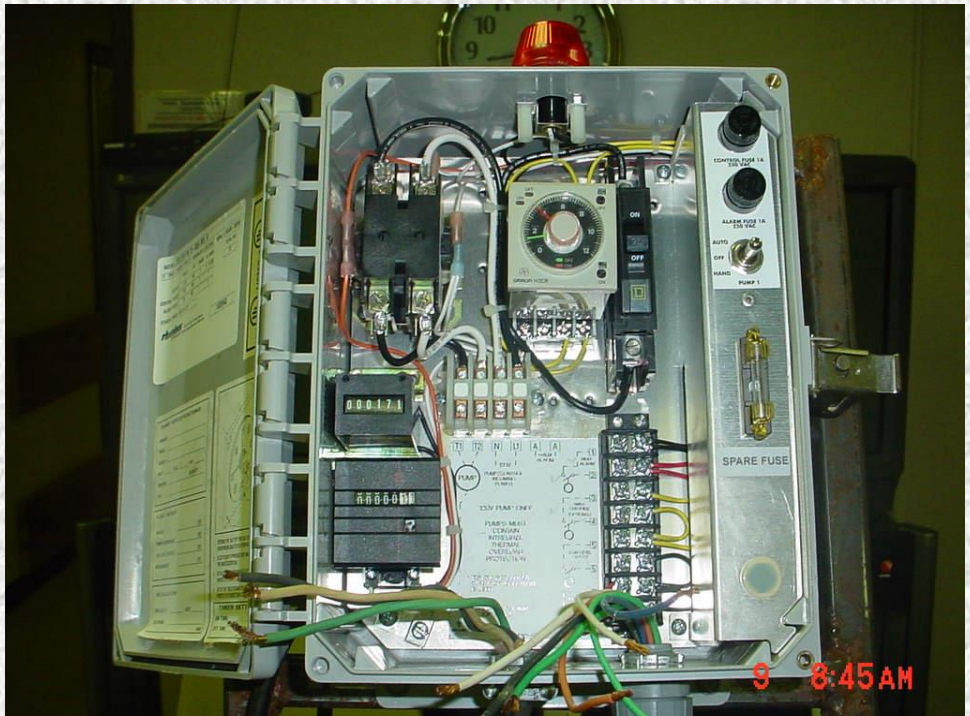
INSTALLER BASICS - ELECTRICAL

- **National Electrical Code (NEC)**
- **Not updated often but <u>YOUR</u> responsibility to stay current**
- **NEC is enforced through Arkansas Labor Board**



Control Panels

- Mounted on side of structure (except for mobile home)
- In sight of main disconnect
- All connection should be in watertight box

Main Disconnect

- Similar to AC unit disconnect
- Must be within sight of the external electrical components
- Lock Out Tag Out
- Reduce chance of electrocution while working on system

Wiring Responsibilities

Installer

- Connection to various floats (high water, low level, dose)
- Control panel to pump

Electrician

- Connections to main breaker
- To and From main disconnect
- From main disconnect to load (control panel)

Determining Breaker Sizes

- **Pump and high-water alarm have SEPARATE breakers → minimum of 2 breakers**
- **Full Load Amperage (FLA) of pump must be 1.25 times or 25% bigger than pump amperage for start up power**
- **Ex. 15 amp pump**

  15 x 1.25 = 18.75 → 20 AMP breaker

Connection Types

- Pump connection will be labeled with a T (motor connection)
- ALL incoming power will be labeled with an L (line) and N (neutral)
  - Follow convention (Black to Black, White to White, etc.)
- Romex must be burial rated (gray sheath)
- Multi-strand wire must be waterproof and burial rated
- Correct wire sizing (next slide)

WIRE SIZE CHART – 110 VOLTS

WIRE SIZE	LOAD	AMPS --	120 volts	SINGLE	PHASE	
*AWG	10 AMPS	15 AMPS	20 AMPS	25 AMPS	30 AMPS	40 AMPS
14	58	39	29	N/A	N/A	N/A
12	80	60	45	36	N/A	N/A
10	150	100	75	60	50	N/A
8	230	154	115	92	77	62
6	367	245	184	147	123	105
4	665	443	334	267	223	165

*American Wire Gage

(DISTANCE IN FEET)

Examples:

1) **How far can you run a 20 AMP breaker on 12-gauge wire?** Up to 45’
2) **What size wire is needed to run a 25 AMP breaker 75 feet?** 8-gauge wire
3) **How far can you run a 30 AMP breaker on 12-gauge wire?** You can’t!

Connection Types

- Circuits must be encased PVC electrical conduit (gray type; not water pipe) from main disconnect to control panel
  - Underground → Sch 40 PVC
  - Above ground (to control panel) → Sch 80 PVC
    - Anchored every 3 feet

Waterproof Junction box

- Located inside riser

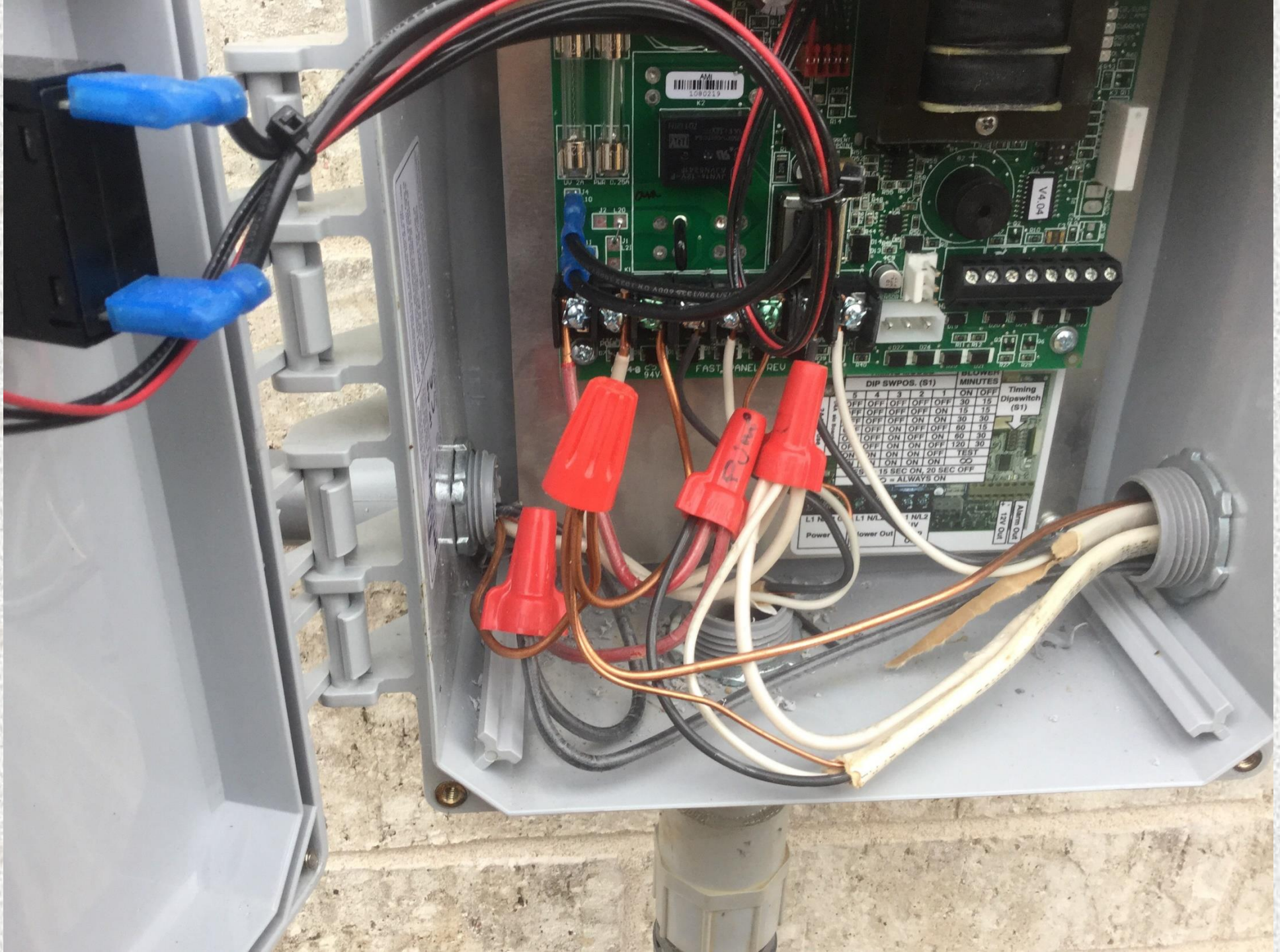
Cracked riser → leaky tank → groundwater in tank

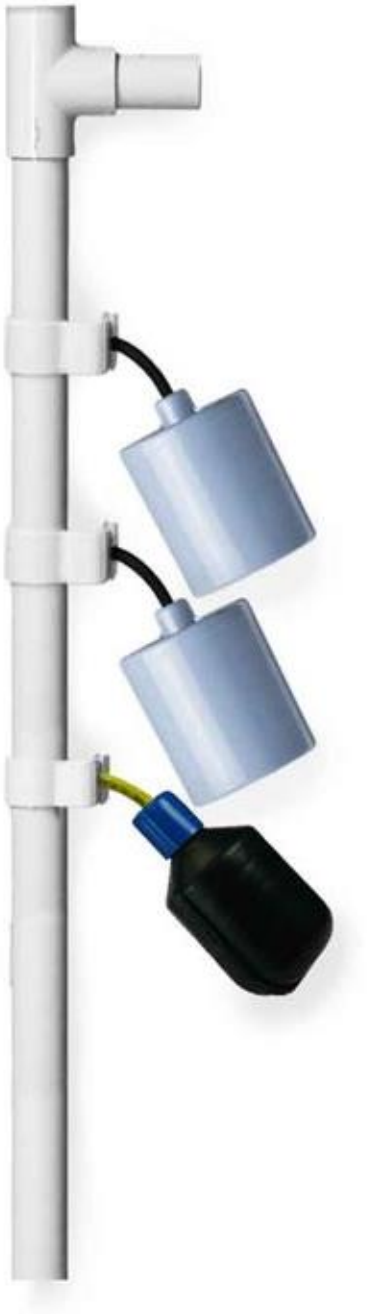
Wiring needs to be waterproofed

Connection Types

- Allowed connections:
  - Butt splicers with heat shrink
  - Encapsulated wire nuts
- Use electrical seal off kit in conduit
  - Protects internal components if junction box fails

Incorrect wiring connections!





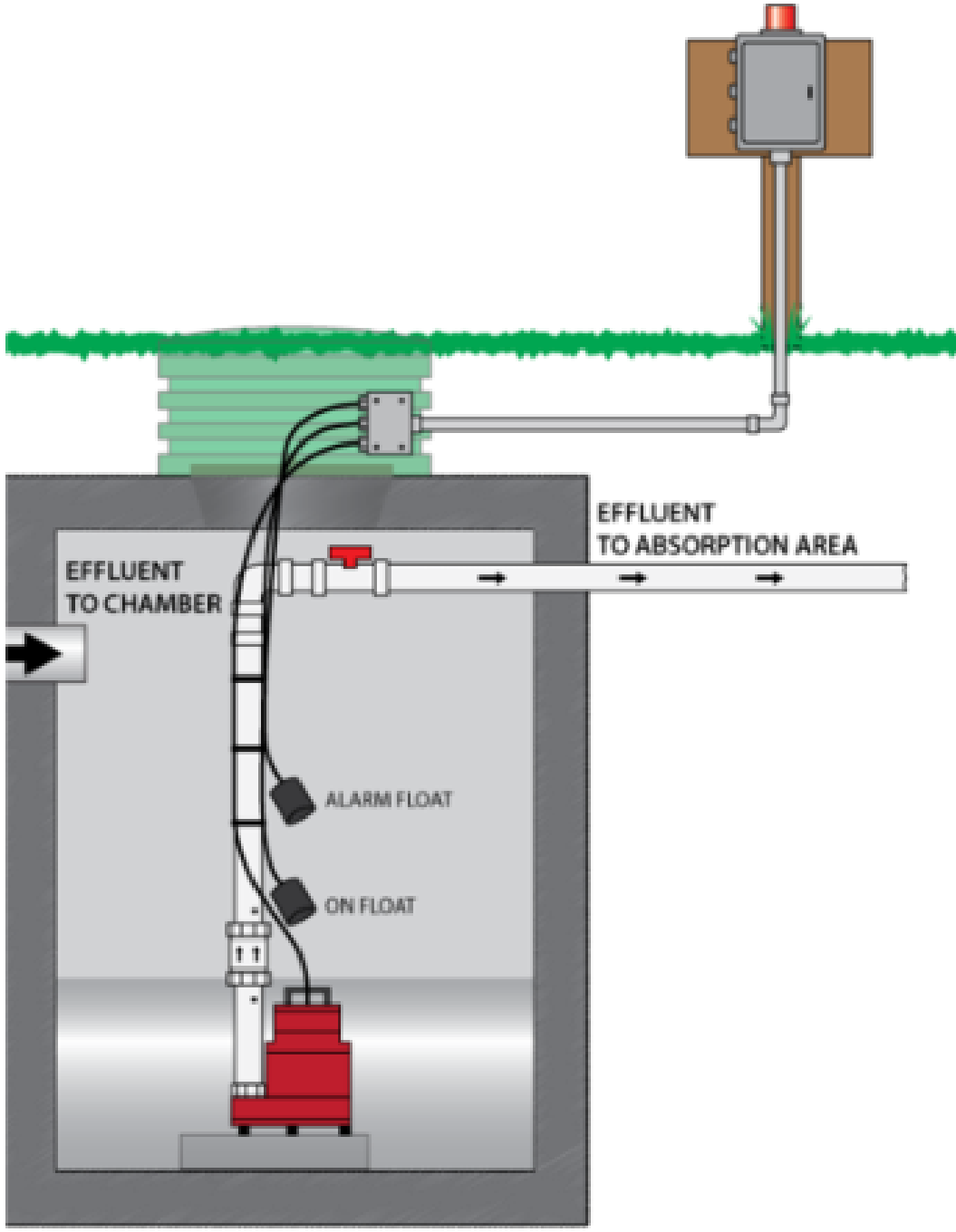
Connection Types

- Number of connections (minimum) – 7
  - 2 for high water alarm
  - 3 for pump
  - 2 for low level cutout

- May be more if additional floats are required

Pump Sizing

- **Pump must be an EFFLUENT pump (not grinder, sump, etc.)**
- **Pump sized by TDH and GPM**
- **Pump model determined by DR**
- **Substitution must be approved by DR and EHS**

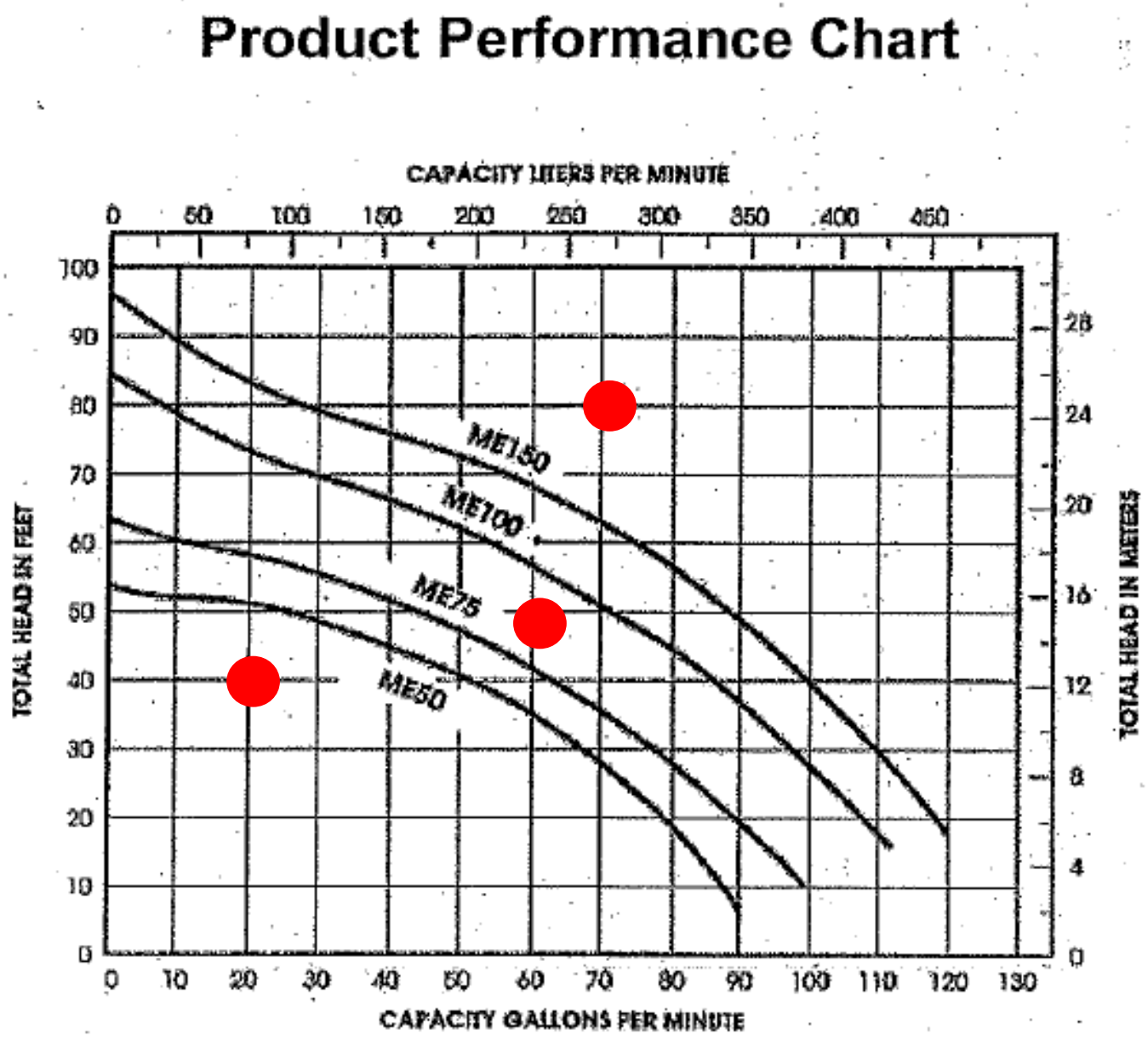


Pump Sizing

- **Pumps are not equivalent by horsepower**

Which pump would we use?

1. **20 GPM @ 40’ TDH** **ME50**
2. **60 GPM @ 50’ TDH** **ME100**
3. **70 GPM @ 70’ TDH** **NONE**



Ratings Label

MODEL: 1121W914H10E

1 PHASE, SIMPLEX TYPE 4X

SCHEMATIC #: 1008001C

SERIAL #: 5554 – 00321

	VOLTS	HZ	PHASE	FL AMPS	TOTAL FLA
MOTOR 1:	120	60	1	8 TO 15	19
CONTROL CIRCUIT:	120	60	1	2	
ALARM CIRCUIT:	120	60	1	2	

STARTING DEVICE: MOTOR CONTACTOR

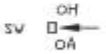
17134.0

Schematic Symbols


FUSE

SPST SWITCH

SPST PUSH SWITCH



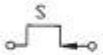
HAND, OFF, AUTO SWITCH


GROUND


LIQUID LEVEL (N.O.) FLOAT

RED ALARM BEACON

AUDIO ALARM (HORN)



SOLID STATE FLASHER

MOTOR CONTACTOR COIL

ELAPSED TIME METER

EVENT COUNTER

GREEN INDICATOR LIGHT

START RELAY COIL

START RELAY (N.C.) CONTACT

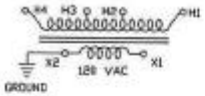
RUN CAPACITOR

START CAPACITOR

CONTROL RELAY COIL

(N.O.) CONTACT

(N.C.) CONTACT



MULTITAP TRANSFORMER

ANTI-CONDENSATION HEATER

LIGHTNING ARRESTOR


THERMAL CUTOUT (N.C.)

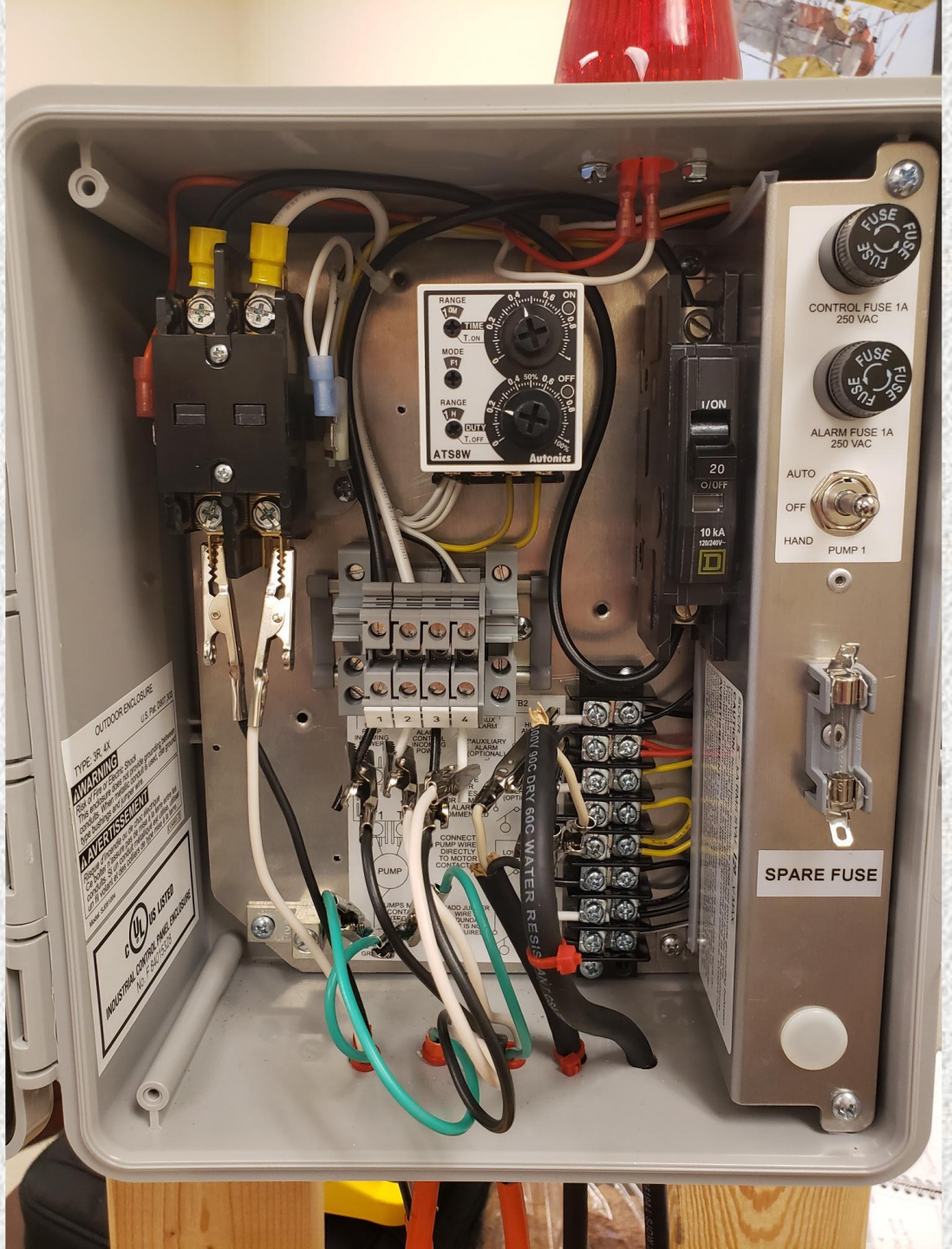
PUMP (MOTOR)

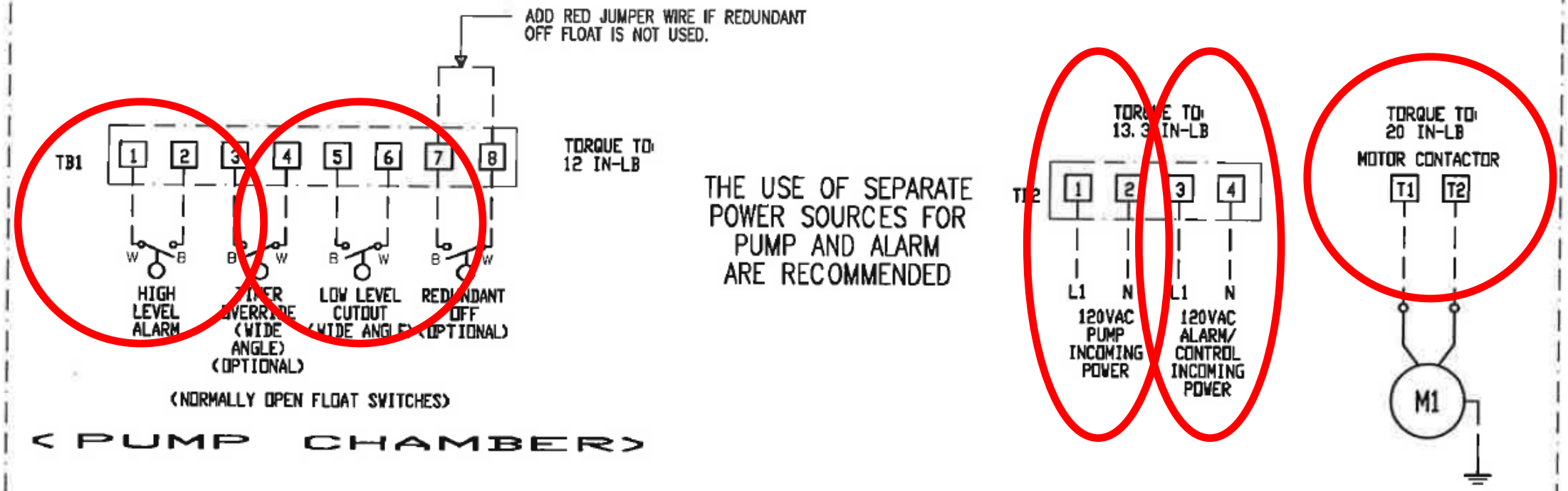
CIRCUIT BREAKER

Wiring Control Panel for Test

What you'll be wiring:

1. Incoming pump power
2. Incoming alarm power
3. High water alarm float
4. Low level cutoff float
5. Power to pump





OVERLOAD PROTECTION,
MAIN DISCONNECT AND OVERCURRENT PROTECTION OF INCOMING FEEDER CIRCUIT PROVIDED BY OTHERS AND MUST BE SIZED ACCORDING TO PUMP/MOTOR MANUFACTURING SPECIFICATIONS

GND LUG

TORQUE TO 45 IN-LB

BRANCH CIRCUIT PROTECTION FOR THE CONTROL AND ALARM CIRCUITS MUST BE PROVIDED BY THE INSTALLER. AN INVERSE TIME CIRCUIT BREAKER NOT TO EXCEED 20 AMPS IS REQUIRED.

TEMPERATURE RATING OF FIELD INSTALLED CONDUCTORS MUST BE AT LEAST 140 DEG. F. (60 DEG. C.). TERMINAL STRIPS AND GROUND LUG USE COPPER CONDUCTORS ONLY.

CONNECT GROUND LUG IN PANEL TO A SECURE EARTH GROUND

DASHED LINES REPRESENT FIELD WIRING

FIELD WIRING SECTION