

## Preface

The “Guidelines for Microtunneling and Horizontal Drilling projects” is one of the outcomes of the French National Research Project “Microtunnels”, for which research and surveys have been undertaken from 1994 to 2002 at a cost of €2.2 million.

Trenchless technology allows the installation or renovation of pipelines by limiting the inconvenience caused to residents, particularly in urban areas. These innovative sites were introduced in France at the end of the 1980s. They include various techniques ranging from the installation of new networks by boring or horizontal drilling to the refurbishment or renovation of existing networks.

For almost 15 years these techniques have been widely developed in France, thereby contributing to the taking into consideration of environmental constraints in urban infrastructure projects. To this day, hundreds of kilometers of networks have been laid using these techniques.

But for all that, during the early years when these techniques were first introduced in France, there were difficulties and even setbacks which indicated the need to progress not only in terms of equipment but also in terms of research in order to refine the methods of calculation, bore fluids, work parameters and soil-machine interactions, etc.

The FSTT (French Society for Trenchless Technology) understood this well and immediately set up an elaborate research program. This approach, entrusted to FSTT and IREX (the Institute for applied research and experimentation in civil engineering) and the Research Directorate in scientific and technical projects (DRAST), actively sustained the National Project, as it was scientific, rigorous, affordable, pragmatic and very simple to apply.

The present guidelines are meant to be a comprehensive aid in design and fulfillment, intended for those whose work is specifically to implement those techniques which respect urban life and its users.

These guidelines successfully bring these techniques out from the realms of confidentiality by popularizing their use. They represent essential stages to be followed by every microtunneling project in order to ensure its success. Every contracting authority, every contractor, every design office and every builder will find here answers to questions which inevitably arise from the setting up of these tricky sites.

I would like to thank here all those who believed in the necessity of this important work of applied research and who objectively made use of their successful as well as uncompleted experience.

Our special thanks go to President Michel Mermet who initiated this National Project and saw it through to completion with great tenacity and to Jean-Pierre and Alain Guilloux, who successively managed the project to its completion.

André COLSON  
Ministry of Equipment, Transportation, Housing,  
Tourism and Oceans  
Research Directorate for scientific and technical affairs  
Civil engineering project leader

## Introduction

When the French Society for Trenchless Technology (FSTT) launched the French National Research Project “Microtunnels” in January 1993, the aim was to meet the ever-increasing requirements to take into account the objectives of the urban environment, reduction in social repercussions, quality and safety, as well as technological innovation for new network projects.

This extensive program had at least two requirements: communications and promotion, particularly with prime contractors on the one hand, and on the other research and technological innovations to improve the reliability of equipment, and adapt it better to the French geotechnical conditions, extend its field of application and refine the quality of projects and management of worksites.

This book, presented in the form of guidelines intended for all those involved in “trenchless” work, is in response to the second requirement. Carried out as a National Project, with the active support of the Equipment Ministry (the DRAST), and part of an agreement with IREX, the FSTT embarked on a diligent, laborious and methodical mission. The objective was to develop multidisciplinary research in order to gather better knowledge of these techniques and adapt them to the characteristics of the situation and the French market. These various research projects, all carried out as part of the National Project, included several aspects:

- scientific (*in situ* monitoring of microtunneling and horizontal drilling sites, laboratory studies, numerical modeling) whose synthesis improved understanding of the many soil-machine interaction mechanisms and suggest theoretical approaches to better comprehend the projects;
- technological (integration of data on the machines, pipes installed, products designed to make the work easier);
- socio-economic (approach of social costs, consideration of the characteristics of trenchless work in the preparation and management of construction contracts);

The current guidelines were prepared based on work undertaken from 1993 to 2002 by a group consisting of contracting authorities, project managers, laboratories and research centers, engineering departments, civil engineering firms and manufacturers of equipment and products.

The book is divided into two parts: Microtunneling and Horizontal Drilling. Each part is structured as follows:

- 1) general introduction of techniques, fields of application,
- 2) technique and principle of operation,
- 3) summary of parameters affecting progress at the site,
- 4) guidelines for exploration,
- 5) guidelines for the choice of machines and equipment, depending on the expected soil and the project environment,
- 6) guidelines for project design,
- 7) guidelines for the supervision of the site: guidance, tunneling parameters, lubrication, interruptions in shaft sinking,
- 8) comments on the socio-economic aspects, and particularly the concept of the “social” and contractual cost of projects.

The guidelines for the microtunneling projects and the guidelines for horizontal drilling, which constitute two distinct publications, have been drafted according to the same clauses. They are designed as a guide for all those who wish to set up a “trenchless” project.

Because this field is developing continually, these guidelines, that constitute the first stage, will have to include the lessons drawn from experience, as they are applied.

We decided to publish the results of the long and laborious collective work of this National Project in a global and pragmatic form. Being “Guidelines”, the approach is indeed ambitious, but it is modest at the same time, because we are conscious of the progress that still remains to be made.

The FSTT is ready to listen to all those who would like to make this document more interesting by sharing their successes as well as the difficulties inherent in these tricky sites.

Michel MERMET  
President of the FSTT  
President of the French National  
Research Project “Microtunnels”

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The National Project included an executive committee presided over by Mr. Mermet. Technical supervision was ensured initially by Jean-Pierre Henry and then by Alain Guilloux since 1996.

These recommendations have been prepared by a drafting committee consisting of:

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- Damien Deppner (REHAU),
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- Roger Wilkinson (Wise),

based on 31 technical reports and 26 status reports of the National Project (see bibliography).