WELL & WELL PUMP DESIGN AND CONSTRUCTION CONSIDERATIONS

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H2M ARCHITECTS + ENGINEERS
WELL & WELL PUMP DESIGN AND CONSTRUCTION CONSIDERATIONS

• GROUNDWATER WELL COMPOSITION
• DESIGN CONSIDERATIONS
• WELL & PUMP FAILURES
• PREVENTION & REPAIRS
• TAKEAWAY
WELL CONSTRUCTION

METHODS
DRIVEN
CABLE TOOL
AUGERED

DRILLED - MUD ROTARY
DRILLED – REVERSE CIRCULATION
DUG
WELL CONSTRUCTION

**DRIVEN**
SHALLOW/ SMALL DIAMETER
DEWATERING

**DRILLED**
DEEP WELLS / LARGE DIAMETER
FASTER / EFFICIENT

**AUGERED**
SHALLOW WELLS
SOIL SAMPLING

**CABLE TOOL**
SLOW
DEEP WELLS / LARGE DIAMETER
ROCK EXCAVATION
WELL COMPONENTS

SURFACE CASING
INNER CASING
RISER
SCREEN
GRAVEL PACK
SUMP / CAP
WELL COMPONENTS

SHUTTER SCREEN

WIRE WOUND SCREEN
WELL COMPONENTS

WELL COMPONENTS
MOTOR
PUMP
COLUMN & SHAFT
DISCHARGE HEAD

motor
discharge head
column
pump
suction pipe
WELL COMPONENTS

MULTI STAGE LINE SHAFT PUMP

SUBMERSIBLE
DESIGN CONSIDERATIONS

SITING

DEPTH

DEVELOPMENT / CAPACITY
SITING

PROXIMITY TO OTHER SOURCES
SURFACE WATER / GROUNDWATER

RADIUS OF INFLUENCE
CONE OF DEPRESSION
CONTAMINATION SITES
SOURCE WATER ASSESSMENT

REGULATORY REQUIREMENTS
100/200/500 FT.
DEPTH

WATER BEARING FORMATIONS
CONFINING LAYERS
CONTAMINANTS
CAPACITY

CAPACITY
SCREEN LENGTH & SIZE
DEVELOPMENT
WELL DEVELOPMENT

• SURGE WELL AFTER INSTALL
• CLEANS WELL AND CONSOLIDATES GRAVEL PACK
• LOWER PUMPING COSTS
• HIGHER YIELD
• LESS BIOLOGICAL OCCURRENCES
WELL & PUMP FAILURES

- PRESSURE & EXTERNAL FACTORS
- WATER QUALITY
- AGE
OVERPRESSURIZATION

FAILURE AT DISCHARGE PIPING DUE TO HIGH PRESSURE
HIGH PRESSURE

CAUSES

FAILURE OF AIR RELIEF VALVE

SAFETY TIMING

FIX

LARGER AIR RELIEF

ADJUST OPENING SPEED

ADJUST TIMING ON HP SWITCH
WATER QUALITY EFFECTS

TUBERCULATED SCREEN

NEW SCREEN
TUBERCULATED SCREEN ZONE

• REDUCED PUMP CAPACITY

• INCREASED VELOCITY OVER SCREEN AREA
  • RECOMMENDED 0.1 FT/S; UP TO 1.5 FT/S AWWA

• CAUSE
  • POOR WATER QUALITY
  • CORROSION
  • INADEQUATE FORMATION
CORRECTIVE MEASURE

MECHANICAL SCRAPER
BRUSHES
HP JETTING
AGGRESSIVE CHEMICAL CLEANING
CARBON DIOXIDE
LINER SCREEN

INCREASED SPECIFIC CAPACITY
ELIMINATION OF FOULING
FAILED CASING

HOLE IN CASING FORMED ABOVE WATER LINE
CAUSED BY CORROSION

RESULTS

REDUCED CAPACITY
EXTERNAL INFILTRATION
REPAIR

WATER WELL SLEEVE

CASING LINER
OTHER FAILURES

SHAFT FAILURE

SHAFT FAILURE
MORE FAILURES IN SHAFTS

EROSION

PITTING
IMPELLER FAILURES

EROSION OR PITTING OF IMPELLER
FAILURES

BREAKDOWN OF WEAR RING

CASING FAILURE
CAUSES OF FAILURES

• WATER QUALITY
• AGE
• CORROSION
• IMPROPER MATERIAL OR EQUIPMENT
• PAST PRACTICES
• STRAY CURRENT
STRAY CURRENT

DIFFICULT TO DIAGNOSE
FROM IMPROPER EQUIPMENT
GROUNDING
SERVICE GROUNDING
VARIABLE FREQUENCY DRIVES
OUTSIDE SOURCES
PREVENTION

ENSURE PROPER GROUNDING

INVERTER DUTY MOTORS

GROUNDING BRUSHES

AEGIS® RING

INSULATED BEARINGS / COATED BEARINGS
PREVENTIVE MAINTENANCE

ANNUAL PUMP TESTS
WATER LEVEL / SPECIFIC CAPACITY / AMPERAGE / VOLTAGE

VIBRATION TESTS
PROPER VALVE OPERATION
PRE-LUBE
QUESTIONS