5m 20.8.2014		
			Power Shaft 130m D.6,50m 15.4.:	125	2,42
WORKING SYSTEM					
<u>Sinking Shaft, Operations</u> - From top to bottom by Drilling & Blasting 3 m step, bolting 3m swellex or grouted bolts, fibers reinforced shotcreting 5-10 cm and local steel lining.					
<u>Concreting Operations</u> From the bottom to the top, final concrete lining by self lifting Slip-Form, lowering the Concrete by a Bucket N. 2 cu.m capacity.					
WORKING TIME					
Nb. 3 Shifts: 24 h /day and 5,5 days / week					
EQUIPEMENTS USED					
<ul style="list-style-type: none"> - Overhead travelling gantry crane, 12 m rail gauge with Nb. 4 electric Winches, Double Drum each and Radio Remote Controlled: Nb. 3 for the Working platform, Nb. 1 for Personel Cab. - Hanging working steel platform and independent Lift Cab for personel.; - Wet shotcreting pump, mixer and robot for shotcrete; - Electro-hydraulic Drilling Jumbo with Nb. 2 independent booms. - Mucking Excavator type Kamo with Nb. 4 independent hydraulic supporting legs - Containerised workshop. 					

PROJECT	GILBOA PUMPED STORAGE PROJECT Israel <i>Commessa 2016/05</i> Year: 2016	PURCHASER	PAMCO ENGINEERING LTD
		CONTRACTOR	ELECTRA SOLEL BONE
		ROCK TYPE	LIMESTONE ROCKS
WORKS DESCRIPTION		Surge & Power shaft	
<ul style="list-style-type: none"> - <u>High Pressur Shaft</u>: Total Length = 489 m Sinking 419 m from Ø 2,44m to Ø 5,90m and intermediate 70 m from Ø 2,44m to Ø 8,20 m Concreting all the length of 489 m from Ø 5,90/8,20 m to Ø 4,50 m - <u>Upper Surge Shaft</u>: Total Length = 77 m Concreting Concreting by self-lifting Slip Form, from Ø 12,00 m to Ø 10,00 m - <u>LOWER SURGE SHAFT</u>: Total Length = 14 m Concreting by self-lifting Slip Form, from Ø 7,00 m to Ø 5,00 m 			
WORKING SYSTEM			
<u>Sinking Shaft, Operations</u> <ul style="list-style-type: none"> - From top to bottom by Drilling & Blasting 3 m step, bolting 3m swellex or grouted bolts, fibers reinforced shotcreting 5-10 cm and local steel ribs. <u>Concreting Operations</u> <ul style="list-style-type: none"> - From the bottom to the top, final concrete lining by self lifting Slip-Form, lowering the Concrete by a Bucket N. 2 cu.m capacity. 			
WORKING SYSTEM			
Nb. 3 Shifts: 24 h /day and 5,5 days / week			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane, 12 m rail gauge with Nb. 4 electric Winches, Double Drum each and Radio Remote Controlled: Nb. 3 for the Working platform, Nb. 1 for Personel Cab. - Hanging working steel platform and independent Lift Cab for personel.; - Wet shotcreting pump, mixer and robot for shotcrete; - Electro-hydraulic Drilling Jumbo with Nb. 2 independent booms. - Mucking Excavator type Kamo with Nb. 4 independent hydraulic supporting legs - Containerised workshop. 			

PROJECT	VALLEMME VENTILATION SHAFT	PURCHASER	COCIV
	Italy	CONTRACTOR	ITALFER
	Comessa 2016/12 Year: 2016-2018	ROCK TYPE	CLAYSTONE
WORKS DESCRIPTION		Ventilation shaft	
<ul style="list-style-type: none"> - Total Length = 216 m Blind shaft excavation to Ø 7,60 m Reinforced Concrete lining to internal diameter Ø 6,00 m 			
WORKING SYSTEM			
<u>blind Shaft, Operations</u> <ul style="list-style-type: none"> - From top to bottom by Drilling & Blasting 3 m step, Steel ribs, bolting 3m grouted bolts, fibers reinforced shotcreting 15 cm <u>Concreting Operations</u> <ul style="list-style-type: none"> - TNT+PVC waterproof menbrane installation - From the bottom to the top, final concrete lining by self lifting Slip-Form, lowering the Concrete by a Bucket N. 3 cu.m capacity. 			
WORKING SYSTEM			
Nb. 3 Shifts: 24 h /day and 5,5 days / week			
EQUIPEMENTS USED			
<ul style="list-style-type: none"> - Overhead travelling gantry crane, 8 m rail gauge with Nb. 4 electric Winches, Double Drum each and Radio Remote Controlled: Nb. 3 for the Working platform, Nb. 1 for Personel Cab. - Hanging working steel platform and indipendent Lift Cab for personel.; - Wet shotcreting pump, mixer and robot for shotcrete; - Electro-hydraulic Drilling Jumbo with Nb. 2 indipendent booms. - Mucking Excavator type Kamo with Nb. 4 indipendent hydraulic supporting legs - Extraction tower SKIP with 3 cu.m bucket capacity - Containerised workshop. 			

LAVORI IN GALLERIA (TUNNELING WORKS) - REFERENCES LIST							
PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	SEZ. (m2.)	INCLINATION	REMARKS
Calcium Mine VIPITENO (BZ) - ITALY	1998	OMYA S.p.A.	CALCIUM	1000	40	incl. 1,5%	
Limestone Quarry MOLAZZANA (LU) - ITALY	2001	FASSA S.p.A.	LIMESTONE	53 24	28,6 92	12% 3%	
Pumping Station Imp. Sollev. del Flumendosa Cagliari - ITALY - E.A.F.	2001	IMPREGILO S.p.A.	SCHIST	125	9,5	4%	
<i>Commessa 2002/01</i> S.N.A.M. - Oil Pipeline DN 400 GIGNOD (AO) - ITALY	2002	TRE COLLI S.p.A.	PORPHYRY	36,4	9,7	1%	
<i>Carbonate Quarry</i> CAVA COSTIOLO (BG) - ITALY	2002	UNICALCE S.p.A.	CALCIUM CARBONATE	600 / anno	18	horizontal	in execution
Gas Pipeline DN 750 CALESTANO (PR) - ITALY S.N.A.M.	2002	SICIM S.p.A.	MARL	286 6	10 26	10%	
Limestone Quarry TETTI BAVA (CN) - ITALY (subappalto)	2002	FASSA S.p.A.	LIMESTONE	221 25	28,6 92	6%	
<i>Commessa 2002/02</i> Limestone Quarry CAVA MOCCIA - S.ROSALIA (CE) - ITALY	2002	CEMENTI MOCCIA	LIMESTONE	160 15	33 225	2%	
<i>Commessa 2002/09</i> Limestone Quarry CEMENTO MOCTEZUMA, Stab. Di Cerritos - MEXICO	2002	BUZZI UNICEM	LIMESTONE	280	30	horizontal	
<i>Commessa 2003/06</i> Gas pipeline DN750 POZZO GRAVAGNA GRAVAGNA (MS) - ITALY	2003	SICIM	MARL	32	10	5%	
<i>Commessa 2003/04</i> Tunnel for funicular cablecar RUACIA-PRAMAURON VAL GARDENA (BZ) - ITALY	2003	GHERDĚINA RONDA GmbH	DIFFERENT SOILS AND ROCKS	1067 150	30mq 50mq	5-16%	
<i>Commessa 2003/13</i> Real Cava Marmorera VALDIERI (CN) - ITALY	2003	CARBOCALCIO CUNESE Spa	CALCIUM	140 500	25/30mq 60/70mq	7% 10%	
<i>Commessa 2003/18</i> Quarry ROASCHIA CUNEO - ITALY	2003	BUZZI UNICEM SPA	LIMESTONE	15	90 m2	0%	
<i>Commessa 2003/19</i> Underground Quarry MONCALVO (AT) - ITALY	2003	FASSA SRL	LIMESTONE	40	27,5 m	0%	
<i>Commessa 2004/06</i> Underground Quarry MONFORTE D'ALBA (CN)-ITALY	2004	Azienda Agricola ELIO GRASSO	MARL AND TUFO	99	36	0%	
<i>Commessa 2004/07</i> Limestone Quarry "SO.GE.MA." RIOFREDDO (Roma) - ITALY	2004	SO.GE.MA.	LIMESTONE	150	32	2-3%	

LAVORI IN GALLERIA (TUNNELING WORKS) - REFERENCES LIST							
PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	SEZ. (m2.)	INCLINATION	REMARKS
Comessa 2004/07 Limestone Quarry "SO.GE.MA." RIOFREDDO (Roma) - ITALY	2004	SO.GE.MA.	LIMESTONE	150	32	2-3%	
Comessa 2004/11 Underground Garage VILLA LINDA (BG) - ITALY	2004	LAMA IMMOBILIARE	FLICH	28,5	145	0%	
Comessa 2004/13 Limestone Quarry CORI (LT) - ITALY	2004	E.P.L.E.S.	LIMESTONE	80	32	2-4%	
Comessa 2004/10 MOSO IN PASSIRIA Bolzano - ITALY	2004	EUM.Gen.m.b.h.	GRAVEL & SAND	170	16	0%	
Comessa 2005/02 Quarry ROASCHIA ROASCHIA (CN) - ITALY	2005	BUZZI UNICEM SPA	LIMESTONE	30	40	0%	
Comessa 2005/03 Cemetery Plant Brembilla (BG) - ITALY	2005	UNICALCE SPA	LIMESTONE	51 18	36 27	0%	
Comessa 2005/04 Limestone Quarry Caneva (PN) - ITALY	2005	C P S Srl	LIMESTONE	300	30	0%	camerone 3000mq
Comessa 2005/08 Quarry ROASCHIA ROASCHIA (CN) - ITALY	2005	BUZZI UNICEM SPA	LIMESTONE galleria // camerone	180 30 45	35 20 290	0%	
Comessa 2005/11 Underground Garage VILLA PICRI (BG) - ITALY	2005	PICRI SRL	LIMESTONE	12,15	33	0%	
Comessa 2005/13 Cemetery Plant Brembilla (BG) - ITALY	2005	UNICALCE SPA	LIMESTONE	180 100 100	39,27 23,44 //	downhill 8-10% climb 14-15% climb 1-2%	
Comessa 2006/01 Limestone Quarry Cava 'Martina' (BG) - ITALY	2006	NICEM SRL	DOLOMITE	80	70	0	
Comessa 2006/11 Veruca Fall Meran - ITALY	2006	PROVINCIA DI BOLZANO	PORFIRY	155	10	1%	
Comessa 2006/12 Limestone Quarry Vipiteno (BZ) - ITALY	2006	OMYA	LIMESTONE	xxx	66 53 14,24	8÷10% 8÷10% 8÷10%	
Comessa 2006/15 Val Noci Dam Val Noci (GE) - ITALY	2006	MEDITERRANEA DELLE ACQUE	DOLOMITE	40	3,5X3,5	1%	
Comessa 2006/16 Centrale idroelettrica Val Passiria - ITALY	2006	ENERPASS	GNEISS	700	4X4,5	10%	
Comessa 2007/01 Limestone Quarry Cava 'Valdieri' (CN) - ITALY	2007	CARBOCALCIO CUNESE SPA	CALCIUM	270	32	2%	
Comessa 2007/08 Limestone Quarry Vipiteno (BZ) - ITALY	2007	OMYA	LIMESTONE	300	48	0%	
Comessa 2008/01 Limestone Quarry Carpanè di S. Nazario (VI) - ITALY	2008	GRANULATI DOLOMITICI PEROGGIO	LIMESTONE	210	30 250	10%	
Comessa 2008/02 Limestone Quarry Gavardo (BS) - ITALY	2008	FASSA SPA	LIMESTONE	103 30	36 200	0% 0%	

LAVORI IN GALLERIA (TUNNELING WORKS) - REFERENCES LIST							
PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	SEZ. (m2.)	INCLINATION	REMARKS
Comessa 2008/04 Limestone Quarry Veracruz - MESSICO	2008 2009 2009 2009	CEMENTOS MOCTEZUMA (BUZZI UNICEM)	LIMESTONE LIMESTONE LIMESTONE LIMESTONE	650 50 1600 707	36 250 16 16	3% 3% -7% -18%	
Comessa 2008/08 Limestone Quarry Casazza (BS) - ITALY	2008	NICEM	LIMESTONE	1000 mt/year	70 30 20	different kind	
Comessa 2008/09 Limestone Quarry Palazzago (BG) - ITALY	2008	ITALCEMENTI SPA	LIMESTONE	223 60	30 300	7% 0%	
Comessa 2008/11 Hydroelectric Power Corvara Corvara di Moso I.P. (BZ) - ITALY	2008	AZIENDA ELETTRICA CORVARA	MICASCHIST	1006 65	28 70	18% 18%	
Comessa 2008/13 Pedestrian access + Lift shaft Gargnano (Bs)	2008	Mr TESTA Mr BERNASSOLA	CLAYEY MARLS	20 8	5,88 4,37	0% 0%	
Comessa 2009/01 Quarry "Corati" Chiampo (VI) - ITALY	2009	F.LLI NEGRO SNC	LIMESTONE	224	25	12%	
Comessa 2009/06 Quarry "Colle Pedrino" Palazzago (BG) - ITALY	2009	ITALCEMENTI SPA	LIMESTONE	240		7%	
Comessa 2010/05 Limestone Quarry Vicoforte (CN)	2010	OCCELLI SNC	LIMESTONE	85	32	0%	
Comessa 2010/18 "Calce San Pellegrino" Quarry Narni (Tr)	2010	CALCE SAN PELLEGRINO SPA	LIMESTONE	220	43	5%	
Comessa 2011/03 Hydroelectric Plant "Fonti" Bognanco (Vb)	2011	ENERGIE SPA	GNEISS MICA SISTI	324 71	20 10	-8,35%/-14% 1%	
Comessa 2011/14 Limestone Quarry Palazzago (BG) - ITALY	2012	ITALCEMENTI SPA	LIMESTONE	180	10	9±12%	
Comessa 2012/02 Hydroelectric Plant "Agrasina" Montecrestese (VB) - ITALY	2012	BENDOTTI SRL	GNEISS	660	11	2,50%	
Comessa 2012/09 Nurraghe-Arrubiu dam Nurri-Orroli (Ca) - ITALY	2012	LIS SRL	COMPACT PORHYROID	19 53	11,69 11,69	0,00%	
Comessa 2012/10 Quarry "Ponte del Costone" Casnigo (BG) - ITALY	2012	UNICALCE SPA	LIMESTONE	115	32	0,00%	
Comessa 2013/11 Pedestrian tunnel Città Alta - Bergamo - ITALY	2013	GUATTERINI COSTRUZIONI SRL	FLYSCH	30	7	0,00%	
Comessa 2015/02 "Monica" Mine Oltre il Colle/Gorno (BG) - ITALY	2015	ENERGIA MINERALS (ITALIA) SRL	METALLIFEROUS LIMESTONE	700	10,5	0,00%	
Comessa 2015/11 "Graina" Mine Ossimo e Malegno (Bs) - ITALY	2015	CAVA VERALDI SRL	LIMESTONE	150	30	0,00%	
Comessa 2016/02 Torrente Melezzo Toceno S.M. Maggiore (Vb)	2016	AEDES SRL	PARAGNEISS GNEISS GRANITOIDI QUARZOSO FELDSPATICI	660	11,6	0,00%	
Comessa 2016/06 Miniera Rodoreto Prati (To) ITALY	2016	IMERYS TALC ITALY SpA	GNEISS	219,00	20,00	0,00%	

Commissa2016/14 Cava Rocca Incisa Bagnasco (CN) ITALY	2016	SAISEF S.p.A.	LIMESTONE	70,00	34,00	8,00%	
Commissa2017/07 Variante Serramazzone-Pavullo Snam Rete Gas Spa Pavullo nel Frignano (MO) ITALY	2017	Ge.Co. Condotte Srl	SEDIMENTARY ROCKS	34,00	9,20	6,00%	
Commissa2018/01 HPP Maisonettes Avisè (AO) ITALY	2018	Maisonettes srl	CALCESHIST	287 25,00 20,00 24,00 313,00	25,00 100,00 100,00 25,00 12,00	-10% 0,00% 0 0 -0,50%	IN EXECUTION access tunnel cavern power house caver intake tunnel outlet tunnel
TOTAL EXECUTED LENGHT m.				18.499			

CORE DRILLING DIVISION WORKS - REFERENCES LIST

PROJECT SITE PURCHASER	YEAR	CONTRACTOR	ROCK TYPE	LENGHT (m.)	DIA. (m.)	INCLI- NATION (deg.)	EXEC. TIME (*) (days)	REMARKS
Gorno Zinc Project Oltre il Colle (BG) Italy	2015	Energia Minerals Italia srl	Breno, Metallifero, Gorno and Valsabbia formations: grey limestone and dolomitic limestone Limestone, marly limestone and marls Siltstone and volcanoclastic sandstone	17.426	NQ	VARIOUS	June 2015 March 2017	Zinc research