DCA Technical Information No. 2

Model Bill of Quantities

for HDD Measures with
Drilling Rigs > 40t Pull-in Force

January 2012

Impress

Information according §5 TMG:

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Preface

Horizontal Directional Drilling (HDD) is an aspiring technology that has been applied successfully in the trenchless installation of gas and water pipelines and telecommunication cables for years. Given the high technical and scientific requirements, all project phases, from tendering, work preparations and execution to closing documentation, must be carefully planned. This paper entitled "Standard Bill of Quantities for HDD Measures with Drill Rigs > 40 t Pull-in Force" by the Drilling Contractors Association (DCA) aims to provide a model bill of quantities (model BOQ) for drilling operations in the HDD industry. The existing BOQs of clients, engineering firms and contractors vary considerably, both in content and scope. Therefore, there are often misinterpretations when it comes to tendering, since, for example, certain services are put out for tender as supplementary work under a main item in one BOQ and as a separate item in another.
On a general enquiry, without specified items, a client may receive offers which are not easily or hardly comparable in form and pricing. Major price differences often result from differing scopes of work as, for example, one bidder may include necessary supplementary or preliminary work and another expects it to be provided by the client.

This model bill of quantities was developed to render HDD tenders more comparable and, above all, to lend planners, owners or clients a helping hand in preparing a qualified bid. It includes basic and various additional works. Please note that the DCA advises clients to consult a specialised planner with experience in the field of HDD in addition to this model BOQ.

We would like to thank all those involved for their contribution!

Aachen, March 2016
Drilling Contractors Association (DCA)

Introduction

This model bill of quantities (BOQ) shall serve as guidelines for creating individual BOQs and is to be understood as a suggestion.

The model BOQ covers works required for an HDD measure carried out using devices with a pull-force of more than 40 t. We offer text modules that can be used for project specifications and the related tender evaluation.

When selecting text modules, special attention must be paid to the completeness of necessary tasks.
The choice of items to be used in this model BOQ principally resides on the party issuing the invitation to tender.
We distinguish between items which should in any case be priced in connection with the tender of an HDD measure and items which may be included in a BOQ depending on the project.

Prices may be stated in units or on a flat-rate basis, quantities may be adapted according to project-specific requirements. Works that depend only on local conditions, such as site preparation and the reinstatement of surface reinforcements, sheet pile passing or dewatering, were not included in this model BOQ.

For tenders we recommend specifying the HDD measure in a separate title in order to facilitate subcontracting. When separately assigning the trades of drilling works, civil engineering and pipe works, interfaces and responsibilities must be clearly defined either in the specifications or in an annex to the bill of quantities.

For the HDD measure, we recommend producing a sound and comprehensive geotechnical report in advance.
In this regard, please consider the recommendations of the DCA working group "Subsoil" and the information in the DCA Technical Guidelines.

Comprehensible specifications and significant planning documents with an appropriate scale must principally be attached to the bill of quantities as a basis of calculation. Map extracts/satellite images of the construction route serve the purpose of clarity and simplified calculation.

In any case we advise bidders to acquaint themselves with the localities prior to submitting their bid.
If pipes are provided by the client or owner, the tender must include pipe specifications and loading/delivery addresses for the pipes.

If there are third-party requirements (e.g. water management authorities or environment agencies) to be taken account of by the bidder, they must be attached to the tender documents.

Given the complexity of the necessary preliminary work (e.g. pre-examinations, calculations and authorisations) and the project-related scope of the work that goes beyond this model BOQ, the DCA recommends consulting a specialised planner.

Besides cost effectiveness, we further recommend making sure bidders hold the necessary qualifications.
To that end, references or certificates should be claimed for verification.

In conclusion, it is recalled that every project may involve special occupational safety requirements. For further information and support please contact the competent BG BAU.

Note: the DCA cannot be held liable for the completeness or accuracy of these text modules.

Table of contents

00 Preliminary observations HDD

Drilling equipment and navigation system chosen for the project (to be indicated by the bidder before submitting the offer):

(project-related choice/decision by the party issuing the invitation to tender)

- manufacturer/type of drilling rig:
- construction year:
- dimensions of the drilling rig: L x W x H [m]:
- weight [t]:
- max pull force [kN]:
- max push force [kN]:
- max torque [Nm]:
- navigation system for pilot drilling:
- capacity of the high-pressure pump, max operating pressure at max pumping volume [l/min], [bar]:
- max capacity of the mud mixing and recycling unit with solids content [m³/min]; [%]:
- technical parameters of the drill string
    - o make-up torque [Nm]:
    - o max permissible torque [Nm]:
    - o min permissible bending/drilling radius [m]:
    - o set up of roller track:

Qualification of the bidder:

(project-related choice/decision by the party issuing the invitation to tender)
Bidders must certify their qualification according to:
for example:

DVGW GW 321 GN 2 A (for drilling rigs with a pull force of < 400 kN)	☐
DVGW GW 321 GN 2 B (for drilling rigs with a pull force of ≥ 400 kN)	☐
DCA membership	☐
DVGW GW 301	☐
DVGW GW 302	☐
Güteschutz Kanalbau RAL-GZ 961	☐
ISO 9001:	☐
ISO 14001:	☐
SCC (safety contractors certificate)	☐
AMS (occupational safety and health management system)	☐
OHSAS 18001 (occupational health system and safety)	☐
other:	☐

Attach a reference list of comparable projects that were carried out by the bidder.
The reference list should include the following details: client, place and year of execution, short description of the project (length of the drilling, borehole diameter, subsoil, pipe material)
Alongside the offer, the bidder shall present a detailed construction schedule including all working steps.
Drilling records must be submitted to the representative of the client promptly and without further demand during drilling operations.

Contractors please note:
The attached geotechnical report forms the basis of calculation for all earthworks.

01 Standard works for HDD measures with drilling rigs > 40 t pull force

01.01 General measures

01.01.01 Preparation work

Preparation work encompasses:

- ☐ Creating traffic control plans including consultation with police and other competent authorities
- ☐ Setting up a construction schedule and keeping it during the project works
- ☐ Details, drawings of sheet piles, etc. and creating drafts of individual construction stages according to the requirements arising from the specification
- ☐ Marking the planned structures, including existing pipelines, other structural works, etc. on site plans in an appropriate scale
- ☐ Detailed drawings of the transition areas at shaft structures and the tie-ins/connection lines to the main pipeline
- ☐ Consultation with authorities, departments and local residents involved
- ☐ Procurement of all additional authorisations that may become necessary during the construction phase. Refund of charges upon presentation.
- ☐ Supporting the preservation of evidence
- ☐ Supply and preparation of all auditing and as-built documents in electronic format; specification: .....
- ☐ Documentation of the individual construction stages. Upon approval the necessary documents for all equipment and building components must be submitted, for example .....
- ☐ Quality test records and regulations
- ☐ Construction drawings according to specifications

1,000 LS ....

01.01.02 Securing and lighting

Securing and lighting of construction site (calendar days)
This item includes the following works:
provision, maintenance and operation, including cleaning and maintaining the necessary safety devices (fencing and lighting material), if required clearing snow and ice, gritting circulation areas on site, including crossings and pedestrian bridges.

1,000 days ....

01.01.03 Insurance

Insurance in accordance with details and requirements laid down in the specifications

1,000 LS ....

01.02 Construction site installation

01.02.01 Transport and removal

Provision of plants, tools, materials and other equipment (if necessary also pipe rollers) required to perform the horizontal drilling, transport to/removal from construction site, transport of personnel

1,000 LS ....

01.02.02 Assembly and dismantling

Preparation of construction site for HDD project, to this end set up for operation/dismantle plants, tools, materials and other equipment (if necessary also pip rollers) required to perform the horizontal drilling, including all works needed for that purpose.
When it comes to providing sanitation and toilet blocks as well as complying with applicable regulations on occupational safety and health, take account of the workplace ordinance.
All materials, tools and containers must be removed.
Special requirements for site facilities

- ☐ construction-site office for client, details: ...
- ☐ construction sign; details: ...
- ☐ ....

1,000 LS ....

01.02.03 Provision of site facility areas

Provision of workspace and sanitation. Provision of means of communication to enable a direct ex change of information between driller and personnel at the drilling site and at pipe site/at the exit point of the drill (e.g. two-way radios).
Disposal of general construction waste; waste must be disposed of in accordance with applicable regulations.

1,000 days ....

01.02.04 Construction of rig anchor

Construction and dismantling of an anchorage system to resist forces while drilling.

☐ the dimensions of the rig anchor must be based at least on the expected pull force

☐ the construction of the anchorage system includes submitting a verified statistical proof

1,000 pieces ....

01.02.05 Entry pit

Create and close an open pit as entry pit

☐ for the horizontal drilling

☐ and for the tie-in of the pipe, design water level for temporary works in accordance with report.

Allow for sheet piles according to DIN 4124 and statistical requirements, if necessary.
Dimensions chosen by contractor (LxWxD):

.....
to be indicated by bidder

Sheeting chosen by contractor:

.....
to be indicated by bidder

1,000 pieces ....

01.02.06 Exit pit

Create and close an open pit as receiving pit for the

☐ horizontal drilling

☐ and for the tie-in of the pipe design water level for temporary works in accordance with report.

Allow for sheet piles according to DIN 4124 and statistical requirements, if necessary.
Measurements chosen by contractor (LxWxD):

.....
to be indicated by bidder

Sheeting chosen by contractor:

.....
to be indicated by bidder

1,000 pieces ....

01.03 Drilling / pull back

01.03.01 Pilot drilling

Carry out pilot drilling between entry and exit point based on the measurements stated
in the specifications and planning documents.
length = straight/true length of the drilling
(please cross out incorrect options)
If the drill hole has to be abandoned during the drilling, it must be filled with appropriate material.
After 28 days the compressive strength of the filling material should total at least 1 N/mm².
Provide evidence of the filling and the final compressive strength achieved.
Costs of an abandoned borehole must be listed under item.
Diameter of the pilot drilling [mm]: .....
The pilot drilling must be carried out with accuracy according to DVGW GW 321.

☐ yes

☐ no, accuracy see below:

The pilot drilling must be carried out with the following accuracy:
horizontally: ±..... m
vertically: ±..... m
(with reference to the intended drilling line)
During the pilot drilling the client must have access to the borehole surveying data at all times;
the deviation between the target position and actual position of the measuring probe must be indicated.
Required as pilot steering system is:

☐ chosen by client:

☐ chosen by contractor:

- ☐ walk-over system
- ☐ TruTrack®/ParaTrack® system
- ☐ gyro compass

1,000 m ....

01.03.02 Reaming

Reaming of the borehole according to the DCA Guidelines with an overcut big enough to pull back the product pipe, the product pipe bundle and the duct pipe. The overcut must be documented.
Reaming method and number of reaming stages chosen by the bidder or
according to project-related requirements.
Throughout all reaming stages the drilling fluid must be collected in the entry and target pit in a controlled manner and pumped out.
While reaming it must be made sure that the borehole will be clean and
free from cuttings after the operation.

To be indicated by the bidder:
number of reaming stages:
o type of drilling tools 1: …….
final diameter [mm] reaming stage 1: ……..
proportion of reaming operations [% of unit price]: ……
o type of drilling tools 2: …….

final diameter [mm] reaming stage 2: ……..
proportion of reaming operations [% of unit price]: ……
o type of drilling tools 3: ……
final diameter [mm] reaming stage 3: ……..
proportion of reaming operations [% of unit price]: ……
o type of drilling tools 4: ……
final diameter [mm] reaming stage 4: ……..
proportion of reaming operations [% of unit price]: ……
A permanent and continuous connection between entry and exit pit must be guaranteed throughout all reaming operations.

☐ yes

☐ no

1,000 m ....

01.03.03 Pullback

Supply and provision of appropriate pulling heads of the pipe string that needs to be pulled back to the pulling assembly; pullback of the pipe string/pipe bundle.
During pullback the drilling mud must be collected in the entry and target pit in a controlled manner and pumped out.

1,000 m ....

01.03.04 Drilling Fluid

Supply, mixing and, if necessary, recycling/reconditioning of the drilling fluid.
Allow for triple the borehole volume.
Supply of water at construction site (allow for ten times the borehole volume).
Throughout all drilling operations a drilling fluid engineer is:

☐ required

☐ not required

Information on scheduled fluid materials and their yield are to be provided by bidder:
product 1:..... yield: ..... m³/t
product 2:..... yield: ..... m³/t
product 3:..... yield: ..... m³/t
Material data sheets on the aforementioned products must be attached to the offer:

☐ yes

☐ no

1,000 t ....

01.04 Disposal

01.04.01 Recovery / disposal of excess drilling fluid (LAGA Z0)

Recovery or disposal of residual fluid after pullback of the product pipe in accordance with applicable regulations. Proof of adequate recovery/disposal must be accounted for under this item.
Volume to be indicated by the bidder: ..... m^3

1,000 LS ....

01.04.02 Recovery / disposal of drill cuttings using a separation device (LAGA = Z0)

Recovery of separated cuttings in accordance with applicable regulations.
Proof of adequate recovery must be accounted for under this item.
Volume to be indicated by the bidder: ..... m^3

1,000 LS ....

01.05 Quality assurance

01.05.01 Documentation

The following documentation must be established:

- ☐ Daily reports
- ☐ Drilling fluid reports
- ☐ Borehole survey reports
- ☐ Drilling records
- ☐ Proof of the recovery/disposal of the drilling fluid
- ☐ Proof of the recovery/disposal of the solids
- ☐ Proof of land use
- ☐ As-built drawings
- ☐ ....

1,000 LS ....

02 Additional works for HDD projects with drilling rigs > 40 (project related)

02.01 General measures

02.01.01 Road traffic control

Traffic control and road safety throughout the contractual completion period (calendar days), including setting up and removing means of traffic control and safety equipment in accordance with specifications.

1,000 days ....

02.01.02 Site fence

Fence made from mesh wire (system fence), 2.00 m high, including all posts, links and entrance gates, to fence in the construction site as stated in specifications must be supplied and set-up, maintained throughout the construction period, moved if necessary and taken down and removed from the site upon completion of the construction works.

1,000 LS ....

02.01.03 Coordination of health and safety

Provision of a site coordinator according to § 3 (1 and 3) of the BaustellV.
Coordination of measure, e.g. for all those working at the site, by a suitable coordinator. The coordinator must be appointed for the entire construction period. Monitoring compliance with safety regulations and working instructions is part of the coordinator's job.
Evidence of the qualification of the coordinator is required. The competent drilling superintendent and other personnel in charge of site supervision are barred from functioning as coordinator.
The coordinator is obliged to immediately report safety deficiencies at the site to the client’s representative (construction supervision).
These deficiencies must be documented and immediately presented to the construction supervision in the form of records.
Responsibility for compliance with industrial safety regulations on site lies with the contractor.

to be indicated by the bidder:

- designated coordinator:

.....

1,000 LS ....

02.01.04 Health and safety plan (HSE Plan), advance notice, documentation of later work

Drawing up or updating the health and safety plan according to § 2 (3) of the BaustellV.
Changes to execution or schedule must be incorporated in the health and safety plan and the documentation accordingly. The health and safety plan and the documentation from the planning phase are made available to the appointed contractor in electronic form.
Drawing up and delivering the advance notice according to § 2 (2) of the BaustellV. The advance notice must be sent to the competent authority at least 2 weeks before works commence (set-up of construction site).
A copy of the advance notice must be submitted to the client. The advance notice and the health and safety plan must be posted in a conspicuous place on site where they are easily visible to all personnel.
The document for later work must be submitted to the client after completion of the works.
Posting necessary site notices according to regulations of the employers' liability insurance association.

1,000 LS ....

02.01.05 Measurements of settlement

The operator of the plant must hire an authorised and certified survey engineer, including, if necessary, a safety officer in the vicinity of the construction site.
The frequency of measurements and the number of height points are determined by the client.
Cost of the safety officer (usually paid for the entire construction period, irrespective of actual working time), for measurements on site must be included here.

1,000 LS ....

02.01.06 Topographic surveying

Topographic measurements as provided in the specifications.

1,000 LS ....

02.01.07 Additional soil investigations

Additional soil investigations, including laboratory tests and analyses according to

- ☐ specification client / specifications
- ☐ specification contractor

1,000 days ....

02.02 Construction site installation

02.02.01 Construction of pits

Construction of other pits as provided in the specifications.

1,000 pieces ....

02.02.02 Storage reservoirs

Establishment, provision and removal of drilling fluid reservoirs

☐ reservoirs; general specification (number, dimension L x W x H): .....

☐ lined with foil; specification foil: .....

☐ reservoir volume; specification: .....

☐ reservoir with submersible pump; specification: .....

☐ reservoir with gradient; specification: .....

☐ location reservoir (☐ rig site; ☐ pipe site);

☐ further specifications: .....

Establishment, provision and removal of storage facilities for cutting

☐ storage, general specification (number, dimension L x W x H): .....

☐ lined with foil; specification foil: .....

☐ storage volume; specification: .....

☐ storage with submersible pump

☐ storage with gradient; specification: .....

☐ location of storage (☐ rig site; ☐ pipe site);

☐ further specifications: .....

1,000 LS ....

02.02.03 Relocation of drilling rig

Relocate drilling rig and set up for operation

☐ on the drilling site

or

☐ within the area of the construction site (distance: .....m)

including all related ancillary work. Regarding rig anchors, see item (Rig anchor)

1,000 pieces ....

02.02.04 Construction site supply

Supply of construction site with water (also to mix the drilling fluid; account for ten times the borehole volume), power, telephone/computer connections according to specification, etc. by client:

.....

.....

.....

Connections for the construction site will be provided by:

☐ client

☐ contractor

1,000 pieces ....

02.03 Drilling operations

02.03.01 Cleaning run

Carry out a cleaning run according to the specifications of the

☐ client

☐ bidder

specification:

.....
.....
.....
.....

1,000 m ....

02.03.02 Basket reamer run

Carry out a basket reamer Run according to the specifications of the

☐ client

☐ bidder

specification:

.....
.....
.....
.....

1,000 m ....

02.03.03 Dummy run

Carry out a dummy run according to the specification of the

☐ client

☐ bidder

specification:

.....
.....
.....
.....

1,000 m ....

02.03.04 Provision of additional/special drilling tools

according to specification of the

☐ client, specification: .....

or

☐ contractor, specification: .....

Time of delivery free construction site: .....

1,000 pieces ....

02.03.05 Drilling fluid transfer

between entry/exit point is

☐ not required

☐ required; bidders must indicate type of drilling fluid transfer:

.....

All necessary works and material supplies, the deployment of staff and equipment must be taken account of in order to maintain mud circulation throughout the drilling operations.

1,000 LS ..... only unit price

02.03.06 Cementing of the annulus

between the pipeline or pipeline bundle and the borehole wall on the section of the route: ..... to ..... m and ..... to ..... m

As annular fill apply:

☐ specification of the client:

☐ specification of the contractor:

Cementing procedure and time:

☐ specification of the client:

☐ specification of the contractor:

Minimum strength and setting time:

☐ specification of the client:

☐ specification of the contractor:

The drilling fluid replaced while cementing must be recovered/disposed of adequately and included under item "Disposal".

1,000 m ....

02.03.07 Abandonment of the pilot drilling

Take account of:
- pull-back of pilot drill string
- filling of borehole

☐ with drilling fluid

☐ with cement; specification: .....

Relocation of drilling rig (if necessary) is not included as depends on location, cause of abandonment, etc.

1,000 m ....

02.03.08 Abandonment of the drilling at reaming stage 1

Take account of:
- removal of pipe string
- disassembly of drilling tools
- filling of borehole

☐ with drilling fluid

☐ with cement; specification: .....

Relocation of drilling rig (if necessary) is not included as dependent on location, cause of abandonment, etc.
In case reaming is performed in different stages this item must be completed for every reaming stage.

1,000 m ....

02.03.09 Abandonment of the drilling at reaming stage 2

as listed before, but include reaming stages 1 and 2.
Take account of:
- removal of pipe string
- disassembly of drilling tools
- filling of borehole

☐ with drilling fluid

☐ with cement; specification: .....

Relocation of drilling rig (if necessary) is not included as dependent on location, cause of abandonment, etc.
In case reaming is performed in different stages, this item must be completed for every reaming stage.

1,000 m ....

02.03.10 Abandonment of the drilling at reaming stage 3

as listed before, but include reaming stages 1 to 3
Take account of:
- removal of pipe string
- disassembly of drilling tools
- filling of borehole

☐ with drilling fluid

☐ with cement; specification: .....

Relocation of drilling rig (if necessary) is not included as dependent on location, cause of abandonment, etc.
In case reaming is performed in different stages, this item must be completed for every reaming stage.

1,000 m ....

02.03.11 Installation of casing pipe

☐ for the pilot drilling

☐ for all working steps

☐ at entry point, according to specification of:

☐ contractor: .....

☐ client: .....

☐ at exit-point, according to specification of:

☐ contractor: .....

☐ client: .....

o The borehole shall be cased over a length of at least ..... m.
o The maximum cover between the top of the casing pipe and ground level will amount to ..... m after installation.
o The borehole shall be cased with a pipe of the following dimensions: .....
o The borehole casing must be fully removed before/after pulling back the product pipe/product pipe bundle.

1,000 m ....

02.03.12 Additional supply drilling fluid/additives (quotation request)

Supply and mixing of drilling fluids that become demonstrably necessary due to unforeseeable events.
10.4.1 Product 1:.....unit price..... €/kg
10.4.2 Product 2:.....unit price..... €/kg
10.4.3 Product 3:.....unit price..... €/kg

02.03.13 Measurement of mud pressure in annulus during the pilot drilling

Additional cost for item "pilot drilling" for the measurement of the annulus pressure at the drilling head during the pilot drilling, including the documentation of recorded data.

1,000 m ....

02.03.14 Additional works/Supplement borehole survey system

Additional cost for to item "pilot drilling" for applying a cable-based borehole survey system during the pilot drilling.

☐ TruTrack®/ParaTrack® system or the like

☐ gyro compass (System Drillguide® or the like)

1,000 m ....

02.03.15 Measurement of pulling force at pull head during pull-back

Traction must be documented with a pulling-force measurement device at the pull-head.
System chosen by the bidder:
.....

1,000 LS ....

02.03.16 Ballasting

The pipe which will be pulled in must be ballasted in order to reduce pull-back forces and to protect the pipe and pipe insulation.

☐ as specified by the client;

specification: .....

☐ as specified by the contractor;

specification: .....
Include possible emptying und cleaning of the pipe/s under this item.

1,000 LS ....

02.04 Disposal of specially designated bentonite mud

02.04.01 Sampling and classification according to LAGA M20 of

☐ drilling fluid

☐ cuttings

☐ affected area/surface certified test laboratory (name: .....)

Details on type and scope of the sampling carried out by the

☐ client

or

☐ contractor

specification:
.....
.....
.....
The sampling results must be presented to the client within an appropriate time frame.
Before drilling begins, it must be illustrated which areas or routes will be used for possible recovery/disposal.

1,000 LS ....

02.04.02 Disposal of excess drilling fluid (LAGA Z ..... (specification client))

Disposal of the residual drilling fluid after pull back of the product pipe in accordance with applicable regulations. Proof of adequate disposal to be included in this item.

1,000 m^3 ....

02.04.03 Disposal of drill cuttings using a separation plant (LAGA Z..... (specification client))

Recycling of cuttings according to applicable regulations.
Proof of adequate recycling to be included in this item.

1,000 m^3 ....

02.05 Quality assurance with special requirements

02.05.01 Mapping of the pulled-in pipe string by

☐ pressure cell

☐ gyro compass

Test distance every ## m; analysed data must be added to the as-built documentation.

1,000 LS ....

02.05.02 Carrying out hydrographic bearing in accordance with local regulations (to be attached to the tender)

1,000 LS ....

02.06 Hourly work

02.06.01 Stand-by time drilling rig, including equipment and personnel

1,000 h ....

02.06.02 Stand-by time drilling rig, incl. equipment (excl. personnel)

1,000 h ....

02.06.03 Charge rate borehole survey system, incl. surveyor

1,000 h ....

02.06.04 Charge rate fluid engineer/technician

1,000 h ....

02.06.05 Additional travel of the drilling crew

1,000 LS ....

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