



PAINT SPRAY BOOTHS - WATER WASH TUNNEL TYPE

1. GENERAL

- 1.1 Water wash tunnel type paint spray booths shall be used in the application of all prime, enamel and lacquer finishes requiring manual and/or automatic spray operations except when such operations are of an intermittent touch-up nature, or where production volume is not sufficient to warrant the water wash booth; therefore, a dry booth can be used.
- 1.2 A properly designed, ventilated and protected paint spray booth shall be provided when combustible paint spraying is conducted at a fixed location.
- 1.3 When ESB-M2P4, ESB-M2P5 or ESB-M2P22 standard quality in painting operations is required, booths of this designation shall be supplied with tempered, cleaned air in accordance with Section 6 and be equipped with a sludge handling system.
- 1.3.1 Booths of this designation shall be provided with a pressurized tack-off vestibule at the entrance end, and a pressurized flash-off vestibule at the exit end connecting the booth to the bake oven.
- 1.3.2 Down-draft booths with overhead fresh air supply are generally used for truck and automotive body painting operations.
- 1.3.3 Side-draft booths with water flood curtain and overhead fresh air supply are generally used for sheet metal parts painting operations, such as fenders, hoods and instrument panels when processed separately from the bodies.
- 1.4 Open side, side-draft booths with water flood curtain and utilizing building air are generally used in painting operations for wheels, chassis, castings transmissions, engines, radiator assemblies, etc., where only a protective finish is desired.
- 1.5 Establishment of design specifications are to be considered a part of these standards and shall be prepared for each individual booth. These specifications shall include the following and shall be furnished by the issuing Company activity:
- a. Designate type of down draft booth sections desired.
- Class A Booth (as used for heavy duty sections)
A (3) grain booth as provided for in the BAX-2 acceptance standard to be used when over an average of 144 fluid oz. of paint is sprayed per minute per 15 feet of booth.
- Class B Booth (standard production section)
A (5) grain equivalent booth (able to be modified to the 3 grain acceptance level) can be used when less than an average of 144 fluid oz. of paint is sprayed per minute per 15 feet of booth.

Manufacturing Staff

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PAINT SPRAY BOOTHS
DESIGN & REFERENCE DATA

BAX
PAGE 1-

July 1977

9009160 0051075 145



Documents
Document Sharing Hub



- b. Layout showing location, overall length and typical cross section desired.
- c. Production rate and unit spacing.
- d. Type of conveyor to be utilized.
- e. Weight of conveyor and work load to be supported by vestibules and booth structure.
- f. Size, weight and quantity of automatic painting machine enclosed and supported by booth, if used.
- g. Type of paint to be used.
- h. Number of main over head paint circulating lines required to supply booth as well as auxillary paint line systems.
- i. Number and location of work stations in booth.
- j. Type of heating (gas, oil, hot water or steam) for air supply unit.
- k. Booth exhaust stack height.

1.6 Structural and/or load bearing members, including plate, shall be designed to be not less than the minimum standards of the American Institute of Steel Construction and to conform to local governmental codes.

1.7 Spray booths in operation shall conform to the noise limits specified in Ford Manufacturing Standard SX-1 and meet or exceed ventilation levels specified in OSHA.

1.8 The successful contractor shall submit plans and specifications to the issuing Company activity and to the appropriate local office of the Company fire insurance carrier for review and approval. Questions and notations not acceptable to the fire insurance carrier should be referred back to the issuing Company activity for resolution.

2. WATER WASH SECTIONS

2.1 Water wash sections shall be sturdily constructed and provided with large access doors for ease of maintenance located in such a manner that all interior surfaces are accessible. A thorough scrubbing action by water shall dislodge the suspended paint particles from the air stream, forcing the paint particles into the circulating water systems. The exhaust air must be free of entrained moisture droplets before entering exhaust fan to be discharged to the atmosphere.

2.2 The basic design of the water wash section shall be approved by passing the Ford Acceptance Test for Spray Booths (BAX-2). Water wash sections shall be capable of meeting the paint emission requirements of the booth class as outlined in paragraph 1.5. Modifications of the basic water wash design to increase the relative grain loading are permitted without retesting upon submission of adequate data by vendor (i.e. fan vs. static pressure curves taken at the time of the original acceptance test) to satisfy the issuing Company activity. Changes in basic design of the water wash section shall require subsequent Ford Acceptance Test approval.

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Manufacturing Staff

BAX
PAGE 2

PAINT SPRAY BOOTHS
DESIGN & REFERENCE DATA

July 1977

9009160 0051076 081



- 2.3 Water wash sections shall be equal in length and 10 to 20 feet long for down-draft, and side draft type booth, with related exhaust fans located on platforms outside the building where possible. Each water wash section shall be provided with a separate exhaust fan.
- 2.4 Water wash sections shall be fabricated of black iron sheet metal to the following minimum U. S. or English gauge: end panels, 12 gauge; volutes and/or baffles, 10 gauge; housing, 16 gauge or stainless steel equivalent as specified by issuing activity.

3. VESTIBULE CONSTRUCTION

- 3.1 Vestibules shall be fabricated of 16 U.S. or English gauge (minimum) black iron sheet metal panels, using standard seam construction bolted together air tight. All joints shall be sealed at assembly and all inside seams of completed structure shall be caulked with a material that is impervious to normally used booth cleaning compounds and procedures such as steam cleaning. Clear, wire glass, sealed windows may be provided in the walls of the vestibule at the option of the issuing Company activity.
- 3.2 Structural steel framing shall be furnished on 10 foot centers (maximum) to make the vestibule entirely self-supporting with the inside surface smooth and unobstructed. For vestibules through which monorail conveyors pass, structural steel framing shall be designed to withstand the additional live and dead weight of conveyor and work load.
- 3.3 Vestibules located at entrance end of booths shall be furnished with work platforms constructed of 3/16 inch smooth plate or floor grating and water flood sheet as specified by issuing activity. Platforms shall be the full width and length of vestibule and be the same height as the floor of the booth proper.
- 3.4 Two (2) gasketed 90° swing type access doors shall be provided for each vestibule with one on each side of work conveyor. 90° doors shall be equipped with automatic closers and panic latches. Doors shall have clear wire glass windows and meet OSHA standards as applicable.
- 3.5 Where work platforms are required, both necessary steps and a 3 foot square landing shall be provided for doors. Steps and landing shall be fabricated of 3/16 inch checker plate and be equipped with guard rails and mid rail on one side, constructed to manufacturing standard KZ 3X-1.
- 3.6 Silhouetted openings shall be provided in end of vestibules, allowing approximately 6-inch clearance for work entering or leaving.



- 3.7 Each vestibule shall be provided with an air supply plenum chamber fabricated of 18 U. S. or English gauge (minimum) galvanized sheet metal adequately stiffened to prevent drumming or vibration. Inside of chamber to be smooth and unobstructed. Size of chamber is to be based on volume of air to be supplied. Plenum chamber to be equipped with baffles, fabricated of galvanized sheet metal, located within the chamber, to provide even distribution of entering air, and with filters and access doors. If adjustable baffles are used, adjustment must be operable from outside of plenum chamber.

Steel framing to support filters shall be riveted together with gasketting between to make an airtight joint. When framed filters are used, steel framing shall be provided with soft rubber gasketting fitted to form airtight seal with filter frames. Clamp-type filter frames, used with filter media which requires same, shall be approved by issuing Company activity. Filter frames shall be of non-warping construction and surface in contact with framing gasket shall be smooth and level so as to form an airtight connection.

4. BOOTH CONSTRUCTION

4.1 Enclosure or Tunnel

- 4.1.1 Side and walls shall be fabricated of 18 U.S. or English gauge (minimum) black iron sheet metal flanged panels, and may have clear wire glass fire resistant windows. Construction shall be smooth and unobstructed on the spray booth interior side. Joints shall be sealed at assembly and be airtight. Wall panels may be pre-surfaced with baked on melamine or other paint acceptable to the issuing Company activity and assembled to supporting framework provided that joints are airtight. Joints of the wash sections shall be caulked at assembly to be air tight. Caulking must be impervious to normally used water wash compounds and procedures such as steam cleaning.
- 4.1.2 Booth ceiling shall be adequately framed to support light fixtures, filters, air supply plenum, and air distribution baffles. Sheet metal surfaces of the ceiling, if any, shall be smooth and unobstructed on the spray booth interior side.
- 4.1.3 Structural steel framing shall be furnished to make the booth enclosure entirely self-supporting. Water wash sections shall not be used to support ceiling framing unless specifically designed, and having adequate supporting members, for this purpose. Structural steel framing centers shall be the same as lengths of water wash sections used. For those booths through which monorail conveyors pass, structural steel framing shall be designed to withstand the additional live and dead weight of conveyor and work load.
- 4.1.4 Cat walks shall be furnished on top of and on each side of spray booths and vestibules to give access to light fixtures, fans, motors, plenums baffle adjustments, paint lines, regulators and valves. Cat walks shall be provided with safety railings and shall be fitted with safety ladders at each end and conform to OSHA standards as applicable.

Printed in U.S.A.

Manufacturing Staff

BAX
PAGE 4

PAINT SPRAY BOOTHS
DESIGN & REFERENCE DATA

July 1977

9009160 0051078 954



Documents

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- 4.1.5 Overhead monorail conveyors, when specified, shall be provided through entire length of spray booth and extend 1 foot beyond at each end. When vestibules are used, conveyor shall continue through same and extend 1 foot beyond at each end. Monorail shall be complete with chain guard in accordance with Figure 1.
- 4.1.6 Access doors equipped with clear wire glass windows shall be furnished for all booth enclosures. Down-draft booths shall have doors at each end, with doors located every 50 feet on each side of work conveyor (distance from work station to a door must be 25 feet or less). Side-draft booths shall have one door at each end, located on operator side of conveyor. When doors open into building area, gasketed 90° swing type doors equipped with automatic closer and panic latches shall be provided. When doors open into vestibules, 180° swing type doors with cam or double hinge latches shall be provided. Doors shall have clear wire glass panels. Doorways which do not open onto work platforms, shall be provided with a 3 foot square landing and necessary steps equipped with hand railing and mid rail on the open side constructed to manufacturing standard KZ 3X-1. Landing and steps shall be fabricated of 3/16 inch checkered plate.
- 4.1.7 Booths provided with fresh air supply systems shall be furnished with an air supply plenum chamber, fabricated of 18 U. S. or English gauge (minimum) galvanized sheet metal panels, adequately stiffened to prevent drumming or vibration, using standing seam construction bolted together air-tight. Joints shall be sealed at assembly and all inside seams of completed chamber shall be caulked with a material that is impervious to normally used booth cleaning compounds and procedures such as steam cleaning. Inside of plenum shall be smooth and free of obstructions. Plenum chamber to be equipped with baffles fabricated of galvanized sheet metal, with filters and access doors. Access doors to be on 15' centers (maximum). If adjustable baffles are used, adjustments must be operable from outside of plenum chamber.
- Steel framing to support filters shall be riveted together with gasketing between to make an airtight joint. When framed filters are used, steel framing shall be provided with soft rubber gasketing fitted to form airtight seal with filter frames. Clamp-type filter frames, used with filter media which requires same, shall be approved by issuing Company activity. Filter frames shall be of non-warping construction and surface in contact with framing gasket shall be smooth and level so as to form an airtight connection.
- 4.1.8 Silhouetted openings shall be provided in each end of booth allowing approximately 6 inch clearance for work entering and leaving.
- 4.1.9 Floors of all enclosures shall be constructed of 3/16 inch smooth plate and/or subway type grating. Plates and grating sections shall be interchangeable and size to be easily removable by one man. Grating area shall be a minimum of three-fifths of floor area when a combination of both are used. Structural supports shall be designed so that obstructions in air flow path are held to a minimum.



4.2 Tanks or Flood Sheets

- 4.2.1 The design and water flow rate of vertical and horizontal flood sheets shall be such as to provide for a minimum water depth of $\frac{1}{4}$ inch over the entire area of vertical flood sheets and a minimum of 1 inch over the entire area of horizontal flood sheets. The flood sheets shall be sloped in such a manner so as to provide continuous contact of the full volume of water over the entire surface.
- 4.2.2 Tanks or flood sheets under floor of booth shall be constructed of mild steel plate, with $\frac{1}{4}$ inch minimum thickness. Plates shall be flat and free of buckles and warpages. Tanks or flood sheets are to be constructed from the minimum number of pieces with sides smooth, plumb and square. Tanks to be supported on a channel iron grillage to provide ventilation to underside of the supports or other attachments are to be continuous welded on all sides. Spot welding is not permitted. Body seams shall be butt-welded with misalignment of plates and butt-weld not exceeding 25% of plate thickness. Welds shall be smooth with no holes, high spots, lumps or pockets, and be free from oxide inclusions (caused by burning). Weld splatter shall be removed, inside corners and all weld joints ground smooth, and outside corners rounded to a minimum radius of $1/8$ inch.
- 4.2.3 Structural members supporting the booth proper shall not be extended into tank. Tanks or flood sheets shall be designed and installed so as to avoid obstacles which would prevent free flow of water and paint sludge.
- 4.2.4 Pipe outlets shall be perpendicular to tank walls. Weirs for overflows shall be continuous double-electric welded. Tanks, when used, shall be pitched to sump wells or drains.
- 4.2.5 Tanks for booths not serviced by a separate sludge handling system shall be provided with all necessary accessories, such as drain and overflow connections, quick fill service connection and float-valve arrangement for maintaining a constant solution level. Tank pump suction inlet shall be so located to provide flow of water and paint sludge to front of tank for convenient removal of sludge.
- 4.2.6 For booths not equipped with automatic sludge removal systems, the tank capacity shall not be less than five times the circulated capacity with sufficient free board to hold all circulated solution in system when pumps are shut down.

5. EXHAUST SYSTEM

- 5.1 Exhaust duct work shall be fabricated of 16 gauge (minimum) galvanized iron sheets welded water-tight or stainless steel equivalent as specified by issuing activity. Water wash section exhaust plenums shall be connected to exhaust fans by means of short radius elbows; no fan inlet boxes shall be utilized. Fan and inlet duct work shall be companion angle bolted together with gaskets between flanges to facilitate fan removal.

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PAINT SPRAY BOOTHS
DESIGN & REFERENCE DATA

Manufacturing Staff

July 1977

BAX
PAGE 6

9009160 0051080 502



Documents

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- 5.2 Exhaust stacks shall be fabricated of 16 gauge (minimum) black iron sheets welded water-tight or spiral wound and/or stainless steel equivalent as specified by issuing activity. Stacks and fans shall be companion angle bolted together with gaskets between flanges. All stacks less than 25 feet in height shall be self-supporting free standing without guy wires, and be capable of resisting wind velocities of 100 miles per hour. Stacks over 25 feet in height shall be guyed or structurally designed to be free-standing. Stack height above roof level shall be specified by issuing division on an individual booth basis. Provide flanged type water-tight access doors in all stacks. Locate access doors opposite each sprinkler head.
- 5.3 Vertical discharge type rain protectors shall be provided for all exhaust stacks. Other types must be approved by Ford; however, deflector types are not acceptable.
- 5.4 Exhaust stack diameters shall be sized so as to produce an exhaust gas exit velocity of 2300 feet per minute at stack gas conditions, with 3600 feet per minute preferred where air quality problems exist.

6. AIR SUPPLY SYSTEM

6.1 General

- 6.1.1 Each air supply system shall be provided with safety devices, automatic temperature controls and combustion controls in conformance with Ford Manufacturing Standard EH5X-2.
- 6.1.2 Spray booth fresh air supply enclosures shall be located on the building roof directly over spray booth if building conditions permit. Alternatively, the enclosure may be located within the building.
- 6.1.3 The following equipment which comprises the Standard push thru air supply shall be arranged in the sequence indicated.
1. Air intake
 2. Bird screens
 3. Stationary weather louvres
 4. Motor operated shut-off dampers
 5. Heating unit
 6. Air supply fan equipped with vortex control dampers
 7. Perforated distribution baffles
 8. Roll-type filter
 9. Secondary heating unit (optional - to be determined by issuing Company activity)
 10. Humidifier
 11. Temperature control sensing element
 12. High efficiency filter (optional - to be determined by issuing Company activity)
 13. Distribution duct work