Dewatering Equipment

Topic 1.4

Enabling Objectives

•**Identify** the capabilities and uses of installed drainage in accordance with NSTM 079 VOL 2, NWP 3-20-31, COMNAVSUFLANTINST 3541.1C, COMNAVSURPACINST 3541.4B, NSTM 555 and NSTM 079 VOL 3.

- **Identify** the capabilities and uses of portable dewatering equipment in accordance with NSTM 079 VOL 2, COMNAVSUFLANTINST 3541.1C, COMNAVSURPACINST 3541.4B, NSTM 555 and NSTM 079 VOL 3.

- **Rig** and use a peri-jet eductor to dewater a flooded space in accordance with NSTM 079 VOL 2, NWP 3-20-31, COMNAVSUFLANTINST 3541.1C, COMNAVSURPACINST 3541.4B, NSTM 555 and NSTM 079 VOL 3.

Drainage and Flushing Systems

Definition: Systems of piping on board ships, with or without plumbing facilities, installed for removing waste and flooding water from within the hull of the ship.

- **Principal drainage system**
  - Main drainage
  - Secondary drainage
  - Plumbing and deck drains

- *Main Drainage* -
  - Purpose
    - Serves all main engineering spaces

    NOTE: In some ships, however, it may extend forward and aft of the machinery compartment

    - Drain machinery space bildges
    - Drain floodable voids
    - Drain fuel tanks ballasted with sea water

Pumps

- Steam-driven reciprocating (older ships)
- Turbine or motor driven centrifugal
- Eductors (jet pumps)

- *Secondary drainage* -
  - Purpose
    - To drain spaces forward and aft of the main machinery spaces
    - The secondary drainage is an independent system with it own pumps and eductors
  - Pumps
    - Electrical motor-driven centrifugal
    - Eductors (jet pump)
    - Portable electrical submersible pumps

Plumbing and Deck Drains

- *Purpose*
  - Provided to drain compartments within the ship by gravity. Gravity drainage piping is installed most extensively in compartments above the waterline.

- *Weather deck drains*
  - Purpose
    - Flooding danger exists with gravity drains. Such piping usually pierces the skin of the ship and passes through water tight deck. As a damaged ship lists to one side or settles more deeply, water will flow back through drainage piping.

Plumbing and Deck Drains

- *Overboard discharge connection*
  - Purpose
    - To allow for discharge of liquids through the hull of the ship
  - Location
    - Located on the damage control deck level and as close to the damage control deck as practicable
    - Located on both port and starboard sides
    - Through the hull of each main transverse sub-division
    - Made flush with order hull surface

– ***Size and type***

- Inboard end has a 4 inch female swivel hose connection attached by a chain to a 4 inch male 2-$^{1}/_{2}$" female swivel hose adapter coupling
- A 2-$^{1}/_{2}$" plug closure with standard fire hose coupling cap is attached to the adapter by a safety chain
- Spanner wrenches are stored on station

– *Drainage of magazines*

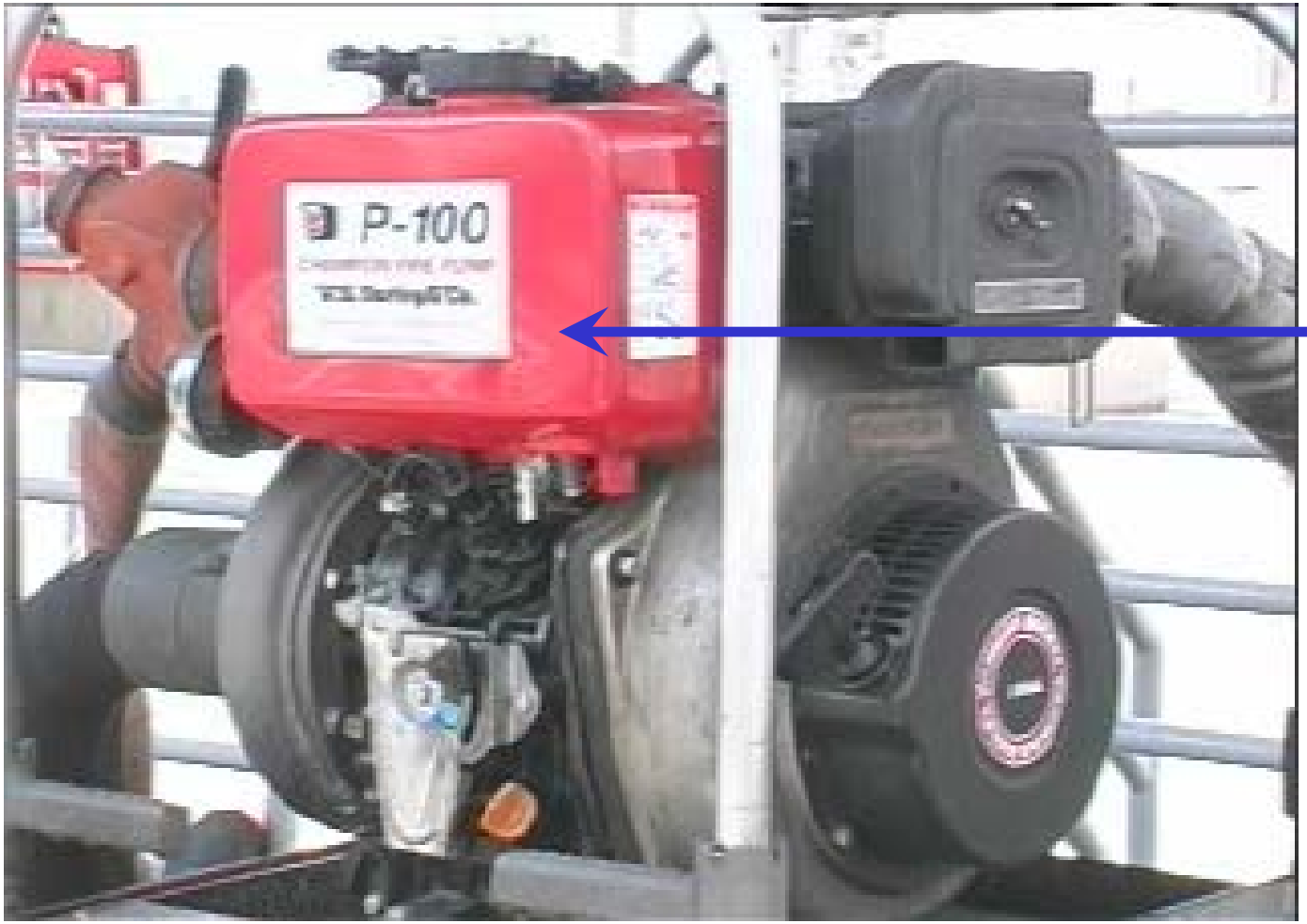
- Purpose
  - All magazines having sprinkler systems have drainage capability
    - » Magazines located above the weather deck and adjacent to the weather deck, drain through a check valve installed in the bulkhead to the weather deck
    - » For magazines not located adjacent to the weather deck, overboard drainage is provided through deck drains in the magazine with independent drain piping having a check valve at the shell
    - » Magazines which cannot be drained overboard by gravity are drained by portable pumps, either through overhead access or a drain pipe installed through the bulkhead to an adjacent handling room, access or passage. The drain pipe is installed in the bulkhead at a point close to the deck and is fitted with a hose valve

P-100 portable fire fighting pump

P-100 portable fire fighting pump

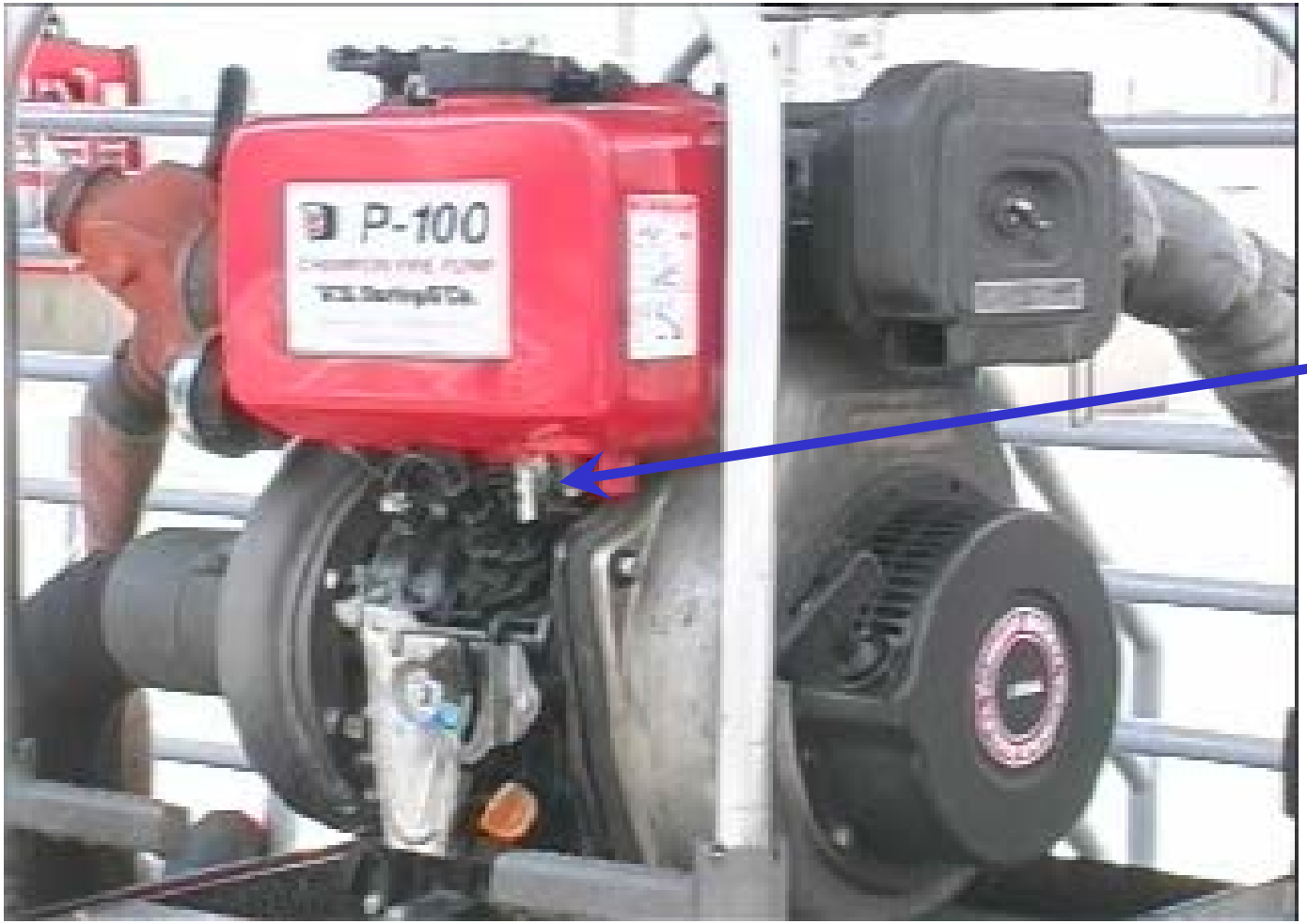
- Air-cooled, diesel driven, single cylinder, 10 hp, portable pump. Designed for dewatering and firefighting.

P-100 portable fire fighting pump



Fuel tank
1.45 gal

P-100 portable fire fighting pump



Fuel pet cock valve

P-100 portable fire fighting pump

P-100 portable fire fighting pump

Run/start
stop lever

P-100 portable fire fighting pump

P-100 portable fire fighting pump

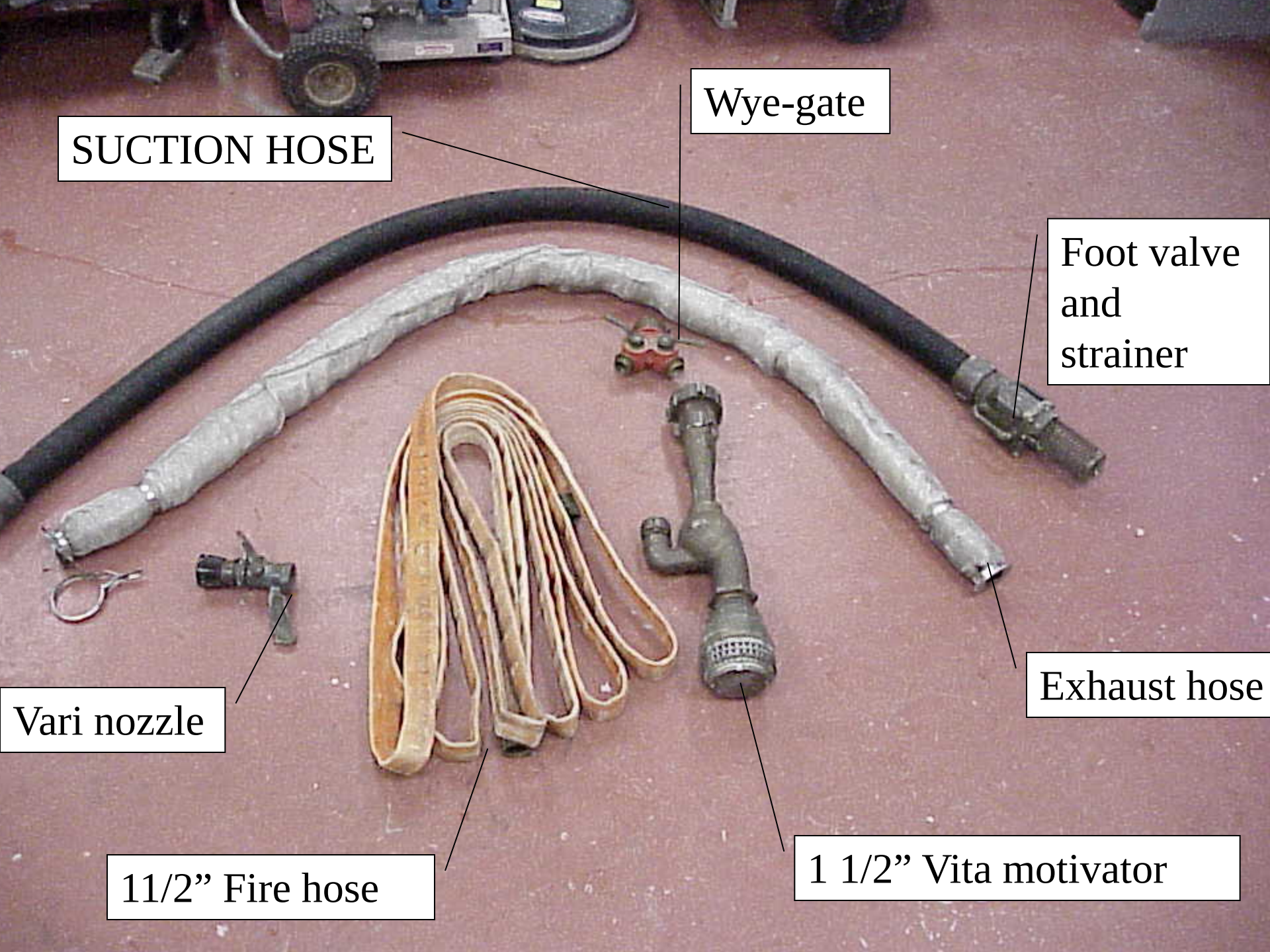
P-100 portable fire fighting pump

2 1/2” discharge

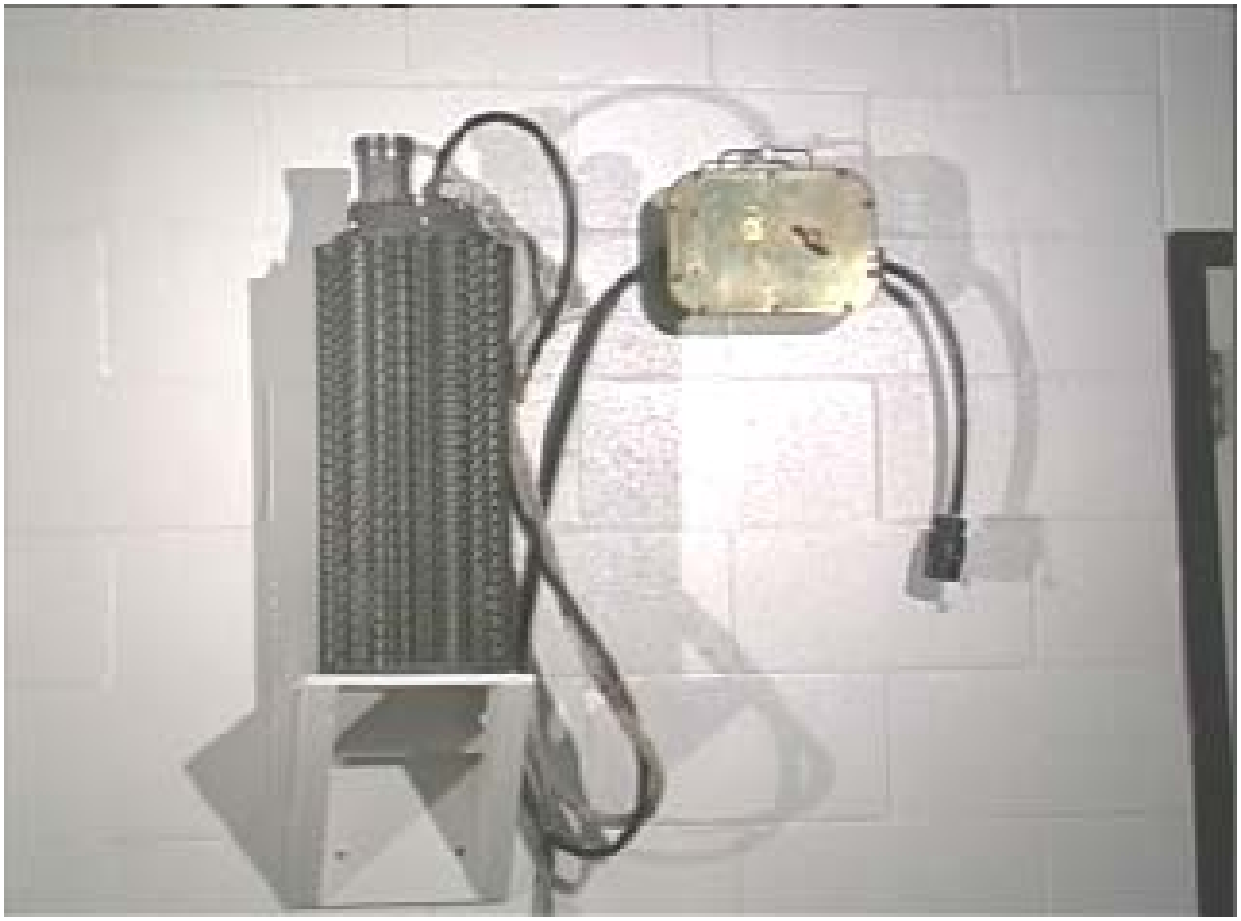
P-100 portable fire fighting pump

Compound pressure gauge

P-100 portable fire fighting pump


SUCTION HOSE
Wye-gate
Foot valve and strainer
Vari nozzle
Exhaust hose
11/2” Fire hose
1 1/2” Vita motivator

Electrical submersible pump



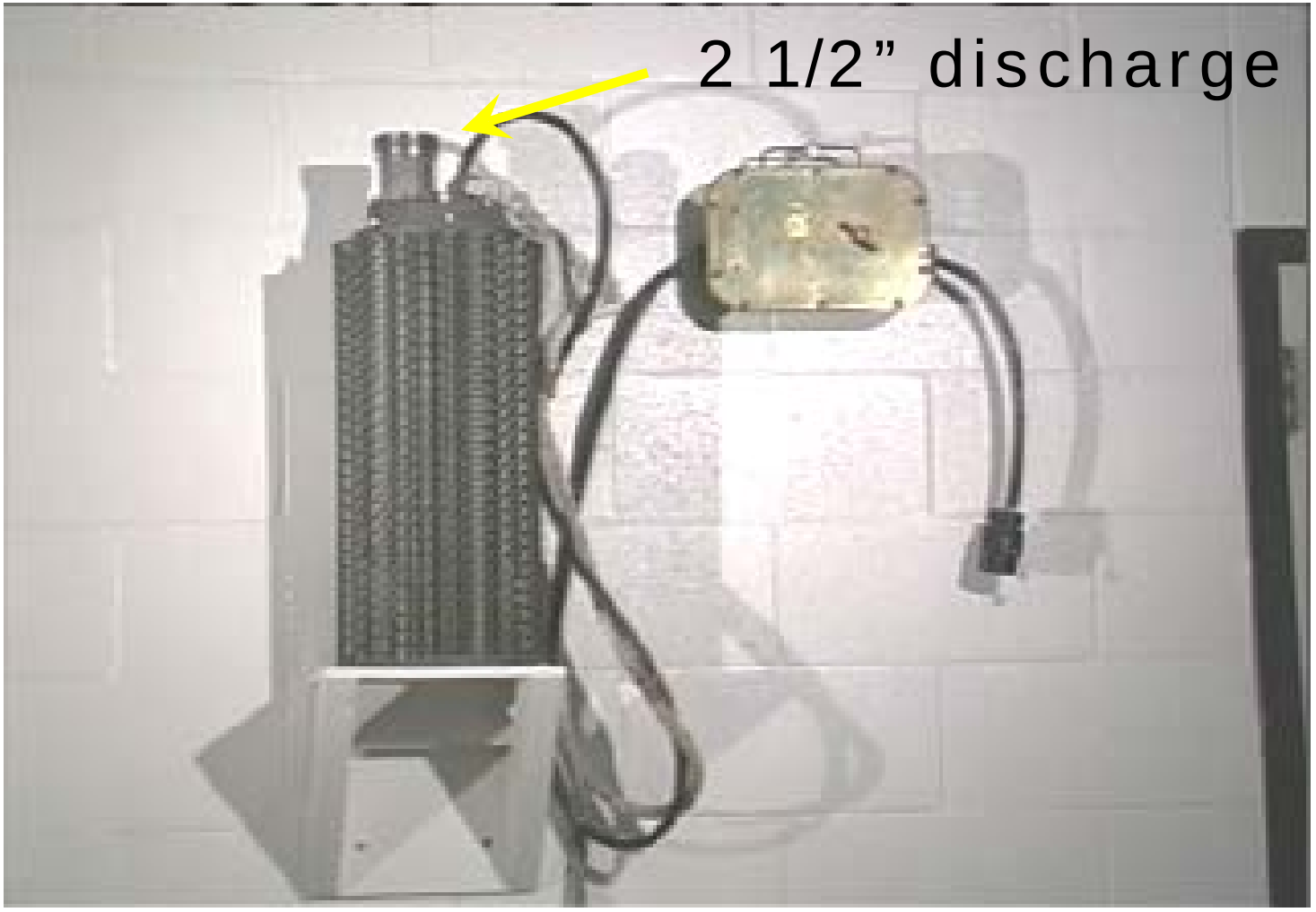
Electrical Submersible Pump

Type
- Either a 3 phase AC motor or a DC motor directly connected to a small high speed water cooled centrifugal pump

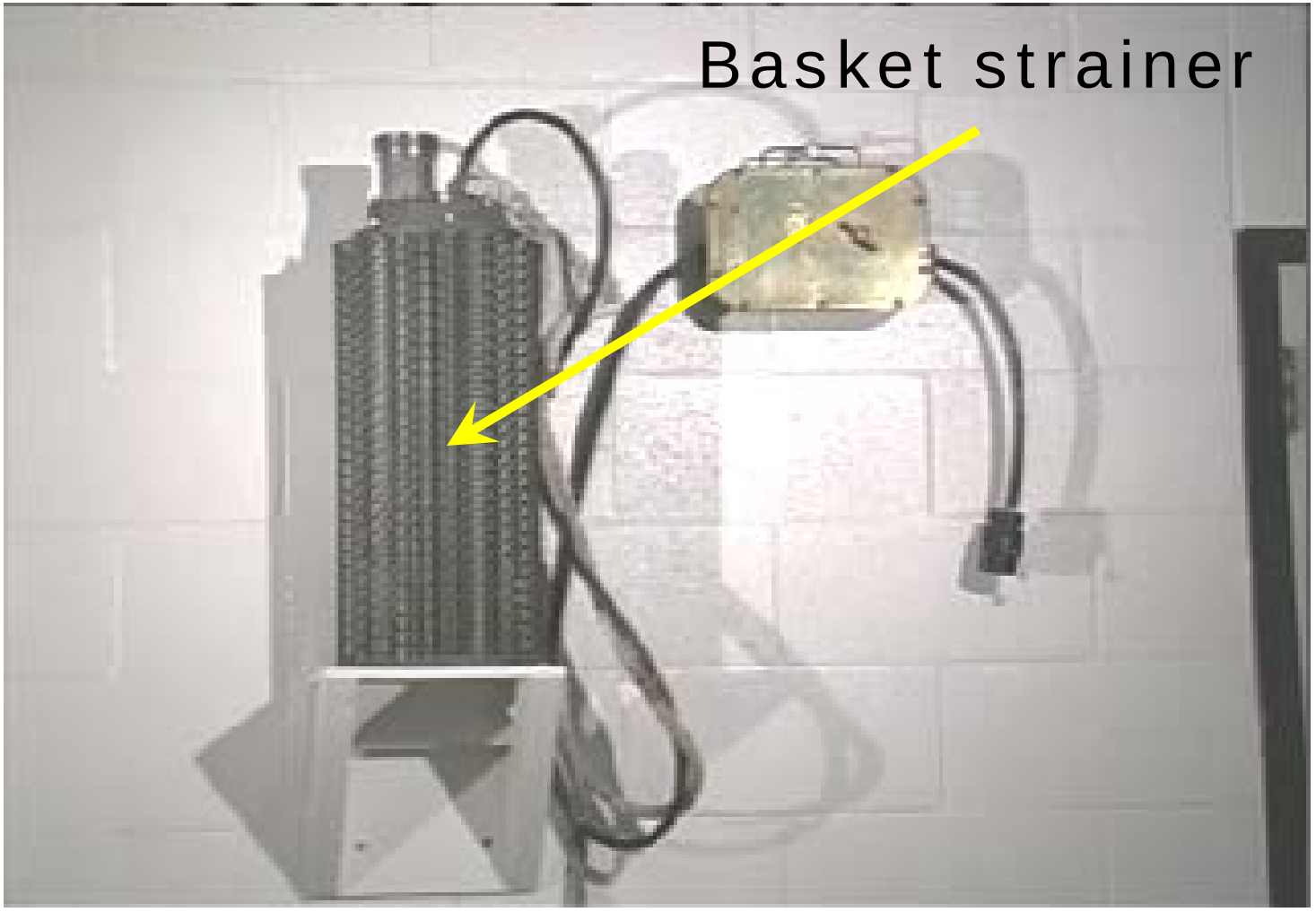
– Purpose
- To dewater compartments not served by installed drainage systems
- Diesel fuel marine(DFM), JP-5, Heavy oil, and navy distillate may be pumped safely. However, it is recommended that two pumps be utilized and rigged in tandem

– Capacities
- 200 GPM @ 50 ft static head
- 140 GPM @ 70 ft static head
- Max suction lift 20 feet

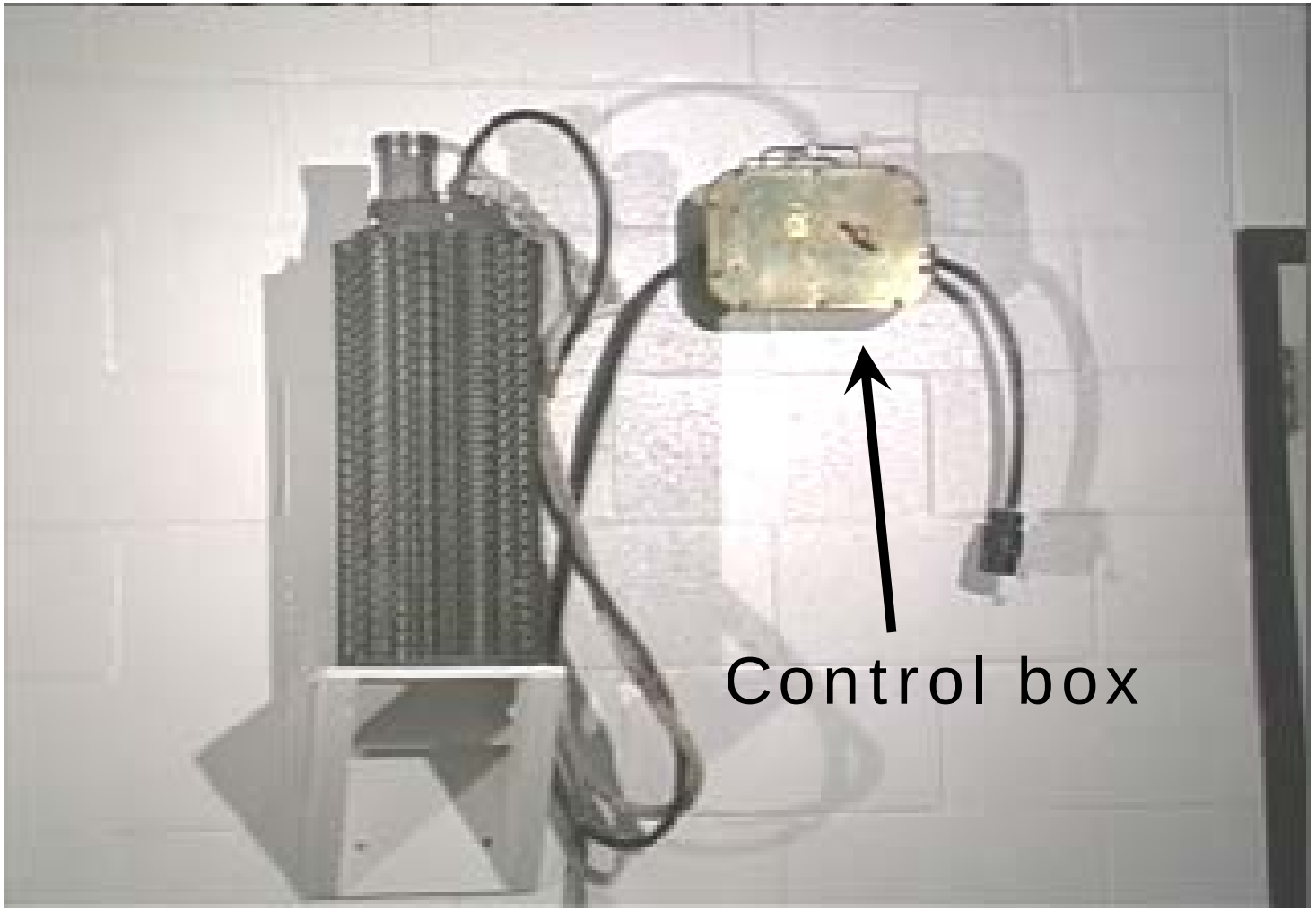
Electrical submersible pump



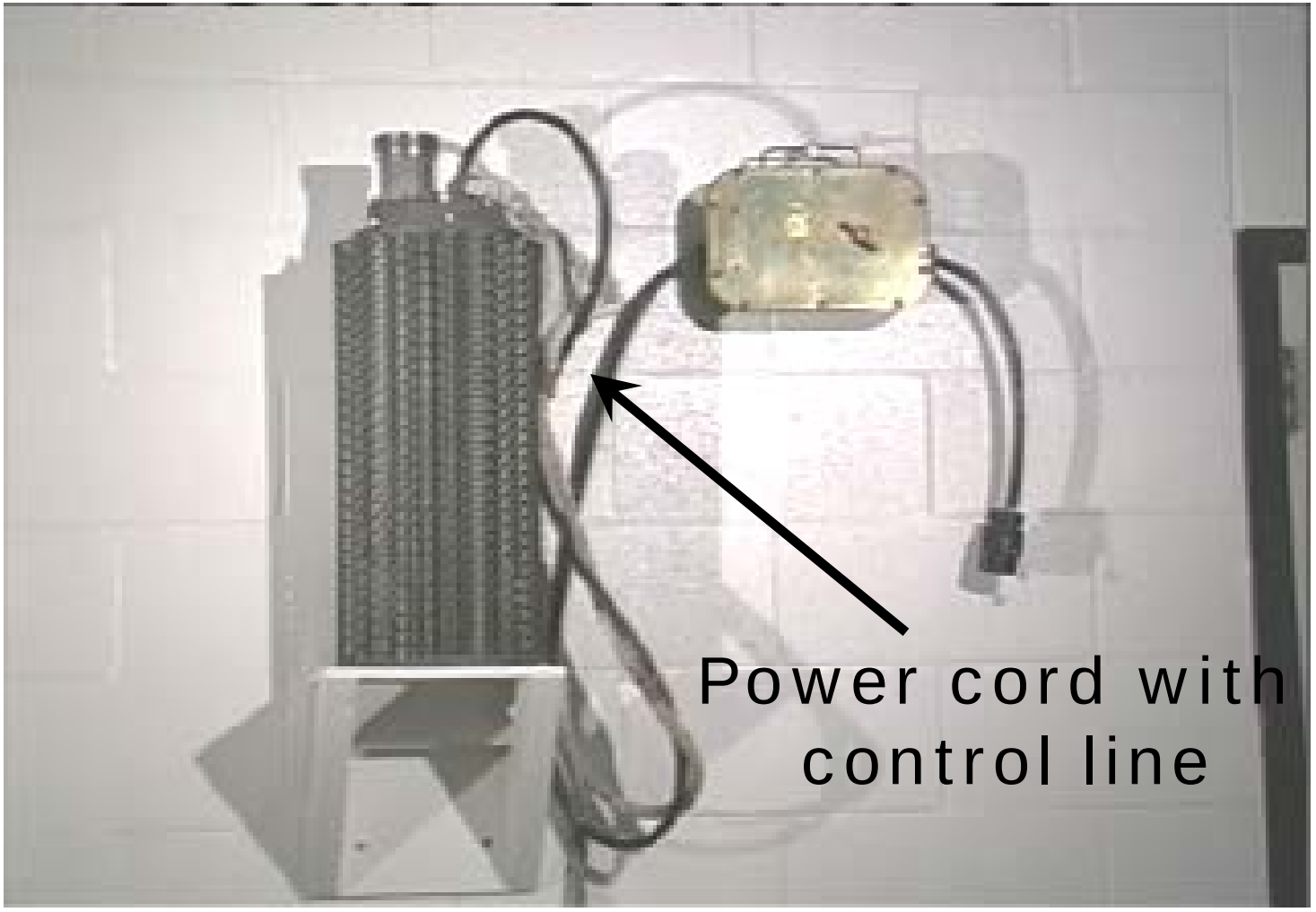
Electrical submersible pump



Electrical submersible pump



Electrical submersible pump



Operation

- Operator must ensure that strainer is attached
- Insure pump is primed
  - **WARNING**: Operator must wear rubber boots and 7500 volt rubber gloves when energizing pump
  - **NOTE**: When using a suction hose with the submersible pump, attach the foot valve
- Pumps may be used in tandem to reduce risk of damage and to increase suction lift
- Energize lower pump first

– Safety precautions

- Keep handling line, electrical cable and discharge hose clear of obstacles so pump can be removed quickly
  - CAUTION: the pump shall not be lifted or handled by the electric cable. The double braided nylon rope should be used for lowering and raising pump through hatches
- The pump can be operated safely with personnel I space
  - NOTE: Three things need to happen for electrical shock to occur: (1) Motor must ground out (2) Ground wire must be severed (3) personnel must physically touch the pump

Keep discharge hose free of kinks and sharp bends

- Keep discharge flow unrestricted (back pressure will rupture motor seals)
- Use strainer
- keep suction lift and discharge head as low as possible
- Keep the suction end of the pump or the end of the suction hose in the water while the pump is operating
- Keep the strainer clean at all times

Peri Jet Eductor

- Portable eductors

  Purpose

  - Dewatering operations, which involve petroleum products or any type of fuel

  – Types
    - Per-jet
    - $1^1/_2$" x $2^1/_2$"

  – Operation
    - Actuated through a fire hose by firemain pressure or from discharge pressure of a P-100 pump or other available internal combustion engine (ICE pumps)

- Emergency drainage system
  – Any pump can be used as a drainage pump if there is power to operate it and if it's suction side can be tightly connected using suitable hose or piping to the flooded area

Peri Jet Eductor cut-away

Peri Jet Eductor cut-away

Peri Jet Eductor cut-away

Peri Jet Eductor cut-away

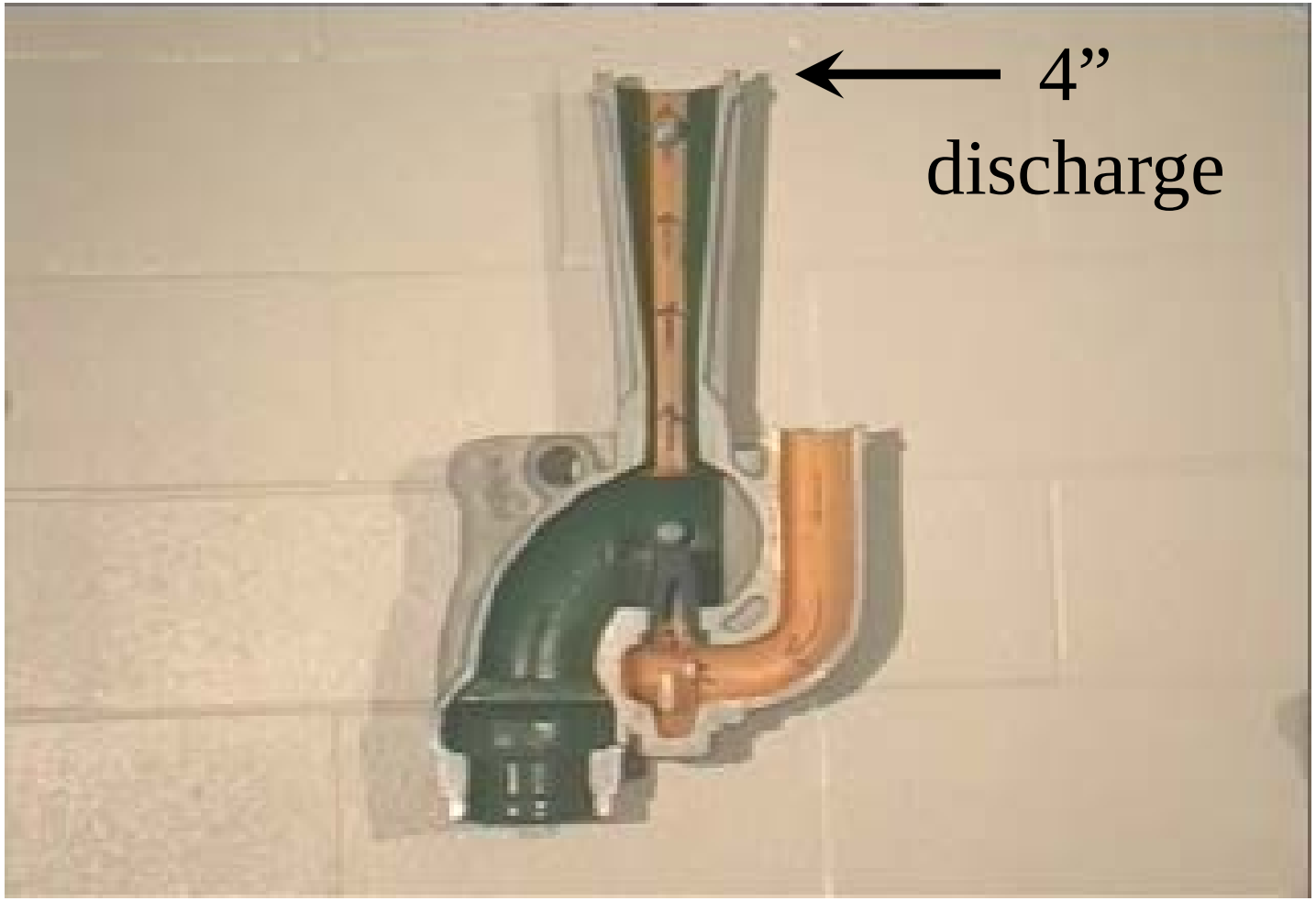
Peri Jet Eductor cut-away

Eductors

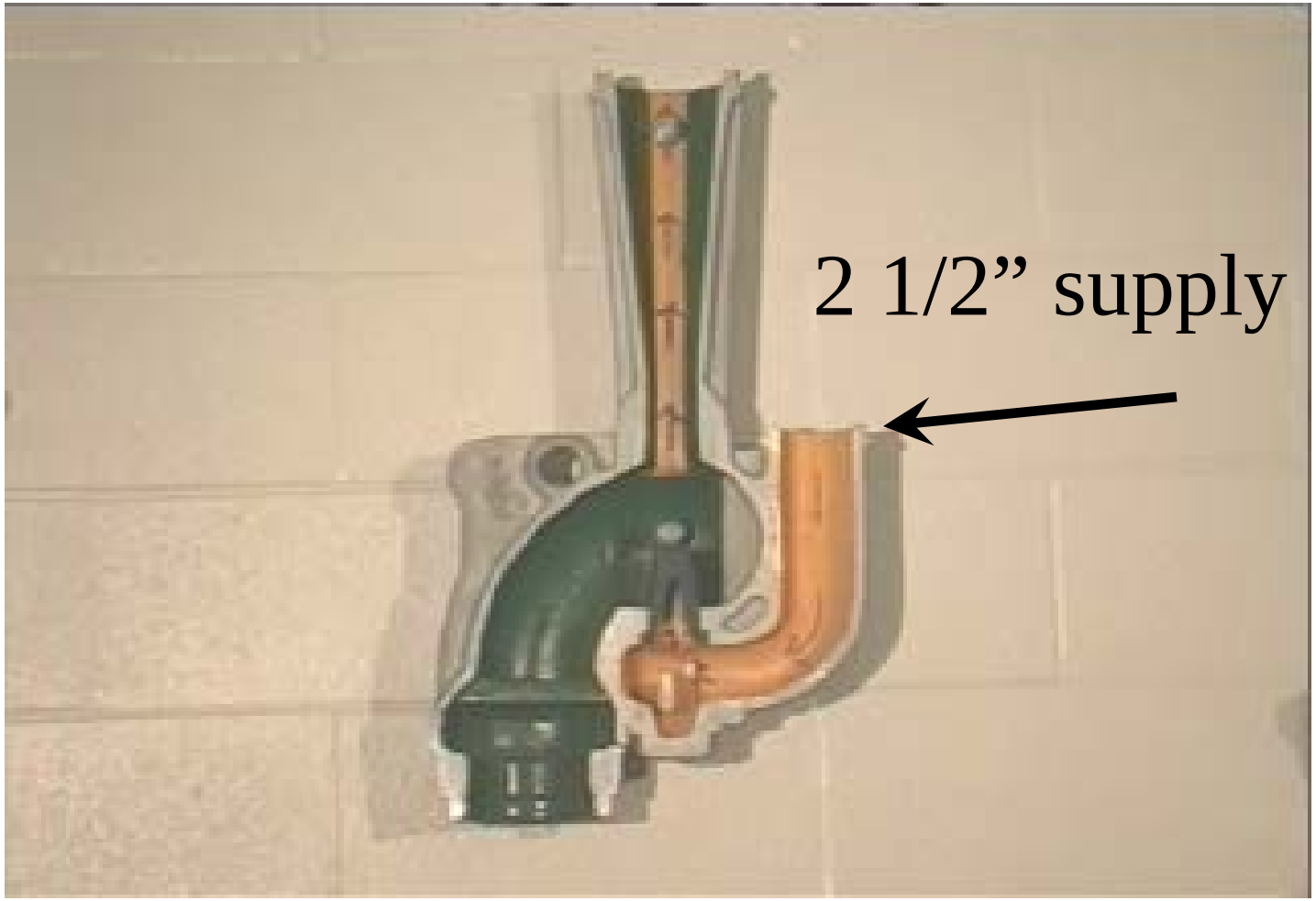
- S-type
  - One jet in vacuum chamber
  - Foot valve
  - Strainer attached and must be raised and lowered when it clogs with debris
  - 1 1/2 inch size available

S type Eductor

S-type eductor cut-away



S-type eductor cut-away



S-type eductor cut-away

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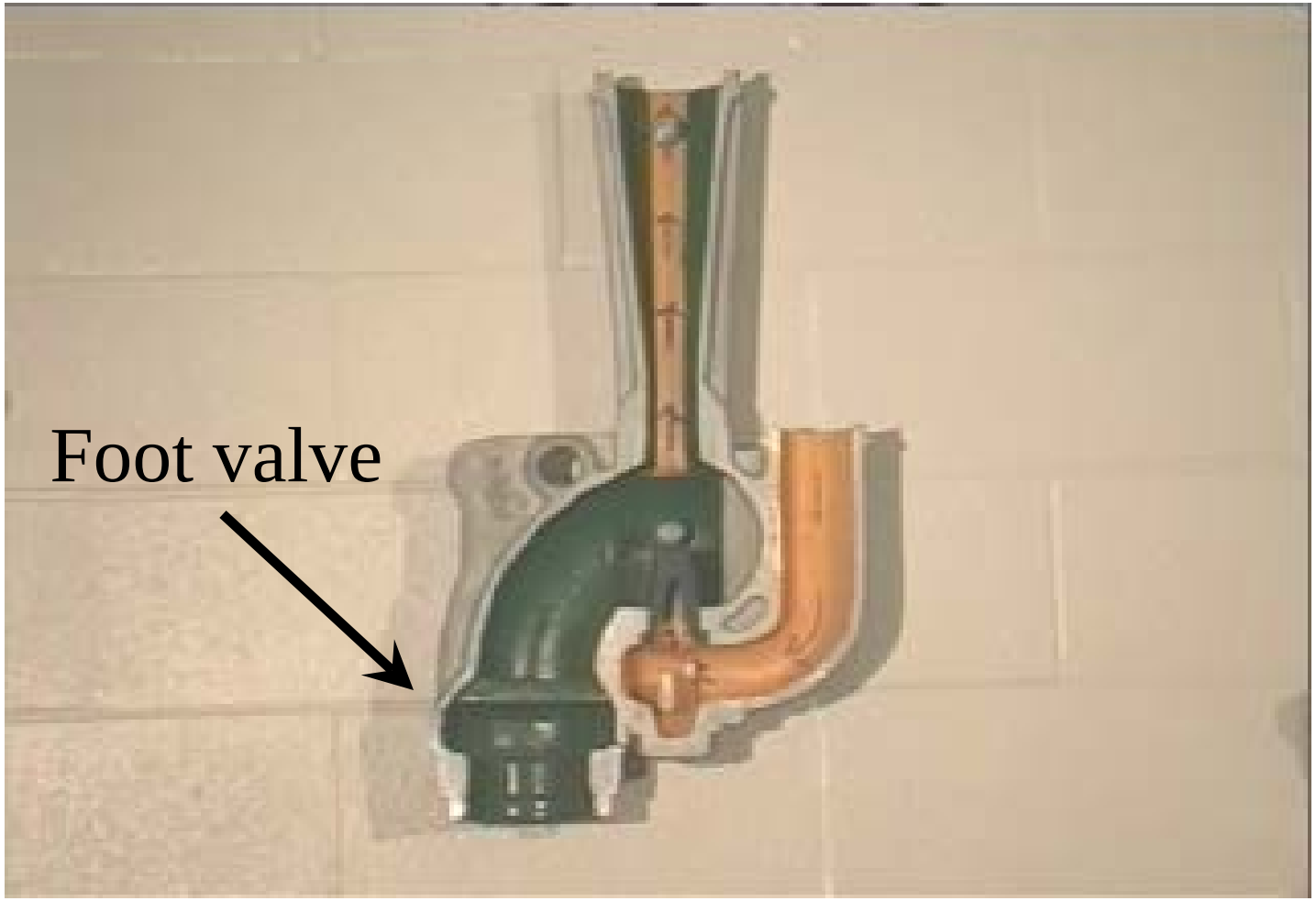
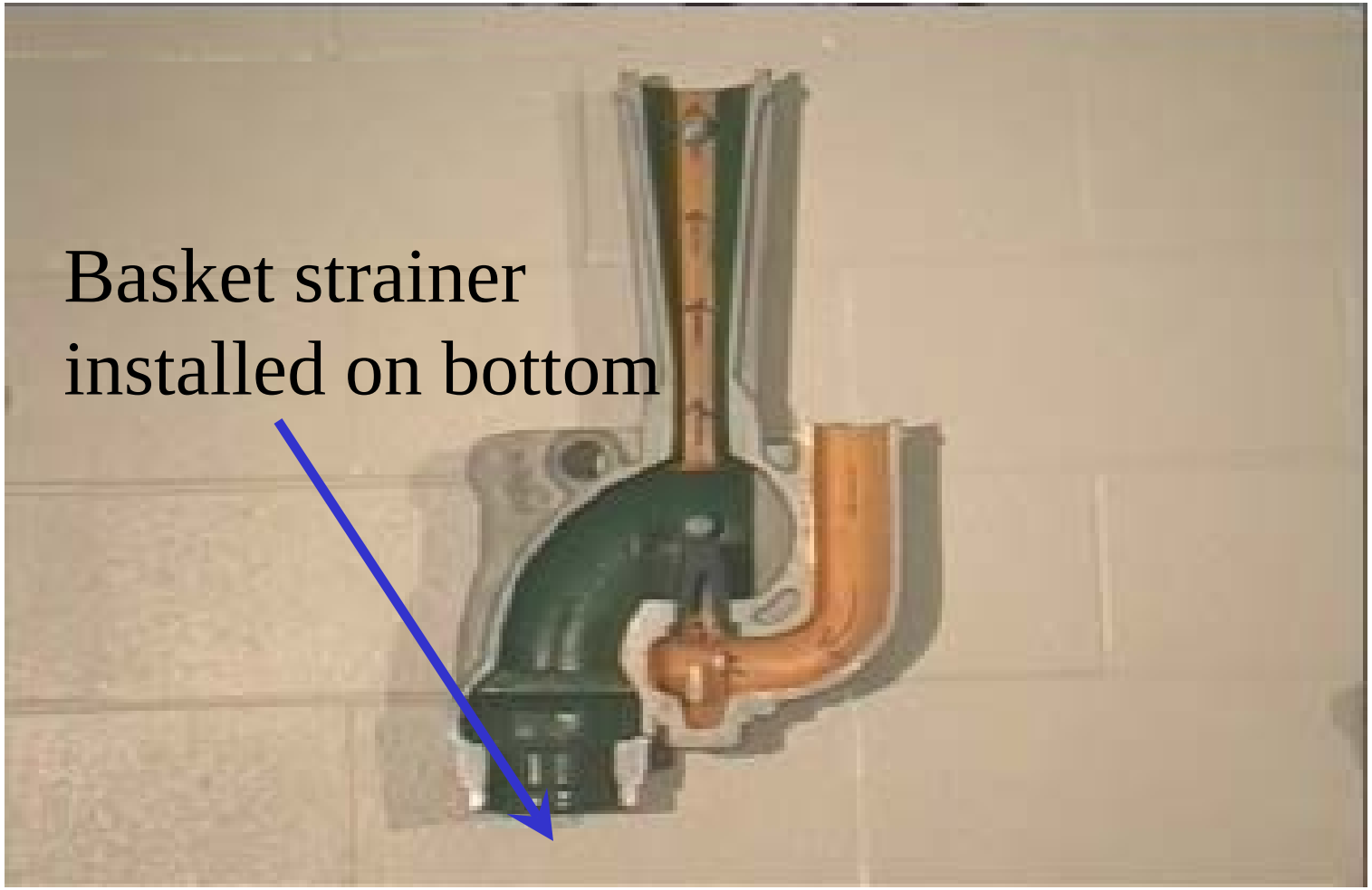


S-type eductor cut-away



Review and Summary

- Dewatering equipment
  - Types of drainage
  - Main drainage
  - Secondary drainage
  - Plumbing and deck drains
  - Weather deck drains
  - Overboard discharge connections
  - Drainage of magazines
- Emergency drainage equipment
  - Portable P-100 pump
  - Portable submersible pump
  - Portable eductors
- Emergency drainage systems
  - Various pump systems