

The formulae $\frac{\partial \rho U_i}{\partial x_i} + \frac{\partial (\rho U_i U_j)}{\partial x_j} = -\frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j} \left(\mu \frac{\partial U_i}{\partial x_j} \right) + g_i (\rho - \rho_s)$ for building $\frac{\partial (\rho \bar{U}_i \bar{U}_j)}{\partial x_j} = -\frac{\partial P}{\partial x_i} + \frac{\partial}{\partial x_j} \left(\mu \frac{\partial \bar{U}_i}{\partial x_j} - \rho \bar{u}_i \bar{u}_j \right) + g_i (\rho - \rho_s)$ state of the art $\frac{\partial (\rho \bar{U}_i \bar{H})}{\partial x_i} = \frac{\partial}{\partial x_i} \left(\lambda \frac{\partial \bar{H}}{\partial x_i} - \rho \bar{u}_i \bar{H} \right)$ biomedical research facilities.

Veterinary Surgical Suites, Part-II

Last month, this series discussed the veterinary surgical suite, which is designed around a workflow that maximizes unidirectionality of animals and staff from clean to dirty spaces. Part I explored the Personnel, Animal, Material, and Equipment Flows. This month's article focuses on Operating Room (OR) design.

Large Animal Operating Rooms: The ceiling around the operating table requires a high level of coordination to accommodate general lighting, boom-mounted surgical lights, monitors, C-arms, video displays, medical gasses, Waste Anesthetic Gas recovery, pumps, robots, or other components as required to support the program. These structural loads may require extensive structural support above the ceiling. These rooms often utilize vertical laminar airflow, dedicating much of the ceiling to supply air diffusers (often HEPA-filtered) which deliver unidirectional airflow around the surgical field to reduce the likelihood of contamination. Low sidewall exhaust grills are placed around the room to promote uniform airflow and eliminate areas of stagnant airflow. Some facilities may require horizontal laminar flow, where the supply air is delivered by HEPA-filtered diffusers across one wall of the room and the exhaust air is removed on the opposite wall. Either approach will significantly impact room design; regardless, veterinary ORs should be designed to maintain 2.5 Pa positive pressure to adjacent spaces.

ORs should be sized to accommodate the potential largest animal and the most equipment and personnel-demanding procedure. The number of doors should be minimized using bidirectional flow into the Scrub Room and unidirectional flow from the Surgical Prep and Recovery Rooms. All doors must be automatically closing and configured for hands-free operation. ORs where animal dentistry is performed pose a heightened risk of aerosolization of infectious particles and require additional engineering and administrative controls to reduce exposure to pathogens, saliva, blood, and bacteria-laden debris. Similar risks exist for resuscitation activities that may occur in Recovery.

ORs are classified as "wet locations" and protected by either isolated ground or ground fault circuit interrupters as well as by wet location-listed in-service covers (not weatherproof covers, which only protect unused electrical receptacles). Facility design should provide ample electrical and data receptacles around the room and on ceiling-mounted columns (where provided). Surgical tables may also require power for heating and lifting systems.

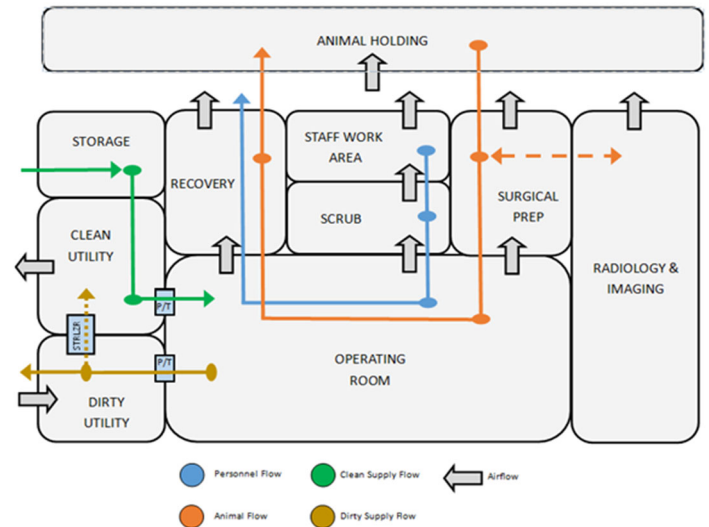


Figure 1: Diagram of various flows through a veterinary OR

Small Animal Operating Rooms: Small animal surgeries may be performed within procedure rooms; however, dedicated small animal surgical rooms are preferred, with downdraft tables to contain aerosols and anesthetic gas. In such cases, an entry anteroom should be considered to allow for positive pressurization of the surgical area without expelling suite air into the corridor.

Conclusion: The veterinary surgical suite is a complex facility that, regardless of facility program, must make every effort to minimize the risk of infection and the amount of time animals must be kept under anesthesia, the latter of which is directly correlated with minimized transport distances. Efficient, unidirectional flows of soiled utilities both reduce infection risk and the turnover time between surgeries.

References

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