



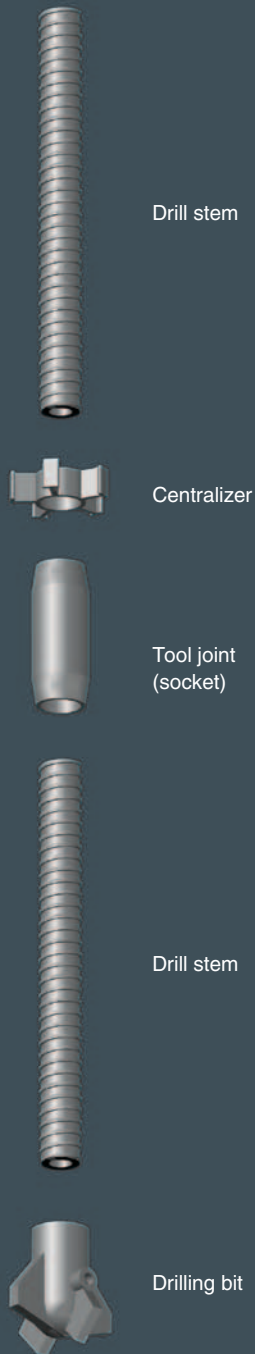
Root piles
and GEOIZOL-MP
anchoring systems
in construction and repair
of railways



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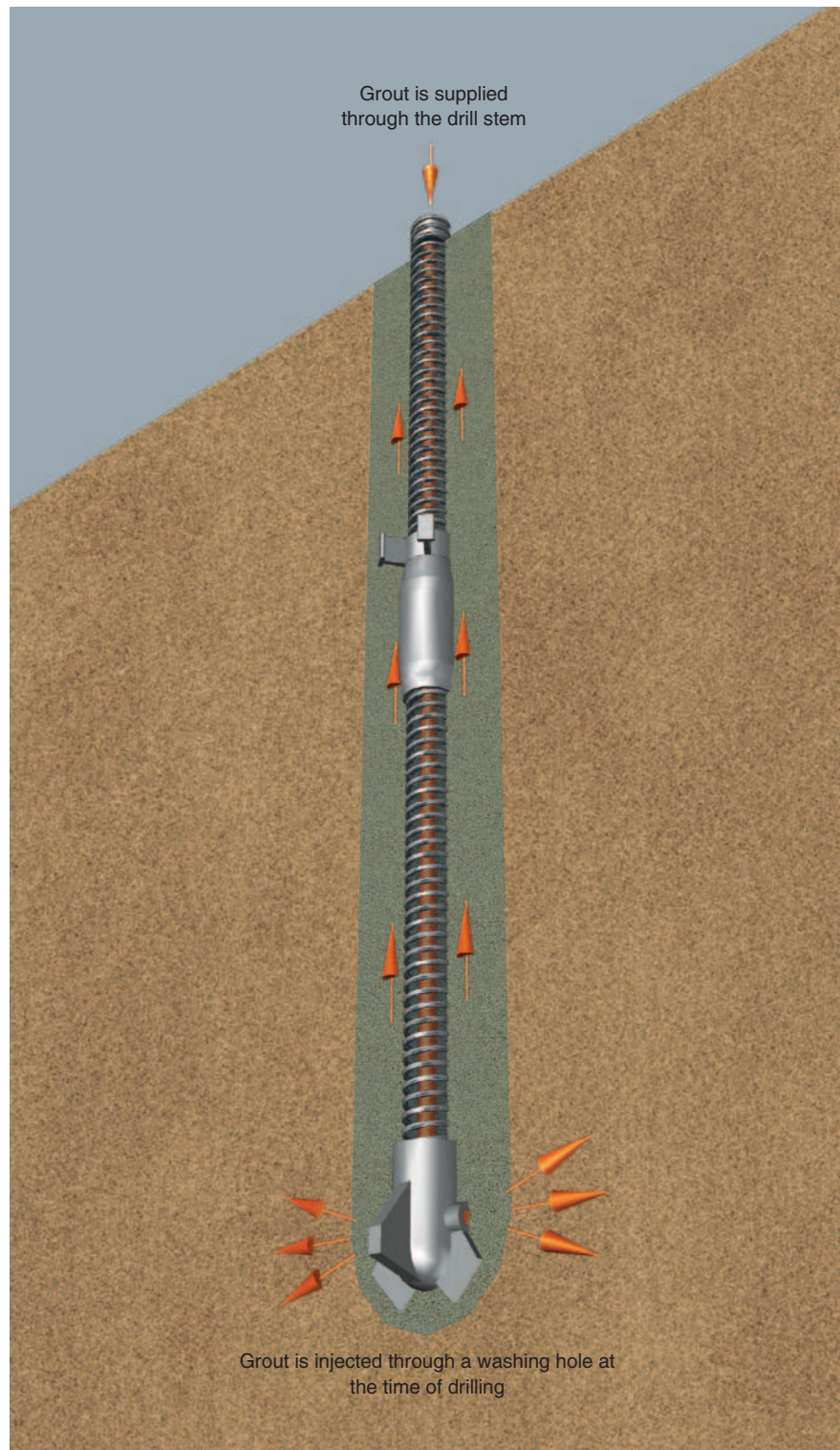
TECHNOLOGIES OF ROOT PILES CONSTRUCTION AND GEOIZOL-MP ANCHORING SYSTEMS INSTALLATION



Geoizol-MP systems consist of center-fed load-bearing element in the form of steel screw drill pipe and also of a grout injected “mace”. Tensile and compression loads are transferred from load-bearing element to subsoil through the injected mace. It is responsible for radial stresses in soil and constraints buckling and also protects steel element against corrosion. The root piles are installed by small-sized rigs, they sustain oscillations and vibrations that makes it possible to carry out works in hard-to-reach places and without suspending train traffic.

Steel drill stems are manufactured with diameters ranging from 30 to 73 mm and may be cut in an arbitrary way and connected by tool joints longwise. Thus an optimal length and diameter of a root pile can be achieved.

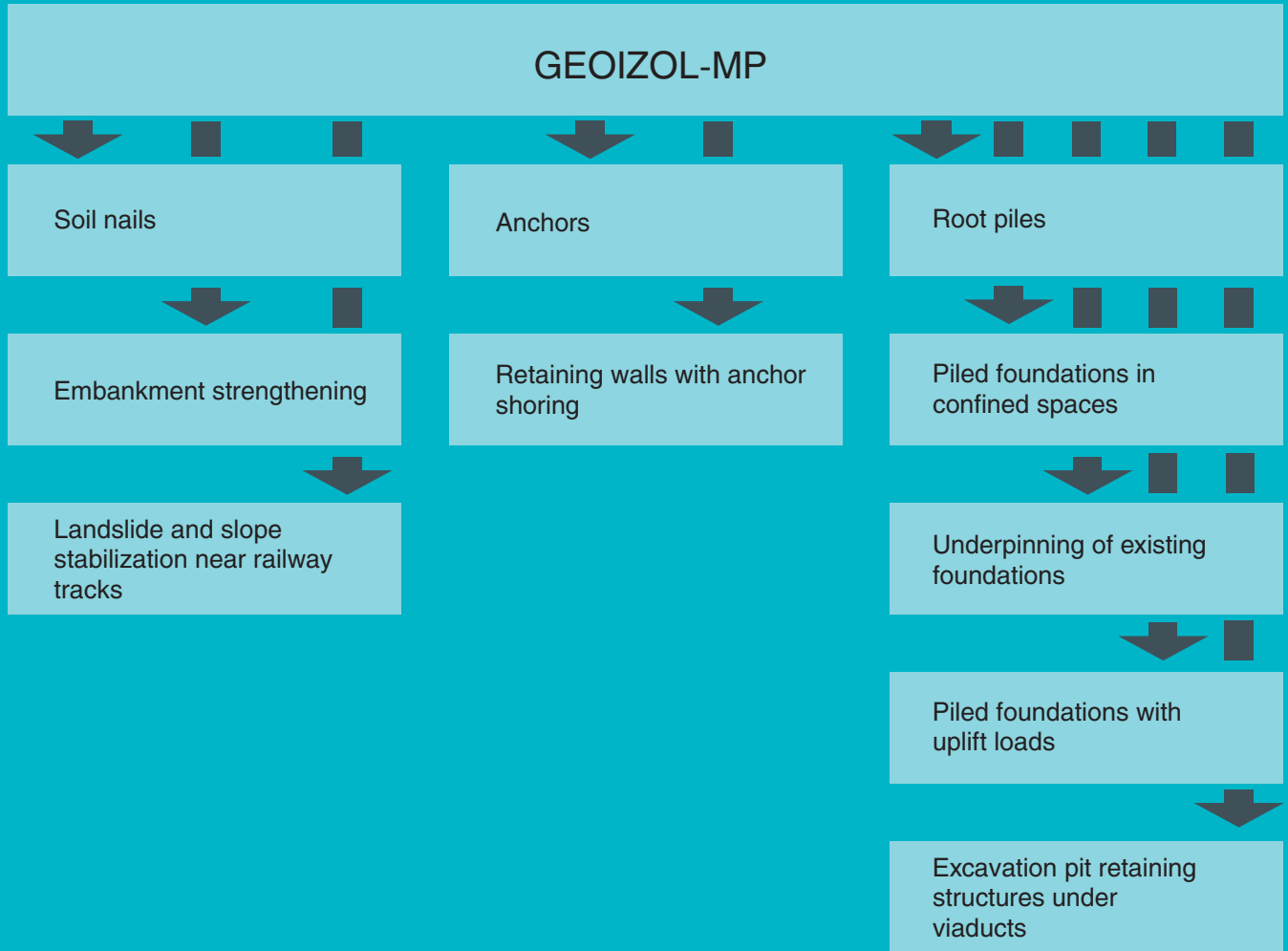
The whole process of pile construction is done at a single process phase. The drill stem is at the same time a drilling and injection drive. Preliminary washing grout is pumped under pressure of 5–10 bars through internal hole of the drill pipe right away at the beginning of drilling. Water to cement ratio is 0.7–0.8. The pressure forces the grout into the soil voids thus strengthening the borehole walls and eliminating the need in casing. Also both the drill stem and tool joints stay in the borehole performing function of pile's center reinforcement. Centralizers are applied to ensure the presence of the protection layer and the designed position of drill stem.



MECHANICAL PROPERTIES OF GEOIZOL-MP TUBE SCREW REINFORCING STEEL BARS (TU 0932-001-04692472-2010)

Propety	Unit	40/21	40/18	40/14	52/31	52/28	52/20	72/49	72/40	105/78	105/52
Internal diameter (ID)	mm	21,2	18,2	14,2	31,3	28,3	20,3	50,0	36,0	78,0	52,0
Linear weight	kg/m	5,96	6,66	7,52	7,87	9,08	11,58	13,85	17,92	26,56	47,17
Cross-section area	mm ²	759	849	958	1003	1156	1475	1764	2283	3384	6008
Yield strength	N/mm ²	590	590	590	590	590	590	590	560	530	500
Ultimate resistance	N/mm ²	708	708	708	708	708	708	708	672	636	600
Specific elongation	%	17	17	17	17	17	17	16	16	16	16
YForce at the yield strength boundary	kN	448	501	565	592	682	870	1041	1278	1793	3004
Failure load	kN	537	601	679	710	819	1045	1249	1534	2152	3605

APPLICATION OF GEOIZOL-MP





SOIL NAILS

Embankment strengthening

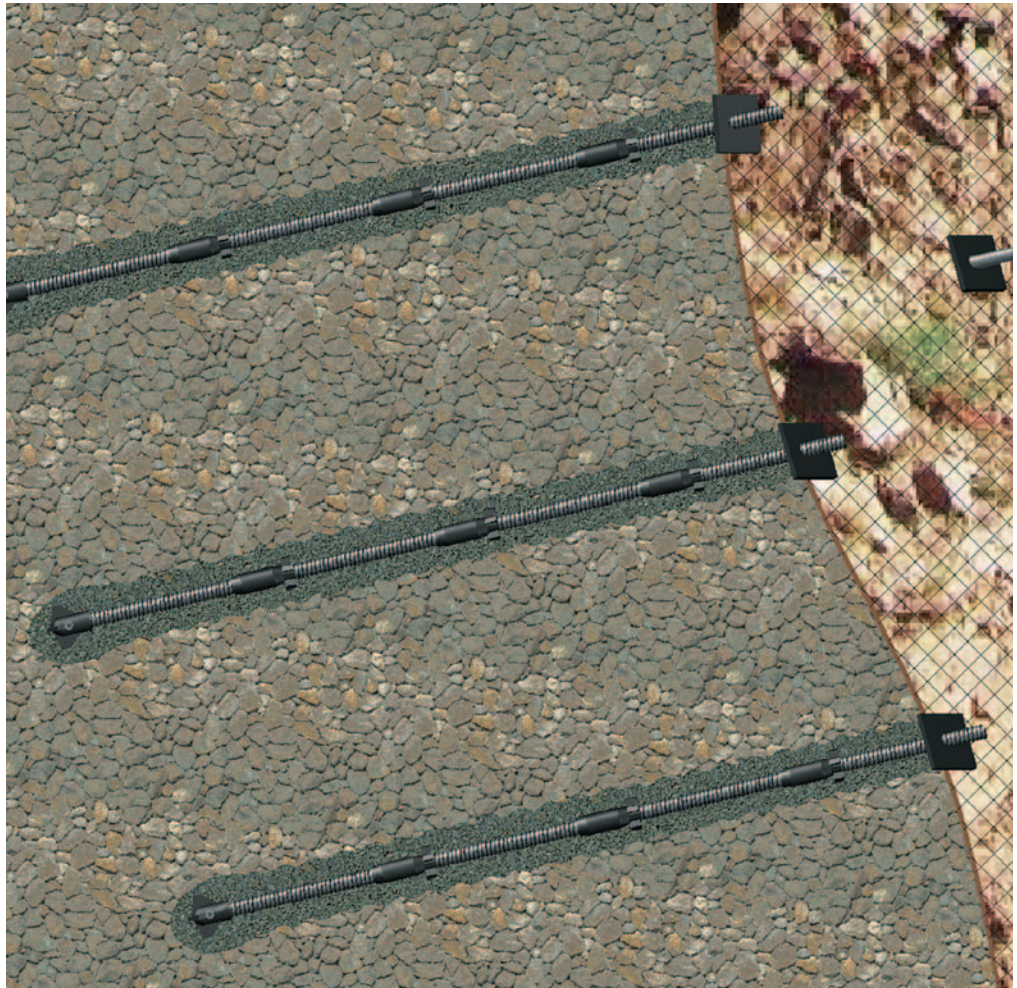
Soil nailing is a geotechnical technique that is used to stabilize slope faces and landslides as well as steep embankments and deep cuts by means of soil mass strengthening with a system of soil nails. Soil nail is a grouted steel screw bar of small diameter. Outer diameter of the bar does not exceed 52 mm.

Landslide and slope stabilization near railway tracks

In order to keep the soil from caving in between the soil nails and to prevent erosion, a protective facing is installed.

Protective facing is made of high strength steel mesh. The mesh is attached to soil nails through clamp plate tightened up by a nut. To provide better adaptation to the slope face the mesh is additionally attached with short drive anchors. As a further erosion prevention measure geocomposite material is placed under the mesh.

Soil nailing may be used both as a permanent and a temporary measure of disaster prevention engineering.





ADVANTAGES OF SOIL NAILING

Soil nailing allows :

- to avoid construction of bulky reinforced concrete structures, thus preserving beautiful views of adjoining slopes;
- not to block railway traffic for the time of works thanks to the small size of the equipment;
- to ensure the strengthening of the existed embankments without earth works.

ANCHORS



Retaining walls with anchor shoring

The purpose of anchor shoring of retaining walls is to transfer horizontal loads to deep soil layers beyond the sliding wedge. The anchor is constructed by inclined drilling according to GEOIZOL-MP technology with subsequent tensioning of steel bar to the design load.





ROOT PILES

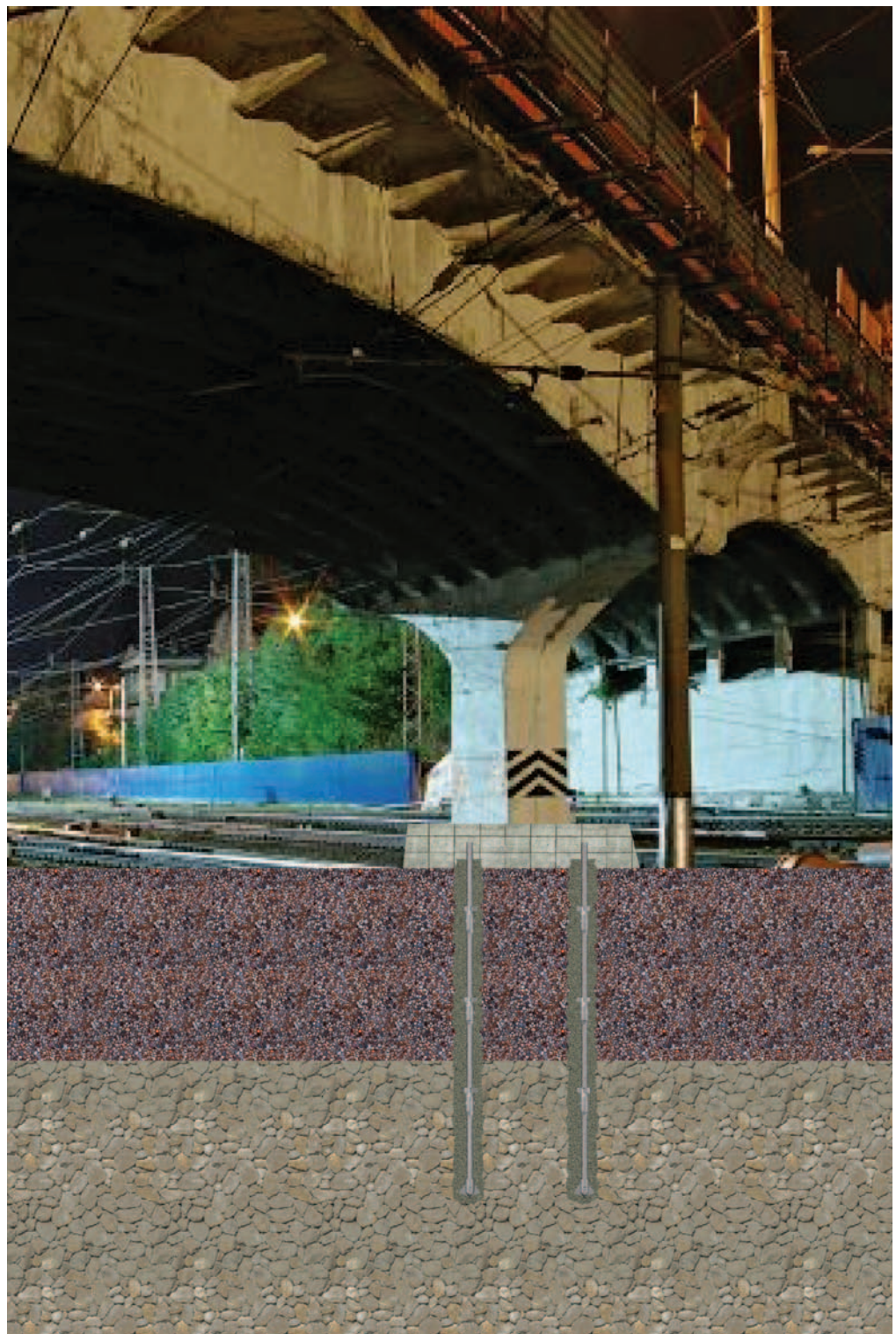
Piled foundations in confined spaces

In some cases it is impossible to use standard pile technologies which requires large-sized equipment.

To construct GEOIZOL-MP root piles small-sized equipment is used, which enables to install root piles in basements of buildings, between railway tracks, under bridges and viaducts.

Underpinning of existing foundations

Root piles are a good option of underpinning of the existing foundations. The underpinning piles may be installed directly through available foundations without a risk of their failure thanks to a small drilling diameter and technology of pile construction without soil extraction.





Piled foundations under uplift loads

Root piles function properly under uplift loads and may be used in piled foundations for power lines and towers.

Foundation pit retaining structures under viaducts

Small-sized equipment allows to construct retaining structures under the condition of limited height in places where it is impossible to use standard equipment to drive sheet piling or piles.



GEOIZOL-MP SYSTEM MANUFACTURING



GEOIZOL Group together with Joint Sock Holding Company All-Russian Research, Design-and-Engineering Institute of Metallurgical Machine Building named after A. I. Tselikov (Moscow) has developed GEOIZOL-MP system

GEOIZOL-MP system was certified and awarded a gold medal of XVII International industrial Exhibition “Metal-Expo” in 2011.

In 2012 ZAO Pushkin Machine Building Plant, included into GEOIZOL Group, commenced manufacturing GEOIZOL-MP systems completed with tool joints and nuts.

GEOIZOL-MP system has become widely used for back slopes and embankments strengthening, as well as for construction of foundations for buildings, supports and structures. Huge experience has been gained in the field of underpinning of buildings and structures including the restoration of historic and cultural buildings.

GEOIZOL Group is one of the leading companies in the Russian construction market which provide full package of services in the field of design, restoration and construction of underground structures.

The company has mastered the full range of geotechnical engineering processes and gained a unique experience in construction of all types of foundations, transport construction, hydraulic engineering, expert surveying and instrumental diagnosing of structures.

GEOIZOL Group incorporates GEOIZOL construction company, GEOIZOL Project engineering company, GEOIZOL Trade company that supplies and sales specialised materials and anchors, and ZAO Pushkin Machine Building Plant.

GEOIZOL Group started in 1995 as a small construction company Geoizol, initially specializing in waterproofing.

Today Geoizol participates in investment and governmental projects as the General Designer, the General Contractor and a Subcontractor.

The company works in all regions of the Russian Federation, and in republics of Tajikistan and Turkmenistan .

The branches of the company – separate subdivisions Sochi and Amurskoye – are engaged in the building projects for winter Olympic Games 2014 in the area of Krasnaya Polyana and in construction of major hydropower stations in Siberia and the Far East of Russia.

In 2012 GEOIZOL Group started industrial manufacturing of unrivalled for the Russian market anchoring systems used as the primary bearing element of high-rise buildings construction, in railway and road construction (interchanges and overhead crossings), in bridges and tunnels. The systems are especially useful for works in congested urban areas, in case of sliding soils and in close proximity to the existing buildings as they allow to eliminate the risk of their damaging.



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St. Petersburg
2014