2012 Green Code Bullet Points

This summary of the International Green Conservation Code, IGCC, is offered to inform and provide reference for evaluating the options contained within the Code.

The IGCC was ratified by the ICC membership, November 2011. The State of Maryland created legislation in support of this Code – HB 972. The current form of the Code is *Optional-Mandatory*. Any portion adopted becomes mandatory as proscribed within the governing conditions of this Code and specifics within each Section of this Code.

Site and environmental requirements within the code stand at odds with Charles County's & the Town of Indian Head adopted zoning and ordinances. This conflict must be reconciled before the requirements of this code can be properly administer; as it is a comprehensive standard.

Code Appendices must be adopted individually.

Residential compliance with this Code is exempted from this edition. Certain Mixed-Use dwellings are the only application where residential occupancies are governed by this Code.

Overview:

- Industrial, Manufacturing, and Residential constructions are exempt – (for now.)
- IGCC is an Overlay Code – it is used in conjunction with existing Codes.
- Life Safety Code Prevails – always; for now.
- Appendix provisions must be adopted individually
- No guarantees of conflict/contradictions with other ICC codes
- IGCC not to nullify other Code requirements – the Most Stringent option Obtains.
- Code encourages flexibility – novel: materials, assemblies, innovations
- The IGCC intent is to increase Minimum Standards
- IBC is complimentary
- IGCC SHALL apply to the installation, repair, alterations, and replacement of equipment, appliances, - all components of each trade ME, PG, FG, EL, other
- Fire prevention, Energy, Performance, Maintenance, Existing Bldg, Code – IGCC SHALL function as an addendum.
- R-2 thru R-4 classifications are recently exempted
- MIXED OCCUPANCY – Portions SHALL be affected
- ZONING Provisions of IGCC SHALL apply to zoning requirements related to the scope of the IGCC.

- Alterations/Additions to Existing Bldgs must NOT increase Energy consumption or alter environmental site conditions that existed before the alteration/addition.

CODE OFFICIAL

- Authorized & directed to enforce IGCC.
- Has authority to render Interpretations of the IGCC, AND,
- Adopt policies and procedures to CLARIFY applications of the provisions, AND,
- To render interpretations of this Code – but no power to WAIVE the IGCC.
- SHALL issue all notices respecting compliance.

CONSTRUCTION DOCUMENTS

- SHALL contain project electives – section 303
- SHALL contain applicable *Commissioning* requirements – 903
- SHALL contain the framework for Manuals , required by this code for Repair, Operational, and Maintenance of the structure, equipment, etc….
- When Special Conditions obtain, the Code Official is authorized to require add'l documents

APPROVAL (Pages)

- Reclaimed materials MUST be approved by the Code Official
- No Code Official opinion may lessen the Minimum Requirements of the IGCC.
- All Alternatives; design, materials, innovation, and construction methods MUST meet the intent and minimum requirements of the IGCC
- Approved Sources for All reports, certifications etc.
- All tests must meet recognized standards.
- Code Official Must approve Compliance Materials

PERMITS:

- SEPARATE permits are NOT allowed.
- Permit Exemptions do NOT relieve the provisions of the IGCC
- The Board of Appeals may NOT waive provisions of the IGCC
- The Board MUST consist of Members trained and experienced in matters covered by the IGCC.

CERTIFICATE OF OCCUPANCY

- POST Occupancy requirements of the IGCC; Chapter Nine (9) MUST be contained in the building U&O –
- IGCC requires testing and reporting – conditional, but extensive, for all new construction.

DEFINITIONS – (9 Pages)

- DEFINITION EXAMPLES - Global Warming Potential, GWP, Demand Response Internet Software, Energy Management & Control System, EMCS, Rainfall percentages, Weighted sound level, Aged Solar Reflectance, Annual Net Energy Performance (ANEP), Brownfield, Conservation area, Daylight saturation,
  (Definitions provide insight into the extent of the IGCC and new equipment required to achieve compliance)

  Definitions clarify expanded conformance requirements

Jurisdictional Requirements and Project Electives:

- Requirements that Jurisdictions select provisions they SHALL adopt. Including; project specific elective requirements to achieve Whole-Building Life-Cycle Assessments – Table 304
- Jurisdiction MUST indicate in Section 302.1 whether specific provisions are mandatory for all buildings regulated by IGCC.
- Project electives Table 303.1 become Mandatory when Owner selects
- All other provisions selected in Table 302.1 SHALL become mandatory
- The Jurisdiction SHALL determine if ASHRAE 189.1 pertains and the Minimum Number of Project "*Electives"* required
- Energy Enhanced requirements for buildings >25,000 sq ft in "Total Building Floor Area", OR, Occupant Spaces >5,000 sq ft SHALL indicate a *zEPI* of 46 or less – from Table 602.1 for each occupancy,
- The Jurisdiction SHALL adopt development PHASEs. 1,2,3,4,. The phase serves to require a GREEN HOUSE GAS inventory to calculate carbon footprints for proposed buildings or spaces. (**Tenant Fit-Out will fall into this category and requirements**) Phases run YEARS.
- The Jurisdiction SHALL Determine which portions are Mandatory
- The Owner SHALL be bound by the Jurisdictional Project Electives.
- Alterations/Additions to Existing Buildings SHALL follow Project electives –
- Alterations/Additions to Existing building SHALL NOT increase energy use or the Site's environmental demands - more than the initial structure. *These conditions SHALL be verified.*

- Construction Documents SHALL include Table 303.1 – Project Electives -- Selected Electives are Mandatory.
- A MINIMUM number of electives SHALL be determined
- Electives topics include: Jurisdictional and Project Electives, Site Development and Land Use, Material Resource Conservation & Efficiency, Energy Conservation, Efficiency and Earth Atmospheric Quality, Water Resource Conservation & Efficiency, Indoor Air Quality and Comfort.
- Whole Building Life Cycle Assessment – SHALL be contained in the Owner Education Manual (Required) Section 904.4 – To achieve NOT< 20% in environmental performance for a minimum of 3 impact measures: Energy use, GWP, Acidification, Eutrophication, Ozone depletion, Smog potential
- Life Cycle Assessment TOOL must be approved by the Code Official.

Life Cycle – SHALL cover:

- demolition and disposal, including (maybe more) on-site construction, maintenance, replacement and material product embodied acquisition, process transportation energy, SHALL be assessed. (EL, ME, and PG equipment and controls are excepted)
  - The Entire building envelope – footings upwards – SHALL be assessed.
  - LIFE CYCLE SHALL conform to TSO 14044.
  - Use and Occupancy Certification is contingent upon Commissioning Tests verifying targeted energy use(s) and other requirements of the IGCC.

SITE / LAND DEVELOPMENT 401

- DEFINED: Requirements that assure building and site minimally imperil environmental concerns. Protect restore and enhance a site's natural features and quality.
- Sites SHALL comply with 402.2-402.3.6
- Wetlands must comply with 402.2.1-402.2.6
- No flood plains
- No wetland buffer location defined by high water mark.
- Exception: IF "water related"
- Conservation Area 50' Rule prohibition in Conservation area.
- No PARK land development
- EXCEPTIONS: Park related. Owned by Government
- Privately held
- Agricultural – Table 302.1
- NO *Greenfield* development
- EXCEPTION – Ag Use/Related
- ¼ mile if >8 dwelling units @ acre, 3.25 minimum

- Diverse use prohibitions ¼ mile for 5, ½ mile for 7.
- At least one from retail, service, community
- Greenfield to have access to Transit Service – building site SHALL be within: ¼ mile to Transit Bus or Streetcar
- ½ mile to rapid transit, rail, ferry, or trams
- Greenfield site located to not< 90 intersects @ mile. Not< 25% of building perimeter SHALL adjoin or adjacent a street, bikeway, or pedestrian pathway
- Intersections SHALL include:
- Public to other public streets, no bikepath and public street, no motor vehicle streets intersect with bike or pedestrian paths,

No connectivity Required:

1. water bodies and wetlands,
2. parks > ½ acre, conservation areas,
3. Gov't jurisdictions.
4. LRG facilities: airport, rail, college/Univ.

Permitted Greenfield:

1. Within: 40' of bldg
2. Within: 15' proposed walkway, paved, and utilities
3. Within: 25' permeable surfaces that req. staging areas.

Site Design & Development:

- Bldgs SHALL comply with site design, water mgmt, vegetation mgmgt, soils mgmt, waste mgmt plans.
- Inventory and assessment of natural resources and BASELINE site assessment MUST be submitted @ application

Pre-Design:

- Locate 402.2 area @ site
- Site disturbance PRIOR to development
- Indentify invasive species for removal
- Identify native species
- 402.3.1.1 – Above MUST be submitted at application

STORMWATER MGMT:

- Section 302.1 – including – infiltration, evapo-transpiration, rainwater harvest, runoff reuse, SHALL be maintained @ Site.
- Stormwater MGMT plans MUST include increases due to site development
- Design retains @ min. 95th percentile rainfall event – OR –
- Retains the pre-development natural runoff throughout the development

Post constr. Runoff rate, volume, durations, and temperature not to exceed pre-development rates – hydrologic analysis

- No design that erodes at site or adjacent prop.

LANDSCAPE IRRIGATION:

- **402.3.3.1 –** non-potable & comply – 406.2
- EXCEPTION: Potable OK if:
  a. During establishment phase
  b. Irrigate food prod.
  c. Supplements non-potable
  d. Apprv'd by Local Ordinance

DESIGN AND INSTALL:

- Minimum use for landscape vegetation.
- Must use one or more:
  a. Drip irrigation,
  b. Subsurface, subsoil, or surface irrigation

- Must Zone irrigation based on needs
- SHALL not direct water to foundation, walkways, paved surfaces

OUTDOOR Fountain & Features:

- MUST use municipal or recovered rain – 406.2
- 706.2 Signage required - nonpotable
- Protect vegetation & Soils.

MUST DEVELOP WRITTEN PLANS 406.5

- Vegetation and soils protection areas (VSPA) Plan required – incl'd Plans
- Protection Plan MUST be apprv'd before construction
- Topsoil Protection – Remove Topsoil @ construction if damage possible. On- Site storage ok. -- MUST secure and protect
- Soil REUSE MUST include prepared, amended, and placed to restore to original condition
- Imported Soils non-native soils may NOT be mined from Prime, Unique, or Statewide important farmland.

EXCEPTION – May be mined from the above if used for the same purpose.

- Invasive Species - Not allowed.
- Mgmt plan MUST include containment, removal, and replacement – generated from published or qualified Professional.

- Existing Veg SHALL be retained & protected.
- Turfgrass - Only 40% of site. *Calcs* do not include roof or Bldg plan changes

EXCEPTION: Sports fields

*** Documentation of the above SHALL be presented at application ***

SITE WASTE MGMT PLAN:

- SHALL be developed, MUST include recycling - not <75% of debris & excavated soils.
- Incl'd: rocks, tress, stumps, assc.
- Vegetation.
- Recycled materials SHALL be spec'd in Waste Plan Documentation.
- No Diversion to Farmland, flood hazard, green field areas
- Contaminated soils – MUST be removed. Removal and location will be treated and disposed.
- Amount SHALL be calculated by weight or volume not both.
- Invasive Species on Quarantined sites SHALL apply with Quarantine Rules.
- Removed Const. Material's , hardscape, and waste SHALL follow 502.1

403 TRANSPORTATION IMPACT

- Paved pedestrian, bike, stroller paths SHALL be provided to entrance – one minimum.
- SHOWER and Changing areas are mandated for Bike Riders
- Bldgs > 10,000 SHALL have Shower & Changing for @ 200 occupants 403.3. Long Term Bicycle parking required also required.

EXCEPTION(s) –

a. When only one is required, UNISEX ok.
b. <2,500 floor area No Bike Parking
c. Subject to Code Official - # of bike stalls may be smaller

SHORT TERM BIKE PARKING:

- SHALL comply with: a.
    a. Illuminated not <1 footcandle at parking
    b. @ grade or location reached by ramp/other
    c. Minimum of 18"X60" per bike.
    d. SHALL provide rack or locking station

EXCEPTION: When signage provided @ entrance, Short Term parking OK inside bldg.

LONG TERM PARKING:

- SHALL comply with:
    a. Within 300 feet of entrance
    b. Illuminated not <1 footcandle at parking
    c. @ grade or location reached by ramp/other
    d. Minimum of 18”X60” per bike.
    e. SHALL provide rack or locking station
    f. 50% MUST be inside Bldg OR under overhangs – protected from weather
    g. Car parking other than 403.4 - OK’d for LT bike parking

VEHICLE PARKING: - UBC PRIMARY

- All vehicle parking required from 403.1 or 403.2
- Signage Required.
- High Occupancy vehicle preference ratio >10,000 sq ft
- Low Emission, hybrid, electric vehicle preferred parking - signed - >10,000 sq ft

HEAT ISLAND MITIGATION

- Mitigation – 404.2 & 404.3
- 50% Hardscape mitigated in ZONES 1-6
    a. 404.2.1 – 4.4.2.4 – Excepting Solar Collector areas.
    b. Materials SHALL have minimum SRI of 29 – using ASTM, E1980

EXCEPTION – Pervious Concrete

- Building Providing Shade –
    a. Open trellis for walkway or pergolas – MUST use native planting mature in <5 years
    b. Parking Shading per 404.3
    c. Adjacent building calculated using peak sun angles at summer solstice
    d. Trees – Must be native and non-invasive
    e. MUST be in construction docs – 10 year plan
    f. Shading calcs MUST be in Const. Docs. Compliance based upon Hardscape factors
    g. No Duplicate Shading Credits
    h. Pavement - pervious and permeable – 2 GPM percolation @ sq ft. AND not < 6” of open graded base below pavers. Aggregate MUST be uniform size.

ROOFS: ZONES 1-3

a. Surface MUST be 75% + IECC 404.3.1.1 OR 404.3.1.2

- **SOLAR REFLECTANCE AND THERMAL EMITTANCE**
    a. If coverings used comply with 404.3, they SHALL comply with 404.3.1.1 or 4.4.3.1.2
    b. Roofs SHALL comply with laboratory accredited by a national organization.

c. SHALL be labeled and certified.

ROOF TESTING:

- Testing Minimum of Three Years for reflectance – ASTM: E1918, C1549 or Test Method one of CCRC-1 and comply with Table 404.3.1

- May use solar reflectance index when calculated using 404.3.1 for minimums.

- ASTM: E1980 with convective coefficient of 2.1 BTU/Hr @ 12 week and the Three Year test samples in accordance with 404.3.1.1

405 SITE LIGHTING

LIGHT POLLUTION CONTROL: Table 302.1 *** *Who will enforce?* ***

- Uplight, Light Trespass, and glare SHALL be limited

EXCEPTIONs:

a. Specialized Signal, directional and marker – for transportation
b. Advertising signs or directional
c. Equipment and instrumentational lighting
d. Theatrical Incl'd performance, stage, film & video
e. Athletic fields –IF hooded or louvered
f. Temporary lighting
g. Industrial, material handling transportation, storage, if hooded & louvered
h. Theme lighting – parks
i. Roadway required by gov't
j. Landmark and monument

LIGHTING ZONES – Table 405.1.1

- Uplight – all exterior lighting SHALL comply with Table 405.2

EXCEPTIONs –
- Facades, landscape, monuments Zones 3 & 4
- Facades only in Zone 2

LIGHT TRESPASS & GLARE

- When mounted in light boundary such that horizontal measure is twice the height – lighting SHALL not exceed glare ratings in Table 406.3.1

- All others SHALL follow Table 406.3.2

SECTION 406
DETAILED SITE DEVELOPMENT REQUIREMENTS

WATER – POTABLE AND GRAY SHALL BE GOVERNED THE SAME

Irrigation –

a. SHALL be limited to subsurface and irrigation
b. Retention < 24 hours
c. Graywater SHALL comply with Sec. 708 – other than 708.6 & 708.12.6.5
d. SHALL be filtered using 100 micor filter
e. Graywater systems SHALL use signs

EXCEPTION – Subject to municipal standards and the Code Official's approval

Rainwater/ Irrigation collected –

- Roof and cistern collected SHALL NOT be limited.
- Surface collected SHALL comply with 707 – other than 707.6, 707.12.1, 707.12.1.1 and 707.12.7.4

Subsurface/ Irrigation Graywater –

- Irrigation SHALL be designed and installed per Sec. 406.3.1 & 4.6.3.6
- Collection and Storage SHALL comply with is sec. and 708 – not 708.6 or 708.12.6.5
- Graywater discharge – In accordance with per day-per occupant: based upon fixture types.
- SHALL use the calculations in 406.3.1

*** PERCOLATION TESTS ***

Synopsis:

a. Sets IGCC standards for performing and measuring and testing.
b. Sets soil type evaluations determine tests methodology and other controls.
c. Sets permeability standards.
d. Sets subsurface standards for drainage
e. Sets lot configuration
f. Includes numerous Tables and standards
g. Sets Piping standards
h. Sets Vegetation controls – see above vegetation requirements
i. Sets Soil controls – see above

Tree Protection Zones – TPZs

- SHALL comply with Part 5 ANSI A300
- Soils SHALL comply with 406.5.1 & 406.5.4
- Preparation
  a. SHALL be cleared of debris
  b. Construction compaction SHALL be scarified
  c. First lift SHALL be mixed into scarified zone

EXCEPTION – Scarification Prohibited in the following:
  a. Would damage existing roots
  b. Inaccessible slopes
  c. Adjacent trenching and drainage
  d. Near or upon footings, inslopes, abutments
  e. Brownfields
  f. Any other place would damage existing structures, utilities, and vegetation

- Restoration SHALL comply with 406.5.2.1 & 4.6.5.2.2

Organics

- All Soils SHALL be amended with compost – mixtures are specified
- 50 year cycle proscribed

EXCEPTION - Reference soil >12” deep SHALL be amended with Native soils

Additional Soil Restoration

- SHALL comply with 406.5.2.1
- Compaction – SHALL NOT exceed Table 406.4.2.2
- Not deeper than 12”
- Infiltration rates –
  a. SHALL be comparable to native soils reference,
  b. SHALL meet requirements of ASTM: D3385, or ASTM: D5093,
  c. SLOPED AREAS MUST meet Standards OR Code Official set standards
- Soil Biology functions – Remediated soils - mineralized nitrogen permitted as proxy assessment
- Soil chemical characteristics – Plant growth standards SHALL be restored
  a. Ph cation exchange and nutrient profiles of original soils SHALL be matched
  b. Fertilizers MUST minimize nutrient loading to waterways

TABLE 406.2.2 – Penetrometer and Soils

Documentation

- **SHALL include**
  a. Receipts from suppliers and content and volume
  b. Test Results to verify 406.5.2.1 and 406.5.2.2 are met
  c. No less than 2 tests
  d. Reports <8,000 sq ft of soil disturbance SHALL NOT contain less than 1 report for @ 4,000 soil disturbed.
  e. Licensed Professional must prepare report

Landscape, soil and water protection plan: 402.3.5.1 SHALL include:

a. Soil that will be retained
b. Topsoils that will be stored
c. Restored and re-vegetated soils
d. Previously developed soils – prior construction
e. Location of sites for storage, parking, haul roads, const vehicle access, temp utilities, trailer locations
f. Treatment details for soils including type, source, volume, compost, mulch, topsoil
g. Narrative of all measures to ensure areas not disturbed, restored soils, protection from traffic, storage, erosion, and contamination

- **Erosion & pollution**
  a. Erosion and pollution controls for construction activities
  b. Best MGMT practices – BMP for construction
  c. Prevent loss of soils – erosion & runoff
  d. Prevent soils to waterways
  e. Prevent air pollution
  f. Prevent runoff and pollution – including: thermal pollution, concrete wash, solvents, hazardous chemicals, PH and pavement sealants,
  g. Protect all soils and vegetation
  h. assure proper disposal

- **Periodic Maintenance Plan –** (Enforcement?)
  a. Watering schedule for plants – MUST including plan to retain former water amounts
  b. Ferilizer use and application
  c. Plan to inspect all major portions of site for impact and records
  d. Maintenance for stormwater – cleaning gutters, downspouts, inlets and outlets, sediment removal, wet detention pond cleaning, vacuum sweeping, high pressure cleaning, pavement
  e. Litter and debris pick up
  f. Schedule of landscape activitities – seeding, reseeding, mowing, height of grass specs – to retain water

Vegetative roofs – 404.3 SHALL:

- Must meet USDA recommendations for zone and mature in < 2 years. Plants must be placed to spec.
- Soils on roof SHALL meet climate and not be synthetic
- No Invasive plants
- No increase fire risk in drought
- SHALL be properly managed

PROJECT ELECTIVES – 407

- 407 Defines the natural resource conservation
- SHALL comply with 407.2.1 and 407.2.11

Preservation of Natural Resources

- Must comply with more than one elective
  1. Flood hazard abatement elective
  2. Agricultural land preservation elective
  3. Wildlife Corridor elective
  4. Infill site elective
  5. Brownfield site elective – MUST meet Brownfield criterion established by appropriate agency
  6. Existing BLDG Reuse elective
  7. Greenfield development elective
  8. Greenfield proximity to development elective
  9. Greenfield to Divers uses elective
  10. Native plant elective
  11. Site restoration elective

Transportation Impact – 407.3.1- 407.3.4

- Shower and changing – elective is <10,000 sq ft floor space
- Long term bike parking Elective
  1. Provide 2X the required amount – Table 403.3
  2. Provide according to 403.3.2
  3. Locate not <90% in Bldg or under permanent cover

Preferred Parking Elective

- High occupancy, low emission, hybrid, or electric – per 403.4
  1. Where 403.4 in Table 302.1 is mandated and <10,000 sq ft
  2. Where 403.4 is NOT listed in 302.1

Heat Island – 407.4.1 – Multiple Electives

1. Site Hardscape Climate zone 1-6 75% is accordance with 404.2.1 – 404.204
2. Site Hardscape Climate zone 1-6 100% is in accordance with or any combo of 404.2.1 – 4.4.2.4
3. Site Hardscape in Climate Zone 7 & 8 50% in accordance with 404.2.1 – 4.4.2.4
4. Roof Covering in Climate Zone 4-8 in accordance with 404.3

Light Pollution

- Where 405.1 is NOT listed in Table 302.1 and a mandatory requirement, develop in accordance with 405.1

Chapter 5
MATERIAL RESOURCE CONSERVATION EFFICIENCY

Governs building materials conservation resource efficiency and environmental performance

- **Construction material and waste management**

Note < 50% of non-hazardous waste diverted form landfills
EXCEPTION – where Table 302.1 is indicated
Salvage or Recycle materials and waste

1. Location for waste type must be indicated: Paper, Aluminum, etc…
2. Salvage by efficient usage or reuse
3. Amounts of materials SHALL be specified and calculated by Weight OR Volume – Not Both
4. Soils, fills, sand, gravel etc… SHALL be according to 402.3.6

Recycling areas for waste generated Post Occupancy

1. Designated & constructed according to jurisdictional law
2. Designed according to available recycling services
3. Designed according to FUTURE recycling services
4. Designed according to regional recycling services
5. Designed to meet occupancy, facilitate efficient pickup

Lamps, Bottles, Electronics

- Storage provided for fluorescent lamps. HID lamps, batteries, electronics

Material Selection

Shall conform to 503.2 and 503.3

EXCEPTION – EL, ME, PG, Security, Fire and alarm controls, elevators, conveying equip. are exceptions.

Not Less than 55% based on cost or mass - SHALL comply with 503.2.1, 2.3, 2.4, 2.5.
Compliance SHALL be demonstrated.
Design Life equal to or greater than Service Life according to 505.1

- **503.2.1 Used Materials** according to 102.4
- **503.2.2 Recycled Bldg Materials**
  1. Contain < 25% Post Consumer and Pre-Consumer recovered matl's
  2. Contains NOT < 50% Pre and Post consumer materials
  3. Pre consumer recycled materials content = ½ actual content.

- **503.2.3 Recyclable Bldg Materials** – Manufactured for recyclability with minimum recovery rate of NOT < 30%

- **503.2.4 Bio-Based Materials** are one of the following:

  1. Contains NOT < 25% combined pre & post consumer recovered materials. Content NOT < 50% per ASTM: D6866
  2. Wood must be labled per SFI Standard. FSC Indicators, PEFC Council, or equivalent.
  3. A certificate of compliance conforming with fiber procurement by an accredited 3rd party
  4. Requirements of USDA 7CFR part 2902

- **503.2.5 Indigenous Materials** Must be harvested within 500 sq miles. If transported – the distance traveled multiplied by .25 and adding that to the distance of NOT using water or rail.

LAMPS – LIGHTS 504

- Mercury levels regulated
- EXCEPTIONS for long life bulbs
- Fixtures classified by Service Life – mandatory repair, maintenance and replacement schedule - Documented.
- ONLY CODE OFFICIAL may approve non-conforming designs
- Design life and In-Use conditions

Service Life - 505

505.1.1 – Table for Design Life

- This is a recycling requirement. All components MUST obtain a 60 Year *DESIGN SERVICE LIFE*
- Comprehensive Plans and the CODE OFFICIAL – MAY approve a 25 year plan.
- Plans that deviate from Table 505.1.1 MAY be approved by the CODE OFFICIAL – for Practical Difficulties
- **Interior ability –** to accommodate 25 years of reconfiguration, disassembly of partition walls, lighting and EL systems. Plan MUST contain detail for interior materials, components, and assemblies that meet the 25 years.

Moisture Control and Material Storage 506

- **On-Site Storage Requirements – refer to MFGs recommendations**
- **If No recommendations –** *Approved* Standards and guidelines MUST be followed
- **Construction Phase Moisture Controls –**
  1. Porous or fibrous: protected from moisture.
  2. Clean and dried if wetted
  3. Replaced and removed if clean and dry will not work

***** Moisture Controls Inspected**

1. Per Sections 903 & 902
2. Frequency per 903.1
3. Conducted by Approved agency
4. Inspection Reports to CODE OFFICIAL
5. Final inspection Report for compliance to CODE OFFICIAL that Includes:
   a) Foundation sub soils
   b) Damp proofing
   c) Flashing
   d) Exterior Wall covering
   e) Roof coverings

Strawbale Construction

- **For strawbale construction**, MUST comply with IBC, IPC, IMC, FGC, NFPA 70.
- **Bales** MUST comply with 507.2.1 thru 507.2.9
- **Standard** construction objectives for strawbale materials and germane methods.
- **Moisture content -** <20%. MUST TEST. Minimum of 5% NOT< 10% of all bales sampled MUST pass.
- **Density –** minimum dry weight 6.5 pounds @ cubic foot. Minimum 2% at least 5 bales tested for conformance

- **Bale materials**
- **Partial Bales**
- **Types of Straw**

- **Protection methods/requirements**
- **Unacceptable bales**

Mositure Control Requirements

a) Moisture content – specified
b) Vapor retarders
c) Horizontal surfaces
d) Bale and concrete separation
e) Separation of plaster and earth
f) Shower walls steam rooms

- **Structure – complies with 507.4.1 thru 507.4.15 AND structural requirements of the IBC**
  1. Foundations
  2. Wall height
  3. Bale configuration
  4. Precompression of bales - EXCEPTIONS: Certain Loads alter standard requirements
  5. Voids and stuffing
  6. Plaster skins
  7. Straightness – defines standards
  8. NO membrane between bale and plaster
  9. Gravity loads MUST transfer to plaster skins
  10. Plaster skin support per 507.4.8.1 and 507.4.8.2
  11. Plaster skin structural walls – foundation loading - masonary stem walls, concrete slab, wood framed and blocked, wood beams, steel angle beams,
  12. NO Screed or plastic weep is acceptable
- **Load Bearing Walls in accordance with 507.4.(2)**
- **Lateral Loads SHALL be permitted** in accordance with Table 507.4.(3) per seismic and wind standards
  1. Plywood
  2. Shear walls
  3. Prefab steel,
  4. Steel cross bracing

  The above is approved if verified in the IBC

Tables 507.4(1)&(2)&(3)

- Out of Plane later loads
- Prescriptive design for plastered strawbale walls
- Loads and limits
- Gravity bearing walls
- Braced panels
- Connections to framed walls

- Alternate performance design criteria **– *Engineered Design/Certification Suggested***
- **FINISHES – IBC defined 507.5.1 - 5.7.5.15**
- EXCEPTION: Truth windows – protected from weather
- **Vapor Retarders**
- **Plaster**
- **Plaster and membranes**
- **Lath and mesh**
- **Plaster on Non-Structural walls**
- **Clay and earth and earthen plaster**
- **Mesh**

    1. Thickness
    2. Rainexposed
    3. Prohibited finish coat
    4. Additives
    5. Separation of wood and clay plaster

507.5.8 - **Soil Cement plaster, earth cement, stabilized earth or pise**

- **General –** Soil cement organics and inert
- **Mesh** SHALL use any corrosion resistant metal used on structural walls
- **Thickness** 1” Minimum

507.5.9- Gypsum Plaster – permitted over structural plaster – per IBC
507.5.10 Lime plaster – SHALL Type N and S hydrated lime. 7.8” thickness
507.5.11 Cement plaster – per IBC
507.5.12 Cement plaster – per IBC
507.5.13 Over plaster finishes

Prohibited plaster and finishes
Separation of Wood and Plaster

507.6 – Fire Resistance – as proscribed in ASTM: E119

- **Clay plaster**
    1. 1-hour rated
    2. Running bond – no gaps
    3. 7.5 lbs @ cu. Foot density
    4. Plaster both sides
    5. Plaster in conformance with 507.5.7

- **Cement Plaster**

1. 2-hour rated
2. Flat on running bond
3. 7.5 lbs @ cu. Foot density
4. Plaster both sides – 1”
5. Plaster in conformance with 507.5.7
6. Woven wire mesh standards
7. Complies with 507.5.12

SAME – AS wood fire rating

Permitted Construction – fire rating equal to Chapter 6 – IBC

- Gaps and clearances must adhere to IBC standards 2111, 2112, 2113

ELECTRICAL - NFPA 70 standard

1. Wiring, attachments, EL boxes, sub-panels and service SHALL all conform to NFPA 70 and Strawbale construction standards

Thermal Insulation – 507.11.1 or 507.11.2

- **R-30 per standard construction**
- **Unit R-Value = R1.3 per inch**

PROJECT ELECTIVES – 508

Material resource conservation and efficiency – Table 303.1

- **Waste MGMT –** Electives within Table 303.1 and 303.4 SHALL comply with 502.1 – Except the landfill amount increased by 20%
- **Material Selection –** SHALL be considered a separate elective

    1. This elective SHALL require compliance with 503.2 – EXCEPT – structures SHALL contain recycled content, recycleable, bio-base and indigeonous materials complying with 503.2.5 – that total to 70% of building products and materials on mass, or cost, used singularly

    2. Compliance with item 1. EXCEPT 85% building products and materials on mass, or cost, used singularly

- **Service Life Plan electives – according to 508.4.1**
- **Building Service Life Plan, BSLP, Electives – Table 303.1 and 303.4 Shall comply with this section.**

- **BLSP in accordance with 505.1 SHALL be in the construction documents, AND< according to Table 508.4.1**

Table 505.4.1 –
defines component minimum life standards

CHAPTER SIX
ENERGY CONSERVATION, EFFICIENCY AND ATMOSPHERIC QUALITY

Shall define the construction, commissioning, and operation of buildings and building sites for effective energy use

Intent to permit flexibility in innovative approaches and techniques to save energy

Minimum Requirements – 502.4, 503.2, 504, 505 of the IECC – Regardless of the path chosen

602 – ENERGY PERFORMANCE PEAK POWER AND REDUCED CARBON DIOXIDE EMISSIONS

- **Zero Energy Performance Index = zEPI**
- **NOT > Table 602.1**

Table 602.1 – Minimum zero energy performance index

1. Occupancy Types, zEPI Point of Entry, and zEPI jurisdictional choices
2. Compliance paths – new buildings, existing buildings, and alterations >25,000 total building floor area AND associated Building Sites SHALL comply with 602.2.2
3. All others SHALL comply with 602.2.1, 602.2.2, 602.2.3 or 602.2.4

Prescriptive based compliance

- Buildings using a prescriptive basis SHALL comply with sections 604, 605, 606, 607, 608, 610, 611, 612 AND SHALL be deemed to have zEPI in compliance with section 602.1

Performance based compliance

- Shall comply with sections 604, 605, 609.6, 611, and 612
- **Minimum performance** zEPI NOT > tah shown in Table 602.1. zEPI SHALL be calculated with section 603.1.1. Buildings complying with the 2006 IECC SHALL have a zEPI rating of 73.
- **Peak energy demand** – SHALL be **DESIGNED AND CONSTRUCTED** to limit peak energy demand per 603.1.2

- **Annual direct and indirect CO2 emissions**. Where total CO2 emissions required in Table 302.1, CO2 calculations SHALL be performed according to 603.1.3 and 603.1.4. Emissions SHALL be < or equal to standard design reference with equation 6-1.
- **Outcome based compliance** SHALL follow 604, 605, and 612.
- **Maximum energy use –** Buildings SHALL be designed, constructed, commissioned, OPERATED, AND MAINTAINED to use energy in accordance with 603.2
- **Building peak demand** SHALL be designed, constructed, commissioned, OPERATED, AND MAINTAINED to limit peak net energy demand during ANTICIPATED peak energy use in accordance with 603.2
- **Emissions -** designed, constructed, commissioned, OPERATED, AND MAINTAINED to annual direct and indirect CO2 emissions in accordance with 603.2

Energy use intensity EUI –

SHALL deliver an EUI that would place the building in the top 10% of existing buildings.
OR
Using the EPA target finder the EUI SHALL be less than or equal to a score of 90 in target finder.
For ineligible buildings as score of 50% lower than the average source EUI for similar space types in CBECS.

- **EUI determination – According to 603.3 and Equation 2**

EUI = TAE/SF **(Equation 6-2)**
Where:
TAE = Total annual energy projected to be consumed on site, including renewable energy generated on site, as determined in accordance with Section 603
IGCC Public Version 2.0
SF = Gross square feet of the building

- **Documentation of existing buildings** – energy performance SHALL NOT BE GREATER THAN the building PRIOR TO ALTERATION

- **Determination of energy savings –** a “12 month comparison” between the building prior to alteration and after alteration.

- **Measurement based compliance performed by an approved agency that documents energy use** and demands. EXCEPTION approved agency Modeling – ASHRAE 140 class 1, section 5

- **3rd party Certification Based compliance -** performed by approved agency that by reason, measurement, simulation, yada yada yada – *approved means* the building DOES NOT use more energy than before.

Determinations - Performance based compliance and CO2 emissions reduction calculation variables come from this section.

Annual Energy Use:

1. ALL energy used – minus Alternative/Renewable energy created or Waste Energy Saved are included in calcs.
2. Zero Energy Performance Index - zEPI - according to 603.3
    a) PD - Total energy delivered and consumed per 603
    b) RE - Total energy savings from renewable
    c) RD - Total energy used by Standard Reference – 603
    d) WE - Total Waste energy recovered
    e) PD, RE, RD, WD, SHALL consist of units from 603.1.1

Documentation Procedures per 506.4 – IECC – energy code

Annual Direct and Indirect CO2 emissions – Where CO2 emissions limits are required by Jurisdiction in Table 302.1 CO2 emissions SHALL follow 603.1.3.1 & 603.1.3.2 on electricity delivered. Associated Emissions SHALL be calculated using the meter and conversions in Table 603.1.3 based upon ***eGRID.***

1. **603.1.3.1 – On-Site electricity** – emissions associated with Table 602.1.2 SHALL be calculated using the meter and conversions in Table 603.1.3 based upon ***eGRID.***
2. **603.1.3.2 On-Site renewable fuels** Emissions associated with non-renewables factored in Table 603.1.4. Fossil fuels SHALL be calculated using the meter and conversions in Table 603.1.3 based upon ***eGRID.***

Annual Direct and Indirect CO2 emissions with on site fossil fuels purchase direct energy.

- Natural gas, fuel oil, propane, SHALL be calculated by using metered electricity and table 603.1.4. Emissions Not listed SHALL be calculated using meter readings multiplied by 250. The factors from 603.1.3 SHALL be calculated using t Table 603.1.3 based upon ***eGRID.***

Table 603.1.1(1)
eGRID sub-region/eGRID name/Energy Conversion Factors

Table 603.1.1(2)
US Average Bldg Fuels Energy Conversion Factors by Fuel Type

Table 603.1.3
Electricity Emissions by eGRID sub region

eGRID 2007 sub region acronmym/eGRID name/2005 CO2e Rate (lbs/MWh)

Table 603.1.4
Fossil Fuels Emissions Factors

Emission Rates (lbs/MMbtu HHV)/Natural Gas Stationary/FuelOil stationary/Propane Stationary

Determination and compliance with annual net energy performance, peak net energy demand and CO2 emissions requirements.

- When outcome base according to 602.2.3 the annual net energy performance , peak energy, and annual direct and indirect CO2 emissions SHALL meet Table 603.2(1) thru 603.2(3). Use SHALL be based on estimated energy use of the Bldg for 12 continuous months PRIOR TO commissioning AND based on actual utility consumption for 12 continuous months AFTER commissioning according to 603.1.1. Annual Direct and Indirect CO2 emissions SHALL be converted from the energy used in sections 603.1.3 and 603.1.4
- Compliance SHALL be determined using 603.2.1 thru 603.2.4

Design –

- for Plan Review and permit approval the Bldg SHALL be based upon calculations and supporting data by a registered design pro – indicating the Bldg complies with 603.2 after construction and commissioning. Calculations TOOLS to document compliance SHALL be identified in 506.6 of the Energy Code IECC

Construction –

- for construction approval purposes compliance SHALL be based upon a statement from the Bldg contractor the bldg meets the approved plans

Annual Operations –

- To confirm the Bldg meets 603.2 a commissioning report required by 603.2.3 AND Bldg operational report SHALL be submitted by Bldg owner showing necessary data from 603.2 on a **CALENDAR YEAR BASIS** according to 612.

Table 603.2(1)
Annual Energy Performance
Building Occupant Type/ANEP

Table 603.2(2) Peak Energy Demand
Building Occupant Type/PNED

Table 603.2(3) Annual Direct & Indirect CO2 Emissions
Building Occupant Type/ACO2E

Calculation Procedures – according to 506.5of the IECC – EXCEPT when 603.3.1 and 506.5.1(1) of the IECC permits another method.

IECC Table 506.5.1 SHALL be modified as follows: Glazing, orientation and electric power changes – performance based.

Electrical system efficiency performance path –

- …. Actual factors and equations for compliance calculations

Qualified Software for energy use – 506.6 from IECC

Design Professionals for Performance – Design Pro mandatory. **Code Official** SHALL be authorized to require the OWNER to hire a design pro to perform energy modeling/simulation.

Minimum Requirements –

- SHALL meet the Standard Reference of Bldg design without regard to technology chosen.

Energy Metering, Monitoring, and Reporting – 604

Purpose – complies with 604. Testing, Reporting, Monitoring Requirements.

ALL Energy used, regardless of source, SHALL BE METERED.

BLDG with Tenants – Metering SHALL include Tenants – Tenants MUST get copy of their use.

Intent – To provide ongoing metering measuring, reporting, and display of energy use, energy demand, and emissions with energy use of the WHOLE Bldg and its systems as required by 612, AND, where required by 603.2 to verify ongoing compliance per 602 and 603.

Energy distribution and Load Type isolation – *SIGNIFICANT CHANGE*

- EACH Energy distribution system within, adjacent to and serving, a Bldg SHALL be designed so EACH primary circuit, panel, feeder, piping system, or supply mechanism supplies ONLY ONE energy use type per 604.3.1 thru 604.3.6.
- Each system SHALL be designated on the energy distribution system, containing use served and adequate space for METERING equip – OR other data collection equip. to measure use.
- Design SHALL be capable of collecting data on EACH energy TYPE used – by each tenant and system - 604.3.1 thru 604.3.6.
- When multiple Bldgs on a site - EACH building SHALL comply SEPARATELY.

EXCEPTION – as permitted in 604.3.1 thru 604.3.6

*****ALL THESE SYSTEMs SHALL BE METERED SEPARATELY**

- HVAC systems to include everything used to heat or cool.
- Lighting System Total energy Use

- BLDG Operation Use (?)
- Plug load Use – appliances, equip & . convenience use
- Process Loads – any system that use 5% of the TOTAL energy used or more
- Misc. Loads – Energy for operations and loads

Energy Type Metering

- Each Bldg SHALL be equip. to monitor energy use, peak demand as per 604.4.1 thru 604.4.7. Utility energy METERS SHALL be permitted to collect data on the entire Bldg and equipped with a Local Data Port – connected to a Data acquisition center.
    1. Gaseous Fuels
    2. Liquid Fuels
    3. Solid Fuels
    4. Electricity
    5. District HVAC
    6. Combined Heat & Power

*****The above SHALL all be metered or measured for gross amount used , peak demand use, and constructed types according to the IGCC and Mech Codes.**

Renewable and Waste energy recovered & used SHALL be METERED

- Solar EL
- Solar Thermal
- Waste Heat
- Wind Power
- Other Renewable

*****The above SHALL all be metered or measured for gross amount used , peak demand use, and constructed types according to the IGCC and Mech Codes.**

Energy Loads Sub-METERING – Bldgs > 25,00 sq ft in floor space SHALL contain a distribution system constructed to accommodate FUTURE Sub-Meters. 604.5 – MUST include space for meters and other *Approved Devices*

Minimum Energy Measurement and Verification

- All Meters connected to Data acquisition Ports – per 604.4 & 604.5
- REAL TIME displays required
- Use Display Required

Annual Emissions –

- Data acquisition SHALL include CO2 emission. Per 604.6. Calculations SHALL conform with 603.

Energy Display

- Permanent. Accessible. Visible. Providing the following:
    1. Current Demand for the entire Bldg – by FUEL TYPE

2. Avg. & Peak demands – previous and same days 604.4
3. Total Energy Used the past 18 months

AUTOMATED DEMAND RESPONSE (AUTO-DR) INFRASTRUCTURE

Open and Interoperable Infrastucture – Bldgs with HVAC and Lighting SHALL comply.

- Energy Mgmt and control system.
- Integrated with HVAC and Lights
- Relay/controls/INTERNET operated. Connected the WEB.
- Energy using equipment SHALL incorporate preprogrammed demand response strategies.
- Automated and connected with an Internet software client –

Software Client – SHALL communicate with (DRAS) demand response server.

HVAC Systems –

- DRAS SHALL be capable of 10% energy reduction – when an OUTSIDE signal operator - Independent System operator, ISO, OR Regional Transmission Operator, RTO, calls for the reduction.
- Including:

1. Temperature set Point
2. Increase/Decrease water supply temps.
3. Increase/Decrease VAV supply temps.
4. Limit HVAC capacity with variable stack controls
5. Cycling HVAC Equip. or turning OFF equip.
6. Disabling HVAC equip.
7. Limiting chilled water, hot water, and refrigeration control valves
8. Limiting supply and exhaust fans – **WITHOUT reducing indoor air quality – per Ch. 4 IMC and ASHRAE 62.1**
9. Limit capacity of cold and hot water
10. Anticipatory strategy to pre-cool or heat anticipating a peak demand

EXCEPTIONS – Hospitals, Life Safety, Smoke detectors, MFG process systems

Rebound Avoidance

- The DRAS SHALL
    1. Include *LOGIC* to avoid rebounds and be integrated to the Metered systems.
    2. If Close to the unoccupied period, the DRAS SHALL extend recovery until the unoccupied period arrives.
    3. Gradually increasing or decreasing
        a) space temperature setpoints
        b) Supply Air
        c) Chilled water
        d) Limited demand equip.

e) Equip turned off
f) Air handling equip.
g) Hot and cold water & valveing

Lighting – DRAS SHALL be capable of reducing power in Group B by NOT LESS than 15%

EXCEPTIONS:

1. Bldg with Lifeline Srvcs
2. Life safety and emergency
3. Emergency circuits
4. <5, 000 sq ft
5. Located in Day Light Zone
6. Signage for Life safety or traffic control

BUILDING ENVELOPE SYSTEMS – 606

Prescriptive Compliance – Prescriptive path SHALL comply with 602.2.1 and IECC 502

- **Insulation & Fenestration –** SHALL exceed IECC by 10%. SKY type roofs SHALL exceed by 5%
- **Permanent Shading for fenestration –** Verical fenestration within 45 degrees of the nearest west, south and east cardinal ordinate SHALL - be shaded
    1. Permanent horizontal projections
    2. > .25 protection
    3. Different projection factors evaluated separately
    4. Weighted average SHALL be calculated
    5. Projections SHALL extend laterally beyond glazing edge by NOT< ½ height except at corners.

EXCEPTIONS: Hurricane locations, Mean roof height exceeds table 1504.8 of the IBC. Windows within 18" of lot line. Equivalent shading provided by fixed surrounding structures.

Air Leakage

- **Sealing Envelope**
    1. All joints, seams penetrations
    2. Site built windows and Skylights
    3. Window and door openings
    4. Utility penetrations
    5. Dropped ceilings
    6. Knee walls
    7. Separating unconditioned spaces
    8. Behind tubs on exterior walls
    9. Common walls

10. Roof access points
11. Spandrel areas
12. Utility boxes
13. HVAC penetrations - except where sealed to drywall & subfloor
14. Other infiltrations
15. Continuous air barrier penetrations

Air Barrier Installations:

1. SHALL cover all ext. walls
2. 2" over laps at joints
3. Vertical joints must lap 6"
4. Material SHALL be continuous – terminated at penetrations and Bldg appendages.
5. Taped per MFG specs.

Testing Requirements

- Tested at framing – after all penetrations are sealed – following ASTM E779. Acceptable if testing achieves < .25 CFM/ft(squared) – when tested pressure of .30 in w.c. (75 Pa).

Outdoor air intakes and exhaust –

- SHALL comply with 502.4.5 – IECC

Fireplaces –

- Outside air feed – must provide flue sealing mechanisms – tight.

Vestibules –

- Doors protecting conditioned spaces must have self closing vestibules. SHALL not permit both doors open at once.

EXCEPTIONS –

1. ME and EL room doors
2. Sleeping room doors
3. Revolving doors
4. Vehicle and material handling doors near personnel doors
5. Code required doors that are not MAIN entries.

Building Mechanical Systems – 607

Prescriptive compliance –

- SHALL met path according to 602.3.1 of the IECC
- HVAC performance – SHALL comply with 607.2.1
- Federal Standard equip. Equip. covered by federal minimum codes SHALL meet IECC standards
- Equip not covered – SHALL meet requirements of this section.
- Ground source heat pumps – SHALL meet – 607.2.2.1 and tested

- Multi-stage ground heat pumps SHALL meet Table 607.2.2.1 and tested.

Table 607.2.2.1
Product type/Minimum EER/Minimum COP/Test procedure

Ventilation fans –
- **SHALL comply** with Energy Star

HVAC system controls –
- SHALL meet the IECC except as noted

Thermostats –
- Programmable types SHALL be labeled and meet Energy Star STDs.

Ventilation –
- **SHALL** follow Ch 4 of the IMC
- **SHALL** provide capability to produce supply to IMC Ch 4, 6.3, minimums OR – ASHRAE 62.1

Duct and plenum –
- SHALL be insulated and sealed to IECC - STDs, except noted herein

Duct leakage testing –
- Ducts exceeding 3 inches of static pressure AND located outdoors SHALL be leak tested according to SMACNA HVAC leak test manual.
- > 25% of assembly SHALL be tested.
- Positive pressure testing approved.
- Ducts > 3 inches of pressure SHALL be noted of Construction documents
- Maximum permitted leakage SHALL be according to equation 6-7 herein.

HVAC piping insulation –
- Piping and vales SHALL be thermally insulated per Table 607.5
- Bldg cavities and interstitial framing SHALL be large enough to accommodate the combined diameter of the pipe plus the insulation, PLUS the full thickness of the insulation and other objects in the cavity tested.

EXCEPTION:
1. MFG installed piping inside HVAC units – 607.2
2. Piping conveying fluids with operating temperatures between 60-105 degrees F.
3. Piping conveying fluids not heated or cooled.
4. Where NO heat gain is realized
5. Piping having O.D. of 1 inch or less associated with strainers, control valves, or balancing valves.

Table 607.5

Minimum Pipe Insulation Thickness(s)

Fluid/Conductivity Btu/Wall Thickness of pipe insulation

Economizers –

- SHALL meet requirements of IECC except as noted
- Air economizer systems – systems with fan SHALL include an air or water economizer per 607.6.1.1 or 607.6.1.2.

Exception: Not required for the following:

1. Individual fan-cooling units- capacity less than the minimum listed in Table 607.6.1(1).
2. Group I-2, Hospitals, and Group B, Ambulatory health care facilities, where more than 75 percent of the air designed to be supplied by the system is to spaces that are required to be humidified above 35° F dew-point temperature to comply
3. Systems that include a condenser heat recovery system that utilize sixty percent of the peak heat rejection load and a documented need for service hot water or space heating during peak heat rejection design conditions.
4. 4 Systems that serve spaces estimated as having a sensible cooling load at design conditions - t the temperature and relative humidity design conditions in accordance with section 6.1 of ASHRAE 55.
5. Where the use of *outdoor air* for cooling will affect supermarket open refrigerated casework systems.
6. 6. Where the cooling *efficiency* meets or exceeds the *efficiency* improvement requirements in Table 607.6.1(2).

Economizer Table 607.6.1(1)

Climate Zones/Requirements

Air economizers.

- SHALL be in accordance with Sections 607.6.1.1.1 through 607.6.1.1.4hrough 607.6.1.1.4**.**

Design capacity. SHALL be capable of modulating *outdoor air* and return air dampers to provide up to 100 percent .

Control signal. Dampers SHALL be sequenced with the mechanical cooling equipment and SHALL NOT be controlled by only mixed air temperature.

- **Exception:** The use of mixed air temperature shall be permitted - space temperature, such as single-zone systems.

High-limit shutoff. SHALL be capable of automatically reducing *outdoor air* intake from Table 607.6.1.1.3(1). High-limit shutoff control settings for these control types shall be those listed in Table 607.6.1.1.3(2).

Relief of excess outdoor air*.* Systems SHALL provide a means to relieve excess *outdoor air*

Table 607.6.1(1)
Climate Zone/Cooling efficiency

Table 604.6.4.4.3(1)
Climate zone/Allowed Control types/ Prohibited Controls

Table 607.6.1.1.3(2)
Device Types/Climate Zones/Required High Limits

Water Economizer systems for HVAC Equipment. SHALL be designed in accordance with Sections 607.6.2.1 through 607.6.2.4.

Design capacity. Water economizer systems shall be capable of cooling supply air by indirect evaporation and providing up to 100

Exception: Must satisfy 100 percent of the expected system cooling load at 45°F dry bulb/40°F wet bulb.

Maximum pressure drop. Water-to-water heat exchangers SHALL have a water-side pressure drop of less than 15 ft of water column OR, a secondary loop SHALL be created so exchanger pressure drop is not seen by the circulating pumps in the normal cooling non-economizer mode.

Integrated economizer control. SHALL be integrated with the mechanical cooling system and provide partial cooling to meet the remainder of the cooling load.

Economizer heating system impact. HVAC system SHALL not increase the *building* heating energy use during normal operation.

Exception: Economizers on VAV systems that cause zone level heating to increase because of reduction in supply air temperature.

Variable air volume (VAV) fan control. SHALL be one of the following:

1. Driven by a mechanical or electrical variable speed drive.
2. Driven by a vane-axial fan with variable-pitch blades.
3. Provided with controls demand not more than 30 percent of its design wattage at 50 percent of design airflow when static pressure set point equals one-third of the total design static pressure, based on manufacturer's certified fan data.

Exception: Systems without zone dampers are exempt from the static pressure reset requirements.

Kitchen exhaust systems SHALL meet the provisions of the *International Energy Conservation Code* except as noted herein.

Kitchen exhaust systems. Replacement air introduced directly into the exhaust hood cavity

SHALL NOT exceed 10 percent of the hood exhaust airflow rate.
SHALL have a maximum exhaust rate in accordance with Table 607.8.1 and shall meet one of the following:

1. Not less than 50 percent of all replacement air is transfer air that would otherwise be exhausted.
2. Demand *ventilation* system(s) are provided for replacement air system airflow rates,
3. *Listed* energy recovery devices with not less than 40 percent shall provided for at least 50 percent of the total exhaust airflow.

Exception: Where not less than 75 percent of all the replacement air is transfer air that would otherwise be exhausted.

Table 607.8.1

Max. Net Exhaust CFM/Ln FT
Type Hood/ Lgt Duty/Med Duty/Hvy Duty/EXT. Hvy Duty

Laboratory exhaust systems. SHALL meet the provisions of the *International Energy Conservation Code* except as noted herein.

Laboratory exhaust systems. *SHALL* provide at least one of the following features:

1. A VAV laboratory exhaust and room supply system
2. A heat recovery system to precondition makeup air
3. Direct makeup auxiliary air supply equal to at least 75 percent of the exhaust air - specified in Section 302.1 of the *International Energy Conservation Code*.

Control of HVAC in hotel/motel guest rooms. A DEDICATED system to automatically control HVAC system energy SHALL be installed to control consumption during unoccupied periods. Such controls SHALL raise cooling and lower heating set points by at least 4 ºF (2 ºC) during unoccupied periods.
Exception: Group R-1, Hotels and Motels, with fewer than 20 guest rooms.

SECTION 608
BUILDING SERVICE WATER HEATING SYSTEMS

Prescriptive compliance. SHALL meet the provisions of the *International Energy Conservation Code*.

Service water heating (SWH) equipment performance requirements. SHALL comply with Sections 608.2.1 and 608.2.2.

Equipment covered by Federal standards. SHALL meet the minimum efficiency requirements of the *International Energy Conservation Code*.

Water heater controls for dwelling units. SHALL be equipped with external water temperature thermostat controls. The controls SHALL allow a setting below 100 ºF and greater than or equal to 50 ºF.

Pools, hot tubs and spas. Shall meet the efficiency requirements of the *International Energy Conservation Code*.

Pools in conditioned space. Pools located within the conditioned space SHALL meet contain at least one of the following:

1. An on-site renewable energy system(s)
2. A heat recovery system.

Snowmelt systems. SHALL comply with the requirements of the *International Energy Conservation Code*.

Exception: Emergency service ingress and egress.
1. An on-site renewable energy system(s)
2. A heat recovery system.

Rough-ins for future solar hot water pre-heat. SHALL be in accordance with Sections 608.5.1 and 608.5.2 TO PROVIDE FOR THE FUTURE INSTALLATION OF A SOLAR WATER HEATING SYSTEM F PROVIDE NOT LESS THAN 50 PERCENT OF THE ENERGY NEEDS LISTED BELOW:

1. Service Water Heating for kitchen, laundry and bathing.
2. Pool Water Heating.
3. Spa Water Heating.
4. Hot Tub Water Heating.

Exception: Solar water heating equipment is not required at building sites when in accordance with Table 611.4.

Solar thermal hot water system piping rough-in. Conduit, sleeve or other pathway **SHALL**

a) **Be installed not less than two runs of piping from the future site for *solar thermal*** to the location of the service water heating equipment.
b) The minimum diameter of the piping shall be ¾ inch nominal
c) Be certified to handle sustained temperatures above 180F. Insulation shall
d) Be sized in accordance with Section 607.5.

Solar electric hot water system electrical rough-in.
SHALL

a) Be Conduit and SHALL be installed from the future site for solar electric to the electric service panel .

b) Conduit not less than ¾ inches in size shall be installed to provide for control wiring.

Conduit Size. ABOVE

Terminations. SHALL terminate near the *solar thermal* or solar electric sites and shall be readily accessible.

Space for future storage tank.

SHALL :

a) Be identified and reserved.
b) Be large enough to accommodate storage for a *solar thermal* system sized to provide 50 percent solar fraction, with an area of not less than ten square feet.

Waste water energy recovery system. The following *building* types SHALL be provided with a waste water heat recovery system

1. Group A-2, Restaurants and Banquet halls;
2. Group F, Laundries;
3. Group R-1, Boarding houses (transient), Hotels (transient), Motels (transient);
4. Group R-2 *buildings*; and
5. Group A-3, Health Clubs and Spas
6. Group I-2, Hospitals, Mental hospitals and Nursing homes.

Exception: Single-*story*, slab-on grade and single-*story*, on crawl-space *buildings*.

Service water heating piping insulation.

1. SHALL be thermally insulated in accordance with Table 607.5. Within attics and crawlspaces, the insulation .
2. SHALL continue to cover the pipe for a distance of at least 6 inches (152 mm) beyond the *building thermal envelope.*
3. SHALL completely surround the pipe with not less than 1 inch of insulation in attics.
4. Where hot water piping is installed in a wall - insulation = Table 607.5,
5. The insulation thickness SHALL NOT be less than ½-inch thick.

Exceptions:

1. Factory-installed piping t tested and rated in accordance with Section 607.5.
2. Piping conveying fluids not heated or cooled such as cold water supply, and natural gas piping.
3. Hot water supply piping exposed under sinks, lavatories and similar fixtures.
4. Hot water *distribution piping* buried within blown-in or sprayed roof/ceiling insulation,

Buried piping. SHALL**:**

- Be insulated in accordance with Section 608.7
- Be placed within a physically protective, waterproof channel or sleeve
- Maintain its dimensional integrity during and after construction.

Exception: Where the insulation manufacturer stipulates that the pipe insulation will maintain its insulating value in underground applications in damp soil where installed according to the manufacturer's instructions.

This exception does not apply to piping that runs under *building* slabs.

Circulating hot water systems. SHALL:

Contain an *automatic* or readily accessible *manual on/off* switch.
NO temperature based pump controls
NO Gravity or thermosyphon circulation loops.

Pumps on circulating hot water systems SHALL be activated either a hard-wired or wireless activation control of one of the following types:

1. A normally-open, momentary contact switch.
2. Motion sensors shall go into a lock out mode for not less than 5 minutes
3. A flow switch.
4. A door switch.
5. Electronically operate on the principal of shutting off the pump with a rise in temperature.

SECTION 609
BUILDING ELECTRICAL POWER AND LIGHTING SYSTEMS

General. Where buildings use the prescriptive-based compliance path in 602.3.1, electrical power and lighting systems **SHALL** meet the provisions of the *International Energy Conservation Code* - and the provisions of Section 609.

Sleeping unit controls.

Sleeping units in hotels, motels, boarding houses SHALL have a control system for detecting occupancy when the unit is not occupied.

> **Exception**: Sleeping unit controls are not required *in sleeping units* where all lighting and switched receptacles are controlled by an *occupant sensor* that requires *manual* intervention to energize circuits.

Sleeping unit bathroom controls.

Wired luminaires in *sleeping units* in hotels, motels, boarding houses etc.. SHALL be equipped with *occupant sensors* that require manual intervention to energize circuits.

> **Exception**: Up to 5 watts of lighting in each bathroom shall be permitted to be connected to the *captive key control* at the main room entry instead of being connected to the *occupant sensor control*.

Interior light reduction controls.

Occupant sensor SHALL automatically reduce connected lighting power by not less than 45 percent when occupants are not present in:

1. Corridors and enclosed stairwells.
2. Storage and stack areas not open to the public.

3. Parking garages.

Lighting in egress SHALL comply the *International Building Code*.

Exception: Automatic power reduction shall not be required where *occupant sensor controls* are overridden by *timeswitch controls* that keep lights on continuously during peak occupancy periods.

Exterior lighting controls. SHALL comply with the requirements of Sections 609.4.1 and 609.4.2.

Exterior light reduction. SHALL be controlled by a *time switch*

Exception: Exterior lighting controls need not be controlled for the following occupancies and conditions:

1. Group H occupancies.
2. Group I-3 occupancies.
3. Lighting which is connected to *occupant sensor controls*.
4. Lighting within means of egress.
5. Solar powered luminaires that are not connected to a centralized power source.

TABLE 609.5
MINIMUM FENESTRATION

Sky Type / Minimum Aperture
Equations

609.6 Plug load controls. SHALL be controlled by an *occupant sensor* or *time switch* as follows:

- In Group B office spaces - be provided for each 50 square feet.
- in Group B office spaces – be provided at each electrical outlet used for powering furniture systems.
- In classrooms in Group B and Group E occupancies – be provided in each classroom.
- In copy rooms, print shops, and computer labs, - be provided for each data jack.
- In spaces with an overhead cabinet - be provided for each work surface.

Distribution and marking. SHALL be distributed in a reasonably uniform pattern throughout each space. Controlled receptacles shall be marked
.

Furniture systems wired receptacles SHALL include not less than two receptacles at each workstation that are connected to a controlled circuit.

Computer office equipment. SHALL be plugged into controlled receptacles.

Audio and visual systems. Group B and Group E classrooms, conference and meeting rooms, and multipurpose rooms SHALL be controlled by an *occupant sensor*.

Water dispensers. SHALL be controlled by *time switch controls*.

Refrigerator and freezer cases. SHALL be controlled by an *occupant sensor* or a *time switch*.

Fuel gas lighting systems. SHALL be included in lighting power calculations required under Sections 505.5 and 505.6 of the *International Energy Conservation Code* by converting the maximum rated *btu*/hr of the luminaire into watts using Equation 6-10.

Wattage Equivalent = Maximum *btu*/hr rating of the fuel gas lighting system / 3.413. **(Equation 6-10)**

Exception: *Historic buildings* in accordance with Section 101.4.2 of the *International Energy Conservation Code.*

Continuously burning pilot lights. Prohibited.

Electrical system efficiency. Electrical systems shall comply with Section 609.8.1.

Prescriptive compliance. Electrical systems SHALL be in accordance with Sections 609.8.1.1 through 609.8.1.3.

Transformer efficiency. Distribution transformers on the load side SHALL comply with the provisions of Tables 609.8.1.1(1), 609.8.1.1(2) and 609.8.1.1(3), of the Energy Policy Act of 2005 as applicable.

Exceptions:

1. Transformers not covered by the Energy Policy Act of 2005.
2. Transformers for special purpose applications, and not used in general purpose applications.
3. Transformers with multiple voltage taps where the highest tap is not less than 20 percent more than the lowest tap.
4. Drive transformers, rectifier transformers, auto-transformers, uninterruptible power supply transformers,
impedance transformers, regulating transformers, sealed and non-ventilating transformers, machine tool transformers, welding transformers, grounding transformers, and testing transformers.

Voltage drop in feeders. SHALL not exceed 1.5 percent at design load.

Voltage drop in branch circuits.

SHALL not exceed 1.5 percent at design load.

609.9 Exterior lighting.

SHALL comply with Section 505.6 of the *International Energy Conservation Code*.

Verification of lamps and ballasts. Prior to issuance of a *certificate of occupancy*, the field inspector SHALL confirm the installation of

1. luminaires, type and quantity;
2. lamps, type, wattage and quantity,
3. ballasts, type, and performance -- for not less than one representative luminaire of each type --consistency with the approved *construction documents.*

Where a discrepancy is found, energy calculations shall be revised and resubmitted.

TABLE 609.8.1.1(1)
LOW-VOLTAGE DRY-TYPE DISTRIBUTION TRANSFORMERS
(Maximum 600 Volt Primary)

Table 609.8.1.1(2)
MEDIUM-VOLTAGE, DRY-TYPE DISTRIBUTION TRANSFORMERS
(Maximum 34,500 Volt Primary, Maximum 600 Volt Secondary)

TABLE 609.8.1.1(3)
MEDIUM-VOLTAGE, LIQUID-IMMERSED DISTRIBUTION TRANSFORMERS
(Maximum 34,500 Volt Primary, Maximum 600 Volt Secondary)

Verification of lighting controls. Prior to issuance of a certificate of occupancy -
The field inspector SHALL confirm the installation of lighting controls shown on the approved construction documents.

Where a discrepancy is found, the installation shall be reviewed for conformance with the *International Energy Conservation Code* and Sections 609.2, 609.3, 609.4, 609.5, and 609.6 of this code as applicable.

SECTION 610
SPECIFIC APPLIANCES AND EQUIPMENT

Permanent appliances and equipment

1. SHALL meet the provisions of Sections 610.2.1 through 610.2.4 as applicable.
2. SHALL be *listed* and *labeled* and installed in accordance with the manufacturer's installation instructions and the the *International Energy Conservation Code, International Fuel Gas Code, International Mechanical Code*, *International Plumbing Code* and *International Building Code*, and

3. SHALL be provided with controls and energy monitoring systems as required by this code.

Elevators. SHALL comply with sections 610.2.1.1 through 610.2.1.2.3.

Lighting. (For the cab interior) SHALL have an efficacy greater than or equal to 50 lumens/watt.

Power conversion system. T*raction elevators* SHALL comply with Sections 610.2.1.2.1 through 610.2.1.2.3.

Motor. Class IE2 efficiency rating motors, as defined by IEC EN 60034- 30, or permanent magnet synchronous motors, SHALL be used.

Transmission. SHALL NOT reduce the efficiency of the combined motor/transmission below that shown for the Class IE2 motor. Gearless machines SHALL have a 100 percent transmission efficiency.

Drive. Potential energy released during motion SHALL be recovered.

Ventilation. Cab *ventilation* fans SHALL have an efficacy greater than or equal to 3.0 CFM per watt (0.085 m_3/min./watt).

Standby mode. Elevator energy use SHALL

- Be de-energized within 5 minutes of stopping, and reenergized prior to opening the doors.
- Cease after the elevator is stopped, lighting is de-energized, and no one is in the car.
- In *buildings* with multiple elevators serving the same floors, switch to sleep mode

Guides. All elevators SHALL be of the roller type. Counterweights SHALL be balanced.

Escalators and moving walkways. SHALL comply with Sections 610.2.2.1 through 610.2.2.5.

Lighting. SHALL have an efficacy of not less than 50 lm/W.

Drive system. Induction motors with a class IE3 efficiency rating, or permanent magnet synchronous motors SHALL be used.

Energy recovery. Down-running escalators SHALL use regenerative drives and return recovered energy to the building electrical power system.

***Handrails**. SHALL use friction-reducing measures,*

Standby mode. SHALL

- Be capable of being automatically slowed to not greater than 50 percent of nominal speed.
- Be capable of being automatically turned off when unoccupied or outside of *facility operations*.
- Have the capability of being turned off in response to reduced occupant traffic.

Commercial food service equipment. SHALL be ENERGY STAR-eligible food service equipment.

Conveyors. Motors SHALL

- Be sized to meet the expected load and designed to run within 90 percent of capacity.
- Be provided with sleep mode controls.
- Be designed to use gravity feed when conditions allow.

Portable appliances and equipment.

Appliances and equipment not exempted in Section 610.1 & not permanently connected to the *building* energy SHALL meet the provisions of Section 610.3.1.
Appliances and equipment SHALL be *listed* and *labeled*, installed in accordance with the manufacturer's installation instructions, and provided with controls and energy monitoring systems as required by this code.

Compliance shall be documented and verified by the *approved agency* designated by the adopting agency, during the *commissioning* or operational phase of the *building*.

ENERGY STAR appliances and equipment.

THE *BUILDING* OWNER & EACH TENANT, SHALL:
Maintain on site a list of installed portable ENERGY STAR-eligible appliances AND Equipment indicating the corresponding rated power of each of the following items and whether each such item is an ENERGY STAR-qualified item:

1. Residential service appliances,
2. Commercial service appliances,
3. Consumer electronics,.
4. Office machines and equipment

Aggregate rated power. The aggregate rated power of all ENERGY STAR - SHALL constitute not less than 50 percent of the aggregate rated power of all portable appliances and equipment in the *building.* .

Such a list shall be made available to the **CODE OFFICIAL** *upon request*.

SECTION 611
BUILDING RENEWABLE ENERGY SYSTEMS

Renewable energy systems requirements.

Buildings that consume energy SHALL comply with this section.

- SHALL be equipped with one or more renewable energy systems in accordance with this section.
- SHALL meet the requirements of Section 611.2 for *solar photovoltaic* systems, Section 611.3 for wind systems, or Section 611.4 for solar water heating systems, and Section 611.5 for performance monitoring and *metering* of these systems as *approved* by the **CODE OFFICIAL**.
- These systems shall be commissioned according to the requirements of Section 612.

Exceptions:

1. *Buildings* or *building sites* where there are multiple *buildings &* total estimated annual energy use on the site, with on-site renewable energy meeting the requirements of Section 611.2, 611.3, or 611.4.
2. Where not less than four percent of the total annual *building* energy consumption takes the form of a ten-year commitment to *renewable energy credit* ownership, confirmed by the **CODE OFFICIAL.**
3. Where the combined application of on-site generated renewable energy confirmed by the **CODE OFFICIAL**, totals not less than four percent of the total annual *building* energy consumption from renewable generation.

Building performance-based compliance. SHALL be equipped with one or more renewable energy systems that provide not less than two percent of the total calculated annual energy use of the *building*, or collective *buildings* on the site, with on-site renewable energy in accordance with Section 603.

Building prescriptive compliance.

AN EXAMPLE OF THE COMPLEX DIFFICULTIES IN THIS CODE:

Where there are multiple *buildings* on the *building site*, that seek compliance with this code in accordance with Section 602.3.1, Prescriptive compliance SHALL be equipped with one or more renewable energy systems that have the capacity to provide not less than two percent of the total estimated annual energy use of the *building*, or collective *buildings* on the *building site*, with on-site renewable energy by calculation demonstrating that on-site renewable energy production has a rating of not less than 1.75 *Btu*/hr or not less than 0.50 watts per square foot of conditioned floor area, and using any single or combination of renewable energy generation systems meeting the requirements of Sections 611.2, 611.3, or 611.4.

Solar photovoltaic systems. SHALL be designed, constructed and sized in accordance with Section 611.1.1 or 611.1.2.

Exception: Solar photovoltaic systems are not permitted to be used to comply with section 611.1 where building sites with total global insolation levels lower than 2.00 kWh/m2/day as calculated in accordance with NREL SERI TR-642-761.

*** **Requirements.** The installation, **inspection,** maintenance, repair and replacement of s*olar photovoltaic systems SHALL* comply with the manufacturer's instructions, Sections 611.2.1.1 through 611.2.1.4, and NFPA 70.

Roof-mounted solar photovoltaic systems.

- The roof SHALL be constructed to support the loads imposed .
- Supporting structure SHALL be constructed of noncombustible materials -- equivalent to that required for the roof construction.
- Not less than four feet of clearance shall be provided.

Performance verification. *SHALL* be tested upon installation and meet the design specifications. A report of the tested performance shall be provided to the *building* owner.

Wind energy systems. SHALL be designed, constructed and sized to provide not less than two percent of the total estimated annual electric energy consumption , or in accordance with Section 611.1.1 or 611.1.2.

Installation, location and structural requirements. Wind energy systems shall be located on the *building*, adjacent to the *building*, or on the *building site*.

Roof top set back. SHALL be set back from the edge ofthe *building* a distance not less than two times tip height where tip height is defined as the height from the base of the tower to the top of one blade in the 12 o'clock position.

Roof and wall penetrations. SHALL be flashed.

Solar photovoltaic modules. SHALL be listed and labeled in accordance with UL 1703.

Inverters. SHALL be listed and labeled in accordance with UL 1741.

Solar water heating equipment. Not less than ten percent of the *building's* annual estimated hot water energy usage SHALL be met by on-site solar water heating equipment.

Renewable energy system performance monitoring and metering. SHALL be *metered* and monitored in accordance with Sections 611.5.1 and 611.5.2.

Metering. SHALL be metered separately from the *building's* electrical and fossil fuel meters. Renewable energy systems shall be *metered* to measure the amount of renewable electric or thermal energy generated on the *building site* - Section 604.

Monitoring. Renewable energy systems SHALL be monitored to measure the peak electric or thermal energy generated in accordance with Section 604.

SECTION 612
ENERGY SYSTEMS COMMISSIONING AND COMPLETION

*** Mechanical systems commissioning and completion requirements.

- Within 60 days from approval conducting the final mechanical inspection, **THE REGISTERED DESIGN PROFESSIONAL** SHALL provide evidence of mechanical systems commissioning and completion of the mechanical system installation to the **code official** and in accordance with the *International Energy Conservation Code.*

- Drawing notes shall clearly indicate provisions for *commissioning* and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner and made available to the **code official** upon request.

Commissioning plan. SHALL be developed by a ***REGISTERED DESIGN PROFESSIONAL*** **OR APPROVED** ***AGENCY*** and shall include as a minimum all of the following items:

1. A narrative describing each phase of *commissioning*, including guidance on the activities and how they are completed.
2. Equipment and systems tested, and the number and extent of tests.
3. Functions to be tested.
4. Conditions under which the test shall be performed and affirmation of winter and summer design conditions and full outside air.
5. Measurable criteria for performance.

Systems adjusting and balancing.

1. HVAC SHALL be balanced.
2. Air and water flow rates SHALL be measured and adjusted within the tolerances provided in the product specifications.
3. Test and balance activities shall include as a minimum, the provisions of Sections 612.1.2.1 and 612.1.2.2.

Air systems balancing. Each supply air outlet and zone terminal device shall be equipped with a means for air balancing in accordance with the *International Mechanical Code*. Discharge dampers are prohibited on constant volume fans and variable volume fans with motors of 10 hp (18.6 kW) and larger. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

Exception: Fans with fan motor horsepower of 1 hp or less.

Hydronic systems balancing.

- **H**eating and cooling coils SHALL be equipped with means for balancing and measuring flow. Hydronic systems SHALL be proportionately balanced in a manner to first minimize throttling losses,
- Pump impeller SHALL be trimmed or pump speed shall be adjusted to meet design flow conditions.
- Systems SHALL have either the capability to measure pressure across the pump, or SHALL have test ports at each side of each pump.

Exceptions:

1. Pumps with pump motors of 5 hp or less.
2. Where throttling results in not greater than five percent of the nameplate horsepower draw above that required if the impeller were trimmed.

Functional performance testing. SHALL be in accordance with the requirements of Sections 612.1.3.1, 612.1.3.2 and 612.1.3.3.

Equipment. Performance testing SHALL

- Demonstrate the operation of components, systems, and system-to-system interfacing relationships in accordance with *approved* plans and specifications such that commissioned systems are confirmed.
- Include all specified modes of control and *sequence of operation*, including under full-load, part-load and all of the following emergency conditions:
  1. Each mode as described in the *sequence of operation*.
  2. Redundant or *automatic* back-up mode.
  3. Performance of alarms.
  4. Mode of operation upon a loss of power and restoration of power.

Controls. HVAC SHALL be tested to operate in accordance with the *approved* plans and specifications. *Sequences of operation* SHALL be tested to document they operate in accordance with the *approved* plans and specifications.

612.1.3.3 Economizers. SHALL test to operate in accordance with manufacturer's specifications.

Preliminary commissioning report- and results SHALL be completed and C**ERTIFIED BY THE *REGISTERED DESIGN PROFESSIONAL* OR *APPROVED AGENCY*** and provided to the *building* owner.
The report SHALL identify all of the following:
1. Itemization of deficiencies found during testing.
2. Deferred tests that cannot be performed at the time of report preparation.
3. Climatic conditions required for performance of the deferred tests.

***** Acceptance.** *Buildings* SHALL not pass the final mechanical **inspection** until the **CODE OFFICIAL** has received a letter of transmittal acknowledging receipt of the Preliminary Commissioning Report.

Copy. The **CODE OFFICIAL**, SHALL receive a copy of the Preliminary Commissioning Report.

Certification. A certification, signed and sealed by the ***REGISTERED DESIGN PROFESSIONAL*****,** documenting compliance with the *International Energy Conservation Code* Sections 503 and 504, respectively, shall be provided to the **CODE OFFICIAL.**

Completion requirements. The ***CONSTRUCTION DOCUMENTS*** SHALL specify requirements in this section are provided to the *building* owner within 90 days of the date of receipt of the *U&O.*

Drawings. ***CONSTRUCTION DOCUMENTS -*** SHALL include the location of and performance data pertaining to each piece of equipment.

Manuals.

An **OPERATING AND MAINTENANCE MANUAL** in accordance with industry-accepted standards SHALL be provided and SHALL include all of the following
1. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.
2. Manufacturer's operation manuals and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the *building* project. Required routine maintenance shall be clearly identified.
3. Names and addresses of not less than one *service agency*.

A **SYSTEMS MANUAL** shall be provided and shall include all of the following:
1. HVAC controls system maintenance - calibration information - wiring diagrams – schematics - and control sequence descriptions. Desired or field-determined set-points shall be permanently recorded on control drawings at control devices or, for digital control systems, in programming comments.
2. A complete narrative of how each system is intended to operate, including recommended set-points, seasonal change-over information and emergency shutdown operation.
3. Control sequence descriptions for lighting, domestic hot water heating and all renewable energy systems with a description of how these systems connect to, and are controlled in conjunction with, the overall building system.

System balancing report. A written report describing the activities and measurements completed in accordance with Section 612.1.2.

Final commissioning report. A complete report of test procedures and results identified as "Final Commissioning Report" shall be completed and provided to the building owner. The report shall include all of the following:

1. Results of all functional performance tests.
2. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.
3. All functional performance test procedures used during the *commissioning* process including measurable criteria for test acceptance, provided herein for repeatability.

Exception: Deferred tests that were not performed at the time of report preparation because of climatic conditions.

Post occupancy re-commissioning.

- **THE *COMMISSIONING* ACTIVITIES SPECIFIED IN SECTIONS 612.1.2 THROUGH 612.1.5 SHALL BE REPEATED 18 TO 24 MONTHS AFTER CERTIFICATE OF OCCUPANCY.**

- Systems and control devices that are not functioning properly SHALL be repaired or replaced. Adjustments to calibration settings shall be documented. This documentation shall be provided to the *building* owner.

Sequence of operation.

- A *sequence of operation* SHALL be developed and finalized upon *commissioning*.
- A *sequence of operation SHALL* be the final record of system operation.
- And SHALL be included on the control diagram 'as-builts', or as part of the education and operation and maintenance document that is provided to the owner.

Lighting and electrical systems commissioning and completion requirements.

- **Prior to issuance of *certificate of occupancy*,** the ***REGISTERED DESIGN PROFESSIONAL*** SHALL provide evidence of lighting and electrical systems *commissioning* and completion in accordance with the *International Energy Conservation Code* and the provisions of this section.
- Drawing notes SHALL specify the provisions for *commissioning* and completion requirements. Copies of all documentation SHALL be given to the owner and made available to the ***code official*** upon request in accordance with Sections 612.2.4 and 612.2.5

Pre-construction documentation, lighting.

Construction and owner education documents SHALL include floor plans, diagrams and notations describing the types of, location and operational requirements of all lighting controls including a ***sequence of operation,*** preliminary set points for dimming systems, *automatic daylight controls,* demonstrating conformance to the provisions of this code, relevant laws, ordinances, rules and regulations, as *approved* by the ***code official*.**

Verification.

- The ***APPROVED AGENCY* CONDUCTING *COMMISSIONING - SHALL*** verify controls are installed according to the ***approved construction documents***.

- **Discrepancies SHALL be reviewed for compliance with Section 609 and the requirements of Section 505.2 of the *International Energy Conservation Code*.**

Commissioning. Lighting controls SHALL be commissioned in accordance with this Section.

Occupant sensors. SHALL be verified in accordance with *International Energy Conservation Code* Section 505.2.

Automatic daylight controls. SHALL be commissioned in accordance with the following:

1. The placement and orientation of each sensor is consistent with the manufacturer's installation instructions.
2. Control systems shall be initially calibrated to meet settings established in the construction *documents*;
3. All lamps shall be seasoned in accordance with the recommendations of the lamp manufacturer before testing.
4. Inside *buildings*, calibration of open-loop *daylight controls, SHALL NOT* occur until fenestration shading devices are installed and commissioned;
5. Calibration of *daylight controls,* that receive illumination from both natural and artificial light, SHALL NOT occur until furniture systems, interior finishes, and any fenestration shading devices have been installed and commissioned; AND
6. Calibration procedures SHALL follow manufacturer's installation instructions.

Time switch and programmable schedule controls. In accordance with Section 609, SHALL

1. Be programmed.
2. Scheduling shall incorporate weekday, weekend and holiday operating times, including leap year and daylight savings time corrections.
3. Be verified that system overrides work and are located in compliance with Section 505.2 of the *International Energy Conservation Code*.

Dimming systems with preset scenes. SHALL be verified as working and programming is complete. All lamps shall be seasoned i.

***** Post-commissioning documentation**.

SHALL be provided to the *building* owner in accordance with Section 903.

1. Settings determined during *commissioning* activities per Section 612.2.3.
2. A narrative describing the intent and functionality of all controls including any capability for users to override a schedule or master command.
3. Specification sheets for all lighting equipment and controls.
4. **OPERATION MANUALS FOR EACH LIGHTING CONTROL DEVICE**. Required maintenance and maintenance schedules shall be clearly identified.
5. Documentation and instructions necessary for ***building*** **maintenance**, AND, **personnel to maintain,** AND, re-calibrate lighting systems and controls.

6. **An annual inspection schedule for lighting controls.**
7. Troubleshooting information for fluorescent dimming systems and false-ons and false-offs.

Post occupancy re-commissioning.

- THE *COMMISSIONING* ACTIVITIES IN SECTION 612.2.3 SHALL BE REPEATED 18 TO 24 MONTHS AFTER ISSUANCE OF THE CERTIFICATE OF OCCUPANCY.
- Broken Control devices SHALL be repaired or replaced.

- Adjustments to calibration settings SHALL be documented.
- Documentation SHALL be provided to the *building* owner.

Building envelope systems commissioning and completion requirements.

- Prior to issuance of a *certificate of occupancy*, the ***REGISTERED DESIGN PROFESSIONAL*** SHALL provide evidence of *building thermal envelope* systems *commissioning* and completion to the building owner in accordance with the *International Energy Conservation Code* and the provisions of this section.
- Construction documents shall specify the provisions for *commissioning* and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements.
- Copies of all documentation shall be given to the building owner and made available to the ***code official*** upon request in accordance with Sections 612.4.1 and 612.4.2.

Pre-construction documentation, building thermal envelope.

Construction and owner education documents SHALL

- Indicate the location, nature and extent of the work proposed and
- Show the functional requirements and operation of all *building thermal envelope* systems
- demonstrate conformance to the provisions of this code, relevant laws, ordinances, rules and regulations,
- Be *approved* by the ***code official*.**

- **Verification**. The *APPROVED AGENCY* CONDUCTING *COMMISSIONING* SHALL Verify that *building thermal envelope* systems have been installed in accordance with the *approved construction documents*.
- Discrepancies SHALL be reviewed for compliance with requirements of the *International Energy Conservation Code* and this code.

SECTION 613
JURISDICTIONAL REQUIREMENTS & PROJECT ELECTIVES

General. Section 613 provides *Jurisdictional requirements* and *project electives* related to energy conservation and efficiency and atmospheric quality.
Project electives SHALL NOT be mandatory unless selected by the owner or *DESIGN PROFESSIONAL in responsible charge* and indicated in the Project Elective Checklist in accordance with Section 303.4.

Post certificate of occupancy zEPI, energy demand, and CO2e emissions reporting. Where the jurisdiction indicates in Table 302.1 that ongoing post certificate of occupancy zEPI, energy demand and *CO2e emissions* reporting is required, and where the jurisdiction has indicated in Tables 302.1 and 602.1 that enhanced energy

performance in accordance with Section 602.1 or *CO2e emissions* in accordance with Section 602.2.2.3 are required, zEPI, energy demand, and *CO2e emissions* reporting shall be provided in accordance with this section.

Purpose. To provide uniform **REPORTING AND DISPLAY** of

1. Total annual net energy use,
2. Peak demand for each energy form
3. Emissions associated with *building* operations and *building sites.*

Intent. To provide for the ONGOING REPORTING AND DISPLAY of the *above and* to document ongoing compliance with the provisions of Sections 602 and 603.

Reporting. Reports in accordance with Sections 613.2.3.1 through 613.2.3.3 shall be generated

*** Annual net energy use.

1. The zEPI associated with the operation of the *building* and the *buildings* on the site, as determined in accordance with Section 603.1.1, SHALL be reported by the *building* owner or the owner's registered agent to **CHARLES COUNTY CODES PERMITS AND INSPECTIONS**
2. Where there are multiple *buildings* on a *building site*, each *building* shall have its zEPI reported separately.
3. Where there are energy uses associated with the *building site* other than the *buildings* on the site, the zEPI for the *building site* shall be reported separately.
4. Energy use for the previous year shall cover the complete calendar year and be reported on, or before, March 1st of the following year.

***** Peak monthly energy demand reporting.** The peak demand of all energy forms serving each *building* and the *building site*, as determined in accordance with Section 603.1.2, SHALL:

1. Be reported by the *building* owner or the owner's registered agent to the **CHARLES COUNTY CODES PERMITS AND INSPECTIONS**.
2. Where there are multiple *buildings* on a *building site* each *building* SHALL have its energy demand reported separately.
3. Where there are energy uses associated with the *building site* other than the *buildings* on the site, the energy demand for the *building site* shall be reported separately.
4. Monthly energy demand data for the previous year shall cover the complete calendar year and be reported on, or before, March 1st of the following year.

*** Annual CO2e emissions reporting.

1. The annual emissions associated with the operation of the *building* and its systems, as determined in accordance with Section 603.1.3, shall be reported by the *building* owner or the owner's registered agent to the **CHARLES COUNTY CODES PERMITS AND INSPECTIONS.**
2. Where there are multiple *buildings* on a *building site* each *building* shall have its annual emissions reported separately. Where there are energy uses associated with

the *building site* other than the *buildings* on the site, the annual *CO2e emissions* for the *building site* shall be reported separately.

3. Emissions reported for the previous year shall cover the complete calendar year and be reported on, or before, March 1st of the following year.

zEPI reduction project electives. *Project electives* for performance-based compliance with Section 602.3.2 SHALL be in accordance with the portions of Table 302.1 that reference section 613.3, Equation 6-2 and the calculation procedures specified in Section 603.3

Mechanical systems project elective. *Buildings* seeking a mechanical systems project elective in accordance with Table 303.1 and Section 303.4 SHALL comply with Sections 613.4.1 through 613.4.5.

Prescriptive path. SHALL be designed prescriptively in accordance with Section 602.2.1.

Mechanical equipment. SHALL comply with Sections 613.4.2.1 through 613.4.2.4 to achieve the mechanical systems *project elective*:

Heating equipment. For heating equipment, 10 percent greater than the part-load efficiencies shown in the applicable tables of Section 606, the *International Energy Conservation Code*, or ASHRAE 90.1, SHALL meet ENERGY STAR criteria, as applicable.

Cooling equipment. For heating equipment, 10 percent greater than the part-load efficiencies shown in the applicable tables of Section 606, the *International Energy Conservation Code*, or ASHRAE 90.1, SHALL meet ENERGY STAR criteria, as applicable.

Geothermal heat pumps. SHALL meet the provisions of Table 613.4.2.3 based on the applicable referenced test procedure.

Multi-stage geothermal heat pumps. SHALL meet the provisions of Table 613.4.2.3 based on the applicable referenced test procedure.

TABLE 613.4.2.3
ENERGY-EFFICIENCY CRITERIA FOR GEOTHERMAL SOURCE HEAT PUMPS

Product/Min. EER/Min. COP/ Test Procedure

Duct insulation. SHALL be insulated

- R-8 or greater in unconditioned spaces
- R- 11 minimum where located outside of the *building structure*.
- Exempt spaces by R-8 insulation or greater.

Duct system testing.
SHALL be leak-tested with the SMACNA *HVAC Air Duct Leakage Test Manual.*
SHALL have a rate of air leakage in accordance with equation 5-2 of the *International Energy Conservation Code.*

Documentation. SHALL demonstrating that representative sections NOT <50 percent of the duct area are tested sections and meets the requirements of Section 613.4.4.

Service water heating equipment. Efficiency SHALL be 10 % greater than the efficiencies shown in the *International Energy Conservation Code* and ASHRAE 90.1 or equipment shall be ENERGY STAR qualified.

Service Water heating project elective. Buildings seeking service in accordance with Table 303.1 and Section 303.4 SHALLcomply with Sections 613.5.1 through 613.5.3.

Prescriptive path. SHALL be designed prescriptively in accordance with Section 602.3.1.

Occupancy. The building shall be designed to serve one of the following occupancies:

1. Group A-2, Restaurants and Banquet halls;
2. Group F, Laundries;
3. Group R-1, Boarding houses (transient), Hotels (transient), Motels (transient);
4. Group R-2 *buildings*; and
5. Group A-3, Health Clubs and Spas
6. Group I-2, Hospitals, Mental hospitals and Nursing homes.

Service water heating efficiency. Efficiency shall be 10 percent greater than the efficiencies shown in the *International Energy Conservation Code* and ASHRAE 90.1 or t equipment shall be ENERGY STAR qualified.

Lighting system efficiency project elective. Efficiency project elective in accordance with Table 303.1 and Section 303.4 SHALL comply with Sections 613.6.1 through 613.6.3.

Prescriptive path. SHALL be designed prescriptively in accordance with Section 602.3.1.

Interior lighting system efficiency. SHALL be 10 percent less than the allowance determined in accordance with Section 505.5 of the *International Energy Conservation Code.*

Exterior lighting system efficiency. SHALL be 10 percent less than the allowance determined in accordance with Section 505.6 of the *International Energy Conservation Code.*

Passive design project elective. Passive design *project elective* in accordance with Table 303.1 and Section 303.4 SHALL comply with Sections 613.7.1 and 613.7.2.

Performance path. SHALL be designed using the performance path in accordance with Section 602.2.2.

Passive design provisions. THE SIMULATION OF ENERGY USE preformed pursuant to Section 603 **SHALL document** that 40 percent of the annual energy use reduction realized by the *proposed design has* been achieved through passive heating, cooling, and ventilation design compared to the *standard reference design*.

CHAPTER 7
WATER RESOURCE CONSERVATION AND EFFICIENCY

SECTION 701
GENERAL

Scope. The provisions of this chapter shall establish the means of conserving water used indoors, outdoors and in wastewater conveyance.

FIXTURES, FITTINGS, EQUIPMENT AND APPLIANCES

Fitting and fixture consumption. A schedule of plumbing fixtures and fixture fittings SHALL demonstrate compliance with all of the following:

1. The maximum water consumption shall complies with the flow rates specified in Table 702.1 for the fixtures and fittings listed therein.
2. The aggregate *potable* water consumption SHALL be at least 20 percent less than the reference value calculated in accordance with Section 702.1.1.

Exceptions: The following fixtures and devices shall not be required to comply.
1. Blowout design water closets.
2. Clinical sinks.
3. Service sinks, bath valves, pot fillers, laboratory faucets, utility faucets, and other fittings designed primarily for filling operations.

Aggregate fixture and fitting water consumption calculation. The aggregate consumption of all fixtures and fittings SHALL be calculated in accordance with Tables 702.1.1(1) and 702.1.1(2) and comply with the aggregate consumption requirement in Sections 702.1 and 702.1.2.
Table 702.1.1(1) is used first to calculate the reference water use
Table 702.1.1(2) is then used to calculate the required reduction reference water use.

The percentage of total water reduction use SHALL be calculated in accordance with equation 7-1.

TABLE 702.1
MAXIMUM FIXTURE AND FITTING FLOW RATES FOR REDUCED WATER CONSUMPTION

TABLE 702.1.1(1)
REFERENCE FIXTURE AND SUPPLY FITTING WATER CONSUMPTION
To Calculate Baseline Water Use Projections

TABLE 702.1.1(2)
DESIGN FIXTURE AND SUPPLY FITTING WATER CONSUMPTION To Calculate Water Use Reduction Compared to Baseline Projections

Additional reductions.
The provisions for Tier 1 and Tier 2 maximum fixture flow rates shall be applicable where indicated in Table 302.1. The specific requirements for Tier 1 and Tier 2 fixture and fitting consumption shall be as follows:

- **Tier 1.** A schedule of plumbing fixtures and fixture fittings shall be provided that demonstrates that fixture and fitting consumption meets the applicable reduced flow rates specified in Table 702.1
- **Tier 2.** A schedule of plumbing fixtures and fixture fittings shall be provided that demonstrates that fixture and fitting consumption meets the applicable reduced flow rates specified in Table 702.1

Reduction prohibited. The flow rates for emergency and decontamination fixtures and fittings shall not be reduced below the specifications of ANSI/ISEA Z358.1.

Combination tub and shower valves. SHALL be not more than 0.1 gpm, in accordance with the requirements of ASME A112.18.1/CSA B125.1.

Food establishment pre-rinse spray heads. SHALL have a maximum flow rate in accordance with Table 702.1 and shall shut off *automatically* when released.

Drinking fountain controls. SHALL shutoff *automatically* upon the release of the valve.

***METERED* drinking fountains** SHALL comply with the flow volume specified in Table 702.1.

Nonwater urinal connection. SHALL connect to a branch drain that serves one or more lavatories, that discharge upstream of such urinals.

Appliances. Sections 702.6.1 through 702.6.4 SHALL regulate appliances that are not related to space conditioning.

Clothes washers & Ice makers SHALL be Energy Star *labeled*.

Food steamers. Food steamers SHALL NOT consume > 2.0 gal (7.5 L) per hour in the full operational mode.

Dishwashers. Dishwashers SHALL be Energy Star *labeled.*

TABLE 702.6.4
MAXIMUM WATER CONSUMPTION FOR COMMERCIAL DISHWASHERS

702.8.2 Volume calculation. The volume of water SHALL be calculated using Table 702.8.2. Water supplied by a circulating hot water system SHALL be considered to be the loop or the heat -traced pipe, and the volume SHALL include the fitting on the loop that supplies the fixture branch.

TABLE 702.8.2
INTERNAL VOLUME OF VARIOUS TYPES OF WATER DISTRIBUTION PIPE AND TUBING

Trap priming water. NO *Potable* water use where a *municipal reclaimed water* distribution system or a *graywater* distribution system is provided.

Filtration required. SHALL be filtered - 100 micron or finer filter.

Labeling and signage. SHALL be signed in accordance with Section 706.2.

ALL - *Non potable Makeup water supply. Water powered pumps. Food service handwashing faucets. Dipper wells. Automated vehicle wash facilities.*
Self-service vehicle wash facilities. Vehicle washing facilities. Splash troughs. Covers.Food water disposers. TCombination ovens. Autoclaves and sterilizers. Vacuum autoclaves and sterilizers. Liquid ring vacuum pumps. Film processors
are covered by this code. This code set limits on energy use, valving, water use, types of water permitted, water and energy recovery.

SECTION 703
HVAC SYSTEMS AND EQUIPMENT

Hydronic closed systems. SHALL NOT connect to a *potable* makeup water supply.

Humidification systems. SHALL be disabled when the relative humidity in the space served is greater than 55 percent.

EXCEPTIONS - Medical, agricultural, archival or scientific research purposes,

Condensate coolers and tempering. SHALL NOT use *Potable* water

Condensate drainage recovery. **G***raywater* or rain water collection system, SHALL collect condensate and discharged to water feature or fountain.

Heat exchangers. NO *Potable* water in any heat exchanger except where the *potable* water is recirculated.

Humidifier discharge. SHALL be collected for reuse where a collection and reuse system exists.

Cooling Towers, Evaporative Condensers and Fluid Coolers. SHALL be installed in accordance with the requirements of Section 908 of the *International Mechanical Code.*

Location. SHALL be located so as to prevent the discharge vapor plumes from entering occupied spaces. Plume discharges shall be not less than 5 feet (1524 mm) above and 20 feet (6096 mm) away from any ventilation inlet to a building.

Once-Through Cooling. is prohibited.

Metering. The metering of mechanical systems, system components, equipment and appliances SHALL be conducted in accordance with Section 705.2.
ALL ENERGY USED IN THE STRUCTURE IS METERED.

Controllers and Alarms. SHALL be equipped with conductivity controllers and overflow alarms.

- **Drift.** Cooling towers, evaporative condensers and fluid coolers SHALL produce drift losses of Not greater than 0.002 percent for counter-flow systems,
- Not greater than 0.005 percent of the recirculated water for cross-flow systems.

Water Quality. SHALL conform to the water quality and treatment requirements of the jurisdiction having authority

Discharge. The discharge water SHALL

- Meet the requirements for cycles of concentration in Table 703.7.7.
- Where the discharge water is not captured it must treated in accordance with jurisdictional requirements, if applicable.

Exception: Discharge water with total dissolved solids in excess of 1,500 mg (1,500 ppm/L), or silica in excess of 120 ppm (120 mg/L) measured as silicon dioxide SHALL NOT be required per Table 703.7.7.

CONCENTRATION FOR DISCHARGE WATER
MAKEUP WATER TOTAL HARDNESS (mg/L)* MINIMUM CYCLES OF CONCENTRATION

Make-up hardness/Min. Concentration cycles

Wet-Hood Exhaust Scrubber Systems. SHALL incorporate a water recirculation system. In accordance with Section 705.2.

Washdown Systems. SHALL utilize self-closing valves. Such systems shall be designed to drain automatically after each washdown.

Water Sources. Makeup water supplies to the recirculation system SHALL utilize non-potable water o appropriate for the application.

SECTION 704
WATER TREATMENT DEVICES AND EQUIPMENT

Water softeners. SHALL comply with Sections 704.1.1 through 704.1.4.

Demand initiated regeneration. Water softeners shall be equipped with demand- initiated regeneration control systems.

Water consumption. Water softeners SHALL have a maximum water consumption during regeneration of 5 gal (18.9 L) per 1000 grains of hardness per NSF 44.

Waste connections. SHALL

- Not discharge to *reclaimedwater* collection systems
- Discharge in accordance with the *International Plumbing Code*.
-

Efficiency and listing. Water softeners connected to the water system

- By piping not exceeding 1 ¼ inch in diameter,
- HAS a volume of 3 cubic feet (0.085 m_3) or more of cation exchange media
- SHALL have a rated salt efficiency of not less than 4,000 grains of total hardness exchange per pound of salt (477 g of total hardness exchange per kg of salt), based on sodium chloride equivalency,
- AND
- SHALL be listed as compliant with NSF/ANSI 44.
- All other water softeners :
- SHALL have a rated salt efficiency of not less than 3,500 grains of total hardness exchange per pound of salt (477 g of total hardness exchange per kg of salt), based on sodium chloride equivalency.

Reverse osmosis water treatment systems. SHALL

- Comply with NSF 58.
- Discharge piping SHALL connect to the *building* drainage system in accordance with Section 611.2 of the *International Plumbing Code*.
- Be equipped with an automatic shutoff valve.

SECTION 705
SPECIFIC WATER CONSERVATION MEASURES

Indoor ornamental fountains and water features - Supplied by *potable water*, the *building* that contains them SHALL comply with one additional *project elective* from Section 710.
This SHALL be in addition to the requirements of Table 302.1.

METERING -

- **SHALL** be required for **water consumed from any source**.
- Each WATER source used **SHALL be *metered* separately**.
- **SHALL** comply with the *International Plumbing Code*.
- **SHALL** be capable of communicating water consumption data remotely.

Metering. All water supplied to the applications listed in Table 705.2.1 SHALL be individually *metered* in accordance with the requirements indicated in Table 705.2.1
Similar appliances and equipment shall be permitted to be grouped and supplied from piping connected to a single *meter*.

SECTION 706
NON-POTABLE WATER REQUIREMENTS

Scope. N*on-potable* water and the construction, installation, and design of systems utilizing *non-potable* water. SHALL comply with laws, rules and ordinances applicable in the *jurisdiction*.

Signage required. Caution: non-potable water. DO NOT DRINK."
The words SHALL be legibly and indelibly printed on a sign constructed of corrosion-resistant waterproof material.
The letters of the words SHALL be not less than 0.5 inches in height and of a color in contrast to the background on which they are applied.
The required wordage, SHALL follow pictograph shown in Figure 706.2
The required location of the signage and pictograph SHALL be in accordance with the applicable section of this code.

Water quality. *Non-potable* SHALL meet the minimum water quality requirements - laws, rules and ordinances applicable in the *jurisdiction*.

TABLE 705.2.1

METERING REQUIREMENTS
APPLICATION / REQUIREMENTS

SECTION 707
RAINWATER COLLECTION AND DISTRIBUTION SYSTEMS.

Scope. This section shall govern the construction, installation, *alteration*, and *repair* of RAIN*water collection and conveyance systems*.

Permits. MANDATORY and SHALL contain:
Construction documents, engineering calculations, diagrams, and other such all be submitted with each application for *permit*.

Potable water connections. SHALL contain backflow devices per Section 608 of the *International Plumbing Code*.

Non-Potable water connections. Sources combined in a system SHALL comply with **THE MOST STRINGENT OF THE REQUIREMENTS** of this code that are applicable.

Installation. SHALL be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions.

Applications. Untreated *rainwater* SHALL be utilized per Section 702 and local codes. Treated *rainwater* shall be per with Section 706 or *potable* water provisions of the *International Plumbing Code*, as applicable, and as permitted by local codes.

Approved components and materials. SHALL be manufactured of material *approved* for the intended application and compatible with any disinfection and treatment systems used.

Insect and vermin control. SHALL prevent the entrance of insects and vermin into *storage* aperture of not greater than 1/16 inch and shall be close-fitting. Screen materials shall be compatible with contacting system components

Drainage.

- SHALL NOT be drained to the sanitary sewer.
- SHALL be diverted from the *storage tank* and discharge in a location that will not cause erosion or damage to property.
- *Roof washers* and debris excluders shall be provided with an automatic means of self draining between rain events, and shall not drain onto roof surfaces.

Freeze protection. SHALL keep *storage tanks* and the related piping from freezing.

Trenching requirements. All water service piping SHALl:

- Be separated from the *building* sewer by 5 feet (1524 m) of undisturbed or compacted earth.
- Not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits.
- Comply with the requirements of Section 306
- of the *International Plumbing Code* for support, trenching, bedding, backfilling, and tunneling.

Exceptions:

1. SHALL NOT apply where the bottom of the water service pipe within 5 feet (1524 mm) of the sewer is a minimum of 12 inches (305 mm) above the top of the highest point of the sewer and shall comply with the *International Plumbing Code* for such applications.
2. Water service pipe **IS PERMITTED** to be located in the same trench with a *building* sewer, provided such sewer is constructed of materials that comply with the *International Plumbing Code* for such installations.
3. The required separation distance SHALL NOT apply where a *potable* or *non-potable* water service pipe crosses a sewer pipe provided the water service pipe is sleeved - with pipe materials that comply with the *International Plumbing Code* for such applications.
4. Irrigation piping located outside of a *building* and downstream of the backflow preventer is not required to meet the trenching requirements for *rainwater* used for outdoor applications.

Rainwater catchment and collection systems. SHALL conform to accepted engineering practice.

Collection surface. *Rainwater* shall be collected
Only from above-ground impervious roofing
surfaces constructed from *approved* materials.
Be prohibited from vehicular parking areas except where the water is used exclusively for landscape irrigation. Not include HVAC equip discharge onto *rainwater* collection surfaces.

Potable water applications. From Rainwater MUST conform to NSF P151 **specs.**

Debris excluders.
SHALL be connected to a *roof washer.*
Debris excluders SHALL be self cleaning.

Roof gutters and downspouts. SHALL be constructed of materials compatible with the collection surface and the *rainwater* quality for potable use. No Lead.

Slope.
SHALL slope continuously
SHALL have a slope of not less than 1/8 inch per foot along their entire length,
SHALL NOT permit the collection or pooling of water at any point.

> **Exception:** Siphonic drainage systems installed in accordance with the manufacturer's installation instructions shall not be required to have slope.

Size. SHALL be installed in accordance with Section 1106.6 of the *International Plumbing Code* and local rainfall rates
.

Cleanouts. SHALL be provided in the water conveyance system so as to allow access to all filters, flushes, pipes and downspouts.

Collection pipe materials.
SHALL collect *rainwater* and convey it to the *storage tank*.
Venting systems SHALL be utilized
Drains SHALL use *approved* waste piping.

Joints. SHALL conform for use with the *distribution piping* as specified in the *International Plumbing Code*.

Size. SHALL be sized in accordance with local Chapter 11 of the *International Plumbing Code* and local rainfall rates.

Labeling and marking. SHALL NOT be required beyond that required for sanitary drainage, waste, and vent piping by the *International Plumbing Code*.

***** Filtration. SHALL** be filtered to the level required for the intended end use.
SHALL be accessible for inspection and maintenance.

Disinfection. R*ainwater SHALL* be treated as needed to ensure that the required water quality is delivered at the point of use.

Storage tank. SHALL be in accordance with Sections 707.12.7.1 through 707.12.7.11.

Location. *Storage tanks* SHALL:

Be installed either above or below grade.
Be protected from direct sunlight
Be constructed using opaque, UV resistant materials i
Have specially constructed sun barriers
NOT be located directly under any soil or waste piping or any source of contamination.
Be located with a minimum horizontal distance as indicated in Table 707.12.7.1

TABLE 707.12.7.1
LOCATION OF RAINWATER STORAGE TANKS
Element Minimum / Horizontal Distance from Tank

Materials. SHALL:
Be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials.
SHALL NOT be constructed of recycled materials and
Be constructed of materials in accordance with the *International Plumbing Code*.
Be constructed of materials compatible with the type of disinfection system
.
Wooden tanks. SHALL NOT be required to have a liner. W
Lined tanks SHALL be NSF approved.
Wood SHALL be decay resistant and untreated.

Foundation and supports. T*ank*s SHALL be supported on a firm base withstanding the storage tank's weight filled to capacity. Where earthquake loads are applicable tank supports SHALL be designed and installed for the seismic forces in accordance with the *International Building Code*.

Ballast. Underground *storage tank* SHALL be ballasted, or otherwise secured.
The combined weight of the tank and hold down ballast shall meet or exceed the buoyancy force of the tank.
Foundations SHALL be flat and shall be designed to support the *storage tank* weight when full.

Structural support. Below grade, *storage tank* SHALL be designed to withstand earth and surface structural loads without damage and with minimal deformation.

Makeup water. Reclaimed or recycled water SHALL be provided as a source of makeup water for the *storage tank* and protected against backflow by means of an air gap above the overflow or an *approved* backflow device in accordance with the *International Plumbing Code*.

There shall be a full-open valve shall be controlled by fill valves or other automatic supply valves installed so as to prevent the tank from overflowing and dropping below a predetermined level.

Overflow.

- Overflow pipes SHALL conform with Section 708 of the *International Plumbing Code*.

***** Access.**

- A minimum of one opening SHALL be provided to allow inspection and
- cleaning of the tank interior.
- SHALL have an *approved* locking device or shall otherwise be protected from unauthorized access.
- SHALL be provided with either a manhole not less than 24 inches (610 mm) square or a manhole with an inside diameter of not less than 24 inches (610 mm).
- Manholes SHALL extend not less than 4 inches above ground or shall be gasketed and bolted to prevent water infiltration.
- Finish grade shall be sloped away.
- Each manhole cover shall have an effective locking device.
- Service ports in manhole covers SHALL NOT BE less than 8 inches (203 mm) in diameter and be a minimum of 4 inches (102 mm) above the finished grade level.
- The service port SHALL have an effective locking cover or a brass cleanout plug.

Exception: *Storage tanks l*ess than 800 gallons and installed below grade SHALL NOT be required to be equipped with a manhole where provided with a service port that is not less than 8 inches (203 mm) in diameter.

Venting. SHALL conform with the *International Plumbing Code* and based on the diameter of the tank influent pipe.
SHALL NOT connect to sanitary drainage system vents.

Inlets. Inlets SHALL:
introduce water into the tank with minimum turbulence
Be located and designed to avoid agitating the contents of the *storage tank*.

Outlets. SHALL be located at least 4 inches (102 mm) above the bottom of the *storage tanks* and shall not skim water from the surface.

Drain. SHALL
Be located at the lowest point of above ground storage tanks and
Discharge in a manner consistent with the storm water runoff requirements of the *jurisdiction*
A minimum of one cleanout in accordance with Section 708 of the *International Plumbing Code*.

Labeling and signage. SHALL be *labeled (as listed above for this water type)*

Valves. Valves SHALL be supplied in accordance with Sections 707.12.8.1 and 707.12.8.2.

Influent diversion. SHALL be provided to divert *storage tank* influent to allow maintenance and *repair* of the *storage tank* system.

Backwater valve. *SHALL* be installed on each overflow and tank drain pipe.

Roof washer.

- A sufficient amount of *rainwater* SHALL be diverted , to wash accumulated debris from the collection surface.
- The amount diverted SHALL be field adjustable.
- The *roof washer* SHALL operate automatically.
- Diverted *rainwater* SHALL NOT be drained to the roof surface, and shall be discharged in a manner consistent with the storm water runoff requirements of the *jurisdiction*.
- *Roof washers* SHALL be accessible for maintenance and service.

Vent piping. SHALL comply with Section 707.12.7.7.
Vents SHALL comply with the *International Plumbing Code*,
Vent outlets SHALL extend a minimum of 4" above grade, or as necessary.
Vent openings SHALL comply with the requirements of Section 707.8.

Pumping and control system. SHALL be easily accessible.
SHALL be *listed* and *approved* for use with *potable* water systems.
SHALL be supplied as specified by the *International Plumbing Code*.
Pressure-reducing valve SHALL comply with the requirements of the *International Plumbing Code*.

Standby power. Where required for the intended application, standby power, capable of powering all essential treatment and pumping systems under design conditions SHALL be provided.

Inlet control valve alarm. SHALL be fitted with a warning mechanism.
The alarm SHALL activate before discharge into the overflow system.

Water-Pressure Reducing Valve Or Regulator.
A pressure-reducing valve SHALL be installed.
Pressure-reducing valves shall conform with Section 604.8 of the *International Plumbing Code*.

Distribution pipe. *Distribution piping* SHALL comply with Sections 707.12.12.1 through 707.12.12.4.

Materials. SHALL conform to the standards and requirements specified by the *International Plumbing Code.*

Joints. SHALL utilize joints *approved and* specified in the *International Plumbing Code*.

Size. SHALL be sized in accordance with the *International Plumbing Code* for the intended application or.

Labeling and marking.
(SHALL follows the requirements for this water specified above)

> **Exception:** Piping located outside of the *building* and downstream of the backflow preventer is not required to be purple where *rainwater* is used for outdoor applications.

***** Tests and inspections.** SHALL be performed in accordance with Sections 707.13.1 through 707.13.10.

Drainage and vent tests. The TESTING of *rainwater* SHALL be conducted in accordance with Section 312 of the *International Plumbing Code***.**

Drainage and vent final test. A FINAL TEST SHALL be applied to piping, overflow piping, *storage tank*, and tank vent piping in accordance with Section 312.4 of the *International Plumbing Code*.

Water supply system test. The **TESTING OF MAKEUP WATER SUPPLY PIPING SHALL** be conducted in accordance with Section 312.5 of the *International Plumbing Code*.

***** Inspection and testing of backflow prevention assemblies.** THE TESTING OF BACKFLOW PREVENTERS AND *BACKWATER VALVES SHALL* be conducted in accordance with Section 312.10 of the *International Plumbing Code*.

***** Inspection vermin and insect protection.** All inlets and vents to the system **SHALL BE INSPECTED** in accordance with Section 707.8.

***** Roof gutter inspection and test. SHALL BE INSPECTED** in accordance with Section 707.12.3. Gutters TESTED SHALL NOT leak OR retain standing water.

Roofwasher test. SHALL BE TESTED in accordance with the requirements of Section 707.12.9.

***** Storage tank test Procedures.** *Storage tanks* **SHALL BE TESTED** in accordance with the following:

1. *Storage tanks* shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.
2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and verify that there are no leaks.
3. Following a successful test of the overflow, the water level in the tank shall be reduced to a level that is at 2 inches below the makeup water trigger point by using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed for proper operation, and successful automatic shutoff of the system at the refill threshold shall be verified. Water shall not be drained from the overflow at any time during the refill test.

Supply pressure test. The static water pressure SHALL comply and test in accordance with Section 707.12.11.

Water quality test. SHALL be verified at the point of use in accordance with the requirements of the *jurisdiction*.

Operation and maintenance manuals. SHALL be supplied in accordance with 707.14.1 through 707.14.4.

Manual. A detailed operations and maintenance manual
SHALL be supplied in hardcopy form with all *rainwater* collection systems.
SHALL include a detailed system schematic
SHALL provide a maintenance schedule and procedures for all system components requiring periodic maintenance.
Consumable parts including filters shall be noted along with part numbers.
SHALL include system startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

System abandonment. If abandoned, the system SHALL comply with the following:
1. All system piping SHALL be removed or disabled.
2. The rainwater distribution piping SHALL be replaced with an approved potable water supply piping system.
3. The tank shall be secured from accidental access or equivalent.

Potable water applications. P*otable* water applications, SHALL comply with NSF 61.

Water quality testing. COLLECTED *RAINWATER* WATER SHALL BE TESTED in accordance with Sections 707.16.1.1 through 707.16.1.3

Test methods. SHALL be performed in accordance with the latest edition of *Standard Methods for the Examination of Water and Wastewater.*
.
Tests required. SHALL be tested for E. coli, total coliform, heterotrophic bacteria and cryptosporidium.

Test frequency. SHALL be performed prior to the *rainwater* system being connected and **ANNUALLY THEREAFTER**.

Test records. Test records SHALL be retained for not less than two years.

SECTION 708
GRAYWATER SYSTEMS

Scope. The provisions of this section shall govern *graywater* reuse systems.
Permits. *SHALL* BE REQUIRED FOR THE CONSTRUCTION, INSTALLATION, *ALTERATION*, AND *REPAIR* OF *GRAYWATER* SYSTEMS.
Construction documents, engineering calculations, diagrams, and other such data pertaining to the *graywater* system shall be submitted with each application for *permit* in accordance with t he laws, rules and ordinances applicable in the *jurisdiction*.

Potable water connections. SHALL be protected against backflow in accordance with Section 608 of the *International Plumbing Code*.

Non-potable water connections. SHALL comply with the most stringent of the requirements of this code that are applicable to such sources.

Installation. SHALL be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions, as applicable.

Applications. Untreated water SHALL be utilized in accordance with Section 702 and local codes. Treated *graywater* shall be utilized in accordance with Section 706 and as permitted by local codes.

Approved components and materials. SHALL be manufactured of material *approved* for the intended application and compatible with any disinfection and treatment systems used.

Insect and vermin control. SHALL be protected to prevent insects and vermin from entering *storage tanks* - an aperture not greater than 1/16 inch and shall be close-fitting, materials shall be compatible with contacting system components and shall not accelerate corrosion of system components.

Freeze protection. SHALL be made to keep *storage tanks* and the related piping from freezing.

Trenching requirements. SHALL be separated from the building sewer by 5 feet (1524 m) of undisturbed or compacted earth.
Non-potable water service pipes SHALLNOT be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits.
Buried *graywater* piping SHALL comply with the requirements of Section 306 of the *International Plumbing Code*

Exceptions:

(As specified above for similar plumbing installations)

System abandonment. Abandoned systems SHALL comply with the following:

1. All system piping connecting shall be removed or disabled.
2. *Storage tanks* shall be secured against accidental access or equivalent.

Graywater systems. The design of the *graywater* system shall conform to accepted engineering practice.

Graywater sources.
Graywater reuse systems shall collect waste discharge from only the following sources: bathtubs, showers, lavatories, clothes washers, and laundry trays.
Water from other *approved* non*potable* sources SHALL also be permitted as *approved* by the **CODE OFFICIAL** and as appropriate for the intended application.

Prohibited graywater sources. Wastewater containing urine or fecal matter shall not be diverted to *graywater* systems in accordance with the *International Plumbing Code*.
Water from reverse osmosis system reject water, water softener discharge water, kitchen sink wastewater, dishwasher wastewater, and wastewater discharged from wet-hood scrubbers shall not be collected for reuse within a *graywater* system.

Traps. SHALL **h**ave a liquid seal). A Trap seal primer valve SHALL be installed in accordance with the *International Plumbing Code*.

Collection pipe. *Graywater* reuse systems SHALL:
Utilize *approved* for use within plumbing drainage systems.
Vent piping *approved* for use within plumbing venting systems.
Use *approved* waste piping.

Joints. SHALL utilize joints *approved* for use as specified in the *International Plumbing Code*.

Size. SHALL be sized in accordance with the *International Plumbing Code*.

Labeling and marking. SHALL conform with required for sanitary drainage, waste, and vent piping by the *International Plumbing Code*.

***** Filtration.** SHALL
Be filtered as required for the intended end use.
Be accessible for inspection and maintenance.
utilize a pressure gage or other *approved* method to provide indication when a filter requires servicing or replacement.
Be installed with shutoff valves installed immediately upstream and downstream to allow for isolation during maintenance.

Disinfection. SHALL be disinfected as needed to ensure that the required water quality is delivered at the point of use. Untreated *graywater* shall be retained in collection reservoirs for a maximum of 24 hours in accordance with Section 708.12.6.1.

Storage tank. SHALL be in accordance with Sections 708.12.6.1 through 708.12.6.12.

Sizing. SHALL be sized in accordance with the anticipated demand. The *storage tank* shall be sized to limit the retention time of *graywater* to a maximum of 24 hours.

Location.
SHALL be installed above or below grade.
SHALL be protected from direct sunlight
SHALL be constructed to prevent algae growth,
SHALL have specially constructed sun barriers
SHALL not be located directly under any soil or waste piping or any source of contamination.
SHALL be located with a minimum horizontal distance between various elements as indicated in Table 708.12.6.2. Storage tanks containing untreated

graywater shall be located a minimum horizontal distance of 5 feet from buildings, in addition to the requirements in Table 708.12.6.2.

TABLE 708.12.6.2
LOCATION OF GRAYWATER STORAGE TANKS
Element Minimum Horizontal Distance from Storage Tank (feet)

Element / Min Horizontal Distance

Materials. SHALL be collected in an *approved* tank constructed of durable, nonabsorbent and corrosion-resistant materials. Shall be constructed of materials compatible with any disinfection systems used to treat water upstream of the tank and with any systems used to maintain water quality within the tank.

Wood tanks. SHALL be provided with a flexible liner

Foundation and supports. SHALL be supported on a firm base capable of withstanding the *storage tank's* weight when filled to capacity in accordance with the *International Building Code*.

Ballast. SHALL be ballasted, or otherwise secured, to prevent the tank from floating out of the ground when empty.
The foundation SHALL be flat and shall be designed to support the *storage tank* weight when full, consistent with the bearing capability of adjacent soil.

Structural support.

- SHALL be designed to withstand earth and surface structural loads without damage and with minimal deformation when filled with water or empty.
- SHALL be protected against backflow in accordance with the *International Plumbing Code*. SHALL have a full-open valve located on the makeup water supply line
- SHALL be controlled by fill valves or other automatic supply valves
- SHALL not be permitted to drop below the *graywater* inlet or the intake of any attached pump.

Overflow.

- SHALL be equipped with an overflow pipe
- SHALL be trapped and shall be indirectly connected to the sanitary drainage system.
- SHALL NOT be equipped with a shutoff valve.
- SHALL provide and overflow pipe in accordance with Section 708 of the *International Plumbing Code*.

***** Access.**

- SHALL be provided to allow inspection and cleaning of the tank interior.
- SHALL have an *approved* locking device or other *approved* method of
- securing access.
- SHALL be provided with either a manhole

- SHALL be sloped away from the manhole
- SHALL contain service ports in manhole covers shall be not less than 8 inches (
- SHALL have an effective locking cover or a brass cleanout plug.

Exception: *Storage tanks* under 800 gallons SHALL NOT require a manhole, but SHALL have a service port.**708.12.6.8**

Venting. The tank shall be provided with a vent sized in accordance with the *International Plumbing Code*.

Inlets. SHALL be designed to introduce water into the tank with minimum turbulence, and located to avoid agitating the contents.

Outlets. SHALL be located above the bottom of the *storage tank*, and shall not skim water from the surface.

Drain. SHALL be located at the lowest point of the *storage tank*
SHALL be indirectly connected to the sanitary drainage system.
Total area of all drains SHALL NOT be smaller than the total area of all overflow pipes in accordance with Section 708 of the *International Plumbing Code*.

Labeling and signage.
(AS referenced above for similar applications).

Valves. SHALL be supplied in accordance with Sections 708.12.7.1 and 708.12.7.2.

Bypass valve. One three-way diverter valve, NSF 50 or other, SHALL be installed on *graywater* collection piping.
SHALL be installed downstream of fixture traps and vent connections
SHALL be *labeled* to indicate the direction of flow,
SHALL be installed in accessible locations.
SHALL NOT be installed to serve as a bypass valve.

Backwater valve. SHALL be installed on each overflow and tank drain pipe so that access is provided.

Vent piping. SHALL be provided with a vent in accordance with the requirements of Section 708.12.6.8 in accordance with the *International Plumbing Code*,
SHALL be protected against the entrance of vermin and insects in accordance with the requirements of Section 708.8.

Pumping and control system. SHALL be accessible and removable in order to perform *repair*, maintenance and cleaning and within the range specified by the *International Plumbing Code*.
SHALL be installed in accordance with the requirements of the *International Plumbing Code.*

Standby power SHALL be provided.

Inlet control valve alarm. SHALL be provided with a warning mechanism
The alarm SHALL activate before the *storage tank* begins to discharge into the overflow system.

Water-pressure reducing valve or regulator. **G***raywater* pressure supplied by the pumping system then a pressure-reducing valve shall be installed to 80 psi (552 kPa) static or less. Valves shall be specified and installed in accordance with Section 604.8 of the *International Plumbing Code*.

Distribution pipe. SHALL **c**omply with Sections 708.12.10.1 through 708.12.10.4.

Materials. SHALL conform to standards and requirements specified by the *International Plumbing Code* for *non-potable* water.

Joints. SHALL utilize joints *approved* for use with the *distribution piping* as specified in the *International Plumbing Code*.

Size. SHALL be sized in accordance with the *International Plumbing Code* for the intended application or applications.

Labeling and marking.
(AS referenced above for similar applications).
Exception: Outside of the *building*, purple piping is not required downstream.
.
***** Tests and inspections. TESTS AND INSPECTIONS SHALL** be performed in accordance with Sections 708.13.1 through 708.13.9.

Drainage and vent test. A pressure **TEST SHALL** be applied to the *graywater* collection piping, overflow piping, *storage tank*, *storage tank* drainage piping and tank vent piping in accordance with Section 312 of the *International Plumbing Code*.

Drainage and vent final test. A FINAL TEST SHALL be applied to the *graywater* collection piping, overflow piping, *storage tank*, and tank vent piping in accordance with Section 312.4 of the *International Plumbing Code*.

Water supply system test. THE TESTING OF MAKEUP WATER SUPPLY piping and *rainwater distribution piping* shall be conducted in accordance with Section 312.5 of the *International Plumbing Code*.

***** Inspection and testing of backflow prevention assemblies. THE TESTING OF BACKFLOW PREVENTERS AND *BACKWATER VALVES*** shall be conducted in accordance with Section 312.10 of the *International Plumbing Code*.

***** Inspection vermin and insect protection. SHALL BE INSPECTED** to verify that each is protected to prevent the entrance of insects and vermin in accordance with Section 708.8.

***** Storage tank tests. SHALL BE TESTED** in accordance with all of the following:

1. *Storage tanks* shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain water tight without leakage for a period of 24 hours.
2. After 24 hours, supplemental water shall be introduced for a period of 15 minutes to verify proper drainage of the overflow system and verify that there are no leaks.
3. Following the successful test of the overflow, the water level in the tank shall be reduced to a point 2 inches below the makeup water trigger point using the tank drain. The tank drain shall be observed for proper operation. The makeup water system shall be observed to verify proper operation, and successful automatic shutoff of the system at the refill threshold. Water shall not be drained from the overflow at any time during the refill test.

Supply pressure test. The static water pressure SHALL be verified, in accordance with Section 707.12.11.

Water quality test. SHALL be verified at the point of use in accordance with the requirements of the *jurisdiction*.

Operation and maintenance manuals. Operations and maintenance materials shall be supplied in accordance with Sections 708.14.1 through 708.14.4.

Manual. A detailed OPERATIONS AND MAINTENANCE manual shall be supplied in hardcopy form with all *graywater* systems.

Schematics. The manual SHALL include a detailed system schematic, and a list of all system components including manufacturer and model number.
Maintenance procedures. The manual SHALL provide a maintenance schedule and procedures. Consumable parts shall be noted along with part numbers.

Operations procedures. The manual SHALL include startup and shutdown procedures. The manual shall include detailed operating procedures for the system.

SECTION 709
RECLAIMED WATER SYSTEMS

Scope. SHALL govern the construction, installation, *alteration*, and *repair* of *non-potable reclaimed water*.

Permits. SHALL be required for the construction, installation, *alteration*, and *repair* of *reclaimed water* systems. *Construction documents*, engineering calculations, diagrams, and other such data pertaining SHALL be submitted with each application for *permit*.

Potable water connections. SHALL be protected against backflow in accordance with Section 608 of the *International Plumbing Code.*

Installation. SHALL be installed in compliance with the provisions of the *International Plumbing Code* and manufacturer's instructions, as applicable.

Applications. SHALL be utilized in accordance with Section 706 and local codes.

Approved components and materials. SHALL be manufactured of material *approved* for the intended application.

Water-pressure reducing valve or regulator. W*ater* pressure exceeds 80 psi (552 kPa) static, SHALL installed a pressure-reducing valve in accordance with Section 604.8 of the *International Plumbing Code*.

Trenching requirements. SHALL be separated from the *building* sewer by 5 feet (1524 m) of undisturbed or compacted earth.
Reclaimed water service pipes shall not be located in, under or above cesspools, septic tanks, septic tank drainage fields or seepage pits.
Buried piping SHALL comply with the requirements of Section 306 of the *International Plumbing Code*.
Exceptions:
(AS referenced above for similar applications).

Reclaimed water systems. SHALL conform to *accepted engineering practice.*

Distribution pipe. *Distribution piping* shall comply with Sections 709.9.1.1 through 709.9.1.4.

Materials. SHALL conform to standards and requirements specified by the *International Plumbing Code*.

Joints. SHALL utilize joints appropriate for the intended applications as specified in the *International Plumbing Code*.

Size. SHALL be sized in accordance with the *International Plumbing Code* for the intended application.

Labeling and marking. (AS referenced above for similar applications).

Exception: Outside of the *building*, purple piping is not required downstream of the backflow preventer.

*** Tests and inspections.

TESTS AND INSPECTIONS SHALL be performed in accordance with Sections 709.10.1 and 709.10.2.

Water supply system test. The **TESTING OF MAKEUP WATER SUPPLY** SHALL be conducted in accordance with Section 312.5 of the *International Plumbing Code*.

***** Inspection and testing of backflow prevention assemblies.** T**HE TESTING OF BACKFLOW PREVENTERS SHALL** be conducted in accordance with Section 312.10 of the *International Plumbing Code*.

SECTION 710
PROJECT ELECTIVES

General. Section 710 contains *project electives* related to water conservation and efficiency. *Project electives SHALL NOT* be mandatory unless selected by the owner or *registered design professional* and indicated in the Project Elective Checklist required by Section 303.1.

Indoor water use. This section contains *project electives* related to indoor water use.

Water conservation tier project electives. Each water conservation tier above that mandated in Table 302.1 SHALL be recognized as an individual *project elective*.

On-site wastewater treatment project elective. In accordance with Section 303.4, all wastewater from the *building* SHALL be treated on-site to *tertiary standards* and reused on site.

Non-potable outdoor water supply project elective. In accordance with Section 303.4, outdoor outlets SHALL be supplied by *non-potable* water. Such outlets SHALL be locked or operable by means of a removable key.

Labeling and signage. Each outlet shall be provided with signage in accordance with Section 706.2.

Non-potable water for plumbing fixture flushing water project elective. In accordance with Section 303.4 – elective - *nonpotable* water S HALL be used for flushing water closets and urinals.

Water quality. *Non-potable* water for water closet and urinal flushing SHALL:

- Meet minimum water quality requirements
- NOT more than 4 mg/L of chloramines or free chlorine.
- NOT contain gas bubbles having elevated levels of ozone at the point of use.

Filtration required. SHALL be filtered by a 100 micron or finer filter.

Labeling and signage. SHALL be provided with signage in accordance with Section 706.2.

Automatic fire sprinkler system project elective. Projects including an automatic fire sprinklers system *project elective* in accordance with Section 303.4, SHALL:
Be supplied with *non-potable* water from an on-site *rainwater* collection system.
Rainwater collection system shall comply with Section 707.

Comply with the requirements of Sections 710.6.1 and 7

Emergency power. Emergency power system complying with Chapter 27 IBC; SHALL govern the powering the pump and controls for the on-site *rainwater* collection system.

Source volume indication. SHALL be equipped with a device that indicates the volume of *non-potable* water contained in the collection reservoir. Per NFPA 72.

Non-potable water supply to fire pumps project elective. In accordance with Section 303.4, pumps

- SHALL be located within 200 feet of a source of reclaimed water
- SHALL be connected to such source of reclaimed or recycled water.
- SHALL be in accordance with Section 403.3.2 of the *International Building Code*.

Labeling and signage. SHALL have signage in accordance with Section 706.2

Non-potable water for industrial process makeup water project elective. In accordance with Section 303.4, SHALL utilize *non-potable* water.

Labeling and signage. SHALL provide signage in accordance with Section 706.2.

- **Efficient hot water distribution system project elective.** In accordance with Section 303.4, SHALL NOT exceed 64 ounces (1.89 L).
- SHALL NOT exceed 24 ounces (0.47 L).

Volume calculation. SHALL be calculated by adding the internal volume of all piping,

- SHALL be calculated using Table 702.8.2.
- SHALL be considered the loop or the heat -traced pipe,
- and the volume SHALL include the fitting on the loop that supplies the fixture branch.

Non-potable water for cooling tower makeup water project elective. In accordance with Section 303.4, *non-potable* water SHALL be utilized for makeup water - Section 706.3.

Graywater collection project elective. In accordance with Section 303.4,SHALL be collected for reuse onsite in accordance with Section 708. in accordance with Section 710.9.1.

CHAPTER 8
INDOOR ENVIRONMENTAL QUALITY AND COMFORT

SECTION 801
GENERAL

Scope and intent. The provisions of this chapter are intended to provide an interior environment that is conducive to the health and well-being of, *building* occupants, neighbors and construction personnel.

Indoor air quality management plan required. An indoor air quality management plan SHALL address the methods and procedures to be used during design and construction to obtain compliance with Sections 802 through 805.

SECTION 802
BUILDING CONSTRUCTION FEATURES, OPERATIONS AND MAINTENANCE FACILITATION

Scope. To facilitate the **OPERATION AND MAINTENANCE** of the completed *building*, the *building* and it systems shall comply with the requirements of Sections 802.2 though 802.5.

Air handling system access. SHALL allow access for cleaning and *repair* of the air handling surfaces -

- Piping, conduits, and other *building* components SHALL NOT be located so as to obstruct the required access ports.

Durability of air handling surfaces. SHALL be constructed of materials that are resistant to deterioration and will not break away, crack, peel, flake off, or show evidence of delamination in accordance with the erosion test in UL 181.

Air handling system filters.

- SHALL be designed to prevent airflow from bypassing filters.
- SHALL be fitted with flexible seals to provide an effective seal between the doors and panels and the mating filter rack surfaces.
- SHALL NOT be required for opening access doors and panels. Filter access panels and doors shall not be obstructed.

Airstream surfaces. SHALLNOT break away, crack, peel, flake off, or show evidence of delamination or continued erosion when tested in accordance with the erosion test in UL 181.

SECTION 803
HVAC SYSTEMS

Construction phase requirements. The *ventilation* of *buildings* ***DURING CONSTRUCTION*** SHALL be in accordance with sections 803.1.1 through 803.1.3.

Duct openings. SHALL be covered with tape, plastic, sheet metal or shall be closed by an *approved* method -- from ROUGH-IN INSTALLATION AND UNTIL STARTUP .
Dust and debris SHALL be cleaned from duct openings prior to system flush out and *building* occupancy.

Indoor air quality during construction. Temporary *ventilation* during construction SHALL be
provided in accordance with Sections 803.1.2.1 through 803.1.2.3.

Ventilation. *Ventilation* during construction SHALL be achieved in accordance with the provisions of the *International Building Code* or the *International Mechanical Code*, or fans rate = 3X per hour.

Protection of HVAC system openings. SHALL be protected during dust-producing operations.

Return air filters. SHALL be installed prior to system flush out and *building* occupancy.

Construction phase ductless system or filter. SHALL be of the ductless variety, or rated at MERV 8 or higher and SHALL account for pressure drop across the filter.

Thermal environmental conditions for human occupancy. SHALL be designed in compliance with ASHRAE 55 –04, and 6.2, "Documentation."

Exception: Spaces with special requirements which humans find thermally acceptable.

Environmental tobacco smoke control. SHALL:
NOT be allowed inside of buildings.
HAVE Signage
BE located not less than 25 ft (7.5 m) away from building entrances & windows,
Isolation of pollutant sources. SHALL be in accordance with Section 803.4.1.

Print, copy and janitorial rooms and garages. Enclosed rooms where the use of chemicals occurs SHALL COMPLY WITH ALL OF THE FOLLOWING:

1. Extend from the floor surface to the underside of the floor, roof deck or solid ceiling above and shall
2. Be constructed to resist the passage of airborne chemical pollutants.
3. Be automatic or self-closing.
4. Be provided that: provides separate exhaust airflow to the outdoors at a rate of not less than 0.50 cfm per square foot; that maintains a negative pressure of not less than 7pa within the room; and that prohibits the recirculation of air from the room to other portions of the *building*.

Filters.

- SHALL be rated at MERV 11 or higher
- SHALL be designed to be compatible.
- SHALL account for pressure drop across the filter.

SECTION 804
SPECIFIC INDOOR AIR QUALITY & POLLUTANT CONTROL MEASURES

Fireplaces and appliances.

- **V**ented gas *fireplace* heaters and decorative gas appliance SHALL comply with Sections 804.1.1 through 804.1.7.

- **UNVENTED UNITS SHALL BE PROHIBITED**.

Installation. In accordance with the manufacturer's instructions.

Venting.
- SHALL be vented to the outdoors.
- SHALL be provided with combustion air in accordance with the *International Mechanical Code and the International Fuel Gas Code*.

Gas fireplaces. SHALL be direct-vented and listed in accordance with ANSI Z21.50/CSA 2.22 and ANSI Z21.88/CSA 2.33, respectively.

WOOD Burning Fireplaces.
- SHALL be provided with combustion air directly from the outdoors.
- SHALL provide a means to tightly close off the chimney flue and combustion air outlets when the *fireplace* is not in use.

Wood- fired appliances. SHALL be UL *listed* in accordance with UL 1482
SHALL be certified in accordance with the requirements of the EPA Standards of Performance for New Residential Wood Heaters, (?) Commercial CODE? 40 CFR Part 60 subpart AAA.

Biomass appliances.
- SHALL be *listed* in ASTME1509.
- SHALL be *listed* in accordance with CSA B366.1-2009 or UL391.

Radon mitigation. Locations, determined by Figure 804.2(1) and Table 804.2 SHALL comply with Sections 804.2.1 through 804.2.10.

Subfloor preparation. A gas-permeable material SHALL
Be placed under all concrete slabs and other floor systems
Directly contact the ground and facilitate future installation of a sub-slab depressurization system, if needed.
The gas-permeable layer shall consist of ONE OF THE FOLLOWING:

1. A uniform layer of clean aggregate,
2. A uniform layer of sand (native or fill),
3. Other materials, systems or floor designs with demonstrated capability to permit depressurization across the entire sub-floor area.

Soil-gas-retarder. A minimum 6-mil that conforms to ASTM E1643 SHALL
- BE placed on top of the gas-permeable layer prior to casting.
- The sheeting SHALL cover the entire floor with lapping at least 12 inches (305 mm).
- The sheeting SHALL fit closely around any pipe, wire or other penetrations of the material.
- SHALL seal tears & voids or covered with additional sheeting.

Entry routes. SHALL be closed in accordance with Sections 804.2.3.1 through 804.2.3.10.

Floor openings. **Th**at penetrate concrete slabs SHALL be filled with a polyurethane caulk or equivalent sealant .

Concrete joints. SHALL be sealed with a caulk or sealant.

Condensate drains. Condensate drains shall be trapped or routed through nonperforated pipe to daylight.

Sumps.

- **SHALL** be covered with a gasketed or otherwise sealed lid.
- SHALL have a lid designed to accommodate the vent pipe.
- SHALL have a lid equipped with a trapped inlet.
-

Foundation walls. ALL hollows SHALL be filled and not leak.

Dampproofing. The exterior surfaces SHALL be dampproofed.

Air-handling units. SHALL be sealed to prevent induction.

Exception: Units with gasketed seams or units that are otherwise sealed by the manufacturer to prevent leakage.

Ducts. SHALL be sealed water-tight.

Crawl space floors. SHALL be caulked or otherwise filled to prevent air leakage.

Crawl space access. SHALL be closed, gasketed or otherwise filled to prevent air leakage.

Passive submembrane depressurization system. SHALL be installed during construction.
Exception: Buildings in which an *approved* mechanical crawl space ventilation system or other equivalent system is installed.

Ventilation. Ext Walls SHALL be provided with vents to the exterior of the building.

Soil-gas-retarder. A minimum 6-mil that conforms to ASTM E1643 SHALL

- BE placed on top of the gas-permeable layer prior to casting.
- The sheeting SHALL cover the entire floor with lapping at least 12 inches (305 mm).
- The sheeting SHALL fit closely around any pipe, wire or other penetrations of the material.
- SHALL seal tears & voids or covered with additional sheeting.

Vent pipe.

- SHALL be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch-diameter (76 mm or 102 mm) fitting
- SHALL shall be extended up through the building floors, terminate at least 12 inches (305 mm) above the roof in a location at least 10 feet (3048 mm) away from any window.

Passive sub slab depressurization system. System SHALL be installed during construction.

Vent pipe.

- SHALL be inserted horizontally beneath the sheeting and connected to a 3- or 4-inch-diameter (76 mm or 102 mm) fitting
- SHALL shall be extended up through the building floors, terminate at least 12 inches (305 mm) above the roof in a location at least 10 feet (3048 mm) away from any windo

Multiple vent pipes. In buildings where interior footings or other barriers

Vent pipe drainage. SHALL be installed to provide positive drainage to the ground beneath the slab or soil-gas-retarder.

Vent pipe accessibility. SHALL be accessible for future fan installationthrough an *attic* or other area outside the *habitable space*.
Exception: The radon vent pipe need not be accessible in an *attic* space where an *approved* rooftop electrical supply is provided for future use.

Vent pipe identification. SHALL be identified with at least one *label.* The *label* shall read: "Radon Reduction System."

Combination foundations. SHALL have separate radon vent pipes installed in each type of foundation area.

Power source. An active sub-membrane or sub-slab SHALL be installed during construction in the *attic* or other anticipated location of vent pipe fans. An electrical supply SHALL also be accessible in anticipated locations of system failure alarms.

Building flush out. SHALL be flushed-out by
SUPPLYING CONTINUOUS *VENTILATION* WITH ALL AIR HANDLING UNITS AT THEIR MAXIMUM OUTDOOR AIR RATE FOR *AT LEAST 14 DAYS* WHILE MAINTAINING AN INTERNAL TEMPERATURE OF AT LEAST 60°F, AND RELATIVE HUMIDITY NOT HIGHER THAN 60 PERCENT.

Occupancy SHALL be permitted to start 7 days after start of the flush-out, provided that flushout continues for the full 14 days.

The *building* SHALL NOT be “baked out” by increasing the temperature of the space.

Where continuous *ventilation* is not possible, alternate flush-out periods SHALL be equivalent to 14 days of continuous *ventilation*.

Exceptions:

1. Group S, F, H and U occupancies shall not be required to comply with this section.

2. A building SHALL NOT be required to be flushed-out where it is tested for indoor air quality and the testing results indicate that the levels of VOC's are acceptable.

Building Entrances. SHALL EMPLOY AN ***ENTRY MAT SYSTEM*** THAT SHALL HAVE A SCRAPER SURFACE, AN ABSORPTION SURFACE, AND A FINISHING SURFACE IN ACCORDANCE WITH SECTIONS 804.4.1 through 804.4.3. SHALL NOT be less than the width of the entry opening,

Exceptions:

1. Entrances to individual dwelling units.
2. SHALL have a minimum length of 3 ft (914mm) of indoor surface, with a minimum combined length of 6 ft (1829 mm).

MAT Scraper Surface. The scraper surface shall comply with all of the following:

1. It shall be the first surface stepped on when entering the building.
2. It shall be either immediately outside of or inside of the entry.
3. It shall be not less than 3 feet (914mm) in length.
4. It shall consist of permanently mounted grates or removable mats with knobby or squeegee like projections.

MAT Absorption Surface. The absorption surface shall comply with all of the following:

1. It shall be the second surface stepped on when entering the building.
2. It shall be not less than 3 feet (914mm) in length and made from materials that can perform
both a scraping action and a moisture wicking action.

MAT Finishing Surface. The finishing surface shall comply with all of the following:

1. It shall be the third surface stepped on when entering the building.
2. It shall be not less than 4 feet (1219mm) in length and made from materials that will both
capture and hold any remaining particles or moisture.

SECTION 805
ASBESTOS USE PREVENTION

Scope. The use of materials containing asbestos in *building* construction shall be prohibited.

SECTION 806
MATERIAL EMISSIONS & POLLUTANT CONTROL

Emissions from glued wood products. SHALL comply with the emission limits or be manufactured in accordance with the standards cited in Table 806.1

SHALL be demonstrated following the requirements of Section 93120 of title 17, California Code of Regulations, Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products.

Exceptions:

1. Glued wood products that are made using adhesives that do not contain ureaformaldehyde (UF) resins.
2. Glued wood products that are sealed on all sides and edges.
3. Glued wood products that are used to make elements considered to be furniture, fixtures and equipment (FF&E) that are not permanently installed.

TABLE 806.1
GLUED PRODUCTS EMISSIONS

Product / Formaldehyde / Standard

Adhesives and sealants.

A minimum of 85 percent by weight or volume, of site applied adhesivesand sealants

- SHALL comply with the ***VOC* CONTENT LIMITS** in Table 806.2(1) OR alternative *VOC* emissions limits in Table 806.2(2).
- SHALL be determined in accordance with the appropriate standard being either U.S. EPA Method 24, SCAQMD Method 304, 316A or 316B.
- SHALL be determined by either SCAQMD Methods 302 and 303 or ASTM D 3960.
- SHALL conform to the SCQMD Rule 1168 Adhesive and sealant Applications as amended on 1/7/05.
- SHALL NOT apply to adhesives and sealants subject to state or federal consumer
- product *VOC* regulations.
- SHALL be classified as “Other” category within the SCAQMD Rule 1168 sealants table.

Exception: HVAC air duct sealants are not required to meet the emissions or the VOC content requirements when the air temperature in which they are applied is less than 40°F (4.5°C). Table 806.2(2) adhesive alternative emissions standards compliance shall be determined utilizing test methodology incorporated by reference in the CDPH/EHLB/Standard Method V1.1 “Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.1” dated February 2010. The alternative emissions testing shall be performed by a laboratory that has the CDPH/EHLB/Standard Method V1.1 test methodology in the scope of its ISO 17025 Accreditation

TABLE 806.2(1)
SITE APPLIED ADHESIVE AND SEALANTS VOC LIMITS
ADHESIVE / VOC LIMIT

TABLE 806.2(2)
VOC EMISSION LIMITS
VOC / LIMIT

Single-ply roof membrane adhesives. SHALL be exempt from the requirements of Table 806.2(1) in climate zones 6, 7 and 8 as identified in the 2009 IECC.

Architectural paints and coatings. A minimum of 85 percent by weight or volume, of site-applied interior architectural coatings

- SHALL comply with *VOC* content limits in Table 806.3(1) or the alternate emissions limits in Table 806.3(2).
- SHALL be determined by ASTM D3960. Table 806.3(2) architectural coating alternate emissions standards compliance
- SHALL be determined utilizing test methodology incorporated by reference in the CDPH/EHLB/STANDARD METHOD V.1.1 "Standard Method For The Testing And Evaluation Of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers Version 1.1" dated February 2010.
- SHALL be performed by a laboratory that has the CDPH/EHLB/STANDARD METHOD V 1.1 test methodology in the scope of its ISO 17025 Accreditation.

Flooring A minimum of 85 percent of the total area of flooring installed within the interior of the *building*
SHALL comply with the requirements of Table 806.4 (2).
SHALL comply with these requirements. The test methodology used to determine compliance shall be from CDPH/EHLB/STANDARD METHOD V.1.1 "*Standard Method For The Testing And Evaluation Of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers Version 1.1*" dated February 2010.
SHALL be performed by a laboratory that has the CDPH/EHLB/STANDARD METHOD V 1.1 test methodology in the scope of its ISO 17025 Accreditation.
T the flooring listed in Table 806.4(1) **SHALL** be deemed to comply with the requirements of Table 806.4(2).

Acoustical ceiling tiles and wall systems. A minimum of 85 percent of acoustical ceiling tiles and wall systems, by square feet,

- SHALL comply with the requirements of Table 806.5(2).
- SHALL comply with the test methodology used to determine compliance
- SHALL be from CDPH/EHLB/STANDARD METHOD V.1.1 *"Standard Method For The Testing And Evaluation Of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers Version 1.1"* dated February 2010.
- SHALL be performed by a laboratory that has the CDPH/EHLB/STANDARD METHOD V 1.1 test methodology in the scope of its ISO 17025 Accreditation. Where post manufacture coatings or surface applications have not been applied, the ceiling or wall systems listed in Table 806.5(1)
- SHALL be deemed to comply with the requirements of Table 806.5(2).

Insulation. A minimum of 85 percent of insulation shall comply with the requirements of Table 806.6.
The test methodology used to determine compliance shall be from CDPH/EHLB/STANDARD METHOD V.1.1 *"Standard Method For The Testing And Evaluation Of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers Version 1.1"* dated February 2010.

The emissions testing shall be performed by a laboratory that has the CDPH/EHLB/STANDARD METHOD V 1.1 test methodology in the scope of its ISO 17025 Accreditation.

TABLE 806.3(1)
VOC CONTENT LIMITS FOR ARCHITECTURAL COATINGSc,d,e
Effective: JANUARY 1, 2010 Effective: JANUARY 1,

Table 806.3(2)
ARCHITECTURAL COATINGS VOC EMISSION LIMITS

TABLE 806.4 (1)
FLOORING DEEMED TO COMPLY WITH VOC EMISSION LIMITS

TABLE 806.4(2)
FLOORING VOC EMISSION LIMITS

TABLE 806.5 (1)
CEILING AND WALL SYSTEMS DEEMED TO COMPLY WITH VOC EMISSION LIMITS

TABLE 806.5(2)
ACOUSTICAL CEILING TILES AND WALL SYSTEMS VOC EMISSION LIMITS

TABLE 806.6
INSULATION
VOC EMISSION LIMITS

SECTION 807
ACOUSTICS

Sound transmission. *Buildings* and tenant spaces shall comply with the sound transmission requirements of Sections 807.2 through 807.5.2.

- **Exception:** The following buildings and spaces need not comply with this section:
- *Building* or *structures* that have the interior environment open to the exterior environment.
- Parking *structures*.
- Concession stands and toilet facilities in Group A-4 and A-5 occupancies.

Exterior sound transmission. Where Group A1, A3, E and I occupancy *buildings*, Group B occupancy *buildings* used for educational purposes, or Group R are constructed at the locations listed in Items 1 through 4 - the wall and roof-ceiling assemblies making up the *building* envelope **SHALL have a sound transmission class (STC**) or outdoor-indoor transmission class (OITC) of not less than 50, the windows and doors in the *building* envelope

walls shall have a sound transmission class (STC) or outdoor-indoor transmission class (OITC) of not less than 30, the sliding doors in the building envelope walls shall have a sound transmission class (STC) or outdoor-indoor transmission class (OITC) of not less than 28 and the hinged doors in the building envelope walls shall have a sound transmission class (STC) or outdoor-indoor transmission class (OITC) of not less than 30.

WHERE THE SOUND TRANSMISSION IS FIELD TESTED, the sound transmission shall be not less than 45 STC or OITC for wall and roof-ceiling assemblies and not less than 25 STC or OITC for windows and doors. Transmission classes shall be determined in accordance with ASTM E90 for sound transmission class (STC) values or ASTM E1332 for outdoor indoor transmission class (OITC) values.

1. Within 1000 feet (300 m) of a freeway**,** fire station, fuel dispensing facility, factory, industrial or manufacturing zone or facilities, commercial storage facility, or sports arena or stadium.
2. Within 500 feet (150 m) of a roadway containing 4 or more traffic lanes**.**
3. Within the published DNL 65 dBA noise contour associated with a commercial airport, or where such information is lacking, within 5 miles (8 km) of a commercial airport.
4. Within 3,000 feet (900 m) of an active railway.

Interior sound transmission. Wall and floor-ceiling assemblies that separate Group A, F and M occupancies from Group B, I or R occupancies shall have a sound transmission class (STC) of not less than 50. Sound transmission classes shall be determined in accordance with ASTM E90, or for concrete masonry and clay masonry assemblies shall be calculated in accordance with TMS 0302 or determined in accordance with ASTM E90.

Exception: This section shall not apply to wall and floor-ceiling assemblies enclosing:

1. Public entrances to tenants of covered and open mall *buildings*.
2. Concession stands and lavatories in Group A-4 and A-5 occupancies.

Mechanical and emergency generator equipment and systems. *Building* mechanical and
emergency generator systems shall be designed to control airborne *noise* in accordance with Sections 807.4.1 through 807.4.3.

Separating assemblies. SHALL have a sound transmission class (STC) of not less than 60 determined in accordance with ASTM E90 and ASTM E413, or for concrete masonry and clay masonry assemblies as calculated in accordance with TMS 0302

***** Mechanical and emergency generator equipment outside of buildings.**
SHALL NOT be subjected to a sound level greater than indicated in Table 807.4.2.
SPECIAL INSPECTIONS SHALL BE REQUIRED AND CONDUCTED IN ACCORDANCE WITH SECTION 903.1 in order to demonstrate compliance.

HVAC background sound.

- SHALL be in accordance with the lower and upper noise criteria (NC) limits as shown in Table 807.4.3.
- SHALL be required and conducted in accordance with Section 903.1 in order to demonstrate compliance.

TABLE 807.4.2
MAXIMUM PERMISSIBLE A-WEIGHTED SOUND LEVELS

TABLE 807.4.3
BACKGROUND SOUND IN ROOMS

***** Special inspections for sound transmission.** An *approved agency*, **funded by the *building* owner,**
SHALL furnish report(s) of test findings indicating that the results are in compliance with this section and the *construction documents*.
SHALL be brought to the attention of the design professional and **code official** prior to the completion of that work.
A final testing report documenting required testing and corrections of any discrepancies noted in prior tests SHALL be submitted at a point in time agreed upon by the *building* owner, or *building* owner's agent, design professional, and the ***code official*** for purposes of demonstrating compliance.

Testing for mechanical and emergency generator equipment outside of buildings.

- All mechanical and emergency generator equipment SHALL be FIELD TESTED in accordance with Table 903.1.
- **Testing** SHALL be conducted following the complete installation of the equipment or generators, the installation of sound reduction barriers, and balancing and operation of the equipment or generators.
- **Testing** SHALL be at locations representing the four cardinal directions from the face of the project *building*.
- **Testing** SHALL occur on a Tuesday, Wednesday or Thursday at both the day and night times within the periods shown in Table 807.4.2.

Testing for building system background noise.
Testing SHALL be executed in accordance with Section 807.4.3 within not less than 50 percent of the total number of rooms contained in a *building* or *structure*, exclusive of closets and storage rooms less than 50 square feet in area, and exclusive of toilet facilities in accordance with Table 903.1.
Testing SHALL occur following the complete installation of the equipment and systems, the installation of any sound reduction barriers, and balancing and operation of the equipment and systems.

SECTION 808
DAYLIGHTING

General.

- SHALL be placed in accordance with Sections 808.1 through 808.3.

- SHALL be planned to benefit from the exposure to natural light offered by the fenestration in accordance with this section.

Applicability. Daylighting of *building* spaces SHALL be required for buildings containing Group A-3, B, E, F, M or S occupancies.
Exception: Daylighting is not required in the following rooms and space**s: (**Libraries, education facilities, facilities with special light or temperature needs each have special exceptions)

Daylighting of building spaces.
Not less than 50 percent of the total floor area SHALL be located within a *daylit area* that complies with either Section 808.3.1 or Section 808.3.2.
Buildings required to have more than 25,000 square feet of *daylit area* SHALL comply with Section 808.3.2.
Exception: SHALL be modified in accordance with Equation 8-1.

Daylight prescriptive requirements. Each *toplighting daylight zon*e that complies with Section 808.3.1.2 SHALL be considered to be a *daylit area*.

Sidelighting. SHALL include *fenestration* that complies with Table 609.5 and Figure 609.5. *Fenestration* shall not be located in an *obstructed wall*.

Toplighting. SHALL include fenestration that complies with Table 609.5 and Figure 609.5. *Fenestration* shall not be located in an *obstructed roof*.

Daylight performance requirements. SHALLNOT be conducted in accordance with Section 808.3.2.1.

Daylight simulation. A climate based analysis SHALL comply with the following:

1. Provide data on an hourly basis for a typical meteorological year, excluding hours between and including the last hour before sunset and the first hour after sunrise every day.
2. Address the effects of exterior shading devices, shade trees complying with all of the requirements of Section 404.2.3, *buildings, structures,* and geological formations. Include the effects of movable exterior fenestration shading devices. The configuration of manually controlled exterior fenestration shading devices shall be adjusted on the spring and fall equinoxes only. The configuration of automatically controlled exterior fenestration shading devices and fenestration with automatically controlled variable transmittance shall be adjusted to accurately represent the control system operation.
3. Exclude the effects of interior furniture systems, shelving, and stacks
4. Use the actual reflectance characteristics of all materials.
5. Include the effects of blinds, shades and other movable interior fenestration shading devices. The configuration of *manually* controlled fenestration shading devices shall be adjusted on the spring and fall equinoxes only. The configuration of automatically controlled fenestration shading devices and fenestration with automatically controlled variable transmittance shall be adjusted to accurately represent the control system operation.
6. Calculation points shall be spaced not more than 39 inches (991 mm) by 39 inches

(991 mm) and 30 inches (762 mm) above the floor. The calculation grid shall start within 39 inches (991mm) of each wall or partition.
7. Where details about the window framing, mullions, wall thickness and well depth cannot be included in the model, the visible transmittance of all fenestration shall be reduced by 20 percent.

SECTION 809
PROJECT ELECTIVES

General. Section 809 contains ***project electives*** related to indoor air quality and environmental comfort. *Project electives* SHALL NOT be mandatory unless selected by the owner or *registered design professional* and indicated in the Project Elective Checklist required by Section 303.1.

Electives in this section work for Performance Paths and other elective variables.

TABLE 809.4
INTERIOR PLANT DENSITY a
Occupancy Specific Use Plant Density

CHAPTER 9
COMMISSIONING, OPERATION AND MAINTENANCE
SECTION 901

GENERAL
Scope. The provisions of this chapter are intended to facilitate the pre- and post- occupancy *commissioning*, operation and maintenance of *buildings* constructed in accordance with this code in a manner that is consistent with the intent of other provisions of this code, and to further that goal through the EDUCATION OF *BUILDING* OWNERS AND MAINTENANCE PERSONNEL WITH REGARD TO RELATED BEST OPERATING AND MANAGEMENT PRACTICES.

SECTION 902
APPROVED AGENCY

Approved agency. An *approved agency* SHALL provide all of the information necessary for the code official to determine that the agency meets the applicable requirements.
The *code official* shall be permitted to be the *approved* agency.

Independence. An *approved agency* SHALL be objective, competent and independent from the contractor responsible for the work being inspected. The agency SHALL disclose possible conflicts of interest so that objectivity can be confirmed.

Equipment. An *approved agency* SHALL have adequate equipment to perform the required *commissioning*. The equipment SHALL be periodically calibrated.

Personnel. An *approved agency* shall employ experienced personnel educated in conducting, supervising and evaluating tests and *commissioning*.

SECTION 903
COMMISSIONING

General.
Where application is made for construction as described in this section, the *registered design professional in charge* or *approved agency* shall perform *commissioning* during construction and after occupancy as required by Table 903.1.

Where Table 903.1 specifies that *commissioning* is to be done on a periodic basis, the *registered design professional* in charge shall provide a schedule of periodic *commissioning* with the submittal documents that shall be reviewed and *approved* by the ***code official*.**

The *approved agency* shall be qualified and shall demonstrate competence, to the satisfaction of the ***code official***, for the *commissioning* of the particular type of construction or operation. The *registered design professional in charge* and engineers of record, involved in the design of the project **are permitted to act as the *approved agency*** provided those personnel meet the qualification requirements of this section to the satisfaction of the **code official**

The *approved agency* shall provide written documentation to the **code official** demonstrating competence and relevant experience or training.

Experience or training shall be considered relevant where the documented experience or training is related in complexity to the same type of *commissioning* activities for projects of similar complexity and material qualities.

Pre occupancy report requirement.
The *approved agency* shall keep records of the *commissioning* required by Table 903.1. The *approved agency* shall furnish *commissioning* reports to the owner and the *registered design professional in responsible charge* and, upon request, to the ***code official*.** Reports shall indicate that work was or was not completed in conformance to *approved construction documents*. Discrepancies shall be brought to the immediate attention of the contractor for correction. **where discrepancies are not corrected, they shall be brought to the attention of the owner, code official and to the *registered design professional*** *in responsible charge* prior to the completion of that phase of the work.

Prior to the issuance of a Certificate of Occupancy, a final *commissioning* report shall be submitted to and accepted by the *code official*.**

Post occupancy report requirement.

Post occupancy *commissioning* shall occur as specified in the applicable sections of this code.
A post occupancy *commissioning* report shall be provided to the owner within 30 months after the Certificate of Occupancy is issued for the project and shall be made available to the **code official** upon request.

TABLE 903.1
COMMISSIONING PLAN
SECTION 904
BUILDING OPERATIONS, MAINTENANCE AND OWNER EDUCATION

General.
The operations and maintenance and *building* owner education documents shall be in accordance with Sections 904.3 and 904.4 and *submitted to the owner prior to the issuance of the Certificate of Occupancy.*
Record documents shall be in accordance with Section 904.2.
The building owner shall file a letter with the code official certifying the receipt of record documents and building owner education, operations and maintenance documents.

At least one copy of these materials shall be in the possession of the owner and at least one additional copy shall remain with the *building throughout the life of the structure.*

Owner responsibility. *Buildings* built under this code *shall be maintained and operated* at the level of performance required by the *approved* documents.

Periodic reporting. *Where required by Table 302.1, a report confirming that the building is maintained and operated at the level of performance required by the approved documents shall be submitted to the code official at approved intervals.*

Record documents. The cover sheet of the record documents for the project shall clearly indicate that at least one copy of the materials shall be in the possession of the owner and at least one additional copy shall remain with the *building* throughout the life of the *structure*.
Record documents shall include all of the following:

1. Copies of the *approved construction documents*, including plans and specifications.
2. As-built plans and specifications indicating the actual locations of piping, ductwork, valves, controls, equipment, access panels, lighting and other similar components where they are concealed or are installed in locations other than those indicated on the *approved construction documents*.
3. A copy of the Certificate of Occupancy.

***** Building operations and maintenance documents.** *The building operations and maintenance documents shall consist of manufacturer's specifications and recommendations, programming procedures and data points, narratives, and other means of illustrating to the owner how the building, site and systems are intended to*

be maintained and operated. The following information shall be included in the materials, as applicable to the specific project:

1. Directions to the owner or occupant on the manual cover sheet indicating that at least one copy of the materials shall be in the possession of the owner or occupant and at least one additional copy shall remain with the *building*.
2. Operations and maintenance manuals for equipment, products and systems installed under or related to the provisions of Chapter 4 including, but not limited to, the following, as applicable:
2.1 Vegetative shading, vegetative roofs and natural resource protections and setbacks.
2.2 Water conserving landscape and irrigation systems.
2.3 Stormwater management systems
2.4 Permanent erosion control measures.
2.5 Landscape or tree management plans.
3. Operations and maintenance documents for materials, products, assemblies and systems installed under or related to the provisions of this code for material resource conservation in accordance with Chapter 5 including, but not limited to, the following, as applicable:
3.1 Care and maintenance and instructions and recommended replacement schedule for flooring, including, but not limited to, carpeting, walk-off mats and tile.
3.2 Care and maintenance instructions for natural materials including, but not limited to, wood, *bio-based materials* and stone.
3.3 Available manufacturer's instructions on maintenance for:
3.3.1. Exterior wall finishes
3.3.2. *Roof coverings*
3.3.3. Exterior doors, windows and *skylights*
3.4 Information and recommended schedule for required routine maintenance measures, including but not limited to, painting and refinishing.
3.5 A copy of the service life plan required by Chapter 5.
4. Operations and maintenance documents for equipment, products and systems installed under or related to the provisions of this code for energy conservation in accordance with Chapter 6 including, but not limited to, the following:
4.1 Heating, Ventilating and Air Conditioning systems including:
4.1.1. Recommended equipment maintenance schedule.
4.1.2. Air filters and fluid filters, including recommended replacement schedule and materials.
4.1.3. Time clocks, including settings determined during *commissioning*.
4.1.4. Programmable controls and thermostats, including settings determined during *commissioning*.
4.2 Domestic hot water systems including performance criteria and controls.
4.3 *Building thermal envelope* systems including:
4.3.1. Glazing systems **inspection** schedule.
4.3.2. Performance criteria for replacements and *repairs*.
4.3.3. Information and recommended schedule on required routine maintenance measures, including but not limited to, sealants, mortar joints and screens.
4.4 Electrical and lighting systems including:

4.4.1. Technical specifications and operating instructions for installed lighting equipment
4.4.2. Luminaire maintenance and cleaning plan
4.4.3. Lamp schedule, recommended relamping plan, and lamp disposal information.
4.4.4. Programmable and automatic controls documentation, including settings determined during *commissioning.*
4.4.5. Occupant sensor and daylight sensors documentation, including settings determined during *commissioning*.
4.5 Automatic demand reduction systems
5. Operations and maintenance documents for equipment, products and systems installed under or related to the provisions of this code for water conservation in accordance *with* Chapter 7, including, but not limited to the following:
5.1 Domestic fixtures.
5.2 Water regulating devices including faucets and valves.
5.3 Irrigation and *rainwater* and *graywater* catchment.
6. Operations *and* maintenance *documents* for equipment products and systems under or related to the provisions of this code for indoor environmental quality in accordance *with* Chapter 8, including, but not limited to the following:
6.1 Humidification/dehumidification.
6.2 Green cleaning products, procedures and techniques.
6.3 Recommended window cleaning schedule.
6.4 *Ventilation* controls.
6.5 Floor finishes.
6.6 Fireplaces and combustion appliances.
6.7 Radon mitigation system.
6.8 Indoor plants.

Building owner education manual.

The owner shall cause to be assembled an informational document on the *building*, site or *structure* and systems and sustainable features that are covered by this code and included in the *building*.

Such information shall be educational in nature and sufficient for future tenants, owners and operators of the *building*, *building site*, *structure* and systems to understand the basic purpose and basis for these systems and features and how they are to be maintained for continued performance.

The education documents shall consist of a statement of performance goals or requirements and a narrative illustrating the reasoning behind the *building's* site, features, and systems design.

One copy of the owner education manual shall be in the possession of the owner and one additional copy shall remain with the *building* throughout the life of the *structure*.

Where a whole *building life cycle assessment* is performed in accordance with Section 304, the data and final report shall be included in the owner education manual.

CHAPTER 10
EXISTING BUILDINGS

SECTION 1001
GENERAL

Scope. The provisions of this chapter shall control the *alteration*, *repair*, *addition, maintenance and operation* and *change of occupancy* of existing *buildings* and *structures*. Existing *building sites* shall comply with Chapter 11.

Building operation and maintenance. Existing *buildings* and parts thereof, shall be operated
and maintained in conformance with the code edition and zoning or other adopted site development regulations applicable at the time of construction, *and as required by Section 102.6.* The owner or the owner's designated agent shall be responsible for the operation and maintenance of existing *buildings.* The requirements of this chapter shall not provide the basis for removal or abrogation of fire protection and safety systems and devices in *existing structures*.

Compliance. *Alterations, repairs*, *additions* and changes of occupancy to *existing structures* shall comply with the provisions of this chapter.

Building materials, assemblies and systems. *Building* materials shall comply with the requirements of this section.

Existing materials, assemblies, configurations and systems. Materials, assemblies, configurations and systems already in use in a *building* in conformance with requirements or approvals in effect at the time of their erection or installation shall be permitted to remain in use *unless determined by the code official to be dangerous to life, health or safety***.** Where such conditions are determined to be dangerous to the environment, life, health or safety, they *shall be mitigated or made safe.*

New and replacement materials, assemblies, configurations and systems. Except as otherwise required or permitted by this code, materials, assemblies, configurations and systems permitted by the applicable code for new construction shall be used. Like materials shall be permitted for *repairs* and *alterations* provided that a hazard to life, health or property is not created. Hazardous materials shall not be used where the code for new construction would not *permit* their use in *buildings* of similar occupancy, purpose and location.

SECTION 1002
ADDITIONS

General. *Additions* to any *building* or *structure* shall comply with the requirements of this code for new construction. Unaltered portions of the *building* or *structure* shall be in accordance with the provisions of the code in force at the time of their construction and shall comply with Section 1003.2. *Additions* to existing portions or components of the *building*

structure shall be in accordance with the provisions of this code for those portions or components being altered.

1. *Additions* to an existing *building* or *structure* shall be made such that the existing *building* or
structure together with the *addition* are not less conforming with the provisions of this code than the existing *building* and or *structure* was prior to the *addition*.
2. *Additions* shall not be permitted to *buildings* and *structures* that are located in *flood hazard areas.*
Exception: Where an existing *building* or *structure* is located such that all habitable space is located not less than 1 foot above the flood elevation, *additions* complying with Section 402.2.1(1) shall be permitted.

SECTION 1003
ALTERATIONS TO EXISTING BUILDINGS

General. *Alterations* to existing *buildings* and *building* systems shall be in accordance with the provisions of this code for those areas, assemblies, systems and components being altered. Unaltered portions and components, areas and systems of the *building* or *structure* shall be in accordance with the provisions of the code in force at the time of their construction and shall comply with Section 1003.2. *Alterations* shall be such that the existing *building* or *structure* is not less conforming to the provisions of this code upon the completion of work than the existing *building* or *structure* was prior to the *alteration.* Energy compliance for this purpose shall be evaluated in accordance with Section 602.4. Areas, assemblies, systems and components that are altered shall be in accordance with this section and Sections 1003.2 and 1003.3.

Exception: Where, in the opinion of the ***code official***, there is no significant compromise of the intent of this code, the **code official** shall have the authority to approve materials and assemblies that perform in a manner that is at least the equivalent of those being replaced.

Minimum energy, HVAC and water requirements. Compliance with Sections 1003.2.1 through 1003.2.3 shall be required.

Exceptions:

1. Materials, assemblies and components regulated by Sections 1003.2.1, 1003.2.2 or 1003.2.3 that are dependent upon properties of other concealed materials, assemblies or system components to function properly and where the properties of the concealed materials, assemblies or components are unknown or insufficient and will not be revealed during construction.
2. Where the application of the requirements of Sections 1003.2.1, 1003.2.2 or 1003.2.3 are determined by the **code official** to be technically infeasible based upon the existing configuration of spaces, **unless the intent of the *permit* applicant is to reconfigure those spaces or portions thereof.**
3. Where a tenant in a multi-tenant *building* does not have control within that tenant space of a complete system or item, compliance for that complete system or item shall not be required.

Heating, ventilation and air conditioning. Heating, *ventilation* and air conditioning systems and equipment SHALL be in accordance with the following:
1. Non-functioning thermostats shall be repaired or replaced.
2. Leaking accessible supply air and return ducts SHALL be sealed with *approved* sealants. Although the presence of existing duct tape shall not be deemed to indicate noncompliance where a duct is not leaking, *duct tape SHALL not be acceptable for repair of such a leak.*
3. Outside air dampers, damper controls and linkages controlled by HVAC units shall be in good repair and adjustment.
4. Hot water and steam leaks, defective steam traps and radiator control, relief, and vent valves *SHALL NOT be permitted in any accessible piping.*
5. Leaking accessible chilled water lines and equipment shall be repaired or replaced.

Service water systems. Defective hot and cold water piping and equipment within service water systems SHALL be repaired or replaced.

Motor-driven equipment. There SHALL NOT be leaks in compressed air or pumped water systems.

Additional requirements. *Alterations* of portions and components of *buildings* SHALL comply with Sections 1003.3.1 through 1003.3.9.
Exceptions:
1. The total cost of improvements required by Sections 1003.3.1 through 1003.3.9 SHALL NOT be required to exceed 10 percent of the costs of the *alterations* exclusive of land and *building site* improvements. The costs of *alterations* shall include costs related to Section 1003.2, but shall not limit its application.
2. This section shall not require compliance that exceeds that required for systems regulated by Chapters 6 through 8 of this code.
3. Materials, assemblies and components regulated by Sections 1003.3.1 through 1003.3.9 that are dependent upon properties of other concealed materials, assemblies or system components to function properly and where the properties of the concealed materials, assemblies or components are unknown or insufficient and will not be revealed during construction.
4. Where the application of the requirements of Sections 1003.3.1 through 1003.3.9 are determined by the **code official** to be technically infeasible based upon the existing configuration of spaces, unless the intent of the *permit* applicant is to reconfigure those spaces or portions thereof.
5. Where a tenant in a multi-tenant *building* does not have control within that tenant space of a complete system or item, compliance for that complete system or item shall not be required.

The building owner shall commission a building energy audit and provide copies of the audit report to the local jurisdiction. The audit shall be conducted by persons qualified to perform such audits, as determined by the code official.

The energy audit report SHALL indicate the improvements listed in Sections 1003.3.2 through 1003.3.9 that the auditor recommends for scoping and prioritizing the modification,

replacement or the addition of equipment or systems *to improve the energy performance of the building.*

Exception: An energy audit and report shall not be required where a *building* is vacant and has been vacant for a minimum of six months prior to the sale date of the property.

Metering devices. Dedicated individual utility or private *metering* devices to facilitate the measurement and verification of energy and water use within the *building* or space SHALL be provided for at least one of the following:

1. Electrical energy consumption for individual tenant spaces
2. Water consumption for individual tenant spaces
3. Natural gas or fuel oil consumption for individual tenant spaces
4. Lighting loads
5. Motor and drive loads
6. Chiller part-load efficiency
7. Cooling loads
8. Economizer and heat recovery loads
9. Boiler efficiencies
10. *Building* process systems and equipment loads
11. Water consumption for landscape irrigation

Heating, ventilation and air conditioning. Heating, *ventilation* and air conditioning systems and equipment shall be in accordance with the following:

1. Time clock and *time switch controls* that can turn systems off and on according to *building* occupancy requirements SHALL be provided and connected to the following HVAC equipment: chillers and other space cooling equipment, chilled water pumps, boilers and other space heating devices, hot water pumps, heat exchanger circulation pumps, supply fans, return fans, and exhaust fans. Where occupant override is provided, it shall be designed with a timer to automatically revert to time clock and *time switch controls* in not longer than twelve hours.

Exception: A time clock and *time switch controls* SHALL NOT be required for spaces with twenty-four-hour occupancy or containing materials with special atmospheric requirements dependent on twenty-four-hour space conditioning, or where a majority of areas of the *building* served by the system are under set-back thermostat control, or where manufacturer's specifications stipulate that the system must not be shut off.

2. Functional outside air economizers SHALL be provided on all cooling systems of more than 6 1/4 tons total cooling capability, 75K *Btu*/hr., or more than two thousand five hundred cubic feet per minute air flow, provided manufacturer’s guidelines are available for adding the economizer to the existing system.

Exceptions: An outside air economizer SHALL NOT be required for *buildings* or special uses requiring one hundred percent outside air for *ventilation*, where the existing system has a water based economizer, where the existing system does not have an outside air intake, where special economizer operations such as, but not limited to carefully controlled humidity would require more energy use than is conserved, where there is insufficient space to install necessary equipment, where installation of an economizer would require major modifications to the *building's* life-safety system, or where the existing system is a multi-zone system where the same

intake air may be used at the same time for either heating or cooling in different parts of the *building*.

3. *HVAC piping and ducts, including those located above suspended ceilings, shall be insulated to R-values in accordance with this code.*

Exception: Additional insulation SHALL NOT be required for piping within HVAC equipment, within conditioned space that conveys fluids between sixty degrees Fahrenheit and one hundred five degrees Fahrenheit, piping that is already insulated and the insulation is in good condition, or where the insulation cannot be installed without structural *alteration*.

4. *Furnace combustion units SHALL have been cleaned and tuned within one year prior to the alteration.* Filters shall be replaced in accordance with the furnace manufacturer's recommendations. *Where central heat is intended to be replaced with individual electric space heaters, the application for the electrical permit shall include documentation demonstrating that the new electric heaters will not consume more energy than the existing nonelectric heater(s).*

5. Boiler systems SHALL have been cleaned and tuned within one year prior to the alteration.

6. Boilers SHALL be equipped with an outdoor air lock-out thermostat or a temperature reset control.

7. Chiller systems SHALL have been cleaned and tuned within one year prior to the alteration.

8. Chillers SHALL be equipped with an outdoor air lockout thermostat and chilled water reset control.

9. A maximum 5 year phase out plan SHALL be provided for buildings with existing systems that use CFC-based refrigerants.

10. Where mechanical and electrical systems and equipment are joined with microprocessors that communicate with each other or to a computer, a properly integrated building automation system SHALL be installed to optimize energy, operations, and indoor comfort.

The *building* automation system SHALL allow the owner to set up schedules of operation for the equipment and provide equipment optimal start with adaptive learning; provide trim and respond capabilities based on zone demand; ability to monitor energy usage, including the ability to *meter* electric, gas, water, steam, hot water, chilled water, and fuel oil services; offer economizing based on enthalpy calculation and/or CO2 set point control; offer load shedding when power companies are at peak demand and need; and offer the ability to send alarms to alert *building* owner, manager, or operator when problems occur due to system failures.

Service water systems. Service water systems and equipment shall be in accordance with the following:

1. Water heater and hot water *storage tanks* shall have a combined minimum total of external and internal insulation value of R-16.

2. Accessible hot and cold water supply and *distribution pipes* shall be insulated to *R-values* as specified in this code.

3. In Seismic Design Categories D, E and F, as established in accordance with the *International Building Code*, water heater and water *storage tanks* with a tank capacity of thirty gallons or greater shall be strapped or otherwise secured to a wall, floor,

ceiling, or other object that itself is adequately secured to a wall, floor, or ceiling. Water, gas and overflow pipes connected to water tanks shall be similarly secured. Gas water heaters shall have a flexible gas line entering the appliance.
4. Circulating pump systems for hot water supply purposes other than comfort heating shall be controlled as specified in Section 608.8.
5. Showerhead, toilet, urinal and faucet flow rates shall be in accordance with this code.

Lighting. *Lighting systems and equipment SHALL be in accordance with sections 505.2.2.3 and 505.2.4 of the International Energy Conservation Code.*

Commercial refrigeration equipment. *Commercial refrigeration equipment SHALL be cleaned and tuned for efficiency, including, but not limited to, cleaning of condenser coils and evaporators, and replacement of defective or worn door gaskets and seals.*

Motor-driven equipment. Motor-driven systems and equipment SHALL be in accordance with the following:
1. Filters SHALL be cleaned or replaced.
2. Belts and other coupling systems SHALL be in good repair.

Swimming pools and spas. Swimming pools and spas and their equipment SHALL be in accordance with the following:

1. Heated swimming pools and spas SHALL be equipped with a cover for unoccupied hours.
Exception: A cover SHALL NOT be required for indoor pools or spas in which water temperature is less than eighty degrees Fahrenheit during time of non-use.
2. *Pool and spa recirculation pumps SHALL be under timeclock control.*
3. Heaters SHALL be cleaned and tuned for efficiency within one year prior to the change of occupancy.

Unconditioned attic insulation.
In buildings with three or fewer stories above grade plane, ceiling insulation with a minimum R-value as required by this code SHALL be installed in accessible attic spaces that are directly above conditioned spaces.
For the purposes of this section, accessible attic space SHALL be the space between a ceiling joists and roof rafters where the vertical clear height from the top of a ceiling joist or the bottom chord of a truss, to the underside of the roof sheathing at the roof ridge, *is greater than twenty-four inches.*
Where the required R-value insulation cannot fit in the attic space, the maximum amount of insulation compatible with available space and existing uses SHALL be installed.

Asbestos-containing products. Identification and removal of *asbestos-containing products* shall be in accordance with ASTM E2356 and ASTM E1368.

SECTION 1004
CHANGE OF OCCUPANCY

Change of occupancy. *Where a change in occupancy of a building or tenant space places it in a different division of the same group of occupancy or in a different group of occupancies, as determined in accordance with the provisions of the International Building Code, compliance with Section 1003.2 shall be required. Altered portions of, and additions to, existing buildings that are not a result of change of occupancy requirements, shall comply with other sections of this chapter, as applicable.*

Exception: *Historic buildings* in accordance with Section 1005 shall not be required to comply with Section 1004.

SECTION 1005
HISTORIC BUILDINGS

Historic buildings. The provisions of this code relating to the construction, *repair*, *alteration*, *addition*, restoration and movement of *structures*, and *change of occupancy*, where each individual provision is evaluated separately on its own merit, shall not be mandatory for *historic buildings* for any of the following conditions:

1. Where implementation of that provision would change the visible configuration of *building*
components in a manner that is not in keeping with the *buildings* historic nature, as determined by the **code official,** or
2. Where compliance with that provision would produce a conflict with a *building* function that is fundamental to the historic nature of the *building*.

SECTION 1006
JURISDICTIONAL REQUIREMENTS

General. Sections 1006.2 and 1006.3 shall be mandatory and Section 1006.4 shall be enforced only where specifically indicated by the *jurisdiction* in Table 302.1.
Demolition. Where *buildings*, *structures* or portions thereof are *deconstructed* or demolished, a minimum of 50 percent of materials SHALL be diverted from landfills and incineration. Documentation of the total materials in *buildings, structures* and portions thereof to be *deconstructed* or demolished and materials to be diverted, and evidence of diversion, shall be provided. Material quantities shall be indicated and calculated by weight or volume, but not by both.

Sale of existing buildings and portions of buildings. Buildings and portions of buildings that are sold SHALL comply with Sections 1003.2 and 1003.3 within 1 year of sale.

Evaluation and certification of existing buildings and building sites. Where a *permit* application is accepted by a *jurisdiction* for the evaluation of an existing *building* and *building site* in accordance with the requirements of this code as applicable to a new project, and this code does not otherwise require conformance, evaluation SHALL be in accordance

with the requirements of this section. *Project electives* in accordance with Table 303.1 shall be included in the evaluation of the existing *building*.

Certificate of conformance. Where conformance with the requirements of this code as applicable to a new *building* is verified by the ***code official*** for an existing *building* and *building site*, a certificate SHALL be issued indicating conformance with this code, as modified by the limitations contained in Sections 1006.4.2 through 1006.4.3.2.

Specific exclusions. Where evidence of compliance is not available, *existing buildings* evaluated under Section 1006.4 SHALL NOT be subject to the requirements of Section 806. Provisions of this code related to the projects construction phase, including Sections 402.3.1, 402.3.5, 402.3.6, 502.1, 506 and 803.1, and other sections as approved by the ***code official***, SHALL NOT be required for *buildings* evaluated under Section 1006.4. Where buildings do not comply with the aforementioned sections, the certification shall specifically list the sections for which compliance has not been required or verified.

Existing concealed construction. Existing concealed construction in *buildings* regulated by Section 1006.4 SHALL be in accordance with Sections 1006.4.3.1 and 1006.4.3.2.

***** Previously approved documents.** Previously *approved construction documents* for the initial construction of an existing *building* and, where possible, description of changing uses and major upgrades over the *building's* lifetime for which a certificate of occupancy was previously issued SHALL be deemed an acceptable indication of materials, assemblies and equipment in concealed spaces, except where field **inspection** reveals sufficient evidence suggesting noncompliance, subject to the evaluation of the **code official**.

Previously approved documents not available. *Where previously approved construction documents for the initial construction of an existing project are not available, materials, assemblies and equipment in spaces in existing buildings and existing portions thereof that are concealed, including, but not limited to, materials in spaces within walls and floor/ceiling assemblies,* ***SHALL be exposed and spot checked in limited areas as determined by the code official.***

CHAPTER 11
EXISTING BUILDING SITE DEVELOPMENT
SECTION 1101
GENERAL

*** A number of jurisdictional Conflicts appear in the SITE conformance regulations. Development Services will need to examine the IGCC and make determination IF they will adopt any section(s).

CPI must determine how they will comply with the IGCC if SITE authority is retained by Development Services. (see one option below) ***

Scope. This chapter shall control the *alteration*, *repair*, maintenance and operation of existing *building sites* and the *alteration* to *building site* improvements where *additions* are made to, or changes of occupancy occur within, the existing *buildings* on the site.

Operation And Maintenance. The owner or the owner's designated agent SHALL be responsible to operated and maintained in conformance with the code edition under which the site improvements were installed.
To determine compliance with this section, the **code official** SHALL have the authority to require a *building site* to be reinspected. This chapter shall not provide the basis for removal or abrogation of protections or systems from existing *building sites.*

Compliance. *Alterations and repairs to building sites SHALL comply with the provisions of this code.*
****Where differences occur between the provisions of this code and the provisions of other locally adopted land use, zoning or site development regulations, the provisions of the most restrictive code or regulation SHALL apply.****

> **Exception:** The following need not comply with Chapter 4, provided that the area of *impervious surfaces* on the *building site* is not increased:
> 1. Restriping of parking lots provided there is not a change in the number of parking spaces;
> 2. Replacement of *hardscape*, *structures* and vegetation with materials that duplicate the materials in the permitted plans and specifications

Building site materials, systems and landscaping. *Building* materials used for *building site* development shall comply with the requirements of this section.

Existing materials, assemblies, configurations and systems. Materials and systems already in use on a *building site* in conformance with the requirements or approvals in effect at the time of their installation SHALL be permitted to remain in use unless determined by the **code official** to be dangerous to the environment, life, health or safety.
Where such conditions are determined to be dangerous to the environment, life, health or safety, they SHALL be mitigated or made safe. Existing *buildings* and site improvements located within or located closer to protected areas than permitted by Section 402.2 but that are in conformance with the requirements or approvals in effect at the time of their installation shall be permitted to remain in use unless determined by the **code official** to be dangerous to the environment, life, health and safety of the community and the occupants of the *building site*. Where such conditions are determined to be dangerous to the environment, life, health or safety, they SHALL be mitigated or made safe.

New and replacement materials, assemblies, configurations and systems. Except as
otherwise required or permitted by this code, materials, assemblies, configurations and systems permitted by the applicable code for new construction SHALL be used. Like materials Shall be permitted for *repairs* and *alterations* provided no hazard to the environment, life, health or property is created. Hazardous materials SHALL NOT be used where the code for new construction would not *permit* their use at *building sites* of similar occupancy, purpose and location.

SECTION 1102
ADDITIONS

General. Additions to any *building site* improvements SHALL comply with the requirements of this code for new construction. Unaltered portions of a *building site* SHALL be in accordance with the provisions of the code in force at the time of their construction.
Where additions to a building, or additions to building site improvements result in the alteration of existing portions or improvements of the building site, those alterations SHALL comply with this section and Section 1103.
*A*dditions to an existing building site SHALL be made to ensure the following:
1. *Existing building site Improvements together with the additional or expanded improvements are not less conforming with the provisions of this code than the existing building site was prior to the addition, and;*
2. Where additions to any building reduces, or requires alteration to, building site improvements, the alterations to the building site together with unaltered site improvements SHALL NOT be less conforming to the provisions of this code prior to the addition to the building or structure.

SECTION 1103
ALTERATIONS TO EXISTING BUILDING SITES

General. *Alterations* to existing portions or *site* improvements on *building sites* SHALL be in accordance with the provisions of this code for those portions or *building site* improvements being altered. Unaltered portions and site improvements of the *building site* SHALL be in accordance with the provisions of the code in force at the time of their construction.
Alterations SHALL be such that the existing *building site* is no less conforming with the provisions of this code than the existing *building site* was prior to the *alteration*.
Unaltered portions and site improvements of a *building site* SHALL be in accordance with the provisions of the code in force at the time of their construction or preservation.

> **Exception:** Where, in the opinion of the **code official**, there is no significant compromise of the intent of this code, the **code official** SHALL have the authority to approve materials and assemblies that perform in a manner that is at least the equivalent of those being replaced.

Changes to hardscapes and surface vehicle parking. H*ardscapes* that do not conform to the requirements of 404.2 are altered, the *alterations* SHALL comply with the provisions of this code.

Where existing vehicle surface parking lots that do not comply with Section 403.4 are altered to rearrange parking space configuration or to increase the number of parking spaces, the altered parking lot SHALL comply with Section 403.4.
If the existing *building site* does not have the number of *short term bicycle parking* spaces required by Section 403.3, additional *short term bicycle parking* complying with Section 403.3 SHALL be provided to comply with Section 403.3 for *short term bicycle parking*.

SECTION 1104

CHANGE OF OCCUPANCY

Conformance. Where a change in the use or occupancy of a *building* or tenant space places it in a different division of the same group of occupancy or in a different group of occupancies, as determined in accordance with the provisions of the *International Building Code*, compliance with Sections 1104.2 SHALL be required. *Altered portions of, and additions to, existing buildings and existing building sites that are not a result of change of occupancy requirements, shall comply with other sections of Chapter 10 and this chapter.*

Building site improvements. Where a change in occupancy results in an increase in the *occupant load* of the *building*, bicycle parking SHALL comply with the following:
1. *Short term bicycle parking* spaces SHALL be provided in accordance with Section 403.3 equivalent to a new *building* of the new occupancy.
2. Where the existing *building* and *building site* have parking for motorized vehicles, *long term bicycle parking* SHALL be provided in accordance with Section 403.3 equivalent to a new *building* of the new occupancy. Where the existing *building* does not contain covered parking spaces for vehicles, only 25 percent of the *long term bicycle parking* needs to be covered.

SECTION 1105
HISTORIC BUILDING SITES

Historic building sites. The provisions of this code relating to the construction, *repair*, *alteration*, *addition*, and restoration of *building sites* and site improvements, where each individual provision is evaluated separately on its own merit, SHALL NOT be mandatory for *historic building sites* for any of the following conditions:
1. Where implementation of that provision would change the visible configuration of *building site* improvements in a manner that is not in keeping with the *building site's* historic nature, as determined by the ***code official***,
2. Where compliance with that provision would produce a conflict with a *building site* function that is fundamental to the historic nature of the *building site*, or 3. Where such *building sites* are judged by the ***code official*** to not constitute a distinct environmental hazard.