NATIONAL ENERGY MANAGEMENT INSTITUTE COMMITTEE

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RE: Opposition to the Proposed California Mechanical Code Change Allowing Plenum Return Air in Certain Areas of OSHPD 3 Clinics.

Dear Mr. Gall,

On behalf of the National Energy Management Institute Committee, I write this letter in opposition to the proposed changes to the California Mechanical Code allowing plenum return air in the OSHPD 3 Clinics.

The use of a plenum return-air system within any area of a healthcare facility, clinic, or treatment center provides a greater risk for airborne and waterborne disease infection to building occupants, especially at risk patients and healthcare workers. This is due to the sharing of a common return-air plenum whereas a ducted return-air system is isolated to each HVAC system. If a common return-air plenum becomes a reservoir for infection, containing dust, moisture and mold, it will distribute infection more widely than a ducted and isolated return-air system.

If not properly designed plenums can be depressurized below ambient pressure and outdoor air can be drawn into the building. The differential in outside air temperature entering the air temperature of the plenum space can result in increased energy load and condensation resulting in the growth of mold. *Bahnfleth, W., et al. (2008), 3*

Return air flows from different zones mix in the plenum space where contaminants may transfer (cross contamination) throughout the building by pressurization or through the HVAC system. Within the common plenum return the HVAC system will spread the contaminant as if the building was one ventilation zone. ASHRAE (2003) and NIOSH (2002) suggest routing ductwork to each air handler to avoid cross contamination.

In contrast, ducted returns eliminate the depressurization across the ceiling and building envelope and minimize the potential for unplanned airflow, moisture problems and contaminants on the outside of the HVAC ducted system from entering the air flow. *Bahnfleth, W., et al. (2008), 27*

As a result of advances in medical technology and therapies, the immune systems of more patients are becoming compromised in the course of treatment. Therefore, these patients are at greater risk for acquiring health-care associated infections. Routine maintenance, renovation and new construction in health care facilities, clinics and treatment centers pose airborne and waterborne disease threats for patients who are susceptible to infection. The increasing need for repair, remediation and updating of aging health-care facilities, clinics and treatment centers (e.g. installing telecommunication wiring, removal/replace ceiling tiles, installation and inspection of fire/smoke dampers, and routine filter maintenance) located above the ceiling in the return-air plenum space which is in or adjacent to patient treatment and consultation rooms increase the risk of infection for the occupants of the building.

In a ducted closed HVAC system a maintenance worker or inspector can access the area above the ceiling without destabilizing the airflow. This is not true for the area above the ceiling which is the return-air plenum. Once penetrated, the return-air plenum is disturbed creating change in air flow throughout all zones that share the common plenum and subjecting those areas to contamination of dust, debris and infectious disease housed in the return-air plenum, which serves as a reservoir in the chain of infection. *Sehulster, LM, et al. (2004)4-6*

In the chain of infection, the reservoir is where the microorganism resides, thrives and reproduces. The return-air plenum potentially can function as a reservoir for disease, and when disturbed the contaminants enter the airflow of the building. *Virginia Department of Health (2011)*

The following are excerpts taken from the American Society of Heating Refrigerating and Air Conditioning Engineers ASHRAE Position Document on Airborne Infectious Diseases
©ASHRAE www.ashrae.org ASHRAE Position Document on Airborne Infectious Diseases, 2014.

Some infectious diseases are transmitted through the inhalation of airborne infectious particles, which can be disseminated through buildings by pathways that include ventilation systems.

Societal disruption from epidemics and the unexpected transmission of disease in workplaces, public access facilities, and transportation warrants further research on the effectiveness of engineering controls.

Recommendations:

- Multidisciplinary teams of engineers, building operators, scientists, infection prevention specialists, and epidemiologists should collaborate to identify and implement interventions aimed at mitigation of risk from airborne infectious disease and understand the uncertainty of the effectiveness of current practice recommendations.
- Committees that write and maintain practice standards and guidelines for critical environments such as health-care facilities and crowded shelters should consider recent research and understanding of infectious disease control and consider adding or strengthening requirements for the following:

- Improve particle filtration for central air handlers
- Upper-room and possibly other UVGI interventions or at least the ceiling heights and electrical infrastructure to quickly deploy them
- The ability to quickly and temporarily increase the outdoor air ventilation rate in the event of an infectious disease outbreak
- Avoiding unintended adverse consequences in infectious disease transmission resulting from lower ventilation levels motivated solely by reduced energy consumption
- Airborne infectious disease researchers should receive input on study design, methodology, and execution from many discipline experts (including engineers, infection prevention specialists, health-care epidemiologists, public health officials, and others) to provide a better picture of the interplay between building systems and disease. *ASHRAE (2014) (Excerpt pgs. 14, 15)*

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Pressure differentials in buildings move airborne contaminants from areas with relatively higher pressure to areas with relatively lower pressure. The HVAC system is generally the predominate pathway for air movement throughout a building.

As supply-air enters a room(s) it is diverted or obstructed by partitions, walls, furnishings, and the occupants of the room. As the flow of air returns to the HVAC air handling unit it carries with it any contaminants of the room(s), as well as, contaminants existing in the common/shared return-air plenum.

The movement of people throughout a building carry contaminants and pollutants, therefore the entire building, chases, corridors, office spaces, treatment rooms, consultation rooms, etc., are all part of the air distribution system feeding into the common return-air plenum.

When an indoor-outdoor temperature differential creates a stack effect, whereby the heated air escapes the upper levels of the building and as it is being replaced by drawing outside air through the building envelope, it brings with it the potential for contamination room-to-room or directly into the return-air plenum. The stack effect can move contaminants from floor to floor through, chases, stairwells and other openings.

In order to control contaminants the HVAC system can be designed to operate so that pressure relationships between rooms are controlled. This requires precision control of the airflow into and out of each room. Control of pressure relationships is critically important in buildings with special areas. Lobbies and buildings in general are often designed to operate under positive pressure (more air is supplied into the room than is removed) to minimize contamination. Note: Without proper operation and maintenance, these pressure differences are not likely to remain as originally designed and with the shared use of a common return-air plenum it would be difficult to isolate contamination to only a portion of HVAC system. *(EPA/HHS) (1991) 8-10*

For these reasons, the National Energy Management Institute Committee opposes the proposed changes to the California Mechanical Code which allow for the use of plenum return air in the OSHPD 3 Clinics. I hope you will consider the information provided in this letter. Please feel free to contact me if you require additional information.

Very truly yours,

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-References

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