

Connecticut Housing Finance Authority

**STANDARDS OF DESIGN and CONSTRUCTION**

January 2009

[For developments approved for funding through 2009 financing programs.]

## **Standards of Design and Construction**

CHFA (“CHFA” or “the Authority”) **Standards of Design and Construction** define the design process and the specific requirements for multifamily housing financed through the Authority. These Standards replace the CHFA “STANDARDS OF DESIGN AND CONSTRUCTION 2008”, and are requirements of the Multifamily Housing Design Review Process for CHFA.

It is the intent of these Standards and the **Design Review Process** to insure that housing financed through CHFA’s multifamily lending programs best serves the needs of its inhabitants with as much quality, safety, energy efficiency, durability, comfort, air quality, and environmental sustainability as the marketplace, resources and need will permit. It is acknowledged, however that individual developments may face unique site, design, financing or market constraints for which full compliance may be difficult or impossible. It is intended that such unique constraints are identified during the Design Review Process, and that the Developer may request a **Standards of Design Modification** or a **Standards of Design Waiver**. CHFA will consider such requests, on a case-by-case basis, to determine whether specific standards should be modified or waived, for reasons and purposes acceptable to the Authority.

The format of this document is intended as an easy reference and one that can be easily updated. Please update your copy of these Standards as new or modified pages are issued.

### **CSI Format**

The Construction Specification Institute (“CSI”) has developed the standard filing system used by architectural, design, engineering, and construction professionals. The CSI MasterFormat provides a uniform approach to organizing specification text by establishing a structure consisting of 16 divisions (see table of contents). The most common version of this system is MasterFormat 1995. Each division is divided into articles, subordinate paragraphs, and subparagraphs, with five-digit codes. An example of the filing system can be seen below:

Where to find Foam Board Insulation?  
Division 07000: Thermal and Moisture Protection  
07210 Building Insulation

With a June 9, 2005 posting on the CSI website, the 16-division, 5-digit-based MasterFormat developed over the past forty years has been revised to become a 48-division, 6-digit-based MasterFormat 2004. While MasterFormat 2004 is the new “official” standard filing system for architectural, design, engineering, and construction professionals, CHFA’s Standards of Design and Construction will remain organized with the more familiar MasterFormat 1995, until MasterFormat 2004 comes into common use. **All project manuals submitted for CHFA review shall be organized under MasterFormat 1995.**

For additional information or questions, please contact the CHFA Technical Services Department: CHFA, 999 West Street, Rocky Hill, Connecticut 06067-4005, 860-571-4357.

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## **00000 GENERAL DESIGN REQUIREMENTS**

### **00010 Applicable Codes and Standards**

(For projects with Building Permit Applications submitted after December 31, 2005)

CHFA uses standards of design and construction to implement its programs: to develop safe housing that will serve the needs of its inhabitants with as much quality, energy efficiency, durability, comfort, air quality, and environmental sustainability as the marketplace, resources and need will permit. All design and construction shall be performed in accordance with these standards. General design parameters for housing financed by CHFA shall also include the following (as applicable):

#### **2005 Connecticut State Building Code (CSBC):**

2003 International Building Code (IBC)

2003 International Existing Building Code (IEBC)

2003 International Mechanical Code (IMC)

2003 International Plumbing Code (IPC)

2003 International Residential Code (IRC)

2005 National Electrical Code National Fire Protection Association (NFPA) 70-2005 Life Safety Code (NEC)

2003 International Energy Conservation Code (IECC)

ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities

2005 State of Connecticut Amendments/State Building Code

#### **2005 Connecticut Fire Safety Code (CSFSC):**

New Construction/Alterations/Renovations/Changes of Occupancy:

2003 International Fire Code (IFC)

2005 State of Connecticut Amendments/State Fire Code

Existing Buildings:

2003 NFPA 101 Life Safety Code (Existing Occupancy Chapters)

2003 International Existing Building Code (IEBC)

2005 State of Connecticut Amendments/State Building Code (Alternative Compliance)

2005 State of Connecticut Amendments/State Fire Code

#### **2005 Connecticut Elevator Code (CSEC):**

1996 ASME A17.1 Safety Code for Elevators and Escalators with 1997 and 1998 Amendments

**Federal Housing and Equal Opportunity Laws** [including the Fair Housing Act (FHAct) and other civil rights laws, including Title VI of the Civil Rights Act of 1964, Section 109 of the Housing and Community Development Act of 1974, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act of 1990 (ADA), the Age Discrimination Act of 1975, Title IX of the Education Amendments Act of 1972 and the Architectural Barriers Act of 1968 (ABA)]

#### **CHFA Standards of Design and Construction 2009 by CHFA Technical Services**

For all developments, including those receiving Low Income Housing Tax Credits and developments financed with Tax-exempt Bonds:

CHFA requires conformance with all funding program, Local, State, and Federal Standards. It shall be the responsibility of the developer and architect to assure compliance of the design and construction with all required Codes and Standards.

CHFA supplements the requirements of current applicable Building Codes and State and Local law with these Standards of Design and Construction to create housing that best suits the needs of Connecticut residents, and serves as a blueprint for healthy, comfortable homes that reduce utility bills and protect the environment.

CHFA Standards of Design and Construction represent a consensus standard of current national and regional building codes, design practices and processes, and construction means, methods, and materials. Elements of national and regional green residential rating system guidelines have also been incorporated, including Energy Star Home (U.S. Dept. of Energy), L.E.E.D. for Homes (USGBC), Model Green Building Guidelines (NAHB), Green Building Standards (Maine State Housing Authority), EarthCraft™ House (Southface Energy Institute), Green Communities Criteria (Enterprise Community Partners), and others. CHFA has coordinated with the content of such resources, but not to the extent that additional costs need be incurred on developments completed using the references and resources included in the Standards, for any sort of rating calculation or certification process. Given the depth and breadth of residential construction in general, and the nature of green building in particular, Development Teams must determine the best resources for techniques, strategies and materials appropriate for specific projects on specific sites.

**These standards are not intended to reduce or circumvent the requirements of law and current applicable Building Codes.** Some of these standards are general, and are intended to be guidelines that must be applied to the local situation. Although these standards apply primarily to new construction, they also apply to the rehabilitation of existing structures where practicable. These standards may be modified only where the particular characteristics of the site or other local conditions make compliance impractical or undesirable. Such modifications may be required by CHFA or may be requested by the developer and accepted by CHFA. When such modifications are made, additional requirements may be imposed by CHFA.

CHFA Standards of Design and Construction are typically revised annually, during the third quarter of the year, in a process including notice and publication on the CHFA website of Draft Standards of Design and Construction for the following year, a period of time for public review, and public forums at CHFA for questions, comments and discussion. Based on public input and other factors, notice and publication of the Standards of Design and Construction to be used in the evaluation of developments submitted for funding programs during the following year are typically made on the CHFA website on or about January 1<sup>st</sup>. However, due to the evolving nature of such factors as construction means, methods, materials, technology, codes and laws, and CHFA programs requirements, processes and procedures, the Standards may be revised at any time, upon notice and publication on the CHFA website.

#### **00010.1 Additional Regulations**

The following regulations shall also apply:

- A. When Federal programs or funding are involved in the development, conform with Section 504 of the Rehabilitation Act of 1973 and the Uniform Federal Accessibility Standards. **(See Appendix A)**
- B. When Housing and Urban Development (HUD) programs are involved and when program guidelines require conformance to Minimum Property Standards, use HUD MPS.
- C. When areas within the development are used for public functions, use the Americans with Disabilities Act (ADA). **(See Appendix A)**

- D. All construction means and methods shall be performed in compliance with Federal Occupational Safety and Health Agency (OSHA) regulations.
- E. All construction means and methods shall be performed in compliance with the recommendations of the Asthma Regional Council of New England: Building Guidance for Healthy Homes (last modified December 2006) [<http://www.buildingscience.com/documents/primers/plonearticlemultipage.2006-12-05.5229931729/appendix-building-guidance-for-healthy-homes-developed-by-the-asthma-regional-council/>]. For technical guidance and practical recommendations for building, renovating and maintaining healthy and affordable housing, see primer #BSP-040 “Read This: Before You Design, Build or Renovate” (last modified December 2006) by Building Science Corporation. [<http://www.buildingscience.com/documents/primers/plonearticlemultipage.2006-12-05.5229931729/>].
- F. Design parameters discussed and agreed to at Pre-Design meetings, including Development Amenities, shall be incorporated into the design and construction documents.

#### **00010.2** Miscellaneous Reference Standards

Architects, engineers and developers should note that these Standards are minimums. Good architectural and engineering practices and manufacturer recommendations shall also be observed. CHFA Design Review comments may address such good practices and actual project requirements exceeding the minimum may be required.

#### **00015** CHFA Technical Services

Multifamily housing units must be constructed to last the life of the mortgage (typically 40 years), plus any extended use terms (up to 15 years). The goal for Technical Services is to facilitate the development of quality affordable multifamily housing at the most reasonable cost, by implementing CHFA’s Standards of Design and Construction through:

- A. Development Team Review
- B. Design/Construction Documents Review
- C. Development/Construction Cost Review
- D. Construction Observation

#### **00015.1** Review Considerations

Technical Services’ review considerations include utility, convenience, health and safety, accessibility, comfort, indoor air quality, quality materials, durable details, energy efficiency, and sustainability/resource conservation.

#### **00015.2** CHFA Project Delivery Method: Integrated Development Team/Design Approach

To best satisfy all of Technical Services’ review considerations, Owner/Developers should assemble an Integrated Design Team – including a qualified Architect and other Professional Consultants, and a qualified General Contractor and Key Sub-Contractors – working with an Integrated Design Approach. Owner/Developers might also consider utilizing a third party for design development coordination, professional peer review, and/or post-construction verification of development performance goals.

The elements of Integrated Design include:

1. Emphasize an integrated process through clear and continuous communication
2. Think of the building as a whole
3. Focus on life cycle design
4. Work together as a team from the beginning through active collaboration among team members
5. Conduct assessments to identify requirements and set quantifiable goals
6. Develop tailored solutions that yield multiple benefits while meeting requirements and goals
7. Evaluate solutions through rigorous attention to detail

8. Ensure development requirements and goals are met through post-occupancy verification

#### **00020 Development Team Selection Process**

CHFA encourages the Owner/Developer to follow an organized Development Team selection process:

1. The Owner/Developer issues a Request for Qualifications (“RFQ”) for architectural services
2. The Owner/Developer selects several candidates, from the Architectural/Engineering (“A/E”) firms, or teams, that respond to the RFQ, to be interviewed
3. The Owner/Developer conducts the interviews, selects an architectural firm or team, and negotiates a contract
4. Using the same RFQ/interview process, the Owner/Developer selects a General Contractor (“GC”), and negotiates a contract

#### **00020.1 Design Development Policies**

Owner/Developers shall employ State of Connecticut-licensed Architects for design and supervisory services. The Architect is the licensed design professional, who coordinates the Owner/Developer’s goals, aesthetics, function, safety, economy, and future user needs in developing documents which enable the GC to build the project, and acts as the Owner/Developer’s representative throughout the design and construction process, to ensure that the final product meets the Owner/Developer’s expectations.

Typically, construction trade or design/build contractors and subcontractors shall not be employed to carry out design work. Where work such as fire suppression design, irrigation design, truss design, commercial kitchen design, and modular building design are carried out by design-build contractors, such work shall be certified by a licensed Engineer, and the Design Architect shall be responsible for coordinating and accepting their work. An exception can be that Civil Engineering site work and Licensed Survey work may be contracted directly by the developer, although the architect will be required to coordinate the Civil Engineering with other design work.

Typically, design/build development teams shall not be employed. Exceptions may be made for experienced development teams with a proven record of successful affordable multifamily development projects.

#### **A. The Architect:**

1. Develops the Owner/Developer’s project requirements (i.e. user needs, functions, design expectations and available budget) into a development program.
2. Addresses governmental regulations, such as building codes, zoning laws, fire regulations, and those requiring easy access by disabled persons.
3. Translates the project program into design concepts.
4. Assembles and coordinates the work of a team of professional consultants.
5. Prepares construction drawings and specifications.
6. Administers the construction contract.

#### **B. CHFA Architect Qualifications:**

The Architect shall be licensed by the State of Connecticut and must have a minimum of five (5) years of relevant, multifamily residential design and construction experience. Proof of such experience, in the form of three (3) reference letters (min.) from current and/or past clients, regarding the Architect's performance on multifamily residential projects of similar types and sizes, must be provided. The Architect’s Professional Consultants shall submit similar documentation of relevant, multifamily residential design and construction experience in their specific disciplines.

#### **C. Owner/Architect Agreement:**

The Owner/Developer/Architect Agreement shall include the following AIA Contract Documents:

1. AIA Document B101-2007 (formerly B141-1997 Part 1) – Standard Form of Agreement Between Owner and Architect with Standard Form of Architect’s Services
2. AIA Document B201-2007 (formerly B141-1997 Part 2) – Standard Form of Architect’s Services: Design and Construction Administration (C/A)

D. CHFA Owner/Architect Agreement Requirements:

1. Contracts shall be assignable to CHFA
2. The Construction Administration portion of the Architect’s fee shall be a minimum of 35% of the total fee, and shall be paid in equal monthly installments based upon the length of the agreed-upon construction schedule.
3. The scope of the Architect’s Services shall include the preparation of agenda, scheduling and running weekly job-site meetings with the Owner/Developer, GC, and CHFA Field Observer, recording meeting minutes and distributing copies to all parties.
4. The Architect shall also prepare and distribute a final punch list to all parties, and verify that the work is completed by the GC.

E. Professional Consultants:

The Architect shall contract with currently-licensed Professional Consultants as necessary to carry out the design. Professional Consultants retained by the Architect may include Environmental Consultants, Land Surveyors, Site/Civil Engineers, Soil Scientist/Geo-technical Engineers, Landscape Architects, Traffic Consultants, Building Code Consultants, Fair Housing Accessibility Consultants, Energy Consultants, Acoustical Engineers, Structural Engineers, Plumbing/Fire Protection Engineers, Mechanical Engineers, Electrical Engineers and Interior Designers.

**00020.2 CHFA Asset Management Repair/Replacement Construction Projects**

CHFA reserves the right to require an architect on any and all replacement/repair construction projects, subject to the complexity of the proposed scope of work.

A. Examples of Repair/Replacement Projects requiring third party architectural/engineering services:

- Asphalt roof shingle repair/replacement/installation
- Built-up roofing repair/replacement/installation
- Single-ply roofing repair/replacement/installation
- Gutter system repair/replacement/installation
- Window replacement/installation
- Exterior door replacement/installation
- Exterior siding repair/replacement/installation
- Tree/bush/shrub removal
- Site grading and retaining wall repair/replacement/installation
- Contaminated/polluted soil/groundwater remediation
- Site paving repair/replacement/installation, including parking areas and sidewalks
- All site utility (storm/sanitary drainage system, and electric/gas/phone/cable line) work
- Replacement of Underground Storage Tanks (UST)
- Replacement/installation of new emergency generators
- Replacement/installation of new Kitchen and Bathroom Exhaust Fans
- Asbestos/lead-based paint/mold removal/abatement
- Repair/replacement/installation of heating plants (includes boilers/furnaces and associated piping/ductwork/ and chimneys/flues)
- Replacement/installation of hot water heaters
- Repair/replacement/installation of baseboard heating equipment
- Installation of new air-conditioning units and sleeves
- Repair/replacement/installation of roof-top air-conditioning equipment and systems

Repair/replacement/installation of building cooling plants (includes cooling towers, piping and ductwork)  
Repair/replacement/upgrade of electrical service  
Repair/replacement/installation of electrical switchgear  
Installation of geothermal heating/cooling system  
Installation of photo-voltaic system

- B. Examples of Repair/Replacement Projects not requiring third party architectural/engineering services:
- Exterior Storm door replacement
  - Kitchen Appliance replacement
  - Kitchen cabinet/countertop/flooring replacement
  - Replacement of Kitchen plumbing fixtures/controls/fittings
  - Smoke detector replacement (unless a new hard wired system is installed)
  - Bathroom cabinet/countertop/flooring replacement
  - Replacement of Bathroom plumbing fixtures/controls/fittings
  - Carpet replacement [CHFA prefers hard floor surfaces with replacable area rugs in dwelling units]
  - Tree/bush/shrub trimming
  - Building and site termite treatment
  - Replacement of air-conditioning units in existing sleeves
  - Repair/replacement of existing security systems
  - Repair/replacement of electrical light fixtures and outlets

#### **00021 Architectural Design Responsibility**

The Authority relies heavily on the professional competency of participating architectural firms and on the Authority's design process as documented in CHFA's Standards of Design. For this process to work effectively, participants must encourage the free expression of both designing and reviewing architects. The Design Architects should fully express themselves in the design submissions and in their responses to reviews furnished by the Authority and must not submit proposals or certify drawings which they, as professionals, do not agree with or which are not prepared by, or under the direction of, the Design Architects' firms. As a general rule, CHFA discourages multiple professional service contracts; however, consideration for such arrangements may be made, on a case-by-case basis, for reasons and purposes acceptable to the Authority. Otherwise, all architectural, planning, engineering, landscaping and other services, which contribute to the drawings and specifications by which a housing development is built, shall be in the employ of or under the direction of the Design Architect. Exceptions can be that Civil Engineering site work and Licensed Survey work may be contracted directly by the developer, although the architect will be required to coordinate the Civil Engineering with other design work.

#### **00021.1 Professional Liability Insurance**

Design/Supervisory Architects, and their Professional Consultants, shall provide and maintain professional liability insurance in a form, amount and term satisfactory to CHFA, and shall furnish evidence of such insurance prior to the date of submission of drawings and outline specifications to the Authority for Preliminary Application. CHFA shall be a named certificate holder on all Professional Liability Insurance Certificates. All insurance policies must be in full force and effect as of the date of submission, and must be maintained for a period of seven (7) years after substantial completion of construction.

The minimum amount of professional liability insurance coverage shall be \$1,000,000 per incident for projects with construction costs up to \$5,000,000, and \$2,000,000 per incident for projects with construction costs between \$5,000,000 and \$10,000,000. Professional liability insurance coverage for projects with construction costs exceeding \$10,000,000 will be a minimum of \$3,000,000 per incident, or as otherwise determined on a case by case basis.

### **00021.2 Design and Supervision**

For all developments, including those receiving Low Income Housing Tax Credits and developments financed with Tax-exempt Bonds:

The Authority requires that appropriate experience of a proposed Design Architect be documented prior to CHFA approval of the architect's firm. Experience is particularly critical in the design of housing developments in excess of three (3) stories in height. A registered structural engineer with appropriate experience must prepare related structural drawings. All firms proposed for doing such work shall submit documentation of their background in such design and further shall submit professional résumés documenting relevant experience of their participating architects and engineers for CHFA review before proceeding with design. In cases where a Design Architect's firm does not have a qualified structural engineer possessing such experience on staff, a licensed independent structural engineering firm must be retained by the Design Architect. During construction, the Authority requires that the approved structural engineer participate in the supervision of such structures.

### **00021.3 General Contractor**

The GC is responsible for the construction or development of a property, pursuant to the terms of a primary contract with the Owner/Developer. The GC is responsible for all means and methods [materials, vehicles, tools and labor] used in the construction of the project, in accordance with the contract documents [construction contract, schedule, general conditions, material/systems specifications and drawings] prepared by the Architect. The GC manages the construction process, including planning, staffing, organizing, budgeting, scheduling and supervision.

CHFA encourages constructive participation by the GC during the design process, and recommends the GC's regular input to help maintain cost control for the proposed housing development. Recognizing that field experience has given the GC unique and invaluable insights into cost-saving construction techniques, the Authority seeks the benefit of this experience as it relates to the design process. To facilitate a constructive exchange of ideas, the Authority forwards Technical Services' Design and Construction Document Review comments to the Sponsor and to the Architect and GC, as well as to the Owner/Developer.

#### **A. CHFA GC Qualifications:**

The GC shall be licensed by the State of Connecticut and must have a minimum of five (5) years of relevant experience in the construction of residential facilities. The GC shall provide proof of such experience by submitting a minimum of three (3) reference letters from current and/or past clients, regarding the GC's performance on residential projects of similar type and size. The GC shall provide a minimum of three (3) reference letters from major material suppliers, regarding the GC's credit account payment history.

#### **B. Owner/GC Agreement:**

The Owner/Contractor Agreement shall include the following AIA Contract Documents:

1. AIA Document A101-2007 (formerly A101 – 1997) Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum
2. AIA Document A201 – 1997 (formerly A201 – 1997) General Conditions of the Contract for Construction, with Instructions
3. AIA Document A312 –1984 Performance Bond and Payment Bond, with Instructions

#### **C. CHFA Owner/GC Agreement Requirements:**

1. Contracts shall be assignable to CHFA
2. Liquidated Damages
3. Date of Commencement and Completion of Construction
4. Progress Payments

## 5. Reduction of Retainage

### D. CHFA Requirements for GCs:

1. The GC must provide a completed “Contractor’s Cost Certification Statement”, signed by the Owner and GC, prior to Initial Closing (**see Appendix G**).
2. The GC must use his own employees to perform at least 15% of the construction work, but can utilize the services of specialty trade firms (Sub-Contractors) to perform particular tasks under the direction and coordination of the GC in a direct contractual relationship, to complete the project.
3. The GC will divide the total General Conditions cost into equal monthly payments based upon the length of the agreed-upon construction schedule, which will be included in the monthly payment requisitions during construction.

### E. Letter of Credit

In lieu of Performance Bond and Payment Bonds, a Letter of Credit (LOC) may be acceptable for some projects.

1. The LOC shall stay in place until the end of the Latent Defects Period (LDP), which will commence on the date of issuance of the final, complete, permanent Certificate of Occupancy, or substantial completion of the development, whichever is later, and will end fifteen months later.
2. After the LDP has passed, the GC shall submit a letter requesting release of the LOC. If there have been no construction-related issues during that time period, CHFA will issue a letter stating that the LOC can be released.
3. If there have been construction-related issues during the LDP, and they have not been corrected, CHFA will maintain the LOC until such time as those issues have been satisfactorily resolved, at which time the LOC will be released by CHFA.
4. The GC shall note that the release of the LOC in now way releases the GC from any warranty or guarantee responsibilities assumed under the original construction contract or any agreed upon change orders.

### **00040 Fair Housing and Equal Opportunity (FHEO)**

Federal laws prohibit discrimination in housing on the basis of race, color, religion, sex, national origin, age, disability, and familial status. Design and construction documents for each development shall comply with all Fair Housing Laws, including the barrier-free requirements of the Fair Housing Act (FHAct), Section 504 of the Rehabilitation Act (Section 504), the Americans with Disabilities Act (ADA), the Architectural Barriers Act (ABA), and the Housing of Older Persons Act (HOPA). The Architect shall provide Certification of ADA and Fair Housing Law compliance is a CHFA Initial Closing/Construction Documents/Commitment requirement. For detailed technical information regarding FHEO requirements or a copy of the laws and regulations, contact the nearest HUD office.

#### **00040.1 Elderly Housing**

A percentage of the units as required by State Law, but no less than 10% of all new units (round up to a whole number), shall be Accessible (“Type A” units), and 100% of all units shall be Adaptable (“Type B” units). For ease in exiting in emergencies, Barrier-free units shall be located on the ground floor (at grade), if possible. Where market demand dictates, CHFA may require that a higher percentage of Barrier-free units shall be provided.

#### **00040.2 Family Housing (New Structures Containing 3 Units or More)**

A percentage of the units as required by State Law, but no less than 10% of the total units (round up to a whole number), shall be Accessible (“Type A” units), and 100% of all units shall be Adaptable (“Type B” units) . Where not controlled by State Law, a market analysis shall determine the unit mix. Where market demand dictates, CHFA may require that a higher percentage of Barrier-free units be provided.

### **00040.3 Rehabilitation**

Barrier-free units shall be provided as required by State Law. Where market demand dictates, CHFA may require that a higher percentage of Barrier-free units be provided.

### **00040.4 Community Facilities**

Except where facilities are provided within Barrier-free units, common spaces such as laundry, storage, kitchens, etc., shall be furnished with Barrier-free equipment and shall be accessible from all Barrier-free units.

### **00040.5 Federal Funding**

Where Federal funds such as HOME funds are used in financing a development, the design must comply with all applicable Federal regulations, which means compliance with the Uniform Federal Accessibility Standards. Under UFAS, the required number of units designed to barrier-free standards is 5% of the total number of units. HOME funds require an additional 2% of the units be made accessible for persons with hearing and vision impairments (Refer to HUD 24 CFR, Part 8).

## **00045 Environmental/Hazardous Materials Design Concerns**

### **A. Environmental Site Considerations**

1. Direct relationship with Site Selection
  - a. Manage Risk and Impact on Site Development Cost
2. Certain issues are readily identifiable:
  - a. Adjacent Properties
  - b. Proximity to Railroads/Highways/Large Agricultural Enterprise
  - c. Wetlands/Floodplains
  - d. Soil Type and Composition
  - e. Illegal Dumping
  - f. Hazardous Materials (HazMats)
  - g. Existing Buildings
  - h. Current/Previous Building Uses (Gas Stations/Dry Cleaners/Heavy Industry/ Brownfields)
3. Prior to property purchase/option:
  - a. Available Resources
  - b. Town/City Agencies
  - c. Architect
  - d. Adjacent Properties
  - e. Environmental Consultant (preliminary information)

### **B. Environmental Consultants**

Environmental Consultants are Licensed Professionals who investigate proposed development sites, in order to identify environmental concerns that need to comply with Federal and/or State Regulations. Based on the nature/conditions of the site and the types of environmental concerns initially identified by the Environmental Consultants, additional investigation and/or testing may be required. Based on the results of investigation and testing, site remediation and /or abatement may be required.

### **C. Environmental Consultant Qualifications**

1. Connecticut Dept. of Environmental Protection (CT DEP):
  - a. Licensed Environmental Professional Program (CT LEP)  
[http://www.ct.gov/dep/cwp/view.asp?a=2715&q=324984&depNav\\_GID=1626](http://www.ct.gov/dep/cwp/view.asp?a=2715&q=324984&depNav_GID=1626)
  - b. Connecticut Dept. of Public Health (CT DPH) Lead Program  
[http://www.dph.state.ct.us/BRS/Lead/lead\\_program.htm](http://www.dph.state.ct.us/BRS/Lead/lead_program.htm)
    1. Licensed Lead Inspector
    2. Licensed Lead Inspector Risk Assessor

3. Licensed Lead Planner – Project Designer
- c. Connecticut Dept. of Public Health (CT DPH) Asbestos Program  
[http://www.dph.state.ct.us/BRS/asbestos/asbestos\\_program.htm](http://www.dph.state.ct.us/BRS/asbestos/asbestos_program.htm)
  1. Licensed Asbestos Consultant – Inspector/ Management Planner
  2. Licensed Asbestos Consultant – Project Designer
  3. Licensed Asbestos Consultant – Project Monitor

D. Environmental Consultant Lists

1. Connecticut Department of Environmental Protection (CT DEP) and Environmental Professionals Organization of Connecticut (EPOC):
  - a. Licensed Environmental Professional (CT LEP)  
[http://www.ct.gov/dep/lib/dep/site\\_clean\\_up/lep/LEProster.pdf](http://www.ct.gov/dep/lib/dep/site_clean_up/lep/LEProster.pdf)
2. The Connecticut Dept. of Public Health (CT DPH):
  - a. Licensed Lead Abatement Consultants and Contractors  
[http://www.dph.state.ct.us/BRS/Lead/Licensing\\_lists/lp\\_liclead.pdf](http://www.dph.state.ct.us/BRS/Lead/Licensing_lists/lp_liclead.pdf)
  - b. Licensed Asbestos Consultants  
<http://www.dph.state.ct.us/BRS/asbestos/CONSULTANTS.PDF>
  - c. Licensed Asbestos Contractors  
<http://www.dph.state.ct.us/BRS/asbestos/contractors.pdf>
  - d. In-State Approved Commercial Environmental Laboratories  
[http://www.dph.state.ct.us/BRS/Environmental\\_Lab/in\\_state.pdf](http://www.dph.state.ct.us/BRS/Environmental_Lab/in_state.pdf)
  - e. Out-of-State Approved Commercial Environmental Laboratories  
[http://www.dph.state.ct.us/BRS/Environmental\\_Lab/out\\_state.pdf](http://www.dph.state.ct.us/BRS/Environmental_Lab/out_state.pdf)
  - f. State/Municipal/Industrial/Non-Commercial Environmental Laboratories  
[http://www.dph.state.ct.us/BRS/Environmental\\_Lab/Non\\_Commercial.pdf](http://www.dph.state.ct.us/BRS/Environmental_Lab/Non_Commercial.pdf)

E. Environmental Site Assessment (ESA) Process

ESA Components are generally presented in three major phases of investigation: Phase I, II and III. It may be cost effective to combine Phase I and Phase II or Phase II and Phase III for certain sites. Environmental Consultants may conduct activities consistent with Phase III for one part of the site, while conducting activities consistent with Phase I or Phase II for other parts of the site.

F. Phase I Site Assessment

A Phase I Site Assessment is an investigation of the existing and past uses of a site for the purpose of identifying areas on a site at which pollutants may have been released into the environment. Such areas may be identified as “Areas of Concern” or “Potential Release Areas.”

1. Site Reconnaissance/Visual Inspection & Observations:
  - a. Site and/or Existing Buildings
  - b. Record & Document Review
  - c. Interviews – Agencies & Key Persons
  - d. Historic Site/Building Uses/Prior Construction
  - e. Date of Construction
2. Report Preparation (submit within 180 days of on-site inspection)
3. Typical Phase 1 ESA Report Format:
 

Table of Contents:

  - a. Introduction
  - b. Site Overview
    1. Site information
    2. Potential receptors/environmentally sensitive areas
    3. Capsule geologic setting
  - c. Site History

1. Present uses
2. Former uses
- d. Regulatory Compliance History
  1. Regulatory identification
  2. Permits
  3. Inspection reports
  4. Enforcement history
  5. Documented releases
- e. Site Features
  1. Description
  2. Water supply
  3. Waste water disposal
  4. Material & waste handling
  5. Other likely source of releases
- f. Site Walkover Survey
  1. Investigators
  2. Observed activities
  3. Building interiors
  4. Indicators of contamination
  5. Potential contaminant pathways
  6. Potential off-site sources of contamination
- g. Findings, Conclusions and Recommendations
- h. Appendices

#### G. Phase II Site Assessment

A Phase II Site Assessment is an investigation of each “Area of Concern” or “Potential Release Area” to determine whether or not pollutants have, in fact, been released to the environment

1. Investigation
  - a. Ground penetration radar survey (GPR)
  - b. Sub-surface soil/groundwater testing
2. Soil excavation, soil test borings, sampling, lab testing & results

#### H. Phase III Site Assessment

A Phase III Site Assessment is an investigation that fully characterizes the nature and extent of contamination resulting from any release which has occurred on a site.

While remedial actions to abate pollution may be taken at any time in the course of characterizing a site, only after a complete Phase III investigation, can a final remedial action plan be developed.

#### A. Additional Investigation & Testing

1. UST’s (age, number, size & location)
  - a. Leaking or non-leaking
  - b. Contaminated Soil-Groundwater
  - c. Define scope or area
  - d. Quantify
  - e. Estimated Costs for Site Remediation
  - f. Remediation Action Plan (RAP)

#### I. Hazardous Waste

1. Treatment

- a. Process used to change the physical, chemical or biological character of a waste to make it less of an environmental threat.
- 2. Storage
  - a. Temporary Holding of waste prior to treatment.
- 3. Disposal
  - a. Approved Landfill Facility designed to permanently contain the waste & prevent release of harmful pollutants.
  - b. Recordkeeping/Reporting
  - c. Manifest Forms, Reports, Procedures are required for Transport/Facility Owners & Operators.
- 4. Additional Resources
  - a. US EPA, CT DEP Websites

**00045.1 Environmental/Hazardous Materials Review Guidelines**

Comply with all current Federal, State & Local Laws & Regulations, and CHFA Environmental/Hazardous Materials Review Guidelines (**See Appendix D**).

**00045.2 Mitigation**

Design and construction documents shall incorporate work necessary to mitigate environmental concerns identified by CHFA and the Owner's consultants unless these concerns are addressed prior to construction start and are outside the limits of the construction documents. Mitigation methods shall be in accordance with a plan prepared in conformance with applicable State and Federal regulations and accepted by CHFA.

**00045.3 Hazardous Material Notification**

In all developments involving demolition or rehabilitation, specifications shall be written to include the following:

"In carrying out the work of this contract, should the contractor encounter asbestos or other toxic materials the Contractor shall:

- 1. Notify all parties to this contract;
- 2. Notify applicable State and Local authorities; and (if the cleanup is to be carried out under the direction of the contractor)
- 3. Make application for permits necessary for removal (or other methods of mitigating the potential harmful effects) of such materials; and
- 4. Upon receipt of required permits mitigate potential harmful effects of such materials in accordance with permits and applicable Codes and Laws."

If the Contractor is not to be responsible for mitigation, the Sponsor/Developer/Owner shall carry out mitigation in accordance with the requirements as stated above.

**00050 Field Engineering Submission Requirements**

**00051 Boundary and Topographic Site Survey**

The purpose of these specifications is to designate and describe the minimum requirements for a boundary and topographic site survey for use in the design and construction of CHFA housing developments.

**00051.1 Property and Topographic Survey**

In general, the surveyor shall perform all field work necessary to accurately determine the location of property lines and existing physical conditions of the site, set monument markers, establish bench marks

and record on a Property and Topographic Survey, the information and data as required and hereinafter specified. The surveyor shall obtain such information and data from public and other records, including a review of underlying documents to current title work (within 30 days), as may be required to complete the work. All data and information required by these specifications shall be depicted and noted on a survey map in accordance with pertinent portions of Section 20-300b-20 of the Regulations of Connecticut State Agencies – Standards for Surveys and Maps. All surveys shall meet or exceed Horizontal Accuracy Class A-2 and Topographic Accuracy Class T-2 as defined herein, and shall be signed and sealed by a Connecticut licensed professional land surveyor.

A North Arrow with appropriate source reference (record map; CT Coordinate System; NAD27; NAD83; etc.) shall be depicted on every sheet.

A perimeter description shall appear on the face of the survey map. Said description shall conform entirely to the survey. Whatever form is utilized, the precise legal description shall be preceded by identification of the appropriate street address, if one is available. Acceptable forms of legal description are the “metes and bounds” or “course and distances” types. Any contiguous plot shall be described by a single perimeter description of the entire subject property. Division into parcels shall be avoided, unless such is requested so as to serve a special purpose. If the property is described as being on a filed map, the survey map shall specifically reference that filed map.

Two bench marks referenced to an established datum shall be marked on a permanent object adjacent to the site and clearly located and described on the survey drawing.

All boundary lines shall be labeled with bearings and distances.

All corners of the site and other boundary line intersections, not previously marked by a monument, shall be marked. Where existing structures preclude setting monuments at the intersection of property lines, a brass pin should be set in the property line extended, tagged and so noted, along with the distance from the true corner. At least one corner of the property shall be designated by course and distance from, or the coordinates of, a readily discernible reference marker. Position and description of each marker shall be depicted and labeled on the survey map.

The total area within boundary lines shall be designated on the map in both square feet and acreage. If the overall boundary is made up of individual parcels, the area of each parcel shall also be indicated.

#### **00051.2 Easements, Encroachments, and Improvements**

Indicate any and all servient and appurtenant easements by Book and Page, if any, the origin (e.g. Deed from A to B), if applicable, and nature. It is also desirable to describe an easement appurtenant to a fee parcel by using a separate parcel description.

Clearly indicate the location, dimensions and nature of (A) all encroachments upon the property; (B) all encroachments upon adjoining property, streets or alleys, by any buildings, structures or other improvements upon the property; and (C) all party walls between, with or adjoining the property and other property.

Indicate position, size and material of any and all improvements on the property, including buildings, retaining walls, decorative walls, areaways, driveways, paving, etc. Indicate the existence and location of off-site structures within 10 feet of the property lines. Indicate the location of any and all adjacent building lines. Note names of adjoining property owners.

### **00051.3 Trees**

Indicate location, species and size of trees over 6" in trunk diameter, measured at breast height (dbh).

### **00051.4 Roads and Rights of Way**

The following data shall be indicated on survey drawing for all streets, alleys, roads, highways and rights-of-way adjacent to the site:

- A. Dimensions and distances from property lines
- B. Type(s) and condition of material(s)
- C. Type(s) of curbs and gutters
- E. Elevations of sidewalks along edges nearest the site, at 20-foot intervals, at corners, and points of slope change
- F. Elevations of tops of curbs and flow-line of gutters, at 20-foot intervals, at corners, and points of slope change

### **00051.5 Utilities**

The following data pertaining to utilities adjacent to the site shall be depicted and noted on the survey:

- A. Location and type of available electric service, including lines, poles and manholes
- B. Location of water mains, hydrants and manholes, indicating size of water mains
- C. Location and size of gas mains, including type (low or high pressure)
- D. Location, size, direction of flow, pipe slope, and type(s) of material of sanitary, storm or combined sewer mains. Indicate public or private, and if use is exclusively for sanitary waste or storm water drainage. Indicate elevations of flow-line, "in" and "out" inverts, and locations of manholes.
- E. If a utility is not available at the site, it shall be noted whether or not, and where service is available in the community.
- F. List the company or governmental body of jurisdiction for all utilities.

Note that development of sites without access to sanitary service is discouraged, due to the costs associated with providing well-designed, efficient on-site wastewater treatment and disposal systems. Development of sites without access to public water and sanitary services will not be funded.

### **00051.6 Topography**

Elevations of the site shall be taken on a grid suitable to the topography and size of the site. Contour lines shall be at two-foot intervals. Elevations shall be marked on contour lines at regular intervals, and the reference datum shall be specifically stated.

### **00051.7 Miscellaneous Information**

Note other information pertaining to site conditions, e.g. abandoned foundations, ditches, culverts, mine shafts and tunnels (if visible or known), wells, sanitary drain fields, excavations, etc. Also indicate locations of any and all waterways, wetlands, and established floodplains and floodways.

In addition to other contractual services, the surveyor shall obtain and/or verify requisite information and data from public records, including names, locations, dimensions and elevations of streets, curbs, gutters, sidewalks, established building lines, easements, utilities, proposed improvements, condemnations, etc., necessary for, and incidental to, a completed site survey, preparation of the drawing thereof, and the certification by the surveyor that the data presented meets, at a minimum, the horizontal and topographic accuracy classifications specified in the referenced Standards to which the survey was prepared.

### **00051.8 Coordination with Legal Survey**

The survey shall meet the requirements of CHFA's Legal Department, including the long-form certification language included in section **00154.7**, item H.1. The survey shall also have the imprint of

the surveyor's seal. The "Surveyor's Certificate" is required to be executed, sealed and submitted to CHFA as a prerequisite to Initial Closing. Legal forms may be obtained from CHFA's Legal Department.

The surveyor shall cooperate with the Title Company, Abstractor or Attorneys selected by the Sponsor to furnish title information in connection with the site, in order that the numbering of certificates or opinions of title will correspond with the maps furnished by the surveyor. The surveyor shall review the Title Insurance Commitment/Policy to ensure the survey and the Title Insurance Commitment/Policy describe the same parcel of property. The survey must disclose, by exception item, Book and Page number, all easements, rights-of-way and encroachments set forth in the Title Insurance Commitment/Policy.

#### **00052 Investigation of Structures to be Rehabilitated**

If rehabilitation work is involved, the Owner/Developer shall commission licensed Architectural/Engineering professionals to conduct a physical assessment and evaluation of all building components to remain during the renovation. The findings shall be compiled into a Capital Needs Assessment (CNA) Report. In the case of a complete gutting of buildings, a Structural Needs Assessment Report by a Structural Engineer and Architectural Needs Assessment Report (to maintain functional and aesthetic integrity of such component) by an Architect are required (**see section 00152.4**)

#### **00053 Soil Boring Reports**

The soil survey is to be performed under the direction of a civil engineer registered in the State of Connecticut. The entire site is to be inspected to note variations in types of soils and ground water conditions. Locations for borings are to reflect varying site conditions. Special attention is to be given to boring locations in low or marshy areas, areas where there is a history or evidence of fill or where rock may be expected.

Soil borings are to be made with a drilling rig, taking samples as often as the character of the soil changes, and describing it in accordance with acceptable engineering standards. Samples are to be submitted to a soil specialist for analysis.

The engineer is to indicate the location of borings on a boundary survey and log the borings on the site plan or on a separate document. The logs are to use an exaggerated vertical scale to indicate, with acceptable key names and symbols, the nature of soil composition at each stratum to a depth of 15 to 20 feet.

For sites anticipating high-rise buildings, borings are to be concentrated in the area of the anticipated building location. At least one of these borings shall be drilled to a depth of 100 feet or to hardpan.

Borings are to be performed after buildings have been located on the site plan. There shall be a minimum of two borings per building for low-rise structures and at least two borings per wing for mid-rise structures with a minimum of three to four borings overall for this building type. Borings shall also be carried out in parking areas and roadways.

The engineer shall indicate bearing capacities of soils at various levels with a recommendation for the footing/foundation type for proposed structures and shall provide a recommendation for pavement design of roads and parking.

The engineer shall note ground water conditions such as high water tables, flood zones, etc. and make recommendations for remedies as needed.

### **00053.1 Soils Investigation for Previously Developed Sites**

Where proposed developments are to be located on previously developed sites, particularly developmentally-suspect “brownfield” sites, a soils investigation plan shall be submitted to the Authority and receive Authority agreement prior to Authority Feasibility. The intent of the plan is to determine the extent of underground debris, buried fuel tanks, contaminated soil, etc. that needs to be removed and/or remediated, in order to construct the proposed development’s buildings, parking, and utilities. The plan shall be based on the location of previous structures using a review of historical Sanborn Insurance maps, similar historical information, historical aerial photographs, previous environmental investigations, and the proposed location of future buildings, parking and utilities.

The plan shall call for test pit trenches, using a backhoe, to be dug across the width of all areas of previous structures. The extent of the test pit trenches shall be explicitly delineated in the plan. The extent shall be suitable to determine the amount and cost of debris removal and replacement of excavated materials. The test pits shall be a minimum of 18” wide and to the depth of virgin soil.

Prior to undertaking the soil investigation, and only after plan approval, the development team shall notify the Authority’s Technical Resource and Design staff as to the time and place of the investigation to allow Authority staff to observe the soil investigation. A complete soils report of the investigation, prepared by a qualified professional soils engineer, shall be submitted to the Authority. This soils investigation shall not remove the development team from the responsibility to carry out soil borings necessary to adequately determine the bearing capacity of the soil and recommend an adequate structural design for buildings, parking and utilities.

After the soils investigation and subsequent report, the developer, contractor and architect shall estimate the costs necessary to remove the underground debris and provide a “buildable” site. The costs shall be submitted to the Authority as a separate line item on the Authority’s Exploded Trade Payment Breakdown (ETPB) form. This line item shall also include costs necessary to cover all environmental remediation of the site. The Authority shall review the soils removal costs and the environmental remediation costs as part of the ETPB approval process for Feasibility.

The “soft costs” portion of the Pro Forma for the development, as included in the Feasibility and Commitment action by the Authority’s Board, shall include a contingency for the removal of underground debris, environmental remediation and site restoration to a “buildable” condition, in an amount equal to or exceeding 1.5% of the construction contract amount.

### **00100 Criteria for Evaluating Development Proposals**

In evaluating the suitability of a site or in selecting one proposal from several, CHFA considers a number of criteria, many of which are at cross-purposes and must be balanced against each other. Because the relative importance of each criterion will differ among various developments and communities, many of these standards cannot be stated in absolute terms. The following list will guide a prospective developer in site selection and design and shall direct CHFA in its evaluation:

#### **00100.1 Site Selection**

A site shall not be selected where the surroundings will detract excessively from the quality of development upon it, or where the development may have an adverse effect upon its surroundings. By considering issues such as lot orientation, storm-water management, access to transit, and minimizing street widths early on, many environmental benefits can be accrued at later stages of the project.

The following shall also be considered:

#### **A. Location**

1. Adjacent Uses and Densities

2. Open Space On- and Off-site
  3. Physical/Social Characteristics
  4. Adverse Influences (Railroads, Highways, Floodplains, Heavy Industry, Brownfields, etc.)
  5. Preservation of Historic/Scenic Features
  6. Proximity to:
    - a. Health Care Facilities
    - b. Social Services
    - c. Education
    - d. Places of Worship
    - e. Public Transportation
    - f. Shopping (Supermarkets, Pharmacies, Department Stores, Etc.)
    - g. Commercial Services (Financial, Legal, Etc.)
- B. Planning and Zoning
1. Minimum Lot Size/Frontage
  2. Use Restrictions
  3. Easements, Encroachments, and Rights Of Way
  4. Front, Rear and Side Yard Setbacks
  5. Density and Bulk Restrictions
  6. Maximum Lot Coverage by Buildings/Paving
  7. Parking Requirements
  8. Wetlands and Open Space Requirements
  9. Zoning Approval/Variance Procedures
- C. Land and Soil
1. Topography and Landforms
  2. Geo-technical Report (test pits/ borings)
  3. Soil Type and Composition
  4. Soil Bearing Capacity
  5. Illegal Dumping
  6. Hazardous Materials (HazMats)
  7. Proximity to Large Agricultural Enterprise (odors/insects/pesticides)
- D. Site Utilities
1. Determine accessibility, condition and age of public utility feeds; i.e. water, sanitary/storm sewer, electric, gas, communications
  2. Determine Green possibilities for placement of alternative energy systems to control utilities cost; i.e. solar heat/hot water, photovoltaic cells, geothermal
- E. Existing Structures
1. Previous building uses (gas stations, dry cleaners, factories, etc.)
  2. Structural viability of building and appurtenant structures
  3. HazMats
  4. Feasibility/expense of bringing building(s) up to Code
- F. Site Development Costs
1. Site selection determines limits of site development costs
  2. Administrative and Legal fees
  3. Environmental Testing and Reports
  4. Bring Site into Code compliance
  5. Removal of HazMats/remediation

### **00105 Development Costs**

Overall costs of development shall be considered in relation to the quality of the resulting development, and not only to the number of dwelling units constructed. Location, available services, ease of development, type of construction, quality of materials, size and number of units and amenities provided, all contribute to overall costs. The development budget shall be prepared and evaluated for what it provides, as well as overall and per dwelling costs. It must be supported by the rents generated by the marketplace. In particular, the following shall be considered:

Land costs shall be related to the location, amenities, and ease of development, as well as to the cost of land per dwelling unit

CHFA requires an independent appraisal of land costs by a real estate appraiser licensed in the State of Connecticut

Site improvement and building costs shall be consistent with the type and quality of the proposed development and reasonable in cost per dwelling. Costs shall be evaluated for their adequacy to provide construction which reduces the consumption of energy and the amount of maintenance required over the mortgage life of the development, and for the amenities planned in its design.

Reporting of costs shall be performed in accordance with the procedures and schedules specified by CHFA.

#### **00105.1 Construction Cost Effectiveness**

Cost efficient designs are strongly encouraged. Design solutions are anticipated to be creative and innovative, without compromising the quality of construction, energy efficiency and the durability requirements required by CHFA's Standards of Design and Construction. **(See Appendix E: CHFA Construction Cost Effectiveness Guidelines)**

#### **00105.2 Preliminary Construction Cost**

In order for CHFA to evaluate the construction costs for proposed developments, provide the following project data on the CHFA Project Information form **(see Appendix F)**, which must be updated and re-submitted for each phase of the design review process:

- A. Number of Buildings
- B. Total Project Square Footage (all buildings)
- C. Total Living Area (all dwelling units)
- D. Total Retail Area (all commercial spaces)
- E. Total Number of Units
- F. Total Common Area

#### **00105.3 Preliminary Cost Definitions**

##### **Common Spaces**

Community room areas, common kitchen, office, reception, maintenance, library, meeting rooms, common laundry, lounge, rest rooms, mail room, janitor closets, craft rooms, game rooms, conference rooms, mechanical/electrical rooms for common areas and common storage space.

##### **Residential Spaces**

Dwelling units (including the manager's unit), corridors and traffic areas through lobbies, vestibules, elevators, elevator lobbies, receiving, mechanical/electrical rooms for dwelling units, stairways, trash rooms and required tenant storage.

##### **Lobby Space**

The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space

#### Unit Net Area

All floor area inside finish surfaces of the enclosing walls (unit separation & exterior walls)

#### Unit Gross Area

Sum of floor areas included within outside faces of unit exterior walls and centerline of common or shared walls (including portions of basements and attics used for living space) and centerline of corridor walls.

#### **00105.4** CHFA Project Information Form

The CHFA Project Information Form (**see Appendix F**) is a breakdown of a proposed development's Building Use and Square Footage Information, Unit Distribution Information, and Net Square Footage by Unit type.

#### **00105.5** CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown]

The CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown] (**see Appendix F**) is a statement of Guaranteed Maximum Price (GMP) based on the projected costs developed by the Contractor for each of the 16-divisions of the MasterFormat 1995 standard filing system for architectural, design, engineering, and construction professionals. The CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown] serves as the Contractor's Requisition Template and Cost Certification Template, and must accompany all Tech Services review submissions, whether or not cost changes are proposed based upon additional detail and/or revisions to the construction documents.

#### **00105.6** Prevailing Wage Rates

When a project's Prevailing Wage Rates are established by the Connecticut Department of Labor, documentation and itemization of all Prevailing Wage Rates shall be provided to CHFA immediately upon receipt from the Department of Labor, and must accompany all Tech Services progress review submissions, whether or not cost changes are proposed based upon additional detail and/or revisions to the construction documents.

#### **00105.7** CHFA Cost Acceptance Limits

General Requirements: 4% of Total Hard Cost

Overhead & Profit: 12% of Total Hard Cost

Percentages remain the same for all Change Orders

Percentage Stacking is not allowed

#### **00110 Design Criteria**

A proposal shall demonstrate that location, orientation, and design of vehicular ways, parking areas, pedestrian routes, public outdoor space, buildings, street furnishings, service facilities, and plantings respond appropriately to the following concerns:

##### **00110.1** Layout and Facilities

Buildings shall be planned and located so that the spaces between them become positive elements in the site plan, and not just leftover portions of the site which happen not to be occupied by buildings. In this way, land which is defined by natural or man-made features, and developed purposefully, will contribute to the lives of the inhabitants by permitting fuller use and enjoyment of a site, by adding to a sense of

belonging and pride among the residents, by offering increased privacy, and by decreasing maintenance needs caused by vandalism and misuse. Buildings, roads, parking areas, recreational facilities, paths and landscaping of plants and site furnishings shall be related properly to each other, to the sun, to natural features, to topography and to views on and off the site, in a well-designed assembly that enhances their utility and enjoyment.

#### **00110.2 Vehicular Routes**

Vehicular routes for inhabitants, visitors and service needs shall be provided to ensure the privacy, wellbeing or safety of the inhabitants.

#### **00110.3 Parking**

Parking required for each dwelling shall not be permitted on any street designed for acceptance by the municipality. Parking areas shall be located and sized appropriately and shielded by topography or evergreen plantings so as not to intrude upon portions of the site designed for living and recreation. Parking lots of an area and location that dominate the dwellings are not acceptable. Sufficient numbers of deciduous trees in parking areas shall be planted to avoid the lots from becoming heat sinks. Snow storage areas shall be provided for snow cleared from the drive, parking areas, and walkways.

#### **00110.4 Landscaping**

Special considerations should be given to the landscaping of the site. Tree species shall be selected for form, size and rate of growth to provide for the sheltering of unwanted summer sun (usually mid-day and late afternoon) and storm or cold typical of the site, and for the admission of winter sunshine. Native, drought-resistant plants shall be selected according to conditions of exposure and according to color, texture, and other features that will enhance the attractiveness of the site. Root structures shall be considered for their required space, effects on nearby pavements, and possible interference with subsurface utilities. Plants shall be sized according to proper planting practice and shall be adequate to withstand normal abuse. Selected specimen shade trees should be of the largest caliber the project can afford, but in no case should the caliber be less than 3½”.

#### **00110.5 Pedestrian Routes and Recreation Areas**

Pedestrian routes and recreation areas shall be separated from vehicular ways to the fullest extent possible so as to provide safety to the inhabitants. Family housing developments shall be designed to provide routes which cross as few vehicular ways as possible and which are appropriate for children leading from dwellings to recreation areas, school bus stops and municipal streets. At least one of the pedestrian routes shall be made accessible to the handicapped.

#### **00110.6 Outdoor Seating Areas**

Handicapped accessible outdoor seating areas shall be provided in locations and numbers appropriate for the size of the development which they will serve. They shall be designed to permit the seating of small groups of people in a way which facilitates conversation, is related comfortably to surrounding features of topography, planting, and structures, is oriented for an appropriate view and collection of winter sunshine, and is sheltered from prevailing, fair weather winter winds and from summer sunshine. Some seating shall be planned in family housing developments to relate to children's play areas for use of attending adults, and in elderly housing developments to observe centers of activity on and off the site.

#### **00110.7 Outdoor Recreation Facilities**

Outdoor recreation facilities shall be provided consistent with the needs and size of each development, and its site characteristics. All equipment shall be constructed for durability, resistance to vandalism and misuse, and low maintenance. Playgrounds shall be located to avoid hazards and to provide handicapped accessibility, opportunity for parental supervision, and protection of privacy of nearby inhabitants. Proximity to common laundry facilities or other community centers shall be considered. Horseshoe,

shuffleboard or other recreational facilities for elderly use shall be related appropriately to outdoor seating areas, community facilities or other focuses of social gatherings. Gardening plots, playing fields, scenic walks or other features may be required.

#### **00110.8 Community Facilities**

Community facilities are required for clothes washing, social gathering, maintenance storage, management offices or other needs. Community facilities shall include a meeting room, toilet and kitchen facilities and (for elderly projects) recreation space for crafts.

#### **00110.9 Garbage, Trash and Recycling Facilities**

Provide interior spaces or site-built enclosures for commercially-manufactured recycling containers for recyclable materials such as newspapers, magazines, junk mail, glass, plastic, and aluminum, etc., in accordance with municipal recycling program requirements. Garbage, trash and recycling facilities shall provide sufficient volume for materials accumulated between collections. Dumpsters and large bins shall be used for family housing if regular municipal collection service is not available. Dumpsters and bins shall be placed on concrete pads. Enclosures shall be provided for all collection areas to maintain orderly collection, neat appearance, and sanitary conditions, to deter access by animals, to minimize hazards to playing children, and to provide protection from rain and snow. Locations and numbers shall be convenient to the inhabitants served and accessible to the collecting vehicle, but shall be placed, screened or related to other facilities so as to be unobtrusive.

#### **00110.10 Mailboxes**

Mailboxes, if provided in centralized, outdoor locations, shall be protected from weather, accessible to the mail carrier, convenient to the inhabitants, handicapped accessible, and located, screened or related to other facilities so as not to be obtrusive.

#### **00110.11 Exterior Lighting**

Exterior lighting shall be provided for walkways and parking areas, independent of dwelling unit lighting and shall be integrated with features of the site to provide a coordinated, harmonious and uncluttered streetscape. Lights shall not shine intensely upon windows of dwellings.

#### **00110.12 Storage**

Storage for all dwelling units shall be provided. Primary storage shall be located within the dwelling unit, including coat, linen and bedroom closet spaces (with minimum depth of 24"); secondary storage may be located within the dwelling unit, or in the same building accessible with sheltered passage.

#### **00110.13 Utilities**

Utilities shall be centralized wherever practicable to realize economies of efficiency in operation or maintenance. Layout of electrical distribution, and where possible of heat and water systems, shall be designed for separate metering whenever differential rates do not cause separate metering to be more expensive, in which case the installation shall be readily convertible to separate metering in the future. Electrical entrances shall be underground leading from a point where overhead service does not intrude upon the residential scale.

#### **00120 Building Design**

CHFA requires that housing provide not only shelter but also an environment conducive to social well-being. Each dwelling unit shall be designed to be a private shelter with all the amenities possible within a development budget. CHFA also requires construction which provides the greatest durability and economy over at least the term of the mortgage, consistent with other needs. To these ends, CHFA has identified a number of specific features which must be included in project development. Design

submissions shall demonstrate compliance with the specific requirements and shall respond to the preferences listed below.

#### **00120.1 Traditional Neighborhood Development**

Traditional Neighborhood Development (TND) is a comprehensive planning system that includes a variety of housing types and land uses in a defined area. A TND is served by a network of walks, paths, and streets, accommodating both existing and future modes of transportation, and allowing residents the option of walking, biking or driving. Public and private spaces have equal importance, creating balanced communities that serve a wide range of home and business owners. The inclusion of civic spaces – in the form of plazas, greens, parks and squares – enhances community identity and value.

**Housing Choice:** Dwelling units should differ in type and/or size, and serve different market segments/socio-economic categories. Unit types may include detached, duplex or townhouse, multifamily with/without elevator service, live/work, and accessory. Unit sizes may include less than 600 ft<sup>2</sup>, 600 to 1000 ft<sup>2</sup>, and more than 1000 ft<sup>2</sup>.

**Mixed Uses:** In addition to residential, a variety of commercial, civic, institutional and personal activities are in close proximity (within ½ mile). Uses may be mixed horizontally or vertically, and may include:

Everyday Retail (convenience and grocery stores, pharmacies and banks)

Discretionary Retail (restaurants, department stores and specialty shops)

Entertainment (movies, music and performance venues)

Education (public and private pre-, elementary and secondary schools, continuing/higher education)

Religious (churches, schools and cemeteries)

Government Services (post office, town/city hall, fire/police, courts, detention and motor vehicle)

Other Civic Buildings (transportation stations/terminals, community center, library and museum)

Offices (small professional/personal services)

Medical (hospital, clinic, and private offices)

Public Recreational (playing courts/fields, walking/hiking trails and public gardens)

Light Industrial (auto repair, warehouses, and nurseries)

Lodging

**Connectivity:** Efficiency/directness of travel between any two points within the development, and to destinations outside, including walks, paths, alleys, lanes, streets, avenues and boulevards. Routes are designed to accommodate a mix of travel modes, including motor vehicles, bicycles and pedestrians.

**Proximity:** In neighborhoods where activity centers are accessible by foot (within ¼ mile), residents walk more, put fewer miles on their cars, decrease the number of cars each household needs to own, maintain and store, and increase mobility for those unable to drive or own cars.

Activity centers include schools (pre-, elementary and secondary), parks and transit.

**Location:** Placement of a development, relative to the greater metropolitan or regional context, may reflect smart growth or leads to urban sprawl. Types of development sites include brownfield (vacant, industrial site available for redevelopment), greyfield (paved parking area available for redevelopment), infill (balancing, completing, repairing existing urban fabric), and greenfield (site in an undeveloped/natural condition). Brownfield, greyfield and urban/suburban infill developments, which primarily use existing thoroughfares, schools, transit and other infrastructure, are generally preferable to greenfield developments in farmlands, woodlands, and any areas outside of designated growth areas not served by major transportation corridors.

**Streetscape:** Thoroughfares and their associated spaces serve a variety of transportation modes, unify and organize adjacent buildings, and provide for public congregation and commerce. Formal streetscape

zones include private frontage (the privately-owned layer between building façade and property line), public frontage (publicly-owned layer between property line and the edge of vehicular lanes), and vehicular lanes (the space between curbs/pavement edges). Elements of streetscapes may include street geometry (lane and street width), frontage (width, curb radii, curb detailing, and sidewalk width/continuity), street planters (type and width, tree/plant selection and arrangement), continuity of built-out frontages to create urbanistic enclosure (proportion of building height to width from façade to façade), visibility of garages from opposite side of the street (not more than one at a time) and harmony of architectural ensembles composing the vertical dimension of the streetscape (balance of foreground and background).

Civic Space: Publicly-accessible gathering areas may include plazas (major space enclosed by frontages, with durable pavement for parking and trees, requiring little maintenance), squares (large space enclosed by frontages at the intersection of important streets, with paved walks, lawns, trees and civic structures, requiring substantial maintenance), greens (medium space surrounded by building facades for unstructured recreation, with grassy areas and trees, requiring little maintenance), and tot lots/playgrounds/gardens (small recreational spaces within urban blocks). Elements of civic spaces may include the ratio of enclosing building heights to civic space width, seating configurations for people watching, socializing and viewing scenery, mitigation of climatic extremes, perimeter thoroughfare or walk, and overall aesthetics of the urban fabric (harmony of street and civic space with topography and character of the land, and layered, deflected and terminated vistas, views and skyline).

Architectural Aesthetics: TND architectural design grows out of local geography, climate and topography, in contextual harmony with historic, vernacular design and building practices. Developments should provide/reflect accessible, safe environments (presence and arrangement of doors and windows – permeability vs. blank walls), facade elements which relate to residents and each other through proportion, massing, scale, rhythm and articulation, and patterns of light and shade. Iconography, ornamentation and symbolism should reflect building uses and purposes, and building materials should provide/reflect durability and permanence.

#### A. Neighborhood Scale Development

Developments that are fifteen acres or more may be evaluated by the following:

1. Housing Choice
2. Mixed Uses
3. Connectivity
4. Proximity
5. Location
6. Streetscape
7. Civic Space
8. Architectural Aesthetics

#### B. Block Scale Development

Developments that are more than three acres, but less than fifteen acres, may be evaluated by the following:

1. Housing
2. Mixed Uses
3. Connectivity
4. Proximity
5. Location
6. Streetscape
7. Architectural Aesthetics

### C. Lot Scale Development

Developments that are smaller than three acres may be evaluated by the following:

1. Housing should add to the housing choices available in the larger neighborhood
2. Mixed Uses
3. Proximity
4. Location
5. Streetscape
6. Architectural Aesthetics

#### **00120.2 Building Type**

**Two-family, Three-family and Four-family** buildings may be used for locations where the surrounding neighborhood has a prevailing residential character that would make more intensive forms of development appear out of place, where site area permits adequate space for each dwelling unit and where allowed by local zoning ordinances. Single-story dwelling units, in groups of two to four, shall have individual ground floor entrances protected from the elements by canopies or overhangs. Side-by-side dwelling units may be stacked, but the overall building height shall not exceed 2½ stories.

**Row-house** buildings may be used where the surrounding neighborhood has a prevailing residential character that makes more intensive forms of development appropriate, where site area permits adequate space for each dwelling unit and where allowed by local zoning ordinances. Building massing, the number of dwellings, and the relationship between buildings and other features shall be designed to reduce extended repetition of multiple units, and the sense that the numbers of units and buildings overwhelm an individual dwelling. Each dwelling shall be identifiable from the outside of the building and shall be distinguishable from adjacent dwellings by such features as changes of building line, entranceway, stair-tower, window lines, finish materials, roof lines, plantings or walks. Attached single-story and two-story dwelling units, in groups of five or more, shall have individual ground floor entrances, protected from the elements by canopies or overhangs. The overall building height shall not exceed 2½ stories. A private outdoor space for the enhancement of privacy and identity of the inhabitants shall be provided for each dwelling unit.

**Garden Apartment** buildings may be used where the surrounding neighborhood has a prevailing residential character that makes more intensive forms of development appropriate, where site area permits adequate space for each dwelling unit and where allowed by local zoning ordinances. Building massing, the number of dwellings, and the relationship between buildings and other features shall be designed to reduce extended repetition of multiple units, and the sense that the numbers of units and buildings overwhelm an individual dwelling. Single-story and two-story dwelling units, in groups of five or more, may have individual or common ground floor entrances, protected from the elements by canopies or overhangs. Dwelling units may be stacked, but the overall building height shall not exceed 3½ stories.

**Mid-rise Apartment** buildings, 4 to 7 stories in height, shall be considered appropriate only when land cost, site area, number of dwellings and surrounding densities warrant intensive forms of development and are allowed by local zoning ordinances, and shall be located, oriented, shaped and detailed to relate appropriately to the surrounding community. Mid-rise structures with a bulk massing that overwhelms the scale of other neighborhood development will not be acceptable. Stacked single-story and two-story dwelling units, may have individual or common ground floor entrances, protected from the elements by canopies or overhangs.

**High-rise Apartment** buildings, 8 stories or more in height, shall be considered appropriate only when land cost, site area, number of dwellings and surrounding densities warrant high intensity forms of development and are allowed by local zoning ordinances, and shall be located, oriented, shaped and detailed to relate appropriately to the surrounding community. High-rise structures with a bulk massing

that overwhelms the scale of other neighborhood development will not be acceptable. Stacked single-story and two-story dwelling units, may have individual or common ground floor entrances, protected from the elements by canopies or overhangs. Family housing will not be permitted in high-rise structures.

### **00120.3 Building Form**

**Orientation** of building access, public passageways, places for social gathering, common facilities, dwelling entrances, rooms and windows shall be related to sun direction, prevailing seasonal winds, views, nearby land uses, topography, natural features, vegetation, roads, drives, parking, recreation areas, other common facilities, walks, outdoor areas or any other features as may apply. All dwellings, especially Elderly units, should be oriented on an east/west axis with daytime living portions related to the sun to capitalize on natural light and passive solar heat. They should also be oriented, wherever possible, to provide a daytime view, for the interior living spaces and covered exterior porches of each dwelling, of any areas on or off the site where interesting activity may be observed, consistent with maintaining privacy.

**Shape** of buildings shall be designed to be appropriate to nearby existing development, to each other, to site improvements and to natural features. Sunlight, protection from winter winds, exposure to summer breezes and views shall be considered. Incorporate natural cooling systems: shading from deciduous trees (for east and west-facing glass), window overhangs and awnings (for south-facing glass), and radiant heat-reflective barrier installed in the attic space.

### **00130 Specific Design Standards**

These Design Standards are guidelines to features and facilities which the Authority has found essential for sound affordable housing. In exceptional cases, departures from the Standards may be considered through the Design Review Process by which they may be accepted, rejected, or result in modified design, depending on the circumstances. In the case of measurable or numeric Standards, minimum Standards may be exceeded, but maximums should not be exceeded.

#### **00130.1 General Building Arrangement**

Dwelling units shall be equipped with covered entryways that extend a minimum of three feet out from every exterior door.

Dwelling units shall not be located in basement spaces or where the finish floor of the habitable area is entirely below grade.

“Efficiency” units are acceptable only on a case-by-case basis, subject to CHFA review.

Row-house units of three-bedroom or larger size shall have their entry at grade level. Their habitable spaces may be placed on a second floor level, but not at third floor level or above. Adequate sound insulation must be provided between units on separate floor levels.

Site plans shall not concentrate three and four bedroom units into one area. Concentrating units in such a manner has an adverse impact on parking and site maintenance. Designing for diverse family types by providing a mix of single and multi-bedroom units is encouraged.

In all buildings that are designed to include a multiple number of dwelling units, an enclosed access shall be provided to any of those units that are located above grade. This access may be individual stair enclosures or common stair enclosures.

All units shall have a local area network (LAN) connection in the living/dining room and bedrooms.

CHFA prefers laundry facilities to be located in each dwelling unit. Units with three or more bedrooms shall have a clothes washer and dryer in the unit.

Provide a minimum of one and one half baths in a unit having three bedrooms, and two full baths in four bedroom units. In case of a townhouse type unit, a minimum of a half bath shall be provided on a non-sleeping floor.

### **00130.2 Common Space in Family Developments**

Family developments require community spaces for social activities, office space (including work areas) for rent up and continued leasing, maintenance spaces and storage space for flammable items. Proposed furnishings for Community Buildings shall be appropriate for the spaces to be furnished and for the intended residents.

### **00130.3 Buildings for Elderly Residents**

Physical limitations due to age and/or poor health shall be considered in the design of housing developments for elderly residents. Buildings designed for elderly residents shall be located at grade, or a minimum of two elevators shall be provided to serve upper dwelling unit levels. One such elevator shall be located and sufficiently sized (approximately 5' x 7') so as to facilitate move-ins/outs and emergencies (accommodate evacuees in prone position on EMS stretchers/folding gurneys).

### **00130.4 Handicapped Accessibility and Adaptability**

Housing, programs and services for qualified individuals with disabilities shall be provided in settings that are not unnecessarily separate, segregated or restricted. "Type A" barrier-free (handicapped-accessible) and "Type B" (adaptable to handicapped-accessibility) units shall be provided in accordance with federal law, Connecticut Code and requirements from program and financing institutions. Barrier-free units of different types and sizes shall be dispersed throughout the development. All new ground floor residential spaces shall be designed to be "visitable" by handicapped guests.

### **00130.5 Universal Design Features**

It is possible to design products and environments to suit a broad range of users, including children, older adults, and people with disabilities, people of atypical size or shape, people who are ill or injured, and people inconvenienced by circumstance. Consider providing universal design features in all dwelling units, to make them usable to the greatest extent by people of all ages and abilities, including the following:

- A. In dwelling units not required to be "Type A" (handicapped-accessible) units, provide all "Type B" (adaptable to handicapped-accessibility) features required by Connecticut Code
- B. Lever handles at all windows and doors; loop or louver pulls at cabinet doors/drawers
- C. Bathtub faucets/shower controls in an off-set location close to the outside rim of the tub
- D. Adjustable shelves and hanging rods in closets

### **00130.6 Common Spaces**

Management, mail pick-up and primary vertical circulation functions shall be grouped at the primary entrance and lounge.

All common facilities shall be accessible without passing directly through the lounge. If provided, medical and social services, central dining facilities and similar common facilities (including trash removal) shall be grouped in close proximity to the main circulation elements but in such a way that it is not necessary for a resident to pass through the lobby or the lounge to reach them.

The design shall provide easy "way finding" cues to distinguish location within a building. These cues can include clear organization in the design of space and circulation, plants, lighting, features, color (flooring, walls, and other features), furnishings, and consistent signs.

Provide glass panels adjacent to or in doors to common area rooms, allowing residents to see into a room before attempting to open the door.

Proposed furnishings for Common spaces shall be appropriate for the spaces to be furnished and for the intended resident, paying particular attention to the needs of elderly residents.

### **00130.7 Circulation**

Common corridors shall be a minimum of five feet wide. For reasons of eliminating visual and physical corridor length, the maximum length of a corridor shall be 150'. For the purpose of this measurement, a

corridor shall be defined as ending at any intersection with another corridor resulting in a visual terminus or where common space provides a significant visual break or offset. The length of travel from a unit to an elevator, and from the farthest unit to common dining and/or office facilities shall be minimized through building arrangement. No ramps shall be used in corridors.

**00130.8 Community Rooms**

All community rooms shall be provided with a kitchen that shall minimally have a double bowl sink, garbage disposal, a range/oven, a refrigerator, and a barrier-free workspace.

**00130.9 Crafts Rooms**

All crafts rooms shall be provided with a sink with gooseneck faucet and plaster trap. All craft rooms shall have negative air pressure.

**00130.10 Maintenance Space**

Common maintenance space shall be provided for storage and as a work area. Maintenance buildings or, in large buildings, maintenance spaces shall be provided at all developments. Buildings or spaces shall be heated and insulated, a bathroom for staff shall be provided. The maintenance space shall be approximately 400 square feet. Provision shall be made for the storage of flammable materials. Workbenches and storage shelves shall be provided within the maintenance space.

**00130.11 Common Laundry**

Common laundry rooms shall be provided with a table for folding laundry and a rod for hanging clothes. If feasible, common laundry rooms shall have a window to the exterior. Common laundry rooms shall have a floor drain. Common laundry rooms shall have a seating area within, immediately adjacent to, or in line of sight of the laundry room. All laundry rooms shall have negative air pressure.

**00130.12 Trash Compactor Rooms, Trash Chutes and Trash Rooms**

Trash compactor rooms shall be designed so that the trash gondola can be easily wheeled in and out of the space without sharp turns. A utility sink shall be provided in trash compactor areas/trash rooms for ease in cleaning. Wash-down sprayers shall be provided within the trash chute. Provide remote trash rooms as needed such that residents do not have to carry trash through the main lobby in order to dispose of it. In multi-story apartment buildings, provide barrier-free resident access to the trash chute or trash room on each floor. All trash rooms shall have negative air pressure.

**00130.13 Signs**

All interior signs shall be consistent with applicable building codes.

**00130.14 Package Shelves**

Where dwelling unit entries are accessed from common corridors, and are designed for a multiple number of units for elderly residents, a package shelf of a minimum area of one square foot (ft<sup>2</sup>) shall be placed immediately outside the entry to each dwelling, and at each elevator on the first floor of high-rise developments. Corners protruding more than 1½" shall be rounded or chamfered (45°).

**00130.15 Dwelling Unit Design**

The adequacy of the design of dwelling units shall, for the greatest part, be measured by the dwelling units "furnishability", minimum room dimensions, and the inclusion of several key components. Furniture layouts shall be included on all Step I and Step II unit floor plans. All units, unless otherwise noted, shall meet the following requirements:

- A. Living Area (Minimum dimension of 11'-6"):
  - Sofa: 36" x 84"

Two chairs: 30" x 36" (one additional chair for three bedroom units)  
Television on a table: 20" x 36"  
Table: 18" x 30"

- B. Entrance Area (including a 2' x 3' coat closet):  
Entry door shall be 3 feet in width.

- C. General Storage (near an exterior door):  
Where no basement is provided:  
Single Room Occupancy (SRO)/One-bedroom: 15 sq. ft.  
Two-bedroom: 18 sq. ft.  
Three-bedroom: 22 sq. ft.

1. In buildings with multiple units for elderly residents, storage may be located in cubicles located in common area storage rooms.

- D. Dining Area (minimum of 42" from table edge to a wall or another piece of other furniture):  
Table 3'-6" x 3'-6" or 4'-6" diameter to accommodate four (accommodate six in three-bedroom units)  
Buffet or sideboard: 18" x 42"

- E. Kitchen (minimum of 60" between counters at dead ends):
1. Single bowl sink, with garbage disposal and 18" of counter space each side and task light above
  2. ENERGY STAR® rated Dishwasher: 24" wide (18" wide acceptable for SRO units), adjacent to or in close proximity to the sink
  3. Range/Oven: 30" wide (24" wide acceptable for SRO units), with 18" of counter space each side
  4. ENERGY STAR® rated Range Hood: 30" wide, Recirculating-type, with task light
  5. ENERGY STAR® rated "Frost Free" Refrigerator/Freezer: Width as determined by dwelling unit type/storage requirements, with 18" minimum counter on latch side and cabinet above
  6. Side-by-side or bottom freezer refrigerators, or top freezer units specifically designed for accessibility in barrier-free designed units.
  7. Natural light shall be provided; borrowed light from pass-throughs and open areas over cabinets is acceptable.
  8. Cabinets at a pass-through shall allow a vertical opening of 24" minimum.
  9. In housing for elderly residents, overhead kitchen cabinets shall be placed 15" above the counter top, except as otherwise required for accessibility by handicapped residents. Exceptions to this requirement shall be at pass-throughs and ranges, where cabinets shall be placed 24" above the work surface.
  10. Appliance and cabinet doors and drawers shall not conflict when operated simultaneously.
  11. Counter top work surface shall provide a minimum of 6 lineal feet with wall cabinets above and base cabinets below (split evenly between drawer bases and door bases).
  12. In housing for elderly residents, counter space and an electrical outlet for a counter top microwave oven shall be provided.
  13. Pantries are desirable, especially in barrier-free designed units.

- F. Master Bedroom (Minimum dimension of 10'-6"):  
Queen bed: 60" x 80" (Elderly Housing: two twin beds: 39" x 78" each with 24" between)  
Dresser: 18" x 52"  
Chair: 18" x 18"  
Two nightstands: 18" x 18" each  
Closet with six lineal feet of hanging rod

- G. Secondary Bedroom – Elderly (Minimum dimension of 10'-0"):
  - Double bed: 54" x 80"
  - Dresser: 18" x 42"
  - Chair: 18" x 18"
  - Nightstand: 18" x 18"
  - Closet with five lineal feet of hanging rod
- H. Secondary Bedroom – Family (Minimum dimension of 10'-0"):
  - Two twin beds: 39" x 78" each and 18" between
  - Dresser: 18" x 42"
  - Closet with four lineal feet of hanging rod
- I. Linen Closet:
  - Near bathroom with two lineal feet and five shelves
- J. Bathroom:
  - In all dwelling units visitors shall have access to a water closet and lavatory without having to circulate through a bedroom.
  - Water Closet
  - Bathtub and/or shower
  - Lavatory in a 42" w. vanity base (vanity top in barrier-free units) with 12" w. drawer base
  - Mirror
  - Medicine cabinet
  - Toilet paper holder
  - (2) Towel bars
  - Grab bars, as required
- K. Outdoor Space:
  - Provide a patio of 80 ft<sup>2</sup> minimum (8'-0" least dimension) at all ground floor units.
- L. Circulation:
  - All interior dwelling unit doors within units designed for elderly residents shall be 36" wide.
  - No "winders" shall be included in stair runs.

**00130.16 Acoustical Ratings:**

Acoustical or Sound ratings for wall and floor/ceiling assemblies shall be STC 50 within living units in bathrooms and bedrooms, STC 52 between living units, and between living units and public corridors. Acoustical or Sound ratings for wall and floor/ceiling assemblies shall be STC 55 between living units and other noisy public spaces, such as lobbies, stairs, elevators, mechanical rooms, etc. Materials with adequate mass and sound isolation design shall be selected. Acoustical sealant shall be used to seal all joints. Sound "leakage" through openings for mechanical and electrical pipes, conduits or boxes shall be avoided. Sound isolators shall be used for equipment to prevent impact sound transmission.

**00140 Special Rehabilitation Standards**

Refer to Appendix B for CHFA Rehabilitation Design Standards.

Refer to Appendix C for CHFA Replacement Criteria.

In rehabilitations, design documents shall be prepared to assume that wood floor joists in existing kitchens and bathrooms have rotted and are to be replaced unless investigations prove otherwise. Other areas of special consideration shall be rafters and sleepers.

### **00145 Pre-Design Meeting**

An initial discussion between the Development Team and CHFA staff from Underwriting, Technical Services, Asset Management, and other Authority departments as may be required, is recommended. The purpose of the Pre-design Meeting is to explain the CHFA Design Review Process, to discuss applicable requirements, introduce CHFA's Standards of Design, discuss programmatic parameters and amenities for the development, and to review the development schedule. The Development Team is encouraged to present at this meeting any conceptual sketch design drawings that may have already been developed. It should be noted that CHFA Standards of Design and Construction may be more restrictive than local planning and zoning requirements. As such, the local municipality's planning and zoning review/approval process should be concurrent with the CHFA Step I – Pre-Application: Pre-design/Site Analysis/Concept/Feasibility review process.

### **00150 Design Review Process**

It is necessary that the programming, planning, design and construction of housing developments be based on a logical, step-by-step process that proceeds from the general to the specific, from the overall to the detailed. Such a process will also provide CHFA with a rational sequence for the review of applications for financial assistance.

Design Review Process:

Step I – Pre-Application: Preliminary Design/Concept/Site Analysis/Feasibility

Step II – Full Application: Design Development

Step III – Final Review: Construction Documents Development

Step IV – Initial Closing: Construction Documents/Commitment/Pre-Construction Meeting

Projects will be evaluated by CHFA Technical Services at each stage. The intent, content and requirements of each phase are outlined herein. Early communication with the Authority, and adherence to these requirements, will insure expeditious processing of applications and minimize the need for modifications. Each submission is to include the following basic information:

#### **00150.1 Drawings**

All drawings must be numbered, and contain a graphic and lettered scale, north arrow and sheet title.

#### **00150.2 Title Sheet**

A Title Sheet with development location, including location map, names and contact information for the Sponsor, Architect, Landscape Architect, Site Planner, Surveyor, Engineer and any other special consultants, revision dates, CHFA number, index of drawings.

#### **00150.3 Area Tabulations**

The following spaces in elderly buildings shall be designated **Common Spaces**: community room, common kitchen, office, reception, maintenance, library, meeting rooms, common laundry, lounge, rest rooms, mail room, janitor closets, craft rooms, game rooms, lobbies and common storage space. The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space. **Residential space** shall consist of dwelling units (including the manager's unit), corridors and traffic areas through lobbies, vestibules, elevators, elevator lobbies, receiving, mechanical, electrical, meter rooms, stairways, trash rooms and required tenant storage. Common spaces in family developments shall include community buildings, maintenance spaces, common laundries and common storage space.

In order to provide a standard measure of unit sizes for housing financed by CHFA, "Net Area" and "Gross Area" are defined as follows:

Unit Net Area:

All floor area inside finish surfaces of the enclosing walls (unit separation).

Unit Gross Area (town houses, stacked flats, other configurations without common or shared space):  
Sum of floor areas included within outside faces of unit exterior walls and centerline of common or shared walls; basements are not included.

Unit Gross Area (high-rise, mid-rise, garden apartments, other configurations which include common or shared space):

Subtract the sum of the total Unit Net Areas from the Building Gross Area, divide the remainder by the number of units, and add the result to the Unit Net Area for each unit.

Building Gross Area (town houses, stacked flats, other configurations without common or shared space):  
All floor area, including construction and shaft spaces within the building, measured from the outside of the exterior walls; spaces only partially enclosed, such as balconies, entrance canopies, etc., are not included; basements in town houses are not included.

Building Gross Area (high-rise, mid-rise, garden apartments, other configurations that include common or shared space):

All floor area, including construction and shaft spaces within the building, measured from the outside of the exterior walls shall be included; spaces only partially enclosed, such as balconies, entrance canopies, etc., are not included; floor areas of non-housing, such as commercial spaces, are not included; basements with common space that has a housing use are included.

#### **00151 Step I - Preliminary Application: Pre-design/Site Analysis/Concept/Feasibility**

The purpose of the site analysis and feasibility submission is to prepare a detailed graphic and written analysis of the site and its characteristics to use as a basis for further plan development, and to develop a conceptual plan, using the site analysis as a basis, which relates to the characteristics of the site and conveys the basic intent of the plan that will be developed.

As CHFA Standards of Design and Construction may be more restrictive than local planning and zoning requirements, is intended that the CHFA Step I - Preliminary Application: Pre-design/Site Analysis/Concept/Feasibility review process be completed in conjunction with, and prior to final site plan approval by the local municipality.

##### **00151.1 Architectural Site Review**

This phase shall identify the character, structure and potential of the site. In order to identify these characteristics, and to rely upon them to inspire proper land use, the items listed below should be considered and analyzed. This analysis is to be done not only for the site, but also for those contiguous areas that influence the design and use of any proposed development.

#### **A. Contiguous Land Use**

1. Type and impact of adjoining land use and planned land use
2. Direction and distance to community services, hospitals, shopping, etc.
3. Public transportation route and stops

#### **B. Topography**

1. Basic topography
2. Special or unique ground formations
3. Percent of slope

- C. Drainage
  - 1. Natural watershed (direction)
  - 2. Drainage swales
  - 3. Bog and swamp areas, designated wetlands, floodplains and floodways
  - 4. Soils Studies (if available):
  - 5. Depth and analysis of topsoil indicating basic soil types and their characteristics
  - 6. Locate soil borings and present data (may be a separate report)
  
- D. Vegetation
  - 1. Locate and identify existing tree masses
  - 2. Locate and identify specimen plant material
  - 3. Indicate type of ground cover
  
- E. Climatology
  - 1. Prevailing wind direction
  - 2. Sun angle/shading (potential for passive solar design)
  - 3. Tempering factors created by site character
  
- F. Existing Conditions
  - 1. Structures
  - 2. Utilities (size, capacities, depths)
  - 3. Circulation
  
- G. Special Features
  - 1. Lakes and ponds
  - 2. Special land features, rock outcroppings, etc.
  - 3. Dramatic views
  
- H. Legal Requirements
  - 1. Easements, Rights of Way or other special conditions
  - 2. Planning and Zoning (setbacks, site access, building height limitations, densities, parking, carports and garages, local municipality site plan parameters, etc.)
  
- I. Dwelling Units
  - 1. Allowable site density
  - 2. Types of dwelling units (differentiated by number of bedrooms, floor areas, configurations)
  - 3. Distribution of total number of dwelling units
  
- J. Community Facilities
  - 1. Anticipated management and maintenance spaces
  - 2. Anticipated indoor and outdoor community recreational and social spaces
  
- K. Non-residential Facilities
  - 1. Anticipated facilities.
  
- L. Standards
  - 1. Requests for variance from CHFA Standards of Design (if necessary)
  - 2. Variances, Special Use permits, etc. necessary to the concept

### **00151.2 Site Analysis/Concept/Feasibility Meeting**

The Development Team (Owner, Architect and GC) meets with CHFA staff to present the Site Analysis/Concept/Feasibility Submission. Documents, prepared in accordance with CHFA Site Analysis/Concept/Feasibility Submission Requirements, are submitted to the assigned Underwriter for distribution to Technical Services, Asset Management and other Authority departments as may be required.

The specific requirements of certain funding programs may determine the time-sensitivity of the Site Analysis/Concept/Feasibility Submission. Site Analysis/Concept/Feasibility Meetings are not required for developments applying for 4% and 9% tax credits.

### **00151.3 Preliminary Application Submission Requirements**

The Site Analysis/Concept/Feasibility submission requirements are as follows:

- A. Provide a proposed program statement for the development, which provides guidelines for the conceptual plan based on the market, detailed graphic and written analysis of the site and its characteristics and other development considerations.
- B. Area Tabulations:
  1. Common Spaces
  2. Residential Spaces
- C. Preliminary Drawings:
  1. Title Sheet with development name/address/location map, names/contact information for the Developer, Architect, Landscape Architect, Site Planner, Surveyor, Engineer and other consultants, revision dates, CHFA number, index of drawings
  2. Site Plans with rough grade information
  3. Building Plans and Elevations/Unit Floor Plans
  4. All drawings must be numbered and include a graphic and lettered scale, north arrow and sheet title
- D. CHFA Outline Specification Form Exhibit 15 indicating the proposed major materials and systems to be incorporated into the project (**see Appendix F**)
- E. Architect's qualifications in accordance with CHFA requirements (**see section 00020.1**)
- F. Preliminary construction cost. In order for CHFA to evaluate the construction costs for proposed developments, provide the following project data, which must be updated for each phase of the design review process:
  1. Number of Buildings
  2. Total Project Square Footage (all buildings)
  3. Total Living Area (all dwelling units)
  4. Total Retail Area (all commercial spaces)
  5. Total Number of Units
  6. Total Common Area (community room, common kitchen, library, community meeting rooms, common laundry, lounge, rest rooms, mail room, craft rooms, game rooms, fitness facilities, child care facilities, lobbies and common storage space. The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space)
  7. Total Management Area (office, reception, conference rooms, janitor closets, maintenance work areas and storage, and mechanical rooms.

- F. Contractor's qualifications in accordance with CHFA requirements (**see section 00020.3**)
- G. Preliminary Capital Needs Assessment (CNA) [for rehabilitation projects], and environmental and geo-technical reports

**00151.4 Preliminary Application: Pre-design/Site Analysis/Concept/Feasibility Review**

Subsequent to the Site Analysis/Concept/Feasibility Meeting, Technical Services staff will review and issue formal comments on the submitted documents according to a checklist based on CHFA Standards of Design and Construction 2008. The Developer's Design Team shall then prepare and submit a written response to CHFA, including comments and desired variances from CHFA's Standards of Design and Construction. When requesting a modification or waiver, the Development Team shall provide compelling reasons for CHFA to consider in granting a variance. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard "clouds". All drawings that are to be developed for use in the construction of the development shall be coordinated to allow printing on the same standard sized print pages, and shall be bound together as a complete sets.

**00151.5 Prior Start of Construction**

Although timing issues in the development of a project may create circumstances which would seem to make starting construction prior to CHFA Initial Closing advantageous, CHFA strongly discourages Owner/ Developers from such a course of action, which would be entirely at their own risk. If the Owner/ Developer finds that there is no other viable alternative, and chooses to assume total liability for all construction costs and fees (including those for a CHFA Field Observer) incurred prior to CHFA Initial Closing and the recordation of a mortgage, and all liens and encumbrances resulting possibly therefrom, a Request for Permission to Commence Construction form (**see Appendix F**) may be executed and submitted to CHFA. Additional information and documentation are also required, such as proof of ownership of the project site/buildings/appurtenances, building permits, commencement date and construction schedule, professional service and construction contracts and insurance policies, environmental assessment and implementation plans, construction drawings and specifications, and CHFA cost breakdown forms. In addition, a Pre-construction Meeting with the Owner/Developer, Architect, General Contractor, Bonding Company representative, and CHFA Field Observer and Technical Services staff, must be held at CHFA.

All support documentation submitted with the Request for Permission to Commence Construction form must meet all CHFA Standards of Design and Construction, and the Owner/Developer will be responsible for revisions and resubmission as required by Technical Services' subsequent reviews.

The Owner/Developer must understand that CHFA will not be responsible for any liens or any other objection to title, which might result from the fact that construction of a project commenced prior to CHFA Initial Closing and the recordation of a mortgage, and will not in any respect be deemed to have approved the title prior to closing of the transaction. In addition, it must be understood that CHFA acceptance of a prior start of construction for a development will not in any respect be deemed to obligate CHFA to complete the transaction.

**00152 Step II - Full Application: Design Development**

For all developments, including those receiving Low Income Housing Tax Credits and developments financed with Tax-exempt Bonds:

The purpose of this step is to definitively set forth and agree upon a design solution consistent with the Site Analysis and Site Concept, the Authority's Standards, the construction budget available to the development and, appropriate to, the needs of the anticipated future residents.

### **00152.1 40% Construction Documents**

The 40% Construction Documents shall illustrate and describe the refinement of Preliminary Design Documents, establishing scope, character, relationships, form, size and appearance of the Development, by means of plan, section, elevation, typical construction detail and equipment layout drawings. The 40% Construction Documents shall also include outline specifications, which identify and generally establish the quality of proposed major materials, equipment and systems. Other documents required at this stage shall include: cost estimates, recommendations for the phasing of construction, site plans, landscape plans, and mechanical/electrical plans. All drawings that are to be developed for use in the construction of the development shall be coordinated to allow printing on the same standard sized print pages, and shall be bound together as a complete sets.

### **00152.2 Site Plan**

The Site Analysis/Feasibility plan shall be further developed for Step II. The Design Development Plan shall refine the arrangement and functional groupings of units to a more exact scale to create a meaningful sequence of usable spaces. Specific relationship of unit arrangement, of the structure to the site, site grading, circulation, lighting, paving, screening, setbacks, parking, play areas and recreation areas shall be presented, including:

- A. Structures:
  - 1. Location, shape, size, arrangements and groupings
- B. Circulation and Parking:
  - 1. Indicate location and materials of vehicular and pedestrian routes
  - 2. Indicate parking/dwelling unit relationship, location and number of spaces
- C. Soils:
  - 1. Depth and analysis of topsoil
  - 2. Locate soil borings and present data (may be a separate report)
- D. Utilities:
  - 1. Indicate general major utility layout, easements and connections
  - 2. Irrigation source and pressure
- E. Recreation:
  - 1. Location and type of facilities
- F. Grading:
  - 1. Resolve special and typical relationships
  - 2. General character, existing and proposed contours at 1' intervals, section, etc.
  - 3. Berms and mounds
  - 4. Storm water management; Detention and Retention areas
  - 5. Planting:
    - a. Indicate character
    - b. Indicate screening concepts, relationship to units and open space, etc., with sections or sketches
- G. Lighting:
  - 1. Location and Character (catalog illustration), height, wattage and photometric information (provide a separate Site Lighting Photometric Plan indicating conformance with CHFA-required exterior illumination levels)

H. Survey (see section 00051)

**00152.3 Residential and Community Building Plans**

Definitive designs for typical dwelling units, residential buildings and community building(s) shall be developed and submitted to CHFA. These designs shall be based on careful study of the development program and concept plan.

A. Dwelling Unit Schedule:

1. Total number of units
2. Number and percent of total of each unit type
3. "Net Area" and "Gross Area" of each unit type

B. Dwelling Unit Design Development:

1. Floor plans and sections (with dimensions), as required, at 1/4"=1'-0" scale for each unit type (including door swings, doors and window locations)
2. Room area, dimensions and designation of each room and space (including storage).
3. Demonstration of the "furnishability" of each unit type
4. Plans and elevations of typical residential buildings (groups of town houses) at 1/4"= 1'-0" scale
5. Indicate basic construction technique and exterior materials. Key residential building plans to site plan

C. Community Facilities:

1. Floor plans, sections and elevations (with dimensions) at 1/4"= 1'-0" scale of community building(s)
2. Indicate furnishings and room areas
3. Gross area of community building(s)

D. Non-residential Facilities:

1. Plans and elevations of commercial and other nonresidential facilities included in development as appropriate

E. Additional Information:

1. Such information as is necessary to fully illustrate development conditions (study models and perspective sketches are desirable)

**00152.4 Design Development Submission**

The Development Team (Owner, Architect and GC) meets with CHFA staff to present the Design Development Review Submission. Documents, prepared in accordance with CHFA Design Development Review Submission Requirements, are submitted to the assigned Underwriter for distribution to Technical Services, Asset Management and other Authority departments as may be required.

The specific requirements of certain funding programs may determine the time-sensitivity of the Design Development Review Submission.

**00152.5 Design Development Submission Requirements**

Submit one copy of each of the following documents to CHFA for review:

A. Design Development drawings shall be Construction Drawings at a 40% level of completion, with dimensions on major common areas and typical units. They shall also indicate types and sizes of mechanical and electrical systems, including basic layouts, equipment, materials and operations, and typical building sections, wall sections and details.

1. Design development drawings are Construction Drawings at a 40% (min.) level of completion, in accordance with requirements for financing consideration by the Authority's Board of Directors:
  - a. Drawing titles, sheet numbers, graphic and lettered scales, and a north arrow
  - b. Dimensions on major areas, typical dwelling units and community facilities
  - c. Types and sizes of building systems and equipment
  - d. Typical wall sections and details
  - e. Provide a rectangular space 1¼" h. x 3½" w. in the upper right corner of all drawings for the CHFA 5-party Initial Closing stamp
2. Title Sheet:
 

Development location, including location map, names and contact information for the Sponsor, Architect, Landscape Architect, Site Planner, Surveyor, Engineer and any other special consultants, revision dates, CHFA number, index of drawings and development data summary.

  - a. Development Data Summary:
    1. Area Tabulations for Residential Spaces and Common Spaces
    2. Unit Net Area
    3. Unit Gross Area
    4. Building Gross Area
3. Property Survey, which shall:
  - a. be prepared by a Land Surveyor registered in the State of Connecticut
  - b. be prepared in accordance with Sections 20-300b-1 through 20-300b-20" of the "Regulations of Connecticut State Agencies" and the "Standards for Surveys and Maps in the State of Connecticut", as adopted by the Connecticut Association of Land Surveyors, Inc., as a Property Survey, the Horizontal Accuracy of which is A-2
  - c. comply with current ALTA/ACSM Land Title Survey standards
  - d. note Land Record document references
  - e. depict and label established benchmark and reference datum
  - f. include the CHFA-required long-form certification language (see **00154.7**, item H.1)
4. Topographic Survey, which shall:
  - a. be prepared by a Land Surveyor registered in the State of Connecticut
  - b. be prepared in accordance with Sections 20-300b-1 through 20-300b-20" of the "Regulations of Connecticut State Agencies" and the "Standards for Surveys and Maps in the State of Connecticut", as adopted by the Connecticut Association of Land Surveyors, Inc., as a Topographic Survey, the Vertical Accuracy of which is T-2 or T-3
  - b. depict contours at 2 ft. intervals, clearly labeled
  - c. depict spot elevations
  - d. depict locations of buildings/retaining walls
  - e. depict ditches/streams
  - f. depict the positions of stream channel encroachment lines
  - g. depict the positions of flood plain lines
  - h. depict manholes/catch basins/culverts
  - i. depict underground/overhead utility lines/sizes
  - j. depict poles/fire hydrants
  - k. depict streets/drives/walks
  - l. depict fences/hedges/boundaries of wooded sections
  - m. depict isolated trees 6" dbh and greater (labeled for size and type)
  - n. depict any other man-made or natural features which would interfere with developing the property
  - o. label invert elevations
  - p. label storm and sanitary sewers, steam lines, bottom(s) of electrical duct bank(s), etc. at manholes
  - q. depict existing underground structures and elevations (to the extent locatable)

- r. depict or note the presence of underground tanks, water lines and other utilities, including valve boxes serving the area
  - s. depict street R.O.W. lines within 300 ft. of contemplated construction
  - t. depict the location and elevation of each boring and/or test pit
  - u. depict any wetlands (as delineated by a Certified Soils Scientist), watercourses or other bodies of water, within or bordering the survey area
  - v. include legends for graphic symbols (manholes, utilities, etc.) and abbreviations
5. Site Plan (Further-developed Site Analysis Plan):
- a. The arrangement and functional groupings of units refined to a more exact scale
  - b. A meaningful sequence of usable spaces
  - c. Specific relationships of unit to structure, and structure to site
  - d. Structures
    - 1. Location, shape, size, arrangements and groupings
  - e. Circulation and Parking
    - 1. Location and materials of vehicular and pedestrian routes
    - 2. Parking/dwelling unit relationship, location and number of spaces
  - f. Soils (may be a separate report)
    - 1. Depth and analysis of topsoil
    - 2. Soil boring locations and data
    - 3. Soil testing locations must include areas within proposed building footprint(s)
  - g. Utilities
    - 1. General major utility layouts, easements and connections
    - 2. Irrigation source and pressure
  - h. Recreation
    - 1. Location and type of facilities
  - i. Grading
    - 1. Existing and proposed contours at 2' intervals (minimum – subject to drawing scale and site conditions depicted)
    - 2. Site Section
    - 3. Resolve special and typical relationships
    - 4. Berms and mounds
    - 5. Storm water management; Detention and Retention areas
  - j. Planting (site sections or perspective sketches)
    - 1. General design character
    - 2. Screening concepts
    - 3. Relationship to units and open space, etc., with sections or sketches
  - k. Lighting
    - 1. Location and Character
    - 2. Catalog illustrations
    - 3. Height, wattage and photometric information
    - 4. Separate Site Lighting Photometric Plan
6. Residential Building Plans
- a. Definitive designs for typical dwelling units, based on careful study of the development program and concept plan.
  - b. Dwelling Unit Schedule
  - c. Total Number of Units
  - d. Number and Percent of Total of Each Unit Type
  - e. “Net Area” and “Gross Area” of Each Unit Type (see handout)
  - f. Gross Area of Community Building(s)
7. Dwelling Unit Design Development
- a. Floor plans and building sections (with dimensions)

1. ¼ " = 1'-0 " scale for each unit type
2. Door and window locations
3. Door swings
4. Room area, dimensions and designated use of each room and space (including storage)
- b. Demonstration of the “furnish-ability” of each unit type
  1. Separate Furniture Layout Plans for all unit floor plans
- c. Floor plans and elevations of typical residential buildings
  1. ¼ " = 1'-0 " scale for each unit type
  2. Basic construction techniques and exterior materials
  3. Door swings
- d. Key dwelling unit plans to building plans, and building plans to the site plan
8. Community and Non-residential Building Plans
  - a. Floor plans, building sections and elevations (with dimensions)
  - b. ¼ " = 1'-0 " scale for each unit type
  - c. Door and window locations
  - d. Door swings
  - e. Room area, dimensions and designated use of each room and space (including storage)
  - f. Demonstration of the “furnish-ability” of community spaces
  - g. Separate Furniture Layout Plans for all facilities
  - h. Basic construction techniques and exterior materials
  - i. Key community building plans to the site plan
9. Residential and Non-residential Building HVAC, Fire Suppression and Electrical Plans at a 40% level of completion (**see 00152.5.A**).
10. Outline Specifications/Project Manual
11. Additional Information
  - a. Study models and perspective sketches as may necessary to fully illustrate development conditions

#### B. Construction Cost Breakdown

All submissions of updated construction documents require submission of signed CHFA/DECD Consolidated Application, Project Cost Summary, Construction Schedule of Values [f.k.a. CHFA Form 2328] Schedule of Values, and CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown]. Provide the following project data, updated as required by changes in project scope:

1. Number of Buildings
2. Total Project Square Footage (all buildings)
3. Total Living Area (all dwelling units)
4. Total Retail Area (all commercial spaces)
5. Total Number of Units
6. Total Common Area (community room, common kitchen, library, community meeting rooms, common laundry, lounge, rest rooms, mail room, craft rooms, game rooms, fitness facilities, child care facilities, lobbies and common storage space. The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space)
7. Total Management Area (office, reception, conference rooms, janitor closets, maintenance work areas and storage, and mechanical rooms.

#### C. Stored Materials

CHFA’s “stored materials” language is on signature page 4 of the Exploded Trade Payment Breakdown. In general, CHFA does not allow payment for stored materials, either on-site or off-site. CHFA’s Multifamily Underwriting and Technical Services will consider payment for stored “long-lead” items on a

case-by-case basis, upon request. Such items might include elevators, precast concrete, structural steel and large project-specific mechanical equipment. The GC shall be responsible for, and shall include storage and insurance costs total in the General Requirements. Requisition for payment for “long-lead” items shall be made after they are installed and accepted by the Owner and the CHFA Field Observer.

#### D. Environmental Site Assessment Report (see Appendix D)

#### E. Capital Needs Assessment (CNA) Report

If rehabilitation work is involved, a physical assessment and evaluation of all building components not to be replaced during the renovation shall be conducted by licensed professionals, within 6 months of Finance Application. CNA requirements include the following:

1. The qualifications of the professionals who prepare the report. The CNA consultant(s) must be Connecticut-licensed Architects and/or Engineers. The CNA report must include the author’s observations and assessments based upon physical observations of the building exterior and interior, including mechanical and accessible spaces, attics, roofs, crawl spaces, etc. Any spaces not accessed shall be noted in the report.
2. The report must include a narrative description of the development, including the evaluator’s overall assessment of the property condition. The narrative shall include property location, age, physical attributes, number of units inspected and the physical condition of the units inspected. The assessment shall address the presence, or suspected presence, of environmental hazards, such as asbestos, lead paint or mold.
3. Photographs supporting the findings in the report, including site and building characteristics that accurately reflect the existing conditions present, and shall further examine and analyze:
  - a. The site, including general topography, ground water drainage, bituminous/concrete pavement, bituminous/concrete walks and curbs, site amenities, water, storm, sanitary sewer, gas and electric services.
  - b. The structural system, both for sub-structures and super-structures, including exterior wall systems, doors and windows, roofing system and drainage.
  - c. Common area and unit interiors, including existing finishes (carpet, vinyl wall covering, paint, VCT, ceramic tile, etc.), appliances, cabinets, toilet fixtures, exhaust fans, range hoods, etc.
4. Building mechanical systems including HVAC systems, plumbing and domestic hot water, fire protection systems, electrical lighting and power systems, communication and security systems, etc.
5. Any components which are non-compliant for ADA, Section 504 or the Fair Housing Guidelines. The report shall include a copy of an ADA design conformance consultant’s certification that the specific development complies with all of the ADA and 504 regulations. If the ADA consultant is unable to certify compliance, the report shall include recommendations to the Owner for achieving compliance.
6. The report shall include an interview with on-site property management and maintenance personnel to gain knowledge of past repairs, pending repairs and chronic physical deficiencies. The consultant shall obtain and include a 5-year history of the Owner’s capital repair expenditures for the development.
7. The estimated costs associated with delineated needs, including a budget and an in-depth scope of work for the work proposed. This budget shall include expenditures and costs for all property improvements that may affect the project’s future marketability. Improvements may include adding central air to the development, community room additions, etc.
8. The report shall include a spreadsheet that outlines, by line item, the costs of proposed improvements expensed in year one (including construction items outlined in the CNA), with a life-cycle replacement budget reflecting appropriate line item costs expensed over the proposed mortgage term, if applicable; otherwise a 20-year life-cycle budget is acceptable. The

spreadsheet shall show all costs in today's dollars, with an appropriate rate of inflation for costs expended over the life-cycle term.

9. In the case of a complete gutting of buildings, a Structural Needs Assessment Report (to adhere to the latest applicable codes) by a Structural Engineer and Architectural Needs Assessment Report by an Architect are required. A licensed structural engineer shall investigate all questions regarding structural capacities and conditions of structural components. The reports shall include the age, the material, the condition and life expectancy for such components. A licensed Mechanical Engineer, or a licensed Engineer in association with a contractor licensed to do repair work on the system under investigation, may investigate conditions of mechanical and electrical systems (**see Appendices B and C**).

F. Boring and test pit report by a licensed Geotechnical Engineer

G. Design Development Specifications

H. Finance Application

#### **00152.6 Design Development Review**

Subsequent to the Design Development/Feasibility Submission, Technical Services staff will review and comment on the submitted documents according to a checklist based on CHFA Standards of Design and Construction 2008, and will issue formal written comments at the completion of the review. The Developer's Design Team shall then prepare and submit a written response to CHFA, including comments and desired variances from CHFA's Standards of Design and Construction, including compelling reasons for CHFA to consider in evaluating a modification or waiver. When requesting a modification or waiver, the Development Team shall provide compelling reasons for CHFA to consider in granting a variance. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard "clouds".

#### **00153 Step III - Final Review: Construction Documents Development**

The Review of 90% complete Construction Documents is the next stage of the Design Review Process. This phase facilitates the final documents from which the development will be constructed: complete construction documents consistent with the Design Development or Feasibility drawings, the Authority's Standards, the construction budget available to the development and, appropriate to, the needs of the anticipated future residents. All drawings that are to be developed for use in the construction of the development shall be coordinated to allow printing on the same standard sized print pages, and shall be bound together as a complete sets.

##### **00153.1 Construction Contract Drawings for Site Development**

Construction Contract Drawings for site development shall be complete in every detail and dimension. They shall include all spot grades and proposed contours for adequate grading information.

##### **00153.2 Construction Contract Drawings for Dwelling Units and Community Buildings**

Construction Contract Drawings for dwelling units and community buildings shall be complete to a level of 90% – sufficient information to fully explain the details of the structural, architectural, mechanical and electrical system layouts, materials, equipment and operations involved, pending final coordination among the Development Team and Sub-consultants.

##### **00153.3 Construction Contract Specifications**

Complete Construction Contract Specifications shall also be included. The scope of work under all divisions shall include all labor, materials, equipment and services scheduled, indicated, or referred to either in the drawings or specified therein. The contents of the Construction Contract Documents are

complimentary, and what is required by one shall be as binding as if required by all.

Any work not cited specifically on the Construction Contract Documents, but which can be reasonably inferred therefrom as being necessary to produce the intended results in a quality manner, shall be considered as included in the Scope of Work. Any item or materials noted in one detail or section of the Drawings shall be included in the Scope of Work for all other similar areas or elements. All Work shall be furnished and/or installed in compliance with the highest standards of professional workmanship of the respective building trades performing the work.

**00153.4 Construction Documents Development Review Submission**

The Construction Documents/Commitment Progress Review Submission is a response to the preparation of documents in accordance with CHFA Construction Documents/Commitment Progress Review Submission Requirements. These documents are submitted to CHFA staff from Underwriting, Technical Services, Asset Management and other Authority departments as may be required. This submission need not be made in the forum of a meeting, but may be done so at the Development Team's request.

**00153.5 Construction Documents Development Submission Requirements**

The design drawing and specification submission requirements are as follows:

A. Drawings and specifications at a 90% completion level. The GC shall be part of the development team participating in completing the remaining 10 percent of the contract documents offering his (her) expertise in value engineering.

Submit one copy to CHFA for Site Design and Architectural Review. Provide a Development Data Summary (Refer to Title Sheet specifications).

B. Completed and signed Trade Payment Breakdown (on CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown]). Provide the following project data, updated as required by changes in project scope:

1. Number of Buildings
2. Total Project Square Footage (all buildings)
3. Total Living Area (all dwelling units)
4. Total Retail Area (all commercial spaces)
5. Total Number of Units
6. Total Common Area (community room, common kitchen, library, community meeting rooms, common laundry, lounge, rest rooms, mail room, craft rooms, game rooms, fitness facilities, child care facilities, lobbies and common storage space. The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space)
7. Total Management Area (office, reception, conference rooms, janitor closets, maintenance work areas and storage, and mechanical rooms)

C. Completed environmental test and implementation report with estimated costs.

**00153.6 Construction Documents Progress Review**

Subsequent to the Construction Documents/Commitment Progress Review Submission, Technical Services staff will review and comment on the submitted documents according to a checklist based on CHFA Standards of Design and Construction 2007. The Developer's Design Team may then prepare and submit a written response to CHFA comments and shall identify desired variances from CHFA's Standards of Design. When requesting a modification or waiver, the Development Team shall provide

compelling reasons for CHFA to consider in granting a variance. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard “clouds”.

#### **00154 Step IV - Initial Closing: Contract Documents/Commitment**

The Review of 100% complete Construction Documents is the next stage of the Design Review Process. This phase culminates with the final documents from which the development will be constructed: a complete Commitment Submission, in accordance with the Authority’s Standards and Initial Closing Requirements, the construction budget available to the development and, appropriate to, the needs of the anticipated future residents. All drawings that are to be developed for use in the construction of the development shall be coordinated to allow printing on the same standard sized print pages, and shall be bound together as a complete sets.

##### **00154.1 Site Plans**

List of Drawings:

Title Sheet  
Survey  
Soil Boring Plan  
Demolition Plan  
Road and Building Location Plan  
Site and Grading Plans  
Site Details  
Road Profiles  
Site Utility Plan  
Sewer Profiles  
Planting Plans  
Irrigation Plans  
Soil Erosion and Control Plan

##### A. Demolition Plan:

1. Removal of Existing Structures, roads, paved areas, utilities and vegetation
2. Removal of any existing utilities within any structures to remain

##### B. Road and Building Location Plan:

1. Proposed roads and buildings
2. All base lines and match lines
3. Building locations
4. Road center line data
5. Indicate property line coordinates and data

##### C. Site Layout Plan:

1. Property lines
2. Match lines
3. Limit of contract
4. Bench mark and description
5. North point
6. All roads excluding existing roads to be abandoned
7. Walks and paving (identify types of paving)
8. Play areas and athletic field
9. Fences, walls, gutters
10. Soil boring data (location, table and legend, drilling company noted)
11. Building key plan

12. Graphic scale
13. Building identification, floor elevations (indicate entrances)
14. Material identification or construction details

D. Grading Plan:

1. Property lines
2. Match lines
3. Graphic scale
4. North point
5. Plan of roads, walks, buildings
6. Existing and proposed contours (1' intervals)
7. Grading limits
8. Spot elevations (high and low points, key intersections, proposed grades at base of buildings, top and bottom of walls, and at 40' intervals along centerlines of swales and berms)
9. Elevations of drainage structures, detention and retention areas
10. Finish floor grades
11. Special grading details

E. Planting Plans:

1. Property lines
2. Match lines
3. Limit of contract
4. Legend
5. Planting details, including spacing of plants
1. Maintenance edges at buildings
7. Swales and berms
8. Buildings, roads, walks, steps, walls, fences, gutters, etc.
9. Trees, shrubs, lawn (types of seeded or sodded areas)
10. Coordinate all plant material with utility lines, irrigation and structures
11. Plant list (scientific and common name, size, root condition, and special instructions)
12. Seed and sod limits
13. Topsoil stockpile (seed area when topsoil is removed)
14. Indicate existing material to remain and to be removed
15. Erosion net and staked sod where necessary

F. Site Utility Plan:

1. Building and roads
2. Existing and proposed contours
3. Utility mains and laterals
4. Manholes (top and invert grades, number and type)
5. Size and material of pipe (check with local authority)
6. Existing utility lines and easements
7. Detention and Retention requirements
8. Dimension catch basins, storm inlets, manholes and end walls
9. Storm inlets and catch basins (top and invert grades, number and type, building storm water connection to storm system, head walls or connections to off-site storm system, clean-outs)
10. Detail typical trench
11. Water (meter house or pit, fire hydrants cleared by local fire department, valves and valve boxes, mains and laterals)
12. Gas (meter house, valves and pits, main laterals size only, check grades where lines cross)

G. Sewer Profiles:

1. Profile mains only
2. Indicate finish grades
3. Check height of manhole against city specifications and standards
4. Top and invert elevations
5. Stations and Manhole numbers
6. Type, size, percentage of grade
7. Concrete anchors and cradles (if necessary)
8. Datum, horizontal and vertical scale

H. Irrigation:

1. Scale no less than 1"= 20'-0" and north arrow
2. Overall irrigation plans
3. Detail plans indicating sprinkler head
4. Designer name and telephone number
5. Water source and pressure information:
  - a. If municipal water line is used:
    1. Name of agency with jurisdiction over the line, e.g. Public Works, Engineering, etc.
    2. Name and telephone number of the individual contacted within the agency
    3. Static pressure within the line that will feed the irrigation system
    4. If static pressure is too low and a booster pump is proposed, the make and model number of the pump with specifications sheet for review
  - b. If well water is used:
    1. Name and telephone number of the well driller
    2. Copy of the well log from the irrigation well or the test well
    3. Data on the well pump, e.g. gallons per minute, pressure, with specifications sheet for review
  - c. If surface water is used:
    1. Make, model number and performance data on pump
    2. Electrical requirements of the pump and on-site availability
    3. Suction lift (give elevation difference in feet from water surface to pump)
    4. Run-Time:
      - A. Indicate the necessary run-time to apply .2" of water for each station in the system along with the total hours required to operate the system
    5. Controller locations:
      - A. If control timers are to be mounted indoors, exact location shall be indicated on the plans
      - B. If control timers are to be mounted outdoors, a more general location is acceptable
    6. Back flow Prevention Device:
      - A. Make and model number shall be indicated on the plans. If a vacuum breaker is specified, its approximate installed height, above finished grade, shall be indicated on the plans
    7. Sprinkler Heads:
      - A. Make, model number, gallons per minute and radius for all nozzles shall be indicated on the plans.
    8. Valve sizes:
      - A. Valve and their sizes shall be graphically portrayed on the plans
    9. Additional required submissions to the Irrigation Reviewer:
      - A. Grading Plan
      - B. Landscape Plan
      - C. Site plan indicating water distribution

D. Irrigation portion of Division 2 specifications

- I. Miscellaneous Site Considerations (apply to proper sheet):
1. Drinking fountains
  2. Hose bibbs
  3. Lighting systems, including photometric site lighting plans
  4. Waste station enclosures
  5. Mail box locations and details
  6. Storage buildings
  7. Carports and garages
  8. Electrical outlets
  9. Waste receptacles
  10. Entrance signs
  11. Street and directional signs
  12. Parking layout
  13. Play courts
  14. Recreation equipment
  15. Street furniture including Bicycle racks
  16. Screens, walls, etc.
  17. Flagpoles
  18. Planting tubs
  19. Sculpture, ceramics, etc.
  20. Soil Erosion and Control (use key system per Connecticut Public Act 347)
  21. Dumpster enclosures
  22. Storage and maintenance out buildings

**00154.2 Residential and Community Building Plans**

The following requirements for construction documents apply to each basic living unit, variations thereof, and to the community building(s).

List of Drawings:

Building Demolition Plans (when rehabilitating existing structures)

Building Foundation Plan

Building Demolition Elevations (when rehabilitating existing structures)

Building Elevations

Building Roof Plan

Unit Demolition Plans (when rehabilitating existing structures)

Unit Floor Plans

Unit Demolition Elevations (when rehabilitating existing structures)

Unit Elevations

Unit Sections

Detail Sections

Architectural Construction Details

Schedules

Structural Framing Plans

Mechanical Plans

Electrical Plans

A. Building Demolition Plans (scale not less than 1/8"=1'0"):

1. Schematic representation of existing utility (storm, sanitary, water, communication, electric, fuel) systems, components, lines, ducts, piping, drains, meters, equipment, curbs, and fixtures, etc. to remain and/or to be removed/replaced for site, floor levels, and roof.

2. Schematic representation of existing fencing, footings, foundations, slabs, paving, walks, ramps, stairs, railings, plants, piers, posts, pilasters, columns, framing, walls, chases, soffits, doors, windows, cabinets, appliances, finishes, furnishings, building, and site elements, etc. to remain and/or to be removed/replaced for site, floor levels, and roof.
  3. Notes on drawings regarding scope, protections, storage, re-use, re-location, shoring, bracing, and disposal, etc. as required
- B. Building Foundation Plan (scale not less than 1/8"=1'0"):
1. Foundation wall dimensions, offsets, heights
  2. Location, sizes and connections of foundation drainage systems
  3. Remaining foundation information required if not provided on unit floor plans (basement level)
  4. Footing locations, sizes, depths
  5. Locations and sizes of pads, piers, openings
  6. Slab construction, thickness
  7. Locations, sizes, spacing and directions of reinforcing
  8. Enlarged scale details of areas not clearly indicated at above scale
  9. Notes on drawing stating allowable soil pressure and required concrete and steel strengths and other pertinent design information
- C. Building Demolition Elevations (scale not less than 1/8"=1'0"):
1. Schematic representation of existing utility (storm, sanitary, water, communication, electric, fuel) systems, components, lines, ducts, piping, drains, meters, equipment, curbs, and fixtures, etc. to remain and/or to be removed/replaced.
  2. Schematic representation of existing fencing, walks, ramps, stairs, railings, piers, posts, pilasters, columns, walls, doors, windows, finishes, gutters, downspouts, trim, overhangs, roofs, building, and signage, etc. to remain and/or to be removed/replaced.
  3. Notes on drawings regarding scope, protections, storage, re-use, re-location, shoring, bracing, and disposal, etc. as required
- D. Building Elevations (scale not less than 1/8"= 1'-0"):
1. Design of all exterior views, including courts and offsets
  2. Indication and extent of all major exterior materials
  3. Existing and proposed grades at buildings
  4. Floor lines and elevations, floor-to-floor heights
  5. Windows, doors, openings, vents, louvers, utility meters and equipment
  6. Outline, depth below grade and stepping of building footings
  7. Connection conditions between units
- E. Building Roof Plan (scale not less than 1/8"= 1'-0"):
1. Separate roof plan not required if all essential information is provided on site plan or other drawing
  2. Location of roof ridges, valleys, intersections, chimneys, vents, saddles and parapets
  3. Direction of roof slopes and building outline
- F. Unit Demolition Plans (scale not less than 1/4"=1'0"):
1. Schematic representation of existing utility (storm, sanitary, water, communication, electric, fuel) systems, components, lines, ducts, piping, drains, meters, equipment, curbs, and fixtures, etc., to remain and/or to be removed/replaced for site, floor level, and roof of each type of unit.
  2. Schematic representation of existing fencing, footings, foundations, slabs, paving, walks, ramps, stairs, railings, plants, piers, posts, pilasters, columns, framing, walls, chases, soffits, doors,

- windows, cabinets, appliances, finishes, furnishings, building, and site elements, etc. to remain and/or to be removed/replaced for site, floor level, and roof of each type of unit.
- Notes on drawings regarding scope, protections, storage, re-use, re-location, shoring, bracing, and disposal, etc. as required
- G. Unit Floor Plans (scale not less than 1/4"= 1'-0"):
- Separate floor level plans of each unit type, including end units
  - Exterior unit dimensions, including outdoor patios, terraces, porches and overall dimensions
  - Window, interior and exterior door locations, operation, size and/or schedule key
  - Dimensional location of interior partitions, openings, railings and stairs
  - Location of all permanently installed features and equipment, including kitchen appliances, cabinets, shelving and plumbing fixtures
  - Each living unit type identified by letter and/or numerical designation
- H. Unit Demolition Elevations (scale not less than 1/4"=1'0"):
- Schematic representation of existing utility (storm, sanitary, water, communication, electric, fuel) systems, components, lines, ducts, piping, drains, meters, equipment, curbs, and fixtures, etc., to remain and/or to be removed/replaced for site, floor level, and roof of each type of unit.
  - Schematic representation of existing fencing, walks, ramps, stairs, railings, piers, posts, pilasters, columns, walls, doors, windows, finishes, gutters, downspouts, trim, overhangs, roofs, building, and signage, etc. to remain and/or to be removed/replaced for site, floor level, and roof of each type of unit.
  - Notes on drawings regarding scope, protections, storage, re-use, re-location, shoring, bracing, and disposal, etc. as required
- I. Unit Elevations (scale not less than 1/4"= 1'-0"):
- Exterior elevation of each unit facade type and major variation thereof
  - Indication and extent of all exterior materials
  - Location and size of trim members, gutters, downspouts
  - Window and door indication, sizes and/or schedule key
  - Foundation and areaway outlines
  - Exterior lighting system
- J. Building Sections (scale not less than 1/4"= 1'-0"):
- Typical and atypical Cross-sections
  - Floor level and height relationships
  - Special structural conditions
  - Size and spacing of framing members
- K. Unit Sections (scale not less than 1/4"= 1'-0"):
- Cross-sections through each unit type
  - Size and spacing of all floor, wall and ceiling/roof framing members
  - Interior and exterior finishes, sheathing, insulation
  - Floor levels and heights relationships
  - Basement floors, footings, pads, proposed grades
- L. Detail Sections (scale not less than 1"= 1'-0"):
- Each common wall type, fire wall and typical exterior wall complete from footing to roof
  - Fire and sound ratings for all walls
  - Size and spacing of all floor, wall and ceiling/roof framing members
  - Interior and exterior finishes, sheathing, insulation

5. Opening heights and framing
  6. Overhangs, cornices, sill conditions
- M. Architectural Construction Details:
1. Interior details (scale not less than 1"= 1'-0")
  2. Elevation, section and plan (if not adequately presented on unit plans) of kitchen and bath counters, cabinets and fixtures
- N. Details of any built-in cabinet work, fireplaces and equipment
1. Stair details (scale not less than: 1"= 1'-0")
  2. Section and plan (if not adequately presented on unit plan) of any stairs with rise, run and headroom dimensions: tread, riser, stringer, baluster and handrail sized and with dimensions
- O. Special Conditions (scale as necessary)
1. Adequate information to detail any special conditions in foundations, sills, walls, roofs, overhangs and projections
  2. Handrail details showing cross section and mounting requirements and handrail interruptions
- P. Schedules (complete information for each door and window type and interior treatments):
1. Door and frame size, thickness, construction, material, finish, design, approved fire rating (if required) and key designation
  2. Window size, material, design, key designation
  3. Finish material and finish type for floor, base, wainscot, wall, ceiling and trim for all rooms and areas
- Q. Structural Framing Plans:
1. Plans and details for each floor level and roof construction if not adequately presented on foundation and unit floor plans
  2. Size and spacing of floor, wall and ceiling/roof framing members
  3. Size and spacing of columns, piers, posts
  4. Size, type and construction of girders, beams, headers and lintels
- R. Mechanical Plans:
1. Drawings shall include composite floor/roof plans (scale not less than 1/8"= 1'-0") and unit floor plans and mechanical equipment room plans (scale not less than 1/4"= 1'-0").
  2. Heating and/or cooling system drawings for individual systems shall indicate the following:
  3. Location and size of all equipment and schedules indicating the make, model number, type and complete performance data of each. Performance data shall include entering and leaving conditions, air/water quantities, pressures, horsepower ratings, electrical characteristics, total capacities in BTU/hour, etc.
  4. Layout, location and size of all piping. All piping should be properly identified and all flow arrows shown. Provide a mechanical legend and/or symbol list of various piping, equipment etc. Indicate ductwork and piping to be insulated.
  5. Ductwork is to include mains, risers and branches.
  6. Indicate quantity of fresh air make-up required to accommodate exhaust, combustion air and building pressurization.
  7. Location, sizes and output in kilowatts, BTU/hour, CFM and/or GPM of all radiators, registers, diffusers and grilles, fans, etc. Indicate all accessories to include valves, traps, vents, balancing dampers, fire dampers, louvers, flues, drains, controls, unit supports, thermostats, thermometers, gauges, etc.

8. Data upon which the design of the system was based, including outside design temperature; system operating temperatures; BTU/hour outputs; pressures or temperature drops; air temperatures at registers; pump or fan capacities; volumes and velocities; heat loss for each space to be heated; total heat loss; heat gain of each building; and the total calculated heat load connected to each system.
  9. Data upon which the design of each domestic hot water system was based connected to a heating system.
- S. Plumbing Plans: (foundation and composite floor plans at 1/8"= 1'-0" and unit floor plans and plumbing equipment room plans at 1/4"= 1'-0"):
1. Horizontal storm, sanitary sewers and drain systems together with soil, waste and vent stacks, branch wastes and vents, vents through roofs, floor drains, clean-outs, traps, tile drainage, sump pumps, etc., connections to the sewer indicating invert elevations, sizes of all lines and stacks. Riser diagrams of typical stacks, including soil, waste and vents.
  2. Cold water distribution system, size of mains, risers and branches, location of hose bibbs, valves, drains, meter sizes and service.
  3. Hot water distribution system together with recalculating lines and pumps, valves, sizes and mains and branches.
  4. Gas distribution system, sizes of mains and branches, meters location of all gas-fired equipment, etc., to include tabulation of total connected loads in cubic feet per hour and location and size of domestic water heating equipment to include gallons storage, gallons per hour recovery at 100° F rise, gas input, etc.
  5. All piping should be properly identified and all flow arrows shown. Provide a mechanical legend and/or symbol list of various piping, equipment etc.
- T. Fire Protection Plans (composite floor plans at not less than 1/8" = 1'-0" and unit floor plans and mechanical equipment room plans at not less than 1/4"=1'-0"):
1. Fire Protection Plans may be submitted as shop drawings. Contract specifications shall state that the fire suppression system shall comply with and be approved by the applicable code authority.
  2. Fire protection drawings shall indicate sprinkler head locations on composite floor plans, unit and mechanical equipment room plans and/or on reflected ceiling plans. All main pipe routing should be indicated. Show fire protection pipe sizes of all piping (if pipe schedule) and/or hydraulic calculations with pipe sizes if designed hydraulically. Show any fire pump schedule indicating make, model number and complete performance data.
- U. Electrical Plans (composite floor plans at not less than 1/8"= 1'-0" and unit floor plans at not less than 1/4"= 1'-0"):
1. Load calculations for main and branch services in conformance with N.E.C.
  2. Service location, type, entrance connection
  3. Riser diagram of primary and secondary distribution, wire sizes, conduit sizes and panel diagrams
  4. Layout of receptacles, light fixtures, emergency lighting, special purpose outlets, doorbells, smoke detectors, intercom, switching connections for each unit type
  5. Layout of site lighting, time clock control, exterior wiring and switching connections
  6. Wiring diagram of special equipment as required, e.g. fire detection, emergency generators, security systems, intercom systems
  7. Lighting fixture schedule and legend
  8. Site Lighting Plan and Site Lighting Photometric Plan
  9. Electrical specifications shall address the requirements for low voltage systems, telephone systems, intercom systems, television reception systems, etc.

### **00154.3 Project Manual**

Complete specification of all materials and work to be performed for all aspects of construction shall be in conformance with the Uniform System for Construction Specifications, Data Filing and Cost Accounting (CSI).

Unless otherwise permitted by CHFA, manufacturers' instructions shall be followed for the installation of all materials, products and equipment.

### **00154.4 Contract Documents/Commitment Review Submission**

The Construction Documents/Commitment Progress Review Submission is a response to the preparation of documents in accordance with CHFA Construction Documents/Commitment Progress Review Submission Requirements. These documents are submitted to CHFA staff from Underwriting, Technical Services, Asset Management and other Authority departments as may be required. This submission need not be made in the forum of a meeting, but may be done so at the Development Team's request.

### **00154.5 Contract Documents/Commitment Submission Requirements**

Submit one copy to CHFA for Site Design and Architectural Review. Provide a Development Data Summary (Refer to Title Sheet specifications). The final drawing and specification review submission requirements are as follows:

- A. Drawings and specifications at a 100% completion level
  - 1. Changes to drawings (revisions and additional notes/details) based on specific CHFA Step III 90% Review comments shall be identified in accordance with architectural graphic standards. It is important that such changes be clearly identified from what was previously submitted. The common method in practice is to identify everything that has been revised and/or added by drawing a "cloud" (continuous series of circle segments) around what was changed. Attention is then drawn to those areas and the review of the changes is expedited. Upon acceptance by CHFA for 100% completion, all "clouds" shall be removed from the drawings prior to printing for final Initial Closing submission.
- B. Provide final project data, updated as required for "value engineering" or other changes in project scope:
  - 1. Number of Buildings
  - 2. Total Project Square Footage (all buildings)
  - 3. Total Living Area (all dwelling units)
  - 4. Total Retail Area (all commercial spaces)
  - 5. Total Number of Units
  - 6. Total Common Area (community room, common kitchen, library, community meeting rooms, common laundry, lounge, rest rooms, mail room, craft rooms, game rooms, fitness facilities, child care facilities, lobbies and common storage space. The lobby space necessary for a traffic pattern from the building entry to the elevator and to the unit entry shall not be common space but shall be deemed as necessary residential space)
  - 7. Total Management Area (office, reception, conference rooms, janitor closets, maintenance work areas and storage, and mechanical rooms.

### **00154.6 Contract Documents/Commitment Review**

Subsequent to the Construction Documents/Commitment Progress Review Submission, Technical Services staff will review and comment on the submitted documents according to a checklist based on CHFA Standards of Design and Construction 2007. The Developer's Design Team may then prepare and submit a written response to CHFA comments and shall identify desired variances from CHFA's Standards of Design. When requesting a modification or waiver, the Development Team shall provide

compelling reasons for CHFA to consider in granting a variance. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard “clouds”.

**00154.7 Final Submission Requirements for Initial Closing**

The Step IV submission requirements are as follows:

- A. Contract Documents [All Developments with CHFA Financing] - Two (2) sets of Contract Documents, signed and sealed by the Architect and his (her) team members shall be submitted. Drawings shall include all applicable code-related information. Project manuals shall be assembled in three-ring binders. Each sheet of those documents will have a five-party stamp which will need the initials of the Owner, the Architect, the G.C., the Bonding Agent and the Architectural and Construction Manager of CHFA. These documents are for CHFA’s use throughout the construction period.
- B. Contract Documents [All developments receiving Low Income Housing Tax Credits only (no CHFA financing)] - One (1) set of Contract Documents, signed and sealed by the Architect and his (her) team members, and signed by the Owner, shall be submitted. Drawings shall include all applicable code-related information. Project manuals shall be assembled in three-ring binders. These documents are for CHFA’s use throughout the construction period.
- C. Documents related to the Owner:
  - 1. Owner’s Builder’s Risk & Liability and Worker’s Compensation insurance coverage per applicable CHFA requirements for multi-family developments under construction (<http://www.chfa.org/Multifamily/MF--INS%20REQMNTS%20FOR%20MF%20CONSTRUCTION%20DEVELOP-rev%2011-20-00.pdf.pdf>) and/or with permanent financing (<http://www.chfa.org/Multifamily/MF--INS%20REQMNTS%20FOR%20MF%20PERMANENT%20DEVELOP-rev%2011-20-00.PDF.PDF>).
- D. Documents related to the Architect:
  - 1. Standard AIA Owner/Architect Agreement and Amendments, if any [the fee distributed for construction administration (CA) shall be 25 - 35% of the architect’s total fee as determined by CHFA based upon project cost and schedule]
  - 2. Certificate of Liability Insurance naming CHFA as certificate holder
  - 3. Certification that the documents adhere to all applicable codes and CHFA requirements
- E. Documents related to the GC:
  - 1. Contractor’s Qualifications
  - 2. Standard AIA Owner/Contractor Agreement, including contract time, contract sum, list of addenda, list of drawings and specs, and liquidated damages
  - 3. Riders and Exhibits
  - 4. Contractor’s General Liability, Automobile, Umbrella, Worker’s Compensation and Latent Defects insurance coverage per applicable CHFA requirements for multi-family developments under construction (<http://www.chfa.org/Multifamily/MF--INS%20REQMNTS%20FOR%20MF%20CONSTRUCTION%20DEVELOP-rev%2011-20-00.pdf.pdf>) and/or with permanent financing (<http://www.chfa.org/Multifamily/MF--INS%20REQMNTS%20FOR%20MF%20PERMANENT%20DEVELOP-rev%2011-20-00.PDF.PDF>).
  - 5. Schedule of Values
  - 6. Construction Schedule

CHFA prefers Critical Path Method (CPM) construction schedules, such as those created with Primavera, Suretrack, Microsoft Project or other project scheduling and control software, in order to develop, analyze, update, monitor and report the progression of construction projects such that the Owner/Developer is informed quickly and accurately of project events, potential problems, and corrective actions. If Microsoft Excel-type bar charts are used, the all construction operations shall be consolidated onto one page, or a series of pages, to continuously show all concurrent work. If the project is to be divided into major sub-projects for multiple buildings, color coding the bars can keep the sub-project work together.

7. Performance & Payment Bonds
  8. List of Sub-contractors
- F. Environmental test reports, remediation specifications, and abatement plan and specifications
- G. Soil boring or test pit reports
- H. Property and Topographic Survey and Legal Description
1. Submit two copies of the Property and Topographic Surveys, as described in **00152.5**, items 3 & 4, including the following CHFA long-form certification statement to the Authority, its successors and assigns; the title insurance company/companies insuring the Mortgage; and the Owner/Developer; with no statement of facts objectionable to the Authority:

#### *SURVEY CERTIFICATION*

*“I, \_\_\_\_\_, a Professional Land Surveyor duly licensed in the State of Connecticut do hereby certify to the CHFA, \_\_\_\_\_ Title Insurance Company and to [MORTGAGOR/OWNER] as follows:*

*The survey of the Property depicted on this map was actually made upon the ground on [INSERT DATE]. The survey and bounds and measurements shown on this map are correct and accurate within the standards of a Property Survey and are conforming to the standards of accuracy for a Horizontal Class A-2 survey. This is a [First Survey or Resurvey or Dependent Resurvey or Original Survey – specify which one]. This survey map has been prepared in accordance with Sections 20-300b-1 through 20-300b-20 of the Regulations of Connecticut State Agencies “Standards for Surveys and Maps In The State of Connecticut” as adopted by the Connecticut Association of Land Surveyors, Inc. on September 26, 1996. This survey was prepared to depict the existing conditions of the subject Property (including any leased areas and associated easements). It is intended to be used to depict the position of boundaries with respect to locations of all boundary monumentation; apparent improvements and features; record easements and physical visible evidence of the use thereof; record apparent means of ingress and egress; lines of occupation; deed restrictions pertaining to the location of the buildings and other improvements; unresolved conflicts with maps and descriptions; all apparent boundary encroachments; and existing buildings.*

*Except as shown hereon, (i) title lines and lines of actual possession are the same, (ii) all building lines and improvements are located as shown, are erected entirely within Property lines, and do not encroach over or upon the street, title or building lines or any right of way or easement on or appurtenant to the Property, (iii) there are no utility or other easements or rights of way affecting the Property, (iv) there are no encroachments or projections on or over the Property or on rights of way or easements appurtenant to the same by buildings or improvements erected on adjacent land, and (v) the buildings and improvements on this*

*Property do not violate any building or zoning regulation, covenant, deed restriction or other regulation or requirement relating to the location thereof.*

*The Property is not located within a Special Flood Hazard Boundary as defined by the Federal Emergency Management Agency and are[are not] reflected on Flood Insurance Rate Map [No. \_\_\_\_\_, with a date of identification of \_\_\_\_\_, and the Property has direct access to \_\_\_\_\_ each of which is a dedicated public street.*

*I further certify that this map and the survey on which it is based were made in accordance with “Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys”, jointly established and adopted by ALTA and NSPS in 2005, and includes items 1, 3, 4, 5, 7(a), 7(c), 8, 9, 10, 11b, 13, 14, 15, 16, 17 and 18 of Table A thereof. Pursuant to the Accuracy Standards adopted by ALTA and NSPS in effect on the date of this certification, the undersigned further certifies that the Positional Uncertainties resulting from the survey measurements made on the survey do not exceed the allowable Positional Tolerance.*

*Date \_\_\_\_\_*

*(Signed) \_\_\_\_\_ seal*

*Registration No. \_\_\_\_\_”*

- I. Building Permit
- J. ADA Compliance Certification.
- K. CNA (renovation projects only)

**00155 Construction Observation**

**00155.1** Construction Observation [All developments receiving Low Income Housing Tax Credits only (No CHFA financing)]

For developments funded through tax credit equity only, the CHFA’s Technical Services staff may periodically visit the development site to conduct on-site observations of the construction process. Observations may occur at any time within the duration of the construction process, up to the Placed-in-Service Date, or up to the execution of the IRS Form 8609. The observations will confirm compliance with the Authority’s Standards of Design and Construction. In addition, As-Built Drawings and Specifications reflecting compliance with the Standards, prepared by the GC, and verified/approved by the Architect, shall be submitted prior to the execution of the IRS Form 8609. These compliance monitoring requirements apply to all tax credit developments, including those developments financed with Tax-exempt Bonds.

**00155.2** Construction Observation [All Developments with CHFA Financing]  
Pre-construction Meeting; Construction Observation Schedule/Construction Administration

**00155.3** Pre-construction Meeting  
After Initial Closing, a Pre-construction Meeting will be held at CHFA. Those attending the meeting representing the Development Team shall include the Owner, the Architect, the Contractor, and any other project management/administrative personnel deemed necessary by the Owner. Attending the meeting for CHFA will include Underwriting and Technical Service staff as required. The purpose of the meeting

is to review project management and administrative procedures, responsibilities and expectations before construction mobilization.

Subjects for Review at the Pre-construction Conference include:

1. The construction period, as agreed in the contract.
2. Space in the field office shall be provided by the General Contractor (“Contractor”) for CHFA Field Observer's use to include a lockable desk, chair and unrestricted access to telephone. Shared space in the Field Office is acceptable to CHFA.
3. Job meetings shall be held weekly, or more frequently as determined by the CHFA Field Observer, and notice of the time and date shall be forwarded to CHFA at least one week prior to the scheduled meeting. Said meeting shall be conducted and recorded, and minutes distributed by the Architect who is licensed to practice in Connecticut, attended by the Project Manager, Job Superintendent, Developer, and CHFA Field Observer. Any changes of meeting date or time shall be forwarded to CHFA promptly.
4. Job meetings shall be held weekly between the Contractor and Subcontractors.
5. The Architect and the Contractor shall adhere strictly to the plans and specifications: federal, state and municipal codes and regulations.
6. The Architect shall provide and maintain a weekly (or more frequently, when necessary) field inspection and send CHFA an observation report on A.I.A. Form G711.
7. The Job Superintendent shall maintain daily logs in the Field Office, which must be available to the CHFA Field Observer during working hours. Logs shall include manpower, quantities of materials delivered, work performed, light and heavy equipment in operation on the job (including scaffolding, hoists, etc.). In addition, the Job Superintendent shall maintain up-to date as-built conditions on the all contract drawings.
8. Copies of all communications concerning project construction shall be given to the CHFA Field Observer. All of the Project Architect's Field Orders shall be reviewed by the CHFA Field Observer prior to submission to CHFA.
9. CHFA will consider proposed change orders for changes to the Contract Documents. However, the Development Team shall note that CHFA will only fund that portion of the proposed change order that would be the expected if the proposed changes were originally scheduled and bid. Any costs in excess of that amount will be funded by the Owner. All proposed Change Orders regarding changes in construction design or substitution of specified materials shall be accompanied by sketches and appropriate back-up information to include quantities, sizes, unit prices, subcontractor and/or material suppliers' quotes. Labor costs shall be shown as number of hours times rate as shown on payroll forms. The percentage for Overhead & Profit shall be at or below the amount accepted in the original contract. Change Orders will be prepared on CHFA Form 2437 entitled "Request for Construction Change" (**see Appendix F**). A copy of back-up data with each CHFA Change Order form shall be submitted to CHFA. A copy of the approved Change Order will be forwarded to the Owner upon approval by CHFA. **No work related to a proposed change order will be funded unless a fully-executed Change Order is obtained by the GC before the work commences.**

10. The Contractor shall purchase and post a sign as required by CHFA prior to or upon the start of construction. Any other construction signs, including the City's, should be separated from CHFA's sign.
11. Testing of materials used in construction shall be conducted by an approved testing laboratory; if deemed necessary by the CHFA Field Observer, additional tests may be required. Test results must be **mailed directly** from the testing laboratory to CHFA, Architect, and Engineers.
12. The Contractor shall comply with Safety Regulations and Housekeeping Requirements as set forth in General Conditions and according to industry standards.
13. The Contractor shall provide a complete list of subcontractors, prior to start of construction.
14. Copies of all approved shop drawings shall be made available to the CHFA Field Observer at the field office. A copy of transmittal sheets for shop drawings shall be provided to the CHFA Field Observer.
15. Stored materials will be funded only if the materials are long-lead and site-specific items, such as elevators and special equipment. Such funding is not meant to finance contractors for materials easily obtained and readily incorporated into the work. Upon demonstrating that the request for such funding meets these conditions, the Contractor shall provide evidence of those materials being insured, secured and paid for. For off-site storage, provide the following:
  - A. Evidence of insurance (casualty, theft, etc.) for the stored items and the facility itself (if stored other than at the manufacturer's plant)
  - B. Bonding company's consent to the off-site storage
  - C. UCC-1s for the stored materials creating a security interest for CHFA
  - D. A CHFA Field Observer's report which accepts the storage environment, and a report confirming acceptable delivery of the subject item(s) to the facility
16. The Contractor shall maintain a realistic and workable Construction Progress Schedule or Chart posted in the Construction Field Office. Up-to-date schedule shall be required as part of the requisition package.
17. Pencil-copies of all requisitions for payment shall be made available to the CHFA Field Observer a week prior to submission to CHFA.
18. Requisitions shall consist of three original copies, signed by the Architect, GC and Owner. Requests for payment for on-site inventory shall be made on CHFA's Form entitled "Accounting of On-site Inventory" (**see Appendix F**). Paid invoices showing quantities and dollar amounts must be provided as back up for inventory. Requisitions for approved change orders may be submitted after the related work has been completed. The requisition number of a change-order requisition shall match the one on the regular construction requisition even if the former may have never been submitted previously.
19. Original lien waivers shall be submitted with the monthly requisition in a form acceptable to CHFA. The Connecticut Statutory lien waiver form should be used for each sub-contractor. CHFA requires the copy with live signature and notarized seal. Lien waivers shall be tracked throughout the project on the CHFA "Total of Lien Waiver Payments" for (**see Appendix F**).
20. Progress photographs shall be submitted to CHFA each month, with the monthly requisition. Photographs (originals only) shall be representative of the work completed throughout the project for that month. They should also be identified (location and type of work), dated and organized in letter-

size plastic covered sheets. The photos should be of high-resolution quality, in color and 4"x 6" minimum in size.

21. In order to request a reduction of retainage from 7½% to 5%, the following documents (among others) must be executed:
  - A. Certificate of Occupancy issued by the governing building department
  - B. Certificate of Substantial Completion issued by the architect
  - C. Bonding company's written consent
  - D. Current list of the contractor's payables
  - E. General Contractor's written statement that it will share the released funds with all subcontractors and suppliers.
  - F. Lien waivers from subcontractors and suppliers.
  
22. When the project is ready for occupancy, the Architect shall assist the Owner in preparing and executing a CHFA "Permission to Occupy" request form (**see Appendix F**). At this point, the Contractor may request a Reduction in Retainage from 5% to 2½%. The following items need to be obtained before the request will be considered:
  - A. Certificate of Occupancy issued by the governing building department
  - B. Certificate of Substantial Completion issued by the architect
  - C. Bonding company's written consent
  - D. Current list of the contractor's payables
  - E. Contractor's written statement that he (she) will share the released funds with all subcontractors and suppliers.
  - F. Lien waivers from subcontractors and suppliers.
  - G. An acceptable, audited Contractor's Certificate of Actual Cost which has been prepared by an independent Certified Accounting Firm. The document shall be signed and shall have the accountant's certification.
  
23. The PTO inspection will be conducted by the assigned CHFA Field Observer after items on the architect's punch-list have been amended and units cleaned. The CHFA Field Observer may discontinue the inspection anytime when the items on his or her list are too long or repetitive in nature. The CHFA Asset Manager will inspect the units after the Field Observer considers the unit satisfactory.
  
24. When the project is preparing for Final Closing, and the GC has requested the final 2½% of Retainage, the following documents shall be submitted:
  - A. An ALTA/ACSM Land Title Survey, accepted by the Title Company and the Owner, which depicts the "as-built" of the improvements on the property, and complies in all respects to the requirements for the survey submitted for Initial Closing (**see 00051 through 00051.8, 00052.4.A.3 and .4, and 00154.7.G.1 through .10**).
  - B. As-Built Drawings and Specifications prepared by the GC, verified and approved by the Architect.
  - C. Lien Waivers from subcontractors and suppliers.
  - D. Warranties of all components identified in the Specifications.
  - E. Statement of Compliance from the Environmental Consultant.
  - F. Bonding Company's written consent to the release of Retainage (Consent form must include CHFA as Dual Oblige and shall be an original document, signed and sealed).
  - G. Certificate of General Contractor Form (**see Appendix F**).
  - H. Confirmation that a Supplemental Cost Certification confirming final payments to vendors will be furnished to the Authority within 60 days after it has received its final payment from the Owner.

## 25. CHFA Punch List Inspection Items

The CHFA Field Observer can/may inspect items including but not limited to those listed on this summary. This list is not intended to be “all inclusive” for every type of project. It is intended to serve as guideline for what types of things the CHFA Field Observer will be looking for at the final inspection phase of the project. In general, the CHFA Field Observer will be looking to ensure that the items outlined in the contract documents have been installed in the project. The workmanship and quality must be consistent with the contract documents and that of the construction industry. Below are specific items that will be reviewed:

### A. Bathrooms:

1. Toilet:
  - a. Check that the toilet is seated firmly on the floor with no movement.
  - b. Check that the toilet is caulked to the floor (and the wall if appropriate) all the way around the toilet base.
  - c. Check toilet operation – flush three times to make sure the toilet tank fills in a reasonable amount of time and shuts off automatically.
  - d. Check inside the toilet tank to see that components appear in order and that “cold” water is used for the toilet. (In the past, we have seen the hot water was mistakenly piped to the toilet).
  - e. Check that seat is installed and securely attached.
  - f. Check that the water supply stop is functional and that it does not leak when shut off and turned back on.
2. Shower:
  - a. Check operation of the shower control/diverter. Make sure hot water comes out when set to hot (check for anti-scald operation) and cold water comes out when set to cold. Exercise diverter tub fill to shower operation.
  - b. Check and exercise tub stopper function and let the tub fill (when checking the water temperature) to make sure the stopper works properly.
  - c. Check that the drain assembly is caulked to the tub/shower.
  - d. Check that all grab bars are secure and do not move.
  - e. Check the top of the shower surround to ensure that it is clean and free of drywall compound, dried paint drips and most importantly, caulked to the wall.
  - f. Check the face of the shower / tub enclosure to make sure it is caulked to the walls and the floor.
3. Lavatory:
  - a. Check that the hot and cold water are piped to the correct faucet.
  - b. Check that the hot water gets hot and that anti-scald operation keeps the water from getting too hot.
  - c. Check the function of the stopper and the overflow – let the lavatory fill when testing the water faucet function.
  - d. Check under the cabinet when the lavatory is draining for leaks. Check waste trap for leaks when water is draining from the lavatory.
  - e. Exercise both water supply stops to make sure they hold and do not leak.
  - f. Check top of lavatory:
  - g. Make sure sink is caulked to the counter/wall.
  - h. Make sure back and side splashes are caulked to the walls and the counter
  - i. Check to make sure that escutcheon plates are properly installed around the supplies and the waste line so there are no openings in the wall under the sink.
4. Exhaust Fan/Light:
  - a. Turn on light and fan check for proper operation.
  - b. If the unit has a heating lamp – check operation.

- c. If there is central system toilet exhaust, place a piece of toilet paper over the grille to make sure it is drawing air. (Also obtain a copy of the final testing and balance report if required by the contract documents).
- 5. Medicine Cabinet:
  - a. Make sure the light functions (if attached).
  - b. Make sure shelves are included and in good condition (GC must replace broken or chipped shelves and mirror glass).
  - c. Test function of door to make sure it opens and closes easily and latches closed.
  - d. Check mounting height in accessible units.
- 6. Receptacles:
  - a. Check that there is a GFI near the lavatory.

**B. Kitchen:**

- 1. Range:
  - a. Check to make sure the roasting pan and racks are included in the storage drawer under the range.
  - b. Check to see that the Owner's Manual is included in the nearest base cabinet drawer.
  - c. Check that the anti-tip bracket is installed so the unit will not tip forward if weight is applied to the open oven door.
  - d. Check operation of all burners and the oven.
  - e. Check that the oven light comes on.
- 2. Microwave:
  - a. Check that the glass revolving platter is included.
  - b. Check for the Owner's Manual is located in the nearest base cabinet drawer.
  - c. Check that the clock function works properly.
  - d. Check that the unit is functional and that the light comes on when the door opened.
- 3. Refrigerator:
  - a. Check to make sure the ice trays are in the freezer.
  - b. Check to make sure all the drawers and shelves are included in the refrigerator and the freezer.
  - c. Check that the unit is functional (cold inside) and that the light comes on when the door(s) are opened.
  - d. Wheel out the unit and view the rear of the unit to make sure the coils are not bent and damaged.
  - e. View the gasket around both doors and make sure it is in good condition.
  - f. View the surfaces of the refrigerator to make sure it is not dented, scratched or damaged.
- 4. Kitchen Ventilation/Range Hood:
  - a. Check operation of light and fan.
  - b. Make sure the filter is included in the unit (and that the filter is clean and free of construction dust).
  - c. Check the exhaust duct as it rises through the upper cabinet – make sure it is connected and the duct is sealed around the opening through the cabinet.
- 5. Kitchen Cabinets:
  - a. Check operation of all drawers and doors. All must be plumb and level and secure.
  - b. Check for Lazy Susan unit in the corner if specified.
  - c. Check that shelves are included in each cabinet unit. Check that they are properly supported with minimum of four clips per shelf. Longer shelves have an intermediate shelf support behind the center cabinet post.
  - d. Check that vinyl base is installed in the kick space.
  - e. Check that the kick is continuous in the corner where the base cabinet units come together.

- f. Check counter surface for defects and flaws.
  - g. Check that counter backsplash and side splash is caulked to the wall (and counter if appropriate).
  - h. Check that GFI receptacles have been installed above the backsplash (check for code required spacing).
6. Kitchen Sink:
- a. Check operation of the faucet – hot/cold water on the proper side - make sure water gets hot (check anti-scald to make sure water does not get too hot).
  - b. Check to make sure stopper functions and the water fills.
  - c. Check the underside of the cabinet as the water drains for leaks and that the waste line is secure.
  - d. Check the operation of the disposal unit (if provided).
  - e. Look under the sink to ensure there at least two hold down clips per side of the sink unit and that the unit is sealed to the counter with plumber’s putty.

**C. Doors:**

- 1. Hardware:
  - a. Check the function of the passage/locksets. Make sure the doors close and latch freely. Make sure the strike plate is installed.
  - b. Check that all hinges have screws installed and that hinge pins are fully seated.
  - c. Make sure a floor or wall stop is installed to protect adjacent walls from door lever/handle.
- 2. Doors and frames:
  - a. For wood doors, make sure top, bottom and edges of each door is finished as well as the faces.
  - b. On the top and side corners of the door frame trim, make sure the factory staple/nail holes are filled and sanded then painted. These holes should not be visible after the frame is finished.
  - c. Make sure stops are continuous and secure.
  - d. Check for trim on the inside of the closet door frame.
  - e. Check for weather stripping on exterior doors.
  - f. Check that the exterior doors close tightly to the bottom threshold.

**D. Closets:**

- 1. Coat Rod and Shelf
  - a. Brackets need to be able to support hanging clothes so should not be spaced more than two stud spaces apart.

**E. Windows:**

- 1. Installation/Finish
  - a. Check operation of each window.
  - b. Check that insect screens are installed in all windows.
  - c. Check that all window glass units are clean, not damaged, cracked or clouded (broken seals).
  - d. Check operation of the window treatments – blinds, curtains, etc. Make sure all wands are included.
  - e. Make sure the window sill is caulked to the window.
  - f. Check the paint around the window unit to ensure paint stops on the trim and does not get on the window unit (if factory finished window units are used).

**F. Receptacles and Switches:**

1. Installation/Finish
  - a. All wall receptacles and switches must be square and plumb.
  - b. Receptacles and switches must not have any paint on them.
  - c. Cover plates must completely cover the hole in the wall.
  - d. Screws in the cover plates should all be facing the same direction.
  - e. Receptacles and switches must be flush with the cover plate and secured in the workbox.
  - f. Receptacle and switch cover plates must be flush with the wall. The corners cannot be away from the wall such that a resident can cut their fingers on the cover plates.
  - g. Randomly test receptacles with plug in tester (test the GFI function as well).

**G. Carpet/Vinyl Tile/Sheet Goods/Base:**

1. Installation/Finish
  - a. Make sure flooring is free of defects.
  - b. Make sure there are no foreign objects under the flooring that create a visible bump or tripping hazard.
  - c. See that the base is straight and is tight to the flooring.
  - d. Check each corner to make sure the base is tight inside the corner. Rounded base installations in a square corner will need to be corrected.
  - e. Vinyl base must be tight to all door frames, millwork, etc. Spaces between the end of the base and an adjoining material or surface are not acceptable and will need to be corrected.

**H. Walls and Ceilings:**

1. Installation/Finish
  - a. Nail/screw pops are an unacceptable condition. Walls and ceilings must be free of these defects, smooth and evenly painted.
  - b. Wall surfaces must be straight and free of “bellies”, “wows” and “bulges”.
  - c. There cannot be dried paint drips on any painted finish.
  - d. All drywall seems and patches must be smooth and blend into the wall finish – visible seems are not acceptable.

**I. Light Fixtures:**

1. Installation/Finish
  - a. Lenses and/or globes must be clean.
  - b. Must have bulbs of the correct wattage for the fixture.

**J. Clean Project:**

1. Final Cleaning
  - a. The project must be completely clean and ready for occupancy when the CHFA Observer makes his / her inspection. This applies to the apartments, common spaces, building exterior and site.

**00170 Warranties**

Section 00170 in the Project Manual shall include, among others, the required minimum and/or extended warranty periods for the following items (and other items unique to the project):

- A. GC - 1 year warranty
- B. Roof Shingles - 30 year material, 10 year labor (no dollar limit)
- C. Vinyl Siding - 20 Years material and labor (no dollar limit)
- D. Exterior Insulation and Finish System - 10 years material and labor (no dollar limit)
- E. Membrane Roofing - 15 years material and labor (no dollar limit)
- F. Windows and Exterior Doors - 10 year min. on the entire assembly (window units and installation)
- G. HVAC - 5 years on equipment

- H. Misc. warranties as provided by the manufacturers for specified products and equipment
- I. Misc. labor warranties as provided by manufacturer-trained/approved installers, in conjunction with the manufacturers of specified products and equipment

## **02000 SITEWORK**

### **02000.1 Waste Management Practices**

Dispose of construction debris only at a State-approved construction and demolition landfill. No construction materials shall be burned or buried on-site.

### **02000.2 Recycle Jobsite Demolition and Construction Waste**

Construction waste generally consists of wood, drywall, metals, concrete, dirt, and cardboard - materials that can be reused or recycled if properly prepared. Recycling reduces pressure on landfills saves money by reducing tipping fees, and provides raw materials for future building products. Identify the types and quantities of materials generated at the job site, and contact local recycling facilities and haulers to determine terms and conditions required for recycling them. Allocate space for recycling materials. See the NAHB Research Center's "Builder's Field Guide to Residential Construction Waste Management" publication for more information.

- A. Plastics: The GC shall recycle all plastic food and beverage containers through an approved local recycling program.
- B. Wood: The GC shall avoid disposal of solid sawn wood by recycling at a state or county approved program or by on-site grinding and application of wood chips as mulch. Pressure-treated wood shall be exempt from this requirement and may not be milled or applied as mulch.
- C. Cardboard and Paper: The GC shall recycle all cardboard and paper food containers, newspaper and waste paper through an approved local recycling program.
- D. Metal: The GC shall recycle all metal food and beverage containers through an approved local recycling program.
- E. Drywall: The GC shall dispose of drywall through an approved local recycling program. Site-ground drywall and wood scrap material may be suitable for soil amendment.
- F. Ceiling Panels: Large-scale rehabilitation projects requiring the disposal of a full truckload (30,000 square feet) of approved ceiling panels, from any manufacturer may, be eligible for recycling through US Gypsum [<http://www.sustainableceilings.com/recyclingProgram.asp>].
- G. Shingles: The GC shall recycle all shingle waste through an approved local recycling program.
- H. Fluorescent bulbs: The GC shall dispose of fluorescent bulbs through mercury lamp drum-top crushers/bulb recyclers.

### **02000.3 Donation of Excess Materials for Re-Use**

The GC shall avoid disposal of excess construction materials by donating excess to a nonprofit 501c(3) organization or by re-using the construction materials for another job. Unused or salvaged materials such as surplus wood, windows, doors and other uninstalled materials can be donated to organizations such as Habitat for Humanity or local Youth Build Programs. Donating unused materials reduces landfill deposits and helps local charitable organizations. Donations may be tax deductible. Materials should be clean and in good condition.

### **02000.4 Construction Materials Order and Management Plan**

Protocols for the order, acceptance, and timely installation of building materials shall be required by the developer to minimize material waste and prolonged storage on site. Plan shall include a schedule of anticipated material order, delivery and installation for all major building components and protocols for proper storage and protection of the materials while on site.

### **02000.5 Posted Job Site Waste Management Plan**

The GC shall post and enforce a construction waste management plan on the job site, and each subcontractor shall be educated on the aspects of the plan that pertains to their work. Waste management plan must either provide for on-site separation of materials to be recycled or provide for separation of recyclable materials by clean-up or waste hauling firms; see the National Association of Home Builders Research Center's "Builder's Field Guide to Residential Construction Waste Management" publication for more information [[www.nahbrc.org](http://www.nahbrc.org)]. Onsite grinding helps to reduce the amount of construction waste that goes to the landfill. Consult your local jurisdiction for allowable materials and appropriate practices.

### **02001 Site Design**

The site design shall harmonize with the natural terrain and the trees to be saved. Consider this natural arrangement when planning the location of buildings, sidewalks and driveways. Site design shall take advantage of positive site features and characteristics and shall address and mitigate negative site features. Site analysis and design concept shall be developed to respond to these features. Comply with all federal, state, and local government erosion control and tree protection measures.

#### **02001.1 Low Impact Development**

CHFA encourages Low Impact Development (LID) for sustainable storm water management strategies in response to burgeoning infrastructural costs of new development and redevelopment projects, more rigorous environmental regulations, concerns about the urban heat island effect, the impacts of natural resources due to growth and development, the increased frequency of droughts and concern about water quality issues. The concept of re-using storm water as a viable resource has resulted in a shift in approaches to control storm water and conserve rainwater.

LID can be thought of as a component of the larger approach to sustainable design and water conservation. LID makes use of the rainfall and storm water that reaches a site, filtering it and directing it for reuse. The LID strategy controls water at the source - both rainfall and storm water runoff - which is known as "source-control" technology. It is a decentralized system that distributes storm water across a project site in order to replenish groundwater supplies rather than sending it into a system of storm drain pipes and channelized networks that control water downstream in a large storm water management facility. The LID approach promotes the use of various devices that filter water and infiltrate water into the ground. It promotes the use of roofs of buildings, parking lots, and other horizontal surfaces to convey water to either distribute it into the ground or collect it for reuse.

The benefits of LID include preventing the degradation of water quality and resources, managing storm water more efficiently and cost-effectively, protecting groundwater and drinking water supplies and helping communities grow more attractively.

Site design strategies for every design project address the arrangement of buildings, roads, parking areas, site features, and storm water management plans. LID builds on conventional design strategies by exploiting every surface in the infrastructure—natural and hardscape—to perform a beneficial hydrologic function. The surfaces are used to retain, detain, store, change the timing of, or filter runoff in a number of different configurations and combinations. Some of the more prevalent site design techniques include:

- A. Reduce imperviousness by using permeable paving or landscaping to break up expanses of impervious surfaces
- B. Direct runoff into or across vegetated areas to help filter runoff and encourage groundwater recharge.
- C. Preserve, or design into the infrastructure, naturally vegetated areas that are in close proximity to parking areas, buildings, and other impervious expanses in order to slow runoff, filter out pollutants, and facilitate infiltration
- D. Reduce street widths

- E. Remove curbs and gutters from streets, parking areas, and parking islands to allow storm water sheet flow into vegetated areas
- F. Use devices such as bio-retention cells, vegetated swales, infiltration trenches, and dry wells to increase storage volume and facilitate infiltration
- G. Grade to encourage sheet flow and lengthen flow paths to increase the runoff travel time in order to modify the peak flow rate
- H. Disconnect impervious areas from the storm drain network and maintain natural drainage divides to keep flow paths dispersed
- I. Disconnect roof downspouts and direct storm water into vegetated areas or into water collection devices
- J. Install cisterns or sub-surface retention facilities to capture rainwater for use in irrigation and non-potable uses
- K. Install vegetated roofs or garden roofs
- L. Use native plants (or adaptable species) to establish an adaptable and low maintenance landscape that requires less irrigation and are appropriate for the climatic conditions
- M. Use naturally occurring bio-chemical processes in plants located in tree box filters, swales, planter boxes
- N. Divert water away and disconnect from the storm drain or CSO using correctional drainage techniques

#### LID Technologies and Water Conservation:

Depending on which level of on-site reuse and water conservation is consistent with project objectives, various LID technologies are suggested:

##### A. Level One: Distribution

Storm water runoff is distributed using open and vegetated areas to increase infiltration and reduce the amount of storm water that enters the storm drains. This requires minimal infrastructural modifications/additions.

LID Technologies: Sheet flow to rain gardens, bioswales, bioretention cells, tree box filters, soil amendments, structural soil, native and sustainable ornamental plants

##### B. Level Two: Hardscape Materials and Curbs

Replace hardscape materials with permeable materials. Construct sidewalks, parking bays, and internal alleys with materials, such as permeable concrete or green grids, that allow water to infiltrate. Slope roads in the directions of the parking lot islands, and construct curb-less islands to allow water to flow into the island. Minimal infrastructural alterations/additions are required.

LID Technologies: Permeable paving, curb-less parking lot islands, porous concrete parking bays, and above listed technologies

##### C. Level Three: Recycling Rainwater and Runoff

This level uses above-ground LID devices to channel and collect rainwater from roofs, and uses sub-surface facilities to treat and collect runoff from roads and sidewalks. The recycled and stored water is used for irrigation and other non-potable purposes. The devices are integral with the buildings and infrastructure. Significant infrastructural alterations/additions are required.

LID Technologies: Disconnected roof drains, cisterns, sub-surface storm water retention facility (below parking lots), rooftop channels, rain barrels, and above listed technologies

#### **02001.2 Erosion Control**

Follow guidelines set forth in the NAHB research publication “Storm Water and Non-point Source Pollution Control – Guide for Builders and Developers”, the “2002 Connecticut Guidelines for Soil Erosion and Sedimentation Control” and the “State of Connecticut Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction”, as amended and as applicable.

### **02001.3 Excavated Topsoil Protection**

Designated topsoil areas to be protected throughout all construction activities. Protected topsoil areas shall be clearly marked and the GC shall communicate protection measures to all subcontractors. Excavated topsoil shall be protected from erosion by wind or rain with tarps or other suitable material.

### **02001.4 Redundant Mulch, Compost, or Straw Bales for Erosion Control**

In addition to required silt fencing, GC shall install mulch, compost, or straw bale berms or blankets on steep slopes, locations where silt fences do not hold up, and around storm drains.

### **02001.5 On-call Sedimentation/Erosion Control Personnel**

Provide on-call personnel for inspecting erosion control measures and repairing erosion control failures during rain events that occur during non-working hours at the site. Site should automatically be inspected by designated personnel during rain events of 1/3" or greater in any 24-hour period.

### **02001.6 Tree and Plant Preservation**

Through careful planning and construction practices, valuable trees and plants can be preserved and incorporated into new developments and neighborhoods. Preserving existing, mature landscape features helps prevent soil erosion, maintains existing sources of natural cooling, diverts waste from landfills, and adds a unique character to the community. Enlist a tree expert (Certified Arborist, Landscape Architect, or individual with a professional degree in forestry or related field) to create a Plant Preservation Site Plan which identifies existing trees with diameter at breast height dimensions 6" or greater, and which designates trees to be protected during all construction activities. In general, keep only those trees that are in good health. Save a mix of ages and sizes. Save groups of trees if possible, rather than singling-out individual trees. Some species are more sensitive to change than others, and some species growing in shade may do poorly if changes result in more sunlight. Each species also differs in how it can withstand root cutting or how susceptible it is to insects and disease. Coordinate with landscape architects, engineers and utility managers to place improvements where the impact on trees will be minimized.

Plant or preserve shade trees at regular intervals along both sides of streets. Plant a diversity of species and include native/adaptive trees whenever possible. Plant trees at a minimum interval of 40 feet and in planting strips or tree wells with a minimum dimension of 6 feet by 6 feet. If this dimension is not desirable in a specific context, demonstrate that a sufficient root path is created through the use of structural soil beneath the sidewalk or through another proven technique.

Provide aftercare to help trees recover from the stress of construction. Water periodically, especially in times of drought, and mulch the trees. Remove aggressive or noxious plants from natural areas. To reduce loss of life, property, and resources to fire in forested areas, break up solid areas of evergreens and avoid planting trees close to buildings. Keep trees watered, regularly pruned and in healthy condition. Prevent the build-up of needles and dead branches

### **02001.7 Plant Materials from Disturbed Site Areas**

The Landscape Architect shall identify healthy ornamental and native plants not included within tree-save or undisturbed areas of the site, which can be expected to survive transplantation. Such plants shall be designated on the Plant Preservation Site Plan to be relocated, stored and replanted, or to be made available for relocation by others, prior to the area being disturbed. Transplant healthy trees 3½" in diameter or greater in the path of proposed buildings and site construction features. The Landscape Architect shall provide transplanting notes and specifications.

### **02001.8 Utilities in Tree Root Zones**

Some cutting of roots near construction is inevitable but much is avoidable. The routing of underground utilities does not have to follow a straight line from street to building. Route selection can often avoid

important trees. When this is not possible, tunneling can be used to significantly reduce root damage. Trees that are marked to be preserved on the Plant Preservation Site Plan, and for which utilities must pass through their root zones, shall not have surface-dug trenches. The Site Engineer shall indicate tunnels to be dug through root zones on the Site Plans and provide details, notes and specifications.

**02001.9 Individual Trees Fenced at Drip Line**

No soil from clearing, grading, or construction activity shall be placed on top of any root zone for trees that are designated on the Plant Preservation Site Plan to be preserved. Vehicles driving or parking over roots or construction materials stored over roots result in compaction of the soil which cuts off the air and water passages in the soil. Meet with all foremen, contractors and sub-contractors who will work on the site. Be sure dozer operators, truck drivers and others are aware of tree preservation signs, fences and rules. Protect “save” trees from soil compaction and severed roots with barrier fencing of the critical root zone around the drip line. Trees must be fenced around the drip line throughout the construction process. Fences must be firmly set - if wood fence posts are used, they must, at a minimum, be 2 x 2’s. The Site Engineer shall indicate root zones to be fenced on the Site Plans and provide details, notes and specifications.

**02001.10 Protected Tree Save Area**

A minimum of 25% of suburban lots must be protected from all grading and tree clearing.

**02001.11 Tree Planting**

Site plan shall indicate new tree planting at a minimum rate of 12 trees per acre.

**02001.12 Parking Lots**

CHFA discourages parking layouts with dead ends.

**02001.13 Collector Roads**

CHFA discourages parking along collector roads.

**02001.14 Parking Ratios**

Parking shall comply with local Planning and Zoning requirements. Parking for housing for elderly residents shall be provided at the minimum ratio of 1.2 spaces per unit or greater. Parking for developments for family residents shall be provided at the minimum ratio of 2.4 spaces per unit or greater.

**02001.15 Paving**

Paving thickness shall be based on recommendations provided in a Soils Report prepared by a licensed Soils Engineer. Paving at and in front of waste disposal stations shall be designed to bear the weight of dumpster trucks, 6" thick with reinforcing mesh, minimum. This paving shall be sufficiently large to provide a pad for the truck wheels (front or rear) at time of loading. The minimum width of the concrete paving shall be the width of the dumpster enclosure.

**02001.16 Permeable Paving**

CHFA encourages the use of pervious concrete pavement for walks and drives, where appropriate. Storm-water runoff is a leading source of the pollutants entering our waterways, which can increase algae content, harm aquatic life, and require expensive treatments to make the water potable. Pervious concrete pavement can reduce the amount of untreated runoff discharging into storm sewers, directly recharge groundwater to maintain aquifer levels, channel more water to tree roots and landscaping, so there is less need for irrigation, mitigate pollutants that can contaminate watersheds and harm sensitive ecosystems, eliminate hydrocarbon pollution from asphalt pavements and sealers. In addition to storm-water control, pervious concrete pavements aid in reducing the urban heat-island effect. Because they are light in color

and have an open-cell structure, pervious concrete pavements don't absorb and store heat and then radiate it back into the environment like a typical asphalt surface. The open void structure of the pervious pavement also allows cooler earth temperatures from below to cool the pavement, and because the concrete is reflective, the need for lighting at night is reduced. Because pervious concrete absorbs water rather than allowing it to puddle, hydroplaning and tire spray are reduced.

#### **02001.17 Drives**

No gradients on drives shall be less than 1% or more than 8% (5% where traversed by pedestrians). Parking lots and areas shall have a cross slope or transverse slope no greater than 3%. All ADA, State of Connecticut Barrier-free, UFAS, and FHAA guidelines shall be met where applicable.

Drives shall comply with local Planning and Zoning requirements. Collector drives shall be a minimum of 22'-0" in width. Drives within parking areas shall be a minimum of 20'-0". The Authority recommends main drives and collector roads be crowned for drainage along curbs.

#### **02001.18 Curbing**

All drives, parking areas and planting islands shall be curbed. Curb profiles shall accommodate snow plowing in identified areas.

#### **02001.19 Parking Spaces**

Parking spaces shall comply with local Planning and Zoning requirements. Parking spaces within housing for elderly residents shall be a minimum of 10' wide x 20' long. Parking spaces within developments for family residents shall be a minimum of 9' wide x 20' long.

#### **02001.20 Catch Basins**

Catch basins shall not be located under carports. Drainage shall be away from carports and not towards or through carports.

#### **02001.21 Walkways**

There shall be an internal system of walkways. Barrier-free ramps shall be provided at curb crossings. In housing for elderly residents, walks shall provide easy access to secure interactions with human activity and natural surroundings. Walks shall be concrete. Asphalt bituminous "walking trails" may be provided.

No gradients on walks shall be less than 0.5% or more than 5%. Cross slopes shall not exceed 2%. Accessible ramps shall be no less than 5% or more than 8.3% (landings 0.5%) Walkways along parking spaces where cars may overhang the walk shall be 6'-0" wide or as required by ADA, FHAA, or local ordinance, whichever is greater.

#### **02001.22 Retaining Walls**

Unless an engineered wall, dry-stacked masonry (no mortar) or timber retaining walls shall be constructed such that the wall shall not exceed 4' in height without an equal horizontal setback. An adequate safety barrier shall be provided at retaining walls as required by code. Where the code is silent on retaining walls and the top of a retaining wall is 20" or greater above adjacent grade and a dangerous condition putting pedestrians at risk exists, an adequate safety barrier shall be provided.

#### **02001.23 Lawn Areas**

Grades shall slope away from buildings at 6" in the first 10' (5%). Grades at lawns shall slope 2% (minimum) to 8.3% (maximum), swales and berms 33% (maximum), and "un-mowable" slopes with groundcover 50% (maximum).

**02001.24 Maintenance Strips**

A maintenance strip, not less than 18" in width, to protect siding from backsplash and mowing operations, shall be provided along all building facades. Provide maintenance strips with 4" to 6" (min.) of decorative stones over a weed barrier, and slope away from facades 5% (min.). Where gutters and downspouts are not provided, provide a ground gutter system in lieu of a maintenance strip. Ground gutters shall extend 12" (min.) beyond the roofline (**see section 07710**).

**02001.25 Grind Stumps and Limbs for Mulch**

Grind all tree stumps and limbs for mulch. Mulched material may not be buried in a landfill.

**02001.26 Mill Cleared Logs**

Logs that meet commercial sawmill standards shall be taken to a mill for processing into lumber, pulp or other use. Such logs may not be buried in a landfill, burned or chipped.

**02001.27 Building With Trees Program**

The GC shall participate in the "Building with Trees" program developed by the National Arbor Day Foundation in cooperation with the NAHB (<http://www.arborday.org/programs/buildingwithtrees>), and comply with the Planning and Design, Tree Protection During Construction, and Maintenance/Long-term Care requirements of the program.

**02001.28 Resource-Efficient Landscapes and Gardens**

CHFA encourages landscape techniques which harmonize with the local environment and help conserve water, reduce use of chemicals, create healthier soil and plants, and increase bio-diversity in landscape areas. Low-water landscape designs (such as xeriscape) reduce water use. Design with an emphasis on perennials instead of annuals, and specify native plants that are appropriate for the climate and soil of the area. Select slow-growing, adaptable and drought-tolerant plants which withstand rainfall shortages and utilize less water for irrigation. Space plants appropriately, to give them plenty of room to mature and reduce the need for pruning. Soil shall be tested and amended to improve the growth of plants and grasses. Limit turf grass areas and recycle yard trimmings by "grass-cycling", mulching and composting. For a list of the top ten native plants for the northeast, see the NWF website (<http://www.nwf.org/backyard/northeast.cfm>), or for a more complete list of native and invasive plants, see the plant guide at eNature.com ([http://www.enature.com/native\\_invasive/](http://www.enature.com/native_invasive/)).

**02001.29 Community Garden Area**

For suburban developments, CHFA encourages the dedication of 10 square feet/dwelling unit or more of property for community garden use. Provide soil improvements and raised, accessible planting beds, and encourage organic gardening techniques.

**02001.30 Wildlife Habitat**

For suburban developments, CHFA encourages the establishment of a wildlife habitat area by planting native plants or by leaving tracts of land undisturbed and protected. Wildlife needs the basics of food (native plants), water, and shelter to raise their young. Follow National Wildlife Federation (NWF) procedures and guidelines for community wildlife habitats (<http://www.nwf.org/backyard/>). For a list of the top ten native plants for the northeast, see the NWF website (<http://www.nwf.org/backyard/northeast.cfm>), or for a more complete list of native and invasive plants, see the plant guide at eNature.com ([http://www.enature.com/native\\_invasive/](http://www.enature.com/native_invasive/)).

**02001.31 Road/Vehicle Protocols**

A vehicle washing station shall be provided in close proximity to each construction entrance and protocols describing appropriate use shall be clearly posted both at the on-site office and at the washing station. Descriptions of washing station features and construction can be found in the National Pollutant

Discharge Elimination System (NPDES) reference "Green Book". Protocols for road sweeping and cleaning shall also be clearly posted at the on-site construction office.

#### **02001.32 Downstream Water Quality Testing**

Testing of surface water shall be conducted following National Pollution Discharge Elimination System (NPDES) standards.

#### **02360 Termite Control**

Provide termite control, through soil chemical treatments or physical barriers between subterranean termites and wood-framed structures. Acceptable termite soil treatments include borate application and termite baiting. Toxicants, if utilized, shall be applied by a contractor licensed by the manufacturer, who will provide a written warranty. Treat soil beneath concrete slabs on grade, along the interior and exterior of perimeter foundation walls, and around plumbing and wiring penetrations. Chemicals have limited effective lives. As such, the Owner shall be educated as to the type of treatment provided, and advised of future maintenance and inspection contract requirements and costs.

In order to avoid the expense of routine inspection and re-application of toxicants, and the risk of pesticide exposure to residents and local groundwater, physical barriers are preferred. Physical barriers include termite shields, aggregate, stainless steel mesh, and plastic impregnated with a termiticide. Isolate particularly vulnerable elements of a house, such as beneath concrete slabs on grade, along the interior and exterior of perimeter foundation walls, and around plumbing and wiring penetrations.

Termite shields are continuous, termite-resistant plates of non-corroding metal, with a projecting 1" lip bent down at a 45° angle, which separate the foundation wall or concrete support piers and wood framing. Termites will tunnel through foam insulation to get to wood - if the foundation has exterior insulation, put a termite shield along the top of the insulation. Since some termites can chew through plastics and thin metals, termite shields should be made of thick metal, such as 24 oz. copper or 20 gage galvanized sheet metal or stainless steel (minimum). Seams in the termite shield should be soldered or otherwise sealed. Copper is preferred as it will last longer than galvanized sheet metal, and is much easier to cut, bend and solder than stainless steel.

Aggregate barriers, sometimes called basaltic or sand barriers, are comprised of soil particles that are too heavy or large for termites to move, yet small enough so that spaces between aggregates are too small to pass through. Termites move soil by using their mouth rather than by digging with their legs or bodies, and aggregate in the 1 to 3-mm range is too large for them to manage. A Basaltic Termite Barrier (BTB) consists of basalt aggregate in the #4 to #16 square mesh opening range (4.75mm to 1.18mm). Place aggregate barriers between soil and vulnerable components of a house, beneath slabs on grade and alongside foundation walls.

Stainless steel mesh barriers have a screen opening that is too small for termites to pass through, and too durable for them to shear. In addition, they will not corrode from environmental exposure. Mesh barriers have mesh openings of 0.66 mm x 0.45 mm and come in 47.24 in. by 100 ft. rolls. Apply mesh barriers over potential entry points into the foundation, such as service pipe penetrations, control joints, brick or block piers, etc. Bond the mesh to the cement or masonry foundation using bonding cement or epoxy resin. Use stainless steel clamps to fasten the mesh to pipes.

Plastic barrier systems are designed to be installed around pipes and electrical conduit extending through slab foundations. The system also includes a tub trap barrier for the tub drain penetration through a slab. A polyethylene shell sandwiching a core of termiticide forms the plastic barrier system.

## **02580 Exterior Lighting**

Exterior lighting, including fixtures for required site development signs, drives, parking areas, walks, common entrances/exits, and grade-level unit entrance doors, shall be controlled by photocells. All exterior luminaires shall be “Dark Sky compliant” – designed with opaque housings, baffles, reflectors and/or refractors to prevent glare and reduce light trespass into unwanted areas, adjacent properties and the night sky. All exterior luminaires shall bear the Fixture Seal of Approval of International Dark Sky Association (IDA). The IDA Fixture Seal of Approval Program requires a third-party certification of exterior luminaires, according to a standard set of protocols, based on the Upward Light Output Ratio (ULOR) – the amount of upward flux a fixture produces. Currently, the IDA only approves fixtures deemed “full cut-off” and “fully shielded”. The cut off angle of a luminaire is the angle, measured up from the nadir (i.e. straight down), between the vertical axis and the first line of sight at which the bare source (the bulb or lamp) is not visible. Full cut-off fixtures allow no emission above a horizontal plane through the fixture. The luminous intensity of a full cut-off fixture (in candelas), at or above an angle of 90° above nadir is zero, and the luminous intensity (in candelas), at or above a vertical angle of 80° above nadir, cannot numerically exceed 10% of the luminous flux (in lumens) of the lamp or lamps in the luminaire.

### **02580.1 Poles and Bollards**

Building-mounted flood-lighting for lighting parking lots, and walks to or from parking, shall not be used. Pole-mounted and bollard lights of appropriate heights shall be used for such purposes. Aluminum poles and bollards with baked-enamel painted finishes are preferred. Pole bases shall be located no less than 3'-0" from curbs where cars will be parked head-in.

### **02580.2 Lamps**

Exterior lamps shall be of the compact fluorescent, high-pressure sodium or metal halide type.

### **02580.3 Parking, Roadway and Walkway Lighting**

Exterior lighting levels for parking, roadways and walkways shall be a minimum of ½-foot candle. Lighting shall be even, and "hot" spots are to be avoided. Light fixtures at unit entry doors shall be photocell-operated and controlled for use in conjunction with the development's street/parking/walk lighting. All designs should consider the character and location of the development. Consult the Illuminating Engineering Society of North America Recommended Practice Manual: Lighting for Exterior Environments. Provide a separate Site Lighting Photometric Plan indicating conformance with CHFA-required exterior illumination levels.

### **02580.4 Carport Lighting**

Lighting shall be provided beneath carports at the same ½-foot candle lighting level required for parking. Include carport lighting photometric information on the Site Lighting Photometric Plan.

### **02580.5 Patio Lighting**

Patios shall have a switched light with a shielded light-source to prevent glare.

## **02810 Irrigation**

Every effort shall be made in the design and plant specification for landscapes to minimize the need for irrigation. Where irrigation is desirable, utilize techniques and systems designed to conserve water, including water-smart landscaping, drip and micro irrigation, high-efficiency dishwashers, faucets, and showerheads and clothes washing machines, alternative water sources, including on-site rainwater collection/retention, graywater collection/retention.

#### Drip and Micro Irrigation:

Efficient drip and micro irrigation systems place the correct amount of water directly at the base of each plant, thus reducing water use and waste from over-watering. Drip irrigation systems provide a small but constant water supply to landscape, thus preserving soil moisture, and significantly reducing water waste from overspray. Install drip irrigation systems in place of standard sprinkler systems for all landscape applications except turf.

#### On-site rainwater collection/retention:

Rainwater is channeled through gutters and downspouts to an above ground cistern or underground gravel-filled dry well. Stored water is used for landscape irrigation. Install wherever there is guttered roof runoff and room for the cistern. Rainwater collection reduces the need for using treated, drinkable water for watering of lawns and gardens.

#### Graywater collection/retention:

Graywater is wastewater from sinks, showers and washing machines that is not contaminated by human waste. Graywater plumbing separates the waste pipes from sinks, showers, and washing machines from the toilet waste. Graywater drains are run to a holding tank similar to a septic tank which, in turn, is used to water plants, lawns and gardens. Graywater utilization cuts down on the use of potable water for outside irrigation and lawn watering. It is essentially recycling water at home. Graywater irrigation systems shall be approved by local building and/or health departments and at a minimum shall have a dedicated clothes washer box with a 2-inch drain connected to a subterranean drain field. A separate clothes washer box shall be provided that connects to the sanitary drain system.

#### **02810.1 Irrigation Design**

The irrigation plan must conform to the landscape plan, as well as other site features. Appropriate equipment and design principles shall be practiced regarding terrain, planting materials, exposure and obstructions. As much as practical, provide separate zones for sun and shade. Total run-time shall not exceed five hours per day, based on an application rate of .125" of precipitation per day. Separately zone sprinklers with differing precipitation rates, such as drips, sprays and rotaries. Where it is not practical to separately zone full and part circle rotaries, use matched precipitation rate sprinklers or increase the nozzle size of the full circle sprinklers to more nearly match the precipitation rate of the part circle sprinklers. Over-spray onto public roads, parking areas, and buildings, is prohibited. Every effort should be made to minimize over-spray across walks. Booster pumps shall be approved by the local municipality.

#### **02810.2 Irrigation Controls**

Irrigation controls shall not be located within residential units. Control timers located outdoors are to be in a weather- resistant locking metal enclosure. "Hybrid"-type mechanical controllers with solid-state circuitry are preferred.

#### **02810.3 Smart Water Application Technologies (SWAT)**

Consider providing "smart", climate-based irrigation controllers in lieu of traditional "timer" controls, as recommended by the Irrigation Association SWAT initiative and the EPA WaterSense® Program. Climate-based irrigation controllers have proven through scientific documentation and field testing to reduce outdoor water use by as much as 20% - 40% annually, while maintaining the health and beauty of the landscape. When programmed for specific plant materials, climatological controllers process real-time weather data to produce appropriate, efficient irrigation schedules. "Smart" controllers work by monitoring and using information about site conditions (such as soil types, slope, root zone storage, plant types, irrigation types, irrigation efficiency, precipitation rate, moisture, rain, wind, etc.), and applying the right amount of water based on those factors to maintain healthy growing conditions.

**02860 Tot or Play Lots**

Tot and/or play lots shall be provided in family developments. Play equipment shall be installed per manufacturer’s recommendations for safety and configuration.

**02870 Seating**

In family developments and housing for elderly residents, exterior seating and common area seating shall have backs and arms.

**02900 Plantings**

Shade trees shall have a minimum caliper of 3½”.

Flowering trees shall have a minimum caliper of 3½”.

Evergreen trees shall have a minimum height of 5'-0", with an average height of 6'-0". Mass plantings of evergreen seedlings should be considered for use in screening objectionable views.

Mulch all tree saucers with a minimum of 3" of finely processed shredded bark mulch.

**02980 Site Signs**

A. A CHFA project sign shall be erected on site and remain for the duration of construction work. The project sign shall be constructed of ¾" x 4'-0" x 8'-0" marine-grade AC plywood, with faces and edges painted with a minimum of 2 coats of Connecticut Blue (PMS 295), and all lines, logos and “Albertus XB” (or equal) lettering painted white. CHFA will provide the appropriate project sign design template to reflect the participating financial institution(s), which shall contain at minimum the following information:

Development name, town and state

CHFA logo

“State of Connecticut” with Governor’s Name

“CHFA” with Chairperson’s Name

Other Participating Finance Organization(s) name(s) with Chairperson’s/Commissioner’s name

“Equal Housing Opportunity” with logos

“Equal Employment Opportunity”

B. A lighted development sign containing Fair Housing and Equal Opportunity logos shall be provided.

**03000 CONCRETE**

Fill compaction and concrete testing shall be conducted by an independent testing agency approved by CHFA.

Footings shall be constructed on undisturbed material unless CHFA has approved contract documents indicating otherwise. All fill placed under footings must be engineered fill, designed, compacted and certified by a professional engineer and approved by CHFA before placement.

Apply a capillary break (damp-proofing or membrane) to the tops of concrete footings at all new basements and crawlspaces.

Footing drains shall be provided outside all new foundations surrounding basement and crawlspaces. Outside drains shall drain to daylight or a storm system where possible or to an engineered drywell. All daylight drains must have their outfalls screened and protected from erosion.

In renovations, footing drains may not be present, and retrofitting a new exterior drainage system may not be practical. In such cases, interior perimeter drainage can be used in conjunction with sump pumps at existing basements. Interior sump pits must be fitted with airtight, gasketed covers to prevent soil gas entry.

Styrene or corrugated polyethylene piping shall not be suitable for foundation drains, leaching fields or other below grade applications, except as otherwise required by local authorities. PVC perforated pipe is permissible, provided the minimum wall thickness for 4" pipe is 0.075", and for 6" pipe 0.10".

Drainage lines shall be sized and pitched to provide velocities of at least 2.5 feet per second in storm drainage lines and 2.25 feet per second in sanitary lines. If cast iron pipes are not chosen for storm and sanitary lines, PVC schedule 40 (solid core) shall be specified.

Wood foundations will not be permitted.

Concrete foundation walls shall be extended to 8" min. above exterior grade. Paint all above-grade portions of foundation walls with a vapor permeable, water repellent coating, such as latex paint. Provide details for means to protect the building against moisture penetration where entry walks, ramps and platforms are less than 8" below the bottom edge of exterior finishes.

All new crawlspace floors shall be finished with a top-side semi-permeable coating or chemical sealer.

### **03001 Concrete Design**

Crawlspace vermin barrier slabs shall be a minimum of 3" thick.

Floor slabs and walks shall be reinforced concrete a minimum of 4" thick.

Concrete drives shall be a minimum of 6" thick.

Paving at the front of dumpster stations shall be reinforced concrete a minimum of 6" thick.

#### **03001.1 Curbs**

All curbs shall be concrete.

#### **03001.2 Patios**

Patios provided as outdoor space for grade level dwelling units shall be concrete.

#### **03001.3 Walk Intersections**

Walk intersections shall have a radius or angle configuration that protects the lawn from "cutting the corner". CHFA prefers a 45° diagonal design, where the leg of the diagonal is no less than 17".

### **03010 Concrete Materials**

#### **03010.1 Forms**

Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied. Design formwork to be readily removable. Construct forms to sizes, shapes, lines and dimensions required to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required.

#### **Re-use Form Boards**

Form boards are often 2x10 or larger solid sawn lumber. Carefully remove and separate forms for re-use.

#### **Metal Forms**

Metal forms come in all sizes and shapes and produce a smooth finished surface on the concrete and can be used repeatedly. Metal forms can be used in most applications to replace wood forms and reduce wood use.

### Insulated Concrete Forms (ICFs)

Insulating Concrete Forms (ICFs) are forms for poured concrete walls, which stay in place as a permanent part of the wall assembly. The forms, made of foam insulation, are either pre-formed interlocking blocks, or separate panels, connected with plastic ties. The left-in-place forms not only provide continuous insulation and a sound barrier, but also a backing for drywall on the inside, and stucco, lap siding, or brick on the outside. Rigid foam forming systems can be used wherever below-grade habitable spaces and/or an insulated foundation are desirable.

#### **03010.2 Reinforcing**

Deformed steel reinforcing bars shall conform to ASTM A15 and A305, and as specified by the Structural Engineer. Anchor bolts shall be of sizes and spacing required. Welded wire fabric shall comply with ASTM A 185, and as specified by the Structural Engineer. Install mesh in lengths as long as practicable; lap adjoining pieces at least one full mesh and lace pieces with wire; offset and lap in adjacent widths. Lift and maintain proper position of mesh before and throughout the pour.

#### **03010.3 Vapor Barrier**

Provide a polyethylene vapor barrier not less than 6 mils thick under all crawlspace vermin-barrier slabs.

Line the bottoms and exterior faces of perimeter foundation wall forms at all monolithic slab-on-grade construction with a polyethylene vapor barrier not less than 6 mils thick to form a continuous capillary break up to finished grade (polyethylene “skirt” remains in place after forms are removed). Line the interior faces of perimeter foundation walls with vapor-permeable rigid insulation. Paint all above-grade portions of the perimeter wall with latex paint.

If basement or below-grade spaces in new developments are designed and constructed to be occupied, do not install a vapor barrier under the floor slab. Install continuous vapor-permeable rigid insulation under floor slabs, or over floor slabs in conjunction with a floating floor. Finished wood flooring or carpeting may be installed on insulated floating floors. Carpeting may be installed directly on below-grade slabs only if continuous under-slab insulation is installed. Vinyl flooring should be avoided in all below-grade spaces.

In renovations, under-slab stone and/or a polyethylene vapor barrier may not be present and over-slab control of water vapor may be required. If salts are not present in the ground, epoxy coatings or chemical sealers may be used. Where moisture flow is upwards is small, and/or finished wood flooring or carpet is to be installed, provide a floating floor over vapor-permeable rigid insulation and an air/gas tight dimpled plastic sheet membrane. Carpeting should never be installed directly on un-insulated slabs, as the elevated relative humidity within supports dust mites and mold growth.

All pipe penetrations shall be sealed to prevent water infiltration.

#### **03010.4 Mix**

Concrete shall be ready-mixed with a minimum compressive strengths specified by the Structural Engineer. Portland cement shall be ANSI/ASTM C150, type 1; aggregate shall be ANSI/ASTM C33; water shall be potable.

#### **03010.5 Strength**

Concrete shall be, at a minimum, 3500 psi 28-day compressive strength, with reinforcing materials as required. Exterior concrete shall be air-entrained, and walks and porch/patio slabs shall be, at a minimum, 4000 psi 28-day compressive strength, with reinforcing materials as required. Where structural conditions or exposure to the weather warrant, provide concrete with higher compressive strength(s) as required. Slump limits shall meet ACI Standards. The concrete shall be used at a degree of plasticity

which would produce the required slump(s). Do not increase the water ratio in concrete for easier movement.

#### **03010.6 Backfill**

CHFA encourages the use of recycled content rubble for backfill drainage. Concrete and rubble can be crushed and used for backfill and drainage purposes at the base of foundations.

#### **03010.7 Concrete with Fly Ash or Slag**

Fly ash and slag can be inexpensive substitutes for 15% - 40% of the Portland cement used in concrete for footing, foundation walls, and slabs. Fly ash increases the strength and durability of the concrete, and, by reducing the amount of cement needed, the overall environmental impacts of cement production (mining and energy consumption) are decreased.

#### **03010.8 Recycled Concrete Used as Aggregate**

Demolished concrete can be used as an aggregate in poured concrete structures.

#### **03010.9 Air Conditioner Condensing Unit Pads**

The outdoor pads for air conditioner or heat pump condensing units shall have a minimum of 50% recycled material content (such as plastic or rubber tires). Recycled content must be verified by the manufacturer.

### **03030 Concrete Finishing Materials**

#### **03030.1 Cement Parging**

Provide a two-coat portland cement parge coating, type L, M, or P, in compliance with ANSI A422 and ASTM C150, continuous from the sill to 12" below finished grade (minimum).

#### **03030.2 Waterproofing**

Waterproofing shall be applied to all foundation walls enclosing a basement or crawlspace. At a minimum, provide asphalt-bituminous coating from the outside edge of the top of footings to 3" below finished grade, per manufacturer's printed instructions. Where below-grade habitable spaces are planned, and/or severe underground water conditions warrant, provide more sophisticated systems incorporating rubber membranes, rigid insulation, protection board, bentonite, etc.

#### **03030.3 Sealing**

All exposed concrete floors within residential buildings shall be sealed. If salts are not present in the ground, epoxy and acrylic polymer coatings, or chemical sealers may be used.

### **03315 Concrete Placement**

#### **03315.1 Hot Weather Placement**

Maintain concrete temperature below 90° F at time of placement, in compliance with ACI 301. Chilled mixing water, or chopped ice calculated to be the equivalent of the total amount of mixing water required, may be used to control the temperature. Fog spray forms, steel reinforcement and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots or dry areas.

#### **03315.2 Cold Weather Placement**

Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306. When average high and low temperature is expected to fall below 40° F for three successive days, maintain delivered concrete mixture within the temperature range required by ACI 301. Do not use frozen materials or materials containing ice or snow.

Do not place concrete on frozen subgrade or on subgrade containing frozen materials. Calcium chloride, salt or other materials containing anti-freeze agents as admixtures are not permitted. Consult the Architect and/or Structural Engineer regarding accelerating admixtures when placing concrete at less than 50° F ambient.

### **03346 Concrete Crack Control**

Expansion Joints:

Exterior contraction joints shall be tooled joints.

Interior joints shall be made within 24 hours of concrete placement.

Expansion joints in interior slabs shall be full depth and located beneath walls.

### **03650 Cementitious Underlayment**

Cementitious underlayment, where required, including poured gypsum and lightweight concrete, shall be installed in accordance with manufacturer recommendations. Note in particular the requirements for underlayment for resilient flooring.

### **04000 UNIT MASONRY**

Set masonry units, plumb and true to line in specified bond patterns, with joints pointed to uniform cross section, and well bonded to adjacent construction. Set units, both bottom and end, in full bed of mortar with joints uniform in thickness and head joints in alternative courses plumb over the ones below. Keep air spaces clean of mortar droppings and other materials during construction. Strike joints facing air spaces flush. Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall or where indicated on the drawings. Provide weep holes as specified – every effort must be made to keep weep holes clear during subsequent installations. Provide lintels, flashing, weep holes, anchors and other accessories where required in compliance with the highest standards of masonry practice and professional workmanship.

Where colored mortar is desired, specify natural and synthetic iron oxide and chromium oxide pigments proven satisfactory for masonry mortars. Do not use calcium chloride or masonry cement.

#### **Cold Weather**

Below 40° F ambient temperature, comply with Portland Cement Association reference standard: “Table 501: Recommendations for Cold Weather Masonry Construction” and ACI 530.1/ASCE 6/TMS 602. Do not use frozen materials or materials mixed or coated with frost. Remove and replace unit masonry damaged by frost or freezing conditions.

#### **Hot Weather**

Protect unit masonry work when temperature, humidity and wind conditions produce excessive evaporation of water from mortar and grout.

#### **Sustainable Masonry Practices**

CHFA encourages the use of indigenous Connecticut and New England earth materials, such as common clay, dimension stone (granite, quartzite and sandstone), crushed stone, construction sand and gravel, and lime, and locally/regionally-produced brick and concrete masonry units. Because they are not hauled great distances, transport costs, fossil fuel use and pollution are reduced. Ideally, stone from the building site can be utilized. Depending on the stone type, it may be useful as dimension stone and/or crushed stone.

Earth materials are naturally non-toxic, create no active chemical off-gassing concerns and usually do not require any additional surface finishing procedures or materials. These materials can also be easily recycled and safely returned to the earth after their use is no longer required. Also, using them supports

local/regional business and resource bases. Both brick and stone materials are aesthetically pleasing, durable, and low-maintenance. Exterior walls weather well, eliminating the need for constant refinishing and sealing. Interior use of brick and stone can also provide excellent thermal mass, or be used as a component in a radiant heat system.

#### Moisture-control

“Reservoir” materials that collect and store moisture, such as stone, brick, and stucco, can cause problems if the moisture is allowed to migrate to other components of exterior wall assemblies. Disconnect masonry veneer “reservoirs” by back-venting or by using a condensing surface.

To effectively disconnect a masonry veneer from a wall system by back-venting, a clear 1" cavity must be provided between the masonry and drainage plane, with air inlets at the bottom of the masonry veneer and air outlets at the top.

To effectively disconnect masonry veneer from a wall system by using a condensing surface, the drainage plane must also be a vapor barrier, or a vapor impermeable layer (i.e., rigid insulation) must be installed between the masonry veneer and drainage plane. When a condensing surface is used, a ventilated air space is not necessary, and the presence of mortar droppings is not a concern. Provide a drainage space ¼" or greater and drainage openings at the bottom of the masonry veneer.

Install stucco over two layers of building paper, or over an appropriate capillary break such as foam sheathing.

#### **04050 Masonry Materials**

Concrete Masonry Units in compliance with ASTM C 90

Prefaced Concrete Masonry Units in compliance with ASTM C 90, Type I

Common Brick in compliance with ASTM C 62, Grade SW

Face Brick in compliance with ASTM C 216

Precast Lintels

Steel Lintels in compliance with ASTM A 36

Mortar in compliance with ASTM C 270, Type(s) S, M, and/or N

Colored-Aggregate Mortar in compliance with ASTM C 144

Color-Pigmented Mortar

Grout in compliance with ASTM C 476

Masonry Joint Reinforcement in compliance with ASTM A 153, Class B-2

Steel Bar Reinforcing in compliance with ASTM A 615, Grade 60

Anchors and Ties:

Stainless Steel Wire in compliance with ASTM A 580/580 M, Type 304

Stainless Steel Sheet in compliance with ASTM A 666, Type 304

Hot-dipped Galvanized Carbon Steel Sheet in compliance with ASTM A 366/366 M

Anchor Bolts in compliance with ASTM A 307, Grade A

Partition Top Anchors

Dowels in compliance with ASTM A 666, Type 304

Embedded Flashing

Miscellaneous Masonry Accessories:

Compressible Fillers in compliance with ASTM D 1056, Grade 2A1

Control Joint Gaskets in compliance with ASTM D 2000, Designation M2AA-805

Bond-breaker Strips in compliance with ASTM D 226, Type I

Round Plastic Weep Tubing

Cavity Drainage Material

Cavity-wall Insulation in compliance with ASTM C 578, Type IV

Miscellaneous Masonry Accessories (continued):  
Masonry Cleaners

#### **04050.1 Alternative Masonry Materials**

Some American brick manufacturers are making bricks with sewage sludge. Sludge material is mixed with clay normally used in the manufacturing process. The resulting brick is equally attractive and strong. Another alternative material for brick production is petroleum contaminated soils. Such soils, when combined with clay and fired at very high temperatures, yield brick which is free from hydrocarbon contamination.

#### **05000 METALS**

Comply with applicable provisions of the current editions of the following specifications and documents:

AISC “Manual of Steel Construction, Allowable Stress Design”

AISC “Code of Standard Practice for Steel Buildings and Bridges”

AISC “Seismic Provisions for Structural Steel Buildings” and “Supplements”

AISC “Specification for Steel Buildings – Allowable Stress Design and Plastic Design”

AISC “Specification for Design of Steel Hollow Structural Sections”

AISC “Specification for Allowable Stress Design of Single-Angle Members”

RCSC “Specification for Structural Joints Using ASTM A 325 Or A 490 Bolts”

#### **05050 Metals Materials**

W-Shapes and WT-Shapes in compliance with ASTM A 992

Channels and Angles in compliance with ASTM A 36

Plate and Bar in compliance with ASTM A 36

Cold-formed Hollow Structural Steel Sections in compliance with ASTM A 500, Grade B (rectangular sections) and ASTM A 500, Grade C (round sections)

Steel Pipe in compliance with ASTM A 53, Type E or S, Grade B

Welding Electrodes in compliance with AWS requirements

High-strength Bolts, Nuts, and Washers in compliance with ASTM A 325 or ASTM A 490, Type 1 heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts, and ASTM A 436 hardened carbon-steel washers

Shear Connectors in compliance with ASTM A 108, Grades 1010 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B

Anchor Bolts in compliance with ASTM A 307, Grade A

Un-headed Anchor Rods in compliance with ASTM A 307, Grade A

Threaded Rods in compliance with ASTM A 307, Grade A

Welded Wire Fabric in compliance with ASTM A 185,

#### **05050.1 Metal Studs**

Metal studs are 300 times more thermally conductive than wood, and are prone to condensation and deterioration. Metal studs below grade should not be filled with cavity insulation because it makes them even colder. If basement or below-grade spaces are designed and constructed to be occupied, metal studs should not be used unless separated from floor slabs with sill gaskets and from perimeter foundation walls with vapor-permeable rigid insulation with taped or sealed joints.

#### **06000 WOOD AND PLASTICS**

##### **06100 Rough Carpentry**

Provide rough carpentry work as indicated, and as required by job conditions, including but not limited to the following: wall, ceiling framing, roof framing and sheathing; all fasteners, attachments and

accessories; all blocking, bracing, shimming, furring, firestops, sleepers and nailers; additional framing required to introduce the work of other contractors and trades. All materials, methods and details shall comply with 2005 National Design Specifications, 2001 Wood Frame Construction Manual, and the 2005 Special Design Provisions for Wind and Seismic Supplement by the American Wood Council (AWC). Erect all work true to line, dimension, level, squared, plumb and securely fastened. All work shall conform to the highest standards of quality professional workmanship.

Where flush framing is indicated, method of fastening shall be by means of Code-approved, manufacturer recommended galvanized/stainless steel joist/beam hangers attached with required fasteners, and as specified by the Structural Engineer.

Do not impair integrity of structural members by improper drilling or cutting. All Work shall be adequately braced until all portions of the building affecting its stability are in place and securely fastened. All drilling and notching of joists shall be in accordance with applicable Building Codes/pre-engineered framing manufacturer requirements.

Wall framing studs - interior and exterior - shall be 16" o.c. (maximum). Provide double studs, minimum, at all openings. Framing at windows shall be placed for adequate nailing of siding materials.

Below-grade floors with top side vapor control – semi-permeable floating floor

In new construction, finished wood or carpeting may be installed over ¾" plywood subfloor on 1 x 4 furring at 16" o.c. Install furring over ¾" un-faced extruded polystyrene rigid insulation. Expanded polystyrene may be used if the spacing of the furring is reduced to 12" o.c., or if tongue and groove plywood with biscuit-joined narrow edges is supported directly by the foam. Provide a semi-permeable coating or chemical sealer on top of the floor slab. Do not use this assembly with visibly wet slabs or where salty efflorescence is visible.

Below-grade floors with top side vapor control – airspace approach

In new construction and renovations, finished wood or carpeting may be installed over ¾" tongue and groove plywood, with biscuit-joined narrow edges. Install plywood over, but not mechanically fastened to, un-faced extruded polystyrene rigid insulation. Provide a dimpled plastic sheet membrane between the rigid insulation and the slab, with all joints taped and the membrane sealed to the perimeter foundation to isolate the airspace from the interior. Groundwater leakage can be handled with this approach by draining the airspace to a sump or floor drain.

Below-grade Walls

If basement or below-grade spaces are designed and constructed to be occupied, wood studs should be separated from floor slabs with sill gaskets and from perimeter foundation walls with vapor-permeable rigid insulation with taped or sealed joints. Below-grade wall framing should be pressure-treated.

### **06110 Lumber**

CHFA encourages the use of engineered wood for headers, joists, and sheathing. Large size lumber can be replaced with engineered lumber, such as microlams, paralams, and gluelams. All materials, methods and details shall comply with Engineered Wood Construction Guidelines by the American Plywood Association (APA). Where structural loads allow, single-piece 1¾" structural engineered wood headers provide room in the wall cavity for insulation (provide full-depth horizontal blocking at window head).

Solid wood framing lumber shall be Western Wood Products Association (WWPA) grade-stamped and stress-graded. Framing lumber shall be graded "S-dry," max MC=19% and free of warping, checking or other defects. Load-bearing stud framing shall be #2 grade or better. Finger-jointed studs (graded equivalent to full dimensional studs - 1997 UBC Standard, Chapters 23 and 35) may be used. Spanning

members shall be graded  $F_b=1450$ ;  $E=1.6$ . Framing lumber abutting concrete or masonry shall be WWPA grade stamped pressure-treated unless otherwise required. All framing lumber at exposed exterior locations or which abuts concrete or foundations, such as sill plates, shall be pressure-treated. Solid white spruce framing lumber shall not be used.

#### **06110.1 Reclaimed Lumber**

Whenever possible, use reclaimed lumber for nonstructural applications, in place of new material. High quality dimensional lumber in long lengths can often be salvaged from old buildings that are being deconstructed or salvaged.

#### **06110.2 Resource-Efficient Framing**

CHFA encourages resource-efficient Advanced Framing Techniques (AFT) to minimize material usage, while meeting model building code requirements. Consider the following AFTs:

- A. Provide exterior wall framing with outside dimensions adhering to 24" modular dimensions, rather than the standard 16"
- B. Substitute 2 x 6 studs for standard 2 x 4 studs
- C. Increase wall framing to 24" o.c., rather than the standard 16". To compensate for the increased panel span, CHFA requires exterior wall sheathing and interior gypsum board wall finishes that are 1/8" (min.) thicker than those noted elsewhere in these standards
- D. Increase floor and roof framing to 19.2" or 24" o.c., rather than the standard 16". To compensate for the increased panel span, CHFA requires floor and roof sheathing that is 1/8" (min.) thicker than those noted elsewhere in these standards
- E. Use floor and roof trusses, rather than stick framing
- F. Use "in-line" or "stack" framing to transfer loads directly to the foundation and minimize headers
- G. Use 2-stud corner framing with drywall clips or horizontal ladder framing, rather than 3-stud corners
- H. Use horizontal ladder framing or drywall clips at wall "T" intersections, rather than 3-stud corners
- I. Eliminate headers in non-bearing walls, and engineer headers in bearing walls to adequately support loads with the smallest possible members as may be required

#### **06110.3 Recycled Content Materials**

CHFA encourages the use of recycled content materials for decking, and outdoor amenities such as picnic tables, mail kiosks, gazebos, and playgrounds. Recycled plastic lumber contains only recycled plastic resins, while composite lumber is made by combining recycled wood fiber and recycled plastic resins that are then formed into deck boards. Both products can be used in place of old-growth redwood, cedar and pressure-treated pine. Follow manufacturer recommendations closely regarding the amount of expansion that will occur when using recycled-content plastic lumber.

#### **06110.4 Solvent-Free Adhesives**

Where possible, use solvent-free products in place of standard adhesives for all interior applications such as installation of flooring, countertops, wall coverings, paneling and tub/shower enclosures.

All construction adhesives shall have a maximum Volatile Organic Compound (VOC) content of 250 g/L, or as otherwise noted below.

- A. Multipurpose Construction Adhesives: maximum VOC content of 70 g/L
- B. Subfloor Adhesives: maximum VOC content of 50 g/L
- C. Single Ply Roof Membrane Adhesives: maximum VOC content of 250 g/L
- D. Structural Glazing Adhesives: maximum VOC content of 100 g/L
- E. Drywall and Panel Adhesives: maximum VOC content of 50 g/L
- F. Ceramic Tile Adhesives: maximum VOC content of 65 g/L
- G. Rubber Floor Adhesives: maximum VOC content of 60 g/L
- H. Wood Flooring Adhesives: maximum VOC content of 100 g/L

- I. VCT and Asphalt Tile Adhesives: maximum VOC content of 50 g/L
- J. Cove Base Adhesives: maximum VOC content of 50 g/L
- K. Carpet Pad Adhesives: maximum VOC content of 50 g/L
- L. Indoor Carpet Adhesives: maximum VOC content of 50 g/L
- M. Outdoor Carpet Adhesives: maximum VOC content of 150 g/L

#### **06110.5 Forest Stewardship Council (FSC) Certified Wood**

CHFA encourages the use of sustainably-harvested Forest Stewardship Council (FSC) Certified Wood for new framing materials. FSC certification assures that the forest from which the wood is produced is managed in an environmentally and socially responsible manner to maintain ecological health and biodiversity.

#### **06110.6 No-Formaldehyde Manufactured Wood Products**

CHFA encourages the use of no-formaldehyde manufactured wood products. Two glues, or “binders” (as they are called in the industry), dominate the manufactured wood products industry: urea formaldehyde (UF) and phenol formaldehyde (PF). For interior-grade products, including wood and agrifiber particleboard, MDF, and hardwood plywood, UF binders have long been more popular because of their low cost and light color compared with PF binders. For exterior-grade applications PF binders are favored because of their better moisture resistance. While UF binders are significantly less expensive than PF binders, they give off a lot more formaldehyde, a volatile compound that is classified as a known human carcinogen, and which can cause respiratory problems, eye, nose, and throat irritation, allergic reactions, and depression.

Due to concerns about formaldehyde emissions, and in response to new California regulations that will restrict formaldehyde emissions, the industry has introduced other binders. SierraPine has long used methyl diisocyanate (MDI), a polyurethane binder, in its Medex and Medite II MDF, and since 2006 in its Arreis particleboard. MDI contributes to a better indoor environment for building occupants – once cured, it is extremely stable with virtually no off-gassing – but it is extremely toxic in the factory.

Some OSB manufacturers have also used MDI, as does TrusJoist with its TimberStrand laminated-strand lumber. MDI is even more moisture-resistant than PF, making Medex appropriate for outdoor signage. Agrifiber particleboard, made from rapidly renewable agricultural fibers like wheat straw, soybean and sunflower hulls, uses MDI instead of UF or PF binders – mostly because the MDI adheres better to the fibers. Several wood particleboard products, including Roseburg SkyBlend and SierraPine Encore, also use PF rather than UF binders.

Columbia Forest Products’ PureBond agrifiber-core, wood-veneer panels use a soy-based binder in place of UF or PF. This binder, developed by scientists at Oregon State University, is 87% soy protein, with the remainder a proprietary petrochemical-based polyamide resin. The new binder is water-based, non-flammable, and nontoxic, and water vapor is the only emission during curing. The company’s agrifiber-core panels are made from straw, a waste agricultural product, and among the wood veneers offered are those that are certified according to Forest Stewardship Council (FSC) standards.

#### **06190 Trusses**

Insulation placed at eaves shall be R-30 minimum. Provide “energy heels” at all roof trusses, to raise the top framing members adequately to allow the full depth of required attic floor insulation to run over the top plate, without being compressed by insulation baffles.

#### **06200 Finish Carpentry**

All millwork and exterior finishes shall be carefully cut, erected, and secured with finishing nails for tight-fitting joints. All materials, methods and details shall comply with American Woodwork Institute

(AWI), American Hardboard Association (AHA), Hardwood Plywood and Veneer Association (HPVA), National Particleboard Association (NPA), National Electrical Manufacturers Association (NEMA), and Builders Hardware Manufacturers Association (BHMA) standards. Exposed nails shall be set for putty. All Work shall be installed plumb, level, square, true to line and plane, and in conformance with the highest standards of quality professional workmanship.

#### **06200.1 Interior Trim**

All interior finish woods shall be kiln dried to maximum moisture content of 12% and free from knots, defects, and warpage. Where painted finishes are desired, CHFA encourages the use of non-solid sawn wood (such as finger-jointed) or non-wood material (such as cellular PVC) for interior trim. Interior wood trim can be paint-grade, finger-jointed poplar or #1 pine. Polystyrene molded door casing and baseboard shall not be used. All rooms with floor coverings shall have base trim.

#### **06200.2 Exterior Trim**

CHFA prefers low-maintenance trim materials such as vinyl, cellular PVC, or pre-finished cement boards. All exterior wood trim shall be solid wood free from knots, defects and warpage or finger-jointed wood. Un-clad wood trim, wood columns or other high-maintenance materials shall not be permitted. Aluminum "flat stock" material, exceeding 6" in width, shall not be used for trim bands, unless a "break" in the aluminum stock is provided. This required "break" must be substantial enough to mitigate the effect of "oil canning". A "formed" siding piece may be used in lieu of stock with a "break".

#### **06240 Laminates**

Shelf, cabinet and countertop substrate material for plastic laminate shall be exterior-type, hardwood-faced plywood, or other material approved by the manufacturer of the plastic laminate. If particle board is used, all 6 sides must be coated with a sealant. Sealant shall have a maximum VOC (Volatile Organic Compounds) content of 250 g/L. Whenever possible, eliminate new particleboard inside houses by using formaldehyde-free medium density fiberboard (MDF) for shelving, cabinets and substrates for countertops, such as Roseburg "Skyblend". Sharp edges shall be avoided. Cut-out edges shall be sealed prior to the installation of sinks. Protect walls with back and side splashes - 4" (min.) at bathroom vanity tops and 6" (min.) at kitchen countertops.

#### **06240.1 Counter Tops**

Counter tops shall not have sharp exposed corners. Corners protruding in excess of 1-1/2" shall be rounded or chamfered (45°). In housing for elderly residents, the front edges of the counters shall be rolled.

#### **06240.1 Alternative Counter Top Materials**

Consider providing alternative counter top materials, such as bamboo, lyptus wood, PaperStone, Squak Mountain Stone or IceStone, in lieu of plastic laminate or thermo-set plastic solid surface counter top materials.

Bamboo products qualify for the Materials and Resources credit for rapidly renewable materials in the U.S. Green Building Council's LEED® Rating System. Prefabricated, furniture-grade bamboo countertop slabs and splashes, laminated with non-toxic, food-grade, formaldehyde-free adhesives are available in various patterns, colors, lengths, widths and thicknesses.

Lyptus is a trade name for a type of hardwood made from a hybrid of two species of eucalyptus trees. Because lyptus trees are plantation-grown for commercial use, harvesting does not deplete forests like naturally obtained wood, and there are no harmful effects on surrounding ecosystems. Unlike other woods cut from a single tree which has to be replaced, properly-cut lyptus trees will regrow up to five

times before replacement with a new seedling. Lyptus is the trade name for a type of wood made from two species of eucalyptus.

PaperStone Original contains 50% recycled paper. PaperStone Certified is made with 100% post-consumer recycled paper, is FSC certified, and has been approved by SmartWood and the Rainforest Alliance. PaperStone uses a water base resin system that uses non-petroleum, cashew nut shell liquid (CNSL)-based phenols and when finished has no detectable free formaldehyde.

Squak Mountain Stone is a fibrous-cement material comprised of recycled paper, recycled glass, coal fly-ash and Portland cement. The material is hand cast into “slabs” as an alternative to natural or quarried stone. It resembles soapstone or limestone. The material contains no steel reinforcing, making field modifications possible. The post-consumer recycled content is 2.5%. The post-industrial recycled content is at least 49%. Slabs are provided from the manufacturer sealed with a water-based sealer that provides stain resistance to grease, oil, food, and other common household chemicals for approximately 24 hours. This sealer also provides some limited resistance to acid-etching from household liquids such as vinegar and citrus juices.

VOC-free IceStone durable surfaces are made from 100% recycled glass and concrete, and are “Cradle to Cradle” certified for sustainability under the US Green Building Council’s LEED Green building rating system. IceStone is less porous than marble, heat-resistant, and strong like granite. 99.5% inorganic and chemically-benign in composition, IceStone is a very safe material in terms of toxicity and fire-resistance.

### **06300 Wood Treatment**

CHFA encourages the use of treated wood that does not contain chromium or arsenic for decking and sill plates, and outdoor amenities such as picnic tables, mail kiosks, gazebos, and playgrounds. Use Alkaline Copper Quaternary ammonia (ACQ) and Wolman Natural Select for any application that specifies treated lumber including decking, fencing, and site furnishings. All materials, methods and details shall comply with American Wood-Preservers’ Association (AWPA) standards.

### **06430 Wood Stairs and Railings**

Ainsworth SteadiTred® panels are custom-manufactured from 1" thick oriented strand board (OSB), meeting APA Sturd-I-Floor® grade, and APA Guidelines for Stair Treads. SteadiTred also meets or exceeds product standards and building code requirements. Tread panels are available bull-nosed for carpet finishes, and square-edged for resilient floor and ceramic tile finishes. Ainsworth recommends engineered 1¼" thick Durastrand® OSL Rimboard for use as stringers, and ⅝" or thicker OSB for risers.

#### **06430.1 Handrails**

Handrails shall be easy to grasp and able to withstand 300 pound lateral and vertical loads, without damage or permanent set. Handrails shall meet the “graspability” requirements of, and be located in accordance with, all applicable codes. In buildings designed for elderly residents, handrails shall be provided on both sides of all corridors, and shall return to the walls at all interruptions such as doors and cased openings, and fire hose or fire extinguisher cabinets.

#### **06430.2 Guards**

Guards not less than 36" in height shall be provided at all decks, porches, balconies or raised floor surfaces, including those provided with insect screen enclosures, more than 18" above the floor or grade below. Open sides of stairs with a total rise of more than 18" above the floor or grade below shall have guards not less than 34" in height. Guard openings shall comply with all applicable Building Code limits.

## **07000 THERMAL & MOISTURE PROTECTION**

### **07010 Energy-Efficient Building Envelope**

Dwelling units must meet or exceed all requirements of the 2003 International Energy Conservation Code, the EPA Energy Star® Program, the Connecticut Energy Code and CHFA Standards of Design and Construction, whichever is more stringent, in order to reduce energy consumption due to air leakage, avoid moisture condensation problems and uncomfortable drafts, and provide high indoor air quality through reduced indoor air pollution.

#### **07010.1 Air Infiltration**

Natural Air Changes per Hour ( $ACH_{nat}$ ) shall be less than or equal to 0.50 Air Changes per Hour (ACH), as determined by a blower door test in accordance with ASTM Standard E779-87, "Test Method for Determining Air Leakage by Fan Pressurization".

#### **07010.2 Ventilation**

Dwelling units shall meet the ASHRAE 62-1999 "Ventilation for Acceptable Indoor Air Quality" minimum ventilation requirement of 0.35 ACH, by natural or mechanical means. To ensure consistent indoor air quality, dwelling units testing at 0.20 ACH or tighter will require the installation of an active ventilation system to meet the minimum ventilation requirements of 0.35 ACH.

#### **07010.3 Combustion Safety**

The combustion safety of combustion appliances shall be verified according to ASTM Standard E1998-99, "Standard Guide for Assessing Depressurization-Induced Backdrafting and Spillage from Vented Combustion Appliances", and Section H of the National Fuel Gas Code (ANSI Z223.1/NFPA 54).

### **07030 Air Sealing Measures**

Dwellings must meet or exceed the air sealing requirements of the 2003 International Energy Conservation Code, the Connecticut Energy Code or CHFA Standards of Design and Construction, whichever is more stringent. Many of the following air sealing measures involving the use of caulking to seal construction joints in fiberglass batt-insulated walls and ceilings can be obviated through the use of spray-on and pour-fill foam insulation.

#### **07030.1 Below-grade Walls**

If basement or below-grade spaces are designed and constructed to be occupied, basement walls should be insulated with vapor-permeable rigid insulation panels with taped or sealed joints to prevent interior air from contacting cold masonry walls. No interior vapor barriers should be installed in basements, as they trap moisture inside wall assemblies.

Provide sealant between the exteriors of sole plates and perimeter vapor-permeable rigid insulation panels, at sole plate joints with the floor slab (along the bottom edges of gypsum board wall panels raised ½" from the top of the floor slab), between the exteriors of top plates and perimeter vapor-permeable rigid insulation panels, between the interiors of top plates and gypsum board wall panels, between the interior of the first floor framing plate and perimeter vapor-permeable rigid insulation panels, at the joint between the first floor framing plate and the rim joist, between the exterior of the first floor framing plate and exterior wall sheathing, and between the top of the rim joist and first floor subfloor.

#### **07030.2 Chases**

Framed spaces that connect conditioned areas to unconditioned attics, basements or crawl spaces shall be sealed with sheet material and sealant. These areas include chases for plumbing, duct work, chimneys and flues. For chases with high temperature heat sources, noncombustible sheet materials, such as sheet metal and high temperature caulk, shall be used. Where the code prohibits sealing this gap (such as with

fireplace flues) manufacturer-supplied sheet metal shall be used that fits the flue pipe as closely as allowed. Breaks in framing and interior finish materials that connect unconditioned and conditioned areas, such as for dropped soffits and changing ceiling heights, shall be sealed with blocking or sheet material and sealant.

#### **07030.3 Penetrations through Top and Bottom Plates**

All holes in the floor assembly for plumbing, wiring, ductwork, and other purposes connecting conditioned and unconditioned (and exterior) areas shall be sealed. Penetrations for flues and other heat-producing items shall be sealed with noncombustible sheet materials and high temperature sealant.

#### **07030.4 Joist Cavities under Attic Kneewalls**

Air-impermeable insulation blocking shall be installed between joist cavities underneath kneewalls to seal the floor joist cavities. Align the outside face of the blocking with the inside face of the kneewall framing, to allow cavity insulation to extend under the kneewall. Seal seams at any location where attic air may enter the band area between conditioned floors.

#### **07030.5 Bottom Plates**

Bottom plates shall be sealed to floor or foundation with a foam gasket beneath the bottom plate and/or a suitable sealant. Apply sealant between the interior of wall plates and gypsum board wall panels and between the exterior of wall plates and exterior wall sheathing.

#### **07030.6 Window and Door Rough Openings**

The shim space between the framing for window or door (including attic access) rough openings and the installed units shall be sealed with non-expanding spray foam sealant, closed cell foam backer rod, spray applied insulation, or other suitable sealant. Cellulose, fiberglass or rock wool batt insulation is not acceptable as a sealant but can be used as a backing for a sealant (such as caulk). Thresholds for exterior doors shall be sealed to the subfloor.

#### **07030.7 Gaps in Exterior Wall Sheathing**

All gaps in exterior sheathing, such as seams between adjacent sheets, shall be sealed with a proper sealant. All penetrations, such as holes drilled for condensation lines and utility boxes, shall be sealed with an expanding spray foam or equivalent. Tape all joints in foam sheathing. Extend sheathing below bottom plate and seal.

#### **07030.8 Penetrations Through Band Joists**

All penetrations through the band joists, such as holes drilled for HVAC ducts, plumbing pipes and electrical lines shall be sealed with sheathing and proper sealant.

#### **07030.9 Penetrations Through Insulated Subfloors**

All penetrations through insulated floor systems (such as basements, crawlspaces, and garages) over unconditioned areas must be need sealed including duct, electrical and plumbing penetrations.

#### **07030.10 Penetrations Through Insulated Ceilings**

All penetrations through insulated ceilings, including HVAC boots, bathroom fans, light fixtures, security, and audio speakers shall be sealed with a proper sealant.

#### **07030.11 Recessed Lights in Insulated Ceilings**

Recessed “can” or “high hat” lights in ceilings with unconditioned areas above must meet the Energy Code specification (2000 IECC section 502.1.3 section 1 or 3) for air tightness and must be Insulation Contact (IC) rated.

**07030.12 Cantilevered Floors**

Floors with conditioned area over unconditioned open areas, shall have the floor joist cavity sealed with air-impermeable insulation blocking and sealant above the top plate of the bearing wall and insulated to R-30, minimum.

**07030.13 Attic Kneewall Doors and Scuttle Holes**

Doors in kneewalls and attic scuttle holes that connect conditioned space to unconditioned attic areas shall be weather-stripped and latched to provide an airtight seal against the door trim and wall drywall.

**07030.14 Seams in Band Joists between Conditioned Floors**

All seams in band joists between conditioned floors shall be sealed.

**07030.15 Shower and Tub Drains**

Plumbing penetrations shall be blocked with air-impermeable insulation and sealed at edges with proper sealant. Rockwool, or similar products, shall not be used.

**07030.16 Air Barrier Behind Tubs and Showers on Insulated Walls**

A secondary air barrier shall be installed behind tub and shower units before installing bath and shower assemblies. The air barrier material must be sealed with a proper sealant and the exterior wall must be insulated to the requirements of the Energy Code.

**07030.17 Drywall Penetrations in Insulated Walls**

All penetrations of drywall in insulated walls, including wall switches, electrical outlets and kneewall door rough openings shall be sealed with a proper sealant.

**07030.18 Ceiling Drywall at Top Plate**

Drywall shall be sealed at top plate on ceilings separating attic from conditioned space. Gaskets, caulk or foam can be used to air seal drywall at any stage of the installation.

**07030.19 Firewalls/Party Walls**

To reduce the potential for air infiltration in fire-rated party walls, CHFA encourages walls separating unit envelopes to be constructed using rated construction that does not require the use of airspace or “gap” between two independent walls. One such system is the U370 system, which also has superior sound abatement qualities.

**07190 Vapor Retarders**

Install vapor retarders with a vapor permeability of 1 perm or less (as tested by ASTM E-96 Test Method A – desiccant or dry cup method) in above-grade exterior wall assemblies. In new construction and significant renovations, paper-faced cavity insulation can be used, or provide un-faced cavity insulation, dry-blown/loose-fill/spray cellulose or low-density spray foam insulation in conjunction with a permeable (latex) interior paint finish.

**07195 Air Infiltration Barrier System**

Air infiltration barriers, such as building paper, housewrap or similar material designed to protect the wall from water moving past the exterior cladding shall be used at the exterior face of wall sheathing. If wood siding is used, the system shall include a vented “rain screen” air space between the exterior cladding and wall sheathing. The system shall be integrated with flashing and be designed and installed to minimize moisture migration between the exterior cladding and the wall sheathing.

### **07195.1 Weather-Resistant Barrier Wrap**

If standard building paper is not the material chosen, provide "Tyvek" breathable, weather-resistant barrier wrap around entire building. Wrap in a continuous band, starting at the bottom of the exterior sheathing, and adding subsequent bands overlapping the top edge, as required. All seams must be cut properly and all edges taped to ensure a continuous air/water barrier. Seal overlaps with tape. Tape all joints with tape recommended by the wrap manufacturer for that purpose. Make diagonal cuts at all window and door openings, and wrap into jambs and sills over interior vapor barrier. Cut flap at heads along top of rough opening, and cut up and out at angles from head/jamb joints. Fold resulting flap up and tape in place, until pan flashing at the sill, the window/door unit, and head flashing are installed. Release head flap down over the head flashing, and tape the angle cuts before installing siding and trim, with tape recommended by the wrap manufacturer for that purpose. Seal housewrap below bottom plate. Seal to framing at window and door rough openings, seal all exterior water spigot (hose bibb) openings and seal gap between electrical boxes and sheathing. Seal at openings for building-mounted light fixtures. Seal at top plate or fold over top plate and secure with roofing nails. Attach housewrap to sheathing/framing with plastic-capped nails.

### **07195.2 Sheathing**

Exterior wall sheathing shall be a nail-able wood product, with a minimum thickness of ½". Structural, APA grade-stamped CDX fir plywood is preferred. Panels shall be stress-rated for job conditions; ½" (min.) at walls, and ⅝" (min.) at roofs. If OSB panels are specified, provide high-performance, water-resistant tongue and groove panels bonded with phenolic resin, such as Huber "AdvanTech".

Consider using Huber Zip System® of roof and wall sheathing panels with integrated protective barriers, and seam tape. The Zip System® installs up to 40% faster than standard sheathing with traditional housewraps and roofing felt, and panels are warranted by the manufacturer for 30 years. Zip System® roof panels, IBC/IRC-recognized as all-in-one structural sheathing and underlayment, quickly stop water from entering the unfinished building, and the integrated barrier provides moisture resistance if shingles are storm-damaged. Roof panel strength and stiffness allow the elimination of H-clips, and taped panels lie flat under roof finishes. Zip System® wall panels, IBC/IRC-recognized as all-in-one structural sheathing and water-resistive barrier, keep water out during construction, and eliminate the risk of water becoming trapped between housewrap and sheathing. The integrated "Type 1" Stormex® water-resistive barrier also allows walls to "breathe" and dry to the outside. Zip System® seam tape can help reduce air leakage as recommended by Energy Star®, helping to promote energy efficiency and prevent moisture condensation in walls.

Interior floor sheathing shall be ⅝" (min.) thick, tongue and groove, APA grade-stamped structural panels. Veneer-faced or Sanded-face plywood panels are preferred. If OSB panels are specified, provide high-performance, water/mold/fungus/termite-resistant tongue and groove panels bonded with phenolic resin, such as Ainsworth "Oxboard" Sturd-i-floor. Screw underlayment both directions @ 8" o.c. All joints shall occur over structural framing members.

### **07195.3 Sill Plate**

Flashing at wall bases shall be detailed and specified for all conditions, specifically whenever the outside grade is less than 8" below the interior floor elevation. The flashing material used shall be compatible with the surface it is attached to.

### **07200 Insulation**

A thermally-protected building envelope shall be provided with insulation material having the minimum thermal-resistant values listed, not including windows and doors. All heat loss calculations must be based on an outside design temperature as determined by ASHRAE 97½ % scale for a particular geographic area. Elderly units must be certified as having the capacity to maintain a temperature of 75 degrees F.,

and family units must be certified as having the capacity to maintain a temperature of 70 degrees F. at the specified outside design temperature.

Install insulation over entire framing area of new work exposed to outside ambient conditions as follows:

- A. Exterior Walls/Attic Kneewalls: 5½" R-19 (minimum) [3½" R-15 may be acceptable in renovations where insulation thickness must match existing framing]
- B. Band Joists: 8¼" R-30 (minimum – use the maximum thickness allowed by floor framing)
- C. Band Joists/Floors/Cantilevered Floors: 8¼" R-30-C, or 10¼" R-38-C (minimum – use the maximum thickness allowed by floor framing)
- D. Inhabited Attic Floors/Cathedral Ceilings/Roofs: 10¼" R-38 (minimum)
- E. Uninhabited Attic Floors: 13¾" R-49 (minimum)
- F. Existing Flat/Low-sloped Roofs to be Replaced: R-13 + R-5.6 ci (continuous insulation), per ASHRAE 90.1 Standard 2007 R-value climate zone 5 (minimum)

Installation of all insulation shall be performed with the utmost care; strict compliance with manufacturer's specifications and insulation instructions and with the highest standard of professional workmanship; the insulation shall be continuous (no gaps or missing pieces) and contiguous (in contact with the air barrier). Extend full thickness insulation over entire surface to be insulated. Cut and fit snugly around obstructions, and fill voids with caulking and scrap insulation. The minimum insulation levels must comply with the Energy Code, meeting or exceeding those listed above. Provide unfaced batts where insulation will be in contact with concrete foundation walls.

Below-grade Walls:

If basement or below-grade spaces are designed and constructed to be occupied, pressure-treated wood studs should be separated from perimeter foundation walls with foam-based, vapor-permeable rigid insulation panels with taped or sealed joints to allow the wall assemblies to dry to the interior. Such insulation should run from the top of the footing to the top of the foundation wall, and should return into the wall plate. Provide R-30 (min.) un-faced batt insulation, cellulose or spray-applied foam insulation at the rim joist.

Plumbing:

Avoid installing pipes that carry water – hot and cold supply pipes, steam lines, hydronic heat pipes and air conditioner condensate lines - in exterior walls. Insulation in a wall cavity holds moisture and dries slowly. Water from a plumbing leak in an insulated wall is less likely to be seen inside the house. Insulated wall cavities experience greater temperature swings, which put more expansion and compression stress on pipes, resulting in frozen pipe leaks and breaks. Water damage to framing members and mold growth can result. If plumbing in the exterior wall cannot be avoided, a separate plumbing chase wall shall be provided inside the insulated exterior wall.

#### **07200.1 Recycled Content, Formaldehyde-free Fiberglass Insulation**

CHFA encourages the use of recycled content, formaldehyde-free fiberglass insulation, whenever practical. Such products include recycled glass, formaldehyde-free binders, non-asphalt adhesives and no colored dyes.

#### **07200.2 Dry-Blown, Loose-fill or Spray Cellulose Insulation**

CHFA encourages the use of dry-blown, loose-fill or spray cellulose insulation, treated with borates to meet or exceed the R-value of ceiling insulation beyond the minimums specified above, and to reduce air movement within the wall cavities, moisture intrusion and flame spread.

**07200.3 Spray-on/Pour-fill Cellular Plastic Insulation**

CHFA encourages the use of spray-on (new construction) and pour-fill (renovation of existing, finished walls) cellular plastic insulation to air-seal, eliminate convective air movement in wall cavities, resist condensation, inhibit rot, retard mold, and reduce unwanted outdoor and interior plumbing system noises.

Icynene spray-on/pour-fill cellular plastic insulation provides more effective thermal performance than equivalent R-value air permeable insulation, requires no additional interior or exterior air infiltration protection, is water vapor permeable, does not exhibit capillary properties, is not a source of food for mold, insects and rodents, and contains no formaldehyde or volatile organic compounds (VOCs).

Permax RT-2045 spray-in-place polyurethane foam by Henry Co. contains no formaldehyde and utilizes non-ozone depleting HFC-245fa technology, with no off-gassing. With an R-value of 6.5 per inch, a 3" installation provides a seamless insulating barrier with a PERM rating of 1 or less, and meets Code requirements as a vapor retarder, and Energy Star® guidelines for energy efficiency.

Bio-based® Insulation incorporates natural, renewable soybean oil-based polyols as a replacement for a portion of the traditional petroleum-based polyols found in spray polyurethane foam insulation. BioBased® 501 is a Class 1, semi-rigid, open celled air barrier that is spray applied using water as the blowing agent. It has an R-value of 13 at 3.5 inches, low VOCs in the finished foam, and no CFCs or HCFCs. BioBased® 1701 is a Class 1 closed-cell air barrier. It has an R-value of 19 at 3.5 inches, is a Class II vapor retarder at 2.5 inches, and has no VOCs, CFCs or HCFCs in the finished foam.

**07200.4 Interior Walls with Plumbing Intersecting Exterior Walls**

Where unit separation walls or other interior walls with plumbing intersect exterior walls, insulation shall be placed in the first framing bay of a 2 x 6-framed interior wall to continue the R-19 insulating value and thereby minimize the chance for frozen pipes in other framing bays.

**07200.5 Insulated Headers**

Exterior walls featuring headers (over windows and door openings) shall be framed with rigid foam insulation of the maximum thickness allowed by the framing conditions. Consider pre-fabricated insulated headers, such as Trus Joist TJ-Insulated headers. Two plies of iLevel Trus Joist TimberStrand LSL engineered lumber resists bowing, twisting, and shrinking, and the expanded polystyrene rigid-foam core provides an R-value of 15. The 5½-inch-wide headers are designed for 2x6 walls and come in five depths ([www.ilevel.com](http://www.ilevel.com)).

**07200.6 Energy Heel Trusses/Raised Top Plates**

To ensure full depth of attic insulation above exterior wall top plates, energy heel trusses with raised top chord or raised top plates for joist/rafter assemblies shall be used.

**07200.7 Band/Rim Joist**

Insulation equal to R-30 shall be placed inside exterior band/rim joists.

**07200.8 Attic Ventilation**

Eave soffit and continuous ridge ventilation and/or through-wall gable-end vents shall be provided in sizes required to vent attic spaces. Install equal capacities of clear ventilation in the soffits/eaves and the gable ends/ridges. Provide 2 ft<sup>2</sup> of net free area of venting for every 150 ft<sup>2</sup> of attic floor. Keep insulation from blocking the soffit vents.

**07200.9 Attic Access Doors**

Adhere R-10 (minimum) rigid insulation onto the back of attic access doors and scuttle covers.

**07200.10 Slab**

If basement or below-grade spaces in new developments are designed and constructed to be occupied, install ¾" continuous vapor-permeable rigid insulation over floor slabs in conjunction with a floating floor, to raise the temperature of floor coverings to control mold and dust mites. A minimum 2" thermal break shall be placed at the junction of the slab and foundation.

**07200.11 Foundation Walls**

Foundation walls shall be insulated to a minimum of R-10. Provide vapor-permeable rigid foam insulation with taped joints. If rigid insulation is not rated for exposed application, or an interior finish is desired, provide mold-resistant gypsum board, over pressure-treated, 2 x 4 walls with R-11 un-faced batt insulation, cellulose or spray-applied foam insulation.

Walls shall be airtight and sealed, with foam gasket between the foundation wall and the sill plate, and sealant between the sill plate and the band joist, and between the band joist and subfloor. All penetrations in the crawl space wall shall be sealed, and access doors weather-stripped. Any vents must be closed and sealed during periods of cold-weather.

**07200.12 Bond-break at Contiguous Slab Locations**

Concrete slabs in unconditioned areas that are in contact, or may come into contact, with slabs in conditioned areas due to settlement, shall be separated with an insulating material covering the entire surface of potential slab contact.

**07200.13 Fireplace Chase**

Exterior fireplace chase which connects to conditioned space shall be insulated to R-19 (min.). Insulation must be continuous in exterior walls and ceiling above. Insulation shall be located no closer than 1 inch to the flue pipe, or according to local code.

**07200.14 Insulated Corners**

The outside corner of two insulated walls can be framed as a two-stud "Advanced" or "California" corner with drywall clips, to allow insulation to be more continuous.

**07200.15 Insulated T-Walls**

The intersection of an interior wall and an insulated exterior wall can be framed with "Advanced" ladder framing between exterior wall studs to allow insulation to be continuous.

**07248 Insulation Accessories**

CHFA prefers roof/attic floor details which allow for the full depth of attic ceiling insulation to extend over the exterior wall plate. Where roof framing is insulated, full-width baffles shall be placed between framing members in all framing bays to allow for cold air movement across the bottom of the roof sheathing and to prevent insulation from migrating in to the vented soffit area.

**07310 Roof Shingles****07310.1 Material Standards**

Provide materials complying with governing regulations, and which can be installed to comply with the Factory Mutual requirements for "Class 1" of "Noncombustible", including zoned resistance, and the Underwriters Laboratories "Fire Classified" and "Class 1-90" wind uplift resistance. Comply with published recommendations of shingle manufacturer details and recommendations of NRCA Roofing Manual for installation of underlayment and shingles, using number of nails and coursing of shingles in accordance with manufacturer's standards.

### **07310.2 Underlayment**

Roofing felt: 15 lb., asphalt-saturated non-perforated organic roofing felt, complying with ASTM D226, 36" wide, approximate weight 18 lbs. per square.

Provide an ice and water protection membrane such as Ice and Water Shield where roof slopes are less than 4 in 12 pitch, and at all valleys, roof penetrations, eaves, intersections of walls and roofs, hips, and wherever else required by job conditions. Apply sufficient layers of ice and water protection membrane at the eaves to cover the sheathing from drip edge to 24" inside any heated spaces below. Follow all the manufacturer's specifications for installation. Separate dissimilar metals with an ice and water protection membrane.

### **07310.3 Flashing**

Provide copper or pre-finished aluminum drip edge flashing at roof eaves and rakes, roof to chimney/wall/skylight connections, other horizontal roof material transitions, fastened with appropriate nails.

### **07310.4 Asphalt Cement**

Provide fibrated asphalt cement complying with ASTM D1822, designed for trowel application where required.

### **07310.5 Shingles**

Provide asphalt fiberglass shingles on sloped roofs. Install mineral surfaced, self-sealing, fiberglass asphalt shingles with a 30-year warranty. Provide manufacturer's standard factory-precut ridge shingles units to match shingles or job-fabricated units cut from actual shingles used.

Asphalt shingles shall meet ASTM D3462 standard verified by UL, and have a minimum warranty-period of 30 years. The minimum warranty-period for labor shall be 10 years, No-Dollar-Limit (NDL).

### **07310.6 Shingle Fasteners**

Provide aluminum or hot-dip galvanized 11 or 12 gauge sharp pointed conventional roofing nails with barbed shanks, minimum 3/8" diameter head, and of sufficient length to penetrate minimum 3/4" into solid decking or to penetrate through plywood sheathing. Provide minimum 6 nails per shingle.

### **07310.7 "Cool" Metal Roofing**

Consider providing "cool" metal roofing in lieu of asphalt fiberglass shingles. The two physical properties that define "cool" roofing are Total Solar Reflectance (TSR) and Thermal Emittance (TE). A cool metal roof reflects a large percentage of solar energy during the day, and also emits a large percentage of the absorbed heat at night. Cool metal roofing paint can be formulated with a special grade of polyvinylidene fluoride (PVDF) resin finishes are durable and soil-resistant, and the reflectance remains constant over the life of the roof. Combining the PVDF resin with cool infrared reflective pigments improves the product's thermal performance and takes 80 to 85 percent of the heat out of the coating before it has an opportunity to penetrate into the building. Cool infrared reflective pigmented coatings contain complex inorganic color pigments (CICPs). These are resistant to heat and aging, and are one of the main reasons that cool roofs reflect more solar energy. Ceramic pigments are added to the resin to make the colors. The sun does not oxidize ceramic, so the color stays true well beyond 35 years. These pigments do not affect the visible color, so that darker colors can perform like lighter colors in terms of their solar reflectance values. A cool metal roof with high solar reflectance and high thermal emittance would have a lower surface temperature as compared to a roof with low reflectance and low emittance. In the case of a cool metal roof, a lower surface temperature translates into less heat gain into the attic space or living space below the roof. The result is a cooler building and lower cooling/heating energy usage.

The EPA ENERGY STAR® program has roof products criteria for cool roof products. A roof that meets the ENERGY STAR® performance requirements is considered one that is cool and helps to reduce urban heat island effects. The criteria for a labeled roof in the new version 2.0 of ENERGY STAR®, starting in October 1, 2007 are:

1. For steep slope applications (greater than 2:12 pitch): initial minimum solar reflectance of 0.25, and 3-year aged minimum solar reflectance of 0.15.
2. For low slope applications (2:12 or less pitch): initial minimum solar reflectance of 0.65 and 3-year aged minimum solar reflectance of 0.50.

Many colors of pre-painted metal roof products can meet these criteria and become labeled ENERGY STAR® products.

Typical cool metal roof materials have warranties that last as long as 35 years, and can be expected to last from 35 to 50 years. The combination of lower energy costs and durability provide life-cycle cost benefits and contribute to sustainability. Most metal roofs have at least 25 percent recycled content, and if a roof needs to be replaced, the metal is 100 percent recyclable. This helps reduce waste and could even bring in a return on the sale of the scrap. Metal roofing is extremely fire resistant and can be designed to withstand strong winds. Due to its light weight per unit area, structural savings can be realized in a building when compared to using heavier non-metal roofing alternatives. For re-roofing projects, metal roofing can often be applied over the original roof, saving removal and disposal costs.

#### **07460 Siding**

CHFA prefers low-maintenance siding materials, such as vinyl, recycled-content “hardboard”, and pre-finished fiber-cement boards and panels. Solid-stained wood, applied over rainscreen panels or other pressure-equalizing, venting materials/assemblies may be used for siding. Pre-primed pine or cedar boards/battens, or cedar shakes/shingles shall be free from knots, defects and warpage. Prime all cut ends, and back-prime before installation, to protect against dampness.

##### **Moisture-control**

“Reservoir” materials that collect and store moisture, such as wood and cement siding, can cause problems if the moisture is allowed to migrate to other components of exterior wall assemblies. Disconnect wood and cement siding “reservoirs” by back-venting and/or by back-priming. If siding is back-vented, back-priming of the bottom 24" of siding (min.) is required to avoid problems with back-splash from finished grade. If all siding is painted on all surfaces, back-venting is not necessary.

##### **07460.1 Vinyl Siding**

Vinyl siding shall be double or triple 3", 4" or 5" widths of solid color virgin vinyl, and may include decorative siding products. Trim pieces shall be manufacturer-provided inside corners, “J”-channels, trim boxes (for light fixtures), etc. Where horizontal vinyl siding is continuous across two or more stories of wood construction, an expansion joint shall be provided at the floor line to "absorb" the vertical shrinkage of the wood framing. Vinyl siding shall be at least 0.044" thick; horizontal siding shall have no vertical splice joints unless the width of the wall exceeds the standard 12' length. All splice joints shall be offset a minimum of 2' from siding joints directly below. Warranty period shall be 20 years, NDL.

##### **07460.2 Exterior Insulation & Finish System (EIFS)**

EIFS shall not be permitted unless rain-screen panels or other pressure-equalizing, vented back-draining system is specified. EIFS shall not be permitted on any walls at ground-floor level. Where walls are easily reachable by residents from private exterior stairs, balconies, decks, etc., provide heavy-duty reinforcement mesh. EIFS warranty period shall be 10 years, NDL.

### **07460.3 Texture 1-11**

Texture 1-11 is not acceptable as the siding/sheathing material for any new construction or rehabilitation projects.

### **07460.4 Fasteners and Anchorage**

Provide nails, screws, and other anchoring devices of type, size, material, and finish suitable for intended use and required to provide secure attachment. Conceal where possible. Hot dip galvanized fasteners for work exposed to exterior and high humidities to comply with ASTM A153. Staples shall not be used.

### **07460.5 Recycled-content Siding**

Often referred to as "hardboard", Recycled-content siding includes varying amounts of recycled content materials and looks and performs like wood siding. Hardboard may be used wherever wood siding would be desirable.

### **07460.6 Fiber-cement Siding**

Fiber-cement siding is composed of cement, sand, and cellulose fibers. It is available in shingles, planks and sheets. It is textured to look like wood siding or stucco finish. Fiber-cement siding is more durable than wood, termite resistant, noncombustible and warranted to last 50 years. Fiber-cement siding and panels may be used wherever wood siding or a stucco finish would be desirable.

## **07500 Membrane Roofing**

Single-ply membrane roof covering shall have a minimum warranty period of 15 years, covering both labor and material, NDL. Minimum slope to drains shall be ¼" to 1'-0". To reduce the amount of air-conditioning required, and peak cooling demand in buildings with low-slope roofs by 10 - 15%, consider providing an ENERGY STAR®-rated roof membrane with a minimum solar reflectivity of 65% (minimum aged solar reflectivity value 50%). Reflectivity may be expressed by a number between 0 and 1 (the closer the value is to 1, the higher the percentage). High emissivity (the measure of the ability of a material's ability to emit heat) may be another important product attribute to consider. Emissivity is also expressed as a number between 0 and 1, with higher numbers indicating faster heat transfer.

### **07500.1 Thermoplastic Polyolefin Membrane (TPO) Roofing**

Consider providing reinforced TPO single-ply membrane roof covering in lieu of EPDM or reinforced PVC. TPO polymer does not contain chlorine and no chlorine-containing ingredients are added during sheet production. One of the primary benefits of TPO membrane is the ability to fuse the sheets together with a hot air weld, which results in a bond that is actually stronger than the sheet itself. Flashing details, such as exhaust vents, pipes and parapet corners are also completed using hot air welds and flashing material (typically non-reinforced). TPO membrane is available in the market in widths up to 3.66 m (12 ft). These wider sheets provide installed cost savings by reducing the total number of seams to be completed in the field and the labor associated with the seaming/welding process. Wider sheets also require fewer fasteners to secure the membrane, fewer rolls for the roofing applicator to handle on the roof, and less membrane being utilized in the seam overlaps. TPO membrane, reinforced and non-reinforced, is 100 percent recyclable during the production process. During production, the membrane can be ground into "rework" and this regrind can be incorporated into the bottom ply during the extrusion process to produce new TPO product. This process results in 100 percent reuse of recycled product. TPO membrane is its high level of reflectivity, and white TPO membranes can meet and even substantially exceed the U.S. Environmental Protection Agency's ENERGY STAR performance levels. White TPO membranes typically display reflectivity ratings in the high 80 percent range when new (ENERGY STAR specifications require 65 percent minimum), and in the low 80 percent range after three-year rooftop exposure with cleaning (ENERGY STAR specifications require 50 percent minimum). TPO membranes are highly resistant to mold and algae growth, which can degrade the overall reflectivity of the roof and reduce anticipated energy savings.

## **07650 Flashing**

Provide 20 oz. copper or 0.027" th. pre-finished aluminum drip edge flashing at window and door head casings and other horizontal siding transitions, column/trim/ledge caps, and at all exposed locations where required, fastened with appropriate nails. Aluminum flashing shall not be permitted where flashing is in direct contact with masonry or concrete materials.

### **07650.1 Window and Door Flashing**

Provide moldable flashing tape, such as DuPont "StraightFlash" or "FlexWrap", over 20 oz. copper or 0.027" thick pre-finished aluminum head flashing/drip edges/nailing flanges at all windows and doors. Provide soldered copper sill pan flashing, recycled polypropylene pan system, such as Marvin "Sill Guard", or moldable flashing tape, such as DuPont "FlexWrap", at all sills.

## **07710 Gutters and Downspouts**

Where on-site rainwater collection/retention is not provided, rain from the roof shall be collected in a roof gutter system and directed via downspouts such that water is discharged at least 5' away from the foundation. The minimum thickness for aluminum gutters shall be 0.032", and 0.027" for aluminum flashing material.

Where gutters are not desirable, roof overhangs shall be no less than 24", and a ground gutter system, not less than 12" wider than the overhang shall be provided. Ground gutters shall have 4" - 6" (minimum) of decorative stones over 16" (minimum) of processed stone, with (2) filter fabric-protected 4" perforated PVC pipes draining to rainwater collection/retention cisterns, drywells or approved outfalls.

## **07920 Sealants and Caulking**

Furnish and install sealants according to Section **07030**, and as otherwise required, to provide a complete and finished installation of building systems, components, fixtures, fittings and accessories, and to protect building systems, components, fixtures, fittings and accessories from water and/or air penetration. Caulk all exterior joints between dissimilar materials, around the exterior frames of all windows and doors, and all control joints. Organic-type caulking is not acceptable. Take extra care to provide a smooth, consistent, and clean application of sealant in all areas where the sealant bead is exposed. Consult the sealant manufacturer prior to installation to verify the proper type and chemical composition of sealant for each type of application. Do not use silicone sealants with stone, as this may result in staining of the stone.

The Contractor shall furnish and install backer rods in all expansion joints or any joint where movement is to be expected prior to installation of sealant to ensure the correct hour glass profile of the sealant, and to provide a suitable stop for the sealant in deep joints.

All interior sealants shall have a maximum Volatile Organic Compound (VOC) content of 50 g/L, and exterior sealants shall have a maximum Volatile Organic Compound (VOC) content of 100 g/L. Provide a 5-year manufacturer's standard material warranty, including replacement of sealant materials which fail to adhere, cure or provide a water-tight seal.

### **07920.1 Exterior Envelope Air Infiltration Testing**

Before insulation and interior finishes have been installed, carefully examine joints and penetrations in the exterior building envelope assembly, including duct, conduit, and pipe penetrations. Apply self-adhesive tape (to be concealed from view after finishes are applied) over joints and around penetration openings. The ENERGY STAR® Thermal Bypass Inspection Checklist may be useful as a guide for visual inspections of framing areas where air barriers are commonly missed, and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete. Building Codes, as well as regional ENERGY STAR® program

requirements, may supersede the items specified in this Checklist ([http://www.energystar.gov/ia/partners/bldrs\\_lenders\\_raters/downloads/Thermal\\_Bypass\\_Inspection\\_Checklist.pdf](http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Bypass_Inspection_Checklist.pdf)),

After exterior walls and roof have been constructed, the air-tightness of the dwelling unit shall be tested by a professional energy auditor using a calibrated blower door test, to ensure air sealing measures have been effective. The auditor shall use the calibrated blower door test data to quantify the leakage area, air flow, air changes per hour, and leakage area per square foot. A smoke pencil shall be utilized to detect air leaks at joints, penetrations and openings in the exterior building envelope assembly, under the observation of the Architect, who shall note conditions requiring remediation by the General Contractor.

## **08000 WINDOWS & DOORS**

### **08001 Design**

CHFA prefers double-hung and single-hung windows. Awning and casement windows are acceptable, but their use should be limited due to hardware functioning concerns related to heavy and/or long-term use. Awning and casement windows are not acceptable for elderly developments. Sliding windows are not acceptable due to the high maintenance costs related to maintaining proper track drainage and reduced long-term air and water infiltration resistance due to friction and wear on the weather-stripping. Basement windows shall be operable awning units with insulating glass and vinyl insect screens. Size all window units as required to meet Building Code requirements for natural light and ventilation.

Clad wood windows are preferable, but vinyl, fiberglass and aluminum may also be acceptable. Hollow sections of aluminum frames and sash shall be thermally-broken. Provide argon gas-filled, low-E-coated, insulating glass. Latching devices and fiberglass screens shall be provided for all operable windows. Manufacturer's warranty for window assemblies shall be 10 years (min.). All windows shall conform to all Building Code requirements, including those for safety glazing and emergency egress.

#### **08001.1 Energy and Performance Requirements**

CHFA requires energy-efficient windows, doors and skylights. Window, door and skylight areas and U-factors must comply with all Energy Code Requirements. All glass doors, and 95% of all windows, must have a U-value of .35 in compliance with Energy Star® requirements (5% of windows may be exempted for special feature windows). All skylights must have a U-value of .45 in compliance with Energy Star® requirements. Windows, skylights, and glass doors shall be manufactured in accordance with National Wood Window and Door Association (NWWDA), American Architectural Manufacturers Association (AAMA), Window and Door Manufacturers Association (WDMA) and Canadian Standards Association (CSA) standards, rated by the National Fenestration Rating Council (NFRC), and labeled accordingly. All windows shall have been tested according to AAMA 101 IS-2 97 standards, or the new AAMA/WDMA/CSA 101/I.S.2/A440-05 standards, within the past four years, and shall have met or exceeded the following performance standards: minimum performance grade (25); minimum design pressure (25 psf); minimum structural test pressure (37.5 psf); minimum water resistance test pressure (3.75 psf); positive test pressure (1.6 psf); and maximum allowable air leakage (0.16 cfm/sf).

#### **08001.2 Design Pressure Rating**

All windows shall comply with Design Pressure Ratings ("DPR") as required by Code. Analyze the building site for exposure category, based on the quantity and spacing of wind obstructions. Determine the required DPRs based on the basic wind speed for the local municipality (as proscribed by the Connecticut Building Code), the height and width of the building, the sizes and locations of windows on the building and the height and exposure adjustment coefficient (as proscribed by the Connecticut Building Code). Provide manufacturer's standard, or manufacturer-modified, structurally upgraded window sash, frames, mullions and fasteners to meet the required DPR(s).

### **08001.3 Security and Operation**

Windows within eight feet of grade, or otherwise accessible without the use of a ladder, shall be forced entry resistant meeting AAMA 101/I.S.2-97, or the new AAMA/WDMA/CSA 101/I.S.2/A440-05 standards. All windows shall conform to ASTM F588 Performance Grade 10, minimum. All sliding doors shall conform to ASTM F842 Performance Grade 10, minimum. All side-hinged door systems shall conform to AAMA 1304. All double hung windows shall have been tested according to ASTM E2068 standard procedures, within the past four years.

### **08001.4 Finish**

All wood windows shall be clad with solid-color vinyl, or factory-finished aluminum with a high performance baked enamel paint finish. Aluminum windows shall have a high performance baked enamel paint factory finish. Anodized aluminum finishes are not acceptable.

### **08001.5 Vinyl (PVC) Windows**

Vinyl (PVC) windows shall be provided by a single manufacturer having a minimum of ten (10) years experience producing PVC windows. Window units shall have a minimum frame material thickness of 0.070", a minimum sash thickness of 0.065", factory-balanced block and tackle sash balances in compliance with AAMA-902 and cam-type sash locks.

### **08001.6 Fiberglass Windows**

The "pultrusion" fiberglass manufacturing process produces a material with good dimensional stability, low embodied-energy and environmental source-cost ratings, and thermal conductivity which may outperform wood and vinyl. Fiberglass windows shall be provided by a single manufacturer having a minimum of ten (10) years experience producing fiberglass windows.

### **08001.7 Extra-high-performance Glazing**

Window performance can be optimized by providing extra-high-performance glass. Triple glazing with suspended film coatings, and double interior interspaces with argon/krypton gas, can provide superior insulating values, UV blockage, sound control, condensation resistance, and radiant comfort. Glazing options can be directionally "tuned" for natural lighting and solar energy conditions on northern, eastern, southern and western building orientations, to provide passive solar heating benefits in the winter, and moderate mid-day and afternoon overheating in the summer.

### **08001.8 Installation**

Comply with manufacturer's instructions and recommendations for installation of door, window, and skylight units, hardware, accessories, and other components of work. Set units plumb, level, and true to line without warp or rack of frames or sash. Provide proper support and anchor securely in place. Provide joint fillers and sealants as required. Check for proper operation, adjust for proper closure and lubricate hardware.

### **08001.9 Door Widths**

In all housing developments, the entrance door shall be 36" wide.

In housing for elderly residents, all doors intended for passage shall be a minimum width of 36" wide.

In housing for families, all doors intended for passage shall be a minimum width of 34" wide to provide a 32" clear opening.

### **08001.10 Patio Doors**

In-swing French Doors are preferred. In areas where the crime of breaking and entering is prevalent, swing doors in lieu of sliding doors shall be used as access to ground level patios. Sliding glass doors with panels more than 3'-0" wide (nominal) shall not be used. In housing for elderly residents, provide swinging French doors to patios, in lieu of sliding glass doors. Patio doors on the ground level in family

units shall be equipped with locks at a height that prevents small children from being able to unlock and open the door. Particular attention during design shall address FHAA requirements for thresholds and for 32" clear opening width for egress.

### **08100 Insulated Steel, Fiberglass and Composite Doors**

For durability and shrink, warp and crack-resistance, CHFA prefers insulated steel, fiberglass, and wood veneered steel composite entry doors, which can also be as much as five times as thermally-efficient as solid wood. Unit entry doors, no less than 1¾" thick, shall have a minimum thermal resistance value of R-5. Thresholds shall be thermally-broken and adjustable, and barrier-free. Sides and tops of such doors shall be provided with foam-filled, compression-type weather-stripping, and bottoms of doors shall be provided with triple-contact (min.), extruded vinyl compression tube and blade sweeps, to limit infiltration to a maximum .35 cfm/sf of edge joint at 25 mph. Metal exterior unit entry doors with 25 gauge (min.) galvanized steel facings, and fiberglass unit entry doors with reinforced fiberglass facings, shall be provided with poured-in-place polyurethane foam-filled cores. Insulated steel doors with thermally-broken, interlocking steel edges are preferred. Hinge stiles, lock stiles and top rails, if provided, shall be solid, finger-jointed or laminated wood. Bottom rail reinforcement, if provided, shall be rot-resistant, wood/fiberglass composite. Jambs at the strike area shall be reinforced with the equivalent of a plywood plate, 3/8" x 3-1/2" x 6", nailed to the back of the jamb. Door jambs shall be reinforced with 2 x 4 horizontal bracing at latch height. In-swinging exterior and unit entry doors shall have rabbeted, finger-jointed wood jambs.

### **08200 Wood and Molded Wood Fiber Doors**

All interior passage doors shall be solid-core. CHFA prefers interior swing doors to sliding doors. Bi-fold doors are not acceptable. For durability and shrink, warp and crack-resistance, CHFA prefers molded wood fiber or flush interior doors, made from by-product wood chips and timber from sustainably managed forests. Provide doors with wood stiles, MDF top and bottom rails, and low-VOC particle board cores. Door frames or casings shall not be made of polystyrene. Where allowed by code, doors may be undercut a maximum of 1" to provide return air from bedrooms and bathrooms.

#### **08200.1 Molded Agrifiber Doors**

Consider providing architectural wood doors manufactured from rapidly renewable agricultural fibers, in lieu of standard wood fibers, such as "Safe 'N Sound" and "Safe 'N Sound Emerald", Masonite. Manufactured from materials like wheat straw, soybean and sunflower hulls, and bonded together with low- and zero-formaldehyde resins, agrifiber doors are available with a variety of solid colors, patterns and wood grain laminate or a variety of wood species with factory finishes. No special hardware is required with doors constructed of agrifiber cores, although screws must have a pilot hole to avoid screw break-off. Doors can be specified to arrive at the jobsite with predrilled pilot holes for hinges and face plates.

### **08320 Aluminum and Glass Entrances and Storefronts**

Aluminum and glass doors shall be forced entry resistant in accordance with AAMA/NWWDA/CSA 101/I.S.2-/A440-05 requirements. Baked enamel paint finishes for aluminum and glass doors are preferred to anodized finishes, and sliding doors are discouraged due long-term operation and maintenance issues. Single acting, offset pivot or butt hung aluminum and glass doors in thermally-broken framing with 1" (min.) insulated glazing shall be tested for air infiltration in accordance with ASTM E283, and for thermal performance in accordance with ASTM C236 and AAMA 1503 Air infiltration for single swinging doors and frames shall not exceed 0.50 cfm/ft<sup>2</sup>, and pairs of swinging doors and frames shall not exceed 1.0 cfm/ft<sup>2</sup>, and Thermal Transmittance Coefficient (U-factor) shall not exceed 0.72 BTU/hr/ ft<sup>2</sup>/°F.

**08390 Screen and Storm Doors**

Sliding screen door frames shall not be roll-formed.

**08710 Finish Hardware**

Provide all required finish hardware, including, but not be limited to all butts, hinges, locksets, mortise locks, passage sets, privacy sets, pocket door hardware, push-pulls, door stops, catches, coordinators, flush-bolts, shutter hardware, hooks, house numbers and peep-hole viewers.

All hardware shall be installed with the required screws, bolts, and fasteners as provided by the manufacturer and packaged with the hardware. All packages shall be legibly and adequately labeled, indicating the part of the work for which it is intended.

All entrance doors shall have Mortise-type locks. A hotel-type electronic card-key security system is preferred for apartment buildings. Peephole/viewers are required for front doors of apartment units and townhouses if the doors have no sidelights. Doorbells or door-knockers shall be provided at the main entrance door to all dwelling units.

**08710.1 Peephole/Viewer**

All unit entry doors shall have peepholes and all barrier-free units shall have a second peephole at 42" above the finish floor. Peepholes shall be fitted with fisheye viewers.

**08710.2 Locksets**

All unit entries shall have door locks with simultaneous retraction of the dead bolt and dead latch from the inside and a single key operation from the exterior. The dead bolt shall have a 1" throw. The dead latch shall have a 1/2" throw. Unit entry hardware shall not have parts made of plastic.

Bathrooms and master bedrooms shall have door locks that are non-locking against egress, with panic release operation.

Stair tower doors, first through sixth floors, to the corridor shall have self-locking dead latches and trigger bolt protection prohibiting entry from the stair tower to the corridor. In buildings over three stories, these doors shall also have electric strike releases that will unlock upon signal from the fire alarm.

Rated exterior doors from common spaces, stairs, maintenance areas etc. shall have adjustable self-closing devices, self-locking dead latches and trigger bolt protection.

**08710.3 Lever Handles**

In buildings designed for elderly residents and all barrier-free units, door handles to be used by the residents shall be levers.

**08710.4 Hinge Pins**

Out-swinging exterior doors shall have non-removable hinge pins or shall have security type hinges that prevent unauthorized door removal.

**08710.5 Alarms**

Exterior doors in buildings designed for multiple dwelling units for elderly residents, and all buildings designed for multiple dwelling units in areas where security from trespass is anticipated as a substantial problem, shall have door-ajar alarms wired to a central control panel. Such higher-security areas shall include high-rise developments in large metropolitan areas. Door-ajar signals shall have a manual re-set.

**08742 Electric Locksets**

Exterior doors in buildings designed for multiple dwelling units for elderly residents, and all buildings designed for multiple dwelling units in areas where security from trespass is anticipated as a substantial problem, shall have Code-compliant electric security with multi-point entry door locks, multi-point exit door locks and exit devices. Such higher-security areas shall include high-rise developments in large metropolitan areas.

**08780 Cabinet and Drawer Hardware**

In dwelling units designed for elderly and all barrier-free units, cabinets and drawers shall have easily graspable pulls, such as 'C' pulls.

**08810 Glass**

Doors at laundry rooms shall have integral glazing, or provide immediately adjacent sidelights or interior windows to provide visibility.

**09000 FINISHES****09001 Design****09001.1 Floor Covering**

Floor covering must be provided over all substrates of plywood, "gypcrete" or lightweight concrete.

**09250 Gypsum Board**

Manufacturer's recommendations shall be followed in specifying ceiling drywall adequate for supporting the weight of specified attic insulation. Gypsum board panels in buildings with the bottom chords of roof trusses spaced at 24" on center shall be minimum  $\frac{5}{8}$ " thick. Gypsum board used in walls or ceilings where supporting members are spaced at 16" on center shall have a minimum nominal thickness of  $\frac{1}{2}$ ".

**09250.1 Gypsum Wall Board**

Use  $\frac{1}{2}$ " (min.) gypsum wall board ("Drywall") on all interior partitions unless otherwise required (see above). Provide gypsum-core wall panels surfaced with paper on front, back, and long edges; and complying with ASTM C 36 and C 1396.

**09250.2 Gypsum Ceiling Board**

Use  $\frac{1}{2}$ " (min.) gypsum ceiling board on all interior ceilings unless otherwise required (see above). Provide gypsum-core ceiling panels with additives to enhance the sag-resistance of the core; surfaced with paper on front, back, and long edges; and complying with ASTM C 1395 and C 1396.

**09250.3 Fire-rated Gypsum Board**

Use  $\frac{5}{8}$ " (min.) Type "X" fire-rated gypsum board where required. Provide gypsum core wall panels with additives to enhance fire resistance of the core and surfaced with paper on front, back, and long edges; and complying with ASTM C 36 and C 1396, Type "X".

**09250.4 Mold-resistant Gypsum Board**

Use  $\frac{1}{2}$ " (min.) mold-resistant gypsum wall board, such as Gold Bond "XP" Wallboard by National Gypsum Company, or DensArmor Plus by G-P Gypsum, at bathrooms, kitchens, and wherever wall tile is indicated (except within tub or shower enclosures). Provide gypsum core wall panels with additives to enhance water resistance of core; surfaced with moisture/mold/mildew-resistant paper on front, back, and long edges; and complying with ASTM C 630 and ASTM C 1396. Mold and mildew resistance: Panel score of 10, when tested in accordance with ASTM 3273.

**09250.5 Fire-rated Mold-resistant Gypsum Board**

Use  $\frac{5}{8}$ " (min.) fire-rated mold-resistant gypsum board, such as Gold Bond "XP" Fire-Shield C Wallboard by National Gypsum Company, or DensArmor Plus Fireguard by G-P Gypsum, where required. Provide gypsum core wall panel with additives to enhance fire resistance of the core; surfaced with moisture/mold/mildew resistant paper on front, back, and long edges; and complying with ASTM C 630 and ASTM C 1396, Type "X". Mold and mildew resistance: Panel score of 10, when tested in accordance with ASTM 3273.

**09250.6 Cement Backer Board**

Use  $\frac{1}{2}$ " (min.) cement backer board panels at tub and shower wall enclosures. Provide cementitious, water durable panels, surfaced with fiberglass reinforcing mesh on front and back, with long edges wrapped; and complying with ANSI A118.9 and ASTM C 1325.

**09250.7 Gypsum Sheathing Board**

Use  $\frac{1}{2}$ " (min.) gypsum sheathing board panels at exterior walls and ceilings where required. Provide gypsum core wall panels with additives to enhance the water-resistance of the core; surfaced with water-repellant paper on front, back, and long edges; and complying with ASTM C 79 and C 1396.

**09250.8 Soundproof Drywall**

Consider providing soundproof drywall, such as QuietRock, in lieu of standard sound attenuation techniques such as resilient channels and clips. Available in fire-rated and non-fire-rated  $\frac{1}{2}$ " and  $\frac{5}{8}$ " thick panels, with STC ratings ranging from 49 to 74, QuietRock soundproof drywall hangs and finishes like standard drywall. Using soundproof drywall may result in a lower total cost than other sound attenuation methods, and highest performance is achieved with 24" o.c. resource-efficient framing.

**09270 Gypsum Board Accessories**

Provide gypsum board accessories in compliance with ASTM C 1047. Use corrosion-resistant steel furring channels to attach drywall to inside faces of concrete or C.M.U. walls, except in below grade spaces. Use corner beads at all outside corners and edges. Use J-trim as required by details/job conditions. Use drywall screws to fasten panels to studs as recommended by the drywall manufacturer. Use manufacturer's recommended reinforced tape and joint reinforcement at all seams, corners and screw heads.

**09270.1 Expansion Joints**

In order to eliminate or reduce shrinkage and expansion cracking, manufactured drywall expansion joints shall be placed in long corridor walls above each jamb of all door openings, and elsewhere as required by details/job conditions.

**09310 Ceramic Tile**

Ceramic tile is acceptable as a wall and floor finish in kitchens, bathrooms, laundry areas, storage rooms and mechanical rooms. Conform to standards and methods in Tile Council of America, Inc. (TCA) Handbook for Ceramic Tile Installation, current edition, and SNSI Standard Specifications for Installation. Comply with manufacturer's instructions and recommendations.

Provide specified tile of a particular size, shape, color or pattern, from the same lot by one manufacturer. Use setting materials according to the recommendations of the tile manufacturer. Verify selection of grout color with the Architect and the Owner prior to installation.

Stone saddles at bathroom doors shall be beveled. Transitions between floor materials shall occur at centerline of doors. Lay tile in grid pattern with alignment of floor, base, walls, unless other pattern is shown in the Drawings. Layout to provide uniform joint widths and to minimize cutting; do not use less

than ½ tile units. Provide sealant at joints where and as recommended by TCA and approved by Architect. Tile to be laid on ½" waterproof cement backer board at walls and over ¾" subfloor at floors. Grout and cure, clean and protect.

#### **09310.1 Recycled-content Ceramic Tile**

CHFA encourages the use of recycled content ceramic tile which contain up to 70% recycled glass.

#### **09500 Sustainable Acoustic Panel Ceilings**

Environmental factors that affect the health and wellbeing of building occupants focus largely on indoor air quality, with comfort, humidity, air exchange, acoustics, and lighting quality being contributing factors.

#### **09500.1 Recycled-content Ceiling Panels**

CHFA encourages the use of ceiling panels which contain up to 70% recycled content.

#### **09500.2 Light Reflectance (LR)**

LR value represents the percentage of light reflected from the surface of a material. The industry average for panels is approximately LR .70 to LR .80. CHFA encourages the use of ceiling panels with light reflectance values above LR .85 for reducing energy costs and improving sustainability

#### **09500.3 Formaldehyde Performance**

Ceiling panel VOC and formaldehyde emissions shall provide concentration limits not exceeding 50 parts per billion (ppb). CHFA encourages the use of low-emitting (less than 13.5 ppb) and zero-emitting (less than 1.6 ppb) ceiling panels.

#### **09500.4 Antimicrobial Performance**

Moisture is essential to the growth of mold and mildew. Contributing factors include condensation, improperly maintained ductwork or water pipes, leaks, slow air circulation, improper humidity control, low surface temperature, and even some indoor plants. CHFA encourages the use of ceiling panels with antimicrobial treated face and back surfaces, or panels formulated throughout to inherently resist the growth of mold and mildew.

#### **09650 Resilient Flooring**

Resilient flooring or vinyl tile is acceptable for use in kitchens, bathrooms, laundry areas (except in basements) and storage rooms. Resilient flooring shall have a minimum thickness of ⅛". Wall base trim shall be used in all habitable spaces. Base trim shall not be polystyrene.

#### **09650.1 Non-vinyl Composition Tile**

Consider providing resilient flooring tile made from limestone and ethylene acrylic polymers, such as StoneWalk by Mohawk, as a PVC-free alternative to vinyl composition tile (VCT). Free of all halogens and plasticizers, it emits no volatile organic compounds (VOCs). Much harder than most VCT, it should require less treatment (stripping and waxing).

#### **09650.2 Natural Linoleum**

Consider providing linoleum manufactured from natural materials such as cork and linseed oil in lieu of vinyl flooring.

#### **09660 Rapidly-Renewable Flooring Materials**

CHFA encourages the use of bamboo and cork flooring as alternatives to hardwood flooring and carpeting. Bamboo products qualify for the Materials and Resources credit for rapidly renewable materials in the U.S. Green Building Council's LEED® Rating System, but most bamboo flooring and

panel products are made with urea-formaldehyde (UF) glue. Citing tests based on European standards (none have yet been certified to the Greenguard or FloorScore standards in the U.S.), most bamboo manufacturers claim that their products have very low formaldehyde emissions, but few can honestly claim zero added urea-formaldehyde. A few products, made without the use of UF binders, also meet the criteria for the Indoor Environmental Quality (IEQ) credit for low-emitting composite materials in the U.S. Green Building Council's LEED® Rating System. Provide bamboo flooring and panel products made with a polyisocyanurate binder (similar to the glues used in agrifiber products) in place of UF, such as Smith and Fong PlybooPure and Bamboo Mountain solid bamboo flooring.

### **09681 Carpeting**

Carpeting in dwelling units is acceptable in living and dining areas, bedrooms and bedroom closets, however, CHFA prefers hard-surface flooring with area rugs to wall-to-wall carpeting. All carpeting shall meet the requirements of HUD Use of Materials Bulletin UM44D. Carpet shall be used in accordance with the type and class required per the Bulletin. Per UM44D, all carpeting shall be stamped and labeled as meeting the requirements of the Bulletin. An exception to the requirement of stamping and labeling may be granted for common area carpeting, i.e.: carpeting in lobbies, lounges, community rooms, and libraries etc., (not corridors at residential entries). Carpeting in these areas may be certified by the manufacturer as having met or exceeded the performance standards of UM44D and need not be stamped and labeled, if such carpeting exceeds the pile weight and density required by UM44D by 25% or greater. This exception is intended to allow the use of higher quality "feature" carpeting in limited quantities, without adding the cost of laboratory-authorized stamping and labeling. Such exceptions must receive written approval from CHFA prior to the GC or sponsor or owner ordering the carpet. CHFA prefers all carpeting within dwelling units to be nylon, however polypropylene or a blend of nylon and polypropylene is acceptable, with appropriate anti-microbial, "action-back"-type padding to prolong its life. All carpet padding must meet the requirements of UM72. Minimum weight of carpet shall be 28oz. for dwelling units and for public areas, and shall be certified low-VOC in accordance with the requirements of the Carpet and Rug Institute (CRI) Indoor Air Quality Carpet Testing Program.

The minimum critical radiant flux limits for carpeting in corridors and exit-ways in elderly developments is 0.45 watts/cm<sup>2</sup>. This limit shall be reduced to 0.22 watts/cm<sup>2</sup> when the building has fire sprinkler protection. The limit for carpeting in Elderly units and corridors and exit-ways in family developments shall be 0.22 watts/cm<sup>2</sup>.

#### **09681.1 Recycled-content Carpet and Underlayment**

CHFA encourages the use of recycled-content carpet, padding, and underlayment made from recycled plastic bottles, wool or cotton.

#### **09681.2 PVC-free Carpet Backing Systems**

Consider providing floor coverings with PVC-free backing systems, such as EcoWorx by Shaw. EcoWorx is an infinitely-recyclable product that is 40% lighter than comparable products, which reduces emissions and transportation costs, is easier to install and requires less packaging. To ensure that the materials return to the facility where they can be reused, the company will retrieve floor coverings featuring EcoWorx at the end of their life cycles free of charge, and Nylon 6 fibers in the carpeting can be recycled into new carpet fiber.

### **09900 Painting**

Paint shall be the highest quality grade, and shall be delivered to the site in original containers labeled by the manufacturer, with seals unbroken.

Painting Schedule:

Exterior Siding: 2 coats solid-body stain over pre-primed siding

Exterior Trim: 1 coat primer, 2 coats semi-gloss paint  
Interior Partitions & Walls: 1 coat primer, 2 coats satin or eggshell latex paint  
Interior Ceilings: 1 coat primer, 2 coats flat latex paint  
Interior Trim/Painted Woodwork: 1 coat primer, 2 coats semi-gloss latex paint

Drop cloths shall be used for protection of all surfaces. Employ skilled mechanics to ensure quality workmanship. Use applicators and techniques best suited for the type of materials being finished.

Apply water based paints only when temperature of surfaces and surrounding air are between 50°F and 90°F, unless otherwise permitted by paint manufacturer's printed instructions. Apply solvent thinned paints only when temperatures of surfaces and surrounding air are between 45°F and 95°F, unless otherwise permitted by paint manufacturer's printed instructions.

Remove hardware, hardware accessories, machine surfaces, plates lighting fixtures, and similar items in place and not to be finish-painted, or provide surface applied protection prior to surface preparation and painting operation. Following completion of painting of each space, reinstall removed items.

Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper as required. Sandpaper smooth those finished surfaces exposed to view, and dust clean. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of shellac, varnish or equivalent sealer, immediately upon final cutting and installation.

Apply paint film of uniform finish, color and appearance. Take care to ensure that surfaces, including edges, corners, crevices, and reveals, receive a dry film thickness equivalent to that of flat surfaces. Paints shall be evenly and smoothly spread and free of any runs, drips, sags, brushmarks or "holidays." No successive coats shall be applied until the preceding coat is dry and hard.

#### **09900.1 Non-toxic Paint Strippers**

Most paint strippers are caustic - they work by melting the paint. The active ingredient, methylene chloride, is a known carcinogen. CHFA encourages the use of water-soluble, noncaustic and nontoxic paint strippers with the organic solvent N-Methylpyrrolidone as the active ingredient.

#### **09900.2 Low-VOC and Formaldehyde-free Paint**

CHFA encourages the use of low-VOC and formaldehyde-free non-flat interior paints with a VOC content of 100 g/L (max.), and flat interior paints with a VOC content of 50 g/L (max.). Low-VOC paints, stains and varnishes use water as a carrier instead of petroleum-based solvents. As such, the levels of harmful emissions are lower than solvent-borne surface coatings. These certified coatings also contain no, or very low levels, of heavy metals and formaldehyde.

#### **09900.3 Low-VOC, Water-based Wood Finishes**

CHFA encourages the use of low-VOC, water-based wood finishes with a maximum VOC content of 250 g/L.

#### **09900.4 Natural Paints and Finishes**

CHFA encourages the use of paints and finishes made from natural raw ingredients such as water, plant oils and resins, plant dyes and essential oils; natural minerals such as clay, chalk and talcum; milk casein,

natural latex, bees' wax, earth and mineral dyes. These paints are the safest for resident's health and for the environment.

#### **09900.5 Interior Painting**

All paint over interior drywall shall meet or exceed the limit of 400 strokes on the "scrubability" testing standards established in the most recent version of ASTM D-2486.

Kitchens and baths shall be painted with a washable semi-gloss paint. Satin sheen or egg shell finish paint may be used if a satin or egg shell finish is used throughout the residential unit. Using one paint type (satin or egg shell) throughout is preferable to CHFA.

Dwelling units shall have painted drywall ceilings. Painted concrete ceilings are acceptable where the concrete is part of the structural system, but only where sprayed-on "popcorn" texturing has been applied.

#### **09900.6 PVC-free Peel and Stick Wall Covering**

Consider providing PVC-free wall coverings in lieu of standard vinyl wall coverings where wall coverings are desired, such as 180 Walls by Milliken. 180 Walls is a self-adhered textile wall covering containing 100% recycled polyester, that passes vinyl wall covering performance requirements, yet is breathable, cleanable and durable, and a pressure-sensitive adhesive backing eliminates the need for wallpaper paste.

#### **09900.7 Exterior Painting**

If the exterior is stained wood, the finish shall be a solid-body stain, not the transparent or semitransparent type.

Vents penetrating roofs, with the exception of stainless steel vents, shall be painted with appropriate paint to match the roof shingles.

### **10000 SPECIALTIES**

#### **10426 Interior Signs**

All interior signs shall be sans serif font, and consistent with 2003 IBC Section 1110.4 - Signage, and by reference ICC/ANSI A117.1-2003 Section 703 -Signs.

#### **10550 Mailboxes**

In buildings designed for elderly residents, mailboxes shall be mounted with the bottom of the lowest box no less than 28 inches, and the top of the highest box no more than 58 inches above the floor, or to meet applicable ADA requirements. Boxes shall have keyed locks, and shall be numbered sequentially. If necessary, boxes for barrier-free units shall be located separately to maintain the sequential numbering. Boxes shall have labeling sized for easy reading.

#### **10800 Bath Accessories**

Provide and install all required bathroom accessories. Bathroom accessories shall include paper holders, towel bars, grab bars, soap and toothbrush holders, and robe hooks. Confirm and coordinate all blocking with accessory locations prior to installation of insulation and drywall. Install all accessories plumb, level, true to line and dimension, securely anchored and fastened to solid blocking.

##### **10800.1 Grab Bars**

In buildings designed for elderly residents, grab bars shall be provided at all bathtubs. One 24" long, 1" minimum diameter grab bar shall be placed at 45 degrees, centered on the side opposite the accessible side, and with the lowest point of the bar 12" above the tub rim. The highest end of the diagonal bar shall

be at the control end of the bathtub. An alternative to this diagonal grab bar may be proposed. One 24" long, 1" minimum diameter grab bar shall be placed vertically at the control end of the bathtub at the outside edge, with the top of the bar 4'-6" above the floor.

In buildings designed for elderly residents, grab bars shall be provided at all showers. One 24" long, 1" minimum diameter grab bar shall be placed at 45 degrees, centered on the side opposite the accessible side, and with the lowest point of the bar 29" above the shower floor. The highest end of the diagonal bar shall be at the control end of the shower. An identical bar shall be placed vertically at the control end of the shower at the outside edge, with the top of the bar 4'-6" above the floor.

Tub/shower enclosures with integral grab bars substantially complying with the aforementioned grab bar requirements may not be used without CHFA approval prior to Initial Closing.

Nothing in this Standard shall be interpreted to waive the requirements for blocking under the FHAct.

#### **10800.2 Medicine Cabinets**

Medicine cabinets with beveled-edge mirror doors shall be provided at all bathrooms.

### **11000 EQUIPMENT**

Provide and install specified appliances; supervise, coordinate and provide all required electrical and plumbing requirements for each item. Comply with governing Codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions. Install materials and systems in accordance with manufacturer's instructions, and in proper relation with adjacent construction, with uniform appearance. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

#### **11001 Appliances**

All dwelling unit kitchen appliances, including range/oven, refrigerator, and dishwasher, shall be by a single manufacturer. Clothes washers and dryers shall be by a single manufacturer. All appliances including range and ovens, refrigerators, water heaters, washers, dryers, dishwashers, ventilation fans, furnaces and air conditioners shall be listed by Underwriter's Laboratories. Refrigerators, water heaters, washers, dryers, dishwashers, ventilation fans, furnaces and air conditioners shall be ENERGY STAR® rated.

#### **11452 Residential Appliances**

Provide and install specified appliances. Comply with governing codes and regulations. Use experienced installers. Deliver, handle, and store materials in accordance with manufacturer's instructions. Install materials and systems in accordance with manufacturer's instructions and in proper relation with adjacent construction and with uniform appearance. Restore damaged finishes and test for proper operation. Clean and protect work from damage.

##### **11452.1 Refrigerators**

All refrigerators shall be ENERGY STAR® rated, frost-free refrigerator/freezers with separate compartment doors. Minimum sizes acceptable to CHFA are 15 cubic feet for studio and one-bedroom units, 17 cubic feet for two-bedroom units, 19 cubic feet for three-bedroom units, and 21 cubic-foot for four-bedroom units. Refrigerators shall be placed so that the door will be able to swing at least 135° to allow removal of all drawers. Where refrigerators other than side-by-side type are used, this requirement may be met by selecting a refrigerator with a door design which allows removal of all drawers with a 90° door swing.

In elderly units, the refrigerator/freezers shall be side-by-side. In barrier-free units, the refrigerators shall have a two-door refrigerator compartment with a bottom freezer drawer compartment, unless otherwise specifically designed by the manufacturer for handicap-accessibility.

#### **11452.2 Range/Ovens**

All ranges and ovens shall be four (4) burner electric appliances with a minimum width of 30 inches. Gas range/ovens may be used where they have automatic ignition and automatic pilot shutoff.

Ranges in units designed as barrier-free or for elderly residents shall have front controls with indicator lights, and shall be self-cleaning, unless a roll-under access space is located adjacent to the appliance.

Consider providing a Safe-T-element™ Cooking System at all electrical ranges. This UL-rated fire-prevention system consists of a set of electronically-controlled solid cover plates, which are attached to standard coiled stovetop burners. A patented control unit installed inside the stove controls limits the high-end temperature of the plates to approximately 662° F, which is below the ignition temperature for oil and most common fibers ( $\geq 728^\circ$  F). In addition to the fire-prevention benefit, energy costs may be reduced, because the burners are off for a good percentage of the cooking process, thus reducing demand at peak usage times (breakfast/dinner). The number and cost of potential false alarms is also reduced, and less cooking-related fire claims and may reduce insurance premiums. Safe-T-element™ plates are also easier to clean, and the system may help to extend the life of the burners and the range.

#### **11452.3 Microwave Ovens**

Where microwave ovens are provided as an amenity, they shall be ENERGY STAR® rated and provide a minimum cooking area of 1.0 ft<sup>3</sup>. An electrical outlet shall be provided directly behind the microwave location. In housing for elderly residents, an electrical outlet shall be conveniently placed for a counter top microwave oven.

#### **11452.4 Garbage Disposal Units**

Garbage disposal units shall be provided at all unit kitchens and common area kitchen sinks.

#### **11452.5 Kitchen Ventilation**

All kitchens shall be provided with an ENERGY STAR® rated means of ventilation to the outside. CHFA prefers non-ducted range hoods, in combination with ceiling grills, ducted to in-line, roof-top or side-wall exhaust fans for kitchen ventilation. Recirculating range hoods with integral task lighting shall be provided to match the width of the range below. Kitchen exhaust fans shall be sized at a minimum rate of 100 cfm per foot of range width, and shall be switched separately from kitchen lighting.

Consider providing CookSafe™ range hood/fire-suppression systems at all ranges. CookSafe™ is specifically designed to fight cooking fires, through an active temperature sensor, intelligent electronic controller and failsafe pressurized extinguishing system. As the temperature rises, the powerful fan is turned on to high to help dissipate heat. Once the second temperature setting is reached, the control system will disconnect the energy source for the range – either through a gas valve or electrical disconnect. As the fire reaches the hood surface, one of the three fusible links will melt and discharge the extinguishing agent on the range surface. An internal buzzer sounds and the external alarm system is triggered. Once discharged, the range may not be operated until CookSafe™ is serviced and reset, as the energy source remains disconnected. Alternately, a remote pull may be connected, to allow the discharge to be controlled manually from a safe distance.

#### **11452.6 Bath Ventilation**

All full and half baths, and common area toilet rooms, shall be provided with an ENERGY STAR® rated means of ventilation to the outside. CHFA prefers ceiling grills ducted to in-line, roof-top or side-wall

exhaust fans for bathroom ventilation. Dwelling unit bathroom exhaust fans shall be sized at a minimum rate of 1 cfm per square foot of floor area or 150 cfm, whichever is greater. Bath exhaust fans shall be switched separately from bathroom lighting, and shall be timer-controlled to run for a minimum of twenty minutes, or humidity sensor-controlled. Recessed bath fan/light/night light fixtures, with both humidity sensor and manual odor control modes of operation, are available from Nutone, Inc.

#### **11452.7 Whole House Fan**

CHFA encourages the use of ENERGY STAR® rated whole house fans in units with more than one floor level and attic space above. The fan must be mounted in a hallway ceiling on the top floor of a house, with an insulated, airtight seal to prevent cold air infiltration/warm air escape in winter. Fans should be sized to produce between 4-5 air changes per hour, should have at least two-speed controls: high speed for quick temperature change, and low speed for continuous ventilation.

#### **11452.8 Washers and Dryers**

A recessed washer and dryer hook-up assembly (similar to Symmons Laundry Mate) shall be provided in each dwelling unit of family housing. Convert washers to rinse with cold water only. Dryer vents shall be ducted to the exterior and be equipped with self-closing dampers. If washers and dryers are provided within dwelling units, side-by-side, or full-size stacking washers and dryers shall be provided for units up to two bedrooms. For units with more than two bedrooms, extra-large capacity side-by-side units must be provided. CHFA encourages the use of ENERGY STAR® horizontal axis washing machines. Stacking washers and dryers or under-cabinet combination units must be provided in elderly units. Front-loading side-by-side or under-cabinet combination units must be provided in barrier-free units. Where in-unit washers and dryers are not installed, common laundry facilities shall be provided in a ratio of one washer and one dryer for each 10 and 15 units, respectively, or any fraction thereof. Provide a separate overflow pan connected to a floor drain at all washers.

#### **11452.9 Dryer Ventilation**

All dryers shall vent to the outside. Where in-unit appliances are provided and dryers are not located on an exterior wall (or within the dryer manufacturer's recommended maximum distance to a screened, louvered vent), and in common laundries, provide in-line, roof-top or side-wall dryer booster fans with pressure-sensitive controls. In such cases, rigid metal ductwork shall be used for venting, with the exception that flexible metal ductwork may be used as a final connection to the appliance. Ductwork shall not be left exposed.

#### **11455 Kitchen and Bath Cabinets**

CHFA prefers kitchen and bath cabinetry constructed of plywood boxes with hardwood stile and rail face frames. Kitchen and bath cabinetry for family developments shall be certified by the Kitchen Cabinet Manufacturers Association (KCMA) as meeting HUD Severe Use standards. Hardwood doors with flush, recessed or raised panels shall be hinged to allow full 180-degree operation. Hardwood drawers shall have ball-bearing type hardware. Finished shelves for base and wall cabinets shall be ¾" thick, minimum. All materials, methods and details shall comply with American Woodwork Institute (AWI), American Hardboard Association (AHA), Hardwood Plywood and Veneer Association (HPVA), National Particleboard Association (NPA), National Electrical Manufacturers Association (NEMA), and Builders Hardware Manufacturers Association (BHMA) standards. All cabinets shall comply with the design and construction of the Kitchen Cabinet Manufacturers Association (KCMA) and shall be certified as such. Cabinets may have frames of composite wood materials, provided the design, materials and installation insures the screw holding capacity of the frame is equal to, or better than that of solid oak. With the exception of sink bases, all cabinets shall have back panels. In barrier-free units, and units designed for elderly residents, kitchen and bath cabinets shall have easily grasped door and drawer pulls.

If particle board is used for any cabinet components, all exposed cut edges must be coated with a water-

based polyurethane sealant or a specialty formaldehyde sealant. Particle board sealant shall have a maximum VOC (Volatile Organic Compounds) content of 250 g/L. Whenever possible, eliminate new particleboard inside dwelling units by using formaldehyde-free medium density fiberboard (MDF) for cabinet components and shelving, such as Roseburg “Skyblend”.

Verify access and clearance required for the installation of each cabinet. At all cabinet locations, coordinate the installation of convenience outlets, equipment, lighting fixtures, plumbing, and HVAC vents, etc. Install plumb, level and true. Install any required blocking in walls to receive fasteners. Field verify all field dimensions and clearances, and minimize filler pieces at ends of cabinet runs. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance. Coordinate with work of other sections. Anchor securely in place; coordinate with countertop installation. Adjust and lubricate hardware. Restore damaged finishes and test for proper operation.

All dwelling unit bathrooms shall have 42" wide vanities, with a 30" removable sink base and 12" fixed drawer base. In bathrooms designed to be barrier-free, provide a lavatory set in a counter top, in order to provide “roll-under” access. In such cases, storage shelving at appropriate heights shall be provided elsewhere in the bathroom.

## **12000 FURNISHINGS**

### **12550 Shades and Blinds**

Shades or blinds shall be furnished for all windows. Spring-loaded, roll-up shades are not acceptable. For elderly developments, and in units designed for barrier-free occupancy, or anywhere fire suppression of the units is not provided, shades or blinds shall not be made of polyvinyl chloride (PVC). Safety cord stops shall be installed on all window treatment cords to prevent injury.

### **12600 Furniture**

In housing for elderly residents, exterior seating and common area seating shall have backs and arms, or some other means of support for rising.

### **12664 Tables and Accessories**

Laundry Rooms

In common laundry rooms a laundry folding table 30" to 34" in height, and a hanging rack, shall be provided.

## **13000 SPECIAL CONSTRUCTION**

### **13120 Pre-fabricated Structures**

In order to balance Technical Services’ review considerations [utility, convenience, health and safety, accessibility, comfort, indoor air quality, quality materials/durable details, energy efficiency/water conservation, and sustainability/resource conservation] with CHFA’s expectation of a direct and ongoing emphasis to achieve the lowest construction cost possible, consider using modular and panelized and other innovated construction methods. Modular and panelized construction may provide advantages in quality, time and cost.

Quality Advantages:

1. Trained and closely supervised workforce
2. Larger, more powerful, and more sophisticated equipment
3. Assembly with precision jigs

4. Use of the highest quality, kiln-dried lumber
5. Construction in a climate controlled facility with materials protected from the elements
6. Construction standards that meet or exceed local and state building codes
7. Integral structural strength
8. Superior energy efficiency
9. Rigorous quality control systems
10. Extended warranty coverage

**Time Advantages:**

1. Components can be Fabricated While Site and Foundation Work is Performed
2. Components can be Delivered and Installed Immediately upon Completion of Foundation Work
3. Even the most efficient stick builder systems are no match for assembly line and large workforce systems
4. Saving Time Saves Money

**Cost Advantages:**

1. Inclement weather does not damage the materials
2. Less pilferage and vandalism: Factories are easier to secure than building sites
3. Less waste: By working with standardized dimensions, modular manufacturers are better able to make optimal use of materials and avoid waste

**13120.1 Precast Insulated Foundation Panels**

The Oasis Foundation Wall System, manufactured by Oldcastle Precast, Inc., consists of custom-made, precast, insulated concrete foundation wall panels, factory made from PE-designed and stamped shop drawings. As such, tolerances are tight, measurements are accurate, and walls and angles are square, plumb and level. 10" th. Oasis Foundation Wall System panels are made of high-strength 6,000 psi concrete with 15% recycled flyash content, and are reinforced in all directions. Due to their unique design, 8-ft. 6-in. tall Oasis walls use approximately 1/3 less concrete to manufacture when compared to the typical 7-ft. 10-in. cast-in-place foundation. Factory control of the concrete mix and curing environment creates a foundation wall system that is extremely dense and intrinsically moisture resistant, which may eliminate the need for exterior waterproofing. Patented, custom-molded expanded polystyrene (EPS) insulation core components are used, which enable a fully-insulated assembly with an R-13 rating overall. Interior faces of Oasis walls are pre-finished with DensArmor® Plus paperless wallboard, with glass mat facings rather than paper facings and a treated, moisture-resistant gypsum core, provide moisture and mold resistance. Oasis walls include threaded bolts for sill attachment, concealed joint fasteners and vertical utility chases at 24" o.c (accessible from the top of the wall). Options include integrated egress window wells, beam pockets, precast stairs/bulkheads, precast column pad footings, cast-in vinyl basement windows, custom-cast masonry openings and brick/stone ledges. Since the concrete is cured in the factory, floor/wall construction can commence immediately upon installation by the manufacturer. Oldcastle Precast, Inc. offers a limited lifetime warranty against structural deficiencies and a 15 year warranty against water penetration.

**13120.2 Panelized Wood Framing System**

Panelized wall systems are prefabricated building panels that form a structural envelope for the home, reducing or eliminating the need for conventional on-site wood framing. Panelized construction involves the fabrication of individual walls, or sections of walls, in a factory-controlled environment, with the added efficiency and quality control provided by computer automation: individual shop drawings, state-of-the-art fabrication tables, production saws, automatic nail guns, forklifts, and engineering are used. While several types of wall panels are produced, the "open panel" is most common; interior faces of exterior panels, and interior panels, are left open for wiring, plumbing, heating and on-site inspection

(sheathing is generally factory-installed on exterior faces of exterior walls). Open panels framing is also conducive to custom design, and will accommodate on-site change orders issued during construction.

### **13120.3 Structural Insulated Panels (SIPs)**

Structural Insulated Panels (SIPs) may be used for exterior walls, floors and roofs. SIPs are rigid foam sandwich panels with OSB panels on both faces. The foam core may be comprised of expanded polystyrene (EPS), polyisocyanurate, or polyurethane, and may have an insulating value of R-6 per inch, or more. According to tests at the Oak Ridge National Laboratory, a 4" th. (nominal) SIP wall had the same whole wall R-value (R-11) as a stick-framed 2 x 6 wall (24" o.c.) with paper-faced fiberglass batt insulation and OSB sheathing. OSB panels shall be high-performance, water-resistant tongue and groove panels bonded with phenolic resin, such as Huber "AdvanTech". SIPs shall be designed to reflect Seismic Zone 4 requirements.

### **13120.4 Agriboard Structural Insulated Panels**

The Agriboard Panel wall system is a paper-wrapped SIP system with OSB faces and a reinforced core of compressed straw, which eliminates over 80% of the dimensional lumber typically used in traditional construction. 4<sup>3</sup>/<sub>8</sub>" th. (R-13) and 7<sup>7</sup>/<sub>8</sub>" th. (R-25) panels are available, and the environmentally-friendly insulating core eliminates hot and cold spots, and creates a greater thermal mass, which helps to modulate large swings in temperature. Over 80% of an Agriboard panel consists of straw left over after wheat or rice grain is harvested, from multiple annual crops, ensuring a continuously renewable supply. The patented Agriboard panel forming process is based on proven high pressure and high temperature technologies, which uses no adhesive binders. Safe and effective borax compounds are added to eliminate mold growth and insect infestation.

### **13120.5 Modular Residential Construction**

Modular residential construction consists of residential dwelling units assembled from custom, factory-fabricated, pre-finished boxes up to 14'-0" wide, 66'-0" long, and 13'-6" high in size. Modular units generally include floor, wall and roof framing, exterior finishes, doors and windows, insulation, mechanical and electrical roughing, and interior finishes. Interior finishes generally include painted gypsum board, standing and running trim, floor finishes, cabinetry, and plumbing and electrical fixtures and fittings. Modular units are delivered to the development site by tractor trailer, and placed by crane on site-built foundations. Up to 80% of the construction of residential buildings can be performed by the modular manufacturer, and modular boxes can be fabricated simultaneously with site development and foundation work. During the project planning phase, coordination between the Development Team and the modular manufacturer is critical in determining the Owner's, Architect's and GC's responsibilities before, during and after the modular units are set.

## **14000 CONVEYING SYSTEMS**

### **14001 Design**

A minimum of two elevators shall be provided in all multi-story apartment developments, and barrier-free units in such developments shall not be segregated all to one wing or floor.

### **14200 Elevators**

Where elevators are provided, one shall be a service elevator of a sufficient size (5' x 7' approx.), and be so located, as to facilitate tenant move-ins/outs and emergencies (accommodate evacuees in prone position on EMS stretchers/folding gurneys). Provide hooks and removable pads in service elevators.

#### **14200.1 Biodegradable Hydraulic Elevator Oil**

Leaking hydraulic oil poses environmental risks in the form of soil and water contamination. Cleanup of hydraulic oil-contaminated soil is difficult and costly, and is best avoided by using plant-based hydraulic

oil. In general, it's best to install more efficient, non-hydraulic elevators, but for servicing existing elevators, or in situations in which a hydraulic elevator is the only option, CHFA prefers using a biodegradable fluid. Manufacturers of bio-based, biodegradable hydraulic oils include Environmental Lubricants Manufacturing, Greenland Corporation, Hydro Safe Division, and Terresolve Technologies.

## **15000 MECHANICAL**

### **15010 Design**

#### **15050 Plumbing**

Furnish a complete hot and cold domestic water distribution system. Furnish and install all service, distribution, drainage and vent piping within the building(s), including vent flashing at roof connections. Provide all fixtures, fittings, devices, and accessories as required. Supply, vent and drain piping shall be sized as indicated or required to meet all Codes and standards of authorities having jurisdiction, and to comply with highest accepted practices of the trade.

Provide clean-outs, heavy duty threaded type, at the base of all stacks, and at changes of direction to horizontal drains, in accessible locations. Provide access panels to all cleanouts where required.

Provide hangers and supports, not to exceed spacing as required by code and to assure stable straight and firmly anchored runs. Use separate hangers for each branch. Support vertical risers at each floor with approved extension pipe clamps.

Lay out the plumbing system in careful coordination with the drawings and existing conditions, determining proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system. Lay out all pipes to fall within partitions, walls or roof cavities, and not to require furring other than as shown on the drawings.

Do not cut into or reduce the size of any load-carrying member without the prior approval of the Architect or Structural Engineer. Install all piping generally level and plumb, free from traps, and in a manner to conserve space for other work. Cushion all traps and bearings to minimize transfer of sound. Provide complete isolation of all dissimilar metals. Firmly anchor all pipes into position. Provide uniform pitch of at least ¼ inch per foot for all horizontal waste drainage. Provide air chambers at all fixtures; 16 inch minimum length and of same diameter as the branch. Conceal all piping unless otherwise shown on the drawings.

Upon completion of rough-in, fully test supply system at full pressure. Verify and ensure that system is free from leaks. Obtain all approvals and Certificates of Inspection from all authorities having jurisdiction upon the work.

#### **15050.1 Pipe and Pipe Fittings**

1. Hub and Spigot Cast Iron Sewer Pipe in compliance with ASTM A74, service weight
2. Hubless Cast Iron Sewer Pipe in compliance with CISPI 301, service weight
3. PVC Sewer Pipe in compliance with ASTM D2729
4. Underground Copper Water Pipe in compliance with ASTM B88, type K
5. Above ground Copper Water Pipe in compliance with ASTM B88, type L
6. Cross-linked Polyethylene plastic flexible tubing (PEX) in compliance with ASTM F877, SDR 9 tubing with ASTM F1807 for fittings ASTM F877 for each outlet.
7. Tracpipe FGP-SS4-500 Black Iron Gas Pipe

**15050.2 Valves**

Hot and cold water shut off valves for each living unit shall be provided. Valves shall be installed at all service connections and in all branch lines and risers.

**15050.3 Thermometer and Gauges**

Thermometer and gauge locations shall be indicated on the drawings. All thermometers and gauges shall be readable from the floor.

**15050.4 Expansion Loops**

Expansion loops in hot water piping shall be provided. Expansion joints are to be avoided.

**15050.5 Drainage and Vent Piping**

All drainage and vent piping shall be ASTM D2836-72 solvent welded PVC or ASTM D2751 solvent welded ABS plastic. Cellular foam core PVC shall not be used.

**15050.6 Hose Bibbs**

Provide hose bibbs with freeze-proof cast brass valves.

**15050.7 Mechanical Equipment Identification and Labeling**

Provide proper labeling of equipment and piping in conformance with the latest industry standards.

**15050.8 Escutcheon Plates**

In finished spaces, and within sink and vanity base cabinets, furnish a chromium-plated sectional escutcheon on each pipe or hanger rod penetrating the wall, floor or ceiling. Plates shall fit snugly.

**15180 Pipe Insulation**

Insulate pipe according to the IECC, or provide the following minimum R-Values:

$\frac{3}{8}$ " diameter to  $\frac{1}{2}$ " diameter - R-5

$\frac{5}{8}$ " diameter to  $\frac{3}{4}$ " diameter - R-7

$\frac{7}{8}$ " diameter to 2" diameter - R-9

2 $\frac{1}{2}$ " diameter to 4" diameter - R-8

Insulate all waste stacks for their entire length. Insulation shall be continuous over pipes, valves and fittings, etc.

**15180.1 Heating Piping**

Insulation shall be securely applied to all steam heating and hot water heating supply and return piping exposed or concealed, except short run-outs above the floor to terminal units. Hot water lines that are dead end loops such as running from mains to service a single unit need not be insulated.

**15180.2 Domestic Water Supply Piping**

All water piping in unconditioned spaces, such as basements, crawl spaces, attics and exterior walls shall be covered with universal insulating jacket. Insulation and a vapor barrier shall be securely applied to all domestic water mains, all domestic horizontal cold water piping, domestic water piping installed in locations of the building subject to freezing temperatures, and vertical piping where condensation can create a problem.

**15180.3 Storm Water Piping**

Insulate all horizontal storm water piping above finished ceilings, including elbows looking up and down from the horizontal and underside of drains.

#### **15180.4 Barrier-free Design**

Insulate exposed piping below kitchen sinks and bathroom lavatories in units designed as barrier-free to insure residents in wheelchairs do not touch exposed metal piping. Provide decorative insulating covers specifically designed for this purpose.

#### **15250 Water Softeners and Water Conditioning**

Any domestic water supply with hardness in excess of 250 milligrams/liter of Calcium Carbonate shall be treated by water softening the domestic hot water. This determination will be made by the Environmental Consultant based upon water test and quality data provided by the Drinking Water and Radiological Protection Division of the Connecticut Department of Environmental Quality. Typically, only domestic hot water shall be treated. Where it is economically infeasible to treat only the hot water, the domestic cold water may also be treated.

#### **15460 Plumbing Fixtures and Trim**

General:

All exposed pipe fittings, trimmings, faucets, traps and exposed connections shall be chrome-plated brass. Faucets shall be heavy brass, compression type, with replaceable seats and discs or cartridges. Provide a stop or shut-off valve in the water connection(s) to each water heater, water closet, group of fixtures and main riser.

Kitchens:

Kitchen sinks shall be single bowl and shall be stainless steel, 20 gauge or thicker. Pull-out spray hoses shall not be provided. In housing for elderly residents and units designed to be barrier-free, kitchen sinks shall have a single lever control. A garbage disposal shall be provided.

Bathrooms:

Lavatories shall not be made of fiberglass. Wall hung lavatories shall not be used in dwelling units. In common areas where wall hung lavatories are used, wall chairs to support the lavatories shall be provided. Provide decorative, insulated covers at exposed plumbing pipes in handicapped accessible units.

#### **15460.1 Elderly Units**

In buildings designed for elderly residents, except in Barrier-free designed units, bathtub rim heights above finish floor shall not be higher than 16". The bottoms of all bathtub basins shall have a non-slip finish. In housing for elderly residents, it is preferred to have water closets located adjacent to a wall 48" in length (perpendicular to the plumbing wall) to facilitate the future addition of a grab bar. All bathroom water controls shall be single lever controls complying with barrier-free design requirements. Controls at bathtubs and showers shall be offset toward the entry side of the fixture for ease of access. In housing for elderly residents and for barrier-free designed units, all showerheads, whether in bathtubs or showers, shall be height adjustable on a slide bar device. In non-barrier-free units for elderly residents a flexible, detachable head, with brackets allowing several mounting heights, is an acceptable alternative.

#### **15460.2 EPA WaterSense® Program**

The goal of the EPA WaterSense® program is to label products that are about 20% more water-efficient than average comparable products. Provide plumbing fixtures, fittings and controls which comply with the EPA WaterSense® Program, or install flow reducers in all sink, tub and shower faucets.

#### **15460.3 High-efficiency Toilets (HETs)**

Consider providing WaterSense® labeled high-efficiency toilets (HETs), in lieu of standard toilets. The EPA WaterSense® Program is helping consumers to identify high-performance, water-efficient toilets that can reduce water use by as much as 4,000 gallons per year. Under federal law, toilets must not exceed 1.6 gallons per flush (gpf). HETs use less than 1.3 gpf. The WaterSense® label is available for

HETs that are certified by independent laboratory testing to meet rigorous criteria for both performance and efficiency. Unlike first generation "low-flow" toilets, WaterSense® labeled HETs combine high efficiency with high performance. Design advances enable WaterSense® labeled HETs to save water with no trade-off in flushing power, and many perform better than standard toilets in consumer testing ([http://www.epa.gov/WaterSense/pp/find\\_het.htm](http://www.epa.gov/WaterSense/pp/find_het.htm)). HET models from major manufacturers currently include low-consumption fixtures with larger than conventional flush valves, dual-flush fixtures with larger than conventional flush valves, and pressure-assist fixtures.

#### **15460.4 Graywater Toilet Water System**

Consider providing a graywater recycling system for toilet water, in lieu of fresh water. Bathroom fixtures account for 74% of household water use. About 40% of all domestic water is used to flush toilets, and lavatory faucets account for about 5% of all domestic use. Lavatory water can be captured and re-used to flush toilets, and can reduce metered water usage in a two-person household by about 5,000 gallons per year. In addition to conserving water, graywater recycling systems for toilet water helps save money in reduced water consumption charges and wastewater treatment or sewer fees.

Graywater recycling systems for toilet water include a reservoir hidden in the vanity cabinet below the lavatory sink with a filter to keep hair and other solids from entering the toilet. Disinfection tablets control bacteria and other contaminants. A water hose connects the reservoir to the fill control unit, using gravity, water pressure and a small electrical pump to move water from the vanity to the toilet. A fill control unit inside the toilet tank to keeps fresh water from filling the tank, by holding the ball cock in the off position, to allow water held in the reservoir under the sink to fill the toilet tank. Reused water in the toilet is not harmful to people or pets.

#### **15470 Water Heaters**

##### **15470.1 Residential Water Heaters**

All dwelling units designed for family occupancy shall have individual water heaters. All water heaters shall be gas-fired. Water heaters used as the heat source shall be installed per manufacturer's recommendations with particular attention paid to the outlet locations. Where permitted, shutoff valves for inlet and outlet lines shall be provided for ease of replacement. Heat traps are required on all water heaters. Install individual or sub-metered water meters in multifamily housing units. Tank type water heaters shall meet ENERGY STAR® standards or have an Energy Factor rating equal to, or better than, 0.62 for natural gas and propane. Water heater tanks shall have an insulating jacket equal to or greater than R-5. Jacket must be installed according to manufacturer's recommendations.

Water heater drains from pressure-temperature relief valves shall not be discharged onto the floor. A separate protective pan, connected to a floor drain shall be installed under all water heaters.

All copper fin-tube domestic water heaters, with storage tank capacities of 100 gallons or more, shall have solid state electronic controls to circulate water through the boiler based upon a drop in water temperature in the storage tank.

##### **15470.2 Tankless Water Heaters**

CHFA encourages the use of tankless water heaters to conserve time, water and energy. Install tankless water heater as close to the point of use as possible. The device should have a variable-set thermostat and be appropriately sized.

##### **15470.3 Commercial Water Heaters**

Water heaters shall be gas-fired. All common water heaters shall be of the continuous recirculation design. Refer to **15470.1** for energy use and insulation requirements.

## **15500 Fire Protection Sprinkler Systems**

All fire protection systems shall be wet-pipe sprinkler systems.

### **15500.1 Fire Sprinkler Heads**

All fire sprinkler heads in finished residential spaces shall be white in color and have a minimal cowling. Heads recessed into ceilings and walls are preferable.

## **15600 Heating, Ventilation, and Air Conditioning**

### **15610 HVAC Design**

Heating and cooling systems shall be designed to meet or exceed the requirements of the minimum energy levels set forth in the International Energy Code, or other applicable local code, whichever is more stringent. Energy load data for heating, cooling and electrical energy loads comprised of summary loads of each type of dwelling shall be included as part of the Commitment Submission. Heating equipment and fuel sources shall be selected based on efficiency ratings and life-cycle costs. All materials shall be new, free from defects, and UL listed. All work shall be performed in accordance with the best practices of the trade.

All dwelling units shall have individual HVAC units. In apartment buildings, smaller, sectional boilers for all apartments may be provided, which shall be located in a centralized boiler room. AFUE of all heating equipment shall be 90% or better. Domestic hot water tanks shall meet the same requirements as stated above. Warranty period for equipment shall be 5 years minimum.

Common spaces in developments designed for elderly residents shall be air-conditioned. Corridor make-up air shall maintain corridor temperature at 76° F in the summer, and 70° F in the winter. Common laundries, craft rooms and trash and trash compactor rooms shall all be designed to have negative pressure.

All roof-top equipment shall be installed on 12" high (minimum) curbs. Heavy-duty radiator covers, 18 gauge or better, shall be used when a hydronic heating system is specified. Where unit entries are located at grade for units that have living areas above grade, i.e.: individual entry stacked units, a supply air duct run shall be provided at the grade level entry foyer.

### **15610.1 Zoned Radiant Heating**

CHFA encourages the use of zoned hydronic radiant heating. Hydronic heating is more comfortable and saves energy by heating only the zone that requires heat.

### **15610.2 Manual J Calculation**

Perform Manual J calculations for each mechanical system used for heating and cooling. Manual J calculation shall be based on the actual orientation (for example southwest) to ensure the heating and cooling equipment are properly sized.

### **15610.3 Heating Equipment Sized within 25,000 btu/h of Manual J**

All furnaces and heat pump equipment shall be within 25,000 btu/h of the heating load as determined by the Air Conditioning Contractors Association (ACCA) and American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Manual J guidelines.

### **15610.4 Cooling Equipment Sized within 6,000 btu/h of Manual J**

The size of all heat pump equipment shall be within 6,000 btu/h of the cooling load as determined by the Air Conditioning Contractors Association (ACCA) and American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Manual J guidelines.

### **15610.5 Modular Boilers**

All heating systems shall be designed so that each living unit has at least one programmable thermostat to control space temperature. Gas fired boilers shall be used where heating systems are not provided for each dwelling unit. Boiler systems shall have two or more boilers and shall be furnished with a control panel designed to reset the supply water temperature based on the outdoor temperature. The Control panel shall step fire the boilers in sequential order. Boiler drains from pressure-temperature relief valves shall not be discharged onto the floor. A separate protective pan, connected to a floor drain shall be installed under all boilers.

### **15610.6 Furnaces**

Provide ENERGY STAR®-certified, zoned gas forced air furnaces with a 90% annual fuel utilization efficiency rating (AFUE), or better. Furnaces shall have variable-speed blowers and programmable thermostats. Each zone shall have a separate temperature control and wired damper controls. CHFA prefers air handlers to be located within conditioned space. Vented combustion closets are not considered conditioned space. Furnace filters shall not be made of fiberglass. All furnaces shall bear all applicable UL-listed and AGA certified.

### **15610.7 Air Conditioning**

CHFA prefers ENERGY STAR®-certified, zoned, central air-conditioning systems with programmable indoor thermostats. Each zone shall have a separate temperature control and wired damper controls. Otherwise, through-wall, room air-conditioners shall be provided in living rooms and bedrooms. Central air conditioning units shall bear a seasonal energy efficiency rating (SEER) equal to, or greater than 13. Room air conditioners shall bear an energy efficiency rating (EER) equal to, or greater than 11. Air conditioners shall have variable-speed blowers and a cooling sensible heat fraction (SHF) of 0.75 or less. All cooling equipment shall be charged with refrigerants not containing CFCs or HCFCs, such as HFC-410A (< 100 tons), HFC-134a (>100 tons), and HFC-407C (= DX systems).

### **15800 Air Distribution**

Perform room-by-room load calculations according ACCA Manual J guidelines: calculate the required cubic feet per minute (CFM) based on loads and select equipment based on loads and required CFM. Fresh air by mechanical means shall be provided in all public corridors and other community spaces in apartment buildings.

### **15810 Ductwork/Flues**

Comply with SMACNA HVAC Duct Construction Standards. Fiberglass ductwork or fiberglass insulation within ductwork shall not be used. Rigid glass fiber insulation with a factory applied vapor barrier on the side facing the air stream is acceptable if all requirements of UL 181 for a Class 1 Air Duct System are satisfied. All ductwork terminating at the exterior shall be equipped with a back draft damper. Provide insulation on all ductwork that runs uninsulated spaces, such as attic and crawl spaces. Vertical flue vent pipe shall be double-wall vent type in order to prevent condensation due to the high-efficiency furnaces, boiler and water heaters. Vent pipes shall not extend more than 6" above a chimney or chimney enclosure. Horizontal direct venting is acceptable for equipment specifically designed for that purpose.

#### **15810.1 Duct Design**

Ductwork design shall comply with the ACCA Manual D guidelines: determine the static pressure and available static pressure, calculate total equivalent length of duct runs, determine the friction rate based on total equivalent length and available static pressure, properly size ducts, and locate registers to achieve desired air distribution within each room. All duct work shall be made of rigid sheet metal duct materials. Airflow for each duct run shall be measured and balanced to comply with Manual D specifications to within 15 cfm of design air flow.

**15810.2 Return Capacity 120% of Supply Capacity**

All duct work installed should provide capacity for at least 120% more return air than supply air for every system.

**15810.3 No Open Return Systems**

All air handlers shall be installed with a ducted return plenum sealed to the unit and any associated ducts with mastic or mastic tape.

**15810.4 Rigid Supply Trunk**

All duct systems shall feature at least one long supply trunk with multiple take-offs. An “octopus” system with all duct runs originating at the supply plenum is not acceptable.

**15810.5 Return Ducts**

Each bedroom shall have a dedicated return duct, or, for apartments with no return ducts located in bedrooms, all supply air shall have a direct path back to a return grill even when doors are closed. This path shall be through transfer grills or interior bedroom doors with a minimum clearance of 1 inch between the bottom of door when closed and the finished floor surface.

**15810.6 Ductwork in Conditioned Spaces**

CHFA prefers all ductwork for heating or cooling to be run through conditioned space inside the insulated envelope. No exposed duct runs shall be installed within habitable spaces. Duct runs within chases shall be incorporated into the design as required. All supply duct take-offs shall be spaced at least 6 inches apart from each other with no duct take-offs originating from the cap of the supply plenum (junction boxes with 4 take-offs or less are excluded). Seal all joints and seams in air handler and ductwork with mastic or mastic tape. Use removable tape for filter door. Seal collars to plenum with mastic or mastic tape. All duct trunk lines located outside conditioned space shall be insulated to a minimum of R-8.

**15810.7 Seal All Ductwork**

All ductwork must be sealed and insulated according to the IECC, and duct leakage to unconditioned spaces shall be field-verified to be 6% (cfm/cfm) at 25 Pascals (maximum) using standard ASTM duct testing protocol. All unions between components of HVAC system including joints between ductwork and the air handler shall be sealed with mastic or mastic tape. Flex-to-flex duct connections must have a metal collar connecting them and be sealed with mastic. All transverse seams in supply and return ducts, including supply and return plenums and leakage sites in the air handler, shall be sealed with duct mastic and fibrous reinforcing mesh according to SMACNA specifications. DUCT TAPE IS NOT A SUITABLE SEALANT FOR DUCTS, but may be used for sealing leakage sites at the air handler’s removable access panels and at filter access panels.

**15810.8 Clean All Ductwork**

Clean or vacuum all ducts prior to occupancy, before carpet is laid and finishes are applied.

**15810.9 High-efficiency Particulate Air (HEPA) Filters**

CHFA encourages high-efficiency particulate air (HEPA) filters in the return air stream at the air handler, which should be sized to handle the reduced air pressure caused by the filter.

**15810.10 Heat Recovery Ventilation Units**

CHFA encourages designing Heat Recovery Ventilation Units (HRVs) into HVAC systems to recover heat from exhausted indoor air and transfer it to the incoming fresh air stream. Use of HRVs is particularly appropriate in units with blower door test results of less than 0.35 ACH, and is required in units with blower door test results of 0.20 ACH or less.

## **15900 Mechanical Controls**

### **15900.1 Thermostats**

In all heating/cooling systems, unit thermostats shall be placed on an interior wall, at 48" above the finish floor, away from the direct flow of forced air and drafts. Thermostats in common areas shall have automatic setback controls.

### **15990 Testing and Balancing**

All testing and balancing of mechanical systems shall conform to the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) Standards.

## **16000 ELECTRICAL**

### **16010 Electrical Design**

Furnish and install all wire, cable, conductors, connectors, conduit, junction boxes, electrical services and other rough-in equipment, fixtures, outlets, lamps, and trim requires to render a complete and fully operating, inspected and approved electrical power distribution and lighting system as required.

Provide and install sufficient electrical service to all equipment, appliances, and devices indicated in the Drawings and Specifications, including, but not limited to: residential appliances, HVAC equipment, light fixtures, receptacles, alarm system, telephone system, cable system, doorbells, etc. Ground the entire system as required by all regulations, National Electrical Code, and any other authority having jurisdiction. Provide ground-fault interrupters as required by the Code. The interrupting capacity of circuit breakers shall be as required by the Code.

All Work shall be in accordance with Underwriters' Laboratories, National Electrical Manufacturers Associates, Illuminating Engineer Society, National Fire Protection Association, in addition to above noted regulations and authorities.

Electrical service shall be designed so that all dwelling units can be metered separately.

Energy load data for heating and electrical energy loads comprised of summary loads of each type of dwelling shall be included as part of the Commitment Submission.

Large multipurpose rooms shall be wired so that half of the fixtures may be shut off, and a uniformly reduced lighting level is achieved with the balance of the lighting.

Branch circuit load calculations for general lighting and receptacles in dwelling areas shall be a maximum of 80% of branch circuit capacity.

In housing for elderly residents, an electrical outlet shall be conveniently placed for a counter-top microwave oven, unless a built-in microwave is being provided. Set all outlets and switches in elderly units at the same heights required for barrier-free units.

### **16010.1 Connecticut Energy Efficiency Fund**

The programs of the Connecticut Energy Efficiency Fund ([www.ctsavesenergy.org](http://www.ctsavesenergy.org)) may be able to provide incentives and/or rebates to save energy for new construction and rehabilitation projects. Eligibility may depend on whether your electric distribution utility is Connecticut Light & Power ([www.cl-p.com](http://www.cl-p.com)) or The United Illuminating Company ([www.uinet.com](http://www.uinet.com)).

### **16010.2 Compact Fluorescent (CF) Light Bulbs**

Provide ENERGY STAR®-rated, compact fluorescent (CF) light bulbs. Specify CF bulbs that are approximately one-fourth the wattage of the maximum allowable incandescent bulb for a given fixture. CF bulbs shaped similarly to traditional A19, globe, flood and torpedo/candle/mini-candle incandescent bulbs are available; three-way and dimmable compact fluorescent bulbs are also available (see <http://www.environmentaldefense.org/page.cfm?tagID=633&fixture=0&shape=0&brightness=0&color=0&matchingBulbCount=37>). Only use three-way CF bulbs in three-way fixtures, and dimmable CF bulbs in dimmable fixtures. CF A19 substitutes are not as bright as the equivalent spiral bulbs. If brightness is the priority, use spiral bulbs. For “warm” area lighting, use CF bulbs with a color temperature between 2650° and 2850° Kelvin. For task lighting, use CF bulbs with higher color temperature (+/- 3000° Kelvin). In recessed light fixtures, specify CF bulbs that won’t extend below the edge of the fixture. Only CF bulbs rated for outdoor use should in outdoor fixtures. Only use CF bulbs in timers or photocells that are specifically designed to be used in these devices. Just as with incandescent bulbs, check whether the specified CF bulb is rated for use in an enclosed fixture. CF bulbs contain trace amounts of mercury, and burned-out bulbs require proper disposal. Recycling burned-out CFs is the best option. To find out if there are recycling options in the project locality, call 1-800-CLEAN-UP for an automated hotline, or visit [www.earth911.org](http://www.earth911.org).

### **16010.3 Insulation-Compatible (IC) Recessed Lighting Fixtures**

Provide Insulation-Compatible (IC) lighting fixtures wherever recessed fixtures are installed in insulated framing.

### **16010.4 Lighting Controls**

CHFA encourages the use of lighting controls, such as sensors and timers, to turn lights off in unused areas or during times when lighting is not needed. Lighting controls are particularly useful for exterior uses, but are not recommended for use in bathrooms.

### **16010.5 Alternative Energy Sources**

CHFA encourages the use of alternative energy sources to supplement the operation of common area features, amenities, and fixtures. Examples include photovoltaic systems for signage, parking area lighting or common area and hallway lighting.

Photovoltaic (PV) Systems offer the ability to generate electricity in a clean, quiet and reliable way. PV systems are comprised of photovoltaic cells, devices that convert light energy directly into electricity. Because the source of light is usually the sun, they are often called solar cells. The solar module (or panel) is comprised of several individual photovoltaic cells connected in series or parallel with a metallic material. Photovoltaic cells and modules can be arranged to produce a specific current and voltage. By connecting solar panels in certain configurations (called a solar array), one can dictate the current and voltage of the array, thus dictating the electricity the system produces. The size of a photovoltaic is based on the amount of daily energy required (loads) and the amount of energy available at specific locations. Lower future energy costs may justify the initial installation cost of a PV system. Information regarding local, state and federal incentives for renewable energy may be found through the Connecticut Energy Efficiency Fund ([www.ctsavesenergy.org](http://www.ctsavesenergy.org)), Connecticut Light & Power ([www.cl-p.com](http://www.cl-p.com)) or The United Illuminating Company ([www.uinet.com](http://www.uinet.com)), depending on the project service area, or at the Database of State Incentives for Renewables and Efficiency (<http://www.dsireusa.org/>).

### **16010.6 Door-ajar Alarms**

Exterior doors in buildings designed for multiple dwelling units for elderly residents, or any apartment buildings in areas where security from trespass is anticipated as a substantial problem, shall have door-ajar alarms wired to a central control panel. The door-ajar signal shall have a manual reset.

**16010.7 Main Entrance Doors**

Main entrance doors to buildings designed for access to multiple dwelling units shall have electric door release hardware. Such controls shall be located near the entry space and shall not be integrated with the intercommunication system for remote operation.

**16010.8 Stair Tower Doors**

Stair tower doors to the corridor shall have self-locking dead latches and trigger bolt protection prohibiting entry from the stair tower to the corridor. This requirement is applicable for the first through sixth floors. In buildings over three stories, these doors shall also have electric strike releases that will unlock upon signal from the fire alarm.

**16010.9 Ceiling Fans**

CHFA encourages the use of ceiling fans in living rooms and bedrooms to reduce the need for air conditioning and heating. Ceiling fans must be supported adequately between ceiling joists.

**16120 Wires and Cables**

Copper wiring shall be used throughout except that aluminum wiring may be used for wiring #6 or larger. Wire size shall be based on 75° Celsius.

Electrical wiring of the following types are not permitted:

1. Solid Aluminum Conductors
2. Stranded Aluminum Conductors Smaller than #8 Awg
3. Stranded Aluminum #8 Awg without Antioxidant Paste at Lugs
4. Aluminum Conductors as a Ground for Antenna Systems

**16140 Wiring Devices**

Garbage disposal unit and range hood switches shall be considered controls which are required to be within reach for access by elderly and handicapped persons, and therefore should be located on a side wall or at the front of the counter.

**16200 Emergency Generator**

An emergency generator shall be provided in any CHFA-financed building of, or exceeding, 4 dwelling units or 2½ stories. Additionally any building that is required to have a fire pump for the fire protection system, unless a diesel fire pump is provided, shall have an emergency generator. Emergency Generators shall provide automatically transferred power for the full operation of all loads essential for the safety of human life as defined in the 2003 NEC, IFC and the 2005 CT Fire Safety Code. In addition, the system shall include but not be limited to: lighting in areas of refuge, emergency elevator (with cab size capable of handling a stretcher horizontally), and emergency call systems. Where capacity exists in a generator sized for the above equipment, recirculation pumps on boilers and make up air supply shall be powered off that generator. The emergency generator shall be provided with a fuel supply that will allow operation for a minimum of 24 hours. No underground storage tanks shall be used.

**16300 Service**

A separately-metered electrical load center with a minimum capacity of 100 amps shall be provided for each dwelling unit. A maximum of six service-main disconnects in the same location or room will be allowed. Rated fire assemblies separating main disconnects shall not be penetrated with circuiting.

**16500 Lighting****16500.1 Illumination Levels**

Average illumination level at the task surface, in foot-candles (fc), shall be:

1. Offices at desk surfaces: 50fc
2. Corridors, Lobby, Stairs: 15fc
3. Kitchen (counter top, sink and range surfaces): 30fc
4. Toilet rooms and Bathrooms at vanity tops in family developments: 15fc
5. Bathrooms at vanity tops in housing for elderly residents: 30fc.
6. Bathrooms at bathtubs: 15fc
7. Store rooms, mechanical rooms, electrical rooms, etc.: 10fc

Fixtures shall be selected to provide a minimum of glare.

Egress emergency lighting shall be maintained at a 1fc inside the building and to a point 20 feet outside the building exits.

#### **16500.2 Night Lights**

A night light, or an outlet for a night light, shall be provided near the bedroom/bathroom area in all units designed for the elderly.

### **16510 Interior Luminaires**

#### **16510.1 Corridor Lighting**

Corridor lighting shall be wired so that each half of the fixtures may be shutoff during late night periods of minimal use, and a uniformly reduced lighting level is achieved with the balance of the lighting.

General corridor lighting shall be fluorescent lighting. This requirement is not intended to discourage the use of decorative fixtures, such as wall sconces, in which compact fluorescent lamps may be used, or accent lighting with a variety of lamping to highlight artwork or architectural features.

#### **16510.2 Common Area Lighting**

Common area lighting shall be fluorescent lighting. This requirement is not intended to discourage the use of decorative fixtures, such as wall sconces, in which compact fluorescent lamps may be used, or accent lighting with a variety of lamping to highlight artwork or architectural features.

#### **16510.3 Kitchen Lighting**

Dwelling unit kitchen lights shall be fluorescent. Each kitchen shall have a task light above the sink and the range (integrated into the range hood) and a ceiling-mounted general kitchen light.

#### **16510.4 Fixture Types**

Bare bulb porcelain fixtures shall not be used except in basements and mechanical closets. Provide compact fluorescent lamps.

Exit lights shall be light-emitting diode (LED) or light-emitting capacitor (LEC) fixtures.

### **16720 Alarm and Detection Systems**

#### **16720.1 Smoke Detectors**

All dwelling unit smoke detectors shall be photoelectric type. In buildings for elderly residents the unit smoke detectors shall be part of a "fully addressable" system, and shall be wired to activate an audible alarm in the unit and at the primary annunciator panel. The system shall also activate a remote signal in the manager's unit if a secondary panel is provided. Unit smoke detectors shall not be wired in a "buddy" or "zoned" configuration with other dwelling units, nor shall they initiate the general building alarm. "Fully addressable" shall mean that this unit smoke detector system shall have the capability to identify

the location of the dwelling unit from which the signal originated, and display such information at the annunciator panel. The system must require a manual reset at the annunciator panel. The system shall also have the capability to send the same identifying information to a remote location off-site to a monitoring agent, pager, etc.

The operation of this system shall be discussed during the design stage with the local fire department to determine their system operation requirements. The operation of the system shall comply with the fire department regulations, but the capabilities of the system, as required herein, shall not be diminished.

#### **16720.2 Emergency Call**

An emergency call system shall be installed in all buildings designed for elderly residents. The emergency call system shall be a “fully addressable” system which shall include:

Pull cord stations in the bathroom and bedrooms, with bathroom fixtures and bedroom "furnishability" dictating station placement (note especially conflicts with towel bars), and a colored light (no bell or alarm) over the unit entry.

An annunciator panel located in the manager's office or reception area, on which a light displays and a sound is emitted to indicate the dwelling unit in which the emergency call was pulled, or a remote annunciator panel located in the manager's unit.

To be “fully addressable”, the display at the office annunciator panel(s) shall differentiate between the smoke detector alarm signal and the emergency call signal, and shall be able to identify the dwelling unit from which the call originated. The system must require a manual reset at the annunciator panel(s). The system shall have the capability to send the same identifying information to a remote location off-site to a monitoring agent, a pager, etc.

The operation of this system shall be discussed during the design stage with the local emergency medical service provider determine their system operation requirements. The operation of the system shall comply with the service provider regulations, but the capabilities of the system as required herein shall not be diminished.

#### **16722 Building Security and Detection Systems**

Intrusion alarms shall be installed within residential units with grade level entrances or where otherwise vulnerable to intrusion, in buildings designed for multiple dwelling units for elderly residents, or any apartment buildings in areas where security from trespass is anticipated as a substantial problem

#### **16740 Telecommunications Systems**

Telephone systems shall be pre-wired, with outlets located in the kitchen, living room or hallway, and master bedroom, in locations suitable for convenient use and related to likely furniture placement.

##### **16740.1 Local Area Network**

All dwelling units shall be provided with a Local Area Network connection in the living or dining room, capable of providing a high-speed internet connection.

#### **16760 Intercommunications**

All buildings that are designed to include a multiple number of dwelling units accessible through a common entry shall have a two-way intercom between the main entry and the individual units. Intercom communications shall not result in additional costs to the resident.

In areas where added security is necessary, as determined by CHFA and the development's management company, door releases at common entries shall be at the door and not remotely operated.

**16780 Television Systems**

Television master antenna or cable systems shall be provided in all developments. Jacks shall be installed in the master bedroom and living room in an appropriate location for viewing and likely furniture placement.

A central TV antenna system shall be provided unless three major networks and public television can be received at the site without cost to the resident, or if basic cable is to be provided at no cost to the residents. All units shall be wired for cable television. Television antenna and cable outlets shall be provided on at least two walls of the living room and one location in the master bedroom. All antenna and cable wiring shall be concealed within walls.

**16785 Sound Wiring**

Doorbells or door-knockers shall be provided at the main entrance door to all dwelling units.

**16850 Electric Heating**

Electric baseboard heat is not allowed. Use of electric heat pump systems, or small electric space heaters, is also not allowed, unless justifiable by life-cycle cost analysis, and specifically approved by CHFA.

# Appendix A: Disability Rights in Housing

## 1. Definition of Disability:

Federal laws define a person with a disability as “Any person who has a physical or mental impairment that substantially limits one or more major life activities; has a record of such impairment; or is regarded as having such impairment.”

## 2. Disability Rights in Private and Public Housing:

- A. In private or public housing, Federal laws impose the following prohibitions and requirements related to persons with disabilities:
1. Prohibits discrimination against persons with disabilities: It is unlawful for a housing provider to refuse to rent or sell to a person simply because of a disability. A housing provider may not impose different application or qualification criteria, rental fees or sales prices, and rental or sales terms or conditions, other than those required of, or provided to, persons who are not disabled.
  2. Requires housing providers to make reasonable accommodations for persons with disabilities: A reasonable accommodation is a change in rules, policies, practices, or services so that a person with a disability will have an equal opportunity to use and enjoy a dwelling unit or common space. A housing provider should do everything s/he can to assist, but s/he is not required to make changes that would fundamentally alter the program or create an undue financial and administrative burden. Reasonable accommodations may be necessary at all stages of the housing process, including application, tenancy, or to prevent eviction.
  3. Requires housing providers to allow persons with disabilities to make reasonable modifications: A reasonable modification is a structural modification that is made to allow persons with disabilities the full enjoyment of the housing and related facilities.
  4. Requires that new covered multifamily housing be designed and constructed to be accessible: In covered multifamily housing consisting of 4 or more units with an elevator built for first occupancy after March 13, 1991, all units must comply with the following seven design and construction requirements of the Fair Housing Act:
    - a. Accessible Entrance on an Accessible Route
    - b. Accessible Public and Common Use Areas
    - c. Useable Doors
    - d. Accessible Route Into and Through the Dwelling Unit
    - e. Accessible Light Switches, Electrical Outlets, Thermostats, and Environmental Controls
    - f. Reinforced Walls in Bathrooms
    - g. Usable Kitchens and Bathrooms
- B. In covered multifamily housing without an elevator that consists of 4 or more units built for first occupancy after March 13, 1991, all ground floor units must comply with the Fair Housing Act seven design and construction requirements.
- C. In Federally assisted multifamily housing consisting of 5 or more units, 5 percent of these units (or at least one unit whichever is greater) must meet more stringent physical accessibility requirements. Additionally, 2 percent of units (or at least one unit, whichever is greater) must be accessible for persons with visual or hearing disabilities.
- D. People with Disabilities in Federally-assisted Housing: Federal law makes it illegal for an otherwise qualified individual with a disability to be excluded, solely because of his or her disability, from programs receiving federal financial assistance.

E. Zoning and Land Use: It is unlawful for local governments to utilize land use and zoning policies to keep persons with disabilities from locating to their area.

**3. The Americans with Disabilities Act:**

In most cases, the ADA does not apply to residential housing. Rather, the ADA applies to places of public accommodation such as restaurants, retail stores, libraries, and hospitals as well as commercial facilities such as offices buildings, warehouses, and factories. However, Title III of the ADA covers public and common use areas at housing developments when these public areas are, by their nature, open to the general public, such as rental offices. Title II of the ADA applies to all programs, services, and activities provided or made available by public entities (state and local governments). Title II requires “public entities to make both new and existing housing facilities accessible to persons with disabilities.” The ADA, when it is applicable to a residential housing project, does not “supersede” Section 504, assuming Section 504 is also applicable. Instead, where both laws apply to a housing project, the project must be in compliance with both laws.

**4. The Architectural Barriers Act:**

The Architectural Barriers Act of 1968 (ABA) (42 U.S.C. §4151-4157) requires that certain buildings financed with Federal funds must be designed, constructed, or altered in accordance with standards that ensure accessibility for persons with physical disabilities. The ABA requires that covered buildings comply with the Uniform Federal Accessibility Standards (UFAS). The ABA does not cover privately-owned housing, but covers buildings or facilities financed in whole or in part with Federal funds. The ABA applies to public housing (24 CFR 40), and to buildings and facilities constructed with CDBG funds (24 CFR 570.614). In practice, buildings built to meet the requirements of Section 504 and Title II of the ADA will conform to the requirements of the ABA.

**5. The Fair Housing Act:**

The Federal Fair Housing Act (FHA) 42 U.S.C. §§ 3601-19, prohibits discrimination in housing practices on the basis of race, color, religion, sex, national origin, familial status, and disability. The FHA uses the term “handicap”, however this document uses the term “disability”, which has the same legal meaning. The Act prohibits housing providers from discriminating against persons because of their disability or the disability of anyone associated with them and from treating persons with disabilities less favorably than others because of the disability. The Act also requires housing providers “to make reasonable accommodations in rules, policies, practices, or services, when such accommodations may be necessary to afford such person(s) equal opportunity to use and enjoy a dwelling.” In addition, the Act requires that housing providers allow tenants to make reasonable modifications to units and common spaces in a dwelling. The Act applies to the vast majority of privately and publicly owned housing including housing subsidized by the federal government or rented through the use of Section 8 voucher assistance. HUD's regulations implementing the disability discrimination prohibitions of the Act may be found at 24 CFR 100.201-205.

**6. Accessible Unit:**

The Section 504 regulations define an accessible dwelling unit as a unit that is located on an accessible route and can be approached, entered, and used by individuals with physical disabilities. A unit that is on an accessible route and is adaptable and otherwise in compliance with the standards set forth in 24 CFR 8.32 is accessible. In addition, the Section 504 regulations impose specific accessibility requirements for new construction and alteration of housing and non-housing facilities in HUD assisted programs. Section 8.32 of the regulations states that compliance with the appropriate technical criteria in the Uniform Federal Accessibility Standards (UFAS), or a standard that is equivalent to or stricter than the UFAS, is an acceptable means of meeting the technical accessibility requirements in Sections 8.21, 8.22, 8.23 and 8.25 of the Section 504 regulations.

**7. New Federally-Assisted Housing Development:**

If a new construction project has four or more dwelling units and is built for first occupancy after March 13, 1991, it is also subject to the accessibility and adaptability requirements of the FHAct, regardless of whether it receives federal financial assistance. The FHAct's accessibility requirements are not as strict as those for Section 504 and the UFAS, however, the FHAct's accessibility requirements apply to a broader number of dwelling units. Under the FHAct's new construction requirements, if the building has an elevator, all of the dwelling units must meet the FHAct's design and construction requirements; if there is no elevator, all of the ground floor dwelling units must meet the FHAct's requirements. A unit that meets the FHAct's accessibility requirements will be one that does not have as great a degree of accessibility as a UFAS-complying unit, but is one that may be easily adapted to be fully accessible without significant costs and the need to do significant structural modifications.

**8. Substantial Alterations to Existing Federally-Financed Facilities:**

If alterations are undertaken to a project that has 15 or more units and the cost of the alterations is 75% or more of the replacement cost of the completed facility [See 24 CFR 8.23(a)], the new construction provisions of 24 CFR 8.22 apply. Section 8.22 requires that a minimum of 5% of the dwelling units, or at least one unit, whichever is greater, shall be made accessible to persons with mobility disabilities and an additional 2% of the dwelling units, or at least one unit, whichever is greater, shall be made accessible to persons with hearing or visual disabilities.

**9. Other Alterations to Existing Federally-Financed Facilities:**

A. If the project involves fewer than 15 units or the cost of alterations is less than 75% of the replacement cost of the completed facility and the recipient has not made 5% of its units in the development accessible to and usable by individuals with disabilities, then the requirements of 24 CFR 8.23(b) - Other Alterations apply. Under this section, alterations to dwelling units shall, to the maximum extent feasible, be made readily accessible to and usable by individuals with disabilities. If alterations to single elements or spaces of a dwelling unit, when considered together, amount to an alteration of a dwelling unit, the entire unit shall be made accessible. Alteration of an entire unit is considered to be when at least all of the following individual elements are replaced.

1. Renovation of whole kitchens, or at least replacement of kitchen cabinets.
2. Renovation of the bathroom, if at least a bathtub or shower is replaced or added, or a toilet and flooring is replaced.
3. Replacement of entrance door jambs.

B. When the entire unit is not being altered, 100% of the single elements being altered must be made accessible until 5% of the units in the development are accessible. However, CHFA strongly encourages a recipient to make 5% of the units in a development readily accessible to and usable by individuals with mobility impairments, since that will avoid the necessity of making every element altered accessible, which often may result in having partially accessible units which may be of little or no value for persons with mobility impairments. It is also more likely that the cost of making 5% of the units accessible up front will be less than making each and every element altered accessible. Alterations must meet the applicable sections of the UFAS which govern alterations.

**10. Building Areas Exempted from Accessibility Requirements:**

Mechanical rooms and other spaces that, because of their intended use, will not require accessibility to the public or beneficiaries or result in the employment or residence therein of individuals with physical disabilities, are not required to be made accessible in projects undergoing either substantial or other alterations. [See 24 CFR 8.32 (6)]

**11. ADA , UFAS, and FHA (March 04)**

Title II of the Americans with Disabilities Act (ADA) applies to State and local government entities. Section 504 of the Rehabilitation Act of 1973 applies to programs and activities receiving Federal assistance, and the Fair Housing Act and its Amendments apply to most types of housing. So, Housing Authorities must comply with all three: Title II of the ADA, Section 504, and the Fair Housing Act.

## **Appendix B: Rehabilitation Design Standards**

### **1. General Policy Statement**

CHFA will undertake financing developments involving rehabilitation when developments provide the best alternative for development, meet CHFA-targeted objectives, and provide a reasonable risk with a reasonable prediction that the development will result in successful outcomes. Successful outcomes are measured in terms of providing a continuing, marketable development, a stable resident population, a well-maintained structure, and repayment of the loan throughout the term of the loan.

### **2. Occupied Housing Developments**

Where the development proposal involves the rehabilitation of an existing occupied development, a Capital Needs Assessment (CNA) shall be required. The CNA shall be thorough and provide a written analysis of all major systems of the structure(s) and life cycle costing. Additionally, the CNA shall incorporate a report that evaluates the structural capacity of the existing building(s). A Connecticut licensed structural engineer shall prepare this portion of the CNA.

The proposed development design and construction cost determination shall address all of the identified CNA needs. Capital Needs not addressed by the design shall be addressed through the development replacement reserves.

Where the development is not a previously financed CHFA development, CHFA Design Review, Cost Review and Construction Document Review staff will carryout a walk-through of the development, prior to the acceptance of the development proposal for processing, but after receipt of the CNA.

An analysis by CHFA Underwriting will be made to determine if the proposal will meet the overall objectives set forth in the CHFA General Policy Statement.

Where the development proposal includes the reuse of internal building components, the reuse shall be done in accordance with CHFA's Replacement Criteria.

All replacement materials shall be equal to materials and methods of construction as required in CHFA's Standards of Design for new construction.

Financing shall provide a construction contingency equal to no less than 10% of the construction contract.

### **3. Adaptive Re-use or Unoccupied Housing Developments**

Where the development proposal involves the rehabilitation of non-occupied existing housing structures or an adaptive re-use of structures, CHFA shall require the development team to prepare a thorough Capital Needs Assessment ("CNA") investigation and analysis of the existing site and existing structure, exterior and interior.

A preliminary analysis of the effects of historic designation requirements i.e.: impact on the community, funding, and costs, shall be prepared by the development team.

Location and site selection will be important underwriting considerations of acceptance for processing, and shall meet CHFA's site selection criteria. Locations shall provide appropriate parking, meeting CHFA Multifamily standards, reasonable security, and appropriate outdoor spaces for the development, and nearby amenities for the targeted resident population.

If commercial space is to be located within the structure, an analysis of the marketability and financial impact of the proposed commercial space shall be prepared by the development team. Uses inappropriate for, or incompatible with, the target population shall not be allowed.

A preliminary analysis showing the proposed size and configuration of units and common spaces, prepared by the development team architect shall be submitted. Rehabilitation proposals shall provide units and common spaces that are marketable provide living conditions comparable to new construction and provide a development that is cost effective to operate and maintain. Units shall provide acceptable views, and basement level units are not acceptable.

Major systems including plumbing, electrical, HVAC, elevators, roofs, windows and insulation shall be replaced and brought up to “new construction” standards as part of the proposal. None of the existing systems shall be considered usable.

It shall be presumed that all finish materials will be new.

Design and construction drawings, specifications and standards shall be equal to CHFA Standards of Design and Construction for new construction.

Financing shall provide a construction contingency equal to no less than 10% of the construction contract.

## Appendix C: Replacement Criteria

The following criteria are to be used in a CHFA-financed rehabilitation where interior building components are to be reused:

All work shall conform to applicable codes. Replacement materials and methods shall comply with the requirements of CHFA's Standards of Design and Construction. The evaluation of building components, using these criteria, will be done by the assigned CHFA technical staff person in cooperation with the supervising Architect, Owner, and General Contractor. Components not covered in this listing shall be evaluated using the listed criteria for similar components.

### 1. General

Painting: Repaint all painted surfaces and paint all repaired surfaces to match existing and/or adjacent painted surfaces. Lead based paint shall be abated in conformance with applicable law.

Drywall: Must be clean, smooth, and have as homogeneous a surface as new finished drywall.

Floor Covering: Unless existing is as new, all sheet vinyl is to be replaced. Reuse carpet only if it is 3 years old or less, it has no stains, no worn areas and each room within a unit matches. Ceramic tile bathroom floors must have no chips or cracks and be clean. Where a ceramic floor is not acceptable it may be replaced, or overlaid with new sheet vinyl after preparation of existing flooring so as to be a smooth, clean surface not subject to telegraphing the joints.

Closet Shelving: Must be smooth, tight fitting, with no delaminating, and be properly anchored.

Drapery Hardware: Must function properly, have clean appearance, and be properly anchored.

Blinds: Unless existing is as new, new blinds shall be provided. Existing blinds shall comply with CHFA Standards of Design and Construction.

Motors and other equipment: Life cycle costing should be considered. The projected life of existing motors and other existing equipment should be equal to or exceed five (5) years, or replacement is required.

### 2. Kitchens

Appliances: The projected life of existing appliances should be equal to or exceed five (5) years, or replacement is required. Reuse only if they function properly, have a good overall appearance with only minor scratches.

Counter tops: There shall be no chips, burns, stains, cracks, or other deformities. Laminate color and finish on all countertops shall match within same kitchen and be adequately anchored. Otherwise, countertops shall be replaced.

Cabinets: Cabinet doors and drawers must function properly, shall have no deep gouges, broken pieces or parts. If new and existing cabinets are located within the same kitchen, colors, finish, styles and hardware must match. In developments for elderly residents, cabinets must have easily graspable pull handles. Otherwise, new cabinets shall be installed.

Sinks: Sinks shall have no cracks, chips or stains and the sink shall be adequately anchored to the countertop. Sink faucets and drains shall not leak or drip and shall function as designed.

Garbage Disposal: Disposal must function properly and not leak. Wall switch shall be provided for operating the disposal unit.

### **3. Bathrooms**

Bath Vanity, Vanity Top, Lavatory (sink) and Medicine Cabinet: Remove any wall-hung sink and replace with new vanity and vanity top with integral lavatory (sink). Existing vanities, sinks and tops must meet the same criteria as those for kitchen countertops, cabinets and sinks. The vanity area shall also be equipped with a light that is activated by a wall switch.

Medicine cabinet shall be clean, plumb and level, properly anchored, shall have a mirror with no scratches, chips or cracks, and shall have at least one shelf.

Bathtub, Shower Base, and Water Closet: Bathtubs, shower bases and water closets shall have no cracks, chips, stains or leaks, must function properly and be adequately anchored. All bathroom fixtures must be clean, function properly and shall not have any chip or cracks.

Wall Surround (Ceramic Wall Tile or Fiberglass): Ceramic wall tile and fiberglass surrounds must have no chips, cracks and be clean with no stains or deformities; tiles must match within same bathroom and be adequately anchored.

### **4. Doors and Door Hardware**

Unit Interior Doors: All unit interior doors shall function properly, be plumb and level within the openings, and have smooth surfaces with no de-laminations. Repairs will be attempted on minor cracks and punctures only; otherwise, new doors will be installed. All existing painted doors shall be re-painted. All door finishes within the unit must match. If most existing doors are painted, existing unpainted (stained) doors may be painted to match doors within units; otherwise, new doors will match the existing unpainted (stained) doors.

Interior Door Hardware: All unit interior door hardware shall have a clean appearance, with only minor scratches, and shall be properly anchored and function properly. Styles and finishes within rooms shall match.

Unit Entry Door and Hardware: All unit entry doors and hardware are to be new, and shall meet CHFA Design and Construction Standards for entry door hardware.

### **5. Windows**

Sash, Glazing and Hardware: All windows and sash shall function properly, be plumb and level within the openings, and have insulating glass and a functioning lock. Window frames must be clad wood or thermally-broken vinyl. Replace all torn screens, and glazing that is cracked, or has broken thermal edge seals.

Interior Trim: Repaint all existing painted sash and window trim. All window finishes within a unit must match. If most existing interior trim painted, existing unpainted (stained) trim may be painted to match doors within units; otherwise, new trim will match the existing unpainted (stained) trim. Seal the perimeter of all window units.

### **6. Plumbing**

Plumbing: All service, distribution and return pipe, connectors, and accessories for Kitchen and Bathroom fixtures and heating systems shall function properly, shall not leak and shall be properly insulated. See fixtures under **Bathrooms** and **Kitchens** above.

## **7. Mechanical**

Heating, Air Conditioning Units and Covers: All materials shall function properly, shall be clean and neat in appearance with no large dents or visible damage. Paint covers to match adjacent walls.

## **8. Electrical**

Electrical wiring: Replace all aluminum wiring smaller than #4, or used for branch service other than to a range.

Electrical Fixtures, Outlets, Switches, Exhaust Fans, etc.: All materials shall function properly and have clean appearance with no chips or cracks. Colors of all controls within each space must match.

Electrical Receptacles and Switch Cover Plates: Replace all cover plates.

Smoke Detectors: Must function properly and have clean appearance. Replacement smoke detectors shall preferably be hard-wired, and shall be photoelectric-type.

## **Appendix D: CHFA Environmental/Hazardous Materials Review Guidelines**

The following environmental/hazardous materials guidelines shall be followed for providing construction financing of multifamily developments pertaining to both new construction and the rehabilitation of existing buildings & properties:

### **1. Environmental/Hazardous Materials Consultant Qualifications**

Submit qualifications of the firm along with the experience & licenses of those employees assigned to investigate, inspect, perform the environmental services and/or prepare reports. Environmental Consultants shall be Connecticut Licensed Professionals within their specific field. For verification of site remediation and or abatement work confirming environmental compliance, the firm and/or individual employed shall be listed on the current "CTDEP List of Licensed Environmental Professionals".

### **2. Environmental/Hazardous Materials Site Assessment Report**

A Phase I Environmental Site Assessment report prepared by a Connecticut Licensed Environmental Professional (CTLEP) shall be submitted to CHFA for review. Environmental Site Assessments shall comply with the National Environmental Policy Act (NEPA) and be prepared in accordance with Standards outlined in the "Transfer Act Site Assessment Guidance Document" (TASA, CTDEP) including current revisions published by the CT DEP and ASTM Standard E1527-05, Standard Practice for Environmental Site Assessments. Based on the information submitted and reviewed, additional phased site investigations, testing and or reports may be required.

### **3. Lead-based Paint**

Current Federal, State & Local Laws & Regulations shall be adhered to, including the following:

- A. "Guidelines for the Evaluation & Control of Lead-Based Paint Hazards in Housing" as published by the U.S. Dept of Housing and Urban Development
- B. State of Connecticut Department of Public Health & Addiction Services, Guidance Document for Lead Abatement
- C. U.S. Environmental Protection Agency requirements regarding removal & disposal of lead-based paint
- D. OSHA, Lead in Construction Standard 29 CFR 1926.62
- E. Local Governmental Laws & regulations pertaining to lead-based paint.

### **4. Asbestos**

Current Federal, State & Local Laws & Regulations shall be adhered to, including:

- A. U.S. Environmental Protection Agency regulations & forms
- B. State of Connecticut Department of Health Services Regulations - Standards for Asbestos Abatement

### **5. Radon**

Provide radon testing of properties where buildings will be used for residential occupancy. If testing results are not provided, a Radon Mitigation System will need to be installed. Comply with all current U.S. Environmental Protection Agency guidelines for Residential Construction including:

- A. EPA Document - "Radon-resistant Construction Techniques for New Residential Construction" (current issue)
- B. EPA Document- "Model Standards and Techniques for the Control of Radon in New Residential Buildings" (current issue)

A passive Radon Mitigation System shall be provided where radon test results are above the EPA Action Guideline of 4 pCi/L. A passive Radon Mitigation System shall also be provided where pre-construction

testing is impractical or impossible. Upon completion of construction, but prior to occupancy, radon testing shall be performed, and test results shall be submitted for review. If radon test results remain above the EPA Action Guideline of 4 pCi/L, passives systems shall be made active by mechanical/electrical means.

**6. Others**

Submit site & building information indicating review of the following:

- A. Mold
- B. Urea Formaldehyde Insulation
- C. PCB (Polychlorinated Biphenyl's)
- D. Drinking Water/Piping Systems
- E. Flood Classification and/or Flood Zone
- F. Wetland Classification and Designated Areas

**7. Environmental Attorney**

The Owner's Environmental Attorney needs to confirm review of environmental reports prepared by consultants to insure that all applicable environmental regulations specific to the property will be met. Submit opinion-statement from the Owner's Environmental Attorney.

**8. Costs**

Upon completion of all testing, and the determination of the scope of possible abatement and or remediation work, submit cost information for review.

## Appendix E: CHFA Construction Cost Effectiveness Scoring

Cost Effectiveness is strongly encouraged. An objective of the Connecticut Housing Finance Authority (CHFA) is to maximize the overall cost effectiveness of developments, including but not limited to, construction costs for applications submitted to CHFA. All applications must meet CHFA's Standards of Design ("Standards") and Construction and comply with CHFA's Underwriting Standards and the CHFA/DECD Consolidated Application. Please find below materials, explanations, guidelines, and examples of CHFA's construction cost effectiveness scoring.

### 1. Definitions

#### A. Square Foot (SF)

Square Footage is calculated using a building's first level footprint square footage, and adding the square footage of other levels (except basements and attics), to determine total square footage. Portions of basements, attics, and cantilevered sections used for living space shall be included (attic living areas are measured from knee wall to knee wall and gable end to gable end, where applicable). SF Cost is determined by dividing the Total Construction Cost by the project's Square Footage.

#### B. Total Construction Cost

Total Construction Cost is defined as all construction costs, inclusive of CSI Masterformat 1995 Construction Divisions 2 through 16, Contractor's General Requirements, Overhead & Profit, Building Permits and Fees, and Bond Premium. Total Construction Cost does not include Contingency Reserve.

#### C. Building Type Rehabilitation Definitions (based on the 2003 International Existing Building Code)

##### 1. Minor Rehabilitation

Construction renovations to existing buildings, consisting of items such as: Kitchen cabinet replacement; Bathroom vanity replacement; new wall, ceiling and floor finishes in Kitchens and Bathrooms; A/C unit and sleeve replacement, etc.

##### 2. Moderate Rehabilitation

Construction renovations to existing buildings, consisting of items such as: Kitchen cabinet replacement; Bathroom vanity replacement; new wall, ceiling and floor finishes in Kitchens, Bathrooms and various other rooms in each apartment; exterior door replacement; exterior window replacement; roof replacement; exterior siding repair or replacement; new hot water heaters; hot water boilers; A/C unit and sleeve replacement; electrical service upgrade, etc.

##### 3. Substantial Rehabilitation

Construction renovations to existing buildings, consisting of all items listed for Moderate Rehabilitation above, and the inclusion of up to 50% of the items listed for Gut Rehabilitation below.

##### 4. Gut Rehabilitation

Construction alterations and renovations to existing buildings, consisting of complete removal, replacement or reconfiguration of: interior partitions and walls; ceiling and floor finishes; replacement of all interior doors and frames; replacement of building mechanical and electrical systems; modifications to existing structure and exterior wall systems, including window and exterior door replacements and new building insulation; replacement of existing roof system(s); replacement of all interior Kitchen cabinets and Bathroom vanities; painting of all rooms in each apartment and common areas, etc.

### 2. Project Building Types Guideline Costs

- A. New Construction single building, multiple story (wood frame, vinyl siding)..... \$136 per SF
- B. New Construction multiple buildings, multiple story (wood frame, vinyl siding)..... \$130 per SF

- C. New Construction single/multiple buildings, multiple story (steel frame)..... \$180 per SF
- D. Existing single building, multiple story minor rehabilitation..... \$32 per SF
- E. Existing multiple buildings, multiple story minor rehabilitation..... \$26 per SF
- F. Existing single building, multiple story moderate rehabilitation..... \$68 per SF
- G. Existing multiple buildings, multiple story moderate rehabilitation..... \$63 per SF
- H. Existing single building, multiple story substantial rehabilitation..... \$99 per SF
- I. Existing multiple buildings, multiple story substantial rehabilitation..... \$94 per SF
- J. Existing single building, multiple story gut rehabilitation..... \$120 per SF
- K. Existing multiple buildings, multiple story gut rehabilitation..... \$115 per SF
- L. Existing single/multiple 19<sup>th</sup>/early 20<sup>th</sup> century mill buildings, gut rehabilitation..... \$145 per SF

**3. Regional Construction Cost Differences**

- A. Regarding the matter of regional cost increases specifically related to cities and towns within Connecticut’s eight counties: The Authority conducts a Prevailing Wage Study using two cities in each Connecticut County based on annual Prevailing Wage Building Rates published by the Connecticut Department of Labor.
- B. Additional research includes the use of Location Factors for 2009 Residential Cost Data and 2009 Building Construction Cost Data, as determined by R. S. Means, a nationally-recognized company specializing in construction cost indices.

**4. Construction Cost Evaluation Methodology**

- A. The Authority recognizes all construction projects as unique and understands there may be verifiable, significant square foot (SF) cost differences between the Standards’ guidelines and a General Contractor’s cost submission. CHFA invites all applicants, before submission of a Financing and/or LIHTC Application to the Authority, to contact Technical Services to discuss conditions which may significantly increase SF costs.
- B. Conditions which may significantly increase SF costs may be: extreme site conditions, extreme environmental conditions, material and labor market conditions, conditions specific to difficult inner city site profiles, interior and exterior finishes, and/or geothermal and photovoltaic applications. Recognition of the cost implications of these conditions results in the upward adjustment to the Standards Guideline SF Cost.
- C. Technical Services derives a final cost per SF for each project by performing numerous site visits, evaluating architectural drawings from the schematic stage to 100% drawings, surveying lumber yards, concrete and asphalt plants, and other wholesalers/retailers for current unit pricing. The Authority’s historical construction cost database is also accessed and used to determine construction cost effectiveness. When a construction project’s final SF cost is determined, the SF cost, and all relevant material, is submitted to the Technical Services Peer Review Committee for further review, discussion and consensus.

Example 1: New construction, multiple buildings, multiple story wood frame, vinyl siding has a Standards guideline SF cost of \$130. With the inclusion of extreme site and environmental conditions, and an upgrade from vinyl siding to brick veneer, the upward adjustments to the \$130 Standards cost for this building type may approach or exceed \$20 SF. A new Standard SF cost is established at \$150 SF by adding additional costs to the Standard’s guideline cost.

Using the Standards Guideline Cost for building type, or adjusting the Standards Guideline Cost due to project specific conditions, the Standards' Guideline Cost is compared to the project's General Contractor's SF cost, and a percentage deviation between the two costs is established.

Example 2: The Standards adjusted cost per Example 1 is \$150.00 SF; the General Contractor's SF cost is \$161.25. By dividing the adjusted Standards' SF cost into the General Contractor's SF cost and subtracting one (1), the percentage deviation is determined:

$$\$161.25/\$150.00=1.075; 1.075-1=.075 \text{ or } 7.5\%$$

## **5. Construction Cost Scoring**

- A. Each project is evaluated on a SF basis separately and apart from all other projects within a competitive funding round; each project is ranked in a competitive funding round, to determine placement in the round.
- B. Applicants are ranked in descending order by their percentage deviation from CHFA's evaluation.
- C. If applicants fall within 0.00%-4.00% of the deviation, they receive 20 QAP points.  
If applicants fall within 4.0X%\*-7.00% of the deviation, they receive 15 QAP points  
If applicants fall within 7.0X%\*-10.00% of the deviation, they receive 10 QAP points
- D. If applicants fall outside of 10% of the deviation, one point is subtracted, per percentage point deviation, from 10 QAP points, until zero is reached.

\* "X" above denotes any decimal extension required to eliminate ties for QAP scoring

*The chart on the following page provides a graphic example of Construction Cost Scoring*

The chart below expands on Construction Cost Evaluation Methodology Examples 1 & 2 above, and uses one building type and one Standard SF cost to represent point scenarios in a competitive funding round. Please note that Cost Effectiveness Ranking is shown for informational purposes only, and has no bearing on the number of QAP points awarded.

<b>Standards' Adjusted Cost</b>	<b>Project S.F Cost</b>	<b>Percent Deviation</b>	<b>QAP Score</b>	<b>Cost Effectiveness Ranking</b>
\$150.00	\$150.00	0%	20	1
\$150.00	\$151.52	1.01%	20	2
\$150.00	\$153.03	2.02%	20	3
\$150.00	\$154.55	3.03%	20	4
\$150.00	\$156.06	4.04%	15	5
\$150.00	\$157.58	5.05%	15	6
\$150.00	\$159.09	6.06%	15	7
\$150.00	\$160.61	7.07%	10	8
\$150.00	\$162.12	8.08%	10	9
\$150.00	\$163.64	9.09%	10	10
\$150.00	\$165.15	10.10%	9	11
\$150.00	\$166.67	11.11%	8	12
\$150.00	\$168.18	12.12%	7	13
\$150.00	\$169.70	13.13%	6	14
\$150.00	\$171.21	14.14%	5	15
\$150.00	\$172.73	15.15%	4	16
\$150.00	\$174.24	16.16%	3	17
\$150.00	\$175.76	17.17%	2	18
\$150.00	\$177.27	18.18%	1	19
\$150.00	\$178.79	19.19%	0	20
\$150.00	\$180.30	20.20%	0	21
\$150.00	\$181.82	21.21%	0	22
\$150.00	\$183.33	22.22%	0	23
\$150.00	\$184.85	23.23%	0	24
\$150.00	\$186.36	24.24%	0	25

Please contact Robert Ottiano, Development Cost Analyst, at (860) 571 4296 with any questions.

## Appendix F: CHFA Technical Services Review Forms

### 1. Preliminary Review

- A. Outline Specification Form Exhibit 15  
(<http://www.chfa.org/Multifamily/ApplicationOutlineSpecs.xls>)
- B. Project Information Form [Building Use and Square Footage Information]  
(<http://www.chfa.org/MainPages/ProjectSqFtInfoTable.xls>)
- C. CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown [f.k.a. CHFA Form 2328 Schedule of Values and Exploded Trade Payment Breakdown]  
(<http://www.chfa.org/Multifamily/ConAppWorkbook1.xls> and
- D. Request for Permission to Commence Construction Form  
(<http://www.chfa.org/MainPages/PermissionToStartLetter.pdf>)
- E. Contractor's Cost Certification Obligation Statement  
(<http://www.chfa.org/MainPages/ContractorCostCertificationStatement.pdf>)

### 2. During Construction

- A. Instructions for Contractor's Req., Contractor's CO Req. & Proposed Change Order Request  
(<http://www.chfa.org/Multifamily/Instructions.pdf>)
- B. Form 2448MR10 – Contractor's Requisition  
(<http://www.chfa.org/Multifamily/CHFAform2448MR10-ContractorRequisition.xls>)
- C. Form 2448 MR11 – Contractor's Change Order Requisition  
(<http://www.chfa.org/Multifamily/CHFAform2448MR11ChangeOrderRequisition.xls>)
- D. Architect Certification Statement (reverse side of requisitions)  
(<http://www.chfa.org/MainPages/ArchitectsCertificationStatement.pdf>)
- E. Lien Track/Waiver of Lien (<http://www.chfa.org/MainPages/LIENTRACK.xls>)
- F. Site Track #1 or #2 (pending on how many buildings being built)  
(<http://www.chfa.org/Multifamily/Sitetrak10.xls> or <http://www.chfa.org/Multifamily/SiteTrak2.xls>)
- G. Form 2437 – Request for Construction Change  
(<http://www.chfa.org/Multifamily/Form2437RequestforConstructionChange.xls>)
- H. Form 5372 – Accounting of On-site Inventory  
(<http://www.chfa.org/Multifamily/CHFAform5372MR11OnSiteInventory.xls>)
- I. CHFA Requirements for Reduction of Retainage  
(<http://www.chfa.org/MainPages/ReductionInRetainage.pdf>)
- J. Certificate of General Contractor – Final Reduction of Retainage  
(<http://www.chfa.org/Multifamily/CertOfGenContractor.doc>  
<http://www.chfa.org/MainPages/ContractorCostCertificationStatement.pdf>)

## **Appendix G: CHFA Contractor's Cost Certification Statement**

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