To:		ENGINEERING INSTRUCTION *New York State Department of Transportation*	*EI 95-011* **Supersedes:**
SUPERSEDED **BY EI 00-017 EFFECTIVE 6/9/00**			

Title: GUIDELINES FOR REVIEWING CLASS A CONTAINMENT PLANS

Distribution:		Approved:	
☒Main Office(30)	☒Local Gov.(31)		
☒Regions(32)	☒Contractors/AGC(39)	[signature]	2/23/95
☒Consultants(34)	☐ ______________ ( )	P. T. Wells, Director, Construction Division	Date

Attached are revised guidelines for reviewing plans for Class A containment enclosures submitted by contractors under Item 18570.1502, Class A Containment System for Paint Removal. These new requirements are effective immediately and replace the plan review guidelines issued June 30, 1993.

The major changes in these revised guidelines include:

1. A maximum exit air velocity of 7000 fpm through exhaust ducts has been incorporated. This is being specified so multiple exhaust ducts will be provided to more uniformly distribute air flow throughout the containment. Additional benefits include reduced friction losses and abrasion in the exhaust ducts.

2. The maximum allowable air-to-cloth ratio is being increased from 5:1 to 7:1 to allow the use of dust collection equipment that has become available with newer and more efficient designs. The requirement that the dust collection equipment be 99.9% efficient against dust and particles 2 microns and greater in size, will not be compromised.

If you have any questions please contact Pratip Lahiri or Dave Brewster at (518) 457-4285.

Attachment

GUIDELINES FOR REVIEWING
CLASS A CONTAINMENT PLANS

The following are guidelines for use in reviewing containment plans submitted by a contractor under Item 18570.1502. These guidelines do not have the authority of the specification. They are offered as a supplement to aid the contractor and DOT personnel in interpreting the specification so that an acceptable containment system is provided.

These guidelines elaborate on key items in the specification, some of which may be unfamiliar. Specification requirements are summarized for each, and where appropriate, comments are provided on the item's function and importance in the operation of a containment enclosure. Questions that follow the discussion provide a "reasonableness" check for the plan reviewer.

Definitions

Total containment

The entire localized work area where abrasive blasting operations are performed is enclosed by sheet materials affixed to a support structure. The enclosure is erected to control releases of airborne debris into the environment and to facilitate collection of the debris for disposal. The deck slab may serve as the ceiling of the enclosure if airborne dust would be contained.

Forced filtered air exhaust

Air is drawn through the containment enclosure by exhaust fans and exited through dust collectors before being discharged into the environment.

General

- Are the detailed working drawing(s) of the Class A containment system prepared and stamped by a registered, licensed Professional Engineer?
- Is adequate space provided between the containment enclosure and the steel to clean and inspect the prepared surfaces?
- Will natural lighting be adequate inside the containment enclosure? If not, are artificial means provided and capable of producing a light intensity of 50 foot-candles?
- Are there provisions to redirect water from deck drains through or around the containment enclosure?
- Are obstructions inside the containment enclosure minimized so as to not block or disrupt the flow of air, e.g., is the air flow parallel to the beams?

- Can the containment structure be assembled and disassembled, and moved to a new location as work progresses, in a timely manner and without causing disruption to essential operations?

Containment Materials -- Either rigid or flexible materials may be used. Rigid materials consist of panels or modular fabrications constructed of plywood, fiberglass, plastic, or metal materials. Flexible materials include tarps and plastic sheeting that are impervious to wind and dust. Light colored translucent materials are recommended to maximize natural lighting.

- Are the materials impervious to dust or wind?
- Are the materials durable, e.g., resistant to wind forces?
- Is the method, grommets or the equivalent, for securing materials to the support structure adequate?
- If flexible materials are used are they fire retardant?
- Are flexible materials proposed for covering the containment floor? If so, the underlying ground or pavement or supporting surface has to be smooth so paint debris can be vacuumed. Rigid materials would span unevenness and provide a smooth surface for vacuuming.

Support Structure -- Either a rigid or flexible support structure may be used. Rigid support structures are comprised of scaffolding and framing to which containment materials are secured. Flexible support structures use cables, ropes or chains.

- Is movement of the support structure and containment materials sufficiently constrained so joints and seams will remain sealed?
- Is the containment floor covered with flexible materials or are the joints of rigid floor sealed?

For suspended containment structures:

- If containment is a down draft design, is the working platform an open grate so as to not restrict air flow?
- If the containment is a down draft design, does the support structure provide a funnel-shaped bottom to facilitate the collection and removal of waste material?

For containment systems that are not suspended:

- Is the pavement or ground used for the containment floor? If so, the surface must be covered with flexible or rigid containment materials. Refer to the previous section on Containment materials for discussion on cover materials.

Joints and Seams -- Joints are mating surfaces between containment materials and the bridge structure. Seams are formed where containment materials are joined. Sealing of joints and seams may be accomplished by overlapping the materials, or by taping, caulking, etc.

Check joint details -- joints are particularly difficult to seal.

- Are the sides of the enclosure sealed against the bridge structure?
- Are the air supply and exhaust ends of the enclosure properly sealed against the bridge structure, or specially designed end sections, to prevent the escape of dust?

Check seam details

- Are rigid materials taped or caulked?
- Are flexible materials overlapped 24" and secured by tape or some type of clamp or tie at 24" intervals along the seam. It is permissible for some outside air to be drawn through seams into the enclosure by the exhaust fan.

Entryway -- Multiple overlapping door tarps are required. The entryway is a potential area for dust escape if used frequently by workers.

Check entryway details.

- Are two or more sets of overlapping door tarps provided with adequate space between so that one set of tarps remains closed when entering or leaving?

Dust Collection System -- Air laden with lead paint and abrasive dust will be drawn from the containment enclosure by the exhaust fan and forced through dust collectors for filtration before being discharged into the environment. A Class A containment system will, by design, operate as a negative pressure system. Air pressure inside the enclosure will be less than air pressure outside.

A specified air flow -- 100 fpm for air moving in the horizontal direction past the workers (50 fpm for vertical air flow containment systems) -- is used to roughly size exhaust fans. Fan capacity is determined by a theoretical calculation taking into account the cross sectional area of the containment enclosure.

The ducts carrying air from the containment enclosure to the dust collector should be sized to achieve a minimum air velocity of 3500 fpm and a maximum air velocity of 7000 fpm. This velocity range is necessary to efficiently transport the dust laden air.

Usually radial type centrifugal fans are used to move air containing abrasive materials. The fans are designed to operate at an air flow rate at a given number of inches water gauge (wg). The latter term is the ventilation system resistance, or head loss, due to air flow inefficiencies that the fan is able to operate against. System resistance for a typical bridge containment enclosure is not known at this time, but is expected to be at least 6 inches water gauge. System resistance could be higher or lower depending on design of the air make-up points, duct losses, the type of dust collector, etc. The largest source of system resistance will likely be the dust collector, which experiences a pressure drop as air passes through the filter media. Fabric collectors are usually selected with ratings in the range of 2 to 5 inches water gauge.

A "multi-rating table" available from the fan manufacturer is used for selecting fan equipment. The table shows a range of capacities for a particular fan size. Air flow and pressure (system resistance) requirements of the ventilation system determine fan size and operating RPM. Fan capacity in equipment specifications is reported as an air flow rate at some given pressure, e.g. "X" cubic feet per minute at "Y" inches water gauge.

Specifications require that dust collection equipment be 99.9% efficient against the passage of dust and particles 2 microns and greater in size. Under these conditions, the effluent from the dust collector theoretically would contain a particulate emission concentration in the order of 0.010 grains/dry standard cubic foot. This concentration is well within the no-visible-dust range.

Fabric collectors are suitable for the heavy dust concentrations associated with abrasive blasting. Interruptible-operation dust collectors shut down for a couple of minutes after several hours operation to recondition the filter media by vibration or by reversing the air at low pressure. Continuous-operation dust collectors recondition only a section of the filters periodically, so operations are never interrupted. Reverse pulses of high pressure air are used to recondition the filter media.

Fabric collectors are sized in terms of air flow rate versus fabric media area. This is called the "air-to-cloth ratio" with units of cfm per square foot of fabric. This ratio represents the average velocity of air through the filter media. Air-to-cloth ratios ranging from 1:1 to 7:1 are acceptable (filter velocity 1-7 fpm).

- Are the exhaust ducts leading from the enclosure to the dust collector sized to achieve an air velocity between 3500 and 7000 fpm. Determine this by dividing the exhaust duct air flow rate by the area of duct opening.
- Will the fan deliver the specified air flow rate at 6 inches (minimum) water gauge? Refer to the multi-rating table for the specified fan to verify capacity. Fabric collectors with pressure drop ratings on the high side (greater than 4 inches water gauge, for example) may require fans that efficiently operate at pressures higher than 6 inches water gauge.
- From the manufacturer's specifications, is the air-to-cloth ratio within the range of 1:1 to 7:1 at the speed at which the dust collector will be operated?

Air Make-Up Points -- Fresh outside air has to enter the enclosure to replace the air that is exhausted. A lack of replacement air will raise the internal negative air pressure (increase system resistance) and overtax the fan, severely decreasing exhaust flow rate. Under these conditions the fan will operate inefficiently with increased operating costs, and will cause air inside containment to flow well below the specified theoretical rate of 100 fpm (50 fpm for vertical air flow containment systems).

Openings required for air make-up are expected to total 1/5 of the enclosure cross-sectional area. A small amount of outside air may be drawn through overlapped seams in the containment enclosure. Additional air may have to enter through specially constructed air make-up points in the enclosure wall opposite the fan. Simple wooden-framed openings covered with furnace air filters can be installed to function as air make-up points. They will distribute the incoming air and prevent the outflow of airborne debris should the exhaust fan suddenly shut down. More elaborate air make-up points include louvered or baffled openings. Fans or blowers at air entry points to assist air flow into the containment enclosure are not required, nor are they desired.

- Are the air make-up points located at the opposite end of the enclosure from the exhaust fan so that the work area is between?
- Are the openings spaced and positioned to distribute make-up air evenly across the face of the enclosure at entry points?
- Is the total area of air make-up points, including openings in overlapped seams and joints, approximately 1/5 the cross-sectional area of the enclosure?
- Are air entry points sized to ensure air velocities through openings range between 200 and 500 fpm (divide air flow rate through opening by area of opening)?
- Are air make-up points covered by filters, like those used for furnaces, or louvered or baffled?

Other

- Has a design analysis of loads on the bridge from the containment enclosure been performed in accordance with Structure Division directives?
- Will the containment structure interfere with normal traffic operations, and if so, has a reasonable M&PT plan been provided?
- Have minimum clearances over waterways and railroads been maintained? Have construction plans been coordinated with appropriate authorities, i.e., U.S. Coast Guard, U.S. Army Corp of Engineers, etc.?
- Does the method of access to the enclosure and the working platform include safety and fall protection measures in compliance with OSHA?