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Parallel Canister Design for Nuclear Carbon Filters Testing

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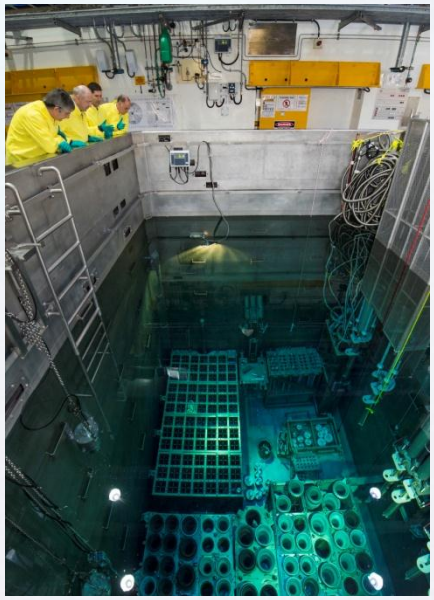
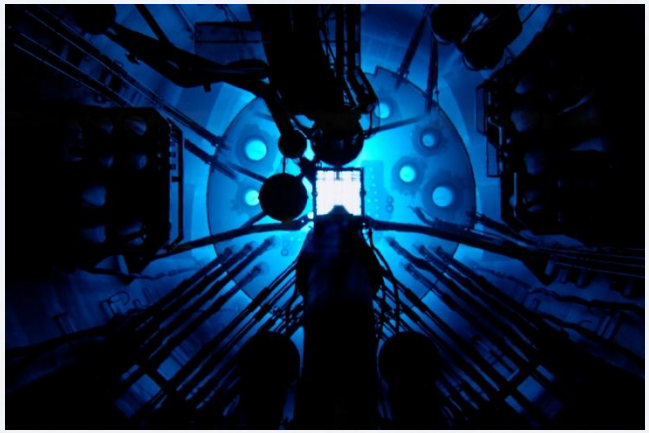




Contents

- Parallel canisters requirements
- ANSTO canister System for 2’ X 2’ X 1’ filters in 2” deep and 10” deep
- USA canisters design for 2’ X 2’ X 1’ filters
- Comparison

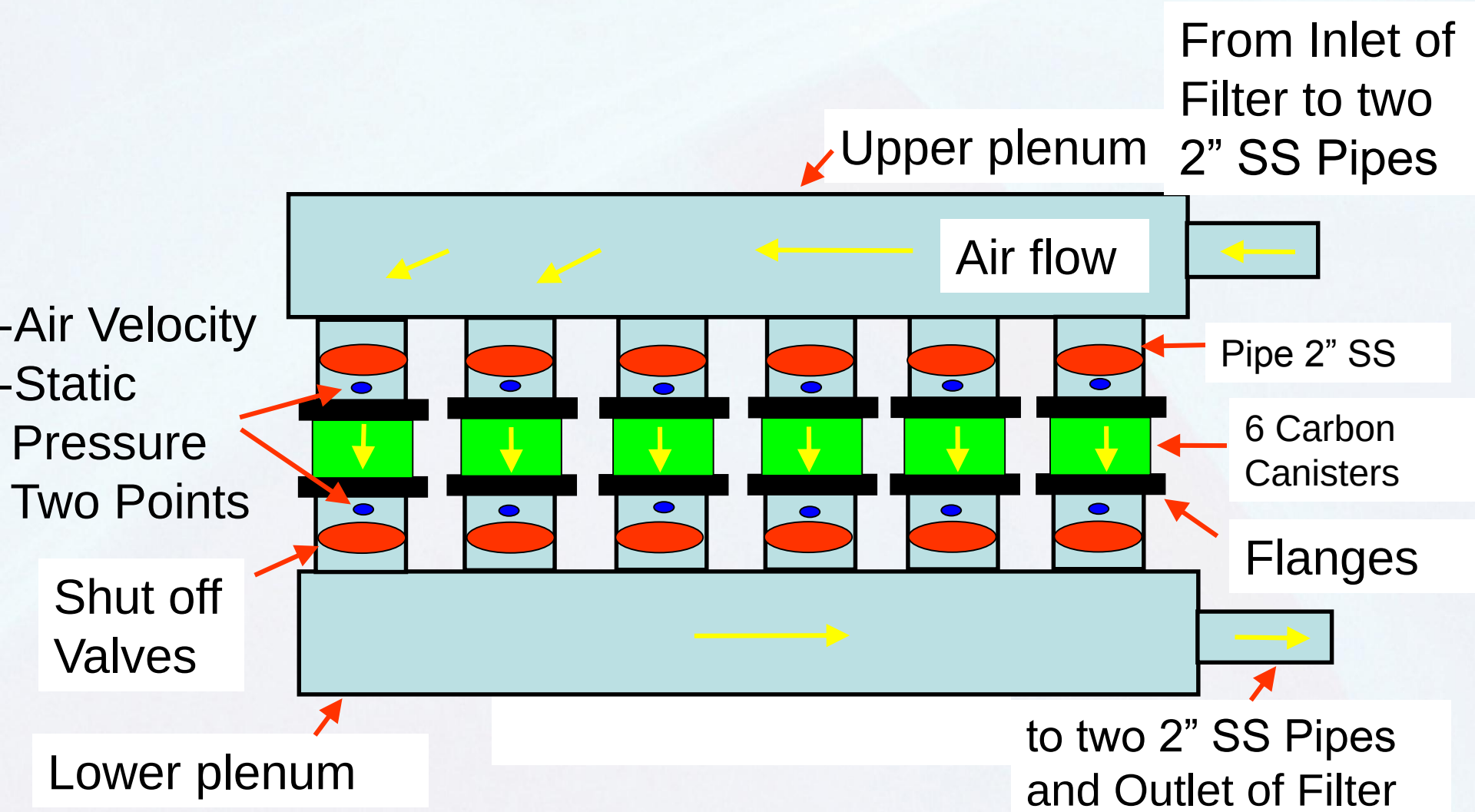
Adopted standards for parallel canisters tests at ANSTO

- ASTM 3803-98 Standard Test Method of Nuclear-Grade Activated Carbon
- ASME AG-1 Code on Nuclear Air and Gas Treatment
- ASME N510 -2002 Testing of Nuclear Air Treatment Systems
- ASME N509-2002 Nuclear Power Plant Air-Cleaning Units and Components

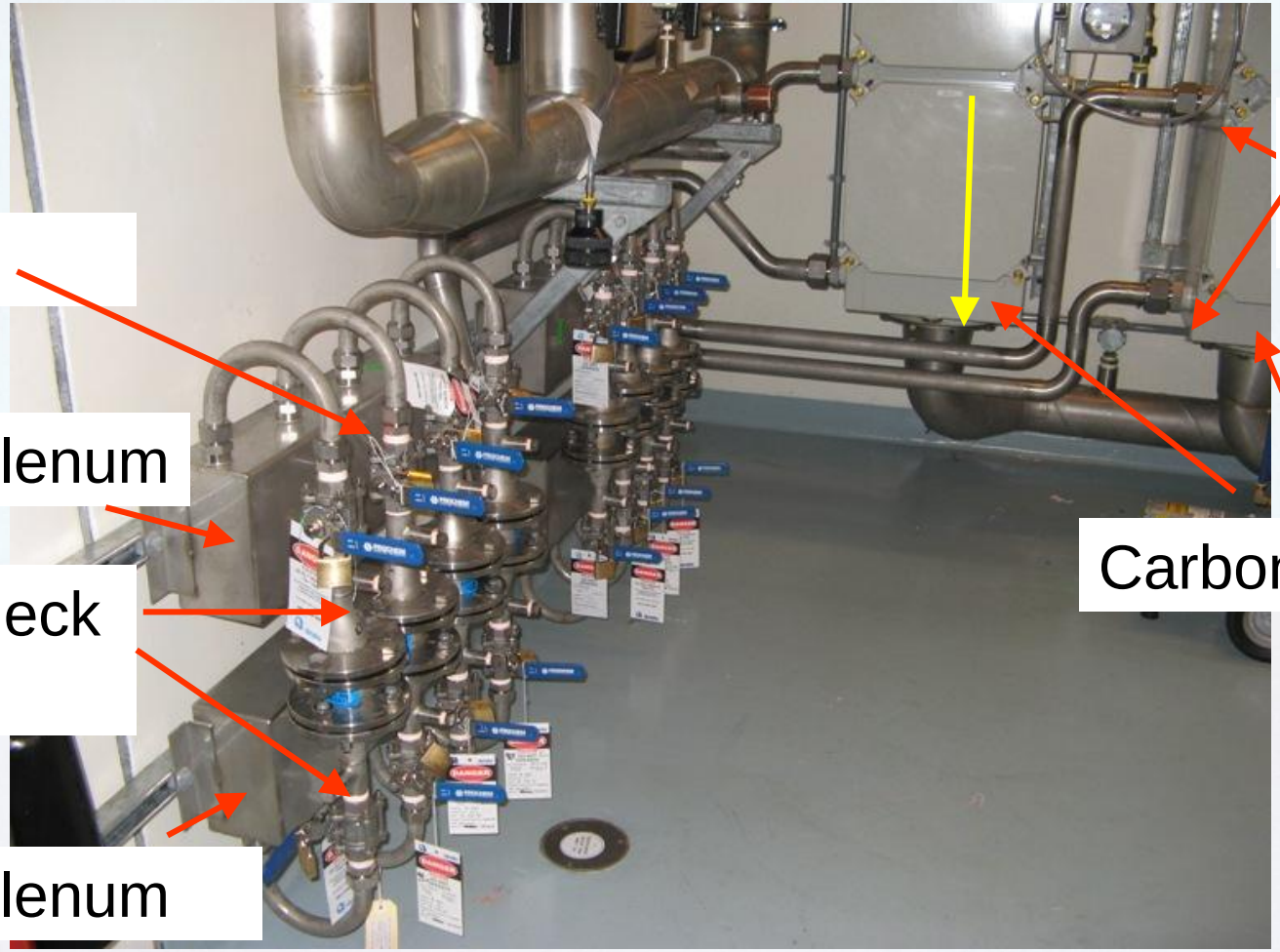
Air filter testing- Carbon Canisters

- The canisters are recommended to be installed vertically in parallel with filters. Set of six
- Carbon of canisters of the same batch as filters.
- Test carbon in a lab to ASTM 3803-98. Maximum allowed penetration 1 % Methyliodine.
- Canisters used at ANSTO are 2” and 10 “ long and all are 2” diameter.
- The airflow in the canisters must be within +/- 10% of the average airflow in the filter.

ANSTO Canister System



Mark 1 Canister Set ANSTO

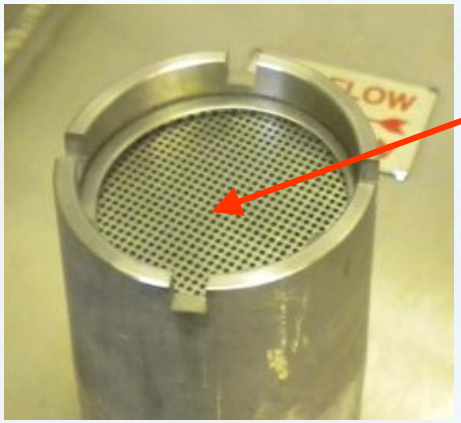


Qualification of Canisters

- Calculations to demonstrate that static pressure losses through connection pipes are negligible
- Factory checks of flows and pressures of carbon canisters in parallel with carbon filters to validate the design
- Measure velocity through each canister to be within +/- 10 % of the flow in filters. Preferred.
- Test rig to check velocity/pressure in each assembled canister. Recommended

2” Length Carbon Canister- US System

Threaded area



Perforated Plate

Circlip

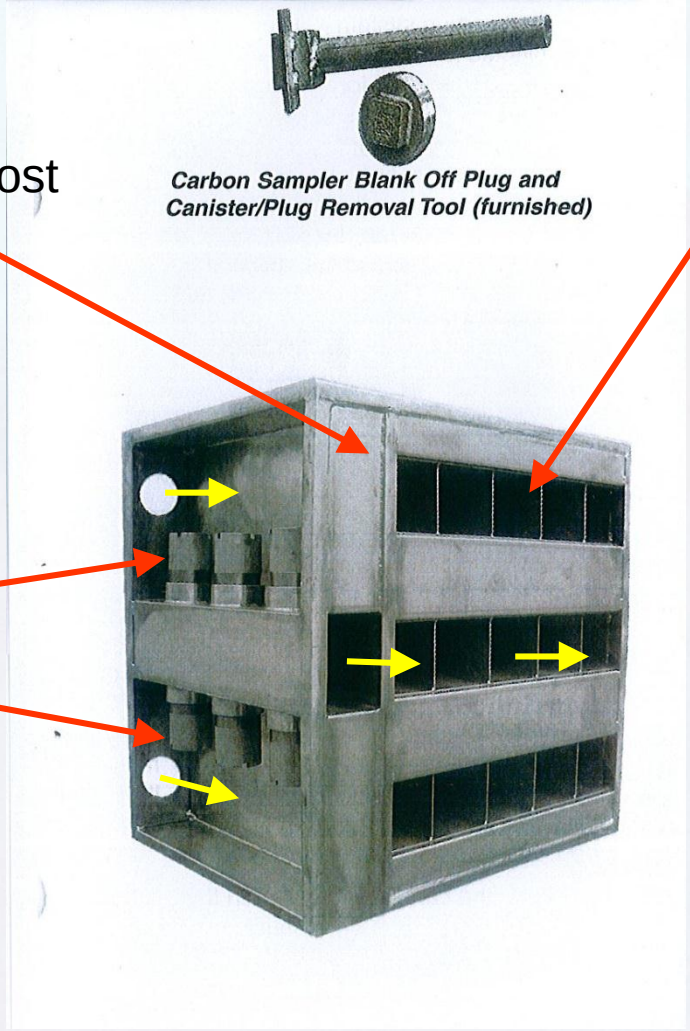
Removal Tool

ANSTO Canisters

US Canisters System for 2” deep Filters Type IV size 2’X2’x1’

Canisters in Standard Type 4 Filter 2’x2’x1’

Area taken
from filter
to install canisters. At
least 10% of filter area lost

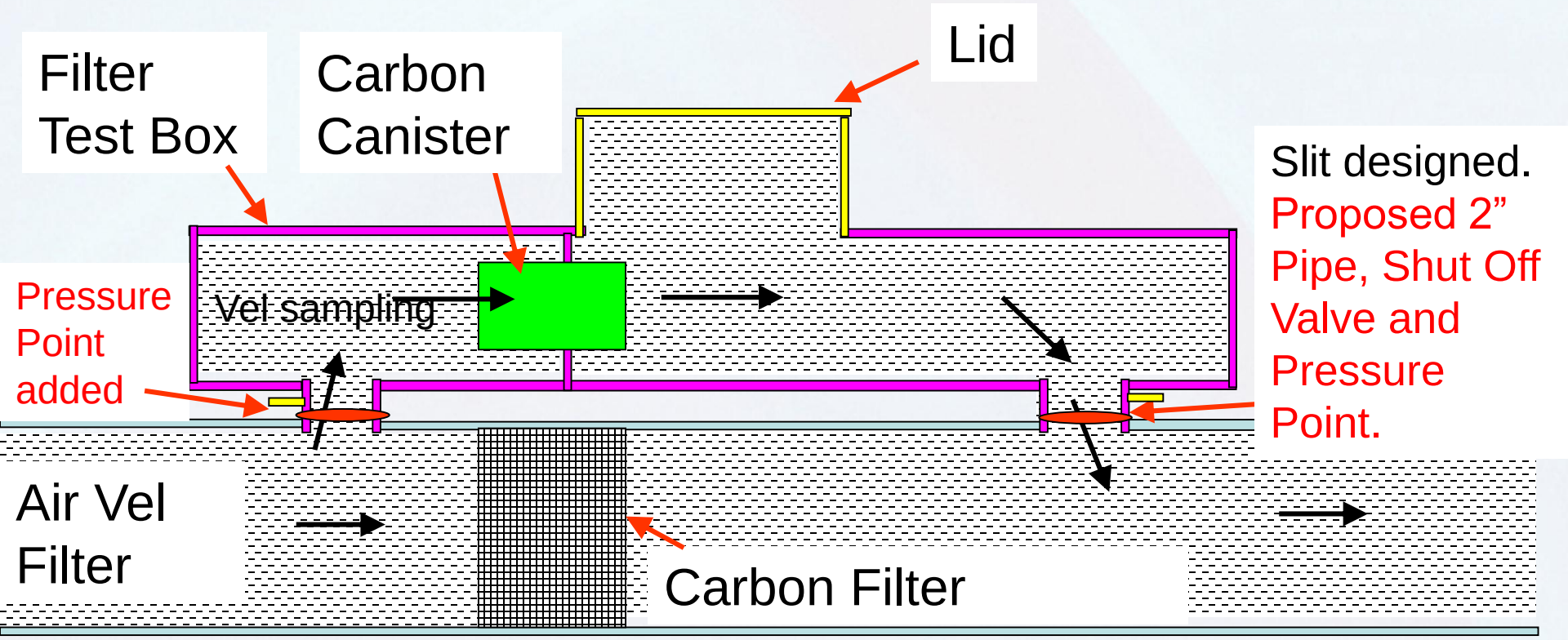


Remaining filter area

Six
Canisters

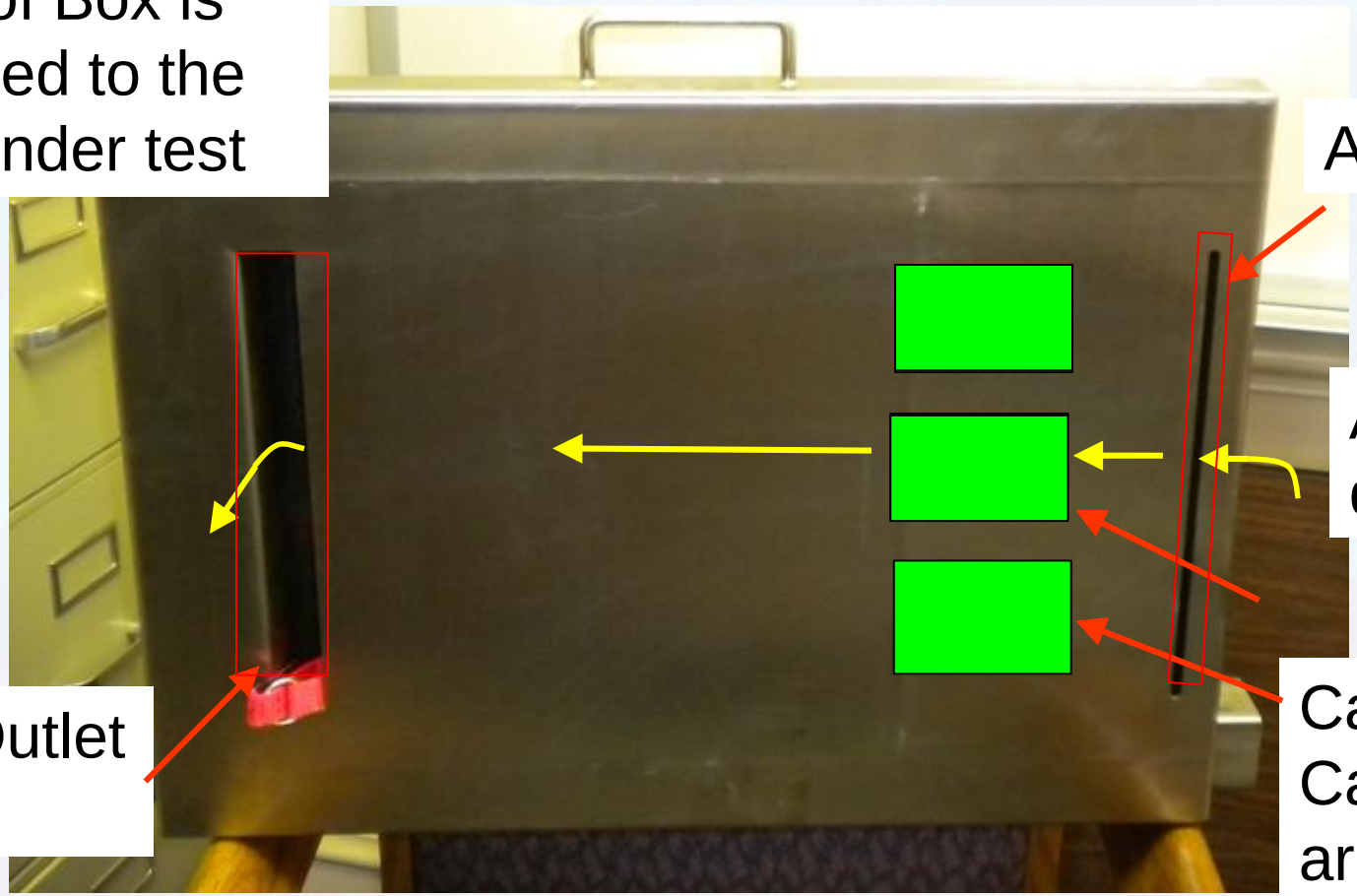
Filter Testing Box- US

Vel Sampling = +/- 10% Vel Filter



Rear of Filter Testing Box- US System

Rear of Box is attached to the filter under test



Air Inlet slit

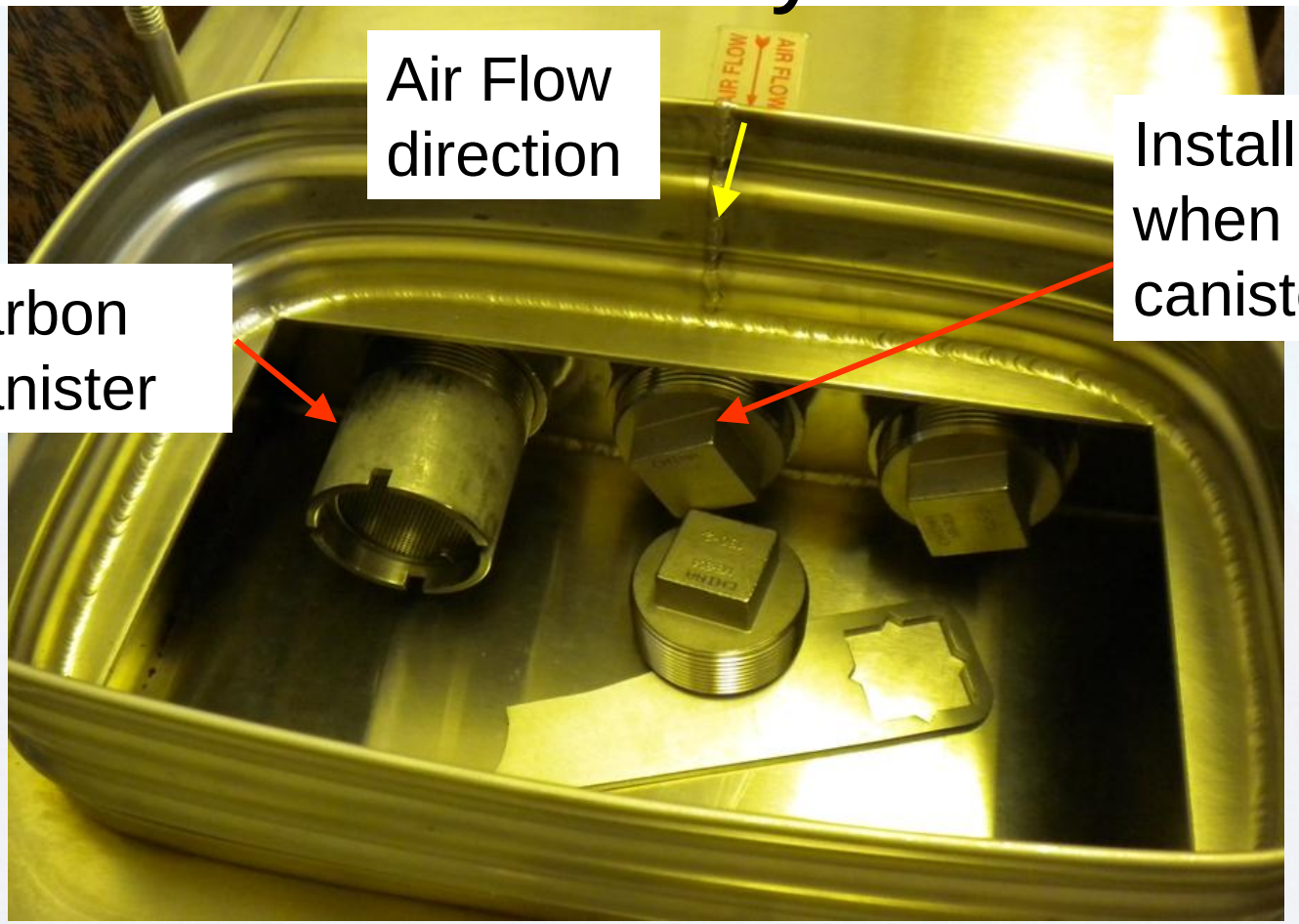
Air Flow direction

Air Outlet Slit

Carbon Canisters are inside the box

Carbon Canisters are in parallel with filter under test

Lid removed from Filter Testing Box- US System



Front of Filter Testing Box- US System

ANSTO Options to Sample Carbon to ASTM 3803-98

June 2014

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Direct sampling from filter

ASTM E300-04 Standard Practice for Sampling Industrial Chemicals.

Sampling equipment used for carbon filters

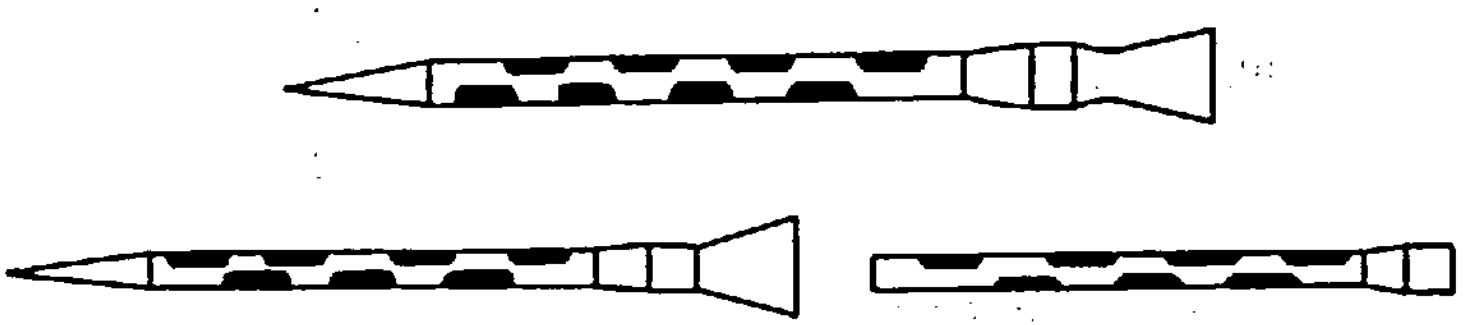


FIG. 10 Multi-Slot Tube Thief

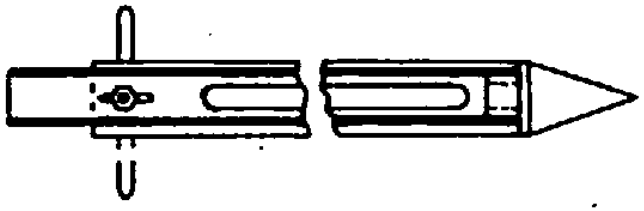
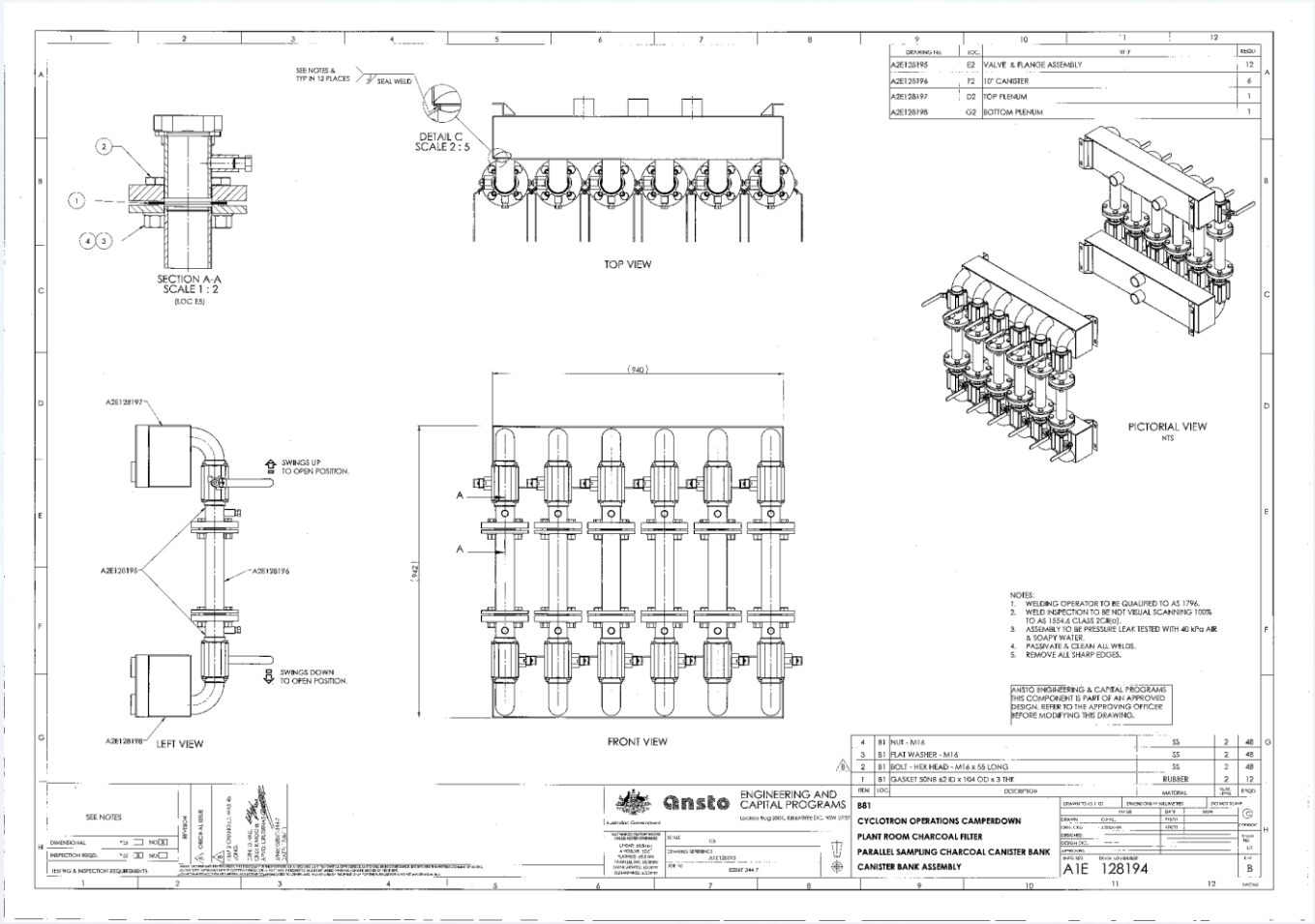


FIG. 11 Single-Slot Tube Thief

Mark 2 Six Canister ANSTO Design



Mark 2 ANSTO 10” Long Canister

Options to test carbon to ASTM 3803-98

- Design new systems of carbon filtration with budget for parallel canisters in mind.

Old Systems already operating

- Retrieve carbon from filters in non-active filters.
- Upgrade carbon filters with canisters pre-installed.
- Install canisters by retrofitting in existing housings. Best option.

Comparison

ANSTO system Advantages

- Access for flow and static pressure measurements
- Isolating valves allows decay of radiation on retrieval
- Canisters installed vertically preventing bypass problems
- Convenient for 10” long canisters.

US system for 2” Canisters Type IV Filters Advantages

- Low cost design
- Easy to install
- Needs to be qualified in the factory or by calculations
- Canisters to be tested in a rig before installation
- Convenient with 2” long canisters

Questions ?

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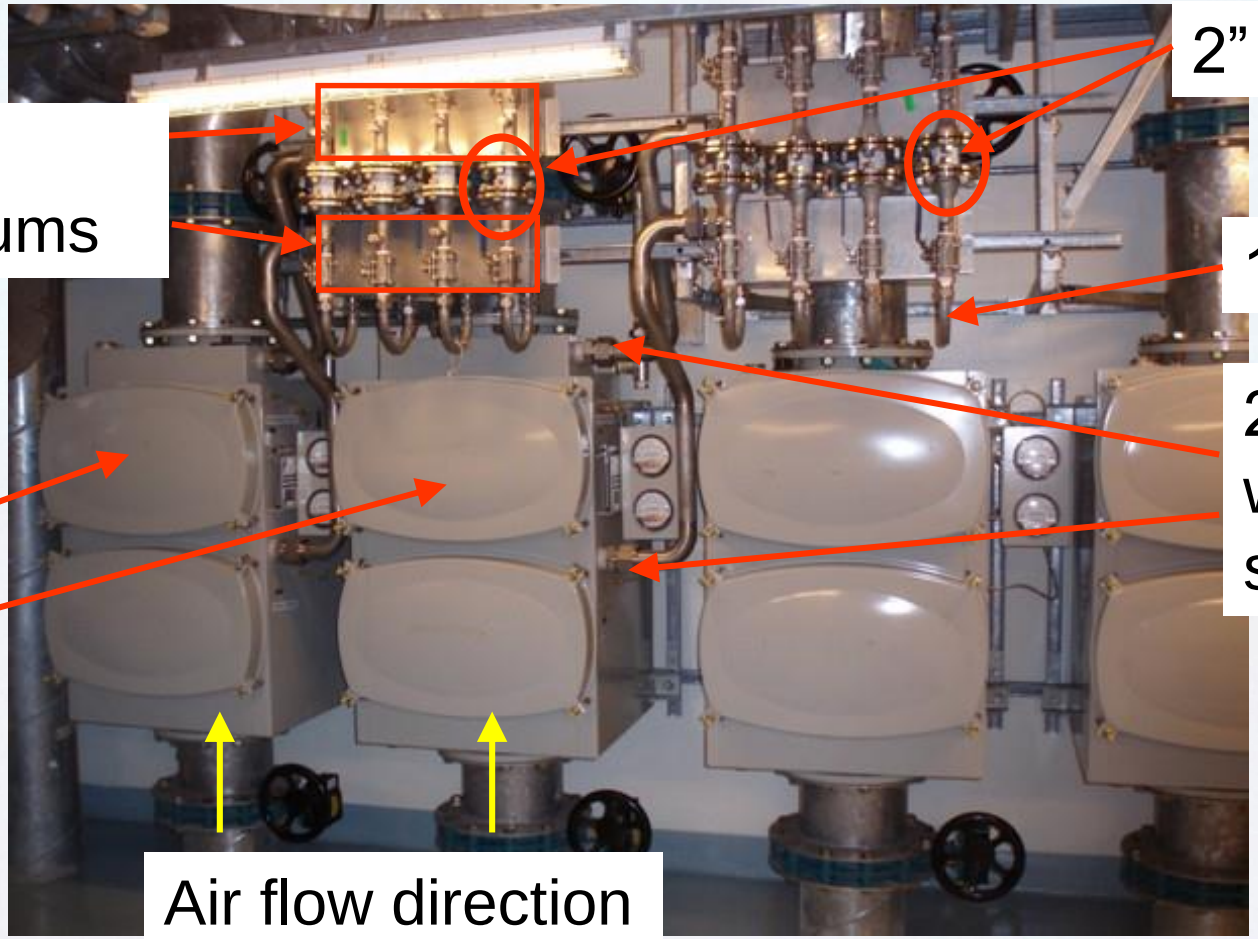
Cyclotron Production

Carbon Canister modules- ANSTO System OPAL

Canisters are in parallel with Filter under test



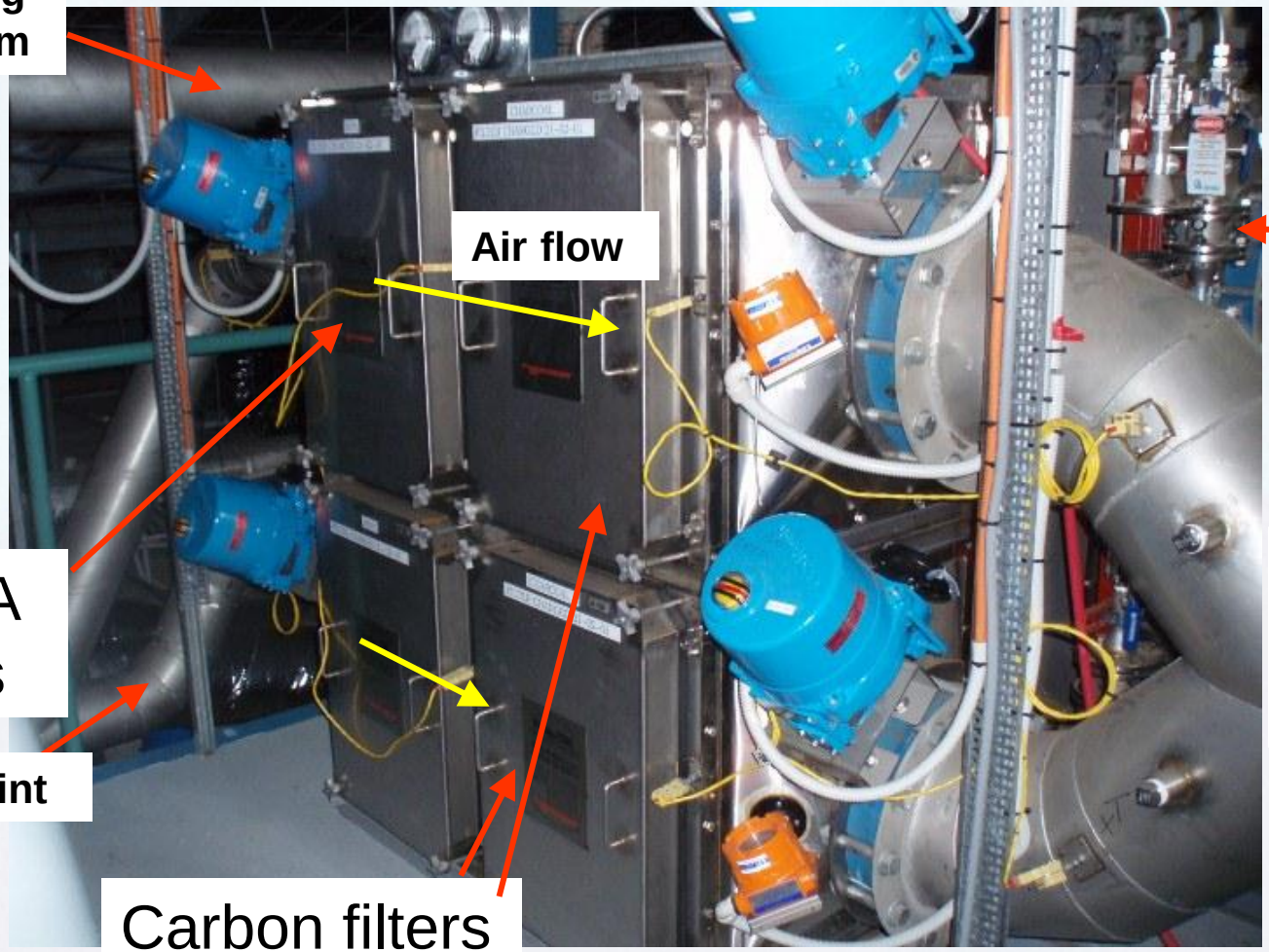
Copper testing manifold-ANSTO

Requires 2” BSP Socket for Installation in the Duct

Carbon for canisters

- Set of carbon filters must have a representative sample of carbon separately supplied to fill canisters. Rarely supplied.
- Solution if carbon not supplied or lost. Take carbon directly from filter to fill the canisters, refill the filter to cover the sample taken with the same carbon specifications and valid within the 5 years ASTM 3803-89 certificate.

Access for Filter Testing- ANSTO system



Access for Filter Testing- US system