**{{jh}}井钻井施工方案精细版**

队 号：

设计人：

批准人：

接收人：

日 期：

**领导审批意见：**

审批人：

审批意见：

审批人：

审批意见：

签字：

**年 月 日**

# 设计信息

## 基础信息

井号：{{jh}}

井别：{{jb}}

井型：{{jx}}

横坐标: {{jkhzb}}

纵坐标: {{jkzzb}}

构造位置：{{gzwz}}

完钻层位： {{wzcw}}

钻探目的：{{ztmd}}

完钻原则：{{wzyz}}

完井方法：{{wjfa}}

## 地质分层

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 地层名称 | | | | | 设计井号 | | | |
| 界 | 系 | 统 | 组 | 段 | {{jh}} | | | |
| 底垂深 | 接触关系 | 厚度 | 断点深度 |
| m  {{sjDzfcList}} | m | m |
| [dcJ] | [dcX] | [dcT] | [dcZ] | [dcD] | [sjdcs] | [sjjcgx] | [sjhd] | [sjddsd] |

## 井身结构

表 1-1 井身结构设计表

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| --- | --- | --- | --- | --- | --- | --- | --- |
| 开次 | 钻头直径 | 井深 | 套管外径 | 套管顶深 | 套管下深 | 水泥返高 | 备注 |
| （mm）  {{sjJsjgList}} | （m） | （mm） | （m） | （m） | （m） |
| [kc] | [ztzj] | [js] | [ttwj] | [ttds] | [ttxs] | [snfg] | [bz] |

井身结构示意图

{{@jsjgt}}

井身结构图

## 井眼轨迹

井号：{{jh}} 轨道类型：{{gdlx}}

轨道设计表

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井底垂深 | 井底闭合距 | 井底闭合方位 | 造斜点 | 最大井斜角 | 磁倾角 | 磁场强度 | 磁偏角 | 收敛角 | 方位修正角 |
| (m)  {{sjJygjGdsjList}} | (m) | (°) | (m) | (°) | (°) | (μT) | (°) | (°) | (°) |
| [jdcs] | [jdbhj] | [jdbhfw] | [zxd] | [zdjxj] | [cqj] | [ccqd] | [cpj] | [slj] | [fwxzj] |

轨道分段参数

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井深 | 井斜 | 方位 | 垂深 | 水平位移 | 南北位移 | 东西位移 | 全角变化率 | 工具面 | 靶点 |
| （m）  {{sjJygjGdfdcsList}} | ( ° ) | ( ° ) | （m） | （m） | （m） | （m） | ( °/30m） | ( ° ) |
| [js] | [jx] | [fw] | [cs] | [spwy] | [nbwy] | [dxwy] | [qjbhl] | [gjm] | [bd] |

轨道设计各点参数

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井深 | 井斜 | 方位 | 闭合方位 | 垂深 | 闭合距 | 南北位移 | 东西位移 | 造斜率 | 方位变化率 | 全角变化率 | 工具面 |
| (m)  {{sjJygjGdsjgdcsList}} | (°) | (°) | (°) | (m) | (m) | (m) | (m) | (°/30m) | (°/30m) | (°/30m) | (°) |
| [js] | [jx] | [fw] | [bhfw] | [cs] | [bhj] | [nbwy] | [dxwy] | [zxl] | [fwbhl] | [qjbhl] | [gjm] |

## 钻井液

分段钻井液设计

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| --- | --- | --- |
| 开次 | 井段(m) | 钻井液体系 |
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分段钻井液性能设计表

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 项目 |  |  |  |  |  |  |
| 密度(g/cm3) |  |  |  |  |  |  |
| 马氏漏斗黏度(s) |  |  |  |  |  |  |
| API 滤失量(ml) |  |  |  |  |  |  |
| API 泥饼(mm) |  |  |  |  |  |  |
| 静切力(Pa) |  |  |  |  |  |  |
| pH 值 |  |  |  |  |  |  |
| 含砂量(％) |  |  |  |  |  |  |
| 总固含(％) |  |  |  |  |  |  |
| 摩阻系数 |  |  |  |  |  |  |
| 动切力(Pa) |  |  |  |  |  |  |
| 塑性黏度(mPa ·s) |  |  |  |  |  |  |

注：（1）钻井液各项性能参数中密度、滤失量严格执行设计，其它性能参数应根据实际情况合理调整；

（2）起下钻、钻井液体系转换、发生钻井液污染、井漏等复杂情况时，调整过程中钻井液性能参数不做 考核。

分段钻井液配方设计

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 序  号 | 材料名称  及代号 | 加量（kg/m3） | 加量（kg/m3） | 加量（kg/m3） | 加量（kg/m3） | 加量（kg/m3） |
| 一开 | 二开 | 三开 | 四开 | 五开 |
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## 套管

套管柱数据表

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 开次 | 井段 | 套 管 规 范 | | | | | 长度 | 钻井液密度 |
| （m） | 外径 | 钢级 | 壁厚 | 扣型 | 最佳上扣扭矩 |
| （mm） | （mm） | （N ·m） | （m） | （g/cm3） |
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套管性能数据表

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 外径 | 钢级 | 壁厚 | 扣型 | 每米重量 | 接箍外径 | 抗拉强度 | 抗挤强度 | 抗内压 强度 |
| （mm） | （mm） | （kg/m） | （mm） | （kN） | （MPa） | （MPa） |
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套管柱强度校核

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 开次 | 井段 | 每米质量 | 重量 | | 抗外挤 | | 抗内压 | | 抗 拉 | |
| 段净重 | 累计重 | 最大载荷 | 安全系数 | 最大载荷 | 安全系数 | 最大载荷 | 安全系数 |
| (m) | (kg/m) | (t) | (t) | (MPa) | (MPa) | (kN) |
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各层次套管固井主要附件表

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| 开次 | 附件名称 | 规格 | 单位 | 数量 | 备注 |
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## 质量要求

井身质量要求

表 3-1 井身质量要求

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| --- | --- | --- |
| 井 段 | 井斜角 | 全角变化率 |
| （m） | (≤°) | (≤°/30m） |
|  |  |  |

定向井段井身质量要求：定向段及稳斜段采用 MWD 随钻测控井身轨迹，根据实际情况采用滑动钻进和复合钻进 两种方式，随时调整井斜和方位。

表 3-2 中靶要求-定向井

|  |  |  |
| --- | --- | --- |
| 靶点 | 靶半径 | 备注 |
| （m） |
|  |  |  |

固井质量要求：{固井质量要求}

完成井井口质量要求：{完成井井口质量要求}

油气层污染判定要求：{油气层污染判定要求}

# 邻井资料

## 区域施工井

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井号 | 井型 | 斜深 | 垂深 | 完钻层位 | 总开次 | 钻井周期(天) | 钻完周期(天) | 井口距离 | 井底距离 |
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| 井号 | 开次 | 起始井深 | 结束井深 | 进尺 | 钻达层位 | 钻进周期 | | | 钻进速率 | 中完(完井)周期 | | |
| 实际周期 | 异常周期 | 生产周期 | 实际周期 | 异常周期 | 生产周期 |
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## 周期数据分析

## 钻头关键数据

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井号 | 开次 | 井段 | 层位 | 进尺 | 机速 | 钻头型号 | 喷嘴 | 磨损情况 | 起钻原因 | 指标(m/d) |
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| 开次 | 钻头型号 | 外径 | 钻头数量 | 一趟钻率 | 进尺中位数 | 机械钻速中位数 | 起出井深中位数 |
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## 钻头区块数据

## 实钻分析结果

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 分析范围 | 分析对象 | 分析现象 | 输出方向 | 优选依据 | 最优建议 | 其次建议 | 推荐评分 | 详细参数 |
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# 工程地质分析

## 工程地质概况

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 地质分层 | 垂深 | 岩性提示 | 油气水提示 | 故障提示 |
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## 特殊岩性的提示表

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 特殊岩性 | 顶深 | 底深 | 厚度 | 硬度等级 | 参考钻时 |
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## 构造特征

### 3.1井位图

{井区井位图}

{上顶面构造图}

### 3.2 地震刨面图

{东西向}

{南北向}

{沿轨迹}

## 三压力剖面

{三压力刨面}

# 施工风险识别分析

## H2S

邻井 H2S 等有毒有害气体显示

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 序号 | 井号 | 井深 | 工程状态 | 层位 | 显示浓度  (PPm) | 显示过程与处理 | 检测时间 | 检测方法 | 位于井口 | | 位于A靶点 | |
| 方位 | 距离 | 方位 | 距离 |
| m | ° | m | ° | m |
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{H2S设计说明}

## 喷漏卡塌

### 2.1设计数据

{喷漏卡塌设计中的风险}

### 2.2邻井风险记录

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 井号 | 故障类型 | 深度 | 描述 | 预防措施 | 应急措施 |
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## 浅层气

### 3.1设计数据

{浅层气设计中的风险}

### 3.2邻井风险记录

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 井号 | 深度 | 描述 | 预防措施 | 应急措施 |
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## 特殊岩性风险

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 特殊岩性 | 深度 | 危害、可能造成的问题 | 建议的预防类措施 | 建议的应急处理类措施 |
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## 防碰风险

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 序号 | 参考井(设计) | | 比较井 | | | | | | |
| 井深  (m) | 垂深  (m) | 井号 | 数据  来源 | 井深  (m) | 垂深  (m) | 最近距离  (m) | 扫描角  (°) | 仰角  (°) |
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{邻井防碰说明}

# 施工概要

## 设计优化

{设计优化}

## 关键装备性能要求

|  |  |  |  |
| --- | --- | --- | --- |
| 钻机型号 | | |  |
| 网电电压 | | |  |
| 电控稳定输出功率 | | |  |
| 整机能力 | 钻机类型 | |  |
| 最大承受拉力 （吨） | |  |
| 最高承受泵压 （MPa） | |  |
| 旋转系统 | 电动转盘 | 最大扭矩(kN·m) |  |
| 顶驱 | 最大扭矩(kN·m) |  |
| 循环系统 | 1#泵 | 类型 |  |
| 型号 |  |
| 最大功率(kW) |  |
| 2#泵 | 类型 |  |
| 型号 |  |
| 最大功率(kW) |  |
| 3#泵 | 类型 |  |
| 型号 |  |
| 最大功率(kW) |  |
| 固控设备 | 振动筛类型 | |  |
| 1#离心机 | 类型 |  |
| 主电机功率(kW) |  |
| 2#离心机 | 类型 |  |
| 主电机功率(kW) |  |
| 3#离心机 | 类型 |  |
| 主电机功率(kW) |  |
| 循环罐 | 数量 | |  |
| 总容量 (方) | |  |
| 储备罐 | 个数 | |  |
| 总容量 (方) | |  |

## 钻具组合及参数表

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井段  /m-m | 钻头 | | | | | | 钻进参数 | | | | | 钻具结构 |
| 型号 | 厂家 | 尺寸  /mm | 水眼  /mm | 压降  /MPa | 钻井液密度/g/cm³ | 钻压（kN） | 转速(r/min) | 排量(L/s) | 泵压(MPa) | 缸套  直径(mm) |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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## 钻井液

## 钻井液性能

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 项目 |  |  |  |  |  |
| 密度(g/cm3) |  |  |  |  |  |
| 马氏漏斗黏度(s) |  |  |  |  |  |
| API 滤失量(ml) |  |  |  |  |  |
| API 泥饼(mm) |  |  |  |  |  |
| 静切力(Pa) |  |  |  |  |  |
| pH 值 |  |  |  |  |  |
| 含砂量(％) |  |  |  |  |  |
| 总固含(％) |  |  |  |  |  |
| 摩阻系数 |  |  |  |  |  |
| 动切力(Pa) |  |  |  |  |  |
| 塑性黏度(mPa·s) |  |  |  |  |  |

## 钻井液配方

|  |  |
| --- | --- |
| 井段(m) | 钻井液体系 |
|  |  |
|  |  |
|  |  |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 序号 | 材料名称及代号 | 一开数量 | 二开数量 | 一开数量 | 二开数量 | 二开数量 | 合计 |
| （t） | （t） | （t） | （t） | （t） |
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## 钻井液药品

## 全井提示

{全井提示}

# 分段施工措施

{分段名称}施工措施

1、{结合邻井一开无复杂数据，可实现一趟钻完成}；

2、井段：{井段}，层位：{地质分层}；

3、地层岩性：

|  |  |  |  |
| --- | --- | --- | --- |
| 名称 | 井段垂深 / m | 岩性 | 备注 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

1. 轨迹分析

{轨迹分析}

1. 轨迹优化

{轨迹优化}

1. 地层压力

{轨迹优化}

7、主要风险：

{分段主要风险}

8、风险管控措施：

{风险管控措施}

9、特殊工具

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 工具名称 | 规格型号 | 数量 | 性能指标要 | 预计安装位置 | 使用目的及预期效果目标 |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

10、钻头选型：

If(邻井推荐)｛

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 井号 | 尺寸  /mm | 型号 | 厂家 | 水眼  /mm | 造斜点  /m | 钻进井段/m-m | 层位 | 机械钻速  / m/h |
|  |  |  |  |  |  |  |  |  |
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结合邻井钻头数据优选推荐莱州原野厂家，型号为{钻头型号}，

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 型号 | 刀翼 | 复合片mm | 水眼 | 复合片齿型 |
|  |  |  |  |  |

｝else{

推荐型号为{钻头型号}，

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 型号 | 刀翼 | 复合片mm | 水眼 | 复合片齿型 |
|  |  |  |  |  |

}

11、钻具组合：

{钻具组合}

12、施工参数：

排量：{排量}，钻压：{钻压}，转速：{转速}。

13、钻井液分段性能：

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 项目 |  |  |  |  |  |
| 密度(g/cm3) |  |  |  |  |  |
| 马氏漏斗黏度(s) |  |  |  |  |  |
| API 滤失量(ml) |  |  |  |  |  |
| API 泥饼(mm) |  |  |  |  |  |
| 静切力(Pa) |  |  |  |  |  |
| pH 值 |  |  |  |  |  |
| 含砂量(％) |  |  |  |  |  |
| 总固含(％) |  |  |  |  |  |
| 摩阻系数 |  |  |  |  |  |
| 动切力(Pa) |  |  |  |  |  |
| 塑性黏度(mPa·s) |  |  |  |  |  |

14、钻井液措施：

{钻井液措施}

15、钻井工程措施

{钻井工程措施}

# 井控专篇

## 各开次钻井口装置

{各开次钻井口装置｝

## 节流管汇及压井管汇

{节流管汇及压井管汇}

## 井控设备配套及试压要求

{井控设备配套及试压要求}

## 材料储备

{材料准备}

# HSE专篇

{HSE专篇}

# 计划周期

|  |  |  |  |
| --- | --- | --- | --- |
| 施工环节 | 起始井深(m) | 结束井深(m) | 计划周期（d) |
|  |  |  |  |
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# 附录

## 应急联系方式

{应急联系方式}

## 喷漏卡塌的预防管控措施

{喷漏卡塌措施}

## 完井施工措施

{完井施工措施}

## 特殊工艺、工具使用指南

{工具使用指南}

## 特殊岩性的知识

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 特殊岩性 | 补充描述 | 识别方式 | 危害 | 预防措施 | 应急处理措施 |
| 膏岩类 | 主要成分为石膏或硬石膏，易溶于水 | 钻时加快、岩屑呈白色或灰白色，遇酸起泡 | 井径扩大、卡钻、污染泥浆 | 使用饱和盐水钻井液，控制钻速 | 调整泥浆密度，补充降滤失剂 |
| 砾岩类 | 颗粒粗大，胶结程度不一 | 岩屑粒径大、棱角分明，钻时波动大 | 钻头磨损快、井壁不稳定 | 选用高强度钻头，提高泥浆携砂能力 | 循环清砂，必要时短起下钻 |
| 煤岩类 | 有机质含量高，易碎 | 岩屑黑色、轻质，可能含甲烷 | 井壁垮塌、瓦斯突出、火灾风险 | 低密度泥浆，加强气体监测 | 关井压井，注入抑制剂 |
| 油页岩类 | 含干酪根，层理发育 | 岩屑呈片状，沥青味，荧光检测阳性 | 井壁失稳、污染泥浆 | 抑制性泥浆，控制钻压 | 增加封堵材料，调整流变性 |
| 石英类 | 高硬度，二氧化硅为主 | 钻时极慢，岩屑呈白色颗粒状 | 钻头寿命缩短、机械钻速低 | 使用PDC钻头或强化钻具 | 优化钻压和转速 |
| 花岗岩 | 火成岩，矿物结晶明显 | 岩屑多棱角，含石英、长石、云母 | 钻具振动大、井斜风险 | 防斜打直技术，稳定器组合 | 调整钻具组合，降低转速 |
| 片麻岩类 | 变质岩，片麻状构造 | 岩屑条带状，矿物定向排列 | 井壁各向异性垮塌 | 提高泥浆封堵性，控制井身质量 | 短起下钻修复井壁 |
| 生物灰岩 | 含化石，孔隙度高 | 岩屑多孔洞，可见生物遗迹 | 漏失风险、储层污染 | 提前备堵漏材料，优化泥浆密度 | 桥塞堵漏，降低排量 |
| 灰岩 | 碳酸盐岩，易裂缝发育 | 钻时快，岩屑呈白灰色，遇盐酸剧烈反应 | 井漏、井喷（含油气时） | 随钻监测压力，防漏堵漏预案 | 压井作业，注入堵漏剂 |
| 盐岩 | 氯化钠或钾盐为主，可塑性 | 钻时均匀，岩屑溶解于水，氯离子含量骤升 | 井径缩小（蠕变）、卡钻、泥浆性能破坏 | 选用油基泥浆或饱和盐水体系 | 提高泥浆密度，溶解盐层后循环处理 |