2015

OBO MECHANICAL CODE

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U.S. DEPARTMENT OF STATE
BUREAU OF OVERSEAS BUILDINGS OPERATIONS

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OBO Supplement to 2012 INTERNATIONAL MECHANICAL CODE (IMC)

The *2015 OBO International Codes Supplement* adopts the *2012 International Mechanical Code* (IMC) and amends its provisions on a chapter-by-chapter basis. Sections listed in the chapters below are amended or added by this supplement. Where a section is not listed, provisions of the IMC section are adopted by OBO in their entirety. A number of IMC chapters are adopted in their entirety without amendment as indicated. Appendixes are adopted or amended as indicated.

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CHAPTER 1
SCOPE AND ADMINISTRATION

SECTION 101
GENERAL

Replace Chapter 1 in its entirety with the following:

101.1 **Title** These regulations shall be known as the *2015 OBO Mechanical Code* hereinafter referred to as "this code."

1. This code incorporates by adoption the *2012 International Mechanical Code* of the International Code Council as amended by the 2015 OBO International Codes Supplements (OBO-ICS).

101.2 **General.** The provisions of Chapter 1 - Administration of the *OBO Building Code*, apply to this code.

END OF CHAPTER IMC-1 AMENDMENTS

CHAPTER 3
GENERAL REGULATIONS (MECHANICAL)

SECTION 303
EQUIPMENT AND APPLIANCE LOCATION

Add the following subparagraph:

303.9 Equipment Spaces. Locate equipment as required by this section.

303.9.1 Air-handling units (AHUs). Air handling units shall be located in conditioned mechanical rooms on the floor served by the air–handling unit.

Exceptions.

1. Air-handling units may be located on the floor adjacent to the floor being served.
2. Outside air AHUs may be located on a roof level if enclosed by a conditioned penthouse.

303.9.2 Vertical stacking. Air-handling unit rooms shall be stacked vertically above each other whenever practicable for efficient riser access

303.9.2 Air-handling uniter room sizes. Sizes for individual air-handling unit room requirements shall be determined by the floor area served (with AHUs provided for PAA, CAA without PCC, and 2 or more for the GWA) and shall follow the general guideline of: Floor Area< 500m^2 = 37.8m^2, 501m^2-1420 m^2 = 48.6m^2, and 1421m^2-1895m^2 = 64.8 m^2 for single side access AHUs.

1. Sizes indicated are a minimum space required for air-handling unit equipment installation and includes maintenance area. A single air handler shall not serve GWA spaces on both sides of the gallery.

2. Multiple air-handling units may be required to serve each area. Site specific adaptation may be required based on quantities and types of equipment chosen. .

HVAC equipment area does not include space that must be allocated for elevators, duct chases, generators, communications equipment and uninterrupted power systems (UPS).

303.9.3 Minimium equipment clearance. Provide a minimum of 600 mm access space on all sides around indoor air-handling units for service and maintenance, provide additional clearance to accommodate filter removal or coil replacement.

303.9.4 Chiller and boiler location. Air cooled chillers and boilers shall be located on the roof level.

Exception. Where approved by OBO/PDCS/DE/ME through the COR.

SECTION 309
TEMPERATURE AND COMFORT CONTROL

Delete the following subsection, keeping the exception, and replace with the following:

309.1 Temperature Control. Temperature and humidity control systems in office buildings and residences on chancery compounds shall be capable of maintaining temperatures between 21 to 24°C and relative humidity between 35-60% at all times. Ventilation rates shall comply with the current edition of ASHRAE 62.1. Equipment controllers shall be programmed such that, during unoccupied periods, the temperature will be set back to 17°C during the heating season and 29°C during the cooling season while maintaining relative humidity at 50% ± 15%. General storage spaces, shops and warehouses shall be maintained between 17°C and 29°C (unoccupied/setback temperatures) while maintaining relative humidity between 30-65% % year round. System/server rooms and other rooms with continuous heat loads or which are continuously occupied, such as Post 1, shall not utilize temperature setback and shall be designed to satisfy that space's specific heating, cooling, and humidity requirements.

Add the following subsection:

309.2 Comfort and Performance Control. Individual thermostatic controls shall be provided for single offices, conference rooms, and similar dedicated spaces. Open office spaces shall be divided into thermostatic zones; no individual zone may be larger than 75 square meters of floor area nor combine areas with dissimilar load profiles; provide individual thermostatic controls for each zone. Thermostats shall be located such that they accurately sense the temperature of the zone served and are readily accessible. Provide ability for office building occupants to adjust thermostat set point +/- 2°C (adjustable) and temporarily override unoccupied setback temperatures in an office/zone when working outside normal business hours.

SECTION 313
HVAC SYSTEM DESIGN

Add the following section:

313.1 Heating and cooling load calculations. Heating and cooling systems shall be sized in accordance with the ASHRAE Handbook of Fundamentals using a design set point of 21 C and >=35% relative humidity for heating and 24 C and <=60% relative humidity for cooling at the ASHRAE 1% cooling and 99% heating conditions. Telecom/server rooms shall be designed to maintain humidity above 35% year round. Occupancy and space utilization shall be based on information provided by OBO. In the absence of more specific information provided, assume a minimum occupant density of 2 square meters per person for consular waiting areas to ensure cooling is adequate during peak use periods.

313.2 HVAC System Considerations.

313.2.1 Air Systems. Buildings on compound built to blast standards shall be served by air handlers with all-air, variable-volume distribution systems incorporating Special Filtration Systems. Outside air ventilation for these building shall be provided in accordance with OBO-ICS IMC Chapter 4 – Mechanical Ventilation.

313.2.2 Building Hydronic (Water) Systems.

1. Provide variable speed pumps, differential pressure controllers, and modulating two way valves at building hydronic distribution systems.

   Exception. PCC system, Refer to PCC requirements.

2. Provide pressure independent (automatic balancing) valves or a reverse piping system to simplify balancing. Hydronic piping shall be designed for a maximum pressure not to exceed1034 kPa.

313.2.3 District Utility Systems. Utilize District Utility Systems (e.g., steam, hot water, chilled water) where available and life cycle cost effective unless otherwise directed by OBO. Utilize the district system to feed a heat

exchanger to transfer energy to a secondary circulation system serving the compound. Where district utility cooling and/or heating plant are employed, provide a single backup system at 100% of design load.

313.3 Cooling System Considerations. Air cooled chillers shall be provided for NECs. Chillers shall be selected on the basis of year round (full and part) load efficiency. In particular, chiller systems must be chosen to efficiently handle low-load 24/7 (including winter) operations. A system of distributed air cooled chillers located on the roof of the building served is the basis of design. This would include at least one system for the Chancery and another for the NOX (which could also serve the MSGQ and Warehouse). The Warehouse may be served by roof-mounted direct expansion (DX) units and the CACs shall be served by DX split systems. This design is a cost effective alternative to a large central plant in a utility building, with extensive underground piping runs and efficiency losses, and could result in a reduction in the overall size of the utility building. Cooling system selection shall be based on the lowest life cycle cost of centrifugal, screw, or scroll chillers, their distribution systems, and heat rejection equipment. Refrigerants shall be HFC-134a, 407c or 410a. Condensate pans, drains and trap piping shall be properly sized and sloped, constructed of non-corrosive materials, and shall be readily accessible for cleaning. Copper tube coils with copper fins shall be used. Chilled water piping and refrigerant suction piping shall be insulated with elastomeric insulation above grade and sealed at all joints to prevent condensation, conserve energy, and reduce noise. Pre-insulated cased pipe shall be used below grade. Design size of the chiller plant and the control system to perform in an energy efficient manner and specifically address low load requirements (including winter cooling loads) for the spaces requiring continuous cooling (see paragraph 313.7). Hydronic fluid flow rates shall be controlled to a maximum of 2m/s or below. Chilled water treatment shall be operational prior to any chiller start-up.

313.4 Heating Systems. Provide heating system for buildings where the 99% winter design conditions are less than 15°C. Heating plant selection shall be made on the basis of the lowest life cycle cost. Boilers shall be energy conserving, low pressure, hot water units with a maximum operating temperature of 93.5^{o}C, shall be constructed in accordance with ASME Boiler and Pressure Vessel Code, and shall be certified for use in the country of installation. The boilers shall have multiple burners and/or shall have variable flame burners. Where natural gas is available, boilers shall be natural gas condensing type with dual-fuel burners. The secondary fuel supply system providing backup operation on fuel oil shall be provided and installed, unless otherwise indicated. If a hot water heating system is installed, a Heat Recovery Chiller shall also be installed. Provide a 24/7/365 block load analysis indicating the simultaneous cooling/heating blocks loads and size the heat recovery chiller to optimize life cycle cost/savings. Insulate heating water supply and return piping with fiberglass insulation above grade and wrapped with a vapor barrier on the cold side of the insulation to conserve energy and reduce noise. Pre-insulated cased pipe shall be used below grade.

313.5 System Redundancy. System equipment shall be designed with redundant boilers, chillers, associated pumps, piping, etc. so that in the failure of any one component of the system equipment, the remainder of building system shall maintain not less than 67% of block heating and/or cooling capacity. The chiller plant shall be one of the following options: 1) A modular air-cooled chiller sized at 100% of the system design load with at least four fully independent refrigeration circuits; 2) Non-modular, air-cooled chillers each sized at 67% of the system design load; 3) Non-modular air-cooled chillers each sized at 33% of the system design load. Piping shall be arranged and sized for operating dual pumps in parallel with cross-connected piping with normally open automatic isolation valves for selective operation of each pump and chiller.

313.6 Air Cooled Condensers.

1. Provide air cooled condensers. Water cooled systems utilizing cooling towers are not permitted.

   Exception. Where directed by OBO.

2. Design PCC chiller to conform with requirements for PCC Critical Cooling Applications contained in Specification 236424, Modular Scroll Air Cooled Water Chillers.

313.7 Chilled Water Free Cooling. When below 7°C ambient conditions exist free cooling through an air to water heat exchanger shall be installed in the main chilled water loop or as part of the chiller. The Design Contractor shall provide calculations to determine the minimum building winter cooling load and shall perform a life cycle cost analysis to determine the optimum capacity of the free cooling heat exchanger. If Heat Recovery is being used on the water systems, the Design Contractor shall determine if free cooling is recommended for the design based on capacity of the heat recovery system and the free cooling heat exchanger and life cycle cost analysis.

313.8 Air-Side Economizer. Provide air-side economizers in accordance with ASHRAE Standard 90.1 requirements for capacity and controls in buildings not incorporating Special Filtration Systems.

313.9 Equipment and Telecommunications Rooms. Systems/server rooms to include the Joint Unclassified Computer Room (JUCR), Individual Unclassified Computer Rooms (UCR), PBX, electrical and telecom rooms shall be provided with cooling in accordance with Paragraphs 1 through 4.

1. Provide a minimum cooling capacity of 3.5 kW per installed rack unless otherwise noted.

2. Cooling load less than 7 kW: System/server rooms shall be cooled by VAV terminal units only. Size VAV terminal units to have 25% spare capacity.

3. Cooling load greater than 7 kW: System/server rooms shall be cooled by chilled water fan coil units and provided with a VAV terminal unit sized for ventilation air only.

4. Hydronic piping.

   A. Provide condensate piping and chilled water supply and return piping at every JUCR, UCR and PBX room.

   B. Size. Condensate piping and chilled water supply and return shall be sized for the greater of:

      1) 32 mm minimum or

      2) Required load plus 25% (i.e. for a 40 kW load, provide pipe sized for 50 kW.

   C. Rooms cooled by VAV terminal units only: Provide condensate, chilled water supply, and return pipes capped and with isolation valves for future use.

SECTION 314
HVAC CONTROLS

Add the following section:

314.1 Scope. Provide a Building Automation System (BAS) for non CAA spaces to monitor and/or regulate the compound water, fuel oil, gas, waste water treatment, interior lighting and HVAC utilities. Control of water systems shall include operation and status of water storage, water usage through the water meters, water treatment systems, distribution pumps and the water heater systems. Fuel oil systems control shall include status of fuel storage and distribution systems as well as the leak detection and overfill protection systems. Equipment serving the CAA shall utilize DDC controls located within the CAA spaces. Digital and/or electric/electronic controls are the OBO/PDCS/DE/EE standard. In case of network system failure, local stand-alone operation of all systems is required. The design engineer shall provide a sequence of operations for all systems and mechanical equipment to be controlled. The operating control sequence shall include normal operation at full and low load conditions, temperature setback operations, emergency operations and maintenance warning indicators. The operations control shall include scheduled sequencing of major equipment, start-up and shut-down, automatic restart of essential bus equipment after power loss/transfer, and redundant equipment run-time based sequencing. The controls contractor

shall provide sufficient space in the control wire conduits and panels to allow a 25 percent increase in control points, shall provide a minimum of 1 year of system support, and shall provide post with a back-up copy of the final controls program to be used if the original programming is destroyed.

The BAS system shall be designed such that the power, fuel oil, gas, and water consumption for the compound, for each building on the compound, and for each piece of HVAC equipment with a connected load of over 100 kVA can be observed and recorded. A minimum of 36 months of data shall be maintained within the system for usage/operation tracking information to allow the creation of user reports showing hourly, daily, monthly, and annual energy and water consumption. PCC, safe-haven, and safe area air conditioning equipment shall have an operating control panel inside the area it serves and shall not be connected to the BAS. Controls for PCC multisuite equipment (AHU, Chiller, etc.) shall have the control panel mounted in the PCC common area. No ducts, control wiring, or piping shall pass through the PCC or Restricted areas except to serve the particular requirements of each room/space in the PCC or Restricted Area.

314.2 Hardware/Front-End System. A Building Automation System with front-end personal computer (PC) or main PC, alarm printer and system printer are required. This system, serving only non-CAA spaces, shall be located in a common area within the Facilities offices, but not in the Facility Manager's office, and shall provide central control over all non-CAA HVAC equipment. Alarm printouts shall be forwarded concurrently to the BAS workstation and to a printer station at Post 1 for after-hours supervision (CAC guard booth at lock and leave facilities). Provide a laptop computer with software configured to program the HVAC equipment and for interfacing with the BAS serving non-CAA spaces. Provide two secure laptop computers, one with software configured to program the HVAC equipment in the CAA, and the other with software configured to program the HVAC equipment in the PCC.

314.3 Timers, Event-Based, and Temperature Set-Back Controls. Use to reset room temperatures during summer and winter months, in order to reduce energy usage without compromising pressurization, humidity, or indoor air quality control. Time delays will be designed into HVAC equipment startup schedules to stagger peak current start-up loads after power loss or during normal daily operations. BAS systems shall be programmed to implement temperature set back and subsequent energy efficient warm up during normally unoccupied hours.

314.4 Room Occupancy Sensors. Provide in offices and public areas of residences (SDA, MSGQ) to control lighting and HVAC setback operation. Control of interior perimeter lighting to maintain proper lighting levels shall be accomplished using appropriate lighting and/or occupancy sensors.

314.6 Variable Frequency Drive (VFD) Motors. VFD control of HVAC motors shall be used to provide efficient operation at full and part-load operation. Inlet guide vanes, discharge damper, or two-speed fan motor controls on air handling units shall not be permitted. Totally enclosed fan cooled (TEFC) type motors shall be standard. When fractional motors are used, they shall be the permanent split capacitor type. Premium efficiency motors are standard for motors of 0.75 kW or higher. Motors of 3.7 kW or larger shall employ power factor correction devices and soft starting devices, such as, reduced current starters and/or variable frequency drives. Variable speed drives shall have continuous current and voltage harmonic distortion monitoring. Electronic filters that conform to IEEE 519 (1992 or later) shall be used on the power. Energy use monitors shall be included on all motors over 3.7 kW. These monitors shall be capable of reporting run time, run speed (or % of full load) and energy usage and shall have capability to report accumulated information to a BAS system using a compatible protocol such as BACNet, LonWorks, Modbus, etc.

314.7 Run-Time Monitoring, Totalizer and Differential Pressure Sensors. Use run-time monitoring for motors and differential pressure sensors for filters and coils to alarm when preventative maintenance is required.

END OF CHAPTER IMC-3 AMENDMENTS

CHAPTER 4
VENTILATION

SECTION 401
GENERAL

Add the following subsection:

401.11 Air Supply Protection. Building air distribution systems shall be protected by incorporating the following measures into the HVAC system design:

1. Air Intakes shall be located above the roof level.
2. All normally occupied office buildings and residences built to blast criteria with non-functioning windows shall incorporate zone pressurization and environmental security (chem/bio) filtration.

SECTION 403
MECHANICAL VENTILATION

Add the following subsection:

403.1.1 General. Outdoor air requirements.

1. New Office Buildings and Staff Apartments (SDAs)
   - A. All outdoor air shall enter the building through the 100% Outside Air AHU (OA AHU).
   - B. OA AHU shall condition air in accordance with the following requirements:
     1) Filtering
     2) Temperature: 13°C +/-1°C (adjustable).
     3) Relative humidity; less than 70% relative humidity (measured at each on-floor AHU mixing box).
   - C. Outdoor air shall be supplied from OA AHU to other building air handling units:
     1) Fully ducted from the OA AHU to the mixing plenum of the indoor air handling units.
     2) To meet outdoor air requirements
     3) To meet zone pressurization requirements.
   - D. Additional requirements:
     1) PCC AHU shall be supplied from OA AHU and:
     2) PCC AHU shall have an emergency outside air intake with dampers.
        - a. Dampers shall open automatically upon a loss of outside air from the OA AHU.
2. CMR/CGR and MSGQ

   a. All outdoor air shall be fully ducted from a roof intake to the mixing plenum on the air return side of the air handling units.

403.1.1.1 HVAC Air Distribution System. The HVAC air distribution systems shall be fully ducted from the zone air handler to the supply diffusers or registers serving each conditioned space. VAV boxes shall be pressure-independent type and provide complete temperature control with no recirculation of plenum air. Balancing dampers shall be provided at the branch duct tap for VAV system diffusers when there is more than one diffuser per VAV box. VAV boxes shall be

provided with minimum air supply settings to maintain zone ventilation and pressurization requirements, whichever is higher. Return fans shall not be used. Return air is to be routed through the plenum and may not be mixed with return air from spaces served by other air handling units. Ductwork shall have adequate insulation, to prevent any mold growth, internal or external condensation, and shall have a vapor barrier on the warm side. Non-encapsulated fibrous internal duct liners are not permitted. Supply diffusers and returns shall be arranged to provide a minimum ventilation effectiveness of 80 percent. Supply diffusers shall have a minimum ADPI of 80 with $T_{0.25}$ /L between 0.9 and 1.2.

Carbon dioxide (CO_2) sensors in the main return air ducts of AHUs shall control outside air supply. The amount of ventilation air shall be adjusted appropriately within each air distribution system to maintain building pressurization requirements and match changes in building occupancy based upon a maximum CO_2 concentration of 900 ppm in occupied spaces. Building ventilation or pressurization requirements (whichever is greater) shall establish the minimum air to be supplied for each system. Conference rooms designed for more than 12 people shall have separate CO2 sensors.

403.1.1.2 Special Ventilation Requirements.

1. Marine Security Guard Posts.
   A. Outside air shall be supplied in the following sequence:
      1) From the Outside Air AHU,
      2) Through an AHU incorporating special filtration system,
      3) To a dedicated VAV terminal serving each space.
   B MSG Posts shall be positively pressurized relative to its surroundings (GWA and PAA).
2. CAC guard booths.
   A. Booth shall be positively pressurized relative to the Guard Station/Screening/Vestibule.
   B. Positive pressurization shall be provided by a supply fan located in the outside air duct.

<u>Add the following subsection:</u>

403.1.2 Zone Pressurization. HVAC system design for office buildings shall provide dedicated HVAC air handling units for spaces within each security boundary (Public Access Area (PAA), General Work Area (GWA), Controlled Access area (CAA), and PCC). The chancery office buildings shall have three levels of pressurization higher than ambient pressure. The three pressure levels serve: (1) the PCC/safe haven (highest pressure); (2) the remaining portions of the controlled access area and the general work area GWA (intermediate pressure); and (3) the public access areas PAA (lowest pressure). There shall be a minimum pressure differential of 2.5 Pascal (Pa) between each pressure area. In addition, there shall be a minimum pressure differential of 7.5 PA between the PCC and the outside ambient pressure. Differential pressure sensors for each zone shall reference the adjacent pressure zone. Note: The PAA AHU may be omitted and the air from Public Access spaces exhausted to the outside if LCC modeling based on hours of space occupancy and after-hours pressurization requirements indicates a savings. The air from the PAA shall not be recirculated to another AHU if a PAA AHU is not provided.

Annex buildings (NOX and GSO) shall have two areas of pressurization: the office area (highest pressure) and the other areas of the building. Residences shall have two levels of pressurization: the private living quarters (highest pressure) and the public space. The pressure will be controlled in the highest pressure zone and the other areas will be monitored to remain higher than outside ambient pressure. These conditions are based on manually closed doors.

The pressure controls and Building Automation System (BAS) shall be installed and calibrated with sufficient signal filtering (PID Loop) to diminish the effects of temporary fluctuations occurring when doors are opened. Air locks are not required between pressure zones. Pressure differential sensors shall be provided between the pressure zones to maintain the proper pressure relationships. Other balancing devices (e.g., air flow measuring devices, low leakage control dampers) shall be provided as necessary to maintain the pressure relationships. A pressure controlled VAV box

with reheat may be used in each zone; but it should be located in a hallway away from occupied space. Deal tray windows shall be provided with latched covers to reduce the loss of airflow through the deal trays when not in use.

Add the following to the end of the paragraph and before 403.3.1

403.3 Supply Rate. Supply air (i.e., make-up plus recirculated air) shall maintain a minimum circulation of at least 4 air changes per hour in occupied spaces. Air velocities in occupied spaces shall not exceed 0.23 m/sec.

Add the following subsection:

403.8 Air Handling Units. Special environmental security air handling units are required for office spaces (NOB, NOX, GSO) and residences (CMR/CGR, MSGQ, SDA). Individual air handling unit capacity shall not exceed 10,000 L/sec. An NOB air handling unit will only serve one of the following areas: Public Access Area (PAA), General Work Area (GWA), the Controlled Access Area (CAA), or the PCC. A single air handler shall not serve GWA spaces on both sides of the gallery. Multiple air handling units may be required to serve each area. Upon field installation, the air handling unit must pass, without field caulking, the particle and gas bypass tests specified by ASME N510 (Sections 9 and 10).

403.8.1 Fan Selection. Fan motor sizes and configurations shall be determined by the supply, return, or exhaust flow rate and the duct design at maximum system (e.g. dirty filter) pressure drop. Variable Frequency Drive (VFD) controllers are standard to allow a large range of operating conditions. AHU VFD Controllers shall include capability of continuous energy usage monitoring and reporting of this data to the BAS.

403.8.2 Heating Coils. The air velocity over the heating coils shall not exceed 4.0 m/sec. Coil water flow velocity shall be sufficiently high to prevent laminar flow.

403.8.3 Humidifiers. Provide for air systems to meet the temperature and humidity requirements of Section 309.

END OF CHAPTER IMC-4 AMENDMENTS

CHAPTER 5
EXHAUST SYSTEMS

SECTION 502
REQUIRED SYSTEMS

Add the following subsection:

502.1.5 General Dedicated Exhausts For residences, provide an individual exhaust fan in each private bathroom, laundry room and MSGQ whirlpool room. A central exhaust system for these spaces may be used when deemed cost effective based on LCC analysis. For office buildings, restroom exhausts may be combined vertically.

Add the following sentence to the end of the subsection:

502.3 Battery-charging areas for powered industrial trucks and equipment. Ventilation rates shall be provided in accordance with The American Conference of Governmental Industrial Hygienists (ACGIH *) Industrial Ventilation: A Manual of Recommended Practice,* current edition.

Add the following paragraph to the end of the subsection:

502.7.3.3 Air Velocity and airflow.

1. Spray booths. Provide air flows and air velocities in accordance with The American Conference of Governmental Industrial Hygienists (ACGIH *) Industrial Ventilation: A Manual of Recommended Practice,* current edition.

Add the following subsection:

502.7.3.7 Paint spray booth and rooms. Spray booths and rooms designs shall be configured as required in the latest edition of ACGIH Industrial Ventilation Manual. Locate spray booth away from the room entrance doors in a location approved by OBO.

Add the following line to the subsection:

502.14 Motor vehicle operation
The source capture system shall conform to the requirements of The American Conference of Governmental Industrial Hygienists (ACGIH *) Industrial Ventilation: A Manual of Recommended Practice,* current edition.

SECTION 505
DOMESTIC KITCHEN EXHAUST EQUIPMENT

Subsection 505.1: Delete Exception 1.

SECTION 508
COMMERCIAL KITCHEN MAKEUP AIR

Add the following subsection:

508.3 Kitchen Hoods Commercial kitchen exhaust hoods used in office buildings and the chancery main residence shall be provided with minimum 60% integrated, short circuit make-up air; the make-up air may require prefilters. All other residences shall use vented kitchen hoods.

SECTION 510
HAZARDOUS EXHAUST SYSTEMS

Add the following subsection:

510.3.1 Provide specialized exhaust systems in the following locations:

1. Health Unit Lab Room Hood Exhaust A biological safety cabinet shall be provided with a dedicated exhaust system to capture biological agents and exhaust chemical vapors to the outside. The lab hood exhaust fan shall be manually controlled by a switch on the hood.
2. Mail Screening Exhaust. Refer to OBO-ICS IBC Chapter 4 (423.1.7 Mail Screening Facilities) and Specification 115355 for requirements. Recirculation of air from this space is prohibited.
3. Mail Distribution Rooms in buildings shall be provided a dedicated exhaust fan to keep the space negatively pressurized with respect to office spaces. Recirculation of air from this space is prohibited.
4. Disintegrator Rooms
   A. Provide a dedicated exhaust system.
   B. Provide dedicated ceiling cabinet exhaust fans switched at the room entrance.
   C. Exhaust flow rate shall be 10 air changes per hour.
   D. Fans shall discharge to the roof:
      1) through schedule 40 steel pipe(s),
      2) maximum pipe diameter: 150mm.
      3) Termination: gooseneck extension with
         a. discharge cover: expanded metal, flattened, 15mm mesh, 16 gauge. All fittings and the discharge cover shall be welded. The discharge cover shall be 450mm above the finished roof.
5. Shops – General requirements.
   A. Provide manually controlled roof or wall-mounted exhaust fans sized for 6 ACH.
   B. Exhaust fan(s) for these spaces shall be used for smoke purge.
   C. Shops may share a common exhaust fan.

      Exception: Any shop required to have a dedicated exhaust.
   D. Where shop is conditioned by the building HVAC system, provide the following:

1) Damper(s) on the return air duct(s)

2) Interconnection to automatically close return air damper(s) upon activation of manually controlled shop exhaust.

6. Vehicle Maintenance Shops. Provide manually controlled vehicle exhaust system sized for the number of maintenance bays in the shop.

7. Welding Shop.

A. Provide dedicated exhaust system in accordance with Section 510.3.1.5.

B. Welding local exhaust systems, where installed, shall conform to the requirements in The American Conference of Governmental Industrial Hygienists (ACGIH *) Industrial Ventilation: A Manual of Recommended Practice,* current edition.

8. Carpentry Shop.

A. Provide with a dedicated exhaust system in accordance with 510.3.1.5

SECTION 511
DUST, STOCK AND REFUSE CONVEYING SYSTEMS

Add the following subsection:

511.3 Carpentry Shop. Provide the following dust collection systems:

1. Self contained system designed for woodworking equipment:

A Self-contained fabric collector

B. Automatic shaker motor

C. Collection drums

D. Provide individual connection to each working machine.

E. Comply with the requirements of The American Conference of Governmental Industrial Hygienists (ACGIH *) Industrial Ventilation: A Manual of Recommended Practice,* current edition.

F. Location of equipment and connection points in the room shall be based on RIP drawings

G. For Carpentry Shops designated as “heavy use,” design ventilation system to accommodate the following:

1. Table saw with 400 mm diameter blade

2. Single planer with 500 mm knives

3. Jointer with 250 mm knives

H. For Carpentry Shops designated as “light use,” design ventilation system to accommodate a table saw with 400 mm diameter blade.

2. Recirculation filtration unit to collect airborne sawdust.

A. Particulate filter

B. Fan sized for 10 ACH.

Add the following subsection:

513.2.2 **Post-Fire Smoke Purge.** In office buildings and residences on the Chancery compound, smoke removal capability shall be designed into every recirculating air handling unit system. The return air damper shall be closed to divert all return air for the floor system to the relief duct or other exhaust ducts.

END OF CHAPTER IMC-5 AMENDMENTS

CHAPTER 6
DUCT SYSTEMS

SECTION 605
AIR FILTERS

Delete Subsection 605.1 in its entirety and replace with the following:

605.1 Filtration System Performance Requirements.

1. Air supplied to offices and residences shall be filtered to provide Chemical/Biological/Radiological (C/B/R) protection.
   A. Mixed return (re-circulated) and ventilation air shall be filtered at the air handling units in the following sequence:
      1) Pre-filters
      2) HEPA filters
      3) V-bed high-efficiency carbon adsorption (HEGA) filters impregnated with ASZM-TEDA
      4) Final (post filters)
2. In new or renovated office buildings built to blast standards, a dedicated outside (ventilation) air handling unit shall supply pre-filtered and pre-conditioned ventilation/pressurization air to all the other air handling units, where mixed return (re-circulated) and ventilation air shall be further filtered as described in the paragraph above.
   A. Outside air shall be filtered in the dedicated outside air unit in the following sequence:
      1) Pre filters
      2) Second particulate filters
      3) Activated carbon filters.
      4) Final (post filters)
3. Renovations.
   A. Renovations of buildings not built to OBO blast standards do not require C/B/R filtration protection. Provide a minimum MERV 13 level of filtration at all air handling units. Filters shall not require change out more frequently than every 90 days.

END OF CHAPTER IMC-6 AMENDMENTS

CHAPTER 12
HYDRONIC PIPING

SECTION 1202
MATERIAL

Replace Table 1202.4 with the following:

MATERIAL	STANDARD (see Chapter 15)	ALLOWABLE SERVICE
Acrylonitrile butadiene styrene (ABS) plastic pipe	ASTM D 1527; ASTM D 2282	Not Allowed
Brass Pipe	ASTM B 43	Not Allowed
Brass Tubing	ASTM B 135	Not Allowed
Copper or copper alloy pipe	ASTM B 42, ASTM M 302	Heating water, Chilled water, and Condensate lines size DN 50 and smaller
Copper or copper alloy tube (Type K, L, M)	ASTM B 75; ASTM B 88; ASTM B 251	Heating water, Chilled water, and condensate lines size DN 50 and smaller
Chlorinated polyvinyl chloride (CPVC) plastic pipe	ASTM D 2846; ASTM F 441; ASTM F 442	Not Allowed
Cross-linked polyethylene (PEX) tubing	ASTM F 876; ASTM F 877	Not Allowed
Polybutylene (PB) plastic pipe and tubing	ASTM D 3309	Not Allowed
Polyethylene (PE) pipe, and tubing	ASTM D 2513; ASTM D 3035; ASTM D 2447; ASTM D 2683	Ground source heat pump loops
Polypropylene (PP) pipe	ASTM F 2389	Chilled water where specifically designated by OBO in other documents.
Polyvinyl chloride (PVC) plastic pipe, Schedule 80	ASTM D 1785; ASTM A 106	Chilled water where specifically designated by OBO in other documents.
Steel Pipe	ASTM A 53; ASTM A 106	Heating water and Chilled water size DN 65 and larger
Steel Tubing	ASTM A 254	Heating water and Chilled water size DN 65 and larger

END OF CHAPTER IMC-12 AMENDMENTS

CHAPTER 13
FUEL OIL PIPING AND STORAGE

SECTION 1301
GENERAL

Add the following subsections:

1301.1.1 Introduction. Petroleum products at Post compounds shall be stored and transferred in accordance with 40 CFR 112 and this supplement to prevent contamination of ground water.

1. Provide double-wall underground storage tanks with leak detection and aboveground containment and diversionary structures.
2. Provide a storage tank management plan per specification.
3. Locate vehicle fueling stations near the perimeter wall.
4. Aboveground fuel tanks with spill containment greater than or equal to the maximum volume of the primary tank are permitted for use as day tanks for Post Engine Generators and Boilers.
5. Locate fuel fill point for liquid petroleum fuel systems at the outside of the perimeter wall in a secure locked compartment.
6. Truck off-load areas shall be paved with concrete.

   A. Concrete shall be sloped to provide positive drainage away from the perimeter wall.

   B. Provide catchment basin(s) to capture fuel spillage.
7. The size of the generator and boiler fuel tanks shall be sufficient to run site generators and boilers operating at full load capacity for a minimum of seven day, 24 hour operation. OBO may require additional storage depending upon the reliability of local power, fuel deliveries, and threat concerns. Each day tank shall be sized to provide an 8 hour fuel supply for the equipment it serves.

1301.1.2 Natural Gas Piping. Where municipal piped natural gas is available and cost effective, a natural gas piping system shall be provided to serve gas appliances, gas boilers, gas chillers, and gas water heaters and gas-fired humidifiers. The natural gas piping system shall be defined to include all piping, valves, and specialties required to install piping that will convey natural gas from the “point of delivery” to the natural gas utilization devices inside the facilities. The natural gas piping system, including materials, installation and testing, shall be installed in compliance with the requirements of the utility supplying the natural gas and the standards of authorities having jurisdiction for natural gas piping systems; but shall be no less stringent than the requirements of the International Fuel Gas Code. The local gas company shall supply the minimum working-pressure ratings. Fuel gas meter reporting to the Building Automation System shall be located within the compound at the Service CAC and measure overall compound gas usage. Gas sub-meters at each building, also reporting to the Building Automation System, shall measure individual building usage. Automatic shut-off valve shall be installed at the perimeter/property line with seismic trip sensor for automatic closing.

Add the following subsections

1301.6 Design Constraints. The fuel shall be delivered to the storage tank system through a secure, remote fuel fill point on the perimeter wall of the Post. In the case of multiple storage tanks, each storage tank will have a separate fuel fill port and be contained in a separate lock box having a unique key that only opens the lock box associated with the tank to be filled. Designs shall take advantage of elevation changes to eliminate the need for transfer pumps and tanks. Pumps shall not be placed on pipelines between remote fuel fill point(s) and fuel storage tank. Locate remote fuel fill port at a vertical elevation that allows fuel to be gravity fed from typical tanker truck type(s) used locally. The delivery vehicle characteristics shall be determined and documented prior to the start of a design. The number of bends in the pipelines and pipeline runs shall be minimized. Provide submersible duplex pumps in each tank to transfer the fuel from the storage tank to the day tanks. PCC Generators shall be delivered fuel from one of the main Post fuel storage tanks through dedicated fuel oil transfer pumps powered from the PCC generator room panel. The underground storage tank used to supply the PCC shall have the normal fuel oil supply suction point located above the dedicated PCC fuel oil suction level. The control system will be designed and commissioned so that the minimum fuel storage requirements (7 days/24 hour full load) for the PCC are always available in the main Post fuel storage tank. The fire pump engine day tank fill shall be equipped with a dead man switch to prevent overfilling.

All fuel lines will be sloped to drain into either the underground storage tank or a vault with the capacity to store the line displacement. The vault will have a leak detector to detect fuel and alarm the appropriate office. The vault will be constructed to prevent run-off or groundwater from entering the vault and will have a lockable cover. If fuel is detected in the vault, the alarm will also shut-off the supply pump.

1301.7 Location. The underground storage tank system remote fuel fill point shall be located at an elevation equal to or greater than the ground surface where the underground storage tank is buried. The distance between an underground storage tank field and building foundations shall be no less than the distance from the ground level to the bottom of the tank. The location of the underground storage tank shall be selected to minimize horizontal and vertical supply and/or return lines between the tank and the equipment served. The location of the underground storage tank system shall be selected to avoid interference between or co-location with any buried utilities and the storage tank or piping. Locate underground fuel tanks and piping a minimum of 30 meters from water wells.

1301.8 Propane, Butane or Other Liquefied Flammable Gases. Propane, butane or other liquefied flammable gases in portable containers shall not be stored or used in any occupancy used for office or living purposes. They may be used, as permitted by the *International Fire Code* in workshops for approved industrial purposes.

1. When specifically approved for use by OBO, all liquefied flammable fuel piping shall be rigid or semi-rigid and approved by a recognized testing laboratory for such use.
2. Residential Occupancies: In Group R Occupancies liquefied flammable gas storage cylinders shall not be stored or located inside a dwelling. Cylinders located at the exterior shall not be located within 7.62m of a source of ignition. All natural gas or liquefied flammable gas appliances shall be rated and equipped by the manufacturer for the specific type fuel to be used.

SECTION 1305
FUEL OIL SYSTEM INSTALLATION

Add the following to the end of the paragraph:

1305.4 Return piping.

1. All day tanks shall be equipped with gravity-feed return lines connected to the main fuel oil storage tank to protect against over-filling.
2. Return line suction shall be connected to the day tank at a point below the level of the vent connection to the tank, and below any other tank openings so that any excess fuel oil will be returned to the main storage tank before reaching overflow level in the day tank.
3. Return lines shall be sized to handle the maximum flow from the supply pump.

SECTION 1309
FUEL DISPENSING SYSTEMS

Add the following subsection

1309.1 Location. Establishment of a requirement for a fuel dispensing equipment shall be identified during the Initial Planning Survey. Fuel dispensing devices shall be located a minimum distance of 3 meters from property lines or any building which is less than 1-hour fire resistive construction and at least 5 meters from any building doors. Additionally, dispensing devices shall also be located so that the nozzle, when hose is fully extended, shall not reach within 1524 mm of any building opening.

1. Dispensing Units shall be at least 6096 mm from all fixed sources of ignition.

1309.2 Concrete Island. All dispensing devices shall be protected against physical damage from vehicles by mounting on a concrete island a minimum of 155.4 mm in height.

1309.3 Listed Emergency Breakaway Devices. Provide for each hose.

1309.4 Listed Emergency Shutoff Valve. Install in the supply line of each dispensing device incorporating a fusible or other thermally actuated device as a protection against impact or seismic occurrences.

1309.5 Electrical Controls. A control shall be provided that will permit the pump to operate only when a dispensing nozzle is removed from its bracket or normal position with respect to the dispensing unit and the switch is manually actuated. This control shall also stop the pump when all nozzles have been returned, either to their brackets or to the normal dispensing position. In addition, electrical controls shall comply with the following:

1. Master Switch: A clearly labeled manually operated pump master switch shall be provided in an approved location, within 30m of but not nearer than 6 m to, any dispenser. Where such master switch is not visible from all dispensers, the location shall be indicated by approved signs.
2. Signs identifying the pump master switch shall be labeled "EMERGENCY FUEL SHUTOFF."

END OF CHAPTER IMC-13 AMENDMENTS