

LARGE SCALE TESTING
OF
SHIPBOARD HALON ALTERNATIVES

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Large Scale Testing of Shipboard HALON Alternatives

The U.S. Navy has made a policy decision that the next major ship acquisition (LPD-17) will be HALON-free. To identify promising alternative technologies, small scale testing of gaseous agents and water mist have been conducted during the past two years at the Naval Research Laboratory (NRL), Chesapeake Beach Division. Based on the small scale findings, specific alternatives have been selected for full scale testing in a shipboard environment.

Testing will be conducted in a simulated machinery space aboard the Navy's fire research ship the EX-SHADWELL in Mobile, Alabama. The fire test area, approximately 30,000 ft³, will consist of full scale mock-ups of ship propulsion machinery: diesel engines, reduction gear, gas turbine modules, and supply/exhaust ducting. Fires scenarios will include flammable liquid spray and pool fires, as well as cable fires. Fire sizes will range from 1 - 10 MW. HALON 1301 will be used as a baseline for assessing performance of alternatives. Gaseous alternatives to be tested are HFC-227 ea (FM-200) and HFC-23 (FE-13). Three water mist concepts will also be evaluated. For gaseous agents the design concentrations, the fire scenarios, and the agent discharge times will be varied.

The tests are expected to conclude by September 1994. Future testing in the same test compartment may include CF₃I and pyrotechnic generated dry chemical aerosol.

The attached slides provide pertinent summaries of the test program.

HALON 1301 ON US NAVY SHIPS

- **2000 SYSTEMS ON 300 SHIPS**
- **1.5 MILLION POUNDS IN THE FLEET**
- **INVENTORY BY APPLICATION:**

| | |
|------------------------------------|--------------------|
| PROPULSION MACHINERY SPACES | 592 SYSTEMS |
| AUXILIARY MACHINERY SPACES | 409 " |
| DIESEL GENERATOR ROOMS | 320 " |
| FUEL PUMP ROOMS | 176 " |
| GAS TURBINE MODULES | 102 " |
| FLAMMABLE LIQUID STOREROOMS | 200 " |
| MISC SPACES | 206 " |
- **OBJECTIVE: NEXT MAJOR SHIP ACQUISITION (LPD-17)
WILL BE HALON-FREE**

LARGE SCALE FIRE TESTS ABOARD EX-USS SHADWELL

- GASEOUS AGENTS (APPROX. 20 TESTS)

- HALON 1301 (BASELINE)
 - HFC - 227 **ea** (FM-200)
 - HFC - 23 (FE-13)

- WATER MIST (APPROX. 32 TESTS)

- 3 NOZZLE/MIST CONCEPTS

- EVALUATE PERFORMANCE AGAINST MACHINERY SPACE FIRE SCENARIOS

- POOL FIRES
 - SPRAY FIRES
 - CLASS A (CABLES)

- TEST COMPARTMENT (APPROX. 56' X 27' X 20')

- 29,800 FT³ GROSS VOLUME
 - 26,800 FT³ NET VOLUME

- MACHINERY MOCK UPS

- DIESEL ENGINES
 - REDUCTION GEAR
 - GAS TURBINE MODULE
 - SUPPLY/EXHAUST DUCTS

- 9 NOZZLE ARRAY FOR GASEOUS AGENTS (PER TEST)

- 18 NOZZLE ARRAY FOR WATER MIST (PER TEST)

TEST VARIABLES

GASEOUS ALTERNATIVES

- DESIGN CONCENTRATIONS

FM-200 (7.9 - 10%)

FE-13 (16-18%)

1301 (4.6 - 5.7%)

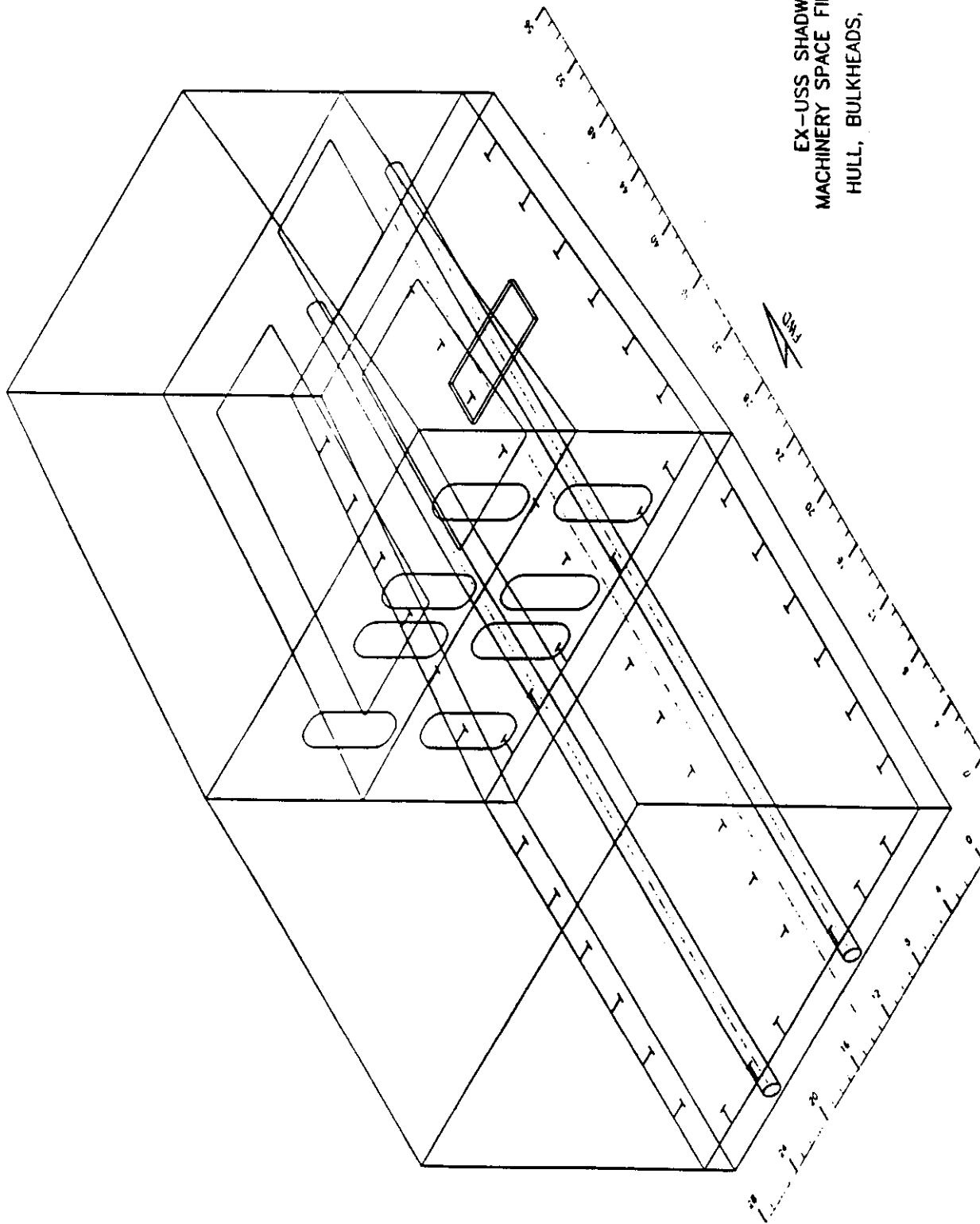
- FIRE SIZE/TYPE/LOCATION

1-10 MW

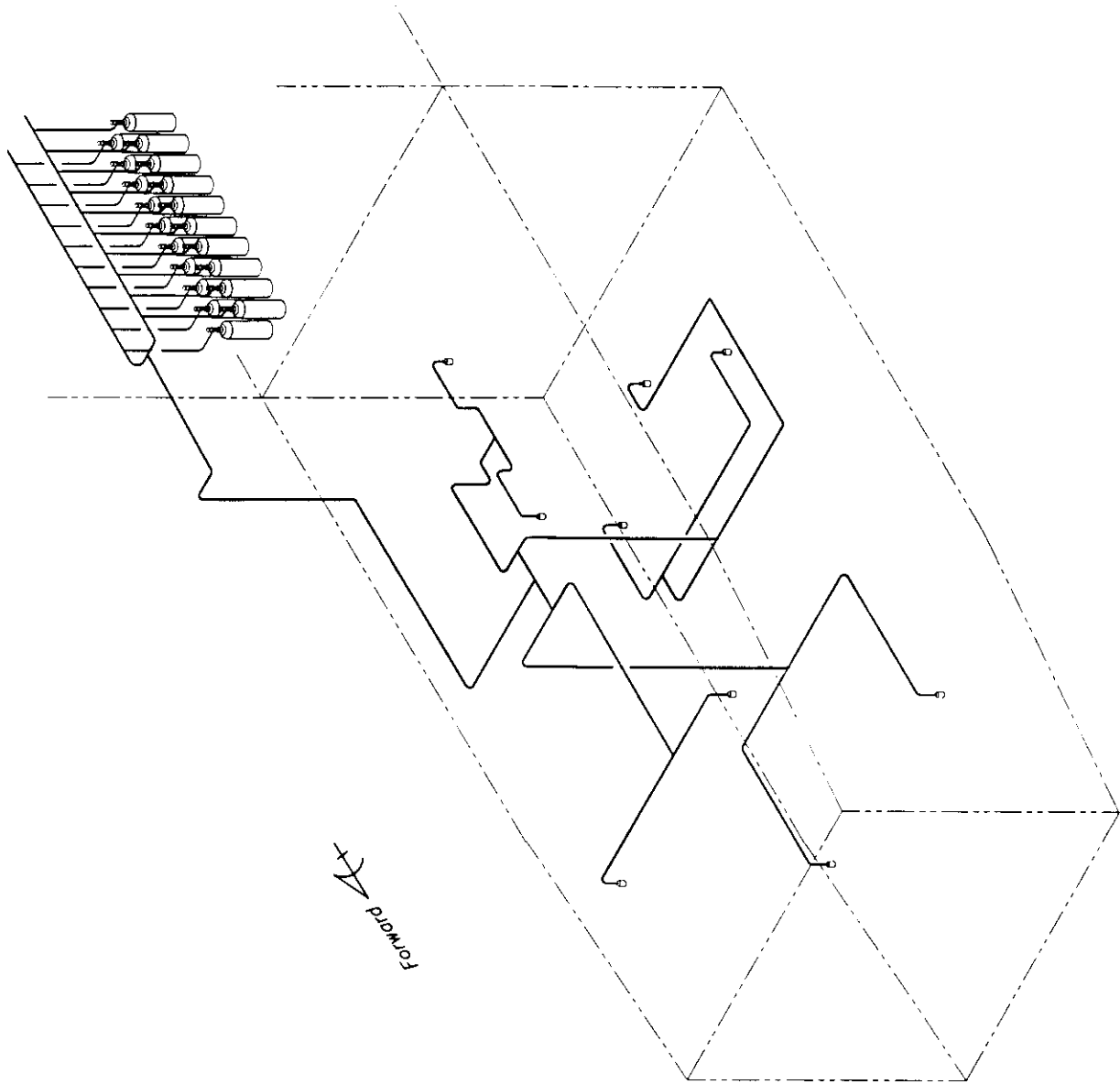
- DISCHARGE TIME (<10, 10, > 10 SECS)

SHORTEN BY PRESSURIZING > 600 PSI

SHORTEN BY REDUCING FILL DENSITY

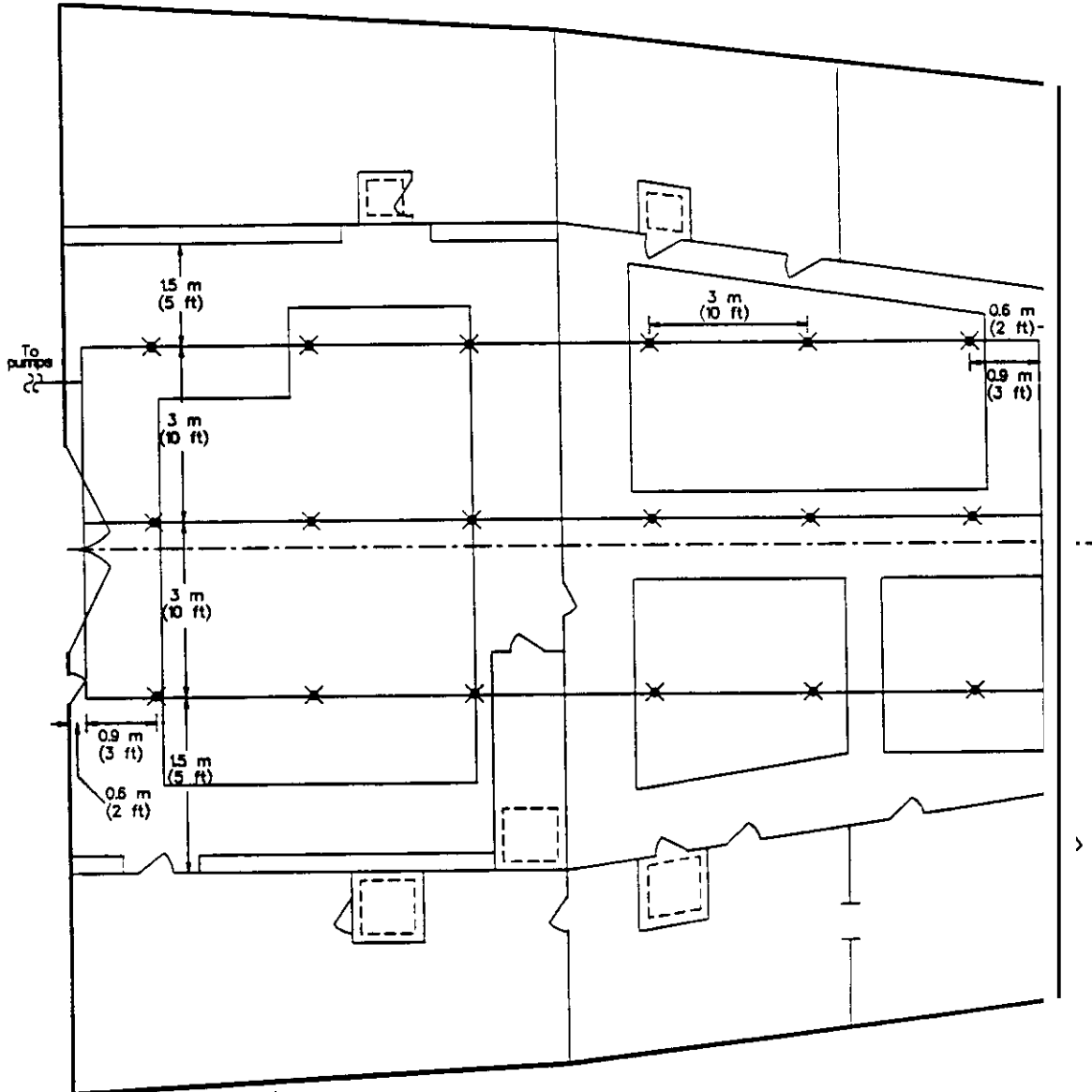


EX-USS SHADWELL
MACHINERY SPACE FIRE TESTS
HULL, BULKHEADS, FRAMES

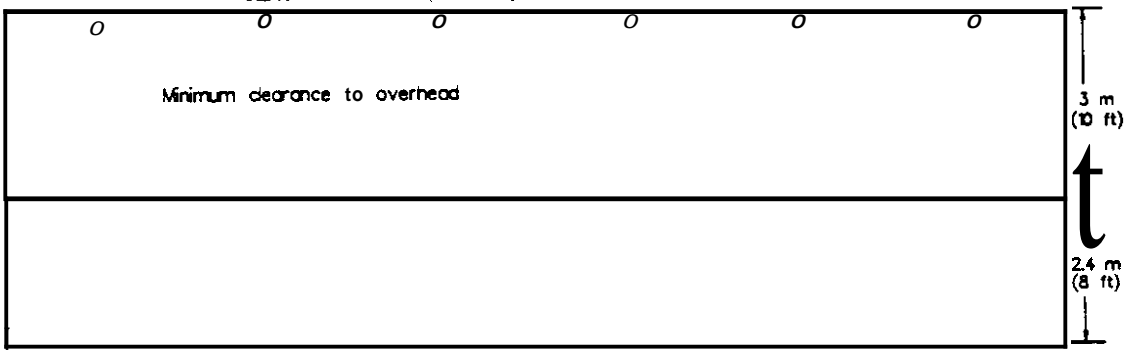


Discharge Piping For Halon Alternatives Tests
On Ex-Shadwell

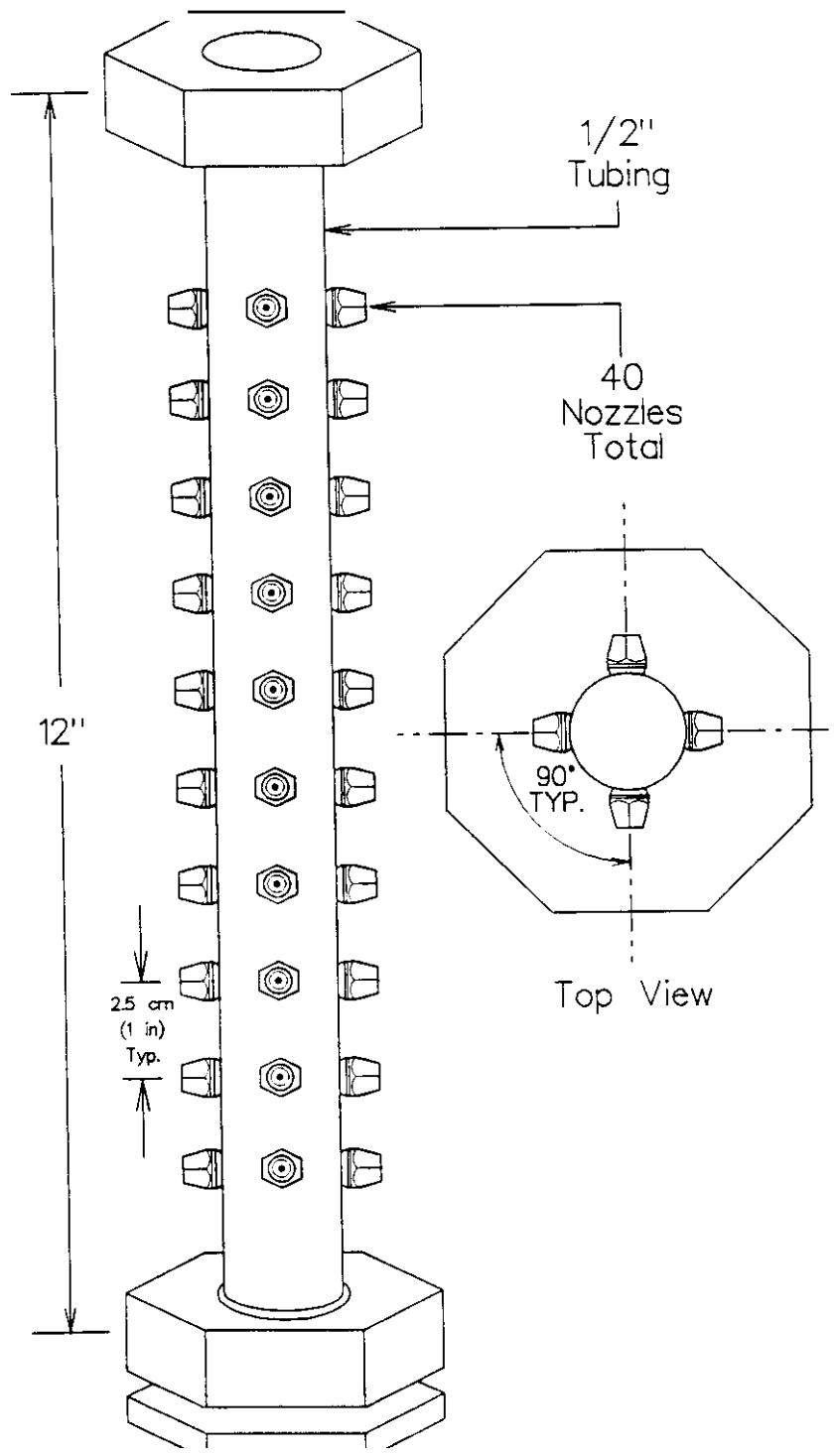
36 35 34 33 32 31 30 29 28 27 26 25 24 23 22



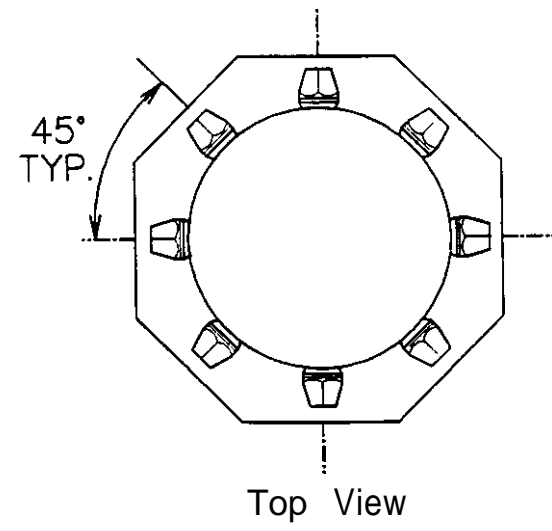
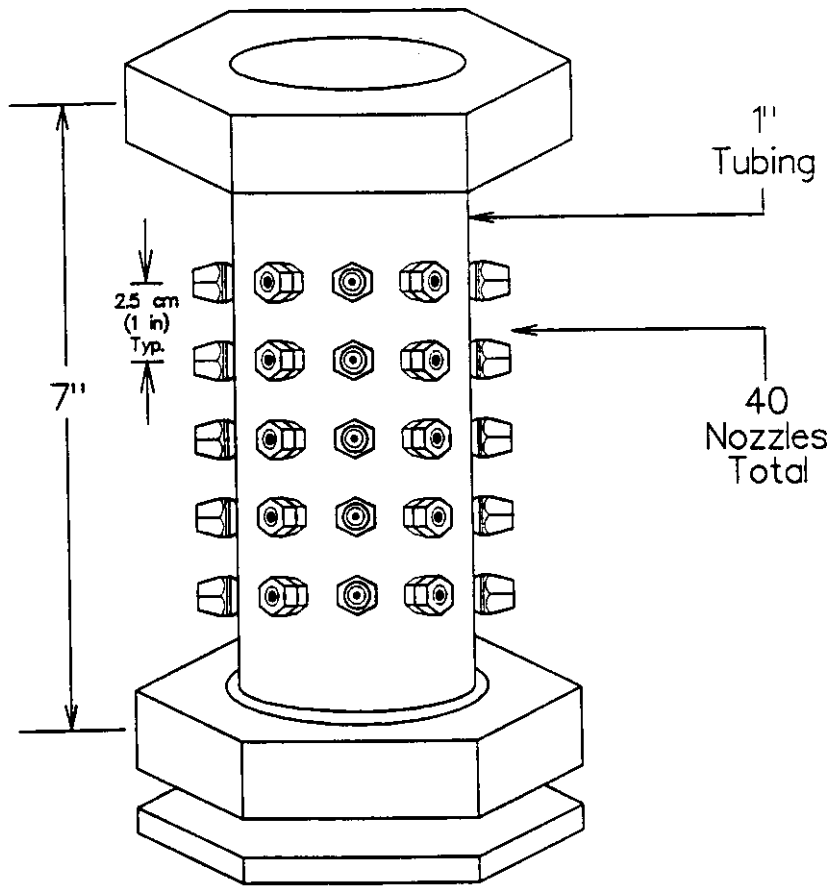
✕ 2.5 cm (1 in) Tee Oriented Toward Deck with Nozzle Adapter and Nozzle (18 Total)



Water mist generic pipe network



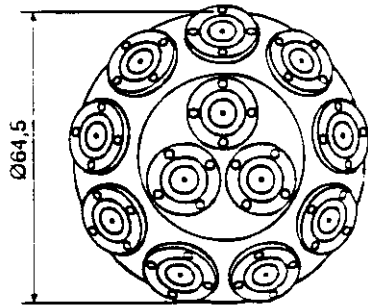
Baumac nozzle (option 1)



Baumac nozzle (option 2)

Hi-fog

SPRAY HEAD

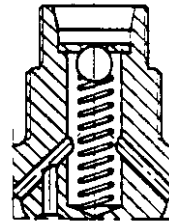
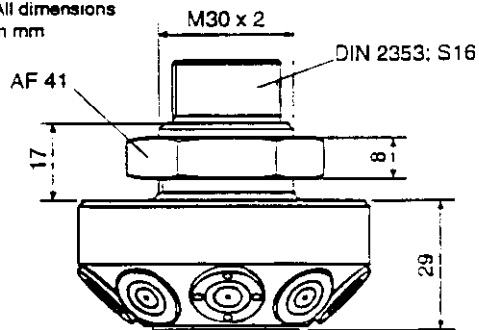


Nozzles: 12
 Connection: Top
 Fixing: Lock Nut Thread

Part no: Hf-S122-C0-B0
 Material: Stainless Steel
 Weight:

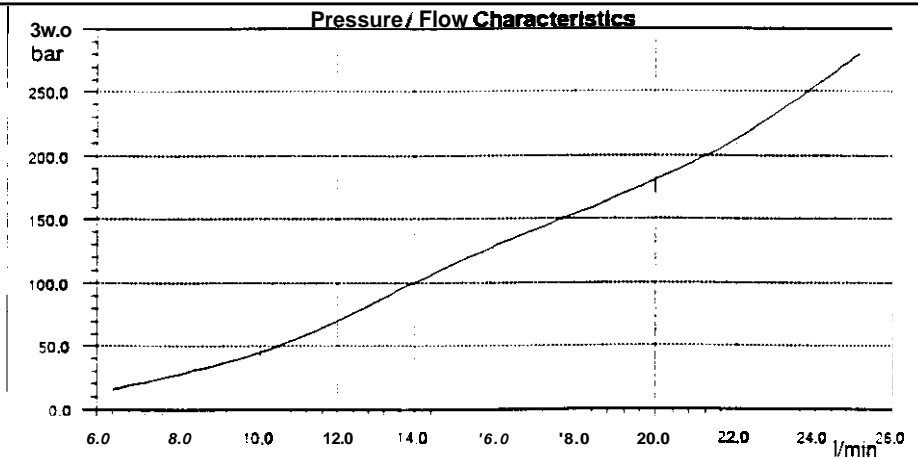
Option: Internal Check Valve

All dimensions
 in mm



Pan no: Hf-S122-C0-BA

Data sheet



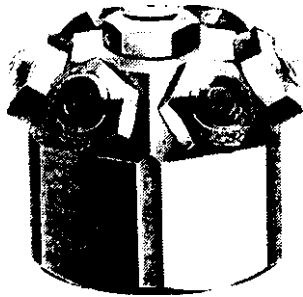
Hi-fog systems & components are protected by over 30 different patent applications

Marioff nozzle (twelve orifice head)

FogJet® SPRAY NOZZLES

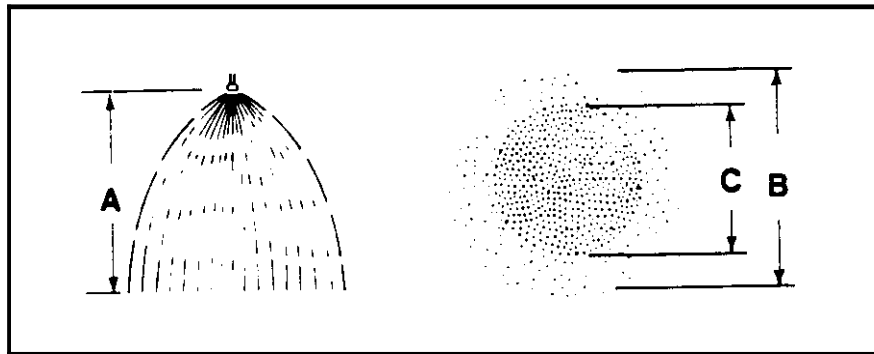
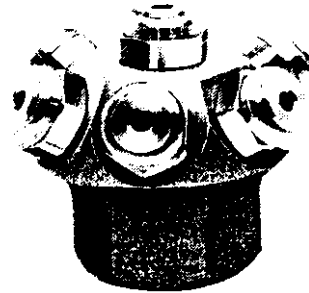
7N

atomizing spray caps
1 NPT (F)



7G

FullJet spray caps
3/4"-1 1/2" NPT (F)



DIMENSIONS & WEIGHTS

Based on largest/heaviest version of each type

| Nozzle No. | Pipe Conn. NPT | H Inches | D Inches | Net Weight |
|---------------------------------------|----------------|---------------------------------|---------------------------------|------------|
| 3/4-7G1 thru 3/4-7G3 | 3/4 | 1 ²⁵ / ₃₂ | 2 ¹ / ₁₆ | 12 oz. |
| 3/4-7G5 | 3/4 | 1 ¹³ / ₁₆ | 2 ¹ / ₈ | 12 oz. |
| 1-7G10 and 1-7G12.5 | 1 | 2 ³ / ₁₆ | 2 ¹¹ / ₁₆ | 1 1/2 lbs. |
| 1-7G25 thru 1-7G40 | 1 | 3 ⁵ / ₁₆ | 4 ¹ / ₁₆ | 3 1/2 lbs. |
| 1-1/2-7G25 thru 1-1/2-7G45 | 1 1/2 | 3 | 4 | 3 3/4 lbs. |
| 1-1/2-7G50 | 1 1/2 | 3 ³ / ₁₆ | 4 ¹ / ₄ | 3 1/2 lbs. |
| All 1-7N | 1 | 2 ³ / ₃₂ | 2 ¹ / ₂ | 1 1/2 lbs. |