Engineering Controls Requirements for Non-Hazardous Drugs

Developed by Carl LaBella of CSI Testing, Inc., the following flowchart details USP <797>'s engineering controls requirements for the compounding of all volumes of non-hazardous drugs. Look for a flowchart of the USP chapter's engineering controls requirements for hazardous and radioactive drugs in the September issue of *Pharmacy Purchasing & Products.*

Risk Category	Primary Engineering Control (PEC) PEC shall have unidirectional airflow *(an airflow moving in a single direction in a robust and uniform manner and at sufficient speed to reproducibly sweep particles away from the critical processing or testing area)*	Secondary Control	Room Air Change Requirement	Room Pressure Differential	Anteroom Secondary Control
Low or Medium Risk	LAFW (laminar airflow workbench), BSC (biological safety cabinet), or zone which meets ISO Class 5 while in operation. CAI (compounding aseptic isolator)/CACI (compounding aseptic containment isolator)	Cleanroom that has HEPA-filtered supply airflow introduced at the ceiling, and that meets ISO Class 7 while in operation.	≥30 room ACPH (Air Changes Per Hour) or ≥15 room ACPH with recirculating PEC providing ≥15 ACPH	0.02 to 0.05 inches water column positive from buffer room to pharmacy areas. If line of demarcation is used, displacement airflow at a rate of at least 40 FPM (feet per minute) from clean to less clean space.	ISO Class 8 cleanroom with positive pressure to adjacent areas *except* to the preparation room. Preparation room should be positive in relation to the anteroom. HEPA-filtered supply air with adequate ACPH required.
	CAI/CACI that maintains ISO Class 5 particle levels during dynamic operating conditions within the main chamber, and during transfers in and out of the main chamber.	None	None	None	None
Low Risk with ≤12-hour beyond-use dating (or as recommended in drug manufacturer's package inserts, whichever is less) before commencing administration to patient	If CAI/CACI does not maintain ISO Class 5 during dynamic operating conditions and/or during transfers, it must be located within the ISO Class 7 cleanroom. If located outside the ISO Class 7 cleanroom, the preparation is limited to ≤12-hour BUD or as recommended in manufacturer's package inserts, whichever is less. If LAFW or BSC must be located outside the ISO Class 7 cleanroom, the preparation is limited to ≤12-hour beyond-use dating or as recommended in manufacturer's package inserts, whichever is less.	Segregated compounding area restricted to sterile compounding activities. It may not have unsealed windows or doors that connect to the outdoors; have high traffic flow; or be adjacent to construction sites, warehouses, or food-preparation areas. Sinks may not be located adjacent to the PEC.	None	None	None
High Risk	LAFW, CAI, CACI, BSC, or zone which meets ISO Class 5 while in operation.	Cleanroom that has HEPA-filtered supply airflow introduced at the ceiling, and that meets ISO Class 7 while in operation.	≥30 room ACPH or ≥15 room ACPH with recirculating PEC providing ≥15 ACPH	0.02 to 0.05 inches water column positive from buffer room to pharmacy areas. No line of demarcation is permitted.	ISO Class 8 cleanroom with positive pressure to adjacent areas *except* to the preparation room. Preparation room should be positive in relation to the anteroom. HEPA-filtered supply air with adequate ACPH required.
	CAI/CACI that maintain ISO Class 5 during dynamic operating conditions within the main chamber, and during transfers in and out of the main chamber.	None	None	None	

Note: CAI and CACI are definitions established by the Controlled Environment Testing Association (CETA) in guidance documents CAG-001:2005 and CAG-002:2006 as meeting certain design and performance attributes.

USP established specific operational performance tests that must be carried out on CAIs/CACIs used for sterile drug compounding to determine whether the isolator may be located outside the cleanroom (buffer room) or whether the isolator can be used for hazardous drug compounding.