INTERNATIONAL MECHANICAL CODE

M1-03/04
106.3.1

Proposed Change as Submitted:

Proponent: Carl A. Longino, Greenville County, SC

Revise as follows:

106.3.1 Construction documents. Construction documents, engineering calculations, diagrams and other data shall be submitted in two or more sets with each application for a permit. The code official shall require construction documents, computations and specifications to be prepared and designed by a registered design professional when required by state law. <u>Where special conditions exist, the code official is authorized to require additional construction documents to be prepared by a registered design professional.</u> Construction documents shall be drawn to scale and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that the work conforms to the provisions of this code. Construction documents for buildings more than two stories in height shall indicate where penetrations will be made for mechanical systems, and the materials and methods for maintaining required structural safety, fire-resistance rating and fire blocking.

Exception: (No change)

Reason: To be consistent with the administration requirements in IBC 106.1. Complex mechanical systems often contain special conditions that can require a registered design professional. Many boiler, high heat, and appliances installed in hazardous areas can provide dangerous situations despite the building size.

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: The term "special conditions" is vague and undefined. The requirement is overly restrictive and could create conflicts with existing state and local ordinances concerning construction documents.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Tony Longino, County of Greenville, SC, requests Approval as Submitted.

Commenter's Reason: The committee disapproved this section because the term "special conditions" was vague and undefined. This term was taken directly from the administration section of the IBC.

106.1 Submittal documents. Construction documents, special inspection and structural observation programs, and other data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. **Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.**

The IRC contains the exact same language.

R106.1 Submittal documents. Construction documents, special inspection and structural observation programs, and other data shall be submitted in one or more sets with each application for a permit. The construction documents shall be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. **Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.**

The only change in this language is from "Building official" to Code Official.

M7-03/04
304.3

Proposed Change as Submitted:

Proponent: Steve Hamblin, Layton City Corporation, UT, representing Utah Chapter of ICC

Revise as follows:

304.3. Elevation of ignition source. Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor-fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. Such equipment and appliances shall not be installed in Use Group H occupancies or control areas where open use, handling or dispensing of combustible, flammable or explosive materials occurs. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage. <u>Rooms or spaces that communicate directly with a parking garage through openings and that contain fuel-burning appliances, shall also comply with Section 406.2.8 of the *International Building Code.*</u>

Proponent's Reason: Inclusion of this language will assure that this section of the IBC is not overlooked in both design and review of plans for parking garages.

Cost Impact: None

Committee Action: **Approved as Modified**

Modify proposal as follows:

304.3. Elevation of ignition source. Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor-fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. Such equipment and appliances shall not be installed in Use Group H occupancies or control areas where open use, handling or dispensing of combustible, flammable or explosive materials occurs. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage. ~~Rooms or spaces that communicate directly with a parking garage through openings and that contain fuel-burning appliances shall also comply with Section 406.2.8 of the *International Building Code*~~.

304.3.1 Parking garages. Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the appliance are elevated in accordance with Section 304.3.

Committee Reason: Based on the proponent's published reason. The modification deletes the new proposed language and adds the IBC language for parking garage connections.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Dennis Martinelli, Fairfax County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

304.3. Elevation of ignition source. Equipment and appliances having an ignition source and located in hazardous locations and public garages, private garages, repair garages, automotive motor-fuel-dispensing facilities and parking garages shall be elevated such that the source of ignition is not less than 18 inches (457 mm) above the floor surface on which the equipment or appliance rests. Such equipment and appliances shall not be installed in Use Group H occupancies or control areas where open use, handling or dispensing of combustible, flammable or explosive materials occurs. For the purpose of this section, rooms or spaces that are not part of the living space of a dwelling unit and that communicate directly with a private garage through openings shall be considered to be part of the private garage.

> **Exception:** Elevation of ignition source is not required for appliances that are listed as flammable vapor resistant and for installation without elevation.

304.3.1 Parking garages. Connection of a parking garage with any room in which there is a fuel-fired appliance shall be by means of a vestibule providing a two-doorway separation, except that a single door is permitted where the sources of ignition in the appliance are elevated in accordance with Section 304.3.

> **Exception:** This section shall not apply to appliance installations complying with Section 304.5.

Commenter's Reason: Without this proposed text, installations complying with Section 304.5 would not be recognized as an approved method of appliance installation without a one or two-doorway separation. This is a simple fix to continue permitting a proven installation method that has a safe track record.

M11-03/04
306.7

Proposed Change as Submitted:

Proponent: John N. Terry, C.B.O., State of New Jersey, representing Dept. of Community Affairs, Division of Codes and Standards

Add new text as follows:

306.7 Access. Access to air-handling units and furnaces shall be controlled by the use of locked doors or panels or other security measures.

Proponent's Reason: Air-handling units, furnaces and self-contained equipment (all defined terms) offer the potential for people to introduce chemical and biological toxins into the building's HVAC system. By restricting access to such systems, the threat of introducing airborne toxins into and throughout the building is reduced.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: The proposed language would be difficult to enforce. Equipment security should be addressed in the installation instructions or the standards.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John N. Terry, C.B.O., State of New Jersey, Dept. of Community Affairs, requests Approval as Submitted.

Commenter's Reason: This proposed change was submitted with a package of changes to address building issues as a result of the tragedy at the World Trade Center. The consensus of the Code Development Committees and the membership in general has been to take the "wait and see" approach until the NIST Report on the WTC is published later this year. It is our belief that this is an incorrect approach. We think that "what happened" and "what needs to be done about it" are well understood. Our concern is that there is technical work to be done on this issue and that work does not need to wait for the NIST Report to be published. We think that the work on these issues can begin now.

The supporting statement published with the original code change proposal accurately reflects our position on the change. The committee disapproved this proposed change because "Equipment security should be addressed in the installation instructions or the standards." We disagree. Equipment installation instructions deal with the installation of the equipment into a building, not with the requirements for the building in which the equipment is located. It is for these reasons that we respectfully request the membership to vote for M 11-03/04 as submitted.

M12-03/04
307.2.3

Proposed Change as Submitted:

Proponent: Carl A. Longino, County of Greenville, SC

Revise as follows:

307.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 307~~.2.1,~~ a secondary drain or auxiliary drain pan shall be required for each cooling coil, ~~or~~ evaporator coil or fuel-fired condensing appliance where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. One of the following methods shall be used:

(No change to Items 1, 2 or 3)

Reason: Evaporators and cooling coils are no longer the only equipment that produce condensate. All condensing furnaces are equipped with exhaust fans with drain ports that require drains to be run to the outside. Most manufacturers of condensing furnaces recommend a pan under their equipment. However a recommendation is not enforceable. Furnace drains are equally subject to stoppage and obstructions as cooling or evaporator coils, produce the same condensate, and damage building components in the same way.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: The change is unnecessary; the standards for this equipment already address secondary drains.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Robert Adkins, Prince William County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

307.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 307, a secondary drain or auxiliary drain pan shall be required for each cooling ~~coil~~ or evaporator coil or fuel-fired ~~condensing~~ appliance that produces condensate, where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. One of the following methods shall be used:

(No change to Items 1, 2 or 3)

> **Exception:** Fuel fired appliances that automatically shut down operation in the event of a stoppage in the condensate drainage system.

Commenter's Reason: This proposal was disapproved based on the assumption that the appliance standard requires this type of appliance to shut down in the event of condensate stoppage. The construction standards these appliances must comply with do not require shut-down, but rather, only offer shut-down as an alternative. This provides the allowance when the appliance is manufactured to prevent condensate overflow into the structure. The only time this added language is applicable is when a particular condensing appliance is installed without a cooling coil.

Public Comment 2:

Tony Longino, County of Greenville, SC, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

307.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 307 a secondary drain or auxiliary drain pan shall be required for each cooling ~~coil,~~, evaporator coil ~~or fuel-fired condensing appliance~~ or Category IV condensing appliance where damage to any building components will occur as a result of overflow from the equipment drain pan or stoppage in the condensate drain piping. One of the following methods shall be used:

(No change to Items 1, 2 or 3)

Commenter's Reason: The committee disapproved this section on the basis that condensing appliances were equipped with water detection devices that address the problem of drain blockage or drain failure as an industry standard. To my knowledge, no condensing appliance is equipped with such a provision. In fact many manufacturers require drain pans to be installed under their appliances where damage can occur in their installation instructions. Some examples are Heil, Tempstar, Arco-air and Comfortmaker. Some Manufacturers recommend pans for this type of installation, while others do not address the problem at all. One manufacturer even has a disclaimer stating it cannot be held responsible for condensation damage caused by loose or damaged hoses, yet approves the appliance to be installed on wood floors.

The change from fuel –fired condensing appliances to Category IV condensing appliance was made to be consistent with IRC 1411.4, which was approved as submitted by the committee at the 2003/2004 public hearing

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M16-03/04
401.5.1

Proposed Change as Submitted:

Proponents: Shahriar Amiri, Montgomery County, MD, representing Montgomery County Dept. Of Permitting Services

James Anjam, Arlington County, VA, representing VPMIA/VBCOA

Revise as follows:

401.5.1 Intake openings. Mechanical and gravity outdoor air intake openings shall be located a minimum of 10 feet (3048 mm) horizontally from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code. Where a source of contaminant is located within 10 feet (3048 mm) horizontally of an intake opening, such opening shall be located a minimum of 2 feet (610 mm) below the contaminant source.

Reason: (Amiri) The purpose of this proposal is to state the intent of the code. The current code is silent on how to measure the distance.

(Anjam) This added term clarifies the intent and provides the user information relating to how to measure these locations.

Cost Impact: None

Committee Action: Approved as Submitted

Committee Reason: Based on the proponent's published reason.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment 1:

Frank Stanonik, representing GAMA, requests Disapproval.

Commenter's Reason: We disagree with the Committee's support of the proponent's reasons. This proposal will not clarify the code, but only add further confusion. This proposal establishes an infinitely high, 20 foot-wide zone above a contaminant in which an air intake opening may not be located.

M17-03/04
401.5.1

Proposed Change as Submitted:

Proponent: James Anjam, Arlington County, VA, representing VPMIA/VBCOA

Revise as follows:

401.5.1 Intake openings. Mechanical and gravity outdoor air intake openings shall be located a minimum of 10 feet (3048 mm) from any hazardous or noxious contaminant, such as vents, chimneys, plumbing vents, streets, alleys, parking lots and loading docks, except as otherwise specified in this code. Where a source of contaminant is located within 10 feet (3048 mm) of an intake opening, such opening shall be located a minimum of 2 feet (610 mm) below the contaminant source.
The exhaust from a bathroom or kitchen in a residential dwelling shall not be considered to be a hazardous or noxious contaminant.

Reason: The committee's opposition to this was that someone may have an allergy to something from the next-door neighbor and this would take away the 10-2 clearances. Absolutely, this will remove the overly restrictive 10-2 requirements for the application of motels, hotels, and apartments. These type structures usually do not have the 10-2 availability due to the window locations, however, most jurisdictions allow these terminations to occur within the 10-2 distance based on the facts that there are no supporting claims that either of these items will create physical harm to occupants of residential structures. These two items are left up to each jurisdiction to decide whether or not the 10-2 clearances are applied to residential window openings. While some of these odors may appear mildly offensive, they cannot be defined as hazardous or a noxious contaminant. The residential window opening can be closed for a short period of time and reopened later. The code needs to address what is currently being applied in the industry and this proposal is the solution.

Cost Impact: None

Committee Action: Approved as Submitted

Committee Reason: Based on the proponent's published reason.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Gary Miller, City of Irving, TX, representing the North Texas Chapter of ICC, requests Disapproval.

Commenter's Reason: We agree with the proponent's stated intent, but believe that the proposal should be disapproved for two reasons:

1) A change to section 401.5.1 should be accompanied by a similar change to section 501.2 to avoid creating an unintended conflict between the two sections.
2) The proposed change is unclear as to whether it is intended to restrict the excepting language to a single kitchen or bathroom exhaust or is intended to allow the combined exhaust ducts from multiple kitchens or bathrooms to vent in the specified locations.

If a modified proposal is submitted addressing these concerns, we will be in support of the proposal.

M19-03/04
401.5.1.1

Proposed Change as Submitted:

Proponent: John N. Terry, C.B.O., State of New Jersey, representing Dept. Of Community Affairs, Division of Codes and Standards

Add new text as follows:

401.5.1.1 Height above grade. All mechanical outdoor air intake openings shall be located a minimum of 20 feet above adjoining grade.

Exceptions:
1. Intakes that are integral to rooftop mounted equipment where access to the equipment is limited by approved security measures.
2. Intake openings that serve individual dwelling units and guest rooms.

Reason: Outdoor intake openings offer the potential for people to introduce chemical and biological toxins into the building's HVAC system. By raising and/or restricting access to such openings, the threat of introducing airbome toxins into and throughout the building is reduced. Since individual intake openings that serve single residential units would not disperse contaminants throughout the building, they are exempt.

Committee Action: Disapproved

Committee Reason: The proposed language would be difficult to enforce. Equipment security should be addressed on a case-by-case basis for buildings susceptible to terrorist attack. It should not be a base requirement for all buildings.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

John N. Terry, C.B.O., State of New Jersey, Dept. of Community Affairs, requests Approval as Submitted.

Commenter's Reason: This proposed change was submitted with a package of changes to address building issues as a result of the tragedy at the World Trade Center. The consensus of the Code Development Committees and the membership in general has been to take the "wait and see" approach until the NIST Report on the WTC is published later this year. It is our belief that this is an incorrect approach. We think that "what happened" and "what needs to be done about it" are well understood. Our concern is that there is technical work to be done on this issue and that work does not need to wait for the NIST Report to be published. We think that the work on these issues can begin now.

The supporting statement published with the original code change proposal accurately reflects our position on the change. The committee disapproved this proposed change because "Equipment security should be addressed on a case-by-case basis for buildings susceptible to terrorist attack." We disagree. In today's society, we, as code enforcement personnel, have a responsibility to provide for a safe built environment. As much as we hate to admit it, we need to address the issue of threat assessment. This proposed change does not increase the cost of construction and reduces the likelihood of airborne contaminants being introduced into and throughout the built environment that we are charged with protecting. It is for these reasons that we respectfully request the membership to vote for M 19-03/04 as submitted.

M20-03/04
403.2

Proposed Change as Submitted:

Proponent: Gene Pirtle, City of Fort Worth, representing Department of Development

Add new text as follows:

403.2 Outdoor air required. The minimum ventilation rate of required outdoor air shall be determined in accordance with Section 403.3.

> **Exception:** Where the design professional demonstrates that an engineered ventilation system is designed in accordance with ASHRAE 62, the minimum required rate of outdoor air shall be permitted to be as specified in such engineered system design.

Reason: Recognize the most commonly used standard as an alternate design method.

Analysis: ASHRAE 62 has not been referenced in the code because it is not believed to be enforceable and has not previously complied with ICC policy for referenced standards.

Cost Impact: None

Committee Action: Approved as Modified

Modify proposal as follows:

403.2 Outdoor air required. The minimum ventilation rate of required outdoor air shall be determined in accordance with Section 403.3.

> **Exception:** Where ~~the~~ a registered design professional demonstrates that an engineered ventilation system is designed in accordance with either the Ventilation Rate Procedure or the Indoor Air Quality Procedure of ASHRAE 62, the minimum required rate of outdoor air shall be permitted to be as specified in such engineered system design.

Committee Reason: Provides a direct reference to design methods to assist the design professional and the code official in evaluating alternate design methods. The modification adds specific design methods within ASHRAE 62.

Assembly Action: Disapproved

Individual Consideration Agenda

This item is on the agenda for individual consideration because an assembly action was successful and public comments were submitted.

Public Comment 1:

Frank Stanonik, representing GAMA, requests Disapproval.

Commenter's Reason: Delete the proposal in its entirety. We support the action recommended by the Assembly, ASHRAE Standard 62 should not be referenced.

Public Comment 2:

Guy Tomberlin, Fairfax County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

403.2 Outdoor air required. The minimum ventilation rate of outdoor air shall be determined in accordance with Section 403.3.

Exception: Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.

~~**Exception**: Where a registered design professional demonstrates that an engineered ventilation system is designed in accordance with either the Ventilation Rate Procedure or Indoor Air Quality Procedure of ASHRAE 62, the minimum required rate of outdoor air shall be permitted to be as specified in such engineered system design.~~

Commenter's Reason: The floor action in Nashville was to disapprove this proposal. Comparing IMC Section 403.2 in the 2003 code with the same section in the 1996 code reveals that while both prescribe minimum ventilation standards (derived from ASHRAE 62), only the 1996 code expressly stated that *"where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design."* The unfortunate elimination of this wording from the IMC after the 1996 code understandably lead to the proponent's code change proposal, notwithstanding the fact that code officials are already otherwise empowered to approve any code modification request that clearly demonstrates that the alternative design will provide "equivalence" to the prescriptive standards of the code.

However, there is a significant problem in trying to remedy the concerns of the code change proponent by requiring the code official to automatically approve any design based on any of the provisions of ASHRAE 62. That's because not all of the provisions of ASHRAE 62 produce air quality results equivalent to the ventilation rate tables contained in ASHRAE 62, and hence, contained in the IMC. Simply stated, the "Ventilation Rate Procedure" in ASHRAE 62 presumes that CO2 can be used as a "indicator" of the presence of more objectionable gases, vapors and orders associated with human occupancy, and that if sufficient ventilation is provided to limit the rise of CO2 during human occupancy of a facility, then the accumulative of these other substances will remain within "comfort" tolerances for human habitation. ASHRAE 62 goes on to establish that a 700 PPM (parts per million) rise in CO2 concentrations (above ambient conditions) during such occupancy should be considered the upper limit of such contamination. Not surprisingly, the prescriptive ventilation rates contained in the ASHRAE standards, for the presumed "metabolic activity level" associated with the human activity within each occupancy use group, do indeed limit the CO2 rise to about 700 PPM above ambient conditions.

Inexplicably, there is a single sentence within ASHRAE 62 that says *"Where peak occupancies of less than three hours duration occur, the outdoor air flow rate may be determined on the basis of average occupancy for buildings for the duration of operation of the system, provided the average occupancy used is not less than one-half the maximum."* This seemingly logical concession for limited duration occupancies can result in CO2 concentrations double the level established by the ASHRAE standard itself, for virtually the entire period the facility is occupied. (Consider the typical school, where classrooms are occupied for 50-minute periods, with 10 minute breaks between classes, and the HVAC runs 24 hours per day.)

Please reject the IMC Committee action, and re-institute the qualifying language that existed in the 1996 IMC to clarify to all that maintenance of air quality is the objective, not some arbitrary ventilation rate.

M21-03/04

403.2.1

Proposed Change as Submitted:

Proponent: Ken Schoonover, P.E., KMS Associates, Inc., representing Airxchange, Inc.

Revise as follows:

403.2.1 Recirculation of air. The air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one dwelling to another or to dissimilar occupancies.

2. Supply air to a swimming pool and associated deck areas shall not be recirculated unless such air is dehumidified to maintain the relative humidity of the area at 60 percent or less. Air from this area shall not be recirculated to other spaces where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.

3. Where mechanical exhaust is required by note b in Table 403.3, recirculation of air from such spaces shall be prohibited. All air supplied to such spaces shall be exhausted, including any air in excess of that required by Table 403.3.

4. Where mechanical exhaust is required by note h in Table 403.3, mechanical exhaust is required and recirculation is prohibited where 10 percent or more of the resulting supply airstream consists of air recirculated from these spaces.

TABLE 403.3
REQUIRED OUTDOOR VENTILATION AIR

OCCUPANCY CLASSIFICATION
Correctional Facilities Cells (with plumbing fixtures) ~~b,~~ g, h
Education Locker rooms ~~b,~~ h
Hotels, motels, resorts and dormitories Bathrooms ~~b,~~ g, h
Private dwellings, single and multiple Toilet rooms and bathrooms g, h
Public spaces Locker rooms ~~b~~ h Shower rooms (per showerhead) ~~b,~~ g, h Toilet rooms ~~b,~~ g, h

(Remainder of table unchanged)

a. (No change)

b. Mechanical exhaust required and the recirculation of air from such spaces as permitted by Section 403.2.1 is prohibited [see Section 403.2.1 Items 1 and 3].

c. through g. (No change)

h. Mechanical exhaust is required and recirculation is prohibited except that recirculation shall be permitted where the resulting supply airstream consists of not more than 10 percent air recirculated from these spaces [See Section 403.2.1 Items 2 and 4].

Reason: The purpose of this change is to relax the prohibition on recirculation of air from certain rooms and spaces consistent with ASHRAE 62. The reason for the change is that an absolute ban on recirculation from certain rooms is unfounded and presents a significant barrier to the use of technology that recovers energy from exhaust air to reduce the load on heating and cooling systems from required outdoor ventilation air. The technology and these systems are referred to as energy recovery ventilation (ERV) systems.

Last cycle the membership adopted a new section in Chapter 5 with basic provisions for the installation of energy recovery ventilation systems. Clearly, the growing use of ERV systems is being acknowledged and the provisions of Chapter 5 establish the appropriate installation requirements and limitations. It must also be recognized that most of the various types of ERV systems on the market today by their nature cannot completely eliminate leakage between the exhaust and supply airstreams. The ERV industry is working toward and may someday reach the goal of zero leakage, but that simply is not feasible today. Many systems on the market have been engineered to the point that actual leakage is under 5%. This proposal uses 10%, not only for consistency with the proposed revisions to ASHRAE 62, but also to provide a level playing field for the entire industry. Ten percent is a limitation that all current suppliers of ERV systems can meet and this proposal will therefore not have the effect of creating an advantage for one type of system over another or one manufacturer over another.

More importantly, the absolute ban on recirculation presents a significant barrier to the use of energy recovery technology. The lack of opportunity to recover energy from the exhaust air of toilet room and locker rooms unnecessarily limits the overall effectiveness and feasibility of ERV technology -- the energy in that air is lost to the atmosphere because of the absolute ban on recirculation. Further, in ventilation systems in which the air being exhausted is a mixture of air from toilet rooms and other spaces where recirculation is allowed, the problem is compounded -- none of that air can be subject to energy recovery since some the leakage would involve toilet room air -- and that air is even more diluted than exhaust air that consists entirely of toilet room air. ERV technology is a highly effective and cost beneficial means of energy conservation. ASHRAE 90.1 and the IECC in fact require the use of ERV systems within certain threshold conditions. The absolute ban on recirculation works at cross-purposes with the objectives of ASHRAE 90.1 and the IECC. This proposal will reconcile that problem without jeopardizing the fundamental health and safety objectives of the IMC.

ADDENDUM Y TO ASHRAE 62-99
ASHRAE 62 is the standard on which the ventilation provisions in the IMC are based. This proposed change is consistent with ASHRAE Addendum 62y that is currently under consideration within ASHRAE. In summary, the ASHRAE addendum will establish 5 classifications of air and allows, limits or prohibits recirculation based on those classifications.

The classifications are described by subjective statements of degree of contaminant concentration, sensory-irritation intensity, and offensiveness of odor. Class 1 air has the least or lowest negative characteristics (i.e. is the cleanest air) and Class 5 has the greatest or highest negative characteristics (i.e. is the dirtiest air). Recirculation of Class 1 air is completely unrestricted. Public and private toilet rooms, locker rooms, bathrooms in hotels resorts and dormitories, swimming pool and deck areas and prison cells with toilets are designated as Class 2 spaces. <u>The addendum would allow Class 2 air to be redesignated Class 1 if it is diluted with Class 1 air or outside air such that no more than 10% of the resulting air stream consists of Class 2 air.</u> This is expressly intended by the addendum to enable the application of energy recovery technology to air from these spaces.

ODOR VERSUS HEALTH ISSUES
Medical and research sectors represented on the ASHRAE 62 committee have long affirmed that there is no health issue related to toilet room exhaust. The issue is one of odor perception. In the broadest sense, odor perception is not a health and safety issue and should therefore not be used as a basis for determining code requirements. This proposal is not asking that the code ignore odor entirely, only that allowing 10% recirculation from the spaces indicated is reasonable and justified. The absolute ban on recirculation is not justified from a health and safety standpoint, and in any case, is unfounded given that air from toilet rooms leaks to adjacent spaces whenever the door opens and closes. The critical factor is that as long as there is sufficient dilution of toilet room exhaust air, a small amount of recirculated air is irrelevant. Odor control is more appropriately a matter for the designer to consider, and if given the allowance of 10% recirculation, odor happens to be an issue for a particular project, which is extremely unlikely, it can be resolved as a design consideration.

DISCUSSION OF SPECIFIC TEXT REVISIONS
403.2.1(2): ASHRAE Addendum 62y classifies air from pool and pool deck areas as Class 2 air. This allows for recirculation of a portion of the air consistent with the addendum and makes such air eligible for application of energy recovery technology.

403.2.1(3): This proposal is not seeking to relax all of the current restrictions on recirculation. Note b and the absolute prohibition on recirculation will still apply to some of the entries in the table (e.g. smoking lounges, autopsy rooms, garages). This proposal would also have no effect on other provisions of the code that prohibit recirculation in hazardous exhaust systems. The scope of this paragraph now would have to be limited to those entries where note b is specified for correlation with those cases in which limited recirculation would now be allowed.

403.2.1(4): This limited allowance for recirculation is consistent with ASHRAE Addendum 62y and matches the same limitations and conditions in the addendum for recirculation of Class 2 air. Specifically, it is limits the content of the new supply airstream to no more than 10% of air taken from Class 2 spaces. All of the spaces to which this new footnote will apply are classified by the addendum as Class 2 spaces.

Table 403.3: Reference to footnote b is deleted and replaced with a reference to the new footnote h. The new footnote establishes the limited extent to which recirculation would be permitted for these spaces, consistent with ASHRAE Addendum 62y. These are the only spaces in which the recirculation restriction is relaxed.

Footnote b to Table 402.3: This is for correlation with the revisions to Section 403.2.1. Paragraph (2) and the new paragraph (4) under this proposal will allow limited recirculation of air. Paragraphs (1) and (3) will now be the only paragraphs that relate to the application of note b and the absolute prohibition on recirculation. This will provide a precise and clear indication of the text that is relevant to footnote b.

Footnote h to Table 402.3: This is for correlation with the text proposed for 403.2.1(2) and (4). The footnote follows the consistent and useful format for tables in which a footnote captures the provision stated elsewhere in text and references the applicable section for the convenience of the code user. The limited allowance of recirculation applies only to those spaces that are indicated with reference to footnote h. (This footnote may be more logically positioned as a new footnote c to follow current footnote b. It was proposed as footnote h only to simplify presentation of the proposed change and to avoid having to clutter the proposal with showing the editorial redesignation of existing footnote letters.)

Bibliography:
ASHRAE Proposed Addendum 62y

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: The addendum to ASHRAE 62 was not completed for committee consideration.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ken Schoonover, KMS Associates, Inc., representing Airxchange, Inc., requests Approval as Submitted.

Commenter's Reason: The committee disapproved the proposed change because the addendum to ASARAE 62 that would incorporate these revisions was not finalized at the time of the public hearing. I expect the revision to ASHRAE 62 to be finalized before the final action hearing. This proposed change would then eliminate a significant difference between the IMC and ASHRAE 62, which is the standard on which the model codes have long based their ventilation requirements.

M31-03/04
403.3.1

Proposed Change as Submitted:

Proponent: Devon Cortright, H2L Consulting Engineers

Revise as follows:

403.3.1 System operation. The minimum flow rate of outdoor air that the ventilation system must be capable of supplying during its operation shall be permitted to be based on the rate per person indicated in Table 403.3 and the actual number of occupants present.

> <u>**Exception:** Where the occupants are the primary source of pollutants in a space, the flow rate of outdoor air provided by the ventilation system shall be permitted to be modulated such that it maintains the concentration of CO_2 in the occupied space at a level that is not greater than 700 parts per million (ppm) higher than the CO_2 concentration in the outdoor air. The occupants shall be considered the primary source of pollutants in assembly occupancies.</u>

Reason: <u>**Purpose:**</u> The proposed change references methods and technology that is readily available.

As currently written Section 403.3.1 requires the introduction of a specific quantity of outside air based on the "actual number of occupants present". This could be interpreted to require the installation of automatic devices capable of identifying the actual number of persons present. This is beyond what is currently available in a cost effective manner. The proposed change would officially recognize a method of modulating outside air that is readily accepted, cost effective and accomplishes the intent of Section 403.3.1.

Reasons: The concentration of CO2 in a space is a generally accepted indication of the number of, and activity level of the occupants of a space. Cost effective CO2 sensors are readily available that are capable of modulating the outside air as described above.

Substantiation: The American Society for Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 62-1999 Section 6.1.3 states "Comfort criteria with respect to human bioeffluents are likely to be satisfied if the ventilation results in indoor CO2 concentrations less than 700 ppm above the outdoor concentration.

Cost Impact: None

Committee Action: Approved as Modified

Modify proposal as follows:

403.3.1 System operation. The minimum flow rate of outdoor air that the ventilation system must be capable of supplying during its operation shall be permitted to be based on the rate per person indicated in Table 403.3 and the actual number of occupants present.

> ~~**Exception:**~~ Where the occupants are the primary source of pollutants in a space, the flow rate of outdoor air provided by the ventilation system shall be permitted to be modulated such that it maintains the concentration of CO_2 in the occupied space at a level that is not greater than 700 parts per million (ppm) higher than the CO_2 concentration in the outdoor air. The occupants shall be considered the primary source of pollutants in assembly occupancies.

Committee Reason: Based on the proponent's published reason. The modification deletes the word "exception" and makes the new language a second paragraph instead of an exception.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Len Damiano, EBTRON, Inc., requests Disapproval.

Commenter's Reason: Remove all additional text approved by the committee. Return section to its original language.

The proposal should be disapproved in its current form, because:

1. The proposed method of control is not sufficiently defined in the proposal.
2. The proposal does not identify the needed application and structure type limitations to the means proposed for ventilation control for intermittent and variable occupancy spaces. It should not be applicable to an entire occupancy type due to the mixture of space types within the structure (e.g. church offices, bible classrooms, theater management and administration offices, etc.) It should not be applicable to non-assembly building types, those with relatively stable occupancies or any with lesser densities.
3. No justification is included for the stated conclusion that all "assembly" occupancies can be considered devoid of space generated contaminants, requiring no additional dilution ventilation for contaminant sources other than those occupant-related.
4. Without dilution-related contaminant control, source control is necessary and is not indicated as a requirement.
5. Original section language already allows use of other non-CO_2 based methods of Demand Controlled Ventilation (DCV) for variable and intermittent occupancy, providing that maximum design or a more accurate count of actual occupants is used.
6. The proposal gives no indication how the "primary source of pollutants" in a space are to be determined, or how its determination can be identified, regulated and enforced.
7. There are multiple methods of applying CO_2 sensing for ventilation control and the method of control selected is critical to the results. "DCV" does not define a specific method of CO_2 control. No description of the proposed method of control was included, other than limited references used in the substantiation.
8. The proposal is unable to satisfy IMC 403.3.2 for Multi-space supply or 403.3.3 for VAV systems without significant cost implications and a large risk of measurement errors due to the use of multiple sensors, and does not indicate how of if they are excluded.
9. The proposed means of DCV control involves significant reliability issues, compounding existing ventilation reliability problems already identified and studied, i.e. air side economizers on packaged equipment in California were shown to be defective in 70% of the 140 cases reported. (Calif. EPA-ARB letter 12/20/02 to California Energy Commission)
10. Usage of CO_2 DCV without significant application limitations contradicts the intent of ASHRAE 62's Ventilation Rate Procedure (6.1), which is directly reflected in IMC 403, namely: the automatic and continuous maintenance of prescribed minimum ventilation rates during all occupied periods.
11. The use of and reference to ASHRAE 62 in the substantiation for the proposal is not valid. ASHRAE 62 reference to CO_2 in Section 6.1.3 was an attempt to correct misunderstandings of CO_2 references used in previous versions of the standard.
12. ASHRAE 62-99, 6.1.3 was incorrectly used in substantiation and misrepresented the nature and intent of the Standard's Ventilation Rate Procedure (6.1). *"… Comfort criteria with respect to human bioeffluents* [Author's note: ONLY] *are likely to be satisfied if the ventilation rate results in indoor CO_2 concentrations less than 700 ppm above the outdoor air concentration…."* Contrary to the implication in the proposal, this should not be interpreted to mean, "CO_2 measurement can be used to calculate ventilation rates".
13. The ASHRAE 62 Appendix D (62-1999) or Appendix C (62-2001) describing the "steady state" formula is not part of the standard and is included only to provide the reader with information on the source of the rates used in the Table. Interpretations (IC 62-1989-27, January 27, 1997; IC 62-1999-33 on August 14, 2000; and IC 62-2001-34 on January 12, 2002) on the use of CO_2 are so narrow as that they strictly limit the "approved" usage of CO_2 sensors for ventilation reduction with rates presumably determined by some other means. Neither of the interpretations specifically allow the direct control of ventilation rates by CO_2 measurement, only that the intake rate may be reduced during periods of less occupancy as evidenced by reductions in CO_2 differentials, effectively resetting the intake rates as determined by another means. Other ancillary requirements of the standard afford this conclusion. All interpretations and the Ventilation Rate Procedure require that the rates in the Tables be maintained at all periods of occupancy, under all conditions and all points of operation. None of these can be verified, confirmed or determined using differential CO2 control alone, without some very tenuous assumptions.
14. Instrument calibration requirements, frequency, method and the calibration reference standard are significant to reliability of the method and are not specified.
15. CO_2 sensing for direct ventilation control, without independently verifying flow rates under varying conditions and without providing application guidance does not give proper consideration to the significant application limitations of using CO_2.

Maintenance of specific CO_2 concentration levels (or differentials) does not insure that minimum ventilation rates are being supplied or maintained as conditions change (for contaminant dilution, displacement and removal) because of the following technical reasons:

1. Three major assumptions are required for the ASHRAE "steady state" concentration balance equation to provide valid results (a steady-state rarely occurs and is non-transient, zero sensor and sampling error, respiration rates are assumed at slightly above sleeping). These may never exist simultaneously in a real world situation. CO_2 sensing for direct control of intake rates, coupled with the "steady state" mass balance formula methodology, provides unneeded risk of for large measurement errors – both positive and negative.
2. Because of long response times, intermittently occupied conditions may transit the space before control is established – dilution control lags occupancy (CO_2 generation) from 1 - 4 hours. CO_2 control is not "real-time".
3. Many researchers and engineers have demonstrated that the use of CO_2 sensors is at best an indirect indicator of occupancy, and that a base ventilation rate must be continuously maintained to dilute contaminants which can not be effectively measured or removed from within the building. This conclusion is also reflected in the existing language of the IMC and in interpretations published by ASHRAE on the ventilation standard.
4. CO_2 concentrations are incapable of providing or maintaining a "base" ventilation rate for dilution of building-sourced contaminants.

5. CO_2 concentrations ignore building pressurization requirements, which are essential for energy conservation, comfort control, IAQ and the prevention of mold growth inside exterior walls.
6. Significant variability in outdoor CO_2 concentrations in non-rural settings may not be assumed to be constant without dramatically increasing the uncertainty of the measurement result. Studies have shown exterior CO_2 range from 200 ppm to over 500 ppm, making the use of an "average" or "constant" value invalid.
7. Instrument error issues are mostly due to the instrument's potential for drift, which was significant enough for standards publishers to question the usage of all CO_2 sensors in recent years and to require frequent recalibrations when used for ventilation control. Newer sensors claim auto calibration features by resetting base levels to reflect previous "night" or unoccupied levels, rather than an established reference standard. This is inventive but needs to be proven a valid surrogate for a scientific reference standard.
8. Temperature effect and temperature limitations (outdoor measurement) make using the "steady state" formula a problem in most climates that can reach 32 deg F.
9. *"Using multiple CO_2 sensors to determine the outside airflow rate is not possible due to the relatively large error associated with the absolute accuracy of commonly available sensors"* (ASHRAE RP-980, 1999)
10. Sensor placement issues create more problems (sensitivity and validity of measurement in certain locations).
11. Carbon dioxide concentrations have often not stabilized when the measurements are performed, and the use of non-steady-state values of CO_2 concentration in a steady-state mass balance equation usually leads to overestimation of the ventilation rate.
12. Concentrations of CO_2 in outdoor air vary with location and time, and significant error may result if assumed outdoor concentrations are used in calculations.
13. The number, weight, activity and diet of the occupants affect the indoor carbon dioxide generation rate and each of these parameters can only be estimated (but assumed constant and leading to large errors in intake rate setpoint). Variable or incorrectly assumed average respiration rates provide a predominantly positive error to intake rates being controlled by CO_2 (-20 to +200% errors shown in modeling based solely on external CO_2 varying form 250 – 500 ppm)
14. Indoor carbon dioxide concentrations may be spatially non-uniform and measurements at a few locations may not accurately represent the average concentration in the return/exhaust air. (applies to sensor placement and sampling error issues). Sampling error is the single largest source of measurement error (one sensor per space) and requires perfect distribution of CO_2 concentrations to be a valid "average".
15. Use of the peak instead of actual "steady state" CO_2 values (as required in the mass concentration formula in the Appendix of ASHRAE 62) may produce erroneous ventilation rate estimates, off by a factor of 2 at low ventilation rates, and less at higher ventilation rates (Persily and Dols 1990).

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Public Comment 2:

Vickie Lovell, Intercode Incorporated, representing Air Movement and Control Association, requests Disapproval.

Commenter's Reason: This requirement is at least premature, if not incomplete, based on the level of knowledge available about using CO2 for Demand Controlled Ventilation systems. It raises, rather than answers, many questions for the manufacturers, the user, the installer, the building owner, and the enforcer.

Original language already allows use of many methods of DCV for variable and intermittent occupancy, providing that an "actual count" of occupants be used i.e. timer, head-count, etc., but not the averages assumed with differential CO2 concentrations.

M31-03/04 as proposed fails to offer sufficient application limitations. The proposal gives no indication how the "primary source of pollutants" in a space is to be determined or how its determination can be regulated and enforced.

No justification for the stated conclusion that all "assembly" occupancies can be considered devoid of space generated contaminants, requiring no additional dilution ventilation for sources other than those occupant-related.

No description of the proposed method of control was included, which is critical for implementation of this technology, other than limited references used in the substantiation. There is more than one method of applying CO2 sensing for ventilation control and the method of control selected is critical to the results.

The use of and reference to ASHRAE 62 in the substantiation for the proposal is invalid. ASHRAE 62 reference to CO2 in Section 6.1.3 was an attempt to correct misunderstandings of CO2 references used in previous versions of the standard. The likely satisfaction of "comfort criteria" should not be interpreted as satisfying occupant needs for health, safety, emotional well-being, dilution ventilation rates or anything other than the reduction of body odors to "acceptable" levels.

The reference to CO2 in the appendix to the ASHRAE standard was included to assist the reader in understanding the technical justification for the rates used in the ventilation tables, not as a proposed method of ventilation control. Appendices in ASHRAE Standards are included for reference only and are not part of the requirements or recommendations in the standards.

To allow CO2 sensing for direct ventilation control, without independently verifying flow rates and without providing application guidance for this technology does not give proper consideration to any of the significant application limitations of using CO2 (or of the proposed method of control, which is not defined in the proposal).

- Carbon dioxide concentrations have often not stabilized when the measurements are performed, and the use of non-steady-state values of carbon dioxide concentration in a steady-state mass balance equation usually leads to overestimation of the ventilation rate.
- Concentrations of carbon dioxide in outdoor air vary with location and time, and significant error may result if assumed outdoor concentrations are used in calculations.
- The number, weight, activity and diet of the occupants affect the indoor carbon dioxide generation rate and each of these parameters can only be estimated (but assumed constant and leading to large errors in intake rate setpoint)
- Indoor carbon dioxide concentrations may be spatially non-uniform and measurements at a few locations may not accurately represent the average concentration in the return/exhaust air. (applies to sensor placement and sampling error issues)
- Use of the peak CO2 instead of actual "steady state" values (as required in the mass concentration formula in Appendix D of ASHRAE 62) may produce erroneous ventilation rate estimates, off by a factor of 2 at low ventilation rates, and less at higher ventilation rates (Persily and Dols 1990).
- Typically, CO2-DCV is defined as a differential calculated between inside and outdoor CO2 levels. With hand-held instruments for one-time analysis, differentials in the errors between the measurements is cancelled out by using one instrument to measure both concentrations. The only source of error associated with the sensor then becomes its repeatability. "Using multiple CO2 sensors to determine the outside airflow rate is not possible due to the relatively large error associated with the absolute accuracy of commonly available sensors" (ASHRAE RP-980, 1999).

Significant ventilation rate errors in the use of CO2 may also be due to any combination of the following:

Major reliability issues (Calif. EPA-ARB letter 12/20/02 to California Energy Commission on CO2-DCV references in Title 24 Energy Code)

Variability in outdoor CO2 concentrations in non-rural settings (assumed constant by many using DCV)

Variable or incorrectly assumed average respiration rates

Instrument error, primarily due to drift - significant enough to require daily reset ("auto-calibration")

Sampling error, single largest source of measurement error with one sensor per space

Temperature effect and temperature limitations (outdoor measurement)Sensor placement issues (sensitivity and validity in the use of certain locations)

Instrument calibration requirements, frequency, method (the calibration reference standard should not be the previous "night" levels)

Response time - control lags occupancy and CO2 generation from 1 - 4 hours (not "real-time")

Non-linear relationship (CO2 concentration vs. intake rates)

This change should be disapproved and further developed for next cycle.

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M39-03/04
504.5

Proposed Change as Submitted:

Proponent: James Anjam, Arlington County, representing VPMIA/VBCOA

Delete and substitute as follows:

504.5 Makeup air. ~~Installations exhausting more than 200 cfm shall be provided with makeup air. Where a closet is designed for the installation of a clothes dryer, an opening having an area of not less 100 square inches shall be provided in the closet enclosure~~. <u>Clothes dryers shall be provided with makeup air as required by the dryer manufacturer's instructions and Section 504.1.</u>

Reason: Current language is too prescriptive and may be inadequate for some installations and too excessive for others. The manufacturer's instructions specify the amount of air needed and the means for providing it; the code should rely on this to determine what is appropriate for each installation.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: If the dryer is not on the jobsite at the time of inspection, the inspector will have no guidance in applying the makeup air requirements.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Charles Gerber, Henrico County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

504.5 Makeup air. ~~Clothes dryers shall be provided with makeup air as required by the dryer manufacturer's instructions and Section 504.1~~. <u>Makeup air shall be provided for clothes dryer installations in accordance with Sections 504.5.1 and 504.5.2.</u>

Add new text as follows:

<u>**504.5.1 Type 1 clothes dryers**. Make-up air for Type 1 clothes dryers shall be provided in accordance with the clothes dryer manufacturer's installation instructions.</u>

<u>**504.5.2 Type 2 clothes dryers**. Except as otherwise required by the manufacturer's instructions, makeup air for Type 2 clothes dryers shall be provided by one or more openings to the outdoors having an aggregate free area of not less than 1 square inch per 1000 btu/h of the total input rating of all dryers in the space.</u>

Commenter's Reason: Current text has no technical basis. Committee action to disapprove was based on the proposed text being unenforceable and the code's need for some minimum level of protection to prevent negative pressures. This section applies to both domestic and commercial dryers and yet prescribes an arbitrary threshold of 200 cfm to cover both. If a dryer exhausts exactly 200 cfm, no makeup air is required. If a dryer exhausts 201 cfm, makeup is required, but no method or rate is given. The only guidance is the manufacturer's instructions. The proposed modification is consistent with the NFGC, Z223.1, Section 9.4.3.1, except that the NFGC text does not state where the required openings are intended to open. Type 2 dryers are not put in closets and makeup air is typically taken directly from the outdoors. The same modification has been submitted for FG43-03/04.

M41-03/04
506.3.2

Proposed Change as Submitted:

Proponent: Carl A. Longino, County of Greenville SC

Revise as follows:

506.3.2 Joints, seams and penetrations of grease ducts. Joints, seams and penetrations of grease ducts shall be made with a continuous liquid-tight weld or braze made on the external surface of the duct system. <u>Before covering with any construction assembly or duct wrap, a light test shall be required, with a 150-watt bulb minimum, to determine that all welds and brazing joints are liquid tight. The permit holder shall furnish the necessary test equipment to perform the test.</u>

Exception: (No change to the existing text)

Reason: There is currently no code proscribed method to assure all joints and seams are liquid tight as required by this section. Although many jurisdictions require the duct to be tested, with light or smoke, a clear and consistent method of testing needs to be in the code. Many jurisdictions do not test welds and brazing at all because of the lack of requirement in the code. It is rare for our test to find a hood vent with no holes or gaps in the welds. We have tried both methods of testing, and find the light test to be by far superior.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: The inspector should not be limited to only one test method. There are other methods readily available.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Tony Longino, County of Greenville, SC, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.2 Joints, seams and penetrations of grease ducts. Joints, seams and penetrations of grease ducts shall be made with a continuous liquid-tight weld or braze made on the external surface of the duct system. Before covering with any construction assembly or duct wrap, ~~a light test shall be required, with a 150-watt bulb minimum,~~ a test to determine that ~~all welds and brazing joints~~ all brazing or welds are liquid tight, shall be required. The permit holder shall furnish the necessary test equipment to perform the test.

Commenter's Reason: Committee action was to disapprove this section because the light test stated would limit the code official to one method of testing. Deleting that line allows the code official to choose any method available to perform this very necessary test.

Public Comment 2:

Guy Tomberlin, Fairfax County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.2 Joints, seams and penetrations of grease ducts. Joints, seams and penetrations of grease ducts shall be made with a continuous liquid-tight weld or braze made on the external surface of the duct system. ~~Before covering with any construction assembly or duct wrap, a light test shall be required, with a 150-watt bulb minimum, to determine that all welds and brazing joints are liquid tight. The permit holder shall furnish the necessary test equipment to perform the test.~~

Exception: (No change to the existing text)

Add new text as follows:

506.3.3.1 Grease duct test. Prior to the use or concealment of any portion of a grease duct system, a leakage test shall be performed in the presence of the code official. Ducts shall be considered to be concealed where installed in shafts or covered by coatings or wraps that prevent the ductwork from being visually inspected on all sides. The permit holder shall be responsible to provide the necessary equipment and perform the grease duct leakage test. A light test or an approved equivalent test method shall be performed to determine that all welded and brazed joints are liquid tight. A light test shall be performed by passing a lamp having a power rating of not less than 100 watts through the entire section of duct work to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls.

A test shall be performed for the entire duct system including the hood-to-duct connection. The ductwork shall be permitted to be tested in sections, provided that every joint is tested.

Commenter's Reason: A light test is the most cost efficient method to test grease ductwork. It has been used for many years quite successfully. It is the most effective method to locate any defects in grease duct installations. Leaks in grease ductwork can lead to the passage of grease to surrounding areas of the ductwork and in cases of accidental ignition, this has proven to be extremely hazardous. This dangerous potential can be eliminated by performing this simple test. The typical permit holder/installer has a ladder, drop light, and cords, and that's all that is needed to complete this test. The reason for disapproval of this change was that there are other methods of testing. So that's why this proposal includes the statement "or approved equivalent test method". However, it is important to note that SMACNA has no criteria for testing this type of installation. It can be very dangerous to pressurize ductwork of this nature, mostly due to the size. Even a smoke test requires some pressure, and even then, one cannot be assured of the even distribution of smoke throughout the entire system.

M46-03/04
506.3.10

Proposed Change as Submitted:

Proponent: John R. Wiggins, Underwriters Laboratories, Inc.

Revise as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with UL 2221 ~~a nationally recognized standard for such enclosure materials~~. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001 Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies M506.3.10

Reason: UL 2221 is the nationally recognized standard for grease duct enclosures and should be included in the IMC to clarify the standard to which grease duct enclosure assemblies are required to be tested and listed.

Analysis: UL 2221-01complies with Section 3.6 of the ICC code development process.

Cost Impact: None

Committee Action: Approved as Submitted

Committee Reason: Identifying a specific standard simplifies the approval process for the designer and the code official. The proposed standard complies with ICC requirements.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Sarah Brewer, Unifrax Corporation, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with <u>ASTM E2336 or</u> UL 2221. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001	Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies
<u>ASTM E 2336-2004</u>	<u>Standard Test Methods Fire Resistive Grease Duct Enclosure Systems</u>

Commenter's Reason: Manufacturers' of field-applied grease duct enclosure systems and prefabricated factory built grease ducts have utilized ICBO-ES AC101 and AC121, respectively as the predominant test methods and criteria for evaluating their grease duct protection systems.

There has been little market or regulatory resistance to ICBO-ES AC101 or AC121, so there is no justification for permitting an exception exclusively for UL2221 tested systems. With one exception, none of the manufacturers' of rigid or flexible grease duct enclosures use UL2221 as the test Standard for these materials.

ASTM has recently approved a **full concensus** Standard which is widely supported by grease duct enclosure system manufacturers and parallels AC101. Based upon the history of protection systems tested per AC101 and the existence of the new ASTM Standard, **ASTM E 2336 should be added** to the original proposal of UL2221 as an acceptable test Standard.

Public Comment 2:

Tony Crimi, A.C. Consulting Solutions, Inc., representing the International Firestop Council, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with <u>ASTM E2336 or</u> UL 2221. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001	Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies
<u>ASTM E 2336-2004</u>	<u>Standard Test Methods Fire Resistive Grease Duct Enclosure Systems</u>

Commenter's Reason: Over the past 18 months, ASTM has been working on the development of a consensus Standard entitled Standard Test Methods For Fire Resistive Grease Duct Enclosure Systems. This Standard was developed to parallel, as much as possible, the existing requirements of ICBO ES AC 101, which had been used for the past 10 years for the evaluation of flexible duct wrap systems. Contrary to the proponent's reason as stated in the monograph, UL 2221, which was first published in September 2001, is not, and has never been, the nationally recognized Standard for grease duct enclosures. The current published edition of UL 2221 was not developed through UL's new consensus based system. UL has since established a Standards Technical Panel (STP), which is responsible for the publication of the next edition of UL 2221. A ballot of UL 2221 was conducted in December 2003. As a result, it appears that several participants in the

STP have identified numerous apparent conflicts and deficiencies which need to be reviewed by the UL Standards Technical Panel (STP) which is responsible for the publication of the next edition of UL 2221.

In fact, the AC 101 Standard, which was first published in April 1994, has been the most “nationally recognized standard” for the evaluation of such enclosure materials since its inception.

At their last ASTM meetings in December 2003, ASTM Committee E5 approved the publication of a new Standard entitled “Standard Test Methods For Fire Resistive Grease Duct Enclosure Systems”. This Standard closely parallels the requirements of the AC 101 Acceptance Criteria for Grease Duct Enclosure Materials that have been in effect since April 1994 under the auspices of ICBO-ES, and more recently ICC-ES. The ASTM Standard has widespread support from the manufacturers of field-applied duct enclosure systems. The UL Standard does not currently have widespread support among manufacturers' of flexible, field-applied grease duct enclosure systems.

Public Comment 3:

Vicki Floyd, representing Thermal Ceramics, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with <u>ASTM E2336 or</u> UL 2221. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001	Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies
<u>ASTM E 2336-2004</u>	<u>Standard Test Methods Fire Resistive Grease Duct Enclosure Systems</u>

Commenter's Reason: Sole reference to UL 2221bears diminutive market justification as a widely accepted industry performance standard. Since UL 2221 publication in September 2001, there has been little to nil participation from manufactures of field applied grease duct enclosure materials, prefabricated grease duct systems, or code enforcement support to meet UL 2221 compliance due to unresolved industry consensus.

In 1992, Thermal Ceramics was the first to pioneer the field applied fire resistive grease duct wrap enclosure concept in compliance of UL 1978, the only grease duct standard available at that time. Since 1994, ICBO ES AC101, which has now been developed through ASTM and will be published as ASTM E2336-04, has been the industry accepted common practice representing a higher performance level and possessing a more repeatable and consistent evaluation applicable to a wide variety of materials, field conditions and fire threat exposures beyond that of the UL1978 standard originally utilized by the industry. Since 1997, it has been the industry desire to harmonize consistency in grease duct test standards reflecting realistic fire conditions without duplication.

IMC section 506.3.10, Exception, should be revised to include the market driven and supported ASTM E 2336-04 Standard Test Methods Fire Resistive Grease Duct Enclosure Systems, substantiated by the widely industry accepted and code enforced practice since 1994.

Public Comment 4:

Vickie Lovell, Intercode Incorporated, representing the 3M Company, requests Disapproval.

Commenter's Reason:

506.3.10 Exception 1, Remove “UL 2221" and reinstate existing text “a nationally recognized standard for such enclosure materials”.

If this change is approved, it will create an artificially contrived crisis in the industry and the code enforcement community by arbitrarily eliminating existing listed and labeled materials and approvals, with very few product options in their place, new testing requirements, and no compelling justification as to why.

UL 2221 is a nationally recognized standard and, therefore, would be permitted to be used under the existing text. The proponent stated that UL 2221 is “the” nationally recognized standard for grease duct enclosures. UL did not offer any technical reason for eliminating the other nationally recognized standards, to which many companies have already tested and have been accepted.

Surprisingly, the committee accepted that statement in spite of opposition, but UL offered no substantive information to support such a statement. While agreed that fewer standards are better than more, it was odd that the printed committee reason for approving this change did not offer any information other than convenience. This decision should have been justified using a comparison, input on industry acceptance, historical performance, product performance, product availability, or other vital and relevant facts provided by the proponent, and an evaluation of such information provided by the committee as justification for such a change.

Many companies have products tested and accepted to other nationally recognized standards accepted by ICC jurisdictions. If UL 2221 is to become “the” grease duct enclosure standard, then it its efficacy must be demonstrated which would provide a compelling reason for making such a drastic change. First, UL must demonstrate that any of the current standards are ineffective or inappropriate and have resulted in a measurable loss: second, it has to be demonstrated that the more stringent requirements in UL 2221 actually improve fire safety of the grease duct enclosure.

Due to the dual track hearings, we were unable to testify in opposition to this proposed change. However had we been present, 3M would have ***strongly*** opposed this change during public testimony.

Public Comment 5:

David Messina, Vesuvius, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with ASTM E2336 or UL 2221 for such enclosure materials. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001 Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies

ASTM E 2336-2004 Standard Test Methods Fire Resistive Grease Duct Enclosure Systems

Commenter's Reason: ICBO ES AC101 is a nationally recognized standard that has been in effect since 1994. Several companies have developed systems that comply with AC101. These companies have invested money and resources developing, testing, and listing these systems. To my knowledge, there has been no property loss or life safety concern raised using systems that comply with AC101. The recently approved ASTM E2336 full consensus standard parallels the test protocols of AC101 and therefore should be included as an acceptable standard. I do not believe that the use of the UL 2221 standard would provide a higher level of life safety than use of the ASTM E2336 standard, and as such, limiting the exception to include only UL 2221 is not justified.

Public Comment 6:

John D. Nicholas, representing Omega Point Laboratories, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with a nationally recognized standard for such enclosure materials or UL 2221. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

Commenter's Reason: The proponent's language struck the phrase "a nationally recognized standard for such enclosure materials" from Exception 1 of Section 506.3.10 of the IMC. In place of that phrase was inserted "UL 2221". We propose to retain the original phrase and add "or UL 2221" after that original phrase to Exception 1 of Section 506.3.10.

There already exists at least one other "nationally recognized standard for such enclosure materials" titled AC 101 *Acceptance Criteria For Grease Duct Enclosure Assemblies* that has been in effect since April 1994. This standard is under the auspice of the ICC Evaluation Service, Inc. (ICC-ES), which according to the ICC ES website is a nationally recognized source of technical information on building products, systems, materials and methods that are code-compliant. The ICC-ES acceptance criteria for products are developed by the ICC-ES technical staff in consultation with input from industry and other interested parties through public hearings of the ICC-ES Evaluation Committee (*made up entirely of code officials representing the different regions in the United States*); and the acceptance criteria must be approved by that committee. Some acceptance criteria, such as AC101, have been reviewed by ICC-ES technical staff for adequacy to address both the International Codes and various legacy codes (Uniform Codes, National Codes, Standard Codes, etc.). According to the ICC ES website, AC101 complies with the ICC, which specifically references the IMC on this subject.

AC101 contains similar test criteria as the proposed standard UL 2221.

AC101 (1994)	UL2221 (2001)
Non-combustibility Test (ASTM E 136)	Non-combustibility Test (ASTM E 136)
Fire-resistance Test (ASTM E 119)	None
Durability Test (ASTM C 518)	Steady-State Test (ASTM C 518)
Internal Fire Test Phase 1 - 500°F and Phase 2 - 2000°F	Internal Fire Test Phase 1 – 470 to 520°F and Phase 2 – 1970 to 2020°F
Fire-engulfment Test (ASTM E 119)	Fire-engulfment Test (ASTM E 119)
None	Surface Burning (ASTM E 84)
None	Hot Surface Performance (ASTM C 411)
Firestop (ASTM E 814)	Firestop (ASTM E 814)

According to the ICC ES website there are several companies that comply with AC101 requirements. To our knowledge, there has not been a property loss or life safety issue due to application of grease duct enclosure materials complying with AC101 requirements. Why is a nationally recognized standard in use for over nine (9) years no longer acceptable?

Some might still argue that the test protocols of AC101 are technically flawed. Many industry experts, including the proponent's laboratory (UL), testified at public hearings to the validity of the AC101 tests for determining acceptance of grease duct enclosure materials for field application.

The proponent offered no rationale for removing other acceptable standards, such as AC101. Rather, it was stated that UL 2221 is "*the* nationally recognized standard for grease duct enclosures and should be included in the IMC to clarify the standard to which the grease duct enclosure assemblies are required to be tested and listed." The first edition of UL 2221 was published September 17, 2001: while AC101 was published in April 1994, 7 years earlier than UL 2221. Further, ASTM just adopted the test protocols of AC 101 in the form of an ASTM standard.

Another nationally recognized standard that addresses the performance of such enclosure materials is UL 1978 *Standard for*

Grease Ducts developed in March 1995 through UL's canvass method approved by ANSI and therefore would presumably meet the requirements of Section 3.6 of the ICC Code Development Process. This standard also requires an internal and external fire test similar to UL 2221 and it was developed 6 years earlier.

Still there are other nationally recognized standards, which address the performance of such enclosure materials, that may not have been evaluated to the IMC requirements. AC35 *Acceptance Criteria for Grease Duct Enclosure Systems* developed January 1991, developed 12 years earlier than UL 2221. AC121, *Acceptance Criteria for Grease Duct Systems, Self-Enclosed* developed April 1997 still 4 years ahead of UL 2221.

How can UL 2221 be "*the* nationally recognized standard for grease duct enclosures" when it was developed after several other nationally recognized standards for grease duct enclosure materials.

To introduce another new standard into the code that addresses a specific need is always welcomed. However, to remove other existing nationally recognized standards for grease duct enclosures (such as AC101) and replace it the new standard (UL 2221) just because the existing nationally recognized standards were not a cited code reference in Chapter 15 is a questionable precedent to set. Other grease duct enclosure standards may meet the requirements of Section 3.6 of the ICC Code Development Process; but they may not be cited in Chapter 15.

Other standards, which are acceptable to code officials, have been used for years to determine fire performance of grease duct enclosure materials. Language such as the phrase "a nationally recognized standard for such enclosure materials," which is now proposed for deletion is the basis for those standard's use. UL 1978 and AC101 are well known to UL. Yet UL has not stated, "UL 1978 and AC101 are not a viable nationally recognized standard for grease duct enclosure materials". Both standards have been used for over eight years without loss being reported or a life safety issue being raised based on their use.

The proponent did not debate the other standards' applicability for determining use of enclosure materials on grease ducts. If technical flaws in the existing standards were presented, which potentially pose a risk to property or life, OPL may agree with the proposed change. However, to avoid a technical discussion by using a technicality as the basis for code adoption may not be seen in the interest of life safety.

The proponent did not state that the reason for replacing the existing language was to set one national consensus standard for this application. Other interested parties may have participated in the IMC Hearing process if that was the basis for the proposed change. While the canvass method used to develop UL 2221 is a consensus process, it is not always representative of industry consensus and other interested parties. Rather it represents only those chosen few selected by the canvass organization to participate in the process. The STP process of UL 2221 is underway and it is our understanding that numerous technical arguments have been made a number of the STP participants, which may indicate that the canvass version while acceptable to the code process did not produce a standard acceptable to industry or one that is technically viable.

Laboratories, such as OPL and UL, usually benefit by changes to the code that require re-testing listed and labeled products. Our concern is that the existing version of UL 2221 may not be supported by industry and may have technical issues. If the manufacturer's who tested their products to the existing nationally recognized standards for grease duct enclosures *knew* that the proponent was going to arbitrarily eliminate all their existing listed and labeled materials, then one might have expected them to have been present to voice their concerns. One might ask why they were not present. Do they support the new proposed standard in lieu of the existing nationally recognized standards for grease duct enclosures or was there another reason?

By way of this letter urging "Approved as Modified, by this public comment," (AMPC), the manufacturers will be given one last chance to address this issue. *If industry does not respond to the issue of why they were not present at the IMC Code Hearings in October, and do not attend the Final Action Hearings, then OPL will withdraw this comment during the public hearings and will let the proponent's proposed change stand and potentially reap benefits from it.*

Public Comment 7:

Shaun Ray, Metal-Fab, Inc., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code.* Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:
1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with <u>ASTM E 2336 or</u> UL2221 <u>for such enclosure materials</u>. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001	Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies
<u>ASTM E 2336-2004</u>	<u>Standard Test Methods Fire Resistive Grease Duct Enclosure Systems</u>

Commenter's Reason: UL2221 test standard was developed per the request from field-applied enclosure and factory built enclosure manufactures in order to have one nationally recognized test standard that evaluated both types of construction methods. Prior to the publication of UL2221, similar but separate test standards were used for evaluating various methods of enclosure systems. As a manufacturer that has tested and meets the requirements outlined in UL2221, we support the current modification to specify UL2221 in lieu of the current language "…. evaluated for such purpose, in accordance with a nationally recognized standard for such enclosure materials".

UL2221 was developed based upon previous acceptance criteria utilized by industry (ICBO-ES AC101 and AC121) and a previously published UL test standard for factory built enclosure systems (UL1978A). As a result, UL2221 is a culmination of test requirements used for ICC-ES evaluations with additional requirements to address structural integrity of enclosure systems under abnormal conditions.

ASTM has recently approved a new test standard, which is supported by the grease duct enclosure system manufacturers and parallels AC101. Once published, we predict that a number of grease duct enclosure system manufacturers will obtain evaluations to this standard as an economical alternative to testing and meeting the UL2221-2001 requirements. Due to the similarities of UL2221 and ASTM E 2334, we see no justification to exclusively permit UL2221 as the test standard for these materials and therefore recommend that ASTM E 2334 be added to Exception 2 of Section 506.3.10.

Public Comment 8:

James D. Rogers, ETS Schaefer Corporation, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

506.3.10 Grease duct enclosure. A grease duct serving a Type I hood that penetrates a ceiling, wall or floor shall be enclosed from the point of penetration to the outlet terminal. A duct shall only penetrate exterior walls at locations where unprotected openings are permitted by the *International Building Code*. Ducts shall be enclosed in accordance with the *International Building Code* requirements for shaft construction. The duct enclosure shall be sealed around the duct at the point of penetration and vented to the outside of the building through the use of weather-protected openings. Clearance from the duct to the interior surface of enclosure of combustible construction shall be not less than 18 inches (457 mm). Clearance from the duct to the interior surface of enclosures of noncombustible construction or gypsum wallboard attached to noncombustible structures shall be not less than 6 inches (152 mm). The duct enclosure shall serve a single grease exhaust duct system and shall not contain any other ducts, piping, wiring or systems.

Exceptions:

1. The shaft enclosure provisions of this section shall not be required where a duct penetration is protected with a through-penetration firestop system classified in accordance with ASTM E 814 and having an "F" and "T" rating equal to the fire-resistance rating of the assembly being penetrated and where the surface of the duct is continuously covered on all sides from the point at which the duct penetrates a ceiling wall or floor to the outlet terminal with a classified and labeled material, system, method of construction or product specifically evaluated for such purpose, in accordance with ASTM E 2336, UL2221, or other nationally recognized standards for such enclosure materials. Exposed duct wrap systems shall be protected where subject to physical damage.
2. A duct enclosure shall not be required for a grease duct that penetrates only a nonfire-resistance-rated roof/ceiling assembly.

CHAPTER 15
REFERENCED STANDARDS

UL 2221 – 2001	Standard for Tests of Fire Resistive Grease Duct Enclosure Assemblies
ASTM E 2336-2004	Standard Test Methods Fire Resistive Grease Duct Enclosure Systems

Commenter's Reason: Manufacturers of field-applied grease duct enclosure systems and prefabricated factory-built grease ducts have tested their products to ICC-ES AC101 and AC121 respectively as the predominant test criteria for evaluating their grease duct protection systems.

There have been no life safety issues and no regulatory resistance resulting from adherence to AC101 or AC121 test criteria. ASTM has recently approved a full consensus Standard (ASTM E 2336) which is universally supported by grease duct enclosure system manufacturers and closely parallels AC101. The ASTM 2336 standard is a "nationally recognized standard."

There is no justification for assigning UL2221 the rose as the exclusive fire test criteria for grease duct enclosure systems when there is another nationally recognized and fully responsive test criteria already in place which has broad acceptance.

M52-03/04
507.13.5

Proposed Change as Submitted:

Proponent: Douglas J. Horton, D.J. HORTON and Assoc., Inc., representing Commercial Kitchen Ventilation Technical Interest Group

Add new text as follows:

507.13.5. Dishwashing Appliances. The minimum net airflow for Type II hoods used for dishwashing appliances in accordance with Section 507.2.2 shall be 100 CFM per linear foot of hood length.

Exception: The minimum net airflow for engineered Type II hoods shall be in accordance with the manufacturer's instructions.

Reason: Though Section 507.2.2 requires installation of Type II hoods for dishwashing appliances, current code does not provide a minimum net airflow. Section 507.13.4 does not apply because that section pertains to Light Duty Cooking Appliances, and the exhaust rates for this category are higher than industry practice for dishwashing appliances. Additionally, the exceptions to Section 507.1 do not apply because Type II hoods are not listed to UL 710 or UL 197. The intent of this new section is to set a minimum for all hood configurations for Type II hoods for dishwashing appliances and also to provide an exception for engineered Type II hoods, which may be operated per manufacturer's instructions, and which may be operated with higher or lower exhaust rates, depending on manufacturer design or practice.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: Section 507.2.2 already requires installation in accordance with the manufacturer's installation instructions. The proposed exception is redundant with the engineered systems allowance of the code.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

James Anjam, Arlington County, VA, representing VPMIA/VBCOA, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

507.13.5. Dishwashing appliances. The minimum net airflow for Type II hoods used for dishwashing appliances ~~in accordance with Section 507.2.2~~ shall be 100 CFM per linear foot of hood length.

Exception: ~~The minimum net airflow for engineered Type I hoods shall be in accordance with the manufacturer's instructions.~~ Dishwashing appliances and equipment installed in accordance with Section 507.2.2, exception number 2.

Commenter's Reason: This is a needed provision for dishwashing appliance installations because the code is silent on this issue. Currently, Type II hoods are only mentioned under light duty cooking operations and this is a misapplication of the airflow rates, because dishwashers are not cooking appliances. The proposed text is designed for specific heat and steam emissions. 100 CFM per linear foot of hood is what industry states is the appropriate formula.

M55-03/04
510.1

Proposed Change as Submitted:

Proponent: Lou DiBerardinis, Mike Austin, Manuel Gomez (AIHA staff), American Industrial Hygiene Association-Laboratory Health and Safety Committee, representing American Industrial Hygiene Association

Revise as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

<u>**Exception**: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:</u>

1. <u>The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450.</u>
2. <u>A laboratory ventilation system is provided to control health hazard emissions in accordance with 29 CFR 1910.1450. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.</u>
3. <u>The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Sections 501.2 and 510.3 of this code.</u>

Reason: This proposed change is necessary to provide safety conditions in research laboratories. The nature of research is such that laboratory scale quantities of a wide variety of chemicals are used which vary over time. According to the definition in 29 CFR 1910.1450 - Occupational Exposure to Hazardous Chemicals in Laboratories (OSHA Lab Standard), "laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person. Requirements for fire suppression and prohibition on manifolding of these laboratory ventilation systems will decrease rather than increase overall safety relative to designs based upon NFPA/AIHA Z9.5.

Scope - As noted above, the scope of the requested exception is consistent intent of the OSHA Lab Standard, a federal standard which was enacted to control health hazards in laboratories, while recognizing the unique nature of this work environment. Use of the "lab scale" definition serves to recognize that both academic and industrial research laboratories may have one or more "pilot scale" operations which involve large quantities of hazardous materials, operations which would be excluded from the scope of the exception. However, the far more common application is use of a wide variety of chemicals in very small quantities, and often for very short periods of time on a very infrequent basis.

<u>**Manifolding -**</u> A review of ANSI/AIHA Z9.5 shows that it is not necessary, nor is safety improved by limiting manifolding of laboratory exhaust systems based on concerns about flammability, toxic materials control, or incompatible material reactions within duct work where only very dilute concentrations of these materials will be present. ANSI Z9.5 also requires a "hazard evaluation" to assure that no unusual conditions exist that require special attention, such as filtration or a dedicated exhaust fan connected to the process. In addition, manifolding has the following benefits:

If laboratory hood exhaust is mixed with general room exhaust there is immediate dilution. When dealing with a multi-story building, the contaminated air from each floor can be combined in rated chases, or on the roof of the building using a header duct, thereby increasing the dilution factor even further. Finally, if the exhaust fan propels contaminated air off the building's roof at a rate of 3000-4000 feet per minute the resulting plume is diluted even further. Once the building's exhaust reaches atmosphere, its chemical content is diluted to a point generally below measurable levels reducing exposure to maintenance personnel working on the roof. In addition, by eliminating multiple dedicated fume hood exhaust fans the overall time that maintenance personnel must spend on the roof of the building is reduced Having redundant exhaust fans, as required by ANSI Z9.5 to support the manifolded exhaust system eliminates the problem of system failure and provides an opportunity to inspect and maintain the system components without shutting the system down.

<u>**Fire Suppression**</u> - The ANSI Z9.5 commentary indicates that addition of fire suppression within laboratory hood exhaust ducts increases potential chemical exposures to workers. During a fire emergency when the sprinkler is activated, the exhaust is turned off just when it is needed most. In addition, an uncontrolled flow of water from sprinklers in chemical hood duct work could push the contents of the hood out of the hood and create a very dangerous situation, especially if the hood contained water-reactive chemicals.

This proposed change would eliminate unnecessary modifications to properly functioning laboratory exhaust ventilation systems. Laboratory ventilation systems safety features are well described in NFPA 45 Chapter 6, "Laboratory Ventilation Systems and Hood Requirements," and ANSI/AIHA Z9.5 "Standard For Laboratory Ventilation". These standards are specific to laboratory ventilation issues and are put forth by organizations that have extensive experience with laboratory ventilation system issues as they relate to issues of proper construction and durability. These standards contain more detailed design information concerning laboratory ventilation systems than section 510 and are appropriate references on this topic. The significant differences and the appropriateness of content in NFPA 45, Chapter 6 and ANSI/AIHA Z9.5 relative to section 510 necessitate the request for an exception rather than simple inclusions of NFPA 45 and ANSI/AIHA A9.5 as additional references. See attached review of IMC sections vs. these alternate standards. The IMC contains numerous references to other codes/standards where more specific information is available on particular topis. Laboratory ventilation is a topic where additional references are both appropriate and necessary.

By requesting this exemption for laboratory scale operations, yet not modifying any of the other content of IMC 510, the application of hazardous exhaust systems requirements for other operations is preserved, while exempted laboratories would be covered in an equivalent and superior fashion by these other standards that have been developed specifically for such laboratory environments. Control of exposure to health hazard materials (including NFPA 704 Health Hazard Rating 4 materials), are addressed by the OSHA Lab Standard.

More detail and supporting documentation for this proposed language change to Section 510.1 are provided in the following attached documents:

1) AIHA Position Paper: hazardous Exhaust Systems Are Unnecessary in Research Laboratories That Involve "Laboratory Scale" Use of Chemicals - *provides feedback that overall safety risk associated with laboratory ventilation systems in increased, not decreased through the designation of laboratory exhaust systems as hazardous exhaust systems per IMC Section 510.*
2) Summary Comparison of IMC Section 510 Hazardous Exhaust Requirements With Standard Laboratory Exhaust - *presents information on equivalency or superiority of design protection based on NFPA 45 and ANSI/AIHA Z9.5 vs. IMC 510.*
3) Experimental and Empirical Studies Documenting that 25% of LAL Will Not be Exceeded in Laboratories with Laboratory Scale Use of Chemicals.
4) Soon to be published Revision of ANSI/AIHA Z9.5 "Standard for Laboratory Ventilation"
5) AIHA Request for Letter of Interpretation Regarding Hazardous Exhaust Requirements In Laboratories (L. Cayman to G. Press, November 2002)

Analysis: The proponent had not submitted the standards for staff review prior to the printing of the monograph.

Cost Impact: None

Committee Action: Disapproved

Committee Reason: NFPA 45 was not submitted for review. Locating the exception in Section 510.1, General, would preclude the enforcement of any other sections of 510 such as the fire suppression requirements of Section 510.7. The language was considered difficult to enforce.

Assembly Action: None

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

Steve Frei, representing Affiliated Engineers, Inc., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

> **Exception**: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:
>
> 1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.
> 2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
> 3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: Chapter 7 of the *International Energy Conservation Code* (IECC) states: "Commercial buildings shall meet the requirements of ASHRAE/IESNA 90.1". ASHRAE/IESNA 90.1 Paragraph 6.3.6.1 - Exhaust Air Energy Recovery requires energy recovery systems be provided for supply air systems that have both a capacity of 5,000 cfm or greater and have a minimum outside air supply of 70% or greater. (Supply air systems serving laboratories typically meet both of these criteria.) The use of energy recovery systems from non-manifolded exhaust systems is not practical from an operational perspective. Therefore the current requirements of IMC Section 510 prohibit compliance with Chapter 7 of the IECC.

The use of dedicated exhaust systems to serve individual fume hoods creates a major safety concern related to potential equipment failures as compared to a manifolded exhaust system. When a fume hood is served by a dedicated exhaust fan, and that exhaust fan experiences an operating failure, there will be no air flow through the associated fume hood. This could result in the researcher being exposed to harmful fumes or vapors. The use of a manifolded exhaust system will eliminate this concern, as manifolded exhaust systems typically are provided with multiple exhaust fans operating in parallel. Therefore in the event of operating failure of one fan, exhaust airflow is maintained through the fume hoods by the remaining fans that are operational. In theory one could minimize this concern through the installation of a second fan at each fume hood exhaust to operate in the event of a failure of the operating fan. This will not eliminate the concern as there will be a period of no airflow through the fume hood, during the time required to sense the failure of the operating fan and the time it takes the standby fan to become operational. It is also unlikely that building owners will be willing to accept the impacts of adding a standby fan at each dedicated fume hood exhaust system (i.e. additional equipment costs, additional controls cost, additional maintenance costs, additional space requirements, etc.).

It has been our experience that code authorities from different localities have different interpretations regarding the application of IMC 510 to laboratory exhaust systems. These varying interpretations have resulted in variations in the system requirements rather than achieving consistent systems, as is the intent of the code. The acceptance of the proposed revisions will result in more consistent interpretations of system requirements and system designs.

Public Comment 2:

Raymond J. Garant, representing the American Chemical Society, requests Approval as Submitted.

Commenter's Reason: The American Chemical Society supports the AIHA Code Change proposal for the reasons and substantiation provided in Code Change request M55-03/04 and AIHA's letter of September 22, 2003.

Public Comment 3:

Robin Izzo, Assistant Director Environmental Health & Safety, Princeton University, and Thomas Nyquist, P.E., Director of Engineering & Construction, requests Approval as Submitted.

Commenter's Reason: The Princeton University Departments of Engineering & Construction and Environmental Health & Safety have reviewed the International Mechanical Code 2003, Chapter 5 Exhaust Systems. Upon our review Princeton University is submitting a Public Comment form pertaining to Section 510 Hazardous exhaust systems.

In general Princeton University supports the International Mechanical Code however, Princeton feels interpretations of Sections 510.2, 510.4 and 510.7 may result in inconsistencies with the following Standards: NFPA 45 Section 6, ANSI/AIHA Z9.5 Section 5.3 and the OSHA Laboratory Standard (29 CFR 1910.1450).

The laboratory exhaust systems on Princeton's Campus have been designed, constructed and maintained to these Standards. Princeton has over 500 chemical fume hoods attached to laboratory exhaust systems. There are two types of exhaust systems used in our laboratories. The first is the dedicated duct and fan for each fume hood, most of which were installed prior to 1980's. Dedicated exhaust systems have limited application today, used only where it is impractical to connect isolated fume hoods to a manifold exhaust or for Perchloric acid hoods. The second and most common practice is the manifold exhaust systems, which have been used since the 1980's. Princeton University has never experienced any fires within the fume hood exhaust ductwork systems or any significant exposures relating to these types of exhaust systems. Princeton has realized many benefits from using the manifold exhaust system, including:

1. Enhanced dilution by mixing hood exhaust with general exhaust and exhaust from other floors.
2. Minimization of potential chemical exposure to maintenance personnel by reducing the number of fans used and the amount of time maintenance personnel will spend working on these systems. Manifold exhaust systems generally use only two or three exhaust fans (in parallel with isolation dampers) to support the building exhaust requirements. They are also are designed such that if one fan was in need of service, the system would still have adequate exhaust capacity, which enhances safety in the laboratory by allowing fume hoods to continue to function.
3. Energy Recovery technology has been applied to manifold exhaust systems to allow exhaust energy to be exchanged in order to either pre-cool or pre-heat air handlers makeup air, depending on the season. Preconditioning the air significantly reduces energy consumption for both heating and cooling.

The new code would eliminate the benefits listed above and would create design, safety and cost implications. The manifold exhaust system cost is significantly less expensive than the dedicated duct and fan exhaust system since the dedicated exhaust systems require additional ductwork, fans and controls. Single exhaust systems are generally impractical due to the requirement to increase the buildings square footage to allow for the additional shaft space needed to support the numerous exhaust risers. If the additional building space can not be supported from the budget, then the net usable floor space for the laboratories would need to be reduced. There is a significant construction premium associated with the use of dedicated duct and fan exhaust systems.

There are design and safety implications of using dedicated duct and fan exhaust systems on large scale applications. The use of multiple dedicated fume hood exhaust fans will increase the amount of time maintenance workers must spend on roofs, thus, increasing their exposure to hazardous chemicals while working on the fan while adjacent fans are discharging exhaust from active fume hoods. Manifold exhaust systems dilute contaminated air and exhaust fans discharge the air from the roof at a rate of 3,000 to 4,000 fpm, reducing the exposure risk to any maintenance personnel working on the roof. The manifold exhaust system also allows the exhaust to be isolated at a location on the roof so the exhausted contaminants will not reenter the building fresh air intakes. The use of multiple dedicated exhaust systems results in difficulties in directing exhaust away from fresh air intakes.

The manifold exhaust system provides flexibility in the laboratory layout and allows facility personnel to add or relocate fume hoods without major modifications to ductwork, control systems or air handlers. The installation of dedicated exhaust duct and fans in a existing building is very difficult and expensive to obtain.

The installation of a fire suppression system into the exhaust ductwork would be very expensive and could also create a dangerous situation. If a fire suppression system were to be activated in an exhaust duct, the water would flow back into the fume hood, enter the work area and push the fume hood contents onto the laboratory floor. This could present a risk of exposure of chemicals to first responders and laboratory occupants.

A few years ago, Princeton modified a manifold exhaust system in a science building with Heat Recovery coils. The building is served by four 35,000 CFM air handling systems. The systems have been monitored for the past three years.

The total heating BTUs recovered per year for the four air handling systems is approximately 1.1217×10^{10} BTU, translating to an annual heating savings of $43,933.

The total cooling BTU recovered per year for the four air handling systems is approximately 5.1584×10^{8} BTU, for an annual cooling savings of $3,026. The cooling savings would be much greater if Desiccant Energy Wheels were able to be applied to this system. The Desiccant Energy Wheel allows for both latent and sensible heat transfer which allows for sufficient moisture removal in the summer. Princeton has a proposed Science building which incorporated the Desiccant Energy Wheel in the design. The total heating and cooling savings from the four air handling systems is $46,956 per year.

Princeton has been working very hard to minimize carbon dioxide emissions from our Campus. An additional benefit realized from utilizing heat recovery is the reduction in greenhouse gas emissions. In the heat recovery example presented, the estimated tons of carbon dioxide saved per year were 897 tons. There are 55 fume hoods in the affected building, which equates to 16.3 tons of CO_2 per hood saved, as compared to a system without heat recovery.

Princeton University has reviewed the documents posted on the American Industrial Hygiene Association (AIHA) Laboratory Health & Safety Committee Website pertaining to the International Mechanical Code 2003 Section 510. These documents included the AIHA proposal to conditionally exempt laboratories from the International Mechanical Code Section 510; the International Mechanical Code Development Committee Public Hearing results from September 5, 2003; the AIHA Letter of appeal request pertaining to the code change request M55-03/04 to the International Mechanical Code Development Committee and the AIHA- Position paper on Hazardous Exhaust Systems in Research Laboratories that involve "Laboratory Scale" use of Chemicals.

Princeton University concurs with the technical information provided by the AIHA. The proposed code changes by the AIHA would exempt research laboratories from ONLY the Sections 510.2,510.4 and 510.7 of the International Mechanical Code, with the understanding that NFPA 45 Chapter 6 and ANSI/AIHA Z9.5 would remain applicable.

Princeton University request the International Code Council and the International Mechanical Code Committee revisit the code request changes submitted by the AIHA along with the NFPA 45 and ANSI/AIHA Z9.5 Standards. These materials will help to clarify the International Mechanical Code – Code Request M55-03/04, discussed at the International Code Council and International Code Development Committee Public Hearing on September 5, 2003.

Conclusion

Princeton University is hopeful that the International Mechanical Code Committee will reverse their decision and approve the proposed code request changes to M55-03/04 submitted by the American Industrial Hygiene Association.

Thank you for your consideration.

Public Comment 4:

Kenneth Kretchman, representing the American Industrial Hygiene Association Laboratory Health and Safety Committee, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials For the purposes of this section, the health hazard rating of materials shall be as specified in NFPA 704.

~~**Exception**: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:~~

1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450.~~
2. ~~A laboratory ventilation system is provided to control health hazard emissions in accordance with 29 CFR 1910.1450. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.~~
3. ~~The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Sections 501.2 and 510.3 of this code.~~

For the purposes of the provisions of Section 510, a laboratory shall be defined as a facility where the use of chemicals is related to testing, analysis, teaching, research, or developmental activities. Chemicals are used or synthesized on a non-production basis, rather than a manufacturing process.

Modify current text as follows:

510.2 Where required. A hazardous exhaust system shall be required wherever operations involving the handling or processing of hazardous materials, in the absence of such exhaust systems and under normal operating conditions, have the potential to create one of the following conditions:

1. A flammable vapor, gas, fume, mist or dust is present in concentrations exceeding 25 percent of the lower flammability limit of the substance for the expected room temperature.
2. A vapor, gas, fume, mist or dust with a health-hazard rating of 4 is present in any concentration.
3. A vapor, gas, fume, mist or dust with a health-hazard rating of 1,2, or 3 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity.

Exception: Laboratories, as defined in section 510.1, except where the concentrations listed in Item 1 are exceeded or a vapor, gas, fume, mist or dust with a health-hazard rating of 1,2, 3, or 4 is present in concentrations exceeding 1 percent of the median lethal concentration of the substance for acute inhalation toxicity

510.4 Independent system. Hazardous exhaust systems shall be independent of other types of exhaust systems. Incompatible materials, as defined in the *International Fire Code*, shall not be exhausted through the same hazardous exhaust system. Hazardous exhaust systems shall not share common shafts with other duct systems, except where such systems are hazardous exhaust systems originating in the same fire area.

Exception: The provision of this section shall not apply to laboratory exhaust systems where all of the following conditions apply:

1. All of the hazardous exhaust ductwork and other laboratory exhaust within both the occupied space and the shafts is under negative pressure while in operation.
2. The hazardous exhaust ductwork manifolded together within the occupied space must originate within the same fire area.
3. Each control branch has a flow regulating device.

4. Perchloric acid hoods and connected exhaust shall be prohibited from manifolding.
5. Radioisotope hoods are equipped with filtration and/or carbon beds where required by the registered design professional.
6. Biological safety cabinets are filtered.
7. Provision is made for continuous maintenance of negative static pressure in the ductwork.

Contaminated air shall not be recirculated to occupied areas unless the contaminants have been removed. Air contaminated with explosive or flammable vapors, fumes, or dusts; flammable or toxic gases; or radioactive material shall not be recirculated.

510.7 Suppression required. Ducts shall be protected with an approved automatic fire suppression system installed in accordance with the *International Building Code*.

Exceptions:
1. An approved automatic fire suppression system shall not be required in ducts conveying materials, fumes, mists, and vapors that are nonflammable and noncombustible under all conditions and at any concentrations
2. An approved automatic fire suppression system shall not be required in ducts where the largest cross-sectional diameter of the duct is less than 10 inches (254 mm).
3. For laboratories, as defined in Section 510.1, automatic fire protection systems shall not be required in laboratory hoods or exhaust systems.

Commenter's Reason: This proposed change is necessary to provide improved safety conditions in research laboratories. The nature of laboratories is one of a wide variety of chemicals used in small quantities. Of the most important personnel safety considerations for the control of hazardous materials in the lab and at roof emission points are uninterrupted exhaust and high in-duct and point of emission dilution rates, achieved through exhaust manifolding. IMC 510, with its reference to prohibition of exhausting incompatible materials through the same hazardous exhaust system, has led to an unnecessary departure from manifolding of laboratory exhaust systems., therefore missing the safety benefits of added dilution and reliable exhaust availability. In addition, the requirement for laboratory duct fire suppression is unnecessary, and may increase rather than decrease overall risk in the laboratory. The revision to IMC 510 proposed does not change the text for non-laboratory environments, only addresses means to provide improved safety for laboratory operations.

Scope – The scope of the exception requested for the referenced sections of IMC 510 is laboratories. The proposed definition of laboratories provided in Section 510.1 is intended to describe those environments which, unlike manufacturing operations which may use large quantities of chemicals on a constant basis, are characterized by the use of a wide variety of chemicals in very small quantities, and often for very short periods of time on a very infrequent basis. These are operations in which standard laboratory exhaust practices provide significant "in duct" dilution which prevent in-duct incompatible material reactions and buildup of flammable vapors.

Hazardous Exhaust System - The proposed modification of Section 510.2 for laboratories is to recognize the occasional presence of class 4 materials in laboratories in such small concentrations to preclude need for a hazardous exhaust system. Similarly, minute quantities used in middle school or high school chemistry labs should not drive the requirement for a hazardous exhaust system, as the current code language requires. The modification proposed will still address the need for a hazardous exhaust system when hazardous quantities of class 4 materials are in use in any lab environment and represents little change to existing IMC 510 code language.

Manifolding – Manifolding of laboratory exhaust duct has the following benefits:

If laboratory hood exhaust is mixed with general room exhaust there is immediate dilution. When dealing with a multi-story building the contaminated air from each floor can be combined in rated chases, or on the roof of the building using a header duct, thereby increasing the dilution factor even further. The increased fan discharge volume results in additional dilution and "throw" of the exhaust plume. Once the building's exhaust reaches atmosphere, its chemical content is diluted to a point generally below measurable levels reducing exposure to maintenance personnel working on the roof. In addition, by eliminating multiple dedicated fume hood exhaust fans the overall time that maintenance personnel must spend on the roof of the building is reduced. By including redundant exhaust fans, easy to do with a manifolded system, but not feasible with individual fans, loss of exhaust through a mechanical system failure is eliminated and there is also an opportunity to inspect and maintain the system components without shutting the system down. It is also more feasible to bring emergency power to a manifolded exhaust system. Concerns about incompatible material reactions in laboratory ductwork (which are now precluding use of manifolded systems) which are prevented by standard lab exhaust are displacing the real problems of interruption of exhaust due to mechanical failure and lessened exhaust dilution that are encountered routinely. The proposed text highlights those few conditions, referenced in other laboratory ventilation codes, that should preclude manifolding.

Fire Suppression – The ANSI/AIHA Z9.5 "Standard For Laboratory Ventilation" commentary indicates that addition of fire suppression within laboratory hood exhaust ducts increases potential chemical exposures to workers. During a fire emergency when the sprinkler is activated, the exhaust is turned off just when it is needed most. In addition, an uncontrolled flow of water from sprinklers in chemical hood ductwork could push the contents of the hood out of the hood and create a very dangerous situation, especially if the hood contained water-reactive chemicals. This issue has also been thoroughly investigated and addressed in the past by the NFPA 45 committee which authored the chapter, "Fire Protection for Laboratories Using Chemicals." The exemption language used in this section for laboratory exemption is identical to the language used in NFPA 45.

Public Comment 5:

Dr. Ronald L. Petersen, representing Cermak Peterka Petersen, Inc., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

Exception: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:
1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.
2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: The use of dedicated exhaust systems to serve individual fume hoods creates a major safety concern related to the impact of chemical fumes exiting stacks. This problem is illustrated in Figure 3 of an August 2003 ASHRAE Journal Article by the submitter (i.e., Dr. Ronald Petersen). The paper shows that extremely tall stacks are required (20 to 50 ft above the air intake) to ensure that chemical fumes do not reenter the building or surroundings through the fresh air intakes when individual fume exhaust stacks are used (stack flows of 1000 to 2000 cfm and exit velocities of 3000 fpm). As the volume flow is increased (i.e., through manifolding), shorter and shorter stacks are needed. Since it is common practice to use 10 ft stacks, the new code would in effect ensure that toxic and odorous chemicals impact roof top workers and air intakes and consequently people inside the building and neighboring buildings.

In situations where nearby air intakes are located at elevations above the laboratory exhaust stacks, increasing the stack height will not necessarily reduce the potential re-entrainment of the hazardous exhaust. Where this configuration occurs, often the only option available to avoid adverse air quality at the nearby air intake is to increase the initial dilution of the emissions before they exit the exhaust stack. This is best achieved by manifolding the exhaust from as many systems as feasibly possible. The inability to adequately manifold laboratory exhaust will result in a greater probability that Short Term Exposure Limits (STELs) of emitted chemicals will be exceeded inside the taller building.

It should be noted that the most restrictive design criterion for laboratory stacks is an accidental spill of a chemical. Since it is highly unlikely that the same chemical will be spilled in more than one fume hood at the same time, manifolding will not result in higher emissions, it will just dilute the concentration at the point of exhaust.

Public Comment 6:

Michael A. Ratcliff, representing RWDILLC, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

Exception: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:

1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.
2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: Same reasons as defined in the Proposal change M55 – 03/04 to the 2003 *International Mechanical Code*. Plus the following additional reasons relating to air quality impacts of laboratory fume hood exhausts, on which our firm has consulted for almost 20 years.

RWDI strongly recommends that manifolded laboratory exhausts be permitted in the international codes from an outdoor air quality point of view. Individual exhausts greatly increase the likelihood that the exhaust will impact outdoor locations and building outside air intakes after being emitted to the atmosphere. RWDI is a specialty consulting engineering firm that has been giving advice on laboratory exhaust stack design for almost 20 years for hundreds of laboratories in North America. Our recommendation has been to always use manifolded laboratory fume hood exhausts (with the exception of perchloric acid hoods that need washdown systems and radionuclide exhausts that may face decontamination in the future).

We have never received negative feedback from our recommendation for manifolded exhausts versus individual exhausts, nor have we encountered any problems with incompatible chemicals from multiple fume hoods. In contrast, we often encounter odor complaints associated with individual exhausts because the low-flow rate individual exhaust had insufficient vertical momentum to avoid impacts on the building.

The advantages of manifolding in terms of outdoor air quality have been stated in ASHRAE's Application Handbook, Chapter 44 "Building Air Intake and Exhaust Design", Page 44.1, 2003. RWDI personnel were responsible for preparing the text on manifolded exhausts that was included in this chapter and accepted by the ASHRAE technical committee in charge.

The advantages of manifolding are twofold. Additional reasons are given below beyond that included in the ASHRAE handbook:

1) The manifolded exhaust will be diluted prior to being emitted to the atmosphere. In our experience, air quality impacts that do occur arise from a single fume hood with larger than usual emissions. Due to the variety of procedures in laboratories, other fume hood exhausts will have lower concentrations, which act to dilute the single hood emissions. This dilution within the manifolded system makes rooftop areas safer for personnel on the roof and also reduces air quality impacts.

2) The manifolded system will have increased vertical momentum of the contaminated exhaust plume (or "throw") that will greatly help in avoiding outdoor impacts. The rise of the exhaust is directly proportional to both the exit velocity AND the exit diameter. However, noise issues prevent exit velocities from exceeding 4,000 feet per minute. Manifolding increases flow rate and increases diameter while maintaining a reasonable exit velocity. Manifolding of 20 to 40 hoods (a common design) allows much higher throw compared to a single hood exhaust that has a limited exit velocity. Throw heights of 30 ft and more are possible, even under adversely high wind speeds, compared to throw heights of less than 10 ft typical for single hood exhausts.

Bibliography:
2003 ASHRAE Handbook of Fundamentals
Chapter 44 "Building Air Intake and Exhaust Design"
Page 44.1
American Society of Heating Refrigeration and Air Conditioning Engineers, Atlanta GA

Public Comment 7:

Christopher P. Rousseau, PE, representing Newcomb & Boyd, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

Exception: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:

1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.
2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: Newcomb & Boyd was established in 1923 and has successfully designed over 340 laboratory projects, including 132 projects in the last 5 years. Our staff of 43 mechanical engineers, including 21 licensed professional engineers, strongly agrees with the AIHA's position that "following the current Section 510 in place of the current NFPA 45 will cause increased exposures to workers and emergency response personnel". We currently have several large research laboratory projects which will benefit greatly by the immediate approval of this Code Change Proposal. These benefits include improved safety for lab users, improved safety for building maintenance personnel, improved energy efficiency, and lower first costs.

Public Comment 8:

Scott Rusch, representing the Fred Hutchinson Cancer Research Center, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

> **Exception**: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:
> 1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. <u>The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.</u>
> 2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
> 3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: Same reasons as defined in Proposal Change M55-03/04 to the 2003 International Mechanical Code. Plus the following additional reasons.

We join with Affiliated Engineers Incorporated in stating that Section 510 of the International Mechanical Code (IMC) will have significant detrimental impacts on the design, construction and safe operation of laboratory exhaust ventilation systems serving research laboratories, such as those at Fred Hutchinson Cancer Research Center.

The fire history of existing laboratories, which are served by manifolded ventilation exhaust systems without fire suppression systems in the ducts have operated safely for many years. Following the current Section 510 in place of NFPA 45 will result in increased exposures to workers and emergency response personnel during times of equipment failure.

Section 510 of the IMC would require laboratory exhaust ventilation (chemical fume hoods) added to these systems to be provided with a dedicated exhaust system and a fire suppression system installed to protect the ductwork. This will result in safety issues associated with the differences in maintenance and operation required for these systems. Operational failure of dedicated exhaust systems will create safety related issues, potentially resulting in the unnecessary exposure of the researchers to harmful hazardous materials as compared to manifolded exhaust systems which have multiple exhaust fans operating simultaneously.

We concur with the American Industrial Hygiene Association (AIHA) proposed change for Section 510 to the International Code Council that exempts laboratories, such as research laboratories like those found at Fred Hutchinson Cancer Research Center, that involve lab scale operations from the requirements of this section. These chemical fume hoods would meet the requirements of NFPA 45 and ANSI/AIHA Z9.5.

We support Proposed Revision 1: by Proponent Paul Sullivan, P.E., in calling for the deletion of reference 29 CFR 1910.1450 for purpose of clarity in the design of laboratories and code enforcement process and support the proposed revisions.

Public Comment 9:

Andrew Smith, representing the Phoenix Controls Corporation, requests Approval as Submitted.

Commenter's Reason: Phoenix Controls is a recognized leader in the design and manufacture of precision laboratory airflow controls systems and in the interest of laboratory safety, strongly supports M55-03/04 for the reasons stated in the code change.

There are several inconsistencies between the IMC 2000 and widely recognized laboratory standards that can easily be resolved by the proposed change M55-03/04. Those changes will keep laboratories much safer for both workers and emergency responders while maintaining building energy efficiency.

1. Addition of automatic fire suppression within laboratory fume hood exhaust ducts will make them less effective and increase potential exposure to workers. An uncontrolled flow of water from sprinklers could push the contents of the fume hood onto the floor and create a much more dangerous situation.
2. Prohibiting manifolded laboratory chemical exhausts would also increase the potential for exposure to workers. Most laboratory ventilation systems are manifolded and have a redundant fan motor in parallel with the primary motor. This design allows for emergency back up and uninterrupted service during maintenance. A redundant motor on every fume hood is not practical from a cost, space, or maintenance perspective. Dilution is much better with a manifolded system because the fume hood exhaust is mixed with general room exhaust. If we are dealing with a multi-story building we can combine the contaminated air from each floor on the roof of the building using a header duct thereby increasing the dilution factor even further. Finally, if the exhaust fan propels contaminated air off the building's roof at a rate of 3000-4000 feet per minute the resulting plume is diluted even further. In essence, once the buildings exhaust reaches atmosphere, its chemical content is diluted to a point generally below measurable levels.

M55-03/04 suggests an exception for laboratory ventilation systems in research laboratories that involve laboratory scale[1] use with the understanding that one would follow NFPA 45, Chapter 6 and ANSI Z9.5, and would limit duct flammable concentrations to less than 25% of LEL.

[1]"Laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safely manipulated by one person.

Public Comment 10:

Paul D. Sullivan, P.E., representing Partners Health Care, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

510.1 General. This section shall govern the design and construction of duct systems for hazardous exhaust and shall determine where such systems are required. Hazardous exhaust systems are systems designed to capture and control hazardous emissions generated from product handling or processes, and convey those emissions to the outdoors. Hazardous emissions include flammable vapors, gases, fumes, mists or dusts, and volatile or airborne materials posing a health hazard, such as toxic or corrosive materials. For the purpose of this section, the health-hazard rating of materials shall be as specified in NFPA 704.

> **Exception**: This section shall not apply to laboratory ventilation systems in research laboratories that comply with all of the following:
> 1. ~~The laboratories involve only laboratory scale use of substances as defined in 29 CFR 1910.1450~~. <u>The research laboratory is as defined in accordance with Chapter 1 of NFPA 45.</u>
> 2. A laboratory ventilation system is provided to control health hazard emissions ~~in accordance with 29 CFR 1910.1450~~. Such exhaust system shall not recirculate to other areas and the entire system from the laboratory to the exhaust terminal shall operate under negative pressure.
> 3. The laboratory ventilation system required by Item 2 is designed, constructed and operated in accordance with Chapter 6 of NFPA 45 and ANSI/AIHI Z9.5 and complies with Section~~s 501.2 and~~ 510.3 of this code.

Commenter's Reason: The intent of referencing the OSHA (28 CFR 1910.1450) definition in the M55-03/04 proposed change is to ensure that the exception is only utilized by research laboratories using "laboratory scale" chemicals.

"Laboratory scale" means work with substances in which the containers used for reactions, transfers, and other handling of substances are designed to be easily and safety manipulated by one person. "Laboratory scale" excludes those workplaces whose function is to produce commercial quantities of materials.

Public Comment 11:

Charles E. Trunnell, O'Brien/Atkins Associates, PA, representing clients, requests Approval as Submitted.

Commenter' Reason: Amendment M55-03/04 should be reconsidered and adopted. The reasons published for its dismissal by the committee are insufficient explanation for its actions, and totally ignore the life safety issues addressed by the code and this amendment.

Over whelming evidence has been documented by the AIHA regarding the short-comings of the current IMC section 510 in how it disregards currently accepted best practices and compromises life safety issues with respect to the laboratory scale use of improbable but possibly hazardous materials. This information was apparently included in the original amendment, but seems to have been over looked in committee. Furthermore, the existing code in section 510 is not coordinated with the International Fire Code and the IMC has no provisions for addressing the requirements made by section 510. Specifically, nothing in the IFC regulates the introduction of fire suppression inside air ducts. Many Fire marshals I have spoken to scratch their heads at this requirement. Lastly, Section 510 has invalidated the mechanical systems approach to every lab I have worked on by not including reference to NFPA 45. This includes labs in three states, and several code jurisdictions all of which used NFPA 45, but can no longer justify it use, despite being the preferred methodology, since the adoption of the IBC by the states themselves. To attempt to regulate the exhaust systems in 3 pages in section 510 creates gross over simplifications and conflicts for designers and owners.

M57-03/04
511.1.1

Proposed Change as Submitted:

Proponent: Randall R. Dahmen, State of Wisconsin, Dept. of Commerce

Revise as follows:

511.1.1 Collectors and separators. ~~Cyclone~~ Collectors and separators <u>involving such systems as centrifugal separators, bag filter systems, and similar devices,</u> and associated supports shall be constructed of noncombustible materials and shall be located on the exterior of the building or structure. A collector or separator shall not be located nearer that 10 ft (3048 mm) to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe that extends above the highest part of any roof with a distance of 30 ft (9144 mm).

Reason: As currently listed in the IMC, Section 511.1.1 starts out as "Collectors and separators", but the first sentence immediately uses "Cyclone collectors and separators..."which seems to refer to a specific type of collector. There are conflicts in the field on the application of this code section since this section does not currently directly reference bag filter systems. The reference is only inferred. Only through the use of the IMC Code Commentary will a code user find a direct reference. The code should be as explicate as reasonably possible so that the need for interpretations and references such as the IMC Code Commentary are limited.

Cost Impact: None

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's published reason. It clarifies which type of systems are covered by this section.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

James F. McMullen, The McMullen Company, representing The Donaldson Company, Inc., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

511.1.1 Collectors and separators. Collectors and separators involving such systems as centrifugal separators, bag filter systems, and similar devices, and associated supports shall be constructed of noncombustible materials and shall be located on the exterior of the building or structure. A collector or separator shall not be located nearer that 10 ft (3048 mm) to combustible construction or to an unprotected wall or floor opening, unless the collector is provided with a metal vent pipe that extends above the highest part of any roof with a distance of 30 ft (9144 mm).

> <u>**Exception:** Collectors such as "Point of Use" collectors, close extraction weld fume collectors, spray finishing booths, stationary grinding tables, sanding booths, and integrated or machine-mounted collectors shall be permitted to be installed indoors provided installation is in accordance with the International Fire Code and the ICC Electrical Code.</u>

Commenter's Reason: While we agree with and support the clarification the proponent seeks, further clarification is necessary in order to avoid conflicts with the International Fire Code, Chapter 13, Combustible Dust-Producing Operations. This chapter of the International Fire Code contains appropriate explosion protection standards for indoor collection and separation involving combustible dust-producing operations at the point of use and is more specific as to the types of operations covered by the standards.

In some buildings, locating the collector or separator outdoors results in having to use larger capacity systems and motors than would ordinarily be necessary, as well as installing long runs of ducting which often must pass through rated construction. This can result in transporting hazardous byproducts throughout different parts of a building, sometimes through other occupancies, in order to reach the exterior of the building. These conditions are neither ideal, safe nor are they always necessary.

This clarification is necessary in order to avoid conflicts with the International Fire Code and to apply the appropriate explosion protection standards for specific types of combustible dust-producing operations.

M58-03/04
602.2.1.6

Proposed Change as Submitted:

Proponent: Jack Beuschel, Studor, Inc.

Add new text as follows:

<u>**602.2.1.6 Air Admittance Valves**. Air admittance valves shall be permitted to be installed in spaces utilized as supply or return air plenums provided that the valves have a peak rate of heat release not greater than 100 kilowatts, a peak optical density not greater than 0.50, and an</u>

average optical density not greater than 0.15 when tested in accordance with UL 2043. The vent piping and connecting device connected to the air admittance valve and exposed within the plenum shall be made from material that is approved for installation in plenums.

CHAPTER 15
REFERENCED STANDARDS

UL 2043-01 Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces
. . . . 602.2.1.6

Reason: The IPC approves the use of air admittance valves (AAVs) for single fixture and branch venting. Their installation has been prohibited in supply or return plenums since the materials commonly used to manufacture AAVs are ABS and PVC. These are combustible materials that are generally not used in exposed applications within plenums due to their combustion (heat/smoke) characteristics.

The title of UL 2043 is Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces. AAVs are discrete products (as opposed to continuous piping, ducting, insulation, etc.). As such, a test method such as UL 2043 is an appropriate test. The test places limits on heat released and smoke generated when the discrete part is exposed to a large (approximately 60 kilowatt) sand burner flame for 10 minutes. Since the risk of a fire starting within an AAV is zero, a test that simulates response to a larger external fire is a better model to use when evaluating performance. Both the National Electrical Code and the *International Mechanical Code* recognize this type of test for discrete products. The IMC does so explicitly in Section 602.2.1.4 – Requirements for Combustible Electrical Equipment in Plenums.

SGS U.S. Testing Company Inc. has performed tests on 2 types of AAVs to evaluate their ability to function in supply and return air plenums. They determined that a pressure differential between the plenum space and the DWV system of 0.30 inches of water column (WC) was required to unseat the diaphragm. The ANSI/ASSE performance standards pressure required that AAVs open at a maximum negative pressure of 0.30" WC. Therefore, since the maximum pressure differential in a supply and return air plenum does not exceed plus or minus 0.10" water column the operation of the valve will not be adversely affected by air pressure fluctuations. (Please see copy of SGS U.S. Testing Report No. 162142-R.)

In commercial applications the installation of AAVs in plenums will provide significant economic benefits versus open pipe vents without jeopardizing the health and safety of the public.

Analysis: UL 2043-01 complies with Section 3.6 of the ICC code development process.

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: No evidence was presented that the air admittance valve had been tested in a plenum as part of a plumbing system.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Jack Beuschel, representing the STUDOR, INC., requests Approval as Submitted.

Commenter's Reason: The ASSE performance standards require that air admittance valves (AAVs) open at 0.03 inches of negative pressure. Since positive and negative pressure differentials in plenums do not exceed plus or minus 0.01 inches the normal operation of an air admittance valve is not affected. The only criteria for a device to be installed in a plenum is that it is manufactured from material that complies to a material standard that is permitted in plenums. Section 602.2.1.4 of the IMC permits products manufactured from materials that have been tested to Standard UL 2043 to be installed in plenums. Therefore, AAVs that have been tested to and that comply to UL 2043 must be permitted to be installed in plenums.

M60-03/04
602.2.1.4

Proposed Change as Submitted:

Proponent: William A. Webb, P.E., Performance Technology Consulting, Ltd., representing Titus Products, Division of Tomkins Industries

Revise as follows:

602.2.1.4 Combustible electrical equipment and other discrete products. Combustible electrical equipment and other discrete products exposed within a plenum shall have a peak rate of heat release not greater than 100 kilowatts, a peak optical density not greater than 0.50, and an average optical density not greater than 0.15 when tested in accordance with UL 2043. Combustible electrical equipment and other discrete products shall be listed and labeled.

Reason: The purpose of the revision is to require all combustible discrete products, besides combustible electrical equipment already covered, to meet UL 2043.

Analysis: The term "discrete products" is not defined.

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: The proposed term "discreet products" is not defined and could result in inconsistent enforcement of the code.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

William A. Webb, Performance Technology Consulting, Ltd., representing Titus Products, Division of Tomkins Industries, requests Approval as Modified by this Public Comment.

Modify proposal as follows:

602.2.1.4 Combustible electrical equipment and other combustible discrete products. Combustible electrical equipment and other combustible discrete products exposed within a plenum shall have a peak rate of heat release not greater than 100 kilowatts, a peak optical density not greater than 0.50, and an average optical density not greater than 0.15 when tested in accordance with UL 2043. Combustible electrical equipment and other combustible discrete products shall be listed and labeled.

Add new definition to 202 as follows:

DISCRETE PRODUCT. An individually distinct, noncontinuous item, including pipe hangers, duct hangers and supports, air maintenance valves, floor diffusers and similar products installed in a plenum.

Commenter's Reason: The definition is to respond to the Code Committee's reason for rejecting the proposal. The definition is intended to differentiate discrete products from continuous products such as pipe, cable and tubing. The specific products listed in the definition are types already listed as discrete products by Underwriters Laboratories for use in plenums. The appropriate definition for this case of "discrete" in *Webster's New Collegiate Dictionary* is: "**1**: constituting a separate entity : individually distinct **2**. **a.** consisting of distinct or unconnected elements : NONCONTINUOUS"

The word "combustible" was added preceding "discrete products" in the proposal to clarify that the section refers only to combustible products.

M61-03/04
603.5

Proposed Change as Submitted:

Proponent: Ralph Guinn, Canplas Industries Limited, representing Canplas Industries Limited

Revise as follows:

603.5 Nonmetallic outlets. Nonmetallic ducts shall be constructed with Class 0 or Class 1 duct material in accordance with UL 181. Fibrous duct construction shall conform to the SMACNA *Fibrous Glass Duct Construction Standards* or NAIMA *Fibrous Glass Duct Construction Standards.* The maximum air temperature within nonmetallic ducts shall not exceed 250° F(121° C).

> **Exception.** PVC ducts used in central vacuum-cleaning systems installed within a dwelling unit shall comply with the requirements of ASTM F2158. Metallic ducts shall be used where the separation wall between a dwelling unit and a garage is penetrated. Penetrations of walls shall comply with Section 607 and the *International Building Code.*

607.5.3 Fire partitions. Duct penetrations in fire partitions shall be protected with approved fire dampers installed in accordance with their listing.

> **Exceptions:**
> 1. and 2. (No change)
> 3. Metallic ducts for central vacuum-cleaning systems which penetrate the 1-hour wall between a dwelling unit and garage.

CHAPTER 15
REFERENCED STANDARDS

ASTM F 2158 - 01 Standard Specification for Residential Central - Vacuum Tube and Fittings[1] . . 603.5, 607.5.3

Reason: The introduction of Central Vacuum Cleaning units in dwelling units is currently not covered in any of the Codes. A reference standard of conformance has been developed making the timing right for such a revision. Officials will now have a reference for product compliance.

Analysis: ASTM F 2158-01 complies with Section 3.6 of the ICC code development process.

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: There is no guidance provided for other aspects of vacuum cleaning systems, such as sizing of ducts. There was a concern about eliminating fire dampers for these ducts but requiring them for other ducts that penetrate a rated wall. The committee questioned if this section is the appropriate location in the code for vacuum cleaning ducts.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Ralph Guinn, representing Canplas Industries Ltd., requests Approval as Modified by this Public Comment.

Modify proposal as follows:

603.5 Nonmetallic outlets. Nonmetallic ducts shall be constructed with Class 0 or Class 1 duct material in accordance with UL 181. Fibrous duct construction shall conform to the SMACNA *Fibrous Glass Duct Construction Standards* or NAIMA *Fibrous Glass Duct Construction Standards.* The maximum air temperature within nonmetallic ducts shall not exceed 250° F(121° C).

> ~~**Exception.** PVC ducts used in central vacuum-cleaning systems installed within a dwelling unit shall comply with the requirements of ASTM F2158. Metallic ducts shall be used where the separation wall between a dwelling unit and a garage is penetrated. Penetrations of walls shall comply with Section 607 and the *International Building Code.*~~

607.5.3 Fire Partitions. Duct penetrations in fire partitions shall be protected with approved fire dampers installed in accordance with their listing.

> **Exceptions:**
> 1. and 2. (No change)
> 3. Metallic ducts for central vacuum-cleaning systems which penetrate the 1-hour wall between a dwelling unit and garage.

Add new text as follows:

926
Central Vacuum Cleaning Systems.

926.1 General. This section provides for the material, appliance and installation requirements for a central vacuum cleaning system from the inlet valves to the Power unit. The system shall be independent of all other duct systems and shall convey debris to the central vacuum power unit.

926.2 Material. The central vacuum cleaning power unit shall be listed and labeled as being manufactured in accordance with the requirements of UL 1017. The central vacuum cleaning tubing and fittings shall be listed and labeled as being manufactured in accordance with ASTM F2158.

926.3 Installation. Central vacuum power units shall be installed in accordance with the manufacturers instructions. Central vacuum cleaning tube and fittings shall be installed in accordance with the manufacturers instructions. Tubing passing through a fire-resistance-rated wall shall be firestopped in accordance with the requirements in Section 703 of the *International Building Code*.

Commenter's Reason: We agree with the committee that there was no guidance provided for other aspects of central vacuum cleaning systems. We also agree that this section of the code may not be the correct location to reference central vacuum cleaning systems. However we do feel that there is a need to address central vacuum cleaning systems and submit the attached text as a being a new Chapter in the IMC.

It was mentioned that the IRC might be the more appropriate location for this change. A companion change for the IRC will be submitted during the next code cycle. However, we believe it should also be in the IMC and request your approval of this modified change.

M70-03/04
1002.4 & Ch. 15

Proposed Change as Submitted:

Proponent: Tim Kilbane, Symmons Industries, Inc.

Add new text as follows:

1002.4 Water Heaters and storage tanks. Where hot water is produced or stored at temperatures higher than 140° F (60°C), a temperature actuated mixing valve that conforms to ASSE 1017 shall be provided to temper the water supplied to the potable hot water distribution system to a temperature of 140 F (60° C) or less.

CHAPTER 15
REFERENCED STANDARDS

ASSE 1017-99 Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems 1002.4

Reason: For the same reason that the code currently requires that a tempering device be installed on a space heating device (see IMC 1002.2.2) that could produce excessive potable hot water temperatures, it only stands to reason that the same level of protection apply to potable hot water heaters. The ASSE 1017 standard is the appropriate standard for this application.

Cost Impact: None

Committee Action: **Approved as Submitted**

Committee Reason: Based on the proponent's published reason.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Frank Stanonik, representing GAMA, requests Disapproval.

Commenter's Reason: This proposal would require all water heaters to have an ASSE 1017 mixing valve, which is redundant and unnecessary since the code appropriately covers the use of such valves at the point of use. The plumbing committee disapproved several similar proposals, P42, 43 and 44.

M71-03/04
1004.1

Proposed Change as Submitted:

Proponent: David C. Bixby, representing Gas Appliance Manufacturers Assoc.

Revise as follows:

1004.1 Standards. Oil-fired boilers ~~and their control systems shall be listed and labeled in accordance with UL 726~~ shall employ burner assemblies listed and labeled in accordance with UL 296, and shall be installed in accordance with NFPA 31 and the manufacturer's instructions. Electric boilers and their control systems shall be listed and labeled in accordance with UL 834. Boilers shall be designed and constructed in accordance with the applicable requirements of ~~ASME CSD-1 and as applicable,~~ the ASME *Boiler and Pressure Vessel Code*, Sections I, or ~~II,~~ IV~~, V and IX~~; NFPA 8501, NFPA 8502 or NFPA 8504.

CHAPTER 15
REFERENCED STANDARDS

UL 296 Standard for Oil Burners 1004.1

Reason: Currently, nearly all oil-fired boilers utilize burners that are listed to the *Standard for Oil Burners*, UL 296, and the boiler itself is not listed to UL 726. In addition, these boilers comply with Section IV, *Rules for Construction of Heating Boilers*, in the ASME Boiler and Pressure Vessel Code. The safety of oil boilers is not enhanced by requiring a UL 726 listing. Due to the exemplary safety record of oil-fired, boilers, there has been no justification for these boilers to be UL listed, as long as they comply with Section IV, utilize burners listed to UL 296, are installed in accordance with NFPA 31 and the boiler manufacturer's instructions.

There is also no safety justification for compliance with ASME CSD-1. There are several requirements within CSD-1 that conflict with each other, and some sections of CSD-1 conflict with ASME Section IV. There have also been countless instances of misuse and misinterpretation of CSD-1 by jurisdictions and boiler inspectors. Requiring CSD-1 compliance further complicates and hinders the process that enforcement officials must go through to approve new installations.

Section 1004.1 does not include a reference to Section IV, *Rules for Construction of Heating Boilers*, of the ASME Boiler and Pressure Vessel Code. We believe that this is because Section IV was mistakenly omitted from the 2000 IMC when the IMC coverage for gas boilers was moved to the 2000 *International Fuel Gas Code* (IFGC). The reference to Section IV appears in both the 1998 IMC and the 2000 IFGC. The omission of this requirement represents a significant safety concern. The rules of Section IV cover minimum construction requirements for the design, fabrication, installation, and inspection of low-pressure steam heating, hot water heating, and hot water supply boilers.

Analysis: The proponent had not submitted the standard for staff review prior to the printing of the monograph.

Cost Impact: None

Committee Action: **Disapproved**

Committee Reason: Currently referenced UL 726 is the appropriate standard for oil-fired boilers. Requiring different standards for sub-assemblies is not consistent with current ICC listing requirements.

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because a public comment was submitted.

Public Comment:

Frank Stanonik, representing GAMA, requests Approval as Submitted.

Commenter's Reason: Although the Committee's reasons for disapproving GAMA's proposal notes the existence of the standard for oil-fired boilers, this requirement is not how many state jurisdictions have been, and still are, handling oil boiler installations. Before this requirement, states like New York had the same requirements as those in GAMA's proposal, with no reports of safety related incidents. Therefore, it appears that the Committee is going against what has worked for many states for a long time, just because a standard exists for oil boiler assemblies. While some manufacturers are listed to UL 726, many others are not. States enforcing this IMC requirement will force those manufacturers who have not had to certify their residential oil boilers to start doing so for no valid safety reason.

In addition, there is another part of GAMA's proposal that the Committee has apparently overlooked. The IMC does not require compliance with ASME Section IV, whereas the IFGC does. This error is a serious loophole in the IMC. Those states that have adopted the IMC requirement have weakened their code insofar as the boiler construction. This must be corrected.