



Connecticut Housing Finance Authority

Standards of Design And
Construction

2013

Volume I – Project Planning and Technical Review Process

Volume II – Health, Safety and Sustainability
Design Standards and Guidelines

Volume III – Appendices

Standards of Design and Construction

CHFA (“CHFA” or “the Authority”) **Standards of Design and Construction (“Standards”)** define the design process and the specific requirements for multifamily housing developments receiving CHFA funding or other funds administered by CHFA. These Standards replace the CHFA STANDARDS OF DESIGN AND CONSTRUCTION implemented in January 2012, and are requirements of the Multifamily Housing Design Review Process for CHFA.

It is the intent of these Standards and the **Design Review Process** outlined herein to insure that housing financed through CHFA’s multifamily lending programs is designed to best serve the needs of its residents 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 early in the design and underwriting review process, and that the Developer or Owner may request a **Modification** or **Waiver** of the Standards. 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.

CSI Format

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

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

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, or call 860-571-4357.

Established Criteria

1. All multi-family development applications for construction financing submitted to CHFA’s Multifamily Underwriting and Asset Management Departments for CHFA funding or other funds administered by CHFA, are required to meet the same minimum “Established Criteria” for project planning and CHFA Technical Services’ review. Sections of the Standards which contain such “Established Criteria” are indicated in the Table of Contents under “**VOLUME I – PLANNING and REVIEW PROCESS**” thusly: [E]. Headings of portions of each section of the Standards in **VOLUME I** that are considered to be “Established Criteria” for development applications are highlighted in **yellow**.
2. All proposed multi-family developments, regardless of funding type, which proceed to a CHFA Board-approved finance application and loan closing, are required to meet all other planning and review requirements outlined in **VOLUME I**. Construction documents for such developments are required to meet the same minimum “Established Criteria” for health, safety and sustainability. Sections of the Standards

which contain such “Established Criteria” are indicated in the Table of Contents under “**VOLUME II – HEALTH, SAFETY and SUSTAINABILITY STANDARDS AND GUIDELINES**” thusly: [E]. Headings of portions of each section of the Standards in **VOLUME II** that are considered to be minimum standards for the construction of developments approved for funding through 2012 financing programs are highlighted in yellow.

3. All proposed multi-family developments, regardless of funding type, are required to meet all of the requirements outlined in **VOLUME III – APPENDICES**.

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Volume I

Project Planning and
Review Process

2013

00000 GENERAL DESIGN REQUIREMENTS**00010 Applicable Codes and Standards**

(For projects with Building Permit Applications submitted after December 31, 2012)

CHFA uses the Standards to support its programs to design housing that will serve the needs of its inhabitants with as much safety, 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):

A. Connecticut State Building Code – 2009 Amendment to the 2005 Connecticut Supplement*:

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)
 2009 International Energy Conservation Code (IECC)
 ASHRAE 90.1-2007
 ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
 2005 State of Connecticut Amendments/State Building Code

B. 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

C. 2005 Connecticut Elevator Code (CSEC):

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

D. Federal Housing and Equal Opportunity Laws [including, but not limited to, the Fair Housing Act (FHAct) and other civil rights laws, including Title VI and Title VII 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, the 2012 updated regulations of the Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, Title IX of the Education Amendments Act of 1972, the Age Discrimination Act of 1975 and the Architectural Barriers Act of 1968 (ABA)] * Note: CHFA recommends providing all due diligence on FHAct compliance, since the Connecticut Supplement to the 2003 IBC is not be a safe harbor.**E. CHFA Standards of Design and Construction 2013 by CHFA Technical Services**

All developments receiving CHFA funding or other funds administered by CHFA shall conform with all funding program, Local, State, and Federal requirements. It shall be the responsibility of the developer and architect to assure compliance of the design and construction with all such Codes and requirements. CHFA supplements the requirements of current applicable Building Codes and State and Local law with these Standards to create housing that best suits the needs of Connecticut residents, and is healthy, comfortable and sustainable.

1. The Standards 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 and Multifamily High Rise (U.S. Environmental Protection Agency), 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. General “Green” design principles are encouraged: minimize the extraneous; integrate multiplicity of function; design for all aspects of climate at all levels, and for durability and longevity; select products and recyclable materials that use resources efficiently, are made with recycled content and the least toxic materials and manufacturing processes; support local and regional businesses and resource bases. Note that particular examples of sustainable materials, assemblies, equipment, brands and manufacturers may be listed in the Standards as resource information for consideration by development design professionals. In such cases, it should not be inferred in any way that CHFA endorses such materials, assemblies, equipment, brands and manufacturers, requires their use, or guarantees their functionality, performance, durability, quality, install-ability or safety, etc.

2. **The 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 as applicable to the proposed scope of work. 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.
3. The Standards are typically revised annually, and 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. All applications must conform to the Standards current at the time they are submitted.

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 under the guidance of the recommendations of the Asthma Regional Council of New England: [Building Guidance for Healthy Homes](#), which may be found on their website (www.asthmaregionalcouncil.org). 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](#)” by Building Science Corporation, which can be found on their website (www.buildingscienceconsulting.com).
- 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 Department

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

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

00015.1 Review Considerations

Technical Services' staff review considerations include utility, convenience, health and safety, accessibility, resource conservation.

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

- A. To best satisfy all of Technical Services' review considerations, Owner/Developers should assemble an Integrated Development Team – including a qualified Architect and other Professional Consultants, and a qualified General Contractor and Key Sub-Contractors – working with an Integrated Design Approach.
- B. 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.
- C. 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:

- A. The Owner/Developer issues a Request for Qualifications (“RFQ”) for architectural services
- B. The Owner/Developer selects several candidates, from the Architectural/Engineering (“A/E”) firms, or teams, that respond to the RFQ, to be interviewed
- C. The Owner/Developer conducts the interviews, selects an architectural firm or team, and negotiates a contract
- D. 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.

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 the Standards. 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.

- A. 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.
- B. All rehabilitation and new construction developments submitted for CHFA funding, or other funds administered by CHFA, must maintain all required types and levels of insurance coverage outlined in the CHFA document "Insurance Requirements for Projects Under Construction or Renovation", which can be found on the CHFA website.

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.

- A. 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

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

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. 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.

- B.** 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.

C. 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
 - a. The above-noted contract does not include Bonds or Permits as stipulated sum items; these costs are specific to, and defined by, the Construction Cost. CHFA will reimburse these expenditures up to the limit of funds expended by the Mortgagor or General Contractor.
 1. If the Mortgagor's or General Contractor's Bond and/or Permit expenditure is less than the amount accepted at Initial Closing, a Credit Change Order shall be prepared, moving the unspent amounts of these line items onto the Construction Contingency.
 2. If the Bond and/or Permit expenditure is more than the amount accepted at Initial Closing, for fees previously unknown to the Mortgagor or General Contractor, a Change Order shall be prepared to fund these overages out of the Construction Contingency.
 - a. Additional Bond and/or Permit Costs generated by the Change Order preparation and approval process during construction will be handled separately, through a final Change Order at the completion of construction.
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

D. 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

E. CHFA Insurance Requirements for GCs:

1. The GC shall obtain and maintain the following policies and coverage, in forms, amounts and terms satisfactory to CHFA ([CHFA Insurance Requirements](#)):
 - a. Comprehensive or Commercial Form General Liability Insurance: on an occurrence basis, covering work done or to be done by or on behalf of the GC, and providing insurance for bodily injury, personal injury, property damage, and contractual liability. The aggregate limit shall apply separately to the work.

Limits of Liability: \$2,000,000.00 General Aggregate
 \$1,000,000.00 Products and Completed Operations Aggregate
 \$1,000,000.00 Personal and Advertising Injury
 \$1,000,000.00 Each Occurrence
 \$50,000.00 Fire Damage (any one fire)
 \$5,000.00 Medical Expense (any one person)
 - b. Business Automobile Liability Insurance: on an occurrence basis, covering owned, scheduled, hired, and non-owned automobiles used by or on behalf of the GC, and providing insurance for bodily injury, property damage, and contractual liability.

Limits of Liability: \$1,000,000.00 Each Accident – combined single limit for bodily injury and property damage.

- c. Workers' Compensation: including Employers Liability limits and other limits as required under Connecticut law.
Limits of Liability: \$(Statutory) Worker's Compensation
\$1,000,000.00 Bodily Injury by Accident
\$1,000,000.00 Bodily Injury by Disease
\$1,000,000.00 Bodily Injury by Each Employee
 - d. Umbrella or Excess Liability Insurance: beyond General Liability, Automobile Liability and Employer's Liability: written on an occurrence basis; coverage may be written on an excess or following form basis, but in any event, it shall be no less broad than underlying liability policies; the Authority's interest as an additional insured as for General Liability coverage shall also extend to the Umbrella or Excess Liability coverage.
Limits of Liability: \$5,000,000.00 (however, the Authority reserves the right to require additional limits of liability coverage)
 - e. Contractor Environmental Impairment Liability Insurance (Pollution Insurance): Contractor's involved in pollution remediation (including but not limited to the removal of lead or asbestos containing materials) and mold coverage.
Limits of Liability: The greater of fifty percent (50%) of the contract cost or \$3,000,000.00 (however, the Authority reserves the right to require additional limits of liability coverage)
2. The GC must provide a completed "Contractor's Cost Certification Statement", signed by the Owner and GC, prior to Initial Closing.
 3. 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.
 4. 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.

G. 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 no way releases the GC from any warranty or guarantee responsibilities assumed under the original construction contract or any agreed upon change orders.

00021.4 Construction Manager at-Risk (CM@R)

CHFA prefers Owner/Architect/General Contractor Development Teams; typically, Construction Managers shall not be employed. Exceptions may be made for experienced Construction Management firms with a proven record of executing successful affordable multifamily development projects, which enter into a Construction Manager at-Risk (CM@R) agreement with the Owner. CM@R is a global term referring to a business relationship of Owner, Architect and Construction Manager, which entails a commitment by the Construction Manager to deliver the project within a Guaranteed Maximum Price (GMP).

Potential benefits of a CM@R arrangement include maximizing the awareness among Owner, Architect and Construction Manager of all parties' needs and expectations, in order to perform their part of the project in the most efficient manner, and thus maintaining positive working relationships among the three parties. The CM@R delivery method has some of the benefits of the Design/Build method, such as improved quality based on qualifications of the design/build team, and fast-track construction capability. The team approach provides for input from all of the team members throughout the design and the construction phases. Transparency is enhanced, because all costs and fees are in the open, which diminishes adversarial relationships between components working on the project, while at the same time eliminating bid shopping.

Between the 40% to 100% detail design documents complete stage, the Construction Manager negotiates a Guaranteed Maximum Price (GMP) for the entire project. The GMP is composed of work, overhead and profit. The subcontractors are pre-qualified by the Construction Manager with the goals of meeting federal, state, CHFA and local M/WBE-EEO-Affirmative Action requirements, and having quality contractors in the specialty areas necessary for completing the project. The construction of the project is the responsibility of the Construction Manager and the subcontractors selected through the pre-qualification low bid process.

The CM@R delivery method is an alternative procurement process similar to longstanding private sector construction contracting, wherein the Construction Manager acts as consultant to the Owner in the Design Development phase, but as the equivalent of a General Contractor during the Construction and Final Closing phases.

A. Design Development

During this phase, the CM@R shall work closely with the Owner/Developer and Architect on the following tasks:

1. Design Review:
CM@R shall work with the Architect in reviewing and developing the design and construction documents, taking into account the quality of the materials and equipment, and the Standards, to ensure the most efficient design and minimum lifecycle cost. CM@R shall provide information, estimates, schemes, and recommendations regarding construction materials, means, methods, systems, phasing, and costs, and shall participate in design decisions to provide the highest quality building within the Owner/Developer's budget.
2. Project Schedule Analysis:
CM@R shall develop the initial project schedule, setting forth planned progress of the project broken down by the various divisions of work, or parts of the work, and by calendar days. CM@R shall provide phasing and schedule analysis at each of the major design/development milestones [40% and 100% complete construction documents], in each case updating the schedule as necessary to reflect construction-related changes in the development proposal.
3. Constructability Review:
CM@R shall check the documents for completeness and coordination, and make recommendations to the Architect. CM@R shall conduct full and complete constructability reviews for 40% and 100% complete construction documents.
4. Cost Control Management:
CM@R shall value engineer all building systems at each of the major milestones, with a lifecycle analysis for major building elements, such as site, building envelope, HVAC and lighting. In conjunction with the Architect, CM@R shall prepare a cost estimate and evaluate the cost estimate against the construction budget. CM@R shall recommend, if necessary, the appropriate action to correct and/or avoid potential cost over-runs. Project construction cost estimates in CHFA format shall be developed/updated as a part of each of the CHFA submittal: schematic design documents, and 40% and 100% complete construction documents. Cost estimates shall reflect the best professional estimate of actual anticipated costs, while establishing internal estimating allowances consistent with good professional practices appropriate to each phase of development. Larger allowances held at early phases of development are assumed to gradually diminish to zero for the final cost estimate. The CM@R shall not include a construction cost

contingency in its fee proposal. Any such contingency shall be carried by the Mortgagor as a line item in the approved development budget.

B. Construction and Final Closing

During these phases, the CM@R shall work closely with the Owner/Developer and Architect in accordance with all CHFA General Contractor requirements, procedures, and practices for Construction and Final Closing.

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 Accessibility and Adaptability in Elderly Housing Developments

A percentage of the units as required by State Law, but no less than 10% of all new multifamily units (round up to a whole number), shall be "Type A" units, and 100% of all units shall be "Type B" units. Where market demand dictates, CHFA may require a higher percentage of barrier-free units to be provided.

00040.2 Accessibility and Adaptability in Family Housing (New Structures with 4 Units or More)

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

00040.3 Accessibility in Rehabilitation Projects

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

00040.4 Accessibility in Community Facilities

All common spaces such as laundry, storage, kitchens, etc., shall be furnished with barrier-free equipment and shall be accessible from all units.

00040.5 Accessibility in Federal Funded Developments

Where Federal funds such as HOME funds are used in financing a development, the design must comply with all applicable Federal regulations, including Section 504 of the Rehab Act of 1973, which refers to technical criteria contained in the Uniform Federal Accessibility Standards (UFAS). Under Section 504, the required number of units designed to meet UFAS is 5% of the total number of units; an additional 2% must accommodate the needs of people with hearing or visual disabilities (Refer to HUD 24 CFR).

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/Brownfield)
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)
 - b. Connecticut Dept. of Public Health (CT DPH) Lead Program
 - 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
 - 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)
- 2. The Connecticut Dept. of Public Health (CT DPH):
 - a. Licensed Lead Abatement Consultants and Contractors
 - b. Licensed Asbestos Consultants:
 - 1. Asbestos Consultant – Inspectors
 - 2. Asbestos Consultant – Inspector/Management Planners
 - 3. Asbestos Consultant – Project Designers
 - 4. Asbestos Consultant – Project Monitors
 - 5. Asbestos Consultant – Contractors
 - c. In-State Approved Commercial Environmental Laboratories
 - d. Out-of-State Approved Commercial Environmental Laboratories
 - e. Approved Non-Commercial Environmental Laboratories

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, a final remedial action plan can only be developed after a complete Phase III investigation.

I. 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)

J. 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**). CHFA may select and commission an outside, third-party CT-Licensed Environmental Professional (at the applicant's expense), from an approved list developed by the Authority, to review environmental reports for conformance to CHFA Environmental/ Hazardous Materials Review Guidelines. The applicant will make payment in advance for such environmental reviews, which is non-refundable.

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 Clause

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 120 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 the pertinent portions of the current Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS, and 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. All surveys shall meet or exceed Horizontal Accuracy Class A-2 and Topographic Accuracy Class T-2, shall be signed and sealed by a Connecticut licensed professional land surveyor, and shall include the following:

- A. North Arrow with appropriate source reference (record map; CT Coordinate System; NAD27; NAD83; etc.) shall be depicted on every sheet.
- B. 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.
- C. 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.
- D. All boundary lines shall be labeled with bearings and distances.
- E. 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.
- F. 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

- A. 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.

- B. 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.
- C. 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

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. 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.

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 specifies 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.a. 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 **00152.5.E**).

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.

- A. 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.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. The engineer shall note ground water conditions such as high water tables, flood zones, etc. and make recommendations for remedies as needed.

00053.1 Remediation/Re-use of Existing Brownfield Sites

CHFA encourages the re-use and redevelopment of abandoned or underutilized commercial and industrial sites, where redevelopment and re-use has not occurred due to the presence or potential presence of pollution in the

buildings, soil and/or groundwater, which requires remediation before, or in conjunction with, the restoration, redevelopment and re-use of the property.

00053.2 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.

A. Soils Investigation Plan

1. 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.
 2. 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.
 3. 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.
- B. Prior to undertaking the soil investigation, and only after plan approval, the development team shall notify the Authority’s Technical Services 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.
- C. 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.
- D. 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.

00054 Capital Improvements – Repairs/Replacements/Installations

CHFA requires that Capital Improvement Repair/Replacement/Installation work be completed in accordance with all applicable Building Codes, State and Federal regulations and the current Standards. Examples of projects requiring certification of completion in accordance with the Standards can be found in **Appendix G**. Examples are listed in three Project Classifications, and acceptable certifying agent(s) are indicated for each project.

Depending upon the project, the acceptable certifying agent may include one or more of the following: Owner, CT-licensed/insured Building and/or Home Inspector, HUD-approved Inspector, insured FHA 203K Compliance Consultant, Architect, Professional Engineer, Licensed Environmental Consultant, or Approved Vendor.

CHFA prefers the use of Design Professionals (Architects and Professional Engineers), whenever possible, to determine the scope of work to be included in the bid documents, coordinate bids and certify that the work has been completed in accordance with current Building Codes and the Standards. CHFA reserves the right to require a Design Professional on any and all replacement/repair construction projects, subject to the scope and complexity of the proposed project.

For assistance in planning Capital Improvement Repair/Replacement/Installation work, Owners may consult the CHFA Capital Improvement Guidelines attached to the Standards. While individual building materials, components, fabrications, and equipment for all proposed repair, replacement and capital improvement projects shall comply with the applicable section(s) of the current Standards, Owners and Property Managers are strongly encouraged to consider the interconnection of individual building materials, components, fabrications, and equipment that comprise a fully-functioning building. CHFA has developed the CHFA Capital Improvement Guidelines (CIG) for the example projects listed in **Appendix G**. Included in the CIG are “Questions to Consider” – suggested related issues and conditions to be examined when replacing or installing individual building materials, components, fabrications, and equipment.

00054.1 Capital Improvement Project Classification A

A. Classification A

If the Owner will be completing any of the Capital Improvement Projects listed in **Appendix G** under Classification A, the Owner may certify that the work has been completed in accordance with applicable Building Codes, State and Federal regulations and the current Standards.

1. Approval Process

- a. If the cost of the work will be greater than \$25000, the Owner submits CHFA Escrow Release Pre-Approval Form HM 6-21 for the Capital Improvement Project to CHFA the Asset Management Department for approval, along with the proposed scope of work and three (3) bid quotes. The Owner must sign the certification statement indicating that the proposed scope of work will be/has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards. If the Capital Improvement Project falls under Replacement Reserve Descriptive Codes A-2, A-9 or A-10 per CHFA Form HM 6-22, the submission must also include a Capital Improvement Schedule for Extensive Replacement.
- b. Upon completion of the approved project, the Owner submits CHFA Request to Release Escrow Funds Form HM 6-24. The Owner must sign the certification statement indicating that the proposed scope of work has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards.

00054.2 Capital Improvement Project Classification B

A. Classification B.1

If the Owner will be completing any of the Capital Improvement Projects listed in **Appendix G** under Classification B, and the cost for the proposed scope of work is less than \$25,000, the Owner may certify that the work has been completed in accordance with applicable Building Codes, State and Federal regulations and the current Standards.

1. Approval Process

- a. The Owner submits CHFA Escrow Release Pre-Approval Form HM 6-21 for the Capital Improvement Project to the CHFA Asset Management Department for approval, along with the proposed scope of work and three (3) bid quotes. The Owner must sign the certification statement indicating the that the proposed scope of work will be/has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards. If the Capital Improvement Project falls under Replacement Reserve Descriptive Codes A-2, A-9 or A-10 per CHFA Form HM 6-22, the submission must also include a Capital Improvement Schedule for Extensive Replacement.
- b. Upon completion of the approved project, the Owner submits CHFA Request to Release Escrow Funds Form HM 6-24. The Owner must sign the certification statement indicating the that the proposed scope of work has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards.

B. Classification B.2

If the Owner will be completing any of the Capital Improvement Projects listed in **Appendix G** under Classification B, and the cost for the proposed scope of work is \$25,000 or greater, the Owner must retain a Building Design Professional/Consultant to determine the scope of work, prepare the bid solicitation documents, and certify that the work has been completed in accordance with applicable Building Codes, State and Federal regulations and current Standards.

1. Approval Process

- a. The Owner submits CHFA Escrow Release Pre-Approval Form HM 6-21 for the Capital Improvement Project to the CHFA Asset Management Department for approval, along with the proposed scope of work and three (3) bid quotes. The Owner's Building Design Professional/Consultant must sign the certification statement indicating that the proposed scope of work will be/has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards. If the Capital Improvement Project falls under Replacement Reserve Descriptive Codes A-2, A-9 or A-10 per CHFA Form HM 6-22, the submission must also include a Capital Improvement Schedule for Extensive Replacement.
- b. Upon completion of the approved project, the Owner submits CHFA Request to Release Escrow Funds Form HM 6-24. The Owner's Building Design Professional/Consultant must sign the certification statement indicating that the proposed scope of work has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards.

00054.3 Capital Improvement Project Classification C**A. Classification C**

If the Owner will be completing any of the Capital Improvement Projects listed in **Appendix G** under Classification C, the Owner must retain a Building Design Professional to determine the scope of work, prepare the bid solicitation documents, and certify that the work will be/has been planned and designed in accordance with applicable Building Codes, State and Federal regulations and the current Standards. If the Owner will be completing any work listed in **Appendix G** under Classification A and/or B in conjunction with a Capital Improvement Project listed under Classification C, the Building Design Professional will include the Classification A and/or B work in the Classification C project scope of work and bid solicitation documents, and certify that the proposed scope of work will be/has been planned and designed in accordance with applicable Building Codes, State and Federal regulations and the current Standards. All bid documents (prior to bid solicitation) and bid proposals must be reviewed and accepted by the CHFA Technical Services Department. Upon completion of the approved project, the Building Design Professional of record must certify that the work has been completed in accordance with applicable Building Codes, State and Federal regulations and the current Standards.

1. Approval Process

- a. The Owner submits CHFA Technical Services Review and Approval Form HM 6-21TS along with Site Photographs, Drawings, Project Manual/Specifications, Structural Assessment, Comprehensive Capital Needs Assessment Schedule (CNA), Environmental Reports/Testing, and other support documentation as may be required by the scope and complexity of the proposed Capital Improvement Project. The Owner's Building Design Professional must sign the certification statement indicating that the proposed scope of work has been/will be planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards.
- b. Upon determination that the submission is complete, the Asset Manager forwards the submission to the CHFA Technical Services Department for review and approval. Technical Services staff will correspond directly with the Owner and Building Design Professionals (with a cc: to the Asset Manager), to address questions or concerns, and request additional information.
- c. Upon notification from the Asset Manager that the bid solicitation documentation is acceptable, the Owner and Building Design Professional will obtain a minimum of three (3) bids in a competitive

process, and submit the bids, the name of the Owner's recommended Contractor, and CHFA Escrow Release Pre-Approval Form HM 6-21 for the Capital Improvement Project to CHFA Asset Management. The Owner's Building Design Professional must sign the certification statement indicating that the proposed scope of work has been/will be planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards. If the Capital Improvement Project falls under Replacement Reserve Descriptive Codes A-2, A-9 or A-10 per CHFA Form HM 6-22, the submission must also include a Capital Improvement Schedule for Extensive Replacement.

- d. Upon determination that the submission is complete, the Asset Manager forwards the submission to the CHFA Technical Services Department for review and approval. Technical Services staff will correspond directly with the Owner and Building Design Professionals (with a cc: to the Asset Manager), to address questions or concerns, and request additional information.
- e. Upon notification from the Asset Manager of the acceptability of the bid proposal and authorization to proceed, the Owner and Building Design Professional may commence with the construction phase of the project.
- f. Upon completion of the approved project, the Owner submits CHFA Request to Release Escrow Funds Form HM 6-24, and any required back-up information, to CHFA Finance Department. The Owner's Building Design Professional must sign the certification statement indicating that the proposed scope of work has been planned, designed and completed in accordance with current Building Codes, State and Federal regulations and the Standards.

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, some of which may be 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. If federal funding is involved, such as HOME funds, particular care must be taken in selecting sites that are fully accessible. The following list will guide a prospective developer in general site selection and CHFA evaluation criteria:

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. More specific considerations include, but are not necessarily limited to:

A. Location

1. Adjacent Uses and Densities
2. Open Space On- and Off-site
3. Physical/Social Characteristics
4. Adverse Influences (Abutting Public Streets with Speed Limits Exceeding 25 mph, Railroads, Highways, Floodplain, Heavy Industry, Brownfield, Endangered Species Habitat Areas, 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, age and capacity 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:

- A. Land costs shall be related to the location, amenities, and ease of development, as well as to the cost of land per dwelling unit
- B. CHFA requires an independent appraisal of land costs by a real estate appraiser licensed in the State of Connecticut
- C. 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.

D. 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 the Standards. (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

- A. 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.
- B. 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.
- C. 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
- D. Unit Net Area
All floor area inside finish surfaces of the enclosing walls (unit separation & exterior walls)
- E. 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

The CHFA/DECD Consolidated Application, Project Cost Summary and 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 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.

A. Federal prevailing wage requirements under the Davis-Bacon Act of 1931: All federally-assisted construction contracts over \$2,000.00 must include provisions for paying on-site workers no less than locally prevailing wages and benefits paid on similar projects. .

00105.7 CHFA Very Low-Income (VLI) Construction Employment Policy

Effective 07/29/2010, all multifamily projects funded by CHFA mortgages, with CHFA funding or other funds administered by CHFA, and which have \$1 million or more in new and/or rehabilitation "Hard Construction Costs", are required to comply with the CHFA Very Low-Income (VLI) Construction Employment Policy (#CHFA-2010-3). The CHFA VLI Construction Employment Policy requires good faith efforts to hire and train very low-income residents in the area – families and individuals whose incomes do not exceed 50% of the Area Median Income of the location of the development. Documentation evidencing good faith efforts undertaken to comply with the VLI Construction Employment Policy, including, but not limited to advertisements, outreach to community organizations, job informational meetings, job counseling, education and related programs in association with local educational institutions, consultation with state and local agencies administering training programs, incorporating negotiated provisions for a specific number of VLI persons to be trained and/or employed, and subcontracting with Section 3 certified or public housing resident-owned business, must be provided. Suitable documentation includes, but is not necessarily limited to a completed CHFA Very Low-Income (VLI) Construction Employment Status Report form. If, as a result of good faith efforts undertaken, VLI residents were hired during the reporting period to perform work, Part I of the HUD form 60002 "Section 3 Summary Report – Economic Opportunities for Low- and Very Low-Income Persons" must be completed.

00105.8 CHFA Cost Acceptance Limits

General Requirements: 9% of Total Hard Cost (max.)

Overhead & Profit: 7% of Total Hard Cost (max.)

Total for General Requirements + Overhead & Profit: 16% of Total Hard Cost (max.)

Percentages shall remain the same for all Change Orders; Percentage Stacking is not allowed

00110 Project 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. To contribute to the energy-efficiency of the buildings, tree species shall be selected for form, size and rate of growth to provide wind barriers, shading during the summer and sunshine in the winter. Non-invasive, native, drought-resistant plants shall be selected according to conditions of exposure and according to color, texture, and other features that will enhance the aesthetics of the site (lists of appropriate species may be found on websites such as invasivespecies.gov and wildflower.org). Root structures shall be considered for their required space, effects on nearby pavements, and possible interference with subsurface utilities. Soils compacted during construction by materials and/or construction vehicles shall be rehabilitated with 6" of top soil or by tilling 6" down. 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. Provide sidewalks and pedestrian crossing(s) within 500 feet of residential buildings at streets abutting the property to enhance neighborhood walk-ability.

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, cardboard, 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.

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 considered 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.

A. 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 ft², 600 to 1000 ft², and more than 1000 ft².

- B. **Mixed Uses:** In addition to residential, a variety of commercial, civic, institutional and personal activities are in close proximity (within ¼ 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 Park or Community Recreation Center (playing courts/fields, walking/hiking trails and public gardens)
 - Light Industrial (auto repair, warehouses, and nurseries)
 - Lodging
- C. **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. Optimally, three separate routes, designed to accommodate a mix of travel modes, including motor vehicles, bicycles and pedestrians, should be provided.
- D. **Proximity:** In neighborhoods where activity centers are accessible by foot, 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.
- E. **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.
- F. **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).
- G. **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).

- H. **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.
- I. **Development Scale**
1. **Neighborhood Scale Development**
Developments that are fifteen acres or more may be evaluated by the following:
 - a. Housing Choice
 - b. Mixed Uses
 - c. Connectivity
 - d. Proximity
 - e. Location
 - f. Streetscape
 - g. Civic Space
 - h. Architectural Aesthetics
 2. **Block Scale Development**
Developments that are more than three acres, but less than fifteen acres, may be evaluated by the following:
 - a. Housing Choice
 - b. Mixed Uses
 - c. Connectivity
 - d. Proximity
 - e. Location
 - f. Streetscape
 - g. Architectural Aesthetics
 3. **Lot Scale Development**
Developments that are smaller than three acres may be evaluated by the following:
 - a. Housing should add to the housing choices available in the larger neighborhood
 - b. Mixed Uses
 - c. Proximity
 - d. Location
 - e. Streetscape
 - f. Architectural Aesthetics

00120.2 Building Types

- A. **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.
- B. **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.

- C. **Low-rise/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 4 stories.
- D. **Mid-rise Apartment** buildings, 5 to 9 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.
- E. **High-rise Apartment** buildings, 10 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

A. Orientation

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. Whenever possible, orient within 20° of north/south axis, with 90% of south-facing glazing shaded from the sun at noon on June 21st with overhangs, awnings, natural vegetation or automated shading devices, and un-shaded from the sun at noon on December 21st. 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.

B. Shape and Materials

Buildings shall be designed and composed of materials 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), screened operable windows and radiant heat-reflective barriers installed in attic spaces. Use materials that retain heat in the winter and remain cool in the summer.

00125 Energy Efficiency

CHFA requires “beyond Code” thermal efficiency and energy conservation measures in all developments. Development Teams shall prepare and submit a Thermal Efficiency and Energy Conservation Plan with the finance application, which takes into consideration pre-development testing and energy audits of existing buildings for minor, moderate or substantial rehabilitations, and pre-development energy modeling for rehabilitation projects and new construction (see **Appendix H – CHFA Energy Efficiency Effectiveness**). For new and substantial rehabilitation projects, and equipment replacement, developments served by Connecticut Light and Power (CL&P) and the United Illuminating Company, the Connecticut Energy Efficiency Fund (CEEF) may be able to provide technical assistance with no- or low-cost design, construction and post-construction and occupancy evaluation services, and/or financial incentives to mitigate the fees for such services by third-party Energy Consultants, such as:

- Custom and prescriptive incentives for installing energy-saving measures
 - Energy assessment services concerning building envelope components, lighting systems, building controls systems, HVAC systems, and maintenance and operations processes
 - Energy assessment services concerning blower-door testing (air leaks), air sealing, ductwork testing, hot water saving measures, and insulation evaluation
 - Financial incentives for purchasing and installing energy efficient equipment
 - Financial incentives for repairs and replacement, including Energy Management System maintenance
 - Technical, engineering and implementation retro-commissioning support
 - Financial incentives for energy-saving improvements such as boiler optimization and demand ventilation
 - Funds for qualified financial incentives can be committed to a project at the Design Development phase
- Information regarding local, state and federal incentives for renewable energy may be found through the Connecticut Energy Efficiency Fund (CEEF) (<http://www.ctsavesenergy.org/>), Connecticut Light & Power (CL&P) (www.cl-p.com), The United Illuminating Company (UI) (www.uinet.com), or other local municipal electric utility serving the project service area, the **Connecticut** Energy and Finance Authority (CEFA) (www.cleanenergy.com) or at the Database of State Incentives for Renewables and Efficiency (<http://www.dsireusa.org/incentives/CT>).

00125.1 CHFA/CEEF Energy Incentive Process

To assist development funding applicants in obtaining financial incentives for energy efficiency measures, a coordinated outline of the CHFA project planning, design, and construction process, with the CEEF process for awarding energy incentives through the electric utilities serving the State of Connecticut, is provided in **Appendix J**.

00125.2 Energy Efficiency Project Process

Energy Efficiency (EE) Projects can save energy by altering behavior, timing, technology and systems, including increased resident awareness through informational outreach, building control and energy management systems, building system upgrades, such as building envelope, lighting, ventilation and HVAC equipment, motors and drives, and potential Renewable Energy (RE) system retro-fit opportunities, such as geo-thermal, solar hot water and solar generation.

A. Typical EE Project Process:

1. Initial Assessment: Energy Consultants discuss goals (such as ENERGY STAR Certification) and potential EE/RE opportunities with Owners and Property Managers
2. Energy Audit: Energy Consultants perform a building study and present recommendations, including possible utility incentives and rebates

Note: CHFA requires a minimum sample of residential energy use information from 10% of the units, and at least one of each unit type (number of bedrooms), to be used to estimate the total residential energy usage. However, in order to obtain the most accurate Energy Audit results, current energy usage information for the residential portions of buildings should include data from as many dwelling units as possible. In developments where the residents pay for their own utilities, individual lessees will have to

agree to provide such information. Owners of all developments are strongly encouraged to draft a lease rider which permits such information to be obtained directly from the utility companies.

3. Solution Design: Energy Consultants develop a scope of work for competitive bid
 4. Project Finance: Energy Consultants and Owners compare available options and secure funding, including utility incentives and rebates
 5. Competitive Procurement: Energy Consultants solicit and analyze bids; Owners sign construction and incentive contracts
 6. Installation: Energy Consultants provide field observation and construction contract administration
 7. Incentives Acquisition: Energy Consultants provide required test results, reports and certificates to the utilities for release of incentives and rebates
 8. Post-project: Energy Consultants and Owners may pursue ENERGY STAR Certification
- B. Energy Audits
1. "Energy Audit" is a term for a broad spectrum of energy studies ranging from a quick walk-through of a facility to identify major problem areas to a comprehensive analysis of the implications of alternative energy efficiency measures sufficient to satisfy the financial criteria of sophisticated investors. The main issues to be addressed by Energy Audits include:
 - a. An analysis of building and utility data, including study of the installed equipment, and energy bills
 - b. A survey of the real operating conditions
 - c. An understanding of building behavior and the interactions with weather, occupancy and operating schedules
 - d. Selection and the evaluation of energy conservation measures
 - e. An estimation of energy saving potential
 - f. Identification of customer concerns and needs.
 2. Energy Audits should address Owner questions regarding the benefits of EE improvements, such as whether to repair or replace equipment and materials, how much energy use and cost would be reduced (typically 10% - 40%), what the costs to implement the changes would be, whether the proposed initiatives would qualify incentives and/or rebates, and what return on investment (ROI) and property value increase might be realized. The results of the Energy Audit should include recommendations for EE upgrades, increased Owner understanding of EE technologies, incentives and regulations, preparation for future incentive programs and progress toward pending mandates or regulations. Typical Energy Audit formats include the following:
 - a. Executive Summary
 - b. Existing Facility Description
 - c. HVAC and Mechanical Systems
 - d. Lighting
 - e. Building Envelope
 - f. Utility Analysis
 - g. Renewable Energy Options
 - h. ENERGY STAR Potential
 - i. Available Incentives
 - j. Additional Benefits and Next Steps
 3. Criteria for Auditors and Energy Audits
Audits shall be performed by qualified professionals. Individuals who perform energy audits have a Professional Engineer's license in the State of Connecticut, or be a certified auditor/assessor/rater by the Association of Energy Engineers as a Certified Energy Manager (CEM), Building Performance Institute ("BPI"), Residential Energy Services Network Home Energy Ratings Systems ("RESNET HERS") or EnergyStar. Recommended criteria for the selection of a qualified auditor/assessor/rater include:

- a. Firms offering energy audits should provide documentation of the qualifications of the individual performing the audit
 - b. Auditors should indicate any special training or qualifications related to energy efficiency
 - c. Auditors should indicate any limitations or restrictions in their scope of services
 - d. Auditors should disclose if they have any affiliations with equipment manufacturers, vendors, distributors, installation contractors, or energy services contractors (ESCOs)
4. Common types/levels of energy audits are distinguished below, although the actual tasks performed and level of effort may vary with the consultant providing services under these broad headings. The only way to ensure that a proposed audit will meet your specific needs is to spell out those requirements in a detailed scope of work. Taking the time to prepare a formal solicitation will also assure the building owner of receiving competitive and comparable proposals. Generally, four levels of analysis can be outlined (ASHRAE):

Note: CHFA recommends a minimum Level II energy audit for all funding applications.

- a. Level 0 – Benchmarking: This first analysis consists in a preliminary Whole Building Energy Use (WBEU) analysis based on the analysis of the historic utility use and costs and the comparison of the performances of the buildings to those of similar buildings. This benchmarking of the studied installation allows determining if further analysis is required;
- b. Level I – Walk-through audit: Preliminary analysis made to assess building energy efficiency to identify not only simple and low-cost improvements but also a list of energy conservation measures (ECMs, or energy conservation opportunities, ECOs) to orient the future detailed audit. This inspection is based on visual verifications, study of installed equipment and operating data and detailed analysis of recorded energy consumption collected during the benchmarking phase;
- c. Level II – Detailed/General energy audit: Based on the results of the pre-audit, this type of energy audit consists in energy use survey in order to provide a comprehensive analysis of the studied installation, a more detailed analysis of the facility, a breakdown of the energy use and a first quantitative evaluation of the ECOs/ECMs selected to correct the defects or improve the existing installation. This level of analysis can involve advanced on-site measurements and sophisticated computer based simulation tools to evaluate precisely the selected energy retrofits;
- d. Level III – Investment-Grade audit: Detailed Analysis of Capital-Intensive Modifications focusing on potential costly ECOs requiring rigorous engineering study.

00125.3 Commissioning and Re-commissioning Buildings

A. Building Commissioning

Building Commissioning (Cx) is a method for ensuring that building systems meet their design intent, operate and interact optimally and provide the Owner what he or she expects. This systematic process typically includes building HVAC, controls, lighting, hot water, security, fire, and life safety systems. Total building commissioning often includes additional essential buildings systems such as the building's exterior wall, plumbing, acoustical and roofing systems. Commissioning these additional systems can reduce moisture penetration, infiltration and noise problems, and contribute to the building's energy and resource efficiency and occupant productivity. Successful Cx results in optimal energy efficiency, indoor environmental quality, reduced change orders during construction, extended systems life and reduced operation and maintenance costs, often paying for itself before construction is completed. To be most effective, building commissioning begins in the planning phase and continues through design, construction, startup, acceptance, training and the warranty period, and continues throughout a building's life cycle.

B. Retro-Commissioning

The commissioning process can be applied to existing buildings that have never been commissioned, to restore them to optimal performance. Retro-commissioning (RCx), or Existing Building Commissioning, is a systematic, documented process that identifies low-cost operational and maintenance improvements in existing buildings and brings the buildings up to the design intentions of its current usage. RCx

typically focuses on energy-using equipment such as mechanical equipment, lighting and related controls and usually optimizes existing system performance, rather than relying on major equipment replacement, typically resulting in improved indoor air quality, comfort, controls, energy and resource efficiency. RCx typically includes an audit of the entire building including a study of past utility bills, interviews with facility personnel. Then diagnostic monitoring and functional tests of building systems are executed and analyzed. Building systems are retested and re-monitored to fine-tune improvements. This process helps find and repair operational problems. The identification of more complex problems are presented to the owner as well. A final report, recommissioning plan and schedule are then given to the owner.

C. Re-commissioning and Ongoing Commissioning

Building systems can be purchased from different vendors, installed by different contractors and operated by different facilities personnel, who are under pressure to resolve occupant complaints about comfort. Over time, quick fixes may resolve an individual complaint, but can lead to other systems becoming out of balance and losing the persistence of benefits from initial building commissioning or retro-commissioning. Additionally, building systems require periodic analysis and adjustment. Re-commissioning (“commissioning follow-up”), and/or Ongoing Commissioning (“retro-commissioning follow-up”), focus on the preservation of completed improvements. Ongoing commissioning involves regularly scheduled sessions with the building occupants and operation and maintenance staff. This process incorporates monitoring and analysis of building performance data provided by permanently installed metering equipment to verify building performance, the satisfaction of the facilities management and staff, and the extent of actual savings. Re-commissioning and Ongoing Commissioning may be performed by the original Design Team; however, a peer review, analysis and report may be in the better interest of the Owner and produce unbiased results.

00125.4 ENERGY STAR Label for Existing Buildings

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and Department of Energy. ENERGY STAR-labeled buildings benefit from a decrease in energy use and cost, because they are a third more energy efficient than comparable buildings. Energy performance in existing residential buildings can be rated on a scale of 1-100, relative to similar buildings, with the EPA Portfolio Manager Program. Points are awarded based on the information about a building, such as size, location, number of occupants and energy usage. To be eligible for the ENERGY STAR, a building’s energy performance must be within the top 25% of similar facilities nationwide. EPA’s Target Finder lets users establish an energy performance target for design projects and major building renovations. By entering a project’s estimated energy consumption, users can generate an energy performance rating based on the same rating system applied to existing buildings. Outstanding projects are eligible for EPA recognition.

00125.5 ENERGY STAR for Homes and ENERGY STAR Multifamily High-Rise (MFHR)

Proposed Gut Rehabilitation and New Construction projects shall be designed to meet or exceed ENERGY STAR for Homes Version 3.0 or ENERGY STAR Multifamily High-Rise (MFHR) Version 1.0 Program requirements. In order to determine which program a project is eligible for, Development Teams should use the EPA ENERGY STAR Multifamily New Construction Decision Tree, Version 1.0 (**Appendix I**).

A. Multifamily residential buildings eligible for the ENERGY STAR Qualified Homes Program includes:

1. Units in any multifamily building with 4 units or fewer
2. Units in multifamily buildings with 3 stories or fewer above-grade
3. Units in multifamily buildings with 4 or 5 stories above grade that have their own, separate heating cooling and hot water systems, and where dwelling units occupy 80% or more of the occupiable square footage of the building

Note: In evaluating mixed-use buildings for eligibility, commercial/retail spaces are excluded in the determination of the 80% threshold.

B. Units in multifamily buildings that are not eligible to earn the ENERGY STAR through the New Homes Program may be eligible through the Multifamily High Rise (MFHR) Program. If the application is for

the gut rehabilitation of existing high-rise buildings, as defined in Appendix E in the Standards, or for the construction of a new high-rise building, and the building is eligible for the ENERGY STAR MFHR Program, as determined by the EPA ENERGY STAR Multifamily New Construction Program Decision Tree (**Appendix I**) the Thermal Efficiency and Energy Conservation Plan must demonstrate a minimum of 15% annual energy cost savings over ASHRAE 90.1-2007, through the use of approved software, or by meeting the requirements of the MFHR Prescriptive Path.

C. ENERGY STAR Prescriptive Path

The Prescriptive Path provides a single set of measures that can be used to construct an ENERGY STAR Qualified Home or MFHR building. Modeling is not required; however, no tradeoffs are allowed. For multifamily buildings eligible for the Qualified Homes program, the detailed steps to use the Prescriptive Path can be found in the document entitled “ENERGY STAR Qualified Homes, Version 3 National Program Requirements”, which can be found on the EPA ENERGY STAR website at ([ENERGY STAR v 3 Requirements](#)). For multifamily buildings eligible for the MFHR Program, the detailed steps to use the Prescriptive Path can be found in the document entitled “ENERGY STAR MFHR Prescriptive Path, Version 1.0”, which can be found on the EPA ENERGY STAR website at [ENERGY STAR MFHR v 1 Requirements](#).

D. ENERGY STAR Performance Path

The Performance Path provides flexibility to select a custom combination of measures for each home or MFHR building that is equivalent in performance to the minimum requirements of the applicable ENERGY STAR Program in Exhibit 1 of the “ENERGY STAR Qualified Homes, Version 3 National Program Requirements”. For multifamily buildings eligible for the MFHR Program, these requirements can be found in the document entitled “ENERGY STAR MFHR Performance Path, Version 1.0” Equivalent performance is assessed through energy modeling.

1. Home Energy Ratings Systems (HERS) Ratings

- a. A Home Energy Ratings Systems (HERS) rating is an evaluation of the energy efficiency of a home, compared to a computer-simulated reference house of identical size and shape as the rated home that meets minimum requirements of the Model Energy Code (MEC). HERS ratings are conducted by third-party HERS raters.
- b. HERS ratings involve the analysis of a home's construction plans, and at least one on-site inspection of the home. The construction plan review allows the home energy rater to attain technical information such as orientation, shading area, proposed SEER rating, insulation levels, etc. The on-site inspection includes a blower door test (to test the leakiness of the house) and a duct test (to test the leakiness of the ducts). Results of these tests, along with inputs derived from the construction plan review, are entered into a computer simulation program that generates the HERS index and the home's estimated annual energy costs. The HERS rating results in scores ranging from 100 to 0 (a net-zero energy home).
- c. All proposed gut rehabilitation and new construction developments applying to the CHFA Multifamily Underwriting and Asset Management Departments shall meet the performance requirements for ENERGY STAR Homes Version 3.0 OR ENERGY STAR Multifamily High-Rise (MFHR) Version 1.0 Program certification, including:
 1. A HERS index that meets or exceeds the energy performance projected for the modeled ENERGY STAR Reference Design for the same building (ENERGY STAR Homes Program)
 - or –
 2. The modeled percentage ($\geq 15\%$) by which annual energy costs savings will be reduced, as compared to ASHRAE 90.1-2007 Standards requirements (ENERGY STAR MFHR Program).

Development Teams shall prepare and submit a Thermal Efficiency and Energy Conservation Plan with the Design Development Submission, which takes into consideration pre-development testing and energy audits of existing buildings (moderate and substantial rehab projects only – see

Appendix E for definitions), and data produced by pre-development energy modeling (new construction and substantial/gut rehabilitation projects, prepared by a Professional Engineer and/or Building Performance Institute (“BPI”)-, Residential Energy Services Network Home Energy Ratings Systems (“RESNET HERS”)- or ENERGY STAR-certified Assessors/Raters (see **Appendix H**).

- d. The Thermal Efficiency and Energy Conservation Plan should include the projected ENERGY STAR HERS Index Target for the ENERGY STAR Reference Design Home for the project, and the projected HERS Index for the project, if the proposed HERS Index Target for the project is greater than the ENERGY STAR HERS Index Target.
- E. Third-party Verification Tests, Reports and HERS Certificates
Third-party verification test reports and HERS Certificates (ENERGY STAR Homes Program) or EPA Certification Letter (ENERGY STAR MFHR Program) shall be submitted at Final Closing with other required documents for the reduction of retainage from 2½% to 0%.

00130 Specific Design Standards

The 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 requirements may be exceeded, but maximum limits 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; however, if the building is served by an elevator, the elevator must provide access to all units in the building.

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, Adaptability and Visitability

Housing, programs and services for qualified individuals with disabilities shall be provided in settings that are not unnecessarily separate, segregated or restricted. Barrier-free (handicapped-accessible) and handicapped-adaptable units shall be provided in accordance with federal law, Connecticut Code and requirements from program and financing institutions; however, no less than 10% of the units shall be "Type A" barrier-free (handicapped-accessible). 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 "visitible" – designed in such a way as to be visited by people with disabilities, with at least one no-step entrance, doors and hallways wide enough to navigate through, and a half-bathroom on the first floor big enough to get into in a wheel chair and to close the door.

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, comply with "Type B" (adaptable to handicapped-accessibility) dwelling unit requirements contained in ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
- B. Lever handles at all windows and doors; loop or lever 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. 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

Where provided, community rooms shall be handicapped-accessible, and 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

Where provided, Craft Rooms shall be handicapped-accessible, and shall include a large sink, with a 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 Rooms

Where provided, Common Laundry rooms shall be handicapped-accessible, and shall be provided with a table for folding laundry, and a rod for hanging clothes. If feasible, Common Laundries shall have a window to the exterior. Common Laundries shall have a floor drain. Common Laundries 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 handicapped-accessible 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

Interior signage at designated common permanent rooms and spaces 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 (ft²) shall be placed near dwelling unit entrances, and at elevators on the first floors of high-rise developments, without obstructing maneuvering clearances required on the exterior side of the unit entry door. 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, handicapped-accessibility, 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):

1. Where no basement is provided:

Single Room Occupancy (SRO)/One-bedroom: 15 sq. ft.

Two-bedroom: 18 sq. ft.

Three-bedroom: 22 sq. ft.

2. 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-qualified 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, re-circulating, with task light [Provide accessible controls, i.e., hard wired switches for the exhaust fan and task light where required].

5. ENERGY STAR-qualified "Frost Free" Refrigerator/Freezer: Width as determined by dwelling unit type/storage requirements, with 18" minimum counter on latch side and cabinet above

6. ENERGY STAR-qualified exhaust fan

7. Side-by-side or bottom freezer refrigerators, or top freezer units specifically designed for accessibility in barrier-free designed units.

8. Natural light shall be provided; borrowed light from pass-through openings and open areas over cabinets is acceptable.

9. Cabinets at a pass-through shall allow a vertical opening of 24" minimum [Comply with accessibility height requirements where required].

10. 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-through openings and ranges, where cabinets shall be placed 24" above the work surface.

11. Appliance and cabinet doors and drawers shall not conflict when operated simultaneously.

12. 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).

13. In housing for elderly residents, counter space and an electrical outlet for a counter top microwave oven shall be provided.

14. 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

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

ENERGY STAR-qualified exhaust fan

K. Outdoor Space:

Provide a patio of 80 ft² 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:

Minimum acoustical or Sound Transmission Class (STC) ratings for wall and floor/ceiling assemblies shall be STC 34-39 (wood stud walls)/38-40 (steel-stud walls) 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.

00145 Pre-Design Meeting

An initial meeting between the Development Team and CHFA staff from Underwriting, Technical Services, Asset Management, and other Authority departments as may be required, is strongly recommended. The purpose of the Pre-design Meeting is to explain the CHFA Design Review Process, to discuss applicable requirements, introduce the Standards, 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.

A. Design Review Process:

1. Step I – Pre-Application: Preliminary Design/Concept/Site Analysis/Feasibility
 2. Step II – Full Application: Design Development
 3. Step III – Initial Closing: Construction Documents/Commitment/Pre-Construction Meeting
- Projects will be evaluated by the CHFA Technical Services Department 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:

A. Unit Net Area:

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

B. 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.

C. 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.

D. 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.

E. 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. The CHFA Step I - Preliminary Application: Pre-design/Site Analysis/Concept/Feasibility review process should be completed in conjunction with, and/or 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
4. Locate and identify invasive species requiring remediation at disturbed and/or wetland areas

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 the Standards (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 the CHFA Technical Services, Asset Management and other Authority departments as may be required.

- A. 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.** Planning Documents
 1. 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. If the proposed development involves rehabilitation work, provide a written description indicating the level of the rehabilitation, based on a Capital Needs Assessment (CAN) (**see section 00152.5**).
 2. Provide a Thermal Efficiency and Energy Conservation Plan (**see section 00125 & Appendix H**) and information regarding the applicant's efforts to secure other energy efficiency-related funding partners, and/or government-/utility-sponsored incentives.
 3. Provide evidence of availability of utility services to the site; i.e. water, sanitary/storm sewers, electric, gas and cable TV/internet.
 4. Provide a proposed program for protection and creation of natural resources (**see section 02001.2**)
 5. Provide evidence of local Zoning Agency approval.
 6. For multifamily rental housing projects that are designed, built or altered with Federal funds, provide a plan for accessibility by individuals with mobility, hearing and vision impairments in accordance with Uniform Federal Accessibility Standards (**see Appendix A: 6. through 9.**)
 7. For 9% Tax Credit submissions demonstrating Financial Sustainability:
 - a. Building plans and specifications $\geq 40\%$ and $< 90\%$ complete may be provided (**see section 00152**) – or –
 - b. Construction Documents $\geq 90\%$ complete may be provided (**see section 00153**)
 8. For 9% Tax Credit submissions demonstrating Financial Sustainability, a proposed program for a high-performance building envelope may be provided:
 - a. If the application is for the minor, moderate or substantial rehabilitation of existing buildings, as defined in Appendix E in the CHFA Standards of Design and Construction, provide a Thermal

Efficiency and Energy Conservation Plan (**see Appendix H**), which provides for a projected reduction in energy consumption $\geq 33\%$.

– or –

- b. If the application is for the gut rehabilitation of existing buildings, as defined in Appendix E in the Standards, or for new construction, provide a Thermal Efficiency and Energy Conservation Plan which provides for a projected HERS Index for the project ≤ 52 , based on the ENERGY STAR Qualified Home v 3.0 HERS Index Target Procedure.

– or –

- c. If the application is for the gut rehabilitation of existing hi-rise buildings, as defined in Appendix E in the Standards, or for the construction of a new hi-rise building, and the building is eligible for the ENERGY STAR MFHR Program, as determined by the EPA ENERGY STAR Multifamily New Construction Program Decision Tree (**Appendix I**) the Thermal Efficiency and Energy Conservation Plan must provide for energy cost savings $\geq 23\%$ over ASHRAE 90.1-2007 Standards.

9. For 9% Tax Credit submissions demonstrating Financial Sustainability:

- a. A proposed program for a Renewable Energy System – roof-top, building-integrated or landscape-integrated Photovoltaic (PV) electrical generation system, with a minimum goal of providing $\geq 33\%$ of site lighting energy requirements, or an ENERGY STAR-qualified central geothermal HVAC system may be provided

– or –

- b. A proposed program for Low Impact Design site development, with a minimum goal of retaining, infiltrating and/or treating the first $\frac{1}{2}$ " of rainfall in a 24-hour period may be provided.

B. Area Tabulations (**see section 00150.3**):

1. Common Spaces
2. Residential Spaces

C. Preliminary Drawings: $\geq 10\%$ complete

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 Plan(s) (1" = 1'-0" scale, minimum) with rough grade information
3. Building Plans and Elevations/Unit Floor Plans ($\frac{1}{8}$ " = 1'-0" scale, minimum)
4. All drawings must be numbered and include a graphic and lettered scale, north arrow and sheet title

D. Preliminary/Outline Specifications: $\geq 10\%$ complete

E. Architect's qualifications in accordance with the Standards (**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.

G. Contractor's qualifications in accordance with CHFA requirements (**see section 00020.3**)

H. Preliminary 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 the submitted documents and issue formal comments based on the current Standards guidelines. The Developer's Design Team shall then prepare and submit a written response to CHFA, including follow-up comments and desired variances from the Standards. When requesting a modification or waiver, the Development Team shall provide compelling reasons for CHFA to consider in granting a modification or waiver. 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 Notification of Intent 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.

- A. All support documentation submitted with the Notification of Intent to Commence Construction form must meet all the Standards, and the Owner/Developer will be responsible for revisions and resubmission as required by CHFA.
- B. 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 the CHFA Initial Closing and the recordation of a mortgage. 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 in any way.

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 Review of 40% complete Construction Documents is the next stage of the CHFA Design Review Process. 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 Design Development 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
 - 6. No-Disturb Zones
 - a. Identify areas of no-disturbance
 - b. Locate tree and vegetation protection
 - c. Mark areas acceptable for construction vehicles and material storage
- 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. Submit one copy of each of the following documents to CHFA for review:

- A. Design Development drawings shall be Construction Drawings and Specifications 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
 - b. Provide a large note on the title sheet clearly indicating that the drawings are intended as "40% Construction Drawings".
 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
 - 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. $\frac{1}{4}$ " = 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. $\frac{1}{4}$ " = 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. $\frac{1}{4}$ " = 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 as defined in this section.

10. Design Development Specifications constitute a Construction Contract Project Manual at a 40% (min.) level of completion, in accordance with requirements for financing consideration by the Authority's Board of Directors:
 - a. Define all proposed major building components and systems in division 2 through 16, of the 5-digit-based CSI MasterFormat 1995, including Part 1 – General: Warranty information and Part 2 – Products: Manufacturer, Material/Component/Manufactured Unit and Performance information (minimum)
 - b. Provide a rectangular space 1¼" h. x 3½" w. in the upper right corner of all pages for the CHFA 5-party Initial Closing stamp
 - c. Provide a large note on the cover sheet clearly indicating that the Outline Specifications are intended as a "40% Outline Specifications"

11. Additional Information

- a. Study models and perspective sketches as may be 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, and CHFA/DECD Consolidated Application, Project Cost Summary and 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 (For CHFA Rehabilitation Design Standards, see **Appendix B**). CNA requirements include the following:

1. CHFA requires the CNA consultant(s) to be, or to consult with, licensed and insured Professional Architects, Professional Engineers, and/or BPI-, RESNET HERS-, and/or ENERGY STAR-certified Assessors/Raters, or utility-authorized contractors in the preparation of the report.

2. The report must include the evaluator's observations and assessments, based upon physical observations of the building exterior and interior, including mechanical and accessible spaces; i.e., attics, roofs, crawl spaces, etc. Any spaces not accessed shall be noted in the report.
3. 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 of, or suspected presence of environmental hazards, such as asbestos, lead paint or mold.
 - a. The number of living units required to be assessed shall be as follows:
 1. Developments with 4 – 40 units \geq 50%
 2. Developments with 41 – 60 units \geq 35%
 3. Developments with 61 – 80 units \geq 30%
 4. Developments with 81 – 100 units \geq 25%
 5. Developments over 100 units \geq 20%

[If determining the number of units to be assessed results in a fraction, round up to the next number]

4. The report shall include photographs of building characteristics that accurately reflect the existing conditions present.

Physical Assessment:

5. The report 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. Structural systems, both for substructures and super structure, 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.
 - d. Building thermal envelope components, including an evaluation of insulation and air-sealing measures
 - e. Building mechanical systems and controls, including HVAC systems, plumbing and domestic hot water, fire protection, electrical lighting and power, communication and security systems, etc.
 - e. Any components which are non-compliant with the ADA, Section 504 or Fair Housing Guidelines. The report shall include a copy of the Owner's certification that the specific development complies with all of the ADA and 504 regulations, along with compliance with Fair Housing Guidelines. If the Owner is unable to so certify, then the report shall state how the Owner plans to achieve compliance.

Energy Assessment:

6. The report shall include a Level I – Walk-through Energy Assessment (minimum) to assess building energy efficiency, identify defects and simple, low-cost improvements, and create a list of energy conservation measures and retrofit opportunities, including implementation costs and energy savings. This inspection is based on visual verifications, study of installed equipment and operating data, analysis of historic energy use and cost, and a benchmarking comparison to the performance of similar buildings in the area. A Level II – Detailed/General Audit is preferred.
 - a. Coordinate with the utility companies and fuel vendors to analyze common area annual energy usage data. Living units to be assessed for energy efficiency shall be:
 - I. If Owners are responsible for residential utility costs, coordinate with the utility companies and fuel vendors to analyze energy usage data for all units.
 - II. If tenants are responsible for utility costs, and annual energy usage is not currently tracked by the Owner, a sample of information from 10% of the residential units, including at least one of each unit type, shall be assessed.
 - b. For developments served by CL&P/Yankee Gas, UI/Southern Connecticut Gas or other municipal utilities, CEEF (www.ctsavesenergy.org) may be able to provide no-, or low-cost Level I Energy

Audit and assessment services and on-site testing, and financial incentives for energy conservation measures and retrofit opportunities.

7. 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.
 8. If the CNA is required by CHFA for Minor, Moderate or Substantial Rehabilitations, the report shall include a budget and an in-depth scope of work for the proposed rehabilitation work. This budget shall include expenditures and costs for all property improvements that may affect the project's future marketability. Improvements may include energy efficiency upgrades, adding central air to the development, community room additions, etc.
 - a. All proposed improvements (i.e., doors, windows, siding, roofing, paving, etc.) shall comply with the Standards
 1. Individual building materials, components, fabrications, and equipment for all proposed repair, replacement and capital improvement projects shall comply with the applicable section(s) of the current Standards. However, when determining the scope of work for proposed repair, replacement and capital improvement projects, Owners and Property Managers are strongly encouraged to consider the interconnectedness of building materials, components, fabrications, and equipment that comprise a fully-functioning building. CHFA has developed "Capital Improvement Guidelines" (CIG) for various typical repair, replacement and capital improvement projects, which include "Questions to Consider" – suggested related issues and conditions to be examined when replacing or installing additional individual building materials, components, fabrications, and equipment – which can be found on the CHFA website in the Developer Document Library; for CHFA Replacement Criteria, see **Appendix C**.
 9. The report shall include a spreadsheet that outlines, by line item, the costs of proposed improvements expensed in year one, 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 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.
 - a. Please refer to the "Comprehensive Capital Needs Assessment Schedule", which can be found in the Multifamily Rental Housing Development section of the of the CHFA website.
 10. If the CNA is required by CHFA for Moderate and Substantial Rehabilitations, the report shall include a statement of Guaranteed Maximum Price (GMP) based on the projected costs developed by the Contractor for each of the 16-divisions of the CSI MasterFormat 1995 standard filing system for architectural, design, engineering, and construction professionals. This requirement may also apply to large scale improvement projects subject to Technical Services' review, which involve multiple divisions of the CSI MasterFormat 1995. Please refer to the "CHFA/DECD Consolidated Application, Project Cost Summary and Trade Payment Breakdown" (see **Appendix F**).
 11. 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 an 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.
- F. Boring and test pit report by a licensed Geotechnical Engineer
- G. CHFA/DECD Consolidated Application

00152.6 Design Development Review

Subsequent to the Design Development/Feasibility Submission, Technical Services staff will review the submitted documents and issue written comments based on current CHFA Standards guidelines. The Developer's Design Team shall then prepare and submit a written response to CHFA, including follow-up comments and desired variances from the Standards, 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 modification or waiver. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard “clouds”. Drawings that are to be developed for use in the construction of the development shall be coordinated to allow binding into complete sets of one standard size print page.

00153 90% Construction Contract Documents

90% complete is the next industry-recognized major milestone of development for Construction Contract Documents. 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 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 90% Construction Contract Drawings for Site Development

Construction Contract Drawings for site development shall be complete to a level of 90% – sufficient information to fully explain the details of earthwork, spot grades and proposed contours for grading, site utilities, drainage, storm water pollution and erosion control, hardscape and softscape materials, equipment and operations involved, pending final coordination among the Development Team and Sub-consultants.

00153.2 90% 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 90% Construction Contract Specifications

Construction Contract Specifications shall be complete to a level of 90% – sufficient information to explain the scope of work under all divisions, including all required 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 90% Construction Contract Documents 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. 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). 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.

00154 Step III - Initial Closing: 100% Contract Documents/Commitment

The Review of 100% complete Construction Documents is the next stage of the CHFA 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

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.
 3. 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"):
1. Separate floor level plans of each unit type, including end units

2. Exterior unit dimensions, including outdoor patios, terraces, porches and overall dimensions
 3. Window, interior and exterior door locations, operation, size and/or schedule key
 4. Dimensional location of interior partitions, openings, railings and stairs
 5. Location of all permanently installed features and equipment, including kitchen appliances, cabinets, shelving and plumbing fixtures
 6. Each living unit type identified by letter and/or numerical designation
- H. Unit Demolition Elevations (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, 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.
 3. 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"):
1. Exterior elevation of each unit facade type and major variation thereof
 2. Indication and extent of all exterior materials
 3. Location and size of trim members, gutters, downspouts
 4. Window and door indication, sizes and/or schedule key
 5. Foundation and areaway outlines
 6. Exterior lighting system
- J. Building Sections (scale not less than 1/4"= 1'-0"):
1. Typical and atypical Cross-sections
 2. Floor level and height relationships
 3. Special structural conditions
 4. Size and spacing of framing members
- K. Unit Sections (scale not less than 1/4"= 1'-0"):
1. Cross-sections through each unit type
 2. Size and spacing of all floor, wall and ceiling/roof framing members
 3. Interior and exterior finishes, sheathing, insulation
 4. Floor levels and heights relationships
 5. Basement floors, footings, pads, proposed grades
- L. Detail Sections (scale not less than 1"= 1'-0"):
1. Each common wall type, fire wall and typical exterior wall complete from footing to roof
 2. Fire and sound ratings for all walls
 3. Size and spacing of all floor, wall and ceiling/roof framing members
 4. 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.

- A. Contract Documents/Commitment Specifications constitute a complete construction Project Manual:
1. Define all required bidding, contract and general requirements in division 1 of 16, of the 5-digit-based CSI MasterFormat 1995, and technical specifications for all building components in divisions 2 through 16, including Part 1 – General, Part 2 – Products and Part 3 – Execution.
 2. Provide a rectangular space 1¼" h. x 3½" w. in the upper right corner of all pages for the CHFA 5-party Initial Closing stamp
 3. Provide a large note on the cover sheet clearly indicating that the submission is intended as a "Project Manual"

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 II 40% 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 and construction cost breakdown, 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 the submitted documents and issue written comments based on current CHFA Standards guidelines. The Developer's Design Team shall then prepare and submit a written response to CHFA, including follow-up comments and desired variances from CHFA Standards. When requesting a modification or waiver, the Development Team shall provide compelling reasons for CHFA to consider in granting the modification or waiver. When submitting revised drawings, all changes shall be highlighted by architectural graphic standard “clouds”.

00154.7 Final Submission Requirements for Initial Closing

The Step III submission requirements are as follows:

- A. Contract Documents [All Developments with CHFA Financing] – Upon review and acceptance by CHFA Technical Services, two (2) sets of Contract Documents, signed and sealed by the Architect and/or other Professional Consultants on the Design Team (each for their own work), shall be submitted. Drawings shall include all applicable code-related information. Project Manuals shall be assembled into bound volumes. Each sheet/page of one (1) copy of those documents will be five-party stamped, which will require initialing by the Owner, the Architect, the G.C., the Bonding Agent and the CHFA Manager Architectural and Construction Services. Both copies of these documents are for CHFA’s use throughout the construction period.
- B. Contract Documents [All developments receiving 9% Tax Credits only] - 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 insurance coverage per applicable CHFA requirements for multi-family developments with permanent financing, which can be found in the Multifamily Rental Housing Development section of the CHFA website.
- 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 and/or with permanent financing, which can be found in the Multifamily Rental Housing Development Document Library section of the CHFA website
 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 a certification statement to the Authority, its successors and assigns; the title insurance company/companies insuring the Mortgage; the Owner/Developer, DECD (if applicable) and/or other interested parties; with no statement of facts objectionable to the Authority. The survey certification language and attendant notes should include the following basic elements in a format acceptable to CHFA, and should be used for both the pre-construction and As-built surveys:
 - a. Survey Certification Statement:

To: Connecticut Housing Finance Authority, [State of Connecticut Department of Economic & Community Development/Other Lenders], [Title Insurance Company], [Owner/Developer] [Other Interested Parties]:

This is to certify that this map and the survey on which it is based were made in accordance with the 2011 Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 1(existing), 2, 3, 4, 5, 6, 7(a), 8, 9, 10, 11b, 13, 14, 16, 17, 18, 19, 20(a) and 21 of Table A thereof. The fieldwork was completed on [Date].

Date: [Certification Date]

Signature: [Licensed Land Surveyor's Signature with Professional Seal Affixed]

- b. Applicable Notes (including, but not necessarily limited to):
1. *This survey map has been 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 and Topographic Survey, the Boundary Determination Category of which is a [Resurvey or First Survey] conforming to Horizontal Accuracy Class A-2 Topographic Accuracy Class T-2. This [survey/resurvey] is intended to be used for conveyance or financing purposes, and as a base for engineering site design.*
 2. *Reference is made to [List of Maps] of the [Municipality] Land Records.*
 3. *Reference is made to deeds of record found in [List of Books/Pages] of the [Municipality] Land Records.*
 4. *Reference is made to instruments of record as labeled hereon.*
 5. *Areas of the surveyed parcel(s):*
Total = [Sq. Ft. (Acres)]
 6. *There are no wetlands on the subject property as indicated in [Wetlands/Watercourses and Soils Report], prepared by [Soils Science and Environmental Services Consultant], [Date].*
 7. *Property does not lie within a FEMA Flood Hazard Zone, as depicted on Flood Insurance Rate Map, Panel [Number], Map [Number], Effective Date: [Date].*
 8. *Reference is made to map titled [Title] dated [Date], prepared by [Surveyor].*
 9. *Elevations depicted hereon are based on the North Atlantic Vertical Datum of 1988 (NAVD88).*
 10. *Subsurface utility, structure and facility locations depicted hereon have been compiled, in part, from municipal records and field measurements. These locations must be considered as approximate, may not be complete, and other such structures may exist on site. The size, location and existence of all such features must be verified by the appropriate authorities prior to construction.*
- I. Building Permit
- J. ADA Compliance Certification.
- K. Capital Needs Assessment (CNA) [renovation projects only]

00155 Construction Observation

00155.1 Construction Observation [All developments receiving 9% Tax Credits only]

For developments funded through tax credit equity only, the CHFA 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 Standards. 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.

00155.2 Construction Observation [All Developments with CHFA funding, or other funds administered by CHFA]

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, Energy Consultant and any other project management/administrative personnel deemed necessary by the Owner. Attending the meeting for CHFA will include the CHFA Field Observer and other 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. The Pre-Construction Meeting Agenda template can be found in the Developer Document Library on the CHFA website (www.chfa.org).

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 should include the Owner, the Architect, the Contractor and any other project management/administrative personnel deemed necessary by the Owner. Attendance by the Energy Consultant is strongly recommended. CHFA representatives will include staff from Underwriting and Technical Services Departments and the CHFA Field Observer assigned to the project. The purpose of the meeting is to review project management and administrative procedures, responsibilities and expectations during and immediately after the construction phase. The typical agenda for a CHFA Pre-construction Meeting is outlined in the CHFA document "Pre-construction Meeting", which can be found on the CHFA website.

00155.4 Initial Job Meeting

Discussion and coordination of the following construction-phase logistical issues and process recommendations by the Development Team and the CHFA Field Observer at the first job meeting is recommended:

- | | |
|---|--|
| 1. Introductions/exchange of business cards | 21. Utility Connections and Charges |
| 2. Schedule of Values | 22. Fire Extinguishers |
| 3. List of Subcontractors | 23. Emergency Phones |
| 4. Change Orders | 24. Insurance |
| 5. As-built Drawings | 25. Warranties and Guarantees |
| 6. Building Permits | 26. Applications for Payment |
| 7. Additional Sets of Drawings | 27. Protection and Safety |
| 8. Project Site Cleaning | 28. Project Sign |
| 9. Deliveries and Site Access | 29. Sanitary Facilities |
| 10. Color Schedule | 30. Shop Drawings |
| 11. Start/Completion Dates | 31. Soil Erosion and Sedimentation Control |
| 12. Construction Schedule | 32. Soils Information |
| 13. Coordination of Work | 33. Substitutions |
| 14. Daily Reports | 34. Lien Waivers |
| 15. Roles of Architects and Engineers | 35. Surveyor |
| 16. Testing Requirements | 36. Minority Work Requirements |
| 17. Examination of Site | 37. Labor Rates |
| 18. Dimensions | 38. RFI Log |
| 19. Enclosures and Barricades | 39. PCO Log |
| 20. Field Office | 40. Allowance Log |

00170 CHFA Construction Warranty Requirements

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



Volume II

Health, Safety and Sustainability
Design Standards and Guidelines

2013

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 Sustainable Ceilings Recycling Program.
- G. Shingles: The GC shall recycle all shingle waste through a n 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

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. 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 to re-use storm water as a viable resource, control storm water and conserve rainwater. LID makes use of the rainfall and storm water that reaches a site, filtering it and directing it for reuse. The LID “source-control” technology strategy controls both rainfall and storm water runoff at the source. It is a decentralized system that distributes storm water across a project site to replenish groundwater supplies, rather than sending it into a system of storm drain pipes and channelized networks that control water downstream in large storm water management facilities. 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 efficiently and cost-effectively, protecting groundwater and drinking water supplies and helping communities grow more attractively.

- A. LID site design strategies address the arrangement of buildings, roads, parking areas, site features, and storm water management plans, and 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:
1. Reduce imperviousness by using permeable paving or landscaping to break up expanses of impervious surfaces
 2. Direct runoff into or across vegetated areas to help filter runoff and encourage groundwater recharge.
 3. 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
 4. Reduce street widths
 5. Remove curbs and gutters from streets, parking areas, and parking islands to allow storm water sheet flow into vegetated areas
 6. Use devices such as bio-retention cells, vegetated swales, infiltration trenches, and dry wells to increase storage volume and facilitate infiltration
 7. Grade to encourage sheet flow and lengthen flow paths to increase the runoff travel time in order to modify the peak flow rate
 8. Disconnect impervious areas from the storm drain network and maintain natural drainage divides to keep flow paths dispersed
 9. Disconnect roof downspouts and direct storm water into vegetated areas or into water collection devices
 10. Install cisterns or sub-surface retention facilities to capture rainwater for use in irrigation and non-potable uses
 11. Install vegetated roofs or garden roofs
 12. 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
 13. Use naturally occurring bio-chemical processes in plants located in tree box filters, swales, planter boxes
 14. Divert water away and disconnect from the storm drain or CSO using correctional drainage techniques

B. 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:

1. 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, bio-swales, bio-retention cells, tree box filters, soil amendments, structural soil, native and sustainable ornamental plants

2. 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

3. 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 current “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 Solar-reflective Paving

To mitigate heat-island effect, consider light-colored/high-albedo materials and/or open-grid pavement with a Solar-Reflective Index of 0.29 over at least 30% of the site's hard-scape areas.

02001.18 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.

A. 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". Main drives and collector roads shall be crowned for drainage along curbs.

02001.19 Curbing

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

02001.20 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.

02001.21 Catch Basins

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

02001.22 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.

02001.23 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.

02001.24 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).

02001.25 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).

02001.26 Grind Stumps and Limbs for Mulch

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

02001.27 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.

02001.28 Building With Trees Program

The GC shall adhere to the guidelines in the "Building with Trees" program developed by the National Arbor Day Foundation in cooperation with the NAHB, and particularly with respect to the "Planning and Design", "Tree Protection During Construction", and "Maintenance/Long-term Care" requirements of the program.

02001.29 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 xeriscaping) 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 National Wildlife Federation (NWF) website, or for a more complete list of native and invasive plants, see the plant guide at enature.com.

02001.30 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.

02001.31 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 NWF procedures and guidelines for community wildlife habitats.

02001.32 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.

02001.33 Downstream Water Quality Testing

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

02360 Termite Control

Use termite-resistant building materials, or provide termite control through physical barriers between subterranean termites and wood-framed structures. 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. Wherever finished grade will be less than 8" below the bottom of the sill plate, apply borate to wood framing materials from the bottom of the sill to 3' high (min.).

- A. 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.
- B. 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 building, beneath slabs on grade and alongside foundation walls.

- C. 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.
- D. 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, buildings and windows, 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 may be of the compact/tubular fluorescent, LED or metal halide type. UL-wet-listed fluorescent fixtures should also be considered.

02580.3 Parking, Roadway and Walkway Lighting

Exterior lighting levels for parking, roadways and walkways shall be a minimum of ½ foot candle (fc). 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 fc 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 prevent or minimize the need for irrigation. Where irrigation is provided, 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.

A. 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.

B. 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.

C. Graywater collection/retention:

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. Separate clothes washer boxes shall be provided for sanitary drain system connections.

02810.1 Irrigation Design

If irrigation must be provided, the system shall be designed by an EPA WaterSense®-certified professional. 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

If irrigation must be provided, 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)

If irrigation must be provided, CHFA encourages “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 can be programmed for specific plant materials and process real-time weather data to produce appropriate, efficient irrigation schedules, 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 current Governor’s Name

“CHFA” with current 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

Where required, provide concrete in accordance with the following guidelines:

A. Footings

1. Fill compaction and concrete testing shall be conducted by an independent testing agency approved by CHFA.
2. 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.
3. Apply a capillary break (damp-proofing or membrane) to the tops of concrete footings at all new basements and crawlspaces.

3. 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.
 4. 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.
- B. Foundations
1. Wood foundations will not be permitted.
 2. Concrete foundation walls shall be extended to 8" min. above exterior grade. 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.
- C. Foundation Drains
1. 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".
 2. 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.

03001 Concrete Design

Crawlspace vermin barrier slabs shall be a minimum of 3" thick, and shall be finished with a top-side semi-permeable coating or chemical sealer.

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.

- A. Re-use Form Boards: Form boards are often 2x10 or larger solid sawn lumber. Whenever possible, carefully remove and separate wood form boards for re-use.
- B. 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.

- C. Insulated Concrete Forms (ICFs): Consider utilizing Insulating Concrete Forms (ICFs) 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

Compliance with applicable provisions of the current editions of the following standard specifications is recommended: 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

- A. Provide a polyethylene vapor barriers not less than 6 mils thick under all crawlspace vermin-barrier slabs. The Standards encourage drying mechanisms over wetting prevention mechanisms in the design of wall assemblies, i.e.: avoidance of using vapor barriers where vapor retarders will provide satisfactory performance, avoidance of using vapor retarders where vapor permeable materials will provide satisfactory performance, and avoidance of the installation of vapor barriers such as polyethylene vapor barriers, foil-faced batt insulation and reflective radiant barrier foil insulation on the interior of air-conditioned assemblies.
1. If basement or below-grade spaces in new developments are designed and constructed to be occupied, install a vapor retarder or continuous vapor-impermeable rigid insulation under floor slabs, or over floor slabs in conjunction with a floating floor. Carpeting in below-grade spaces in new developments is strongly discouraged. All pipe penetrations shall be sealed to prevent water infiltration.
 2. In existing buildings, under-slab stone and/or a polyethylene vapor barrier may not be present and over-slab control of water vapor may be required. If basement or below-grade spaces in existing buildings to be renovated are intended to be occupied, install a vapor retarder or continuous vapor-impermeable rigid insulation over floor slabs in conjunction with a floating floor. Carpeting should not be installed in below-grade spaces in renovated developments. All pipe penetrations shall be sealed to prevent water infiltration.

03010.4 Slab Edge Insulation

Install R-10 (min.) insulation at slab edges to a depth of 24" (min.).

03010.5 Insulation Under Heated Slabs

Install slab edge insulation and R-15 (min.) full area insulation under heated slabs.

03010.6 Mix

Compliance with applicable provisions of the current editions of the following standard specifications is recommended: 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.

03010.7 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.

03010.8 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.

03010.9 Concrete with Fly Ash or Slag

CHFA encourages the use of fly ash and slag as 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.

03010.10 Recycled Concrete Used as Aggregate

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

03010.11 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**

Compliance with applicable provisions of the current editions of the following standard specifications is recommended: 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 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

Compliance with applicable provisions of the current editions of the following standard specifications and documents is recommended:

A. 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.

B. 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.

A. Compliance with applicable provisions of the current editions of the following standard specifications and documents is recommended:

1. 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.

2. Hot Weather

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

3. Sustainable Masonry Practices

CHFA encourages the use of indigenous Connecticut and New England earth materials, such as common clay, dimensional stone (granite, quartzite and sandstone), crushed stone, construction sand and gravel, and lime, and locally/regionally-produced brick and concrete masonry units for reduced transportation costs, fossil fuel use and pollution. 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.

B. 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.

- C. Compliance with applicable provisions of the current editions of the following Brick Industry Association (BIA) recommendations is recommended:
1. Moisture-control
 - a. "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.
 - b. To effectively disconnect a masonry veneer from a wall system by back-venting, a clear 1" (min.) 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. The Brick Industry Association (BIA) recommends a 2" air space between brick/block and stud back-up framing systems, to prevent encroachment into the wall cavity. Keep wall cavities clean, prevent mortar from "bridging" across the cavity and rendering flashing and weeps ineffective.
 - c. 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.
 2. To prevent mortar droppings from blocking weeps, pour a 2 - 3" layer of pea gravel (larger than weep openings) over flashing, or plastic 1 – 2" plastic mesh net mortar collection devices, per BIA recommendations.
 3. To ensure a proper seal, through-wall flashing should extend a minimum of 8" up the concrete block or stud back-up, per BIA recommendations. When using mortar dropping collection devices, the flashing may need to extend higher than 8". Flashing should extend to the outside face of the wall and form a drip edge, which will help redirect and shed water.
 4. To assist in moisture management, provide weather-resistive barriers, air barriers and/or vapor retarders. Weather-resistive barriers can redirect moisture that happens to get across the cavity; air barriers block random air movement through the cavity, and allow infiltrating water vapor to diffuse back out again; and vapor retarders reduce water vapor moving through the wall system.
 5. Ensure that weeps let air in, as well as let water out as quickly as possible. Open-vent systems are preferred over rope wicks and small diameter plastic tubes, to allow walls to dry out faster. Space open head joints at 24" o.c., and provide vents or mesh for insect control.
 6. Provide adequate caps or copings at the tops of walls and parapets. Caps should slope downward 15° (min.) from the horizontal – caps away from the face of the wall above and copings in one or both directions – and should provide overhangs such that the inner lip of the drip is at least 1" from the face of the wall.
 7. Although some clear coatings that "breathe" (such as silanes and siloxanes) can be useful in minimizing the absorption and penetration of water in existing buildings that leak, the BIA does not recommend them for new construction. Coatings that form a film (such as acrylic and stearates) can trap water in the wall, which can lead to spalling or disintegration of the brick.
 8. Install stucco over two layers of building paper, or over an appropriate capillary break such as foam sheathing.

04050 Masonry Materials

- A. Compliance with applicable provisions of the current editions of the following standard specifications is recommended:
1. Concrete Masonry Units in compliance with ASTM C 90
 2. Prefaced Concrete Masonry Units in compliance with ASTM C 90, Type I
 3. Common Brick in compliance with ASTM C 62, Grade SW
 4. Face Brick in compliance with ASTM C 216
 5. Precast Lintels

6. Steel Lintels in compliance with ASTM A 36
7. Mortar in compliance with ASTM C 270, Type(s) S, M, and/or N
8. Colored-Aggregate Mortar in compliance with ASTM C 144
9. Color-Pigmented Mortar
10. Grout in compliance with ASTM C 476
11. Masonry Joint Reinforcement in compliance with ASTM A 153, Class B-2
12. Steel Bar Reinforcing in compliance with ASTM A 615, Grade 60
13. Anchors and Ties:
 - a. Stainless Steel Wire in compliance with ASTM A 580/580 M, Type 304
 - b. Stainless Steel Sheet in compliance with ASTM A 666, Type 304
 - c. Hot-dipped Galvanized Carbon Steel Sheet in compliance with ASTM A 366/366 M
 - d. Anchor Bolts in compliance with ASTM A 307, Grade A
 - e. Partition Top Anchors
 - f. Dowels in compliance with ASTM A 666, Type 304
14. Embedded Flashing
15. Miscellaneous Masonry Accessories:
 - a. Compressible Fillers in compliance with ASTM D 1056, Grade 2A1
 - b. Control Joint Gaskets in compliance with ASTM D 2000, Designation M2AA-805
 - c. Bond-breaker Strips in compliance with ASTM D 226, Type I
 - d. Round Plastic Weep Tubing
 - e. Cavity Drainage Material
 - f. Cavity-wall Insulation in compliance with ASTM C 578, Type IV
 - g. 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

- A. Compliance with applicable provisions of the current editions of the following specifications and documents is recommended:
 1. AISC "Manual of Steel Construction, Allowable Stress Design"
 2. AISC "Code of Standard Practice for Steel Buildings and Bridges"
 3. AISC "Seismic Provisions for Structural Steel Buildings" and "Supplements"
 4. AISC "Specification for Steel Buildings – Allowable Stress Design and Plastic Design"
 5. AISC "Specification for Design of Steel Hollow Structural Sections"
 6. AISC "Specification for Allowable Stress Design of Single-Angle Members"
 7. RCSC "Specification for Structural Joints Using ASTM A 325 Or A 490 Bolts"

05050 Metal Materials

- A. Compliance with applicable provisions of the current editions of the following specifications is recommended:
 1. W-Shapes and WT-Shapes in compliance with ASTM A 992
 2. Channels and Angles in compliance with ASTM A 36
 3. Plate and Bar in compliance with ASTM A 36
 4. Cold-formed Hollow Structural Steel Sections in compliance with ASTM A 500, Grade B (rectangular sections) and ASTM A 500, Grade C (round sections)
 5. Steel Pipe in compliance with ASTM A 53, Type E or S, Grade B

6. Welding Electrodes in compliance with Comply with AWS requirements
7. 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
8. Shear Connectors in compliance with ASTM A 108, Grades 1010 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B
9. Anchor Bolts in compliance with ASTM A 307, Grade A
10. Un-headed Anchor Rods in compliance with ASTM A 307, Grade A
11. Threaded Rods in compliance with ASTM A 307, Grade A
12. Welded Wire Fabric in compliance with ASTM A 185

05050.1 Light-gauge Metal Framing

CHFA discourages the use of metal studs, which are 300 times more thermally conductive than wood, and are prone to condensation and deterioration. If provided, metal stud framing above grade must be provided with continuous rigid foam insulation with taped or sealed joints in accordance with CHFA requirements (**see section 07200.B.**). 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 continuous, vapor-permeable rigid insulation with taped or sealed joints in accordance with CHFA requirements (**see section 07200.C.**), and should not be filled with cavity insulation.

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 current National Design Specifications, Wood Frame Construction Manual, and the 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 workmanship.

- A.** 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.
- B.** 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.
- C.** Wall framing studs – interior and exterior – shall be installed on 12", 16", 19.2" or 24" modules, as required by structural conditions. Spacing of framing shall conform to specifications on construction documents, except for variations needed to accommodate window and door openings. Coordinate window and door openings with the specified framing module. Provide double studs at all window and door openings; install additional studs only as specifically indicated on the structural engineering drawings. Provide blocking at windows and doors for adequate nailing of siding and trim materials.
- D.** Where provided, double walls should be two, independently-framed walls, with all framing off-set (except at window and door openings), to minimize thermal bridging and allow for continuous insulation.
- E.** Below Grade Floors
 1. 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.

2. 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.

F. 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 glulams. 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 $F_b=1400$; $E=1.4$. 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

Where wood "stick" framing is provided, utilize resource-efficient Advanced Framing Techniques (AFT) to minimize material usage wherever possible, while meeting model building code requirements:

A. Advanced Framing Techniques (AFT)

1. Evaluate the use of 24" modular dimensions, rather than standard 16" modules at exterior wall framing.
2. Utilize 2 x 6 exterior wall studs rather than standard 2 x 4 studs.
3. Increase wall framing to 24" o.c., rather than the standard 16" o.c. To compensate for the increased panel span, CHFA requires exterior wall sheathing and interior gypsum board wall finishes that are ⅛" (min.) thicker than those noted elsewhere in the Standards.
4. Evaluate the use of 19.2" or 24" o.c. modular dimensions, rather than the standard 16" o.c. at floor and roof framing. To compensate for the increased panel span, CHFA requires floor and roof sheathing that is ⅛" (min.) thicker than those noted elsewhere in these Standards.
5. Use floor and roof trusses, rather than stick framing.
6. Use "in-line" or "stack" framing to transfer loads directly to the foundation and minimize headers

7. Use 2-stud “California” corner framing with furring or drywall clips or equivalent alternative framing technique, rather than 3-stud corners.
8. Use horizontal ladder framing, full-length furring, drywall clips or equivalent alternative framing technique at wall “T” intersections, rather than 3-stud corners.
9. Up-set exterior wall headers into floor framing above to allow for full insulation immediately above windows and doors.
10. Eliminate interior wall headers in non-bearing walls, and engineer headers in bearing walls to adequately support loads with the smallest members possible.

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 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.

06110.5 No-Formaldehyde Manufactured Wood Products

Due to concerns about post-installation formaldehyde emissions, wood products containing urea formaldehyde (UF) resin binders should be avoided. Consider products manufactured with adhesives which decrease or eliminate formaldehyde content and emissions, such as phenol formaldehyde (PF), phenol urea formaldehyde (PUF), melamine urea formaldehyde (MUF), methyl di-isocyanate (MDI), hybrid UF/MDI and PF/MDI, and natural tannin and soy-protein resins.

06110.6 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.

- A. All construction adhesives shall have a maximum Volatile Organic Compound (VOC) content of 250 g/L, or as otherwise noted below:
 1. Multipurpose Construction Adhesives: maximum VOC content of 70 g/L
 2. Subfloor Adhesives: maximum VOC content of 50 g/L
 3. Single Ply Roof Membrane Adhesives: maximum VOC content of 250 g/L
 4. Structural Glazing Adhesives: maximum VOC content of 100 g/L
 5. Drywall and Panel Adhesives: maximum VOC content of 50 g/L
 6. Ceramic Tile Adhesives: maximum VOC content of 65 g/L
 7. Rubber Floor Adhesives: maximum VOC content of 60 g/L
 8. Wood Flooring Adhesives: maximum VOC content of 100 g/L
 9. VCT and Asphalt Tile Adhesives: maximum VOC content of 50 g/L
 10. Cove Base Adhesives: maximum VOC content of 50 g/L
 11. Carpet Pad Adhesives: maximum VOC content of 50 g/L
 12. Indoor Carpet Adhesives: maximum VOC content of 50 g/L
 13. Outdoor Carpet Adhesives: maximum VOC content of 150 g/L

06190 Energy Heel Trusses/Raised Top Plates

To ensure installation of the full depth of required attic insulation above exterior wall top plates, without being compressed by insulation baffles, provide energy heel trusses with raised top chords, or raised top plates for joist/rafter assemblies.

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 warping. 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 particleboard is used, all 6 sides must be coated with a sealant having a maximum VOC (Volatile Organic Compounds) content of 250 g/L. Consider particleboard panels that are manufactured with 100% recycled wood fiber or post-consumer waste, and a urea formaldehyde-free adhesive system. Whenever possible, eliminate new particleboard inside houses by using formaldehyde-free medium density fiberboard (MDF) for shelving, cabinets and substrates for countertops and exterior panels. 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 and composites with recycled content, in lieu of plastic laminate or thermo-set plastic solid surface counter top materials.

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. All materials, methods and details shall comply with American Wood-Preservers' Association (AWPA) standards.

06430 Pre-engineered Wood Stairs

Consider providing stair parts such as stringers and treads made from engineered wood, rather than solid hardwoods.

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 Guard Rails

Guard rails 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 rail 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 2009 International Energy Conservation Code, EPA ENERGY STAR Homes Version 3.0 or ENERGY STAR MFHR Version 1.0 Programs, the Connecticut Energy Code and the Standards, 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.

- A. Provide air barriers and other air sealing measures as required for creating a complete exterior building envelope.
- B. All dwelling units in multifamily buildings shall be compartmentalized, in order to reduce the transfer of moist air, smoke, odors, pests and noise from adjacent dwelling units and common spaces.
 1. Provide air barriers and other air sealing measures at common walls between dwelling units, and between dwelling units and common spaces.
 2. Seal all plumbing chases, exhaust ventilation and heating system components, electrical outlets and controls, window and exterior door rough openings, and intersections between interior, party and demising partitions with exterior walls, etc.

07010.1 Air Infiltration

Air Infiltration rates shall be less than or equal to 4 Air Changes per Hour (ACH_{50}), as determined by a Certified Rater using a RESNET-approved protocol.

07010.2 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 the Thermal Bypass Inspection Checklist ([ENERGY STAR Thermal Bypass Checklist](#)).

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.

07010.3 Ventilation

Dwelling units shall meet the ASHRAE 62.2 2007 “Ventilation for Acceptable Indoor Air Quality” minimum ventilation requirement of 0.35 ACH, by natural or mechanical means.

07010.4 Combustion Safety

Spillage or back-drafting of combustion appliances is unacceptable. Only sealed combustion, direct-vented, power-vented or induced-draft combustion appliances should be installed inside conditioned spaces for space conditioning or for domestic hot water. The combustion safety of combustion appliances shall be verified according to ASTM Standard E1998-99, “Standard Guide for Assessing Depressurization-Induced Back-drafting and Spillage from Vented Combustion Appliances”, and Section H of the National Fuel Gas Code (ANSI Z223.1/NFPA 54). Traditional gas water heaters with draft hoods are prone to spillage and back-drafting, and should be avoided. Gas ovens, gas stoves or gas cooktops should only be installed with an exhaust range hood directly vented to the exterior.

In order to ensure good indoor air quality, all combustion appliances are recommended to be sealed combustion units. Such systems are completely decoupled from the interior environment through the use of dedicated outdoor air intake and exhaust ducts connected directly to the unit, which eliminates back-drafting concerns. In addition, it allows the elimination of the usual make-up air ducts required for naturally aspirated units, which are a source of uncontrolled air leakage through the building enclosure, and therefore increase energy use. Sealed combustion appliances also tend to be more efficient than the naturally aspirated units.

07030 Air Sealing Measures

Dwellings must meet or exceed the air sealing requirements of the 2009 International Energy Conservation Code, the Connecticut Energy Code or the Standards, whichever is more stringent. Note that many of the required air sealing measures involving the use of caulking to seal construction joints in fiberglass batt-insulated walls and ceilings may 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 perimeter-insulated with vapor-impermeable 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. Provide sealant at joints between wood wall and first floor rim framing members, perimeter rigid insulation panels and interior finish panels.

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 Rim Joists

All penetrations through the rim joists, such as holes drilled for piping, conduit and wiring, shall be sealed.

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 Rim 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 systems that do not require the use of airspace or “gap” between two independent walls. One such system is the U370 system, which also may provide 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 may 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

Install air infiltration barriers to control air leakage into and out of building envelopes. Air barrier products may include mechanically attached membranes (“housewraps”), self-adhered membranes, fluid-applied membranes, closed-cell spray polyurethane foam (ccSPF), open cell spray polyurethane foam (ocSPF), or board-stock. nbSome air barriers may be water vapor permeable, while others may also function as vapor barriers. Provide all air barrier accessories required to connect and maintain air tightness between air barrier materials, assemblies and components, and to fasten them to the structure of the building; i.e., sealants, tapes, backer rods, transition

membranes, nails/washers, ties, clips, staples, strapping and primers. Inspect materials and accessories as they are installed, to verify that the air barrier has no punctures and is completely sealed.

07195.1 Water-Resistive Barrier Wrap

If a mechanically attached membrane (“housewrap”) is the air barrier material chosen, follow manufacturer’s recommendations for installation. 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 sheathing shall be a nail-able wood product, with a minimum nominal 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.

A. Exterior sheathing:

1. If OSB panels are specified, provide high-performance, water-resistant panels bonded with phenolic resin.
2. Consider using all-in-one structural sheathing and water-resistive barrier engineered wood roof and wall sheathing panels with integrated protective barriers and manufacturer’s seam tape.

B. 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.

1. If OSB panels are specified, provide high-performance, water/mold/fungus/termite-resistant tongue and groove panels bonded with phenolic resin. Screw underlayment @ 8" o.c. (min.). All joints shall occur over structural framing members.

07195.3 Sill Plate Flashing

Flashing at wall bases shall be detailed and specified for all conditions where 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.

A. Install insulation in and/or over entire wood-framed areas of new work exposed to outside ambient conditions as follows:

1. Exterior Walls/Attic Kneewalls: R-19 + R-2.5 ci (continuous insulation) or R-20 (minimum) [R-15 + R-5 ci or 13 + R-7.5 ci is acceptable in renovations where framing depth must match existing 2 x 4 framing]
2. Rim Joists/Floors over Unheated Spaces/Cantilevered Floors: R-30+ R-7.5 ci (minimum) or R-38 (use the maximum thickness allowed by floor framing)
3. Uninhabited Attic Floors: R-49 (minimum)
4. Cathedral Ceilings/Roofs: R-30+ R-6 ci (minimum) or R-38 (use the maximum thickness allowed by roof framing)

5. Existing Flat/Low-sloped Roofs to be Replaced: R-13 + R-5.6 ci , per ASHRAE 90.1-2007 R-value climate zone 5 (minimum) [Flat/Low-sloped Roofs in New Construction: see item 4. above]
- B.** Install insulation in and/or over entire areas of new light-gauge metal-framed work exposed to outside ambient conditions as follows:
1. Exterior Walls/Band Joists/Attic Kneewalls: R-19 + R-10 ci (continuous insulation), R-21 + R-9 or R-25 + R-7 ci (minimum) [R-15 + R-13 ci is acceptable in renovations where framing depth must match existing 2 x 4 framing]
 2. Rim Joists/Floors over Unheated Spaces/Cantilevered Floors: R-19 + R-12 ci, R-21 + R-10 ci, R-25 + R-9 ci, R-30 + R-8 ci or R-38 + R-5 ci (minimum – use the maximum thickness allowed by framing depth)
 3. Uninhabited Attic Floors: R-53 (minimum)
 4. Cathedral Ceilings/Roofs: R-30 + R-8 ci or R-38 + R-5 ci (minimum – use the maximum thickness allowed by framing depth)
 5. Existing Flat/Low-sloped Roofs to be Replaced: R-13 + R-5.6 ci (continuous insulation), per ASHRAE 90.1-2007 R-value climate zone 5 (minimum) [Flat/Low-sloped Roofs in New Construction: see item 4. above]
- C.** Install insulation in and/or over entire areas of new masonry walls exposed to outside ambient conditions as follows:
1. Exterior Mass Walls: R-13 (minimum) [R-17 when more than half of the insulation is on the interior of the mass wall]
 2. Basement and Crawl Space Walls: R-10 (minimum) [R-13 when more than half of the insulation is on the interior of the basement wall]
- D.** Installation of all insulation shall be performed with the utmost care, with the highest standard of professional workmanship, in strict compliance with manufacturer’s specifications and insulation instructions, and shall be verified by a RESNET-accredited HERS Rater as “Grade I” per RESNET standards. All 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 spray foam. The minimum insulation levels must meet or exceed those listed above. Provide unfaced batts where fiberglass insulation will be installed adjacent to below-grade masonry walls, and avoid direct contact between batts and masonry.
- E.** Where continuous insulation (ci) is required over framed areas with fully-insulated cavities, provide rigid foam insulation panels, such as expanded polystyrene (EPS), extruded polystyrene (XPS), or polyisocyanurate, as required. Follow manufacturer’s recommended means and methods of installation, including proper adhesives, fasteners and joint-sealing tape.
- F.** Where exterior finishes are to be installed over continuous insulation, consider composite insulating sheathing panels consisting of 4' x 8' closed cell polyisocyanurate foam bonded to fiber-reinforced facers on one side, and ½" or ⅝" CDX plywood or OSB sheathing on the other, or panels consisting of 4' x 8' closed cell polyisocyanurate foam bonded to fiber-reinforced facers on one side, a middle layer of 1", 1½" or 2" solid wood ventilation spacers, and a top layer of ½" or ⅝" CDX plywood or OSB sheathing. Follow panel manufacturer’s recommended means and methods of installation, including proper adhesives, fasteners and joint-sealing tape.
- G.** 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.

07200.4 Insulation and Air-Sealing System

Consider using an insulation and air-sealing system which combines the insulating benefits of fiberglass batt insulation with the air-sealing benefits of spray foam: apply a fast-setting, low-expanding two-part foam sealant at framing joints and penetrations in the building envelope, and fill ceiling, wall and floor cavities in the building envelope with fiberglass batt insulation.

07200.5 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.

07200.6 Insulated Headers

Provide R-5 (min.) insulated headers..

A. Consider pre-fabricated insulated headers, with engineered lumber framing and rigid-foam cores.

07200.7 Energy Heel Trusses/Raised Top Plates

Extend full depth of the required attic insulation over exterior wall top plates at energy heel trusses with raised top chords, and raised top plates at joist/rafter assemblies.

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 ft² of net free area of venting for every 150 ft² 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 Slabs

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-impermeable rigid foam insulation with taped joints.

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

Extend required exterior wall insulation into the outside corner of two insulated walls framed with two-stud "California" corner framing with furring or drywall clips, or equivalent alternative framing technique.

07200.15 Insulated T-Walls

Provide continuous insulation at the intersections of an interior and insulated exterior walls framed with horizontal ladder framing, full-length furring, drywall clips or equivalent alternative framing technique.

07248 Insulation Accessories

Provide roof/attic floor details that 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 adhesive ice and water protection membrane 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 fibred 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 (min.).

07310.7 "Cool" Roofing

All roof coverings shall meet ENERGY STAR criteria for cool roof products:

- A.** For low slope applications (2:12 or less - as defined in ASTM Standard E 1918-97): initial solar reflectance \geq 0.65 and 3-year aged minimum solar reflectance \geq 0.50. Products that are typically installed on low-slope surfaces include single-ply membranes, built-up-roofs (BUR), modified bitumen, spray polyurethane foam, roof coatings, and standing-seam profiled metal. Some products that are typically installed on low-slope roofs may also be installed on steep-slope roofs (e.g., single-ply membranes and roof coatings).
- B.** For steep slope applications (greater than 2:12 pitch): initial solar reflectance \geq 0.25, and 3-year aged minimum solar reflectance \geq 0.15. Products that are typically installed on steep-slope surfaces include composite shingles, clay, concrete, or fiber-cement tile, slate, shakes, architectural profiled metal and individual metal roof components.
 - 1. To avoid condensation under light-colored, reflective membrane roofing, insulate fastener heads from the building exterior and eliminate air flow through the system. Mechanically-fasten the first layer of insulation over a vapor barrier into the decking, adhere the second layer of insulation to the first layer of insulation, and adhere the roof membrane to the top layer of insulation.
- C.** Consider providing metal roofing for 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.

- A.** 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

When provided, vinyl siding shall be solid color virgin vinyl, with all required accessories and trim pieces, and may include decorative siding products. Standing and running trim may be solid PVC trim boards or siding manufacturer-provided vinyl components. 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 in horizontal siding 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)

When provided, 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".

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 over 20 oz. copper or 0.027" thick pre-finished aluminum head flashing/drip edges/nauling flanges at all windows and doors. Provide soldered copper sill pan flashing, a pre-fabricated recycled polypropylene pan system, or moldable flashing tape 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.

- A. 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.

- A. 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.
- B. 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.

08000 WINDOWS & DOORS

08001 Window and Skylight 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 and ENERGY STAR requirements, unless otherwise noted. 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).

A. Window and Skylight Thermal Transmittance Coefficient (U) values:

1. All windows shall have a maximum Thermal Transmittance Coefficient (U-value) of 0.30 (R-3.3).
 - a. The required U-value for windows in homes with a window area to above-ground conditioned floor area (WFA) ratio greater than 15% shall be adjusted according the following formula:
Adjusted U-value = $[0.15/WFA] \times 0.30$
2. All skylights shall have a maximum U-value of 0.55 (R-2.2).
 - a. The required U-value for skylights in homes with a window area to above-ground conditioned floor area (WFA) ratio greater than 15% shall be adjusted according the following formula:
Adjusted U-value = $[0.15/WFA] \times 0.55$

08001.2 Design Pressure Rating (DPR)

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

Where provided, vinyl (PVC) windows shall be manufactured by a single manufacturer having a minimum of ten (10) years of 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. Where provided, fiberglass windows shall be provided by a single manufacturer having a minimum of ten (10) years of experience producing fiberglass windows.

08001.7 Extra-high-performance Glazing

CHFA encourages window performance to 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 [U-values $\leq .20$ and R-values ≥ 5], 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 shall be no less than 1¾" thick, and thresholds shall be thermally-broken, 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.

A. Unit Entry Door Thermal Transmittance Coefficient (U) and Solar Heat Gain Coefficient (SHGC) values:

1. All opaque doors shall have a maximum U-value of 0.21
 - a. The required U-value for opaque doors in homes with a window area to above-ground conditioned floor area (WFA) ratio greater than 15% shall be adjusted according the following formula:
Adjusted U-value = $[0.15/WFA] \times 0.21$
2. All doors \leq 1/2 Lite shall have a maximum U-value of 0.27 and an SHGC-value of 0.30
 - a. The required U-value for opaque doors in homes with a window area to above-ground conditioned floor area (WFA) ratio greater than 15% shall be adjusted according the following formulas:
Adjusted U-value = $[0.15/WFA] \times 0.27$
Adjusted SHGC-value = $[0.15/WFA] \times 0.30$
3. All doors $>$ 1/2 Lite shall have a maximum U-value of 0.32 and an SHGC-value of 0.30
 - a. The required U-value for opaque doors in homes with a window area to above-ground conditioned floor area (WFA) ratio greater than 15% shall be adjusted according the following formulas:
Adjusted U-value = $[0.15/WFA] \times 0.21$
Adjusted SHGC-value = $[0.15/WFA] \times 0.30$

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 particleboard cores. Door frames and casings shall not be made of polystyrene.

08320 Aluminum and Glass Entrances, Curtain Walls and Storefronts

For projects requiring aluminum and glass entrance doors and storefront windows, provide single acting, offset pivot or butt hung aluminum and glass doors in thermally-broken framing with low-emissivity, double- or triple-pane insulated glazing. Provide assemblies with ENERGY STAR maximum thermal resistance and solar heat gain coefficient values: U-0.35/SHGC-0.40 metal-framed curtain wall/storefront; U-0.70/SHGC-0.40 metal-framed entrance doors; U-0.45/SHGC-0 at all other metal framing. 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. Aluminum and glass doors shall be tested for air infiltration in accordance with ASTM E283, and for thermal performance in accordance with ASTM C236 and AAMA 1503, and forced entry resistant in accordance with AAMA/NWWDA/CSA 101/I.S.2-/A440-05 requirements. maximum U-value of 0.32 and an SHGC-value of 0.30

08390 Screen and Storm Doors

Where provided, 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.

- A.** 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.
- B.** 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

- A.** 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.
- B.** Bathrooms and master bedrooms shall have door locks that are non-locking against egress, with panic release operation.
- C.** 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.
- D.** 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 intended only for emergency exit from buildings designed for multiple dwelling units for elderly residents, high-rise developments in large metropolitan areas, 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 doors shall be provided with panic hardware and signage which clearly indicates "Emergency Exit Only – Door Alarm Will Sound". Door-ajar signals shall require manual re-setting.

08742 Electric Locksets

Exterior doors intended for common entry, in buildings designed for multiple dwelling units for elderly residents, high-rise developments in large metropolitan areas, 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 doors shall be electronically-controlled by telephone-based intercom/remote entry and key fobs, key cards, etc.

08780 Cabinet Door and Drawer Hardware

In dwelling units designed for elderly and all barrier-free units, cabinet doors and drawers shall have easily graspable pulls, such as 'C' pulls.

08810 Glass View Panels

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 $\frac{1}{2}$ ". Only gypsum board panels manufactured in the United States, and labeled "made in the U.S.A." with the manufacturers name and manufacturing site location, shall be provided.

A. Provide the following materials as required by Building Code, the Standards, project design and job conditions:

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.

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.

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".

4. Mold-resistant Gypsum Board

Use $\frac{1}{2}$ " (min.) mold-resistant gypsum wall board 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.

5. Fire-rated Mold-resistant Gypsum Board

Use $\frac{5}{8}$ " (min.) fire-rated mold-resistant gypsum board 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.

6. Cement Backer Board

Use ½" (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.

7. Gypsum Sheathing Board

Use ½" (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.

8. Soundproof Drywall

Consider providing soundproof drywall in lieu of standard sound attenuation techniques such as resilient channels and clips. Available in fire-rated and non-fire-rated ½" and ⅝" thick panels, with STC ratings ranging from 49 to 74, 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 in wet areas shall be laid on ½" waterproof cement backer board at walls, and over ¾" subfloor at floors. Grout and cure, clean and protect finished installations.

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.

1. Recycled-content Ceiling Panels

CHFA encourages the use of ceiling panels which contain up to 70% recycled content.

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
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.
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 1/8". 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 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 some bamboo flooring and panel products are made with urea-formaldehyde (UF) glue. Products made without the use of UF binders, which 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 are preferable, such as bamboo flooring and panel products made with a polyisocyanurate or phenol formaldehyde binder.

09681 Carpeting

Do not install carpets in basements, entryways, laundry rooms, bathrooms or kitchens. 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 be low-VOC, GreenLabel-certified by the Carpet and Rug Institute (CRI), and 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/cm². This limit shall be reduced to 0.22 watts/cm² 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/cm².

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, which may be lighter than comparable products, reduce emissions and transportation costs, are easier to install and requires less packaging. To ensure that the materials return to the facility where they can be reused, manufacturers may retrieve floor coverings at the end of their life cycles free of charge, and nylon fibers in the carpeting may be recycled into new carpet fiber.

09900 Paints and Coatings

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, non-caustic and non-toxic paint strippers with the organic solvent N-Methylpyrrolidone as the active ingredient.

09900.2 Low-VOC and Formaldehyde-free Paint

Specify low-VOC, formaldehyde-free paints. 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 Painting

A. Paint shall be the highest quality grade, and shall be delivered to the site in original containers labeled by the manufacturer, with seals unbroken.

1. Painting Schedule:

- a. Exterior Siding: 2 coats solid-body stain over pre-primed siding
- b. Exterior Trim: 1 coat primer, 2 coats semi-gloss paint
- c. Interior Partitions & Walls: 1 coat primer, 2 coats satin or eggshell latex paint
- d. Interior Ceilings: 1 coat primer, 2 coats flat latex paint
- e. Interior Trim/Painted Woodwork: 1 coat primer, 2 coats semi-gloss latex paint

B. Procedure

1. 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.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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.

C. Interior Painting Requirements

1. 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.
2. 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.
3. 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.

D. Exterior Painting Requirements

1. If the exterior is stained wood, the finish shall be a solid-body stain, not the transparent or semitransparent type.
2. Vents penetrating roofs, with the exception of stainless steel vents, shall be painted with appropriate paint to match the roof shingles.

09900.6 PVC-free Peel and Stick Wall Covering

Where wall coverings are desired, consider providing PVC-free self-adhered textile wall covering containing 100% recycled polyester wall coverings in lieu of standard vinyl wall coverings that are breathable, yet cleanable and durable, while pressure-sensitive adhesive backings eliminate the need for wallpaper paste.

09900.7 Low-VOC Paint and Architectural Coating Standards

Paint and other architectural coatings are one of the largest non-mobile sources of VOC emissions in the environment. In order to reduce emissions from this source category, provide architectural coatings with the lowest-available VOC content. "Low- VOC" (Clean Air) paints, which meet the regulatory limits in the South Coast Air Quality Management District (AQMD) Rule 1113, are manufactured and sold by numerous companies; however many manufacturers have reformulated to levels well below these limits. Those that meet a VOC standard of <10 g/L are referred to as "Super-Compliant" by the AQMD, which maintains a list of manufacturers of super-compliant products on their website.

A. Paints and other architectural coatings shall comply with the following VOC Standards:

1. Bond Breakers: maximum VOC content of 350 g/L

2. Clear Wood Finishes: maximum VOC content of 275 g/L
3. Concrete Surface Retarder: maximum VOC content of 250 g/L
4. Driveway Sealer: maximum VOC content of 50 g/L
5. Flat Coatings: maximum VOC content of 50 g/L
6. Floor Coatings: maximum VOC content of 50 g/L
7. Form Release Compound: maximum VOC content of 250 g/L
8. Low-Solids Coatings: maximum VOC content of 120 g/L
9. Masonry Sealers: maximum VOC content of 100 g/L
10. Mastic Coatings: maximum VOC content of 300 g/L
11. Metallic Pigmented Coatings: maximum VOC content of 500 g/L
12. Non-Flat Coatings: maximum VOC content of 50 g/L
13. Non-Sacrificial Anti-Graffiti Coatings: maximum VOC content of 100 g/L
14. Pre-Treatment Wash Primers: maximum VOC content of 420 g/L
15. Primers, Sealers and Under-coaters: maximum VOC content of 100 g/L
16. Reactive Penetrating sealers: maximum VOC content of 350 g/L
17. Roof Coatings: maximum VOC content of 50 g/L
18. Roof Coatings (Aluminum): maximum VOC content of 100 g/L
19. Roof Primers (Bituminous): maximum VOC content of 350 g/L
20. Rust Preventive Coatings: maximum VOC content of 100 g/L
21. Sacrificial Anti-Graffiti Coatings: maximum VOC content of 50 g/L
22. Shellac (Clear): maximum VOC content of 730 g/L
23. Shellac (Pigmented): maximum VOC content of 550 g/L
24. Specialty Primers: maximum VOC content of 100 g/L
25. Stains: maximum VOC content of 100 g/L
26. Stains (Interior): maximum VOC content of 250 g/L
27. Traffic Coatings: maximum VOC content of 100 g/L
28. Waterproof Sealers: maximum VOC content of 100 g/L
29. Waterproofing (Concrete): maximum VOC content of 100 g/L
30. Wood Preservatives: Masonry Sealers: maximum VOC content of 350 g/L

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

Provide grab bars in all "Type A" accessible dwelling units as required by Code. Provide solid wood blocking for grab bars in all "Type B" adaptable dwelling units as required by Code. 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.

- A.** 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.
- B.** 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.
- C.** 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.

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, dishwashers, ventilation fans, furnaces and air conditioners must be ENERGY STAR-qualified.

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-qualified, 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-feet 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.

- A. Consider providing Safe-T-element™ at all electric ranges, a UL-rated fire-prevention system consists of a set of electronically-controlled solid cover plates, which can be retro-fitted to standard coiled stovetop burners. The high-end temperature of the plates is limited 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, the number and cost of potential false alarms, and cooking-related fire insurance claims may be reduced, and the useful life of burners and ranges may be extended.

11452.3 Microwave Ovens

Where microwave ovens are provided as an amenity, they shall provide a minimum cooking area of 1.0 ft³. 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-qualified means of exhaust ventilation to the outside. Provide recessed ceiling fans for kitchen ventilation, or ceiling grills ducted to in-line or roof-top exhaust fans for Kitchen ventilation. Re-circulating range hoods with integral task lighting shall be provided to match the width of the range below. Kitchen exhaust fans shall be sized to provide a rate of ≥ 5 ACH continuous ventilation, or an intermittent rate of ≥ 100 cfm. Sound ratings for Kitchen ventilation fans shall be ≤ 1 sone at minimum flow rate, and ≤ 3 sones at maximum flow rate.

- A. Consider providing range hood/fire-suppression systems at all ranges, which are specifically designed to fight cooking fires through temperature sensors, electronic controls, fans, fusible links and pressurized extinguishing systems.

11452.6 Bath Ventilation

All full and half baths, and common area toilet rooms, shall be provided with an ENERGY STAR-qualified means of exhaust 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 to provide a rate of ≥ 20 cfm continuous ventilation, or an intermittent rate of ≥ 50 cfm. Sound ratings for Bath ventilation fans shall be ≤ 1 sone at minimum flow rate, and ≤ 3 sones at maximum flow rate. Bath exhaust fans shall be switched separately from bathroom lighting, and shall be timer-controlled to run for a minimum of twenty minutes of use, or humidity sensor-controlled. Recessed bath fan/light/night light fixtures, with both humidity sensor and manual odor control modes of operation, may also be available.

11452.7 Whole House Fan

For energy-efficient warm weather cooling, CHFA encourages the use of ENERGY STAR-qualified, ducted, in-line whole house fans in units with more than one floor level and attic space above. Vents must be mounted in a hallway ceiling on the top floor of a house, with an insulated, airtight seal to prevent cold air infiltration and warm air exfiltration in winter. Fans should be sized to produce between 4-5 air changes per hour (min.), and should

have at least two-speed controls: high speed for quick temperature change, and low speed for continuous ventilation. Sound ratings for whole house fans shall be ≤ 1 sone at minimum flow rate, and ≤ 3 sones at maximum flow rate

11452.8 Washers and Dryers

A recessed washer and dryer hook-up assembly shall be provided in each dwelling unit of family housing. Convert washers to rinse with cold water only. 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. Front-loading side-by-side or under-cabinet combination units must be provided in barrier-free units.

- A. 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.
- B. Where provided, CHFA requires the use of ENERGY STAR-qualified washing machines. Consider providing high-performance machines with a Modified Energy Factor (MEF) ≥ 2.0 and Water Factor (WF) ≤ 5.5 .

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. Where dryer connections are left for occupant installation of the washer/dryer, vents shall be temporarily capped on the interior and exterior to prevent air infiltration.

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 $\frac{3}{4}$ " 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. 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.

- A. 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 low-formaldehyde sealant. Particleboard 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.
- B. 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.

- C.** All dwelling unit bathrooms shall have 42" wide vanities (min.), 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.

A. 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

B. 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

C. 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 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.

13120.2 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 nominal 4" th. 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. SIPs shall be designed to reflect Seismic Zone 4 requirements.

13120.3 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.

15000 MECHANICAL

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.

- A.** 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.
- B.** 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.
- C.** 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.
- D.** 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.
- E.** 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

Acceptable pipe and pipe fittings/systems include:

- Hub and Spigot Cast Iron Sewer Pipe in compliance with ASTM A74, service weight
- Hubless Cast Iron Sewer Pipe in compliance with CISPI 301, service weight
- PVC Sewer Pipe in compliance with ASTM D2729
- Underground Copper Water Pipe in compliance with ASTM B88, type K
- Above ground Copper Water Pipe in compliance with ASTM B88, type L
- 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
- 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 all plumbing piping. Insulation shall be continuous over pipes, valves and fittings, etc. Insulate all waste stacks for their entire length. Provide the following minimum R-Values:

3/8" diameter to 1/2" diameter - R-5

5/8" diameter to 3/4" diameter - R-7

7/8" diameter to 2" diameter - R-9

2 1/2" diameter to 4" diameter - R-8

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 factory-made 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, trim, 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.

A. Kitchens:

Kitchen sinks shall be single bowl and shall be stainless steel, 20 gauge or thicker. Pull-out spray hoses shall not be provided. A garbage disposal shall be provided.

B. 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.

15460.1 Elderly Unit Plumbing Requirements

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" (min.) in length (perpendicular to the plumbing wall) to facilitate the future addition of a grab bar. All kitchen and 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

Provide plumbing fixtures, fittings and controls which comply with the 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. WaterSense-labeled products include bathroom sink faucets and accessories, showerheads, toilets and flushing urinals and valves (www.epa.gov).

15460.3 Graywater Toilet Water System

Consider providing a graywater recycling system for toilet water, in lieu of fresh water. Lavatory water can be captured and re-used to flush toilets to conserve water; graywater recycling systems for toilet water helps save money in reduced water consumption charges and wastewater treatment or sewer fees.

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. Water heater tanks shall have an insulating jacket equal to or greater than R-5. Jacket must be installed according to manufacturer's recommendations.

A. 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.

B. 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.

- C.** 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.
- D.** ENERGY STAR-qualified tank type domestic hot water equipment shall meet or exceed the following Energy Efficiency (EF) requirements:
1. Gas Units
 - a. 30 Gallons: 0.63 EF
 - b. 40 Gallons: 0.61 EF
 - c. 50 Gallons: 0.59 EF
 - d. 60 Gallons: 0.57 EF
 - e. 70 Gallons: 0.55 EF
 - f. 80 Gallons: 0.53 EF
 2. Oil Units
 - a. 30 Gallons: 0.55 EF
 - b. 40 Gallons: 0.53 EF
 - c. 50 Gallons: 0.51 EF
 - d. 60 Gallons: 0.49 EF
 - e. 70 Gallons: 0.47 EF
 - f. 80 Gallons: 0.45 EF
 3. Electric Units (if no other fuel energy source can be provided)
 - a. 30 Gallons: 0.94 EF
 - b. 40 Gallons: 0.93 EF
 - c. 50 Gallons: 0.92 EF
 - d. 60 Gallons: 0.91 EF
 - e. 70 Gallons: 0.90 EF
 - f. 80 Gallons: 0.89 EF

15470.2 Tankless Water Heaters

CHFA encourages the use of ENERGY STAR-qualified tankless natural gas or propane water heaters to conserve heating time and energy use. Because water must be heated quickly to the desired temperature, electric units will draw more instantaneous power than tank-type water heaters; if electric rates include a demand charge, operation of tankless electric water heaters may be more expensive. 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

Where required, commercial 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 required 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, ventilation and cooling systems shall be designed to meet or exceed the requirements of the minimum energy levels set forth in the current 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.

- A.** 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. Interior design temperatures for calculations shall be for 70° F (max.) for heating and 75° (min.) for cooling when the outside temperature is the appropriate outdoor design temperature for each development location, as specified in accordance with the ASHRAE 99% scale. Warranty period for equipment shall be 5 years minimum.
- B.** Fresh air by mechanical means shall be provided in all public corridors and other community spaces in apartment buildings.
- C.** Common spaces in developments designed for elderly residents shall be air-conditioned. Corridor make-up air shall maintain corridor temperature at 75° F in the summer, and 72° F in the winter. Common laundries, craft rooms and trash and trash compactor rooms shall all be designed to have negative pressure.
- D.** 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 ACCA System Design Process

Utilize the Air-conditioning Contractors of America (ACCA) System Design Process for the proper design and installation of "right-sized" residential HVAC systems, including Manual J (load calculation), Manual T (air distribution), Manual S (equipment selection), and Manual D (duct size calculation).

- A.** Incorporate whole building delivered ventilation per ASHRAE Standard 62.2 2007, Section 4.4. Intake of ventilation air directly from the outdoors is preferred. Air inlets shall be located $\geq 10'$ from stacks, exhaust vents/hoods, or vehicular exhaust, $\geq 3'$ from dryer exhaust, and such that they will remain unobstructed by snow, plantings or other materials. Screen air inlets with mesh with openings $\leq \frac{1}{2}"$.
- B.** Residences should be constructed to have a low building envelope air leakage rate and a controlled mechanical ventilation system. The ventilation system should slightly pressurize the dwelling unit when the air handler unit blower is operating, restricting air exchange to exfiltration. If ducts are located in conditioned spaces, duct gain and loss is minimal. Appliance and occupant heat gain should be factored into the design process. For the outdoor design temperature, use the cooling dry bulb temperature listed in the ASHRAE 2001 Handbook of Fundamentals. The building design load shall be calculated for the worst case elevation at the solar orientation that produces the highest heat gain. For equipment selection, indoor and outdoor coils should be matched. The equipment should be selected to meet the design sensible load at the actual outdoor and indoor design conditions (not ARI standard conditions). Avoid over-sizing cooling equipment to try to compensate for high occupancy, large thermostat setbacks, unusual loads, poor initial design, or inadequate distribution. Over-sizing leads to reduced humidity control, system short-cycles, which reduce efficiency and allow more air stagnation and stratification, and first cost is increased. Size the cooling system to appropriately meet the design load calculated according to ACCA Manual J, to provide good air distribution for improved indoor air quality and thermal comfort. The total capacity of the cooling system should be no greater than 110% of the ACCA Manual J total load. Size the equipment based on 100% of the total cooling load (not the sensible cooling load) at the actual outdoor design condition (not the ARI rated condition) and for the realistically-expected evaporator air flow.
- C.** The capacity of cooling and heating systems should be specified based on the building orientation that creates the highest total load. This usually depends on the location of glazing. At a minimum, the four N, E, S, W

orientations should be considered. It may be advisable to also consider the four off-angle orientations of NE, SE, SW, NW as well, especially if there is significant off-angle, un-shaded glass.

15610.3 Modular Boilers

Gas fired boilers shall be used where heating systems are not provided for each dwelling unit. Where provided, boiler systems shall have two or more gas-fired 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.

15610.4 Furnaces, Boilers and Heat Pumps

CHFA requires ENERGY STAR-qualified heating equipment.

- A. Furnaces: Gas-fired zoned forced air furnaces with a minimum 90% annual fuel utilization efficiency rating (AFUE \geq 90), or better are preferred. 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 labels. Where natural gas is not readily available, ENERGY STAR-qualified oil-fired furnaces (AFUE \geq 85) may be provided.
- B. Boilers: For hot water systems, provide ENERGY STAR-qualified boilers (AFUE \geq 85).
- C. Heat Pumps: Where air-source heat pumps are specified, provide ENERGY STAR-qualified units (SEER \geq 14.5/EER \geq 12/ HSPF \geq 9.25) with ENERGY STAR-qualified electric back-up, or ENERGY STAR-qualified units (SEER \geq 14.5/EER \geq 12/ HSPF \geq 8.2) with ENERGY STAR-qualified dual-fuel back-up. Where ground-source heat pumps are specified, provide ENERGY STAR-qualified units of any product type.

15610.5 Air Conditioning

CHFA prefers requires ENERGY STAR-qualified air conditioning equipment. Zoned, central air-conditioning systems with programmable indoor thermostats, with each zone having separate temperature and wired damper controls are preferred. Otherwise, room air-conditioners in through-wall sleeves 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. 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 chillers). Where room air conditioners are provided, demountable insulated molded plastic air conditioner covers, such as the "CHILL STOP'R"® by Encore Plastics, shall be provided on interior walls for use during cold weather months to prevent air infiltration. ENERGY STAR-qualified room air conditioners shall bear an energy efficiency rating (EER) equal to, or greater than 10. Where heat pumps are specified, see section **15610.4**.

15610.6 CEE/AHRI Verified Directory

The Consortium for Energy Efficiency (CEE) and the Air-Conditioning, Heating and Refrigeration Institute (AHRI) have developed an online database which identifies high efficiency equipment that has been tested to ARI 210/240 and verified by AHRI. The CEE/AHRI Verified Directory identifies a list of equipment (less than 65 MBtuh) that the manufacturers represent as meeting energy performance tiers established by the CEE as part of the Residential Air-Conditioner and Heat Pump Initiative and the High-Efficiency Commercial Air-Conditioning Initiative. These initiatives make use of tiers to differentiate equipment on the basis of energy performance, with a higher tier representing a higher level of claimed performance. The CEE/AHRI Verified Directory lists equipment that meets the performance levels specified in the ENERGY STAR Central Air-Conditioner and Air-source Heat Pump Specification; however, only equipment listed by an ENERGY STAR partner are officially recognized as ENERGY STAR-qualified. For a list of ENERGY STAR partners, see the ENERGY STAR

Partner List at www.energystar.gov. For the CEE/AHRI Verified Directory, see the Non-AHRI Central Air Conditioner Equipment and Air Source Heat Pump (ASHP) Product List at www.energystar.gov.

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.

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. 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. CHFA prefers all duct work to be made of rigid sheet metal materials. Different size rooms may require different size ducts. Often, flexible ducts are stocked in two-inch increment sizes (4", 6", 8", etc.). In energy-efficient, low-load buildings, a 2" gap may be too great, and less common duct sizes (5" and 7") may be required to accomplish the desired air balance. Avoid excessive duct lengths, loops, hard turns and compression in flexible ducts. Support flexible ducts at intervals recommended by the manufacturer, but not $\leq 5'$, and with a maximum sag of $\frac{1}{2}"/ft$ of spacing between supports. Where possible, an extended supply plenum with enough room to make mostly homerun run-outs is the preferred duct layout method, so final air balancing is not dependent on the limitations and difficulties of cascading supply branches. 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 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.

15810.3 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.

15810.4 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. In order to keep supply air from pressurizing closed rooms by more than 3 Pa, provide transfer grills, jump ducts or interior bedroom doors with a minimum clearance of 1 inch between the bottom of door when closed and the finished floor surface to allow supply air to flow back to the central system return.

15810.5 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, such as crawl spaces and attics, shall be insulated. Supply ducts in unconditioned attics shall have insulation \geq R-8; all other ducts in unconditioned space shall have insulation \geq R-6.

15810.6 Seal All Ductwork

All ductwork must be sealed and insulated according to the IECC. Unless all ductwork and air-handling equipment are located in conditioned space, confirm duct leakage to the outdoors as ≤ 4 CFM₂₅/100 ft² of conditioned floor area, and total duct leakage as ≤ 8 CFM₂₅/100 ft² of conditioned floor area, through RESNET-approved testing protocol in conjunction with required blower door testing (**section 07010**). 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 AN ACCEPTABLE SEALANT FOR DUCTS, but may be used for sealing leakage sites at the air handler's removable access panels and at filter access panels.

15810.7 Clean All Ductwork

Clean or vacuum all ducts prior to occupancy, before carpet is laid and finishes are applied.

15810.8 High-efficiency Particulate Air (HEPA) Filters

Size the air handler to accommodate the reduced air pressure caused by the filter. Provide \geq MERV 8 high-efficiency particulate air (HEPA) filters in the return air stream at the air handler, located so that return and ventilation air pass through prior to conditioning.

15810.9 Heat Recovery Ventilation (HRV) 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.

15900 Mechanical Controls

15900.1 Thermostats

All heating systems shall be designed so that each living unit has at least one programmable thermostat to control space temperature. Dwelling 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.

- A. 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. Electrical service shall be designed so that all dwelling units can be metered separately. 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.

- B.** 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.
- C.** 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.
- D.** Branch circuit load calculations for general lighting and receptacles in dwelling areas shall be a maximum of 80% of branch circuit capacity.
- E.** 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 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.

- A.** 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 system 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, or siting, designing, engineering and wiring the development to make the development "PV-ready". Information regarding local, state and federal incentives for renewable energy may be found through the Connecticut Energy Efficiency Fund (www.ctsavesenergy.org), Connecticut Light & Power (www.cl-p.com), Northeast Utilities (www.nu.com) or The United Illuminating Company (UI), depending on the project service area, or at the Database of State Incentives for Renewables and Efficiency (www.dsireusa.org).
- B.** Residential Solar Hot Water (SHW) systems may be used to provide domestic hot water, and may be more than three times as efficient than PV Systems at producing energy from the sun. "Passive" (or "compact") and "active" (or "pumped") systems typically include an auxiliary energy source (connection to a gas or fuel oil central heating system or electrical heating element), which is activated when the water in the tank falls below a minimum temperature setting; e.g., 120°. Solar water heating for washing and bathing may be used to provide 15–25% of home heating energy.

16010.2 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.

16010.3 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.

16010.4 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.

16010.5 Ceiling Fans

CHFA encourages the use of ENERGY STAR-qualified ceiling fans and/or ceiling fans equipped with lighting fixtures 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:

- Solid Aluminum Conductors
- Stranded Aluminum Conductors Smaller than #8 Awg
- Stranded Aluminum #8 Awg without Antioxidant Paste at Lugs
- 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 developments receiving CHFA funding, or other funds administered by CHFA, any building of, or exceeding, 4 dwelling units and 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 current NEC, IFC and Connecticut Fire Safety Codes. 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 Unit Electrical 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**

Lighting fixtures shall be selected to provide a minimum of glare.

- A.** Average illumination level at the task surface, in foot-candles (fc), shall be:
- Offices at desk surfaces: 50fc
 - Corridors, Lobby, Stairs: 15fc
 - Kitchen (counter top, sink and range surfaces): 30fc
 - Toilet rooms and Bathrooms at vanity tops in family developments: 15fc
 - Bathrooms at vanity tops in housing for elderly residents: 30fc.
 - Bathrooms at bathtubs: 15fc
 - Store rooms, mechanical rooms, electrical rooms, etc.: 10fc
- B.** Egress emergency lighting shall be maintained at a 1fc inside the building and to a point 20 feet outside the building exits.
- C.** Provide ENERGY STAR-qualified CFL, LED or pin-based lighting in 80% of fixtures in RESNET-defined Qualifying Light Fixture Locations.

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.

16500.3 Energy Efficient Light Bulbs

Provide ENERGY STAR-qualified compact fluorescent (CF) or light-emitting diode (LED) light bulbs (see [Eartheasy Energy Efficient Lighting](#)) in 80% of all light fixtures (min.). CF bulbs contain trace amounts of mercury, and burned-out bulbs require proper recycling and disposal. For a list of local municipal recycling coordinators in the project locality, see [Connecticut Municipal Recycling Coordinators](#).

16500.4 Insulation-Compatible (IC) Recessed Light Fixtures

Provide Insulation-Compatible (IC) lighting fixtures wherever recessed fixtures are installed in insulated framing. Specify recessed light fixtures with fluorescent lamps, or consider eco-friendly LED technology, such as the "LR6" by Cree. LR6 lamps may last more than 20 years, use less than half the energy and operate cooler than comparable fluorescent lamps, and provide warmer, glare-free lighting.

16500.5 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.

16510 Interior Luminaires

A. Interior Luminaire Requirements

1. General corridor lighting shall be fluorescent or LED lighting. This requirement is not intended to discourage the use of decorative fixtures, such as wall sconces, in which compact fluorescent or LED lamps may be used, or accent lighting with a variety of lamping to highlight artwork or architectural features. 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.
2. Common area lighting shall be fluorescent or LED lighting. This requirement is not intended to discourage the use of decorative fixtures, such as wall sconces, in which compact fluorescent or LED lamps may be used, or accent lighting with a variety of lamping to highlight artwork or architectural features.
3. Dwelling unit and common area kitchen lights shall be fluorescent. Each kitchen shall have a task light above the sink, a CFL-compatible light above the range (integrated into the range hood) and a centrally located general kitchen light.
4. Fixture Types
Bare bulb porcelain fixtures shall not be used except in basements and mechanical closets. Provide compact fluorescent lamps.

5. Exit lights shall be ENERGY STAR-qualified LED or light-emitting capacitor (LEC) fixtures.

16720 Alarm and Detection Systems

16720.1 Carbon Monoxide and Smoke Detectors

Provide carbon monoxide detectors on each floor of each unit, and as otherwise required by code. All dwelling unit smoke detectors shall be photoelectric-type. New smoke-detection systems shall be hard-wired. 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

- A. “Fully addressable” emergency call systems shall be installed in all buildings designed for elderly residents.
 1. Pull cord stations shall be provided in bathrooms 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.
 2. An annunciator panel shall be 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.
 3. 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.
 4. 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 small electric space heaters is also not allowed, unless justifiable by a life-cycle cost analysis, and specifically approved by CHFA.



Volume III

Appendices

2013

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 (FHAct) 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 FHAct 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. Part 8 defines “multifamily housing” as a project with five or more dwelling units. A “project” is defined as the whole of one or more residential structures and appurtenant structures, equipment, roads, walks, and parking lots which are covered by a single contract, or are treated as a whole for processing purposes, whether or not located on a common site. In accordance with this definition, five single family units covered by a single contract, or a single building with five units, each constitute a multifamily housing project.

7. New Federally-Assisted Housing Development:

The regulations at 24 CFR 8.22 and 8.32 state that for new construction of multifamily rental projects, a minimum of five percent of the dwelling units in a project (but not fewer than one unit) must be accessible to individuals with mobility impairments in accordance with the Uniform Federal Accessibility Standards (UFAS). UFAS is the standard that applies to facilities that are designed, built, or altered with Federal funds. An additional two percent of the dwelling units (but not fewer than one unit) must be accessible to individuals with hearing or vision impairments.

8. Substantial Alterations to Existing Federally-Financed Facilities:

The regulations at 24 CFR 8.23(a) state that if alterations are undertaken in a project containing fifteen or more units, and the cost of the alterations is 75 percent or more of the replacement cost of the completed development, then the owner must follow the new construction provisions (of 24 CFR 8.22): a minimum of five percent of the units (but not less than one unit) must be made accessible to persons with mobility impairments, in accordance with UFAS. In addition, a minimum of two percent of the units (but not less than one unit) must be made accessible to persons with hearing or visual impairments.

9. Other Alterations to Existing Federally-Financed Facilities:

The regulations at 24 CFR 8.23(b) apply when alterations are not substantial, as described in the preceding paragraph. Under 24 CFR 8.23(b), alterations to multifamily 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, then the entire unit must be made accessible. At a minimum, HUD considers alteration of an entire unit to take place when at least all of the following individual elements are replaced:

- Renovation of whole kitchens, or at least replacement of kitchen cabinets;
- Renovation of the bathroom, if at least a bathtub or shower is replaced or added, or a toilet and flooring is replaced; and
- Entrance door jams are replaced.

When the entire unit is not being altered, 100 percent of the single elements being altered must be made accessible. However, HUD strongly encourages a recipient to make the entire unit(s) accessible to and usable by individuals with mobility impairments. Doing so avoids having to make every element altered accessible, which may result in having partially accessible units that are of little or no value for persons with mobility impairments. It is also more likely that the cost of making the units accessible up-front will be less than making each and every element altered accessible. Once five percent (5%) or the higher minimum percentage prescribed by HUD, of the housing units are accessible to and usable by individuals with disabilities, the Owner no longer has to make additional units or elements of units accessible. Alterations to common areas or parts of facilities that affect accessibility of existing housing facilities must also be made to be accessible to and usable by individuals with disabilities, to the maximum extent feasible. All alterations must meet the applicable sections of the UFAS that govern alterations. Further, alterations that require removing or altering load-bearing structural members are not required.

Pursuant to 24 CFR 8.23(b), the Owner is not required to make a dwelling unit, common area, facility or element thereof accessible if doing so would impose undue financial and administrative burdens on the operation of the multifamily housing project.

The 504 accessibility requirements apply in addition to, not in lieu of, the design and construction standard provisions established in the Fair Housing Act for new construction of “covered dwellings.” The HUD regulations implementing these Fair Housing Act requirements can be found at 24 CFR 100.205.

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 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 staff will carry-out 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 the Standards.

CHFA prefers financing that provides for 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 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 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 comply with the Standards.

CHFA prefers financing that provides for a construction contingency equal to no less than 10% of the construction contract.

Appendix C: CHFA 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 the Standards. The evaluation of building components, using these criteria, will be done by CHFA 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 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 the Standards, and must comply with CHFA Procedures and CHFA/DECD Consolidated Application requirements.

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 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 19th/early 20th 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 monitors annual Prevailing Wage Building Rates published by the Connecticut Department of Labor for towns and cities in throughout Connecticut.
- B. Additional research includes the use of Location Factors for current Residential Cost Data and 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 to contact the CHFA Technical Services Department to discuss conditions which may significantly increase or decrease 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 and other conditions may result in an 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, upward adjustments would result in a new Standard SF cost

Appendix F: CHFA Technical Services-related Forms

CHFA Tech Services-related forms are listed below for informational purposes. All forms may be obtained in electronic format through downloads from the Developer Document Library on the CHFA website.

1. Tech Services Preliminary Review Forms

- Outline Specification Form Exhibit 3.9.b
- Project Information Table [Building Use and Square Footage Information]
- CHFA-DECD Consolidated Application
- Notice of Intent to Commence Construction Form
- Mortgagor's Advance Application
- Contractor's Cost Certification Obligation Statement
- Pre-Construction Meeting Agenda

2. Tech Services Construction Phase Forms

- Instructions for Contractor's Req., Contractor's CO Req. & Proposed Change Order Request
- Form 2448 MR10 – Contractor's Requisition
- Form 2448 MR11 – Contractor's Change Order Requisition
- Architect Certification Statement (reverse side of requisitions)
- Lien Track/Waiver of Lien
- Site Track #1 for 1 to 10 Buildings
- Site Track #2 for 1 to 21 Buildings
- Form 2437 – Request for Construction Change
- Form 2437 – HUD/CHFA Development Request for Construction Change
- Form 5372 – Accounting of On-site Inventory
- CHFA Requirements for Reduction of Retainage
- Certificate of General Contractor – Final Reduction of Retainage

Appendix G: CHFA Capital Improvement Project Classifications for Repairs/Replacements/Installations

CHFA requires that repair/replacement work be completed in accordance with all applicable Building Codes, State and Federal regulations and current CHFA Standards of Design and Construction. Below is a list of example projects which require certification of completion in accordance with the Standards. Examples are listed in three categories, and acceptable certifying agent(s) are indicated for each project. Depending upon the project, the acceptable certifying agent may include one or more of the following: the Owner [O], a CT-licensed/insured Building and/or Home Inspector, or HUD-approved Inspector [I], insured FHA 203K Compliance Consultant [C], Architect [A], Professional Engineer [PE], Licensed Environmental Consultant [LEC], or Approved Vendor [AV]. CHFA prefers the use of Design Professionals (Architects and Professional Engineers) whenever possible, to determine the scope of work to be included in the bid documents, coordinate bids and certify that the work has been completed in accordance with current Building Codes and CHFA Standards of Design. CHFA reserves the right to require a Design Professional on any and all replacement/repair construction projects, subject to the scope and complexity of the proposed project.

1. Classification A

If the Owner will be completing any of the following Capital Improvement Repair/Replacement/Installation projects, the Owner may certify that the work has been completed in accordance with current Building Codes, State and Federal regulations and CHFA Standards of Design and Construction:

- Air-Conditioning units in existing sleeves replacement [O]
- Bathroom cabinet/countertop/flooring replacement [O]
- Bathroom plumbing fixtures/controls/fittings replacement [O]
- Bathroom and Kitchen exhaust fan replacement [O]
- Building and site termite treatment [O]
- Carpet replacement [O]
- Decking repair/replacement [O]
- Electrical light fixtures and outlets repair/replacement [O]
- Exterior painting/caulking/weatherproofing [O]
- Exterior storm door replacement [O]
- Gutter system repair/replacement/installation [O]
- Kitchen appliance replacement [O]
- Kitchen cabinet/countertop/flooring replacement [O]
- Kitchen plumbing fixtures/controls/fittings replacement [O]
- Laundry appliance replacement [O]
- Kitchen plumbing fixtures/controls/fittings replacement [O]
- Masonry re-pointing, minor brick replacement and joint repair [O]
- Pool/tennis court/fitness center/playground repair/replacement [O]
- Power washing of exterior building elements [O]
- Security systems repair/replacement [O]
- Tree/bush/shrub trimming or removal [O]

2. Classification B

A. Classification B.1

If the Owner will be completing any of the following Capital Improvement Repair/Replacement/Installation projects, and the anticipated cost of the project is < \$25,000; the Owner may certify that the work has been completed in accordance with current Building Codes, State and Federal regulations and CHFA Standards of Design and Construction:

B. Classification B.2

If the Owner will be completing any of the following Capital Improvement Repair/Replacement/Installation projects, and the anticipated cost of the project is \geq \$25,000; a Building Design/Construction Professional/Consultant must be retained to determine the scope of work to be included in the bid documents and certify that the work has been completed in accordance with current Building Codes, State and Federal regulations and CHFA Standards of Design and Construction:

- Air-conditioning units and sleeves installation [I/C]
- Air-conditioning equipment and systems (roof-top) repair/replacement/installation [PE]
- Asphalt roof shingle repair/replacement / installation [I/C]
- Bathroom and Kitchen exhaust fans/systems installation [I/C]
- Built-up roofing repair/replacement/installation [A/PE/I]
- Electrical service repair/replacement [I]
- Exterior door replacement/installation [I/C]
- Exterior siding repair/replacement/installation [I/C]
- Hard-wired smoke detector system/carbon monoxide detector system installation [PE]
- Heating equipment/controls repair/replacement/installation [PE]
- Hot water heaters/controls replacement/installation [I/C]
- Single-ply roofing repair/replacement/installation [A/PE]
- Site paving repair/replacement/installation, including parking areas and sidewalks [I/PE]
- Window replacement/installation [I/C]

C. Classification C

If the Owner will be completing any of the following Capital Improvement Repair/Replacement/Installation projects, regardless of the anticipated cost, a Design Professional must be retained to determine the scope of work to be included in the bid documents, the bid documents must be reviewed and accepted by CHFA Technical Services prior to bid solicitation, and the building design/construction professional of record must certify that the work has been completed in accordance with current Building Codes, State and Federal regulations and CHFA Standards of Design and Construction:

- Alterations to or removal of fire-rated enclosures/separations/passages/doors [A/PE]
- Antenna; i.e. cell tower installation [PE]
- Building or site structural repairs/replacement [PE]
- Commercial space build-out [A]
- Cooling plants for buildings (cooling towers, piping, ductwork, etc.) repair/replacement/installation [PE]
- Decking/balcony repair/replacement (>24" above finished grade) [A/PE]
- Electrical service upgrade [PE]
- Electrical switchgear repair/replacement [PE]
- Elevator repair/upgrade/replacement [AV/PE]
- Emergency generator repair/replacement/installation [PE]
- Energy-efficiency upgrades (building components/systems) [A/PE]
- Exterior fire-escape repair/replacement [A/PE]
- Exterior masonry repairs where movement cracks are apparent [PE]
- Geothermal heating/cooling system installation [PE]
- Heat/fire/smoke suppression systems [AV/PE]
- Heating plants (includes boilers/furnaces and associated piping/ductwork and chimneys/flues) [PE]
- Parking structure repair/modification [A/PE]
- Photo-voltaic/solar thermal system installation [PE]
- Site grading and retaining wall repair/replacement/installation [PE]
- Site utility (storm/sanitary drainage system, and electric/gas/phone/cable line) work [PE]

Appendix H: CHFA Energy Efficiency Effectiveness

Energy efficiency effectiveness is strongly encouraged. An objective of CHFA is to maximize thermal efficiency and energy conservation in all developments approved for funding, regardless of funding type. The Development Teams should prepare and submit a Thermal Efficiency and Energy Conservation Plan with the design development submission, which takes into consideration pre-development testing and energy audits of existing buildings for minor, moderate or substantial rehabilitations, and/or pre-development energy modeling for rehabilitation projects and new construction, prepared by a Professional Engineer and/or Building Performance Institute (“BPI”)-, Residential Energy Services Network Home Energy Ratings Systems (“RESNET HERS”)- or ENERGY STAR-certified Assessors/Raters. A form for submitting Energy Use and Conservation Data is included in the current CHFA-DECD Consolidated Application (see **Exhibit 3.7.g – Energy Conservation**).

1. Energy Use and Conservation Data for Minor, Moderate or Substantial Rehabilitations

If the application is for the minor, moderate or substantial rehabilitation of existing buildings, as defined in Appendix E in the Standardsthe Thermal Efficiency and Energy Conservation Plan should include the following information:

Note: If tenants are responsible for utility costs, and usage information for all units is not currently tracked, a minimum sample of information for 10% of the units, and one of each unit type (number of bedrooms), may be used to estimate the total residential usage.

A. Current Energy Usage:

1. Management/Common Area
 - a. Total Electrical Usage for the past twelve months in kWh and MMBTU
 - b. Total Fuel Oil Usage for the past twelve months in gallons and MMBTU
 - c. Total Propane Usage for the past twelve months in ccf or Gallons, and MMBTU
 - d. Total Natural Gas Usage for the past twelve months in ccf, therms and MMBTU
2. Residential Electrical Usage for the past twelve months in kWh
 - a. Total Electrical Usage for the past twelve months in kWh and MMBTU
 - b. Total Fuel Oil Usage for the past twelve months in gallons and MMBTU
 - c. Total Propane Usage for the past twelve months in ccf or Gallons, and MMBTU
 - d. Total Natural Gas Usage for the past twelve months in ccf, therms and MMBTU

B. Projected Annual Energy Usage (net decrease or increase) upon completion of the proposed EE measures (as applicable):

1. Management/Common Area
 - a. Total Projected Annual Electrical Usage in kWh and MMBTU
 - b. Total Projected Annual Fuel Oil Usage in gallons and MMBTU
 - c. Total Projected Annual Propane Usage in ccf or Gallons, and MMBTU
 - d. Total Projected Annual Natural Gas Usage in ccf, therms and MMBTU
2. Residential Electrical Usage
 - a. Total Projected Annual Electrical Usage in kWh and MMBTU
 - b. Total Projected Annual Fuel Oil Usage in gallons and MMBTU
 - c. Total Projected Annual Propane Usage in ccf or Gallons, and MMBTU
 - d. Total Projected Annual Natural Gas Usage in ccf, therms and MMBTU

C. Proposed Energy Performance-related Improvement Summary

The Thermal Efficiency and Energy Conservation Plan should include a summary of all energy performance-related improvements included in the overall scope of proposed work, and information regarding the

applicant's efforts to secure other energy efficiency-related funding partners, and/or government-/utility-sponsored incentive commitments.

D. Building Energy Performance Summary

1. Total Current Energy Use for the past twelve months in MMBTU
2. Total Projected Annual Energy Use in MMBTU
3. Projected Reduction in Annual Energy Use in Percent
4. Cost of Energy Performance-related Improvements in Dollars
5. Projected Payback Period (Cost/Benefit Analysis) in Years

2. Energy Conservation Data for Gut Rehabilitations and New Construction

If the application is for the gut rehabilitation of existing buildings, as defined in Appendix E in the Standards, or for new construction, the Thermal Efficiency and Energy Conservation Plan should include the following information:

A. Proposed Energy Performance-related Improvement Summary

The Thermal Efficiency and Energy Conservation Plan should include a summary of all energy performance-related assemblies and equipment included in the overall scope of proposed work, and information regarding the applicant's efforts to secure other energy efficiency-related funding partners, and/or government-/utility-sponsored incentive commitments.

B. HERS Index

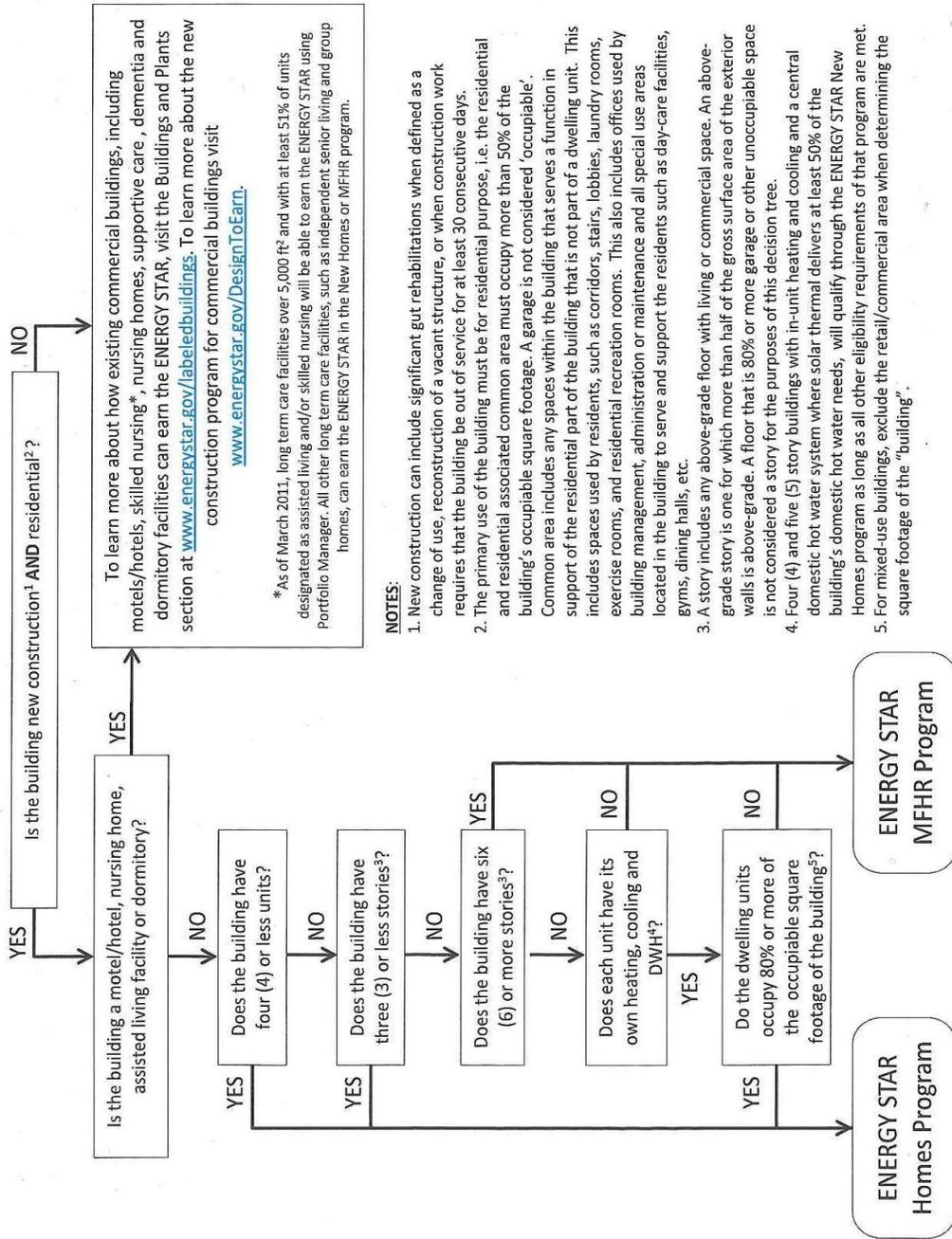
1. Based on the EPA ENERGY STAR Qualified Home Version 3.0 HERS Index Target Procedure, the projected ENERGY STAR HERS Index Target for the project and the proposed HERS Index for the project (\leq ENERGY STAR HERS Index Target)
– or –
An indication that the applicant intends to adhere to the ENERGY STAR Qualified Home Version 3.0 Prescriptive Path
2. If the application is for the gut rehabilitation of existing high-rise buildings, as defined in Appendix E in the Standards, or for the construction of a new high-rise building, and the building is eligible for the ENERGY STAR MFHR Version 1.0 Program (as determined by the EPA ENERGY STAR Multifamily New Construction Program Decision Tree – **see Appendix I**), the Thermal Efficiency and Energy Conservation Plan must demonstrate \leq 15% annual energy cost savings over ASHRAE 90.1-2007 Standards requirements
– or –
An indication that the applicant intends to adhere to the ENERGY STAR MFHR Version 1.0 Prescriptive Path

3. Professional Engineer and/or Certified Assessor/Rater Information

1. Consultant Name
2. Title
3. Firm Name/Address
4. Email Address
5. Telephone Number

Appendix I: EPA ENERGY STAR Multifamily New Construction Decision Tree, Version 1.0

EPA ENERGY STAR Multifamily New Construction Program Decision Tree, Version 1.0



Appendix J: CHFA/CEEF Energy Incentive Process

<u>CHFA</u>	<u>Utilities</u>
Pre-Design Phase	Pre-Design Phase
<p>Minor, Moderate and Substantial Rehab Projects: Owner/Developer commissions a Capital Needs Assessment (CNA) report, including a comprehensive energy assessment, in accordance with CHFA CNA requirements, in order to assess the physical condition and energy efficiency of the existing facilities, to determine the scope and budget for the proposed rehabilitation, and to establish a 20-year life-cycle replacement budget</p> <p>Gut Rehab Projects: Owner/Developer commissions a Structural Needs Assessment report in accordance with CHFA requirements</p>	Development Team Kick-off Meeting with CEEF Program Administrator to review available programs and incentives
Design Phase	Design Phase
<p>All Rehab and New Construction Projects: Owner/Developer commissions Architect/Engineers to design project in compliance with CHFA Standards of Design</p> <p>Owner/Developer submits minimum 10% complete Construction Drawings (CDs) and Energy Conservation Plan with CHFA/DECD Finance Application</p> <p>If eligible for CHFA/DECD funding, project is presented to CHFA Board of Directors</p> <p>CHFA/DECD issue Commitment Letters</p>	Architect/Engineers design qualifying EE measures into the project
Architect/Engineers complete CDs; EE measures are fully modeled/detailed/specified	Architect/Engineers complete CDs; EE measures are fully modeled/detailed/specified
Development Team submits 100% CDs (hard copy) to CHFA - Tech Services reviews for compliance with CHFA Standards of Design and Construction	Owner Developer submits 100% complete CDs (.pdf or hard copy) to CEEF Program Administrator - CEEF Program Administrator reviews plans for qualifying measures
Tech Services may request additional information from the Architect/Engineer	CEEF Program Administrator may request additional information from the Architect/Engineer
Tech Services accepts CDs for Initial Closing - Qualifying EE measures are identified - Development Team identifies project betterments to balance EE incentive funds	Utility creates a Letter of Agreement (LOA) with incentive amounts, energy savings details and verification requirements
CHFA Initial Closing	LOA is signed by Utility Management and Owner/Developer - Incentive dollars are earmarked specifically for the project
Tech Services Pre-Construction Meeting with Development Team - EE measures/incentive tracking requirements confirmed with Owner/Developer, Architect/Engineers/Energy Professionals & GC	
Construction Phase	Construction Phase
CHFA Field Observation - EE measure/incentive tracking by Owner/Developer, Architect/Engineers & GC	EE measure verification inspections/testing by HERS rater/utility staff
Project betterments implemented to balance sources and uses	Verification paperwork and other required data are submitted for utility staff review
Owner/Developer submits verification paperwork with other required information for CHFA Final Closing	Upon completion of review, project is processed for payment (larger projects can be paid in phases)
CHFA Final Closing	