APPENDICES

Single-family Residential Design Guidelines

Marin County Community Development Agency

Technical Appendices

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Appendix A

Design Guidelines User's Checklist

Appendix A

Design Guidelines User's Checklist

The following checklist should be used by staff in reviewing applications to determine conformance with the Design Guidelines. It should also be used by applicants in designing the project.

	YES	NO	N/A
SITE DESIGN			
1. Has vegetation removal been minimized? (A-1.1)	☐	☐	☐
2. Does site design minimize storm water runoff? (A-1.2)	☐	☐	☐
3. Does site design protect streams? (A-1.3)	☐	☐	☐
4. Is grading minimized? (A-1.4)	☐	☐	☐
5. Does design of road access minimize grading? (A-1.5)	☐	☐	☐
BUILDING RELATIONSHIPS			
6. Does the building design include stepbacks? (B-1.1)	☐	☐	☐
NEIGHBORHOOD COMPATIBILITY			
7. Does the structure reflect the existing street setback pattern? (C-1.1)	☐	☐	☐
8. Does the building have varied street setbacks? (C-1.2)	☐	☐	☐
9. Does the building have varied interior setbacks? (C-1.3)	☐	☐	☐
10. Is the garage designed to minimize street presence? (C-1.4)	☐	☐	☐
11. Are parking areas close to the residence? (C-1.5)	☐	☐	☐
12. Do window placements respect privacy? (C-1.6)	☐	☐	☐
13. Are fence and retaining wall heights minimized? (C-1.7)	☐	☐	☐
14. Does the landscape design protect privacy? (C-1.8)	☐	☐	☐
15. Is mechanical equipment screened? (C-1.9)	☐	☐	☐
16. Are noise generators properly buffered? (C-1.10)	☐	☐	☐
17. Are exterior lights compatible with surroundings? (C-1.11)	☐	☐	☐
VISUAL BULK			
18. Is building mass divided into smaller parts? (D-1.1)	☐	☐	☐
19. Is roofline broken up? (D-1.2)	☐	☐	☐
20. Does the design avoid excessive cantilevers/overhangs? (D-1.3)	☐	☐	☐
21. Are exterior wall surfaces articulated? (D-1.4)	☐	☐	☐
22. Is site design sensitive to hillside setting? (D-1.5)	☐	☐	☐
23. Are ridgeline areas avoided? (D-1.6)	☐	☐	☐
24. Are exterior colors and materials compatible with the setting? (D-1.7)	☐	☐	☐
GREEN AND UNIVERSAL BUILDING DESIGNS			
25. Does the project incorporate green building measures? (E-1.1)	☐	☐	☐
26. Are universal design features provided? (E-1.2)	☐	☐	☐

Appendix B

Design Review Administrative Procedures and Design Review Submittal Checklist

Appendix B

Design Review Administrative Procedures and Design Review Submittal Requirements

I. Design Review Administrative Procedures

The Marin County Community Development Agency staff evaluates Design Review proposals according to the following basic procedures.

a. Submittal of Application – The formal processing of a Design Review application begins with the submittal of application forms, project plans, and other materials that are listed in literature available at the public information office of the Community Development Agency Planning Division. These materials are reviewed on a preliminary basis by staff at the public information office to determine if they are complete enough for acceptance. The submittal of application fees is also required at this time.

b. Completeness Review – After the application has been accepted for processing, it is assigned to a staff planner who is responsible for coordinating review of the project. The application materials are transmitted to various agencies and the local community advisory group (if one exists in the project area) for a more thorough review with respect to the completeness of the information.

Staff also solicits early comments from community advisory groups regarding the merits of the proposal -- that is to say whether the project conforms to relevant standards and policies. If the application materials are not complete, staff will issue a notice of project status to the applicant specifying the additional information required to complete the application. The re-submittal of new information is also reviewed by other agencies much in the same manner as described above. Alternatively, once an application is determined to be complete, the applicant is notified through a notice of project status. During the initial completeness review, staff will visit the project site to review the plans and to post a public notice generally describing the proposal.

c. Public Notice – After an application is deemed complete, the Community Development Agency mails a public notice to property owners in the project area, as well as interested public agencies and organizations. The public notice provides a brief description of the project, its location, and indicates the minimum length of the public review period prior to a decision being made on the proposal.

d. Administrative Decision on Application – Following closure of the public review period, the Community Development Agency will usually issue an administrative decision as follows:

- Approval; or

- Approval with conditions requiring either modifications to the project and/or measures required to be taken during the construction process; or
- Denial.

The administrative decision contains findings that disclose the rationale for the decision based upon the project's conformance with applicable policies, standards and guidelines.

e. Public Hearing – As an alternative to the administrative decision described above, the project may be referred to either the Planning Commission or Deputy Zoning Administrator for a decision. Design Review applications are often referred to the Planning Commission if staff has identified a substantive public policy issue arising from the proposal, or a significant amount of public controversy has developed during the review process. In referring the project to a public hearing, the Community Development Agency will issue a report advising the decision maker on the consistency with applicable standards and guidelines, the statutory limits of the review authority, and the necessity for substantiating the recommendation by identifying those standards and guidelines that are satisfied or not satisfied by the proposed development.

Design Review proposals that also involve a coastal permit, use permit, or variance are referred to the Deputy Zoning Administrator for a decision. Decisions by the Planning Commission and Deputy Zoning Administrator are made at noticed public hearings where testimony from the applicant and interested members of the public may be received. At the close of the public hearing, the Planning Commission or Deputy Zoning Administrator will announce their decision to approve, approve with conditions, or deny the application. These decisions are also based upon findings and include conditions if the project is approved.

f. Appeals – Decisions by staff and the Deputy Zoning Administrator may be appealed to the Planning Commission according to the procedures of the Development Code. Planning Commission decisions may be similarly appealed to the Board of Supervisors, which is the final appellate decision making body. Initiating an appeal involves the filing of a petition and fees by an aggrieved party within a prescribed time frame.

II. Steps in the Design Review Process for Single-family Residential Development

a. Community Input - A very important aspect of the Design Review process is the community input received by the Community Development Agency during public comment periods and during public hearings. Property owners should contact neighbors in advance of submitting a permit application to the County for the purpose of soliciting input during the preliminary design stage of a project and considering project modifications in response to neighborhood concerns. Resolving design issues with neighboring property owners before plans are submitted to the County can be an

effective way of minimizing the time and costs associated with the Design Review process. Design changes made through early community-based planning efforts should, of course, be consistent with these Design Guidelines and other applicable standards.

b. Staff Consultation - Before planning and design begins, the property owner or developer is strongly urged to visit the public information office at the Community Development Agency. The nature of the project and site should be described. The planning staff member will clarify the required permits, application and review process and submittal requirements. Critical design issues and Design Review process important to the project may be discussed depending upon the amount and accuracy of information contained in the project description.

c. Pre-application Review (optional) This step is optional, and is intended for larger, more complex projects. Pre- application review requires the submittal of a project description, preferably including conceptual plans, and a processing fee. A pre-application site visit may be requested, but is also intended to be used only for large, complex, or controversial projects or projects requiring extensive grading or alteration of natural features.

Pre-application review will allow the property owner/developer to meet with the Community Development Agency staff to discuss basic intentions and plans before investing time in detailed design. Input from other public agencies and community advisory groups may be solicited. At this stage, site analysis and design, location of buildings, grading, basic form of buildings, and landscape concepts are important. Building elevations and other information may be discussed, but should be kept in preliminary form. The staff will not take official action on a project until a formal application is filed and processed.

d. Design Review Clearance Considerations Design Review applications are reviewed under a three-tiered process. Applications which are of a limited scope (e.g., small additions to existing structures and construction of accessory structures) may require minor staff-level review and approval through the Design Review Clearance process. (On some minor projects, the Community Development Agency staff may determine the work to be exempt from Design Review.) Projects of greater scope or on critical sites are subject to Design Review and approval by staff and if a public hearing is required, the Deputy Zoning Administrator or Planning Commission. This process will allow minor projects to be processed without needless delay, and major projects, or those on critical sites, to be reviewed in a more formal and extensive manner.

e. Full Submittal, Application and Review The submittal of either a Minor Design Review or full Design Review will be required unless a Design Review Clearance has been approved or the project is determined to be ministerial, and therefore not subject to the Design Review process. Minor Design Review is required for residential

additions, detached accessory buildings, and other residential accessory improvements that do not qualify for a Design Review Clearance. Design Review is usually required for new single-family residences, substantial remodels and expansions. The submittal requirements for Minor Design Review and Design Review are basically the same, although more extensive submittal information and longer processing time frames may be required for larger and/or more controversial projects.

III. Design Review Submittal Requirements

The following is a list of the principal items that are typically required for the submittal of a Design Review application. A detailed Zoning/Development Application Submittal Checklist should be obtained at the Marin County Community Development Agency Planning Division office before the application materials are prepared and filed for processing (because the list may be updated periodically, it is important to obtain the most current version of the submittal requirements before completing the submittal package). Some of the items listed below and/or on the Submittal Checklist may be waived by staff depending upon the specific nature and location of a Design Review proposal.

Application Requirements

1. Completed Zoning/Development Application and Submittal Checklist with checkmark next to each item (or written explanation as to why an item was not submitted)

2. Completed Environmental Review Questionnaire/Submission form

3. Written Project Description

4. Project data summary, including existing/proposed lot area, floor area, building height, etc.

5. Site Plan including property dimensions, topography, existing/proposed building setbacks, footprint of existing/proposed structures, street right-of-way, existing/proposed parking, fences, driveways, existing/proposed landscaping, septic systems, public and privately-owned utilities, etc.

6. Floor Plans (1/4" scale or larger preferred)

7. Building Elevations (1/4" scale or larger preferred) with heights, materials and colors noted

8. Building Cross Sections

9. Site Improvements (carports, fences, trash enclosures, mechanical equipment screens, exterior lighting)

10. Grading and Drainage Plan

11. Landscape Plan

12. Color/materials Palette

13. Site Photographs

14. Visual Simulation or three-dimensional illustration of project in context

15. Preliminary Title Report

Appendix C

Development Code Design Review Regulations

Appendix C

Development Code Design Review Regulations

The following excerpt of the Design Review regulations has been taken from Marin County Code Title 22.

CHAPTER 22.42 - DESIGN REVIEW

Sections:

22.42.010 - Purpose of Chapter

This Chapter provides procedures for filing, processing and approval of Design Review for proposed development throughout the unincorporated areas of the County. Design Review consists of a discretionary review of plans and proposals for land use and design of physical improvements in order to implement the goals of the Countywide Plan and to ensure that:

A. Sound and creative design principles are used by applicants in designing proposed projects, which will result in high quality site planning and architectural design, and the innovative use of materials, construction methods, and techniques;

B. Site Planning, building design, and construction practices promote resource conservation through climate responsive design, use of renewable energy and resources, and cost effective use of resource conserving materials where practicable and feasible;

C. The natural beauty of the County, and the public's ability to use and enjoy it, are preserved and encouraged;

D. The design of the built environment respects and preserves the natural beauty of the County and the environmental resources found within;

E. The exterior appearance of proposed structures, along with their associated landscaping, parking, signs, etc. is compatible and harmonious with the design, scale, and context of surrounding properties;

F. The development of paper streets and/or vacant properties which adjoin paper streets is undertaken in such a way as to minimize the impacts associated with the development of paper streets; and

G. Conflicts between land uses are eliminated, environmental values of the site are preserved, and adverse physical or visual effects which might otherwise result from unplanned or inappropriate development, design, or placement are minimized or eliminated.

22.42.020 - Applicability

A. Design Review required. All new structures and physical improvements, and additions, extensions, and exterior changes, of or to existing structures and/or relocation of physical improvements shall be subject to Design Review, whether or not a Building Permit is required, except as otherwise provided in Section 22.42.020.B., below. "Physical improvements" may also include, but are not limited to, the following:

1. Driveways;

2. Fences and walls;

3. Off-street parking and loading areas;

4. Improvements within or adjoining paper streets;

5. Retaining walls;

6. Signs (plans for signs may be considered in the course of Design Review, in lieu of sign review [Section 22.28.080], when the sign plans are included with the Design Review application);

7. Single-family dwellings and residential accessory structures in Planned Districts;

8. Trash (solid waste) enclosures; and

9. Bridges.

B. Exemptions from Design Review. The following developments and physical improvements are exempt from Design Review:

1. Single-family residences and accessory structures in A, A2, C1, H1, RA, RR, RE, R1, R2, and VCR zoning districts that contain 4,000 square feet of total building area or less and are 30 feet in height or less, except as provided by Sections 22.42.030 (Substandard Building Sites), 22.42.045 (Anadromous Fish Streams and Tributaries), and 22.42.040.C (Design Review for Proposed Development Along Paper Streets), and except where a Community Plan adopted by the Board of Supervisors requires Design Review to implement specific design standards;

2. Single-family residences and accessory structures in C-RA, C-R1, C-R2, and C-H1 zoning districts that contain 4,000 square feet of total building area or less and are 25 feet in height or less, except as provided by Sections 22.42.030 (Substandard Building Sites), 22.42.045 (Anadromous Fish Streams and Tributaries), and 22.42.040.C (Design Review for Proposed Development Along Paper Streets), and except where a Community Plan adopted by the Board of Supervisors requires Design Review to implement specific design standards;

3. Agricultural accessory structures that comply with the Stream Conservation Area setbacks established in the Countywide Plan, the Planned District Development Standards for

agricultural zones (Sections 22.08.040, 22.16.040, and Article V (unless otherwise subject to a categorical exclusion or exemption from Coastal Permit requirements pursuant to Article V), and that are 300 feet or more from a property line of an abutting parcel in separate ownership, and which are at least 300 feet from a street. This exemption does not apply to facilities for processing or retail sale of agricultural products;

4. In the A, A-2, C1, H1, RA, RR, RE, R1, R2, VCR, C-RA, C-R1, C-R2, C-VCR, and C-H1 zoning districts, fences or walls that comply with the height limits and standards specified in Section 22.20.050 (Height Measurement and Height Limit Exceptions) and as restricted by Chapter 13.18 (Visibility Obstructions) of the County Code;

5. In the A, A-2, C1, H1, RA, RR, RE, R1, R2, VCR, C-RA, C-R1, C-R2, C-VCR, and C-H1 zoning districts, bridges that comply with the height limits and standards specified in Section 22.20.055 (Bridge Standards);

6. Signs subject to the regulations of Chapter 22.28 (Signs);

7. Other work that the Director determines to be minor and incidental in nature, and which is in compliance with the purpose of this Chapter; and

8. Repair or reconstruction work resulting from an emergency or natural disaster.

22.42.030 - Substandard Building Sites

Where a vacant legal parcel is proposed for single-family residential development, and when the parcel is at least 50 percent smaller in total area than required for new parcels under the applicable zoning district or slope regulations, in compliance with Section 22.82.050 (Hillside Subdivision Design Standards), whichever is more restrictive, the proposed development shall be subject to Design Review. In these instances, the exemption from Design Review provided by Section 22.42.020.B.1, above, shall be void, and setback requirements shall be waived, but applied where appropriate. The subsequent development and physical improvements of these properties shall continue to be subject to Design Review.

22.42.040 - Design Review for Proposed Development Along Paper Streets

A. Purpose. The purpose of the Subsection is to provide regulations for proposed new development along recorded undeveloped streets in the County, which are shown on County maps as paper streets, to prevent inappropriate development. See Article VIII (Development Code Definitions) for the definition of a paper street.

B. Applicability. The provisions of this Subsection apply to development proposed on parcels abutting a paper street, and to the construction of access to a parcel along a paper street except for parcels served by a driveway extending from a previously improved and paved access which does not exceed a length of 250 feet or a slope of 20 percent, and does not traverse a paper street right-of-way.

C. Design Review required. Design Review shall be required for all development and improvements proposed on parcels accessed by paper streets, without regard to the size of the parcels or the applicable zoning district.

22.42.045 – Anadromous Fish Streams and Tributaries

In those instances where a vacant legal lot of record in the Countywide Plan's City Centered and Inland Rural Corridor is proposed for development, any proposed development within the Countywide Plan's Stream Conservation Area that adjoins a mapped anadromous fish stream and tributary shall be subject to Design Review as provided by this chapter if the lot is zoned A, A-2, R-A, H-1, O-A, R-R, R-E, R-1, R-2, R-3, R-3-A, C-1, C-2, A-P, M-1, M-2, and VCR, including all combined zoning districts. Development includes all physical improvements, including, but not limited to, buildings, structures, parking and loading areas, driveways, retaining walls, fences, and trash enclosures. The determination of the applicability of this requirement shall be based on the streams and tributaries shown on the map entitled "Marin County Anadromous Fish Streams and Tributaries," which is maintained and periodically updated by the Community Development Agency.

22.42.050 - Application Filing, Processing and Review

A. **Purpose.** This Section provides procedures for the discretionary review of proposed developments.

B. **Filing and processing.** All Design Review applications shall be completed, submitted, and processed in compliance with Chapters 22.40 (Application Filing and Processing, Fees), and Section 22.40.050 (Initial Application Review).

Design Review application forms are available at the Agency's public information counter.

C. **Notice of action and/or hearing date.** Administrative decisions and public hearings on a proposed Design Review application shall be noticed in compliance with Chapter 22.118 (Notices, Public Hearings & Administrative Actions). The Director may provide expanded public notice to ensure maximum public awareness of any Design Review application.

D. **Project review procedure.** The Director shall approve, conditionally approve, or deny all Design Review applications in compliance with Section 22.42.060 (Decision and Findings), except as follows:

1. **Referral to Commission.** When the Director finds that significant policy issues are raised by the proposed project, the Director may refer the Design Review application to the Commission for a final determination.

2. **Zoning Administrator review.** Where the Design Review application is associated with a permit application that requires a public hearing, the Design Review action may be taken by the Zoning Administrator.

22.42.060 - Decision and Findings

The review authority shall issue the decision and the findings upon which the decision is based. The review authority may approve or conditionally approve an application, with or without conditions, only if all of the following findings are made:

A. The proposed development will properly and adequately perform or satisfy its functional requirements without being unsightly or creating incompatibility/disharmony with its locale and surrounding neighborhood;

B. The proposed development will not impair, or substantially interfere with the development, use, or enjoyment of other property in the vicinity, including, but not limited to, light, air, privacy and views, or the orderly development of the neighborhood as a whole, including public lands and rights-of-way;

C. The proposed development will not directly, or cumulatively, impair, inhibit, or limit further investment or improvements in the vicinity, on the same or other properties, including public lands and rights-of-way;

D. The proposed development will be properly and adequately landscaped with maximum retention of trees and other natural features and will conserve non-renewable energy and natural resources;

E. The proposed development will be in compliance with the design and locational characteristics listed in Chapter 22.16 (Planned District Development Standards);

F. The proposed development will minimize or eliminate adverse physical or visual effects which might otherwise result from unplanned or inappropriate development, design, or placement. Adverse effects include those produced by the design and location characteristics of the following:

1. The area, heights, mass, materials, and scale of structures;

2. Drainage systems and appurtenant structures;

3. Cut and fill or the reforming of the natural terrain, and appurtenant structures (e.g., retaining walls and bulkheads);

4. Areas, paths, and rights-of-way for the containment, movement or general circulation of animals, conveyances, persons, vehicles, and watercraft; and

5. Will not result in the elimination of significant sun and light exposure, views, vistas, and privacy to adjacent properties.

G. The project design includes features which foster energy and natural resource conservation while maintaining the character of the community.

H. The design, location, size, and operating characteristics of the proposed use are consistent with the Countywide Plan and applicable zoning district regulations, are compatible with the existing and future land uses in the vicinity, and will not be detrimental to the public interest, health, safety, convenience, or welfare of the County.

Appendix D

Development Code Planned District Development Standards

Appendix D

Development Code Planned District Development Standards

The following development standards are established in the Development Code for proposed development and new land uses in Planned District zones (e.g., RSP, RMP, and ARP and the Coastal Zone counterparts) and where otherwise applicable through specific code sections. The Development Code and interim version of Title 22 Zoning (for projects located within the Coastal Zone) should be carefully reviewed for other relevant standards pertaining to single-family residential development.

Non-Coastal Planned District Zones

22.16.030 - Planned District General Standards

A. Purpose. This Section provides standards for the development of varied types of land uses designed without the confines of specific yard requirements, where amenities resulting from flexibility of design will benefit the public welfare or other properties in the community, in a manner that will implement the policies of the Marin Countywide Plan.

B. Applicability. The standards of this Section apply to development and new land uses within the planned zoning districts, in addition to the provisions of Section 22.16.020 (Planned District General Standards).

C. Subdivisions, residential density. The minimum lot area for new subdivisions, and the maximum density for residential projects within the planned districts, shall be evaluated for consistency with the Marin Countywide Plan and shall be determined through the processes of Master Plan, Precise Development Plan, and Tentative Map approval, rezoning the site, and shall be shown on the Zoning Map.

D. Site planning standards. The minimum setback requirements, floor area ratio, maximum site coverage, height limits, and other development standards, applicable to a site in a planned district, shall be determined through Master Plan or Precise Development Plan (Chapter 22.44), or Design Review (Chapter 22.42), as applicable.

E. Access:

1. Roads. In ridge land areas designated by the Marin Countywide Plan, roads shall be designed to rural standards. (Generally, not more than 18 feet pavement width, depending on safety requirements. A minimum of 16 feet may be permitted in certain very low use areas, as provided in the improvement standards established in compliance with Title 24, Sections 24.04.020 et seq. of the County Code (Roads).) No

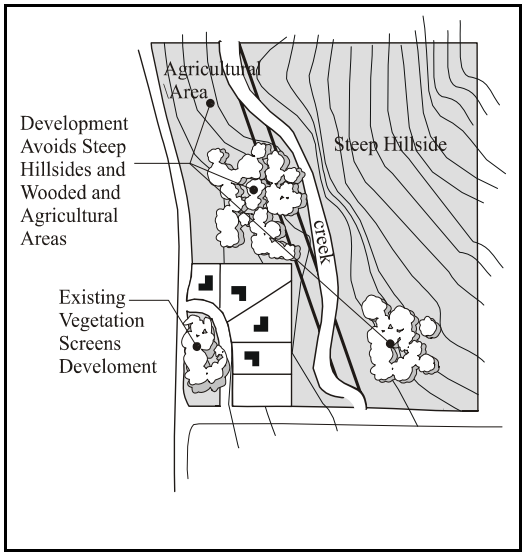
new roads shall be developed where the required grade is more than 15 percent unless the review authority determines that the roads can be built without environmental damage, comply with State fire safety regulations, and be used without public inconvenience.

2. **Driveways.** Driveways shall be designed in compliance with Title 24, Sections 24.04.240 et seq. of the County Code (Driveways). Driveway length shall be minimized, consistent with the clustering requirements of following Subsection F.1.

F. Building location:

1. **Clustering requirement.** Structures shall be clustered in the most accessible, least visually prominent, and most geologically stable portions of the site, consistent with needs for privacy where multiple residential units are proposed. Clustering is especially important on open grassy hillsides; a greater scattering of buildings may be preferable on wooded hillsides to save trees. The prominence of construction shall be minimized by placing buildings so that they will be screened by existing vegetation, rock outcroppings or depressions in topography. In agricultural areas, residential development shall be clustered or sited to minimize possible conflicts with existing or possible future agricultural uses.

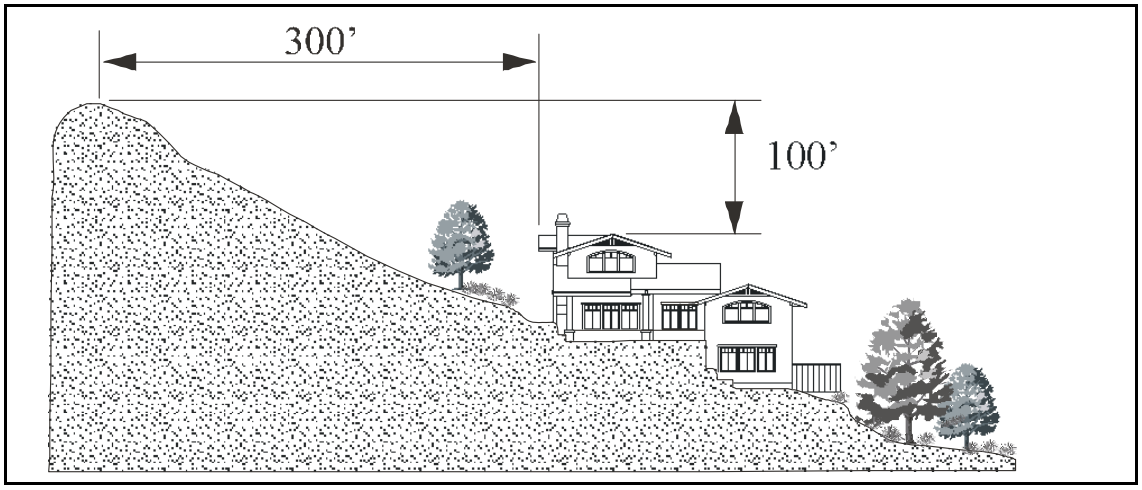
FIGURE 2-2
CLUSTERING OF DEVELOPMENT



2. **Development near ridgelines.** No construction shall occur on top of, or within 300 feet horizontally, or within 100 feet vertically of visually prominent ridgelines, whichever is more restrictive, unless no other suitable locations are available on the site. If structures must be placed within this restricted area because of site constraints,

they shall be in locations that are the least visible from adjacent properties and view corridors.

FIGURE 2-3
LOCATION OF STRUCTURES NEAR RIDGELINES



3. **Energy conservation.** Solar access shall be considered in the location, design, height and setbacks of all buildings. Generally, buildings should be oriented in a north/south fashion with the majority of glazing on the south wall or walls of the buildings.

4. **Noise mitigation.** Noise impacts on residents in nearby areas shall be minimized through the placement of buildings, recreation areas, roads and landscaping.

G. Facilities. Where possible, facilities and design features called for in the Marin Countywide Plan shall be provided on the site. These include units with three or more bedrooms, available to households with children; child-care facilities; use of reclaimed waste water; use of materials; siting; and construction techniques to minimize consumption of resources such as energy and water; use of water-conserving appliances; recreation facilities geared to age groups anticipated in the project; bus shelters; design features for bicycle paths to accommodate people with disabilities linked to City-County systems; and facilities for composting and recycling.

H. Landscaping. Introduced landscaping should be designed to minimally disturb natural areas, and shall be compatible with the native plant setting. Landscaping plans should be prepared in compliance with Chapter 22.26 (Landscaping). Landscaping plans should consider fire protection, solar access, the use of native and drought tolerant plant species and minimal water use. Planting should not block scenic views from adjacent properties or disturb wildlife trails. See also Chapter 22.26 (Landscaping).

I. Lighting, exterior. Exterior lighting visible from off-site should be allowed for safety purposes only, shall consist of low-wattage fixtures, and should be directed downward and

shielded to prevent adverse lighting impacts on nearby properties, subject to the approval of the Director.

J. Open space areas. Project approval may require the preservation of land as open space to protect rural visual character, wildlife habitat, riparian corridors and wetlands.

1. Open space dedication. Land to be preserved as open space may be dedicated in fee title to the County or other agency designated by the County before issuance of any construction permit, or may remain in private ownership with appropriate scenic and/or open space easements/agreements granted to the County in perpetuity. The County may require reasonable public access across those lands remaining in private ownership, consistent with Federal and State law.

2. Maintenance. The County or other designated public agency will maintain all open space lands accepted in fee title, as well as public access and trail easements across private property. Open space lands that remain in private ownership with scenic easements shall be maintained in compliance with the adopted policies of the Marin County Open Space District and may require the creation of a homeowners' association or other organization to maintain the private open space.

3. Open space uses. Uses in open space areas shall be in compliance with policies of the Marin County Open Space District. Generally, uses shall have no or minimal impact on the natural environment. Pedestrian and equestrian access shall be provided where possible and reasonable.

K. Project design:

1. Height limits for structures:

a. 30 feet for primary structures, 15 feet for accessory structures; and

b. The floor level of the lowest floor shall not exceed 10 feet above natural grade at the lowest corner.

c. Where a ridge lot is too flat to allow placement of the house in compliance with Subsection F.2 above, the maximum height shall be 18 feet.

d. Where allowed, agricultural accessory structures located below ridgetops may exceed the above height limits with Design Review approval. See Chapter 22.42 (Design Review).

e. These requirements may be waived by the Director if the Director determines site terrain features make the above height limits ineffective, or unnecessary in minimizing the visibility of the proposed structures.

2. **Materials and colors.** Building materials and colors shall be chosen to blend into the natural environment unobtrusively, to the greatest extent possible.

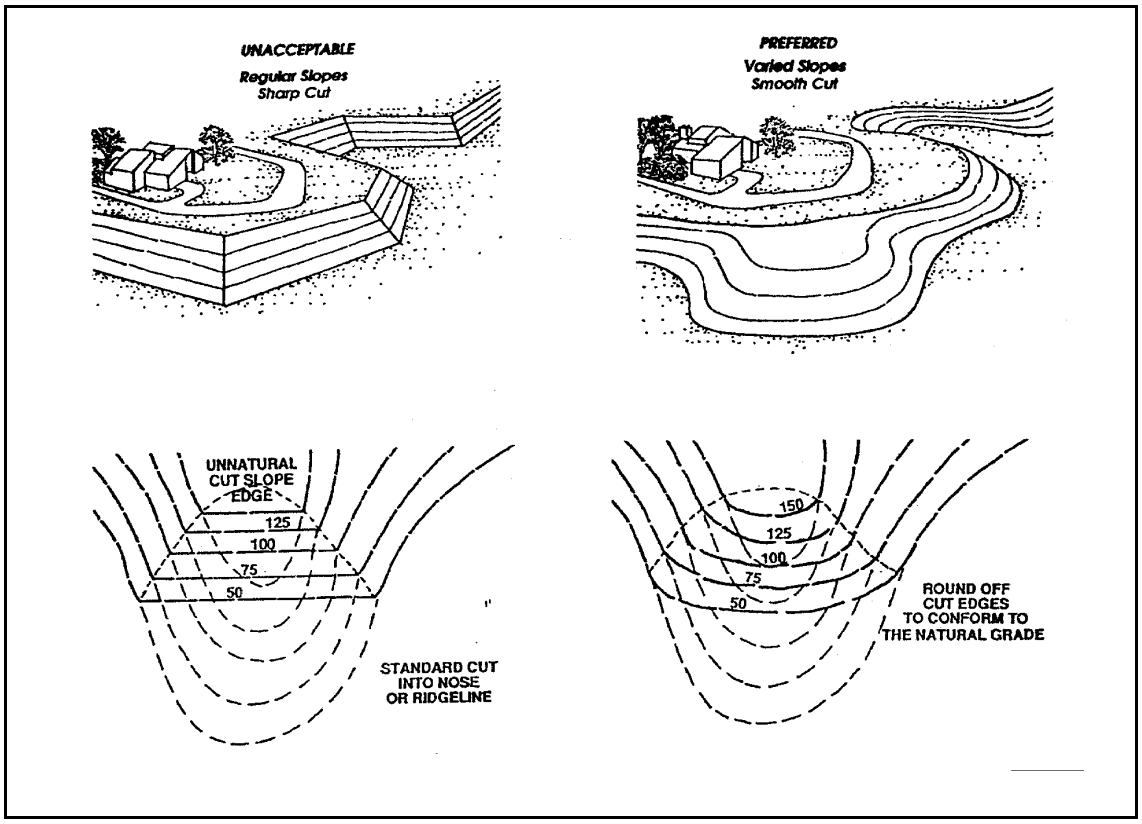
L. Site preparation.

1. **Grading.** Grading shall occur in compliance with Title 23, Chapter 23.08 of the County Code (Excavating, Grading and Filling), but shall be held to a minimum. Every reasonable effort shall be made to retain the natural features of the land: skylines and ridgetops, rolling land forms, knolls, native vegetation, trees, rock outcroppings, and watercourses. Where grading is required, it shall not create flat planes and sharp angles of intersection with natural terrain. Slopes shall be rounded and contoured to blend with existing topography. See Figure 2-4 (Desirable Grading Practice).

2. **Drainage.** Areas adjacent to creeks shall be maintained in their natural state as much as possible. All construction shall ensure drainage into the natural watershed in a manner that will avoid significant erosion or damage to adjacent properties. Impervious surfaces shall be minimized.

3. **Trees and vegetation.** Every effort shall be made to avoid tree removal, or changes or construction that would cause the death of existing trees, rare plant communities, and wildlife habitats.

FIGURE 2-4
DESIRABLE GRADING PRACTICE



4. **Fire hazards.** Development shall be permitted in areas subject to wildfire threat only where the review authority determines there is adequate access for fire and other emergency vehicles, an adequate water supply, a reliable fire warning system, and fire protection service. Setbacks for firebreaks shall be provided if necessary. Projects shall comply with State fire safe requirements including defensible space and residential construction techniques.

5. **Geologic hazards.** Construction shall not be permitted on identified seismic or geologic hazard areas such as on slides, on natural springs, on identified fault zones, or on bay mud without approval from the Department of Public Works, based on acceptable soils and geologic reports.

6. **Watershed areas.** All projects within water district watershed areas shall be referred to the affected district for review and comment. Damaging impoundments of water shall be avoided.

M. Utilities. Street lights in ridge land areas shall be of low intensity and low profile. Power and telephone lines shall be undergrounded in all areas, where feasible.

N. Plan consistency. Project approval shall require findings of consistency with the Marin Countywide Plan and any applicable Community Plan that may have more restrictive standards than the preceding provisions of this Section.

22.16.040 - Additional ARP District Standards

The following standards apply to development and new land uses within the ARP zoning district, in addition to the provisions of Section 22.16.030 (Planned District General Standards).

A. Agricultural and open space uses. Agricultural uses shall be encouraged in ARP zones.

1. As part of the Master Plan review process, usable agricultural land should be identified and efforts made to preserve and/or promote its use. Agricultural land not presently in production, may be preserved as undeveloped private open space to be made available in the future on a lease basis for compatible agricultural uses. The primary intent shall be to preserve agricultural land not in production for future agricultural uses, not to provide open space/recreational land uses that will interfere with agricultural operations.

2. Lands to be preserved for agriculture and/or open space use may require the creation of a homeowner's association or other organization for their maintenance.

3. The nature and intensity of large-scale agricultural uses should be described in the form of an agricultural management plan prepared by the landowner or lessee and approved by the County. Management plans should consider intensity of grazing, water runoff protection, chemical and fertilizer use, and separation from existing or proposed residential uses, to preserve agricultural land practices.

4. In some cases, the County may require reasonable public access across those lands remaining in private ownership. Pedestrian and/or equestrian access shall be provided where consistent with adopted County and coastal plans, where not in conflict with agricultural uses, and where liability issues have been resolved. Public access for pedestrian and/or equestrian purposes shall be required as a condition of plan approval.

B. Fire protection. In rural areas, and areas without public water systems, on-site water storage capacity may be required for each single-family dwelling, subject to the requirements of the County Fire Department. In planned or cluster developments, provisions should be made for common water storage facilities and distribution systems, where feasible. Maintenance of these water storage facilities and distribution systems should be performed according to a plan approved by the County Fire Department.

Coastal Planned District Zones

The following standards from the Marin County Development Code have been approved by the County and are subject to final approval by the California Coastal Commission. They should, therefore, be used as guidelines until approved by the Coastal Commission. The current Coastal Zone regulations in Chapter 22.57 of the interim version of Title 22 should also be reviewed and followed when designing residential projects in the Coastal Zone.

22.66.030 - Planned District General Development Standards

A. Access:

1. Roads. In coastal ridge land areas designated by the Marin Countywide Plan, roads shall be designed to rural standards. Road designs shall minimize road length and maximize the amount of undivided agricultural land.

Roads shall be generally designed with not more than 18 feet pavement width, depending on safety requirements. A minimum of 16 feet may be permitted in certain very low use areas, as provided in the improvement standards established in compliance with Sections 24.04.020 et seq. of the County Code (Roads).

2. Driveways. Driveways shall be designed in compliance with Sections 24.04.240 et seq. of the County Code (Driveways). Driveway length shall be minimized, consistent with the clustering requirements of Subsection D.1 below (Building Location - Clustering Requirement). Applicants are encouraged, to the extent permitted by applicable laws, to utilize pervious surface materials (e.g., turfblock, porous asphalt and gravel) for new or modified driveways to reduce the area of impervious surface and the extent of storm water runoff.

B. Fire protection. In rural areas, and/or areas without water systems, on-site water storage capacity may be required for each single-family dwelling, subject to the requirements of the County Fire Department. Where feasible, the design of planned or cluster developments should include provisions for common water storage facilities and distribution systems. Maintenance of these water storage facilities and distribution systems should be performed according to a plan prepared by the applicant and approved by the County Fire Department.

C. Building design:

1. Height limits for structures:

a. The height limit is 25 feet for primary structures and 15 feet for accessory structures.

b. The floor level of the first floor shall not exceed 10 feet above grade at the lowest corner.

c. Where a ridge lot is too flat to allow placement of the house in compliance with Subsection D.2 below (Building Location - Development Near Ridgelines), the maximum height shall be 18 feet.

d. Where allowed, agricultural accessory structures located below ridgetops may exceed the above height limits with Design Review approval (Chapter 22.42, Design Review).

e. These requirements may be waived by the Director if the Director determines site terrain features make the above height limits ineffective, or unnecessary in minimizing the visibility of the proposed structures.

2. Materials and colors. Building materials and colors should emphasize earth tones, and be chosen to blend into the natural and built environment unobtrusively, to the greatest extent possible. Traditional colors for agricultural structures (red, whitewash, etc.) are appropriate for these structures in agricultural zoning districts.

D. Building location:

1. Clustering requirement. Structures shall be clustered in the most accessible, least visually prominent, and most geologically stable portions of the site, consistent with needs for privacy where multi-family residential units are proposed. Non-agricultural development shall be clustered to retain the maximum amount of land in agricultural production or available for future agricultural use. Homes, roads, residential support facilities, and other non-agricultural development, shall be clustered on no more than five percent of the gross acreage, to the extent feasible, with the remaining acreage retained in agricultural production and/or open space. Proposed development shall be located close to existing roads, or not require new road construction or improvements resulting in significant diminution of the existing or potential agricultural use of the land, grading that is inconsistent with the natural topography of the site, removal of significant vegetation, and degradation of the natural visual qualities of the site. Proposed development shall also be sited to minimize impacts on scenic resources, wildlife habitat and streams, and adjacent agricultural operations.

Clustering is especially important on open grassy hillsides; however, a greater scattering of buildings may be preferable on wooded hillsides to save trees. The prominence of construction shall be minimized by placing buildings so that they will be screened by existing vegetation, rock outcroppings or depressions in topography. In agricultural areas, residential development shall be clustered or sited to minimize possible conflicts with existing or possible future agricultural uses.

2. Development near ridgelines. No construction shall occur on top of, or within 300 feet horizontally, or within 100 feet vertically, of visually prominent ridgelines, whichever is more restrictive, unless no other suitable locations are available on the site. If structures must be placed within this restricted area because of site constraints,

they shall be in locations that are the least visible from adjacent properties and view corridors.

3. **Energy conservation.** Solar access shall be considered in the location, design, height and setbacks of all structures. Generally, structures should be oriented in a north/south fashion with the majority of glazing on the south wall or walls of the buildings.

4. **Noise mitigation.** Noise impacts on residents in nearby areas shall be minimized through the placement of buildings, recreation areas, roads and landscaping.

E. Landscaping. Introduced landscaping shall be designed to minimally disturb natural areas, and shall be compatible with the native plant setting. Landscaping plans shall be prepared with consideration for fire protection, solar access, the use of native and drought tolerant species, and minimal water use. Planting should not block scenic views from adjacent properties or disturb wildlife trails.

F. Open space areas:

1. **Dedication required.** Land to be preserved as open space may be dedicated by fee title to the County or an agency or organization designated by the County before issuance of any construction permit or may remain in private ownership with appropriate scenic and/or open space easements or other encumbrances acceptable to the County, and the County may require reasonable public access across lands remaining in private ownership, consistent with Federal and State law.

2. **Maintenance.** The County or other designated agency or organization will maintain all open space lands accepted in fee title, as well as public access and trail easements across private property. Where open space lands remain in private ownership with scenic easements, these lands shall be maintained in compliance with the adopted policies of the Marin County Open Space District and may require the creation of a homeowners' association or other organization to maintain private open space lands where appropriate.

3. **Open space uses.** Uses in open space areas shall be in compliance with policies of the Marin County Open Space District. Generally, uses shall have no or minimal impact on the natural environment. Pedestrian and equestrian access shall be provided where possible and reasonable. The intent is to serve the people in adjacent communities, but not attract large numbers of visitors from other areas.

G. Site preparation:

1. **Grading.** Grading shall occur in compliance with Chapter 23.08 of the County Code (Excavating, Grading and Filling), but shall be held to a minimum. Every reasonable effort shall be made to retain the natural features of the land: skylines and ridgetops, rolling land forms, knolls, native vegetation, trees, rock outcroppings, and watercourses. Where grading is required, it shall not create flat planes and sharp angles of intersection with natural terrain. Slopes shall be rounded and contoured to blend with existing topography.

2. **Drainage.** The areas adjacent to creeks shall be kept as much as possible in their natural state. All construction shall ensure drainage into the natural watershed in a manner that will avoid significant erosion or damage to adjacent properties. Impervious surfaces shall be minimized. At major creek crossings, bridges should be utilized instead of culverts, wherever possible.

3. **Trees and vegetation.** Every effort shall be made to avoid tree removal, and changes or construction that would cause the death of existing trees, rare plant communities, and wildlife habitats.

4. **Fire hazards.** Development shall be permitted in areas subject to wildfire threat only where the review authority determines there are good access roads, and adequate water supply, and vegetation management plans are required and adopted.

5. **Geologic hazards.** Construction shall not be permitted on identified seismic or geologic hazards, including slides, natural springs, identified fault zones, or on bay mud, without approval from the Department of Public Works, based on acceptable soils and geologic reports.

6. **Watershed areas.** All projects within water district watershed areas shall be referred to the appropriate district for review and comment.

H. Utilities. In ridge land areas, street lights shall be of low level intensity and low in profile. In all areas, power and telephone lines shall be underground where feasible.

I. Plan consistency. Project approval shall require findings of consistency with the Marin Countywide Plan and any applicable Community Plan that may have more restrictive standards than the preceding provisions of this Section.

22.66.040 - C-APZ Zoning District Standards

A. Purpose. This Section provides development standards for the C-APZ zoning district that are to preserve productive lands for agricultural use, and ensure that development is accessory or incidental to, or in support of agricultural uses.

B. Applicability. The requirements of this Section apply to proposed development and new land uses in addition to the standards established by Section 22.66.030 (Planned District General Development Standards) and Chapter 22.70 (Coastal Resource Management Standards), and all other applicable provisions of this Development Code.

C. Development standards. All development permits in the C-APZ district shall be subject to the following standards and requirements:

1. Location of development. All proposed non-agricultural development shall be clustered to retain the maximum amount of land in agricultural production or available for future agricultural use. Homes, roads, residential support facilities, and other non-agricultural development, shall be clustered on no more than five percent of the gross acreage, to the extent feasible, with the remaining acreage retained in agricultural production and/or open space. Proposed development shall be located close to existing roads, or minimize new roadway improvements in accordance with Section 22.66.030(D)(1), and shall be sited to minimize impacts on scenic resources, wildlife habitat and streams, and adjacent agricultural operations.

2. Conservation easements. The approval of non-agricultural uses, a subdivision, or construction of two or more dwelling units, excluding agricultural worker housing, shall include measures for the long-term preservation of lands proposed or required to remain undeveloped. Preservation shall be accomplished by permanent conservation easements or other encumbrances acceptable to the County. The use of encumbrances shall be consistent with Federal and State law. Only agricultural uses shall be allowed under these encumbrances. In addition, the County shall require the execution of a covenant prohibiting further subdivision of parcels created in compliance with this Section and Article VI (Subdivisions), so that they are retained as a single unit.

3. Management plans and organization. The creation of a homeowner's association or other organization and/or the submission of an agricultural management plan may be required to provide for the proper use and management of agricultural lands, and their availability for lease, and/or for the maintenance of community roads or mutual water systems. The Director may waive the requirement for a management plan for a project involving an existing commercial agricultural production operation or an existing commercial agricultural property.

D. Required findings. Review and approval of land use permits and determinations of allowed density in the C-APZ zoning district, shall be subject to the following findings, in addition to those required by Chapter 22.46 (Use Permits), 22.44 (Master Plans), and 22.72 (Coastal Permit Requirements and Procedures):

1. The proposed development will protect and enhance continued agricultural use, and will contribute to agricultural viability.

2. The proposed development is necessary because the agricultural use of the property is no longer feasible. The purpose of this standard is to permit agricultural landowners

who face economic hardship to demonstrate how development on a portion of their land would ease the hardship and enhance agricultural operations on the remainder of the property.

3. The proposed land division or development will not conflict with the continuation or initiation of agricultural uses on the portion of the property that is not proposed for development, on adjacent parcels, or parcels within one mile of the perimeter of the proposed development.

4. Adequate water supply, sewage disposal, road access and capacity and other public services are available to service the proposed development after provision has been made for existing and continued agricultural operations. Water diversions or use for a proposed development shall not adversely impact stream habitats or significantly reduce freshwater inflows to Tomales Bay, either individually or cumulatively.

5. Appropriate public agencies are able to provide necessary services (fire protection, police protection, schools, etc.) to serve the proposed development.

6. The proposed land division and/or development will have no significant adverse impacts on environmental quality or natural habitats, including stream or riparian habitats and scenic resources. In all cases, Local Coastal Plan policies on streams and natural resources shall be met.

E. Transfer of development rights (TDR). Proposed development within the C-APZ district may use the TDR provisions of Chapter 22.34 (Transfer of Development Rights).

22.66.050 - C-ARP Zoning District Standards

A. Purpose. This Section provides development standards for the C-ARP zoning district that are to preserve productive lands for agricultural use through the clustering of allowed development.

B. Applicability. Proposed development and new land uses shall comply with the provisions of Section 22.66.030 (Planned District General Development Standards), and Chapter 22.70 (Coastal Resource Management Standards).

C. Subdivision requirements. Subdivisions of small agricultural holdings within the C-ARP zoning district shall conform with the following standards:

1. Subdivision applications shall include information demonstrating to the Director that the design of proposed parcels provides the maximum feasible concentration of clustering.

2. Clustered development shall be located both to provide for the retention of the maximum amount of land in agricultural use and to protect important upland feeding

areas. Development clusters shall also be located in the least environmentally sensitive area of the site.

3. Open space easements or other restrictions shall be required to designate intended use and restrictions on the property being subdivided.

D. Agricultural and open space uses. Agricultural uses shall be encouraged in the C-ARP zoning district.

1. As part of the Master Plan review process, usable agricultural land should be identified and efforts made to preserve and/or promote its use. Agricultural land not presently in production, may be preserved as undeveloped private open space to be made available on a lease basis in the future for compatible agricultural uses. The primary intent shall be to preserve open lands for agricultural use, not to provide open space/recreational land uses that will interfere or be in conflict with agricultural operations.

2. Lands to be preserved for agriculture and/or open space use may require the creation of a homeowner's association or other organization for their maintenance.

3. The nature and intensity of large scale agricultural uses should be described in the form of an agricultural management plan. Management plans should consider intensity of grazing, runoff protection, chemical and fertilizer use and, in order to preserve agricultural land practices, separation from existing or proposed residential uses.

4. In some cases, the County may require reasonable public access across those lands remaining in private ownership. Pedestrian and/or equestrian access shall be provided where consistent with adopted County and coastal plans, where consistent with Federal and State law, where not in conflict with agricultural uses, and where liability issues have been resolved. Public access for pedestrian and/or equestrian purposes may only be required as a condition of plan approval.

Appendix E

Drainage Practices

Appendix E

Drainage Practices

The consistent application of the following concepts within a site will create a grading and drainage planning framework that minimizes impervious area, reduces direct connections between impervious areas, and is compatible with natural systems while being economical, aesthetically pleasing, and technically sound.

a. The development review process should make apparent to all participants that every site is in a watershed. What happens to the water quality depends on the site's place in the larger watershed, and on the smaller watersheds within the site.

b. Use site planning concepts to improve the quality of stormwater runoff on every site. Use site design to integrate improvements with natural systems. Water quality is most easily and economically achieved if stormwater management starts at the point that water contacts the earth.

c. Design new drainage systems to accommodate appropriate flows while implementing small-scale filtration techniques, applied consistently over an entire property, improving stormwater quality and reducing peak flows.

d. Use natural methods and materials, and explore the use of alternative engineering or maintenance and try to achieve comparable performance to conventional drainage systems. The following provides a summary of natural drainage methods.

- Drainage Devices: Terrace drains, benches, downdrains or other drainage devices should be placed in locations of least visibility on slopes. The side of a drain may be bermed to conceal it. Natural swales leading downhill are a good location for downdrains. Visible concrete drains should be color tinted, faced with stones, and/or screened with planting to be less obtrusive.

- Runoff and Subsoil Discharge. Passage for bulked-flow and subsoil runoff should be provided to a safe point of discharge, such as a street, channel or debris basin, or energy dissipater in a manner such that damage to improvements or slopes will be minimized. Natural stream gradients should not be flattened.

- Debris Collection. Where applicable, the location of proposed improvements should permit accommodation of debris from potential land slippage and/or erosion without damage to improvements or other properties downslope, and with access to a street to provide for cleanup and removal.

- Overflow Route. An emergency overflow route for flood and debris flows which exceed the design capacity of planned drainage, flood control and debris facilities

and devices should be provided. Overflow routes should direct overflows away from slopes and improvements and toward safe points of discharge.

e. Providing well-designed and natural stormwater management facilities is an opportunity. By integrating natural solutions into the overall site plan, stormwater facilities can provide recreation, aesthetic, habitat, and water quality benefits.

f. Drainage systems for residential development can achieve stormwater management goals by using three basic elements, either individually or in combination, depending on site and other conditions: infiltration, retention/detention, and biofilters.

- Infiltration is ideal for management and conservation of runoff because it filters pollutants through the soil and restores natural flows to groundwater and downstream water bodies. Infiltration systems are designed to infiltrate the majority of runoff from small storms into the soil rather than discharging it into a surface water body. Infiltration basins can range from a single shallow depression in a lawn, to an integrated swale, pond, and underground storage basin network.

  Infiltration basins can be either open or closed. Open infiltration basins, which include ponds, swales, and other landscape features, are usually vegetated – the vegetation maintains the porous soil structure and reduces erosion. Closed infiltration basins can be constructed under the land surface with open graded crushed stone, leaving the surface to be used for parking or other uses. Subsurface, closed basins are generally more expensive than surface systems, and are used primarily where high land costs demand that the land surface be reclaimed for economic use.

  The basic design goal of infiltration systems is to provide opportunities for rainwater to enter the soil. This is generally accomplished by retarding the flow of runoff, and by bringing it in contact with the soil, either by holding it in ponds or moving it slowly along the ground surface. Infiltration basins are most economical if placed near the source of runoff, but they should be avoided on steep unstable slopes or near building foundations.

  Concerns with infiltration systems are clogging, and contamination of groundwater from pollutants able to migrate through the soil (e.g. nitrates, solvents), and impacts on slope stability of hillside sites. Residential developments are the least likely to contaminate groundwater or soil from infiltration systems because residential developments generally have low concentration of pollutants. High concentrations, when they occur, such as an oil spill in a driveway, are localized and small. Organics such as petroleum hydrocarbons migrate slowly downward – allowing natural degradation to occur.

- Retention/detention systems store runoff for later release. In that regard, they differ from infiltration systems that are intended to percolate water into the soil. Detention systems usually store runoff for one to two days

after a storm and are dry until the next storm. Retention systems usually have a permanent pool that retains runoff volume until it is replaced during the following storm. A properly designed retention/detention system releases runoff slowly enough to reduce downstream peak flows to their pre-development levels, allow fine sediments to settle at the bottom of the retention/detention basin, and uptake dissolved nutrients in runoff where wetland vegetation is included within and/or adjacent to the basin. Retention/detention systems are most appropriate for areas with silt and expansive clay soils where limited infiltration occurs under pre-development conditions and reducing post-development runoff peaks is generally sufficient because the difference between pre-development and post-development runoff volume is often small.

- Biofilters are vegetated slopes and channels designed and maintained to transport shallow depths of runoff slowly over vegetation. Biofilters are effective if flows are slow and depths are shallow. This is generally achieved by grading the site and sloping pavement in a way that promotes sheet flow of runoff. For biofilter systems, features that concentrate flow, such as curb and gutter, paved inverts, and long drainage pathways across pavement, must be minimized. The slow movement of runoff through the vegetation provides an opportunity for sediments and particulates to be filtered and degraded through biological activity. In most soils, the biofilter also provides an opportunity for stormwater infiltration, which further removes pollutants and reduces runoff volumes. In hillside areas, biotechnical bank or slope stabilization techniques such as vegetated rock rip-rap, willow walls, and "bio-loss" are the preferred methods. The key concept is to move water slowly through the vegetation. The most common ground cover material is turfgrass, which must be irrigated through the dry season. For a turfgrass-lined biofilter to work effectively, the turf must be mowed regularly and the cuttings removed. Clay soils, or soils where vegetation is inhibited, are generally not appropriate for biofilters. Biofilters are especially applicable to parking areas, as the long aisles can be sloped into linear grass swales to collect and treat runoff from pavement surfaces. Adjacent pavement elevations should be set slightly higher than the adjacent biofilter. If water enters at concentrated points, as opposed to sheet flow, erosion control should be included at inlets and outlets.

Appendix F

Driveway and Parking Design

Appendix F

Driveway and Parking Design

The following additional information includes helpful ideas in the design of parking areas and driveways based on best design principles and applicable County regulations.

I. Parking

Please refer to Marin County Code Title 24, Section 22.04.330 et seq. for parking requirements.

a. Parking Areas

In any development, parking areas can consume many acres of land area, often greater than the area covered by streets or rooftops. In a neighborhood of single-family homes, this parking area is generally located on private driveways or along the street.

The space for storage of the automobile, the standard parking stall, occupies only 160 square feet, but when combined with aisles, driveways, curbs, overhang space, and median islands, a parking area can require up to 400 square feet per vehicle. Since parking is usually accommodated on an asphalt or concrete surface with conventional underground storm drain systems, parking spaces typically generate a great deal of directly-connected impervious area. There are many ways to both reduce the impervious land coverage of parking areas and filter runoff before it reaches the storm drain system.

b. Hybrid Parking Surface

Hybrid parking surfaces work on the principle that pavement use differs between driving aisles and parking spaces. Aisles must be designed for speeds between 10 and 20 mph, and durable enough to support the concentrated traffic of all vehicles. The stalls, on the other hand, need only be designed for the 2 or 3 mph speed of vehicles maneuvering into and out of the space. Most of the time the spaces are in use, vehicles are stationary. Hybrid parking surfaces reduce impervious surface coverage in parking areas by differentiating the paving between driving aisles and parking spaces, combining impervious aisles with permeable parking spaces.

If the aisles are constructed of a more conventional, impermeable material suitable for heavier vehicle use, such as asphalt, the stalls can be constructed of a permeable pavement. This can reduce the overall impervious surface coverage of a typical double-loaded parking lot by 60%, and avoid the need for an underground drainage system.

Permeable spaces can be constructed of a number of materials, including crushed aggregate, open-celled unit pavers, porous asphalt, or pervious concrete. A hybrid stall of crushed aggregate stalls and conventional asphalt aisles is a low-cost, practical design that is easily constructed from standard materials. In most cases, stall markings are not

required, as the geometry of the edges promotes orderly parking. If desired, stalls can be indicated with wood headers, change in unit pave color, or pavement markers.

c. Parking Grove

A variation on the permeable stall design, a grid of trees and bollards can be used to delineate parking spaces and create a "parking grove." Please refer to Figure F-1. If the tree locations are spaced approximately 19 feet apart, two vehicles can park between each row of trees. This 9.5-foot stall spacing is slightly more generous than the standard 8.5 to 9 foot stall, and allows for the added width of the tree trunks. A benefit of this design is that the parking grove not only shades parked cars, but presents an attractive open space when cars are absent. Natural or permeable surface materials should be used to minimize impacts to trees. Consideration should be provided to the choice of trees that are suitable for a parking grove, including non-fruit-bearing trees and trees without high sap or leaf-drop characteristics.

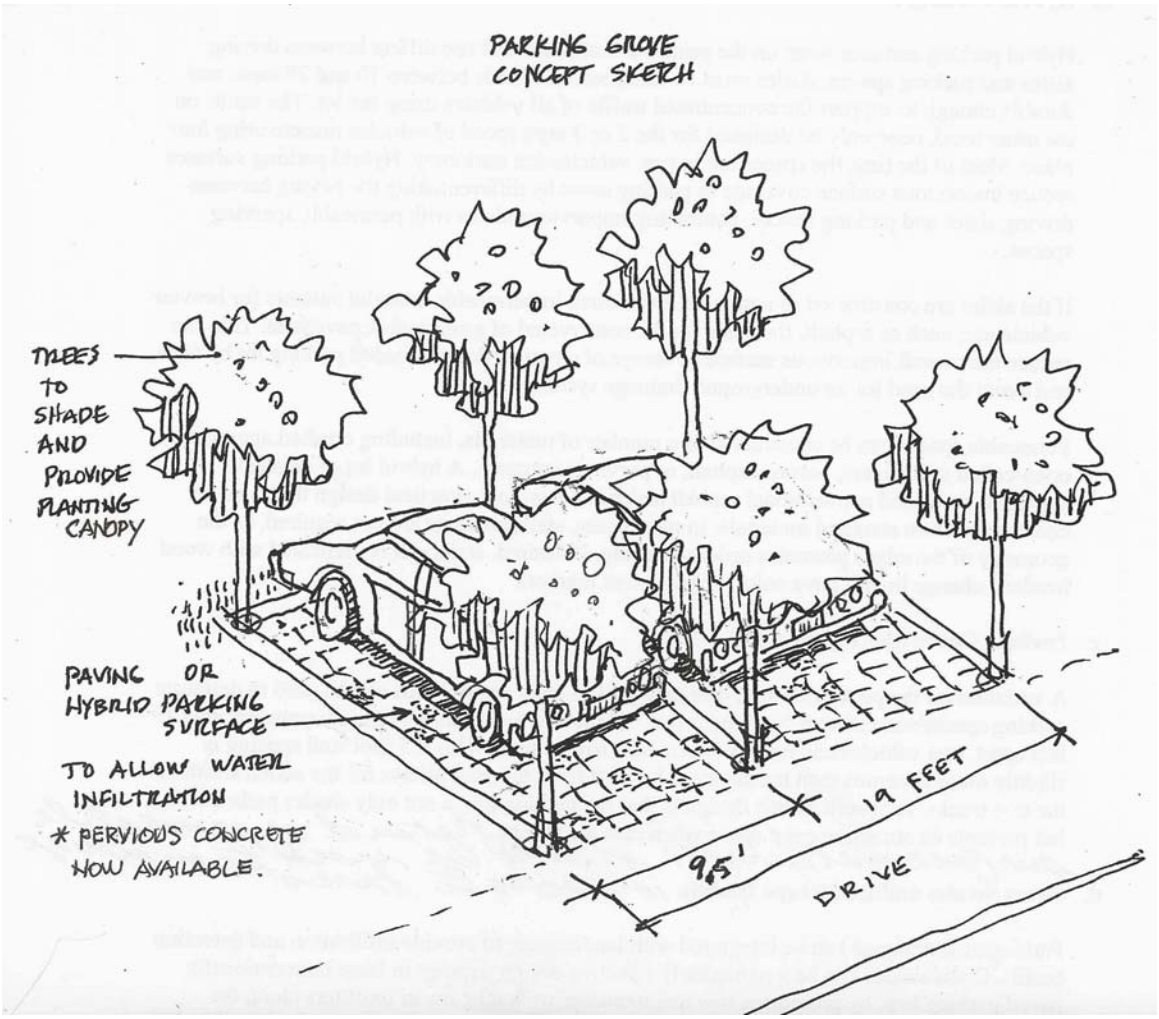


Figure F-1 Parking Grove Example

d. Grass Swales and Landscape Islands.

Parking area drainage can be integrated with landscaping to provide infiltration and detention basins. Grass swales can be a particularly effective design strategy in large conventionally paved parking lots by providing low maintenance and walkable linear biofilters along the perimeter of the lot or along internal islands. Other landscape treatments are also feasible, but may require additional maintenance effort. Stormwater is directed to these linear landscaped spaces and travels slowly over turfgrass or other vegetative surfaces, allowing pollutants to settle and slowing runoff velocities.

II. Driveways

Driveway grades up to a maximum of 25% are allowed unless the County and/or Fire Protection District find good cause for exception, and shall be aligned with the natural contours of the land. The finished grade of driveways shall conform to the finished grade of the lot. Proper design consideration shall be given to vertical curves and parking landings. In any case, parking landings shall be required on all drives over 8%. Please refer to Marin County Code Title 24, Section 22.42.235 et seq. for driveway design requirements.

a. A minimum driveway length of twenty feet should be provided from the front of the garage or parking structure to the back of sidewalk or to the edge of pavement where no sidewalk exists. A lesser length may be approved by the County for constrained sites. On long and curved driveways, the radius of the centerline at the curve should not exceed 150 feet.

b. The minimum improved width of a driveway serving a single dwelling unit is 12 feet. The minimum improved width of a driveway serving two to six dwelling units is 16 feet. Subject to the review and approval of the County, this may be reduced to a minimum of twelve feet along all or part of its length if extenuating circumstances exist. In evaluating a proposal for such a reduction, the amount of grading and tree removal and the height of any retaining walls necessary to obtain the full width shall be of paramount consideration. When such a reduction is proposed the design shall be submitted to the appropriate Fire Department or Fire Protection District for review, comment, advice and mitigation suggestions. In addition, one or more turnouts may be required as determined appropriate by the County. A driveway that serves or may be extended in the future to serve more than six dwelling units shall be considered equivalent to a private road and designed accordingly. If the initial use of such a road will be by less than six units, then construction of the road may be done in phases as determined by the County.

c. Turnouts shall be required on driveways over 150 feet in length or if sight distance problems exist unless the driveway is at least sixteen feet in width. The number, location and dimensions of required turnouts shall be subject to the review and approval of the Agency and shall be no less than 18 feet wide (full driveway width) and 60 feet long including transitions.

d. A turnaround may be required at the end of any driveway and/or adjacent to any parking area where, in the opinion of the County, the alignment, grade or street connection of the driveway is such that backing along the driveway or out onto the street would be inordinately difficult or dangerous. The alignment and dimensions of turnarounds shall be such as to allow the attainment of the desired direction by a standard sized car in no more than one movement.

Appendix G

Streams and Riparian Resources

Appendix G

Streams and Riparian Resources

Streams provide a variety of important values and functions that are essential to protecting and enhancing wildlife habitat, the health of watersheds, and the aesthetics of the natural landscape. The importance of streams and riparian habitat, and the need to protect and enhance these resources, are signified by a specific Stream Conservation Area (SCA) designation and policies established in the Countywide Plan. The SCA policies recognize the dynamic aspects of stream functions that contribute to a healthy environment, such as:

- Convey, filter and store sediment and nutrients
- Provide critical wildlife movement corridors between habitats for both aquatic and terrestrial species
- Provide spawning and rearing habitat
- Assist in maintaining healthy watersheds
- Provide floodplains for recharge of groundwater aquifers and flood prevention

In addition, riparian vegetation is critical to the proper functioning of stream systems and particularly the maintenance of high quality fish habitat, which has become a heightened policy objective of the County in response to the Federal and State listing of the Coho salmon and steelhead trout as special status species.

Stream Conservation Areas consist of a zone or buffer area that extends along all natural watercourses shown as blue line on the most recent appropriate USGS quad map, or other natural watercourses that support riparian vegetation for a length of 100 feet or more. Please refer to Figure G-1. The zone consists of the watercourse and surrounding banks on both sides and a strip of land extending laterally outward from the top of bank to a minimum width of 100 feet in the Coastal and Inland Rural Corridor and a minimum width of 50 feet in the City Centered Corridor. Where large tracts of land in the City Centered Corridor are proposed for development, the normal 50-foot buffer is extended up to 100 feet if consistent with legal requirements and other planning and environmental goals. In the Coastal and Inland Rural Corridor, the zone is extended by including a buffer area 50 feet landward from the edge of riparian vegetation.

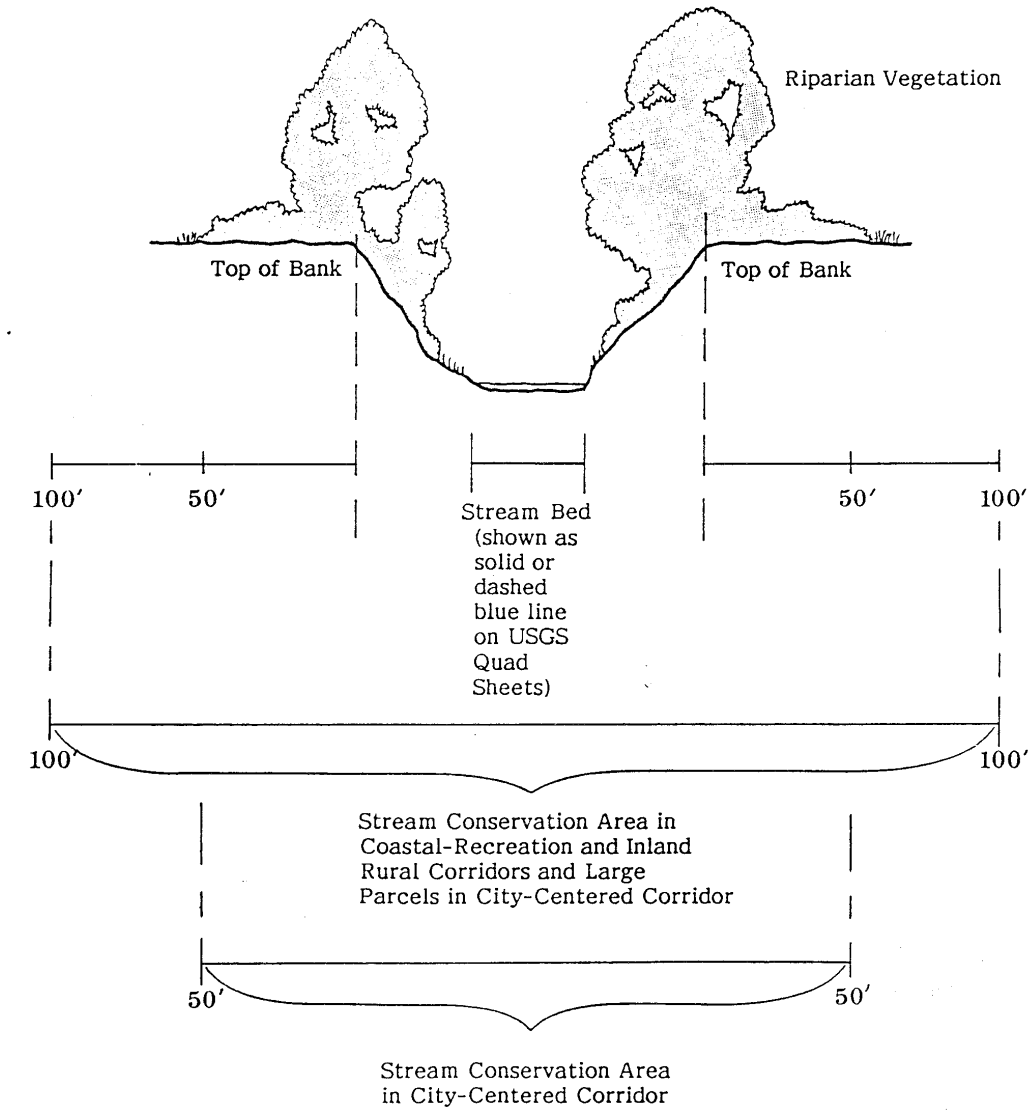


Figure G-1 Stream Conservation Area

Source: Marin Countywide Plan (1994)

(NOTE TO READER: Improvements to the Stream Conservation Area figure above will be made either prior to final adoption of the Design Guidelines or as a subsequent administrative correction.)

The SCA policies prohibit most new land uses and improvements within the above buffers with limited exceptions for existing structures, water supply and flood control projects, fish and wildlife habitat restoration or improvements, grazing of livestock and other agricultural uses, channel maintenance for erosion control and other purposes, road and utility line crossings, trails and water monitoring installations. These uses must also be found consistent with zoning standards. Other uses that are not prohibited by the SCA policies and are allowed by the underlying zoning may be proposed within an SCA only if they meet criteria established in the Countywide Plan. (See Countywide Plan Stream Conservation Area policies.) The following highlights some of the key provisions contained in the SCA policies.

a. Watersheds should be considered on a case-by-case basis to determine site design requirements. The site design should to the greatest extent feasible preserve natural drainage swales, natural drainage patterns, public safety, riparian vegetation and wildlife.

b. Filling in of watercourses, canyons, streambeds, seeps, and springs is prohibited.

c. Debris basins, rip-rap, and energy dissipation devices shall be provided when necessary to reduce erosion when grading is undertaken. Except for necessary flood control facilities, significant natural drainage courses shall be protected from grading activity. In instances where crossing is required, bridges and arched culverts are preferred over culverts to minimize impacts to natural drainage features. Where brow ditches are required, they shall be naturalized with plant materials and native rocks.

d. Natural drainage courses shall be preserved and integrated into project design.

e. Stream bank stabilization

   Self-formed stream channels tend to be in a state of equilibrium, nearly stable, and usually do not require artificial bank stabilization. Land use changes that cause an increase in impervious surfaces or sedimentation will result in channel erosion. This may require measures to stabilize the stream bank.

   1. Stream rehabilitation is the preferred method of stabilization, its objective being to maintain the natural character of the watercourse and riparian area. The process may include enlarging the channel at points of obstruction, clearing obstructions at natural bend and points of constriction, limitation of use in areas of excessive erosion and restoration of riparian vegetation.

   2. If a stream bank stabilization other than stream rehabilitation and vegetative methods is required, biotechnical bank stabilization techniques, such as vegetated rock rip-rap, “willow walls” and “biologs” are preferred.

   3. Concrete channels and other mechanical measures of stabilization shall not be permitted unless no other alternative exists, and shall be lined with stone or other materials to achieve a natural appearance where they are visually prominent.

f. Planting in Riparian Areas.

The riparian area should be kept as close as possible to its natural state. The open spaces and indigenous riparian vegetation such as live oaks, sycamores, bays and scrub should be preserved and the under-story plantings, such as shrubs, herbs and grasses should be emphasized in new plantings. Ornamental plantings and the introduction of non-native species should be avoided. If deemed appropriate by the Design Review Authority, a Riparian Management Plan may be required.

The SCA policies are implemented through the Community Development Agency's development review process, including, but not limited to, single-family residential projects that are subject to Design Review. Because the SCA policies may have a major bearing on the feasibility and design of a development proposal, prospective permit applicants are strongly encouraged to conduct a thorough investigation of the presence of streams and natural drainages on the development site during the preliminary planning and design stages of the project. If a question arises regarding whether a particular watercourse is subject to the SCA policies, prospective applicants should first review the appropriate USGS quad sheet to determine if the parcel is traversed by or is adjacent to a blue line stream. Consulting with a biologist or other qualified professional with a sufficient level of expertise in this area may also be helpful or necessary to resolve questions regarding the status of a stream or drainage, especially with respect to those that are not identified on a USGS quad sheet.

Discretionary permit applications for proposals should include adequate information to determine that the SCA policies are being met. This should include a site plan showing the location and dimensions of streams or other natural drainages, including a clear demarcation of the top of bank, in relation to proposed improvements, grading, and removal of vegetation. The location and type of riparian vegetation associated with the stream or drainage should also be clearly shown on the site plan. In some cases, cross sections of the channel may be needed to clarify the location of the top of bank. For proposals that involve improvements or alterations within the SCA, the application materials should include an environmental assessment, prepared by a qualified biologist or other professional with appropriate expertise, to determine whether SCA standards and criteria are being met, to demonstrate that impacts to SCA resources are avoided or minimized, and to provide sufficient information regarding such impacts for the completion of environmental review pursuant to the California Environmental Quality Act (CEQA). An environmental assessment may also be required for discretionary projects that do not propose any improvements within the SCA if the County determines through the project review process that the proposal may adversely affect streams or natural drainages on or adjacent to the development site.

Property owners and/or their representatives should consult with the Community Development Agency staff regarding the applicability of these policies and procedures before completing the conceptual design of a proposal and filing a Design Review application. Early consultation is particularly important insofar as the policies and procedures summarized above may be amended or otherwise revised in the future.

Hillside Drainage Swales and Drainage Ravines

The riparian areas and watersheds associated with Marin County's hillsides create areas of natural focus in the hillside areas and should be preserved and protected. In order to insure the preservation of these riparian areas, a more harmonious relationship is required between the existing natural environment and the growing man-made environment.

- New hillside residential development applications are required to provide detailed hydrologic analysis to be reviewed by the County Engineer. Developers may be required to replace inadequate on and off-site existing hillside storm drainage facilities.

- A comprehensive study may be required for each project to develop specific information on the nature, extent and magnitude of slope stability hazards in watershed areas. Basic data required would be suitable for determining the types and severity of watershed and debris flow paths that may influence developments. The study product would identify:

  > Major watershed areas related to specific neighborhoods.
  > Areas impacted by recent movements of debris or other surface materials.
  > Areas identified as "High Energy Flow Path Zones."
  > Areas of various degrees of slope, especially areas with steep slopes.

  The potential hazards created by development, grading and alteration of drainage patterns on hillsides are not only a concern of the development itself but may cause damage to properties downhill of the property. For this reason, the larger off-site implications of all proposed buildings and improvements such as roads, driveways, and other built improvements such as parking areas, landform grading and drainage should be considered in all Design Review projects.

Appendix H

Preservation of Trees

Appendix H

Preservation of Trees

Trees are important aesthetic and ecological resources that contribute to Marin County's distinctive landscape character. The County adopted a Native Tree Preservation and Protection Ordinance in 1999 to establish regulations for the preservation and protection of native trees in the non-agricultural areas of Marin County. The original ordinance was subsequently incorporated into the Marin County Development Code update in 2003. (See Development Code Chapter 22.27.)

The basic regulations for native tree preservation and protection are summarized in this Appendix. However, the requirements of Guideline A-1.1 may be applicable to trees other than those defined as a "Protected Tree" under the Development Code if they are found through the Design Review process to provide benefits or values that are important to the implementation of Design Review findings, which may include aesthetic, historic, or habitat value, privacy screening, or drainage control.

I. Definitions

"Protected Tree" shall mean any one of the following:

1. **Trees on an Unimproved Parcel**. Any individual native tree, as further defined by species type and minimum size in the Marin County Development Code and the list "Trees Native to Marin County" maintained and provided by the Community Development Agency, which is located on an unimproved parcel.

2. **Trees on an Improved Parcel.** More than five native trees, as further defined by species type and size in the Marin County Development Code and the list "Trees Native to Marin County" maintained and provided by the Community Development Agency, where the removal of the trees occurs within any 12 month period on an improved parcel.

II. Guidelines

Site development plans should demonstrate that a diligent effort has been made to retain as many protected trees as possible.

1. **Criteria For Removal**

   In assessing the number of trees and specific trees that may be removed, the applicant and Design Review staff should consider the following criteria consistent with Section 22.27.050 of the Marin County Development Code:

   a. The tree is not specifically defined as "Protected Tree";
   b. The general health of the tree is so poor due to disease, damage, or age that efforts to ensure its long-term health and survival are unlikely to be successful;

c. The tree is infected by a pathogen or attacked by insects that threaten surrounding trees as determined by an arborist report or other qualified professional as defined in the Marin County Development Code;
d. The tree is a potential public health and safety hazard due to the risk of its falling and its structural instability cannot be remedied;
e. The tree is a public nuisance by causing damage to improvements, such as building foundations, retaining walls, roadways/driveways, patios, sidewalks and decks, or interfering with the operation, repair, or maintenance of public utilities;
f. The tree has been identified by a Fire Inspector as a fire hazard;
g. The removal of the tree has been specifically proposed and authorized as part of the final approval of a discretionary development permit, including but not necessarily limited to Master Plan, Development Plan, Design Review, Coastal Permit, Tentative Subdivision Map, Final Subdivision Map, Use Permit, or Variance;
h. The tree was planted for a commercial tree enterprise, such as Christmas tree farms or orchards;
i. Prohibiting the removal of the tree will conflict with CC&R's which existed at the time this Chapter was adopted;
j. The tree is located on land which is zoned agriculture (A, ARP, APZ, C-ARP or C-APZ) and is used for commercial agricultural purposes. (This criteria is provided to recognize the agricultural property owner's need to manage these large properties and continue their efforts to be good stewards of the land);
k. Any public agency to provide for the routine management and maintenance of public land or to construct a fuel break during a fire;
l. The tree was removed prior to the effective date of this Chapter; and
m. The tree is invasive and exotic.

2. **When Protected Trees Must Be Removed**

a. When protected trees must be removed, replanting with species listed in Appendix E is recommended, unless otherwise specified by the Marin County Community Development Agency.

b. Trees should be replaced at a ratio of 3 new trees for every tree removed unless the Review Authority determines otherwise.

c. Minimum tree size should be 15 gallon. Adjustments to this requirement may be allowed by the Review Authority (i.e., more plantings of smaller or larger sizes) when site conditions warrant.

d. Replant trees and shrubs consistent with surrounding native vegetation.

3. **Techniques for the Preservation of Oak Trees**

a. Specimen oak trees may be found at scattered locations on the hillsides and in the valleys and canyons. Special care should be taken to retain and protect oaks as significant resources.

b. The most critical issue in the care and maintenance of an existing oak is the altering of conditions under which the tree has grown. "Altering" includes changing the grade within the drip line, changing watering practices from natural rainfall to supplemental irrigation, changing the leaf litter beneath the trees, changing drainage patterns, and the movement of soil around roots caused by heavy equipment. Please refer to Figure H-1.

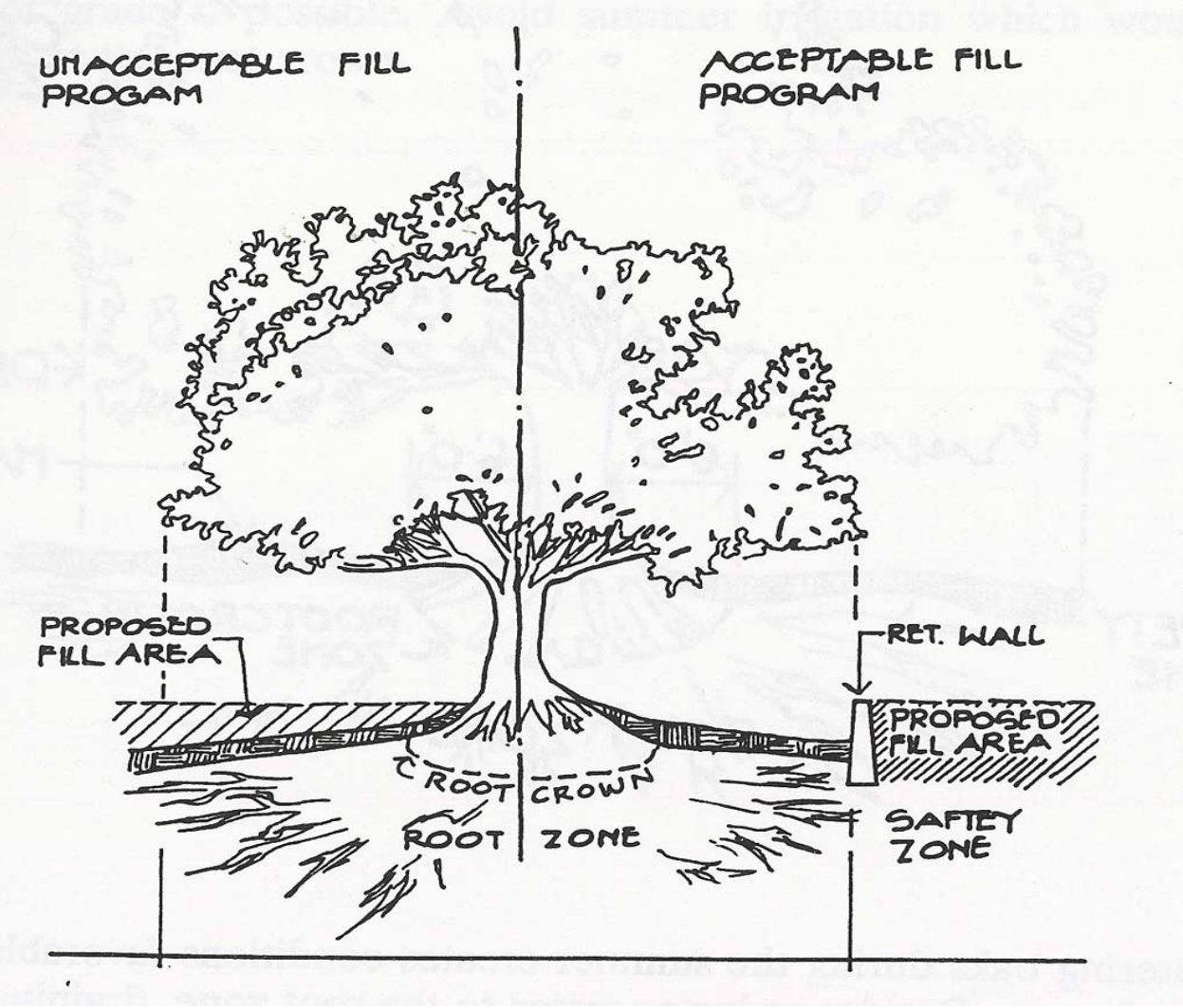


Figure H-1 Dripline Fill Program (Acceptable and Unacceptable)

c. Should changes of grade be necessary, the following steps may be taken:

i. Establish the radius of the existing root system by using soil probes or equivalent. This establishes a Root Crown Zone within which there should be no grading. New development may require gradual root pruning. Consult an arborist for proper techniques. Root pruning enables roots to be cut for a lowering of natural grade. Under no circumstances should soil be added around the Root Crown Zone, but soil may be added over the Root Zone if the Root Crown Zone is protected by retaining devices.

ii. Overwatering oaks during the summer creates conditions favorable to root rot and oak root fungus. Besides reducing water to the root zone, draining water off of the root crown quickly is vital for the health of the tree. Sloping soil away from the root crown improves drainage by creating rapid water runoff. In heavy soils, such as clays, leach lines installed within the drip line and extending out to drainage courses may be necessary to increase drainage. In all cases, the goal is to duplicate the native conditions under which the oak has lived. Essentially, if the existing conditions were dry, leave them dry; if they were wet, leave them wet.

iii. Leaf litter is the accumulation of live and decaying leaves at the base of a tree. In the case of oaks, this litter contributes to a cool atmosphere for root growth, and an acid condition resulting from the decaying of the leaves. When possible, and when it poses no fire hazard, leave the natural litter in place.

iv. Poor drainage caused by a change in grade or compaction produces constant moisture at the base of the trunk. Growing lawns beneath oaks also frequently produces poor drainage. This problem can be averted by using other ground covers, sloping the natural grade away from the tree and diverting sprinklers away from the trunk. A dense turf or compacted soil can greatly reduce aeration in the soil. Reduced aeration plus excessive water favors development of harmful soil organisms, such as oak root fungus, which may be present in an inactive stage until stimulated by favorable growing conditions or even mechanical root injury.

In summary, native oaks are extremely sensitive plants. Minimal grade changes within the drip line can drastically affect aeration of the roots and drainage around the root crown. Avoid changes of grade if possible. Avoid summer irrigation which would produce constant moisture at the root crown.

Appendix I

Marin County Water Conservation Ordinance for Landscaping in Residential Projects

Appendix I

Marin County Water Conservation Ordinance for Landscaping in Residential Projects

The following consists of the Marin County Water Efficiency in Landscaping Ordinance.

Marin County Board of Supervisors

Ordinance No. 3118

An ordinance of the Board of Supervisors Adopting Amendments to Title 23 of the Marin County Code (the Natural Resources Ordinance)
Pertaining to Water Efficiency in Landscaping

Section I: Findings

I. Whereas the Marin County Board of Supervisors recognizes the water within Marin County is a precious and limited resource; and

II. Whereas the Marin County Board of Supervisors recognizes that the Water Conservation in Landscaping Act requires that the county adopt a water efficient landscape ordinance or adopt findings based on climatic, geological, or topographical conditions, or water availability that a water efficient landscape ordinance is unnecessary; and

III. WHEREAS the Marin County Board of Supervisors has considered provisions of the "Model Water Efficient Landscape Ordinance" adopted by the California Department of Water Resources; and

IV. WHEREAS the Marin County Board of Supervisors held a public hearing on December 15, 1992 to consider amendments to Title 23 of the Marin County Code (the Natural Resources Ordinance); and

V. WHEREAS the Marin County Board of Supervisors finds that the proposed Water Efficiency in Landscaping Ordinance has been reviewed by Marin County water agencies and districts; and

VI. WHEREAS the Marin County Board of Supervisors finds that public necessity, convenience and general welfare required these amendments to Title 23 of the Marin County Code; and

VII. WHEREAS the Marin County Board of Supervisors finds that the proposed amendments are consistent with the goals, objectives and policies of the *Marin Countywide Plan;* and

VIII. WHEREAS the Marin County Board of Supervisors finds that the proposed amendments are categorically exempt from the requirements of the California Environmental Quality Act pursuant to Section 15308 of the State Guidelines because these amendments constitute an action by a regulatory agency to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment.

Section II: Amendments to Title 23

Now, therefore, let it be ordained that the Board of Supervisors of the County of Marin hereby adopts the following amendments to Title 23 of the Marin County Code:

Add Marin County Code Chapter 23.10, Water Efficiency in Landscaping, to read as follows:

23.10.010 Purpose. The purpose of this chapter is to safeguard and protect the water resources of Marin County through establishing minimum criteria for water efficiency in landscape and irrigation design.

23.10.020 Applicability. This chapter shall apply to all projects for which landscape plans are required by the county as part of a discretionary permit review by the county or for which water service is being issued or activated, except as follows:

1. Landscapes irrigated exclusively with reclaimed water or with private well water;
2. Registered historical sites;
3. Ecological restoration projects that do not require a permanent irrigation system; or
4. Single and multi-family projects with a landscaped area of less than 2,500 square feet.

In addition, sports fields, turf play areas within parks, golf courses, school yards and cemeteries are exempt from planting limitations outlined in Section 23.10.040; however, all other portions of this chapter shall be applicable.

23.10.30 Definitions. The following definitions apply in reference to this chapter:

1. "Cool season turfgrass" means turfgrass species adapted to growth during cooler periods of the growing season.
2. "High-water-using plants" means annuals, cool season turfgrass and other plants recognized as requiring a substantial and continuous supply of water. High–water-using plants have a plant factor of greater than 0.6. Examples include birch, willow and Scotch moss.
3. "Hydrozone" means a portion of the landscaped area having plants with similar water needs.
4. "Irrigation circuit" means a section of an irrigation system, including pipe and sprinkler heads or emitters, operated by a single remote control valve.
5. "Landscaped area" means the affected planting area within the entire parcel, by new plantings and supporting irrigation, excluding building footprints, paved driveways, parking areas, decks, patios, walkways and undisturbed natural areas. Water features are included in the landscaped area.
6. "Low-water-using plants" means plants recognized as able to withstand extended periods without water, once established,. Moderate-water-using plants have a plant factor of greater than or equal to 0.4. Examples include coast live oak, manzanita and oleander.
7. "Moderate-water-using plants" means plants recognized as able to withstand short periods without water, once established. Moderate-water-using plants have a plant factor of greater than or equal to 0.4 but less that or equal to 0.6. Examples include camphor, boxwood and Escallonia.

8. “Plant factor” means any number which represents the approximate portion of reference evapotranspiration used by a particular plant.

9. “Porous mulch” means a material applied to the soil surface for the purpose of reducing evaporation. Examples include shredded bark, compost, straw, animal manure and gravel.

10. “Precipitation rate” means the depth of water deposited within a given area during a specific length of time, usually measured in inches per hour.

11. “Reference evapotranspiration” means a resultant of a standard calculation of the quantity of water transpired by a reference crop, usually grass, and evaporated from adjacent soil surfaces.

12. “Runoff” means water which is not absorbed by the soil and “runs off” onto adjacent areas.

13. “Scarify” means to rip, rototill or otherwise break the soil surface.

14. “Water features” means ornamental or functional fountains, pools, ponds, etc., including swimming pools.

23.10.40 Planting. Plants selected for landscapes shall be compatible with the climate, geology and topographic conditions of the site. Plants with similar water requirements shall be grouped together in distinct and separate hydrozones. High-water-using plants, such as cool season turfgrass, are permitted when limited in area such that either:

1. they do not comprise more than 25% of the landscaped area; or
2. the average plant factor for the entire landscaped are does not exceed 0.5, when calculated using the following estimates other documented plant factor determinations:
    a. The plant factor for cool season turfgrass and high-water-using plants is 0.8;
    b. The plant factor for moderate-water-using plants is 0.5; and
    c. The plant factor for low-using plants is 0.2.

23.10.050 Irrigation. Landscaped areas shall be water conserving and shall be irrigated with an automatic irrigation system which shall be designed to provide efficient irrigation coverage without overspray onto non-landscaped areas. Automatic irrigation systems shall include:

1. Irrigation controller(s) with repeat start time and multiple program potential;
2. Automatic rain shut-off device for each controller;
3. Pressure regulation devices(s) as required to effect appropriate operating pressures for each type of sprinkler or other application device;
4. Check valves where elevation differential may cause low head drainage;
5. High flow shut-off valves for each overhead sprinkler;
6. Precipitation rates matched within 20% for each overhead irrigation circuit;
7. Point application (drip, bubbler) where overhead irrigation will result in overspray, runoff or non-uniform application; and

8. Separate irrigation circuits for different hydrozones, irrigation methods, precipitation rates, solar exposures, microclimates, slopes and soil types.

23.10.060 Soil Conditioning and Mulching. Soil conditioning shall be suitable to provide healthy growing conditions for plants and to encourage water infiltration and penetration. Soil preparation shall include:

1. Scarifying soil to a minimum depth of 6 inches; and

2. Amending soil with organic material at a minimum rate of 5 cubic yards per 1,000 square feet or per specific recommendations from a soils laboratory report.

In addition, a minimum 2 inch layer of porous mulch shall be applied to exposed soil surfaces of non-turf areas within the landscaped area.

23.10.070 Water Features. Water features shall be designed to minimize evaporation and shall be as water efficient as possible. All water features shall use recirculating water. Fountains which spray water into the air are discouraged. The surface area of water features shall be calculated as high-water-using plants (plant factor greater that 0.6) for limitations outlined in Section 23.10.040.

23.10.080 Compliance. If this chapter is applicable, the following information shall be submitted to the county at the time of application for a development permit:

1. A planting plan which clearly indicates:
    a. Location of existing and proposed trees, shrubs, groundcovers, turf and other plants;
    b. Listing of proposed plants by botanical and common name;
    c. Property lines, building footprints, driveways, parking areas and other hardscape features, undisturbed natural areas and water features;
    d. Notes or specifications regarding recommended soil preparation; and
    e. Calculations for the square footage limitation or average plant factor determination as outlined in Section 23.10.040

2. An irrigation plan which clearly indicates:
    a. Location of connection to domestic system, including meter size;
    b. Location of major irrigation system components, including of controllers, backflow prevention devices, pressure regulating devices, gate valves, automatic control valves, mainline and lateral pipe, rain shut-off devices, sprinklers, etc.;
    c. Listing of major irrigation components, including manufacturer, model number and size, where appropriate; and
    d. Total flow and precipitation rate for each overhead irrigation circuit.

3. A Statement of Conformance, signed by a certified or licensed landscape design professional, which confirms that design requirements of this chapter have been met. The Statement of Conformance form may be obtained from the Planning Department. As used in this section, “landscape design professional” includes, but is not limited to, a landscape architect, landscape architect, landscape contract, irrigation designer, or golf course architect.

Once installation of the landscape has been completed, a Statement of Completion, signed by a certified of license landscape design professional, shall be submitted to the county which confirms that the landscape was installed as designed. The Statement of Completion form may be obtained from the Planning Department.

For projects within jurisdictions of local water districts where landscape water efficiency is required by the water district as a condition of water service, letters from the district confirming project compliance with the district's landscape water efficiency regulations may be accepted in lieu of the requirements listed in this section. These in-lieu letters will be accepted if, in the judgment of the Planning Director, the district's regulations meet the requirements of this section.

For projects within jurisdictions of local water districts where adherence to landscape water efficiency guidelines is voluntary and a project sponsor agrees to install a landscape in accordance with the district's guidelines which, in the opinion of the district, would be equal to or more water efficient than a landscape installed pursuant to thus section, letters from the district confirming project compliance with the district's guidelines may be accepted in lieu of the requirements listed in this section. Theses in-lieu letters will be accepted if, in the judgment of the Planning Director, the district's guidelines meet the requirements of this section.

Appeal. Any person aggrieved by a determination, interpretation, decision, conclusion, decrees, judgment or similar action relative to this chapter may appeal such action as provided in Chapter 22.89 of the Marin County Code.

Amend the title page for Title 23 of the Marin County Code, Natural Resources, to read as follows:

Title 23

NATURAL RESOURCES

Chapters:

23.02 General

23.04 Timber Harvesting Regulations

23.06 Regulations and Control of Surface Mining and Quarrying Operations

23.08 Excavating, Grading and Filling

23.10 Water Efficiency in Landscaping

Amend Marin County Code Section 23.02.020(4), Purposes, to read as follows:

4. Pollution of private and/or public water supplies, waste and/or inefficient use of public water supplies, and impairment of sanitary disposal systems;

Section III. Effective Date

This Ordinance shall be, and is hereby declared to be, in full force and effect on January 15, 1993 and shall be published once before December 30, 1992, with the names of the Supervisors voting for and against the same, in the *Marin Independent Journal*, a newspaper of general circulation published in the County of Marin.

Section IV: Vote.

Passed and Adopted at a regular meeting of the Board of Supervisors of the County of Marin, State of California, on the 15th day of December, 1992, by the following vote to-wit:

Ayes: Supervisors: Brady Bevis, Al Aramburu, Gary Giacomini, Bob Roumiguire

Noes: Supervisors: None

Absent: Supervisors: Harold Brown

Appendix J

Fire Hazard Matrix:
Standards for Managing Vegetation

Appendix J
Fire Hazard Matrix: Standards for Managing Vegetation

Defensible space is the managed landscape around a home that helps it withstand a wildfire by limiting the availability of fuel and altering its arrangement. This space provides firefighters with more time to respond to an incident and an area to work safely and effectively. The table below is a fire-hazard-assessment matrix that defines the recommended extent of defensible space based on site features including aspect (hillside orientation), slope (hillside steepness), and vegetation type. Standards for managing vegetation within the defensible space are also provided.

FIRE-HAZARD ASSESSMENT

Hazard Points	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Total Points**
ASPECT	-	NE	-	NW	-	SE	-	SW	-	
SLOPE (%)	0	5	10	15	20	25	30	35	40+	
VEGETATION TYPE[1]	Domestic Garden	Mixed Evergreen Forest	Short Grass, Oak Savannah	Tall Grass, Oak Savannah	Brush	Redwood Forest	Chaparral	Fire-Prone Hardwood Forest	Fire-Prone Softwood Forest	
									Aspect, Slope, Vegetation Type Total:	

Hazard Scale (Minimum defensible space needed)				
Total Points	**4 5 6 7 8 9**	**10 11 12 13 14 15**	**16 17 18 19 20 21**	**22 23 24 25 26**
Treatment Area[2]	30 x 30 x 30 ft.	30 x 30 x 50 ft.	50 x 50 x 100 ft.	75 x 75 x 150 ft.

DEFENSIBLE SPACE STANDARDS

Vegetation Type	Description	Standards
Domestic Garden	Well-maintained ornamental garden, usually irrigated. Trees and shrubs are well spaced or clustered, thinned, and free of deadwood. The lawn is mowed and clean.	No fire-prone plants within 10 feet of structure; Install and irrigate fire-resistive plants[3]; maintain 10-ft. spacing among shrubs and tree crowns; remove dead material annually.
Mixed Evergreen Forest	Native evergreen forest with a blend of coast live oak, California bay, Pacific madrone, tanoak, and Douglas-fir.	Prune tree branches to 10 ft.; remove all deadwood and fire-prone plants within 10 ft. of dripline.
Grassland, Oak Savannah	Open grassland or grass beneath oak-dominated community with widely spaced clumps or individual oaks.	Cut grass to 3 inches; mulch or remove cuttings.
Brush	Brush-dominated community including young chaparral, coastal scrub, and broom stands.	Separate bushes by no less than 2-times their height; shrub clumps should be less than 20 ft. in diameter and separated by 2-times their height; remove dead branches.
Redwood Forest	Native coast redwood forest mixed with tanoak and California bay.	Prune tree branches to 10 ft.; remove all deadwood and fire-prone plants within 10 ft. of dripline.
Chaparral	Tall (>6ft.), fire-prone brush with excessive deadwood including chamise- manzanita-serpentine-, and mixed-chaparral.	Separate bushes by no less than 2-times their height; shrub clumps should be less than 20 ft. in diameter and separated by 2-times their height; remove dead branches.
Fire-Prone Hardwood Forest	Broadleaf forest high in volatile oils and produce heavy debris and burn intensely. This includes eucalyptus forest, acacia forest, and oak woodland with heavy understory.	Remove all brush, cured grass, fire-prone understory plants, and dead wood. Prune tree branches to 10 ft. and remove deadwood; separate trees 10 ft. crown-to-crown; thin trees by 25 to 30%.

[1] Use the most hazardous existing or potential vegetation type on the property.
[2] Distances measured upslope, sideslope, and downslope, respectively.
[3] Refer to Pyrophytic vs. Fire Resistant Plants, UC Cooperative Extension and Fire Safe Marin, June 1997.

Appendix K

Hillslope Habitat Areas

Appendix K

Hillslope Habitat Areas

The open and wooded hillsides contribute significantly to the scenic backdrop when viewed from developed areas in the valley floors. This is due to the low density of development in the upland areas, the minimal visual bulk of most residential structures and the heavy vegetative screen for residences. Please refer to Figure K-1 for a typical woodland hillside section.

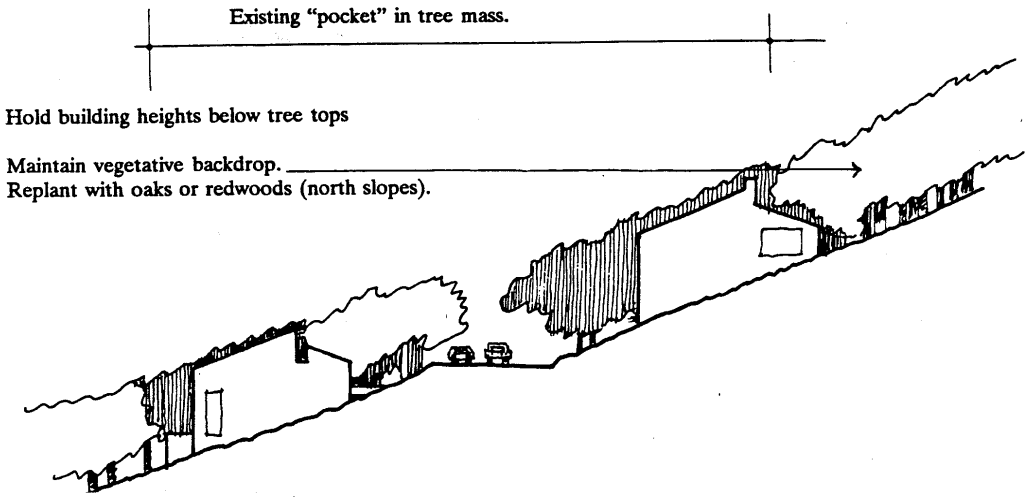


Figure K-1 Woodland Hillside Section

The upland hillslope areas are characterized as having unique scenic qualities, vegetation, wildlife habitat and limited development potential.

The major plant and wildlife communities are as follows:

- Oak Savannah - Oak Savannah is comprised of open grassland with isolated and scattered oak trees.

- Oak Woodland - The Oak Woodland community is comprised of greater tree cover than the Oak Savannah community. The tree canopy may be made up of Coast Live Oak, Bay Oak, California Bay, Madrone and Buckeye Trees. The understory includes different herbs and grasses depending on the quantity of sun exposure. In addition to their wildlife habitat value, Oak Woodlands are important to soil development and watershed protection.

- Mixed Evergreen – Mixed evergreen generally consists of three major associations, including Oak/Bay/Madrone, Tanbark Oak/Madrone-Live Oak/Douglas Fir Forest, and Douglas Fir Forest.

- Redwood Groves - Small groves of redwood trees are found on north facing slopes and valleys which contain natural seepage or springs.

1. Wildland Fire Hazards in Hillslope Areas

The vegetation in hillslope areas is extremely flammable during the late summer, fall and times of drought. This creates a serious hazard in undeveloped areas and large lot homesites with their extensive areas of unirrigated vegetation. In addition to the dry periods of the year, wildland fire hazard is related to slope steepness, vegetation type, exposure to sun and accessibility to fire fighting equipment. Steeper slopes are a major hazard because they have a fire-spreading effect similar to high velocity winds. Fuel loading, which reflects the different amounts of combustible material provided by various vegetation types helps determine the degree of hazard.

To reduce the risk, the County Fire Department and other Districts review development proposals, maintain a system of fire trails and implement programs where information on fire hazard is provided to residences adjacent to open space. The program promotes creative landscaping, with attention to fire resistive characteristics; erosion control; and fuel reduction programs to clear fire transmitting growth.

The appropriate Fire Department or District coordinates with the appropriate water district and County Departments through the development review process to insure that water supply necessary for fire safety and other Fire Department or District concerns are met for new development.

Additional guidelines pertaining to the transitional areas between undeveloped hillslope areas and new development can be found in Appendix L: Planting Design for Hillside Residential Development. Transitional slopes may be used between the domestic plantings of new development and the native flammable brush of undisturbed areas. The goal is to slow down the approaching fire within the transitional zone by reducing the fire's fuel supply. The following techniques may be used to accomplish this goal:

a. Evaluate the plant materials existing within the transitional zone for fuel volume and health. Remove plants from this area which are characterized by particularly high fuel volume, as well as all plants that are in poor health.
b. Retain in thinned out groupings low fuel volume native plants.
c. Clean out all dead leaves and branches in this area annually. Thin native plants by pruning to reduce their fuel volume.
d. If water supplies permit, irrigate this zone monthly during the summer months to retain a high level of moisture in the plant leaves.

2. Development in Hillslope Habitat Areas

The Countywide Plan encourages residential clustering to avoid or reduce impacts on sensitive hillslope habitat areas and to preserve and protect natural features and vegetation groupings. Residential development projects should follow the provisions of this guideline.

Incorporate existing trees and vegetation groups into the design of projects in hillslope habitat areas:

- Oak Savannah habitats - incorporate existing oaks into the design of open space and other undeveloped areas and preserve existing vegetation to screen new development from offsite views.

- Oak Woodland and Mixed Evergreen habitats - preserve existing tree canopies and place new development in "pockets" within the overall tree massing. Use existing vegetation to screen new development from offsite views. Please refer to Figure K-2.

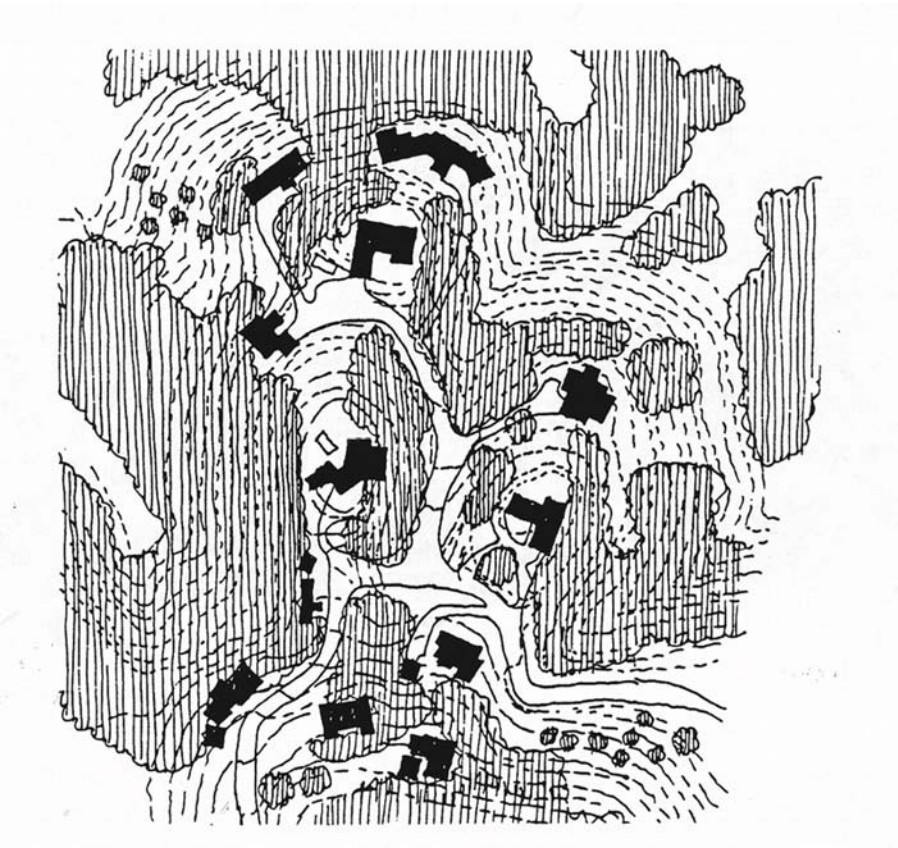


Figure K-2 Residential development located in "pockets" within the overall tree massing

- Allow front and side setback requirements to be flexible (including zero lot line conditions). Please refer to Figure K-3.

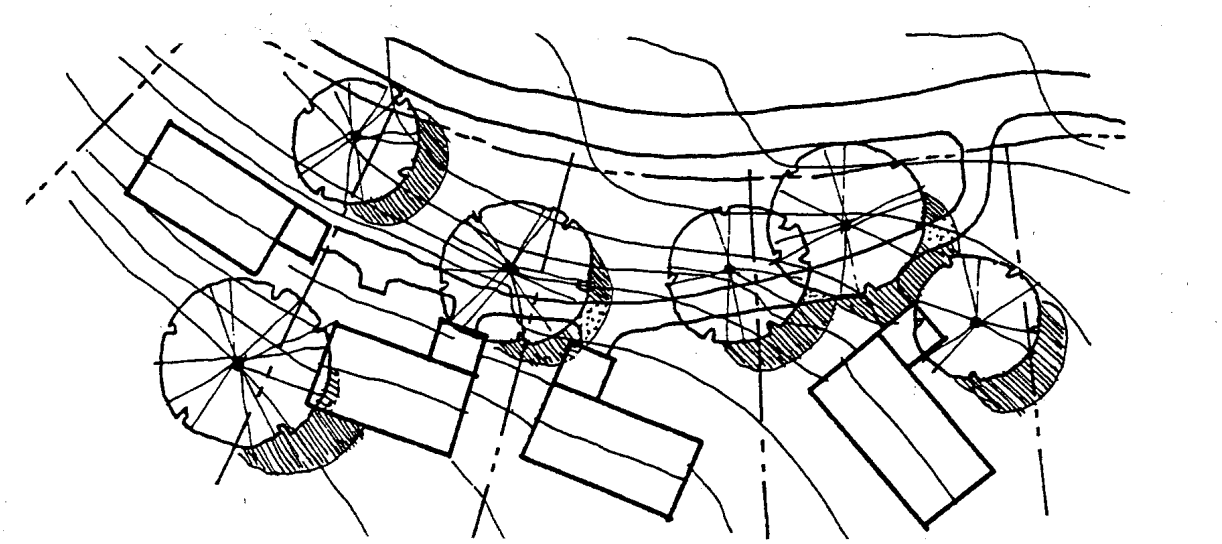


Figure K-3 Siting structures with flexible front and side setbacks in hillside area

- Promote clustering of buildings if this will protect an existing slope.

- Allow flag lots with parking located in "parking pockets" adjacent to roadways to encourage terracing of buildings while minimizing roadway cut and fill.

- Avoid large expanses of flat areas such as parking lots that create an incongruous element in the slope. Siting multiple structure development projects so that buildings have different floor elevations is one suggestion to achieve height variation of buildings located on highly visible hillside sites.

- Buildings located near hillside rims have higher visibility. These buildings should be sited in a staggered arrangement and screened with planting to minimize a "wall" effect.

Appendix L

Planting Design for Hillside Residential Development

Appendix L

Planting Design for Hillside Residential Development

The following are some principles that govern the landscaping in hillside settings.

- **Planting design should reflect the local characteristics of the Marin County landscape.**
- **Plant species should be primarily native, drought tolerant, fire resistant and compatible with the surrounding natural landscape**
- **Protect ridgelines, open hillsides, canyon and riparian areas by using native plantings suitable to the location.**
- **Plant selection should recognize the importance of water conservation, fire resistance and erosion control. Emphasize drought tolerant native plant species.**
- **Use hillside planting design to effectively buffer existing hillside residential neighborhoods from the impacts of new hillside development projects.**

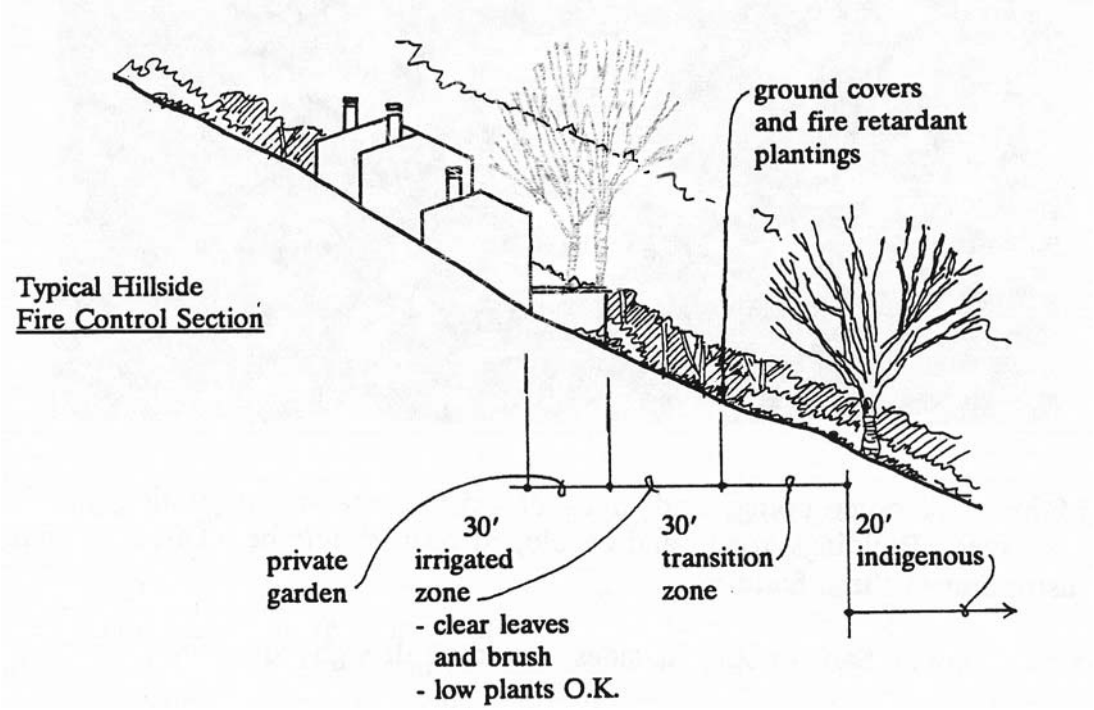


Figure K-1 Hillside Fire Control Section

I. Design Concepts

A. Reinforce the dominant planting patterns that define the oak savannah, oak woodland, mixed evergreen, redwood grove or forest and canyon and riparian habitats of Marin County's hillside areas.

1. The patterns of woodland, grassland savannah, native scrub and oaks that define the hillsides unify and give strong identity to the hillside areas of the County.

Efforts should be made to retain existing tree groupings and specimen trees to incorporate them into new development. When tree groupings must be removed, hillsides could be replaced with irregularly grouped tree species that have a similar appearance when seen from a distance.

2. Major rock outcroppings and areas of existing mature vegetation should be preserved. Buildings, roads, and developed yards should be located to minimize disruption of these features.

3. Large grassy areas adjacent to water courses should be avoided.

4. Natural vegetation along creeks and watercourses should be left undisturbed. Where these areas have been previously disturbed, a restoration plan should be developed and implemented in conjunction with the project.

B. New plantings should be drought tolerant.

1. All new plantings should be able to withstand a summer with restricted irrigation after an establishment period of two years.

2. Turf grasses, shallow rooted ground covers and high water using trees and shrubs are discouraged.

II. Plant Selection

Appendix M: Plant Selection Guide lists suggested plant species and their recommended uses.

Plants have been chosen based upon the following criteria:

1. Compatibility with native landscape;

2. Appropriateness for Marin County's varied climate zone;

3. Drought and fire resistance;

4. Form considerations, such as height, branching patterns, density;

5. Maintenance; and

6. Aesthetic considerations, such as flowering, fruiting, leaf color.

III. Planting Guidelines

A. Follow the draft landscape guidelines in Appendix L (i.e., use of natives versus non-natives based on location). The use of a variety of tree species and sizes in encouraged.

B. All planting plans should conform to applicable water efficiency ordinances.

C. All landscaped areas requiring supplemental water should have irrigation systems capable of sustaining good plant growth. Automatic systems are encouraged.

D. All planting beds should be mulched with an organic mulch of at least 1.5 inches in depth.

E. Shrubs are preferred over ornamental ground covers and lawns due to their low water use characteristics. Shrubs are more deeply rooted than ground covers and turf grasses and will withstand drought conditions better.

F. New planting requirements may be further adjusted to reflect the size and density of existing trees and shrubs.

G. Revegetate scarred or graded areas that have high visibility from the community.

H. On slopes of 2:1 or greater, plant materials with deep rooting characteristics should be selected that will minimize erosion and reduce surface runoff. The planting basin should be kept level with a raised berm around the base of the plant to help retain moisture. A series of low retaining walls, with sub-drain lines, will provide increased planting area on the slope. This will also reduce runoff and potential erosion.

I. Internal Slope Plantings.

Internal slopes that exist within the boundaries of newly developed projects that are not located to blend into native areas, as do transitional slopes, may be planted with a plant palette that includes introduced species. The following principles are recommended for internal slopes:

- Establish gradient of new slope and determine erosion control requirements.
- Fulfill erosion control needs with water-conserving plant material.
- As a general rule, use water conserving plant species.

J. Planting Techniques for Graded Slopes.

Use irregular plant spacing to achieve a natural appearance on graded slopes. Plant trees along contour lines in undulating groups to create grove effects which blur the distinctive

line of the graded slope. Shrubs of varying height may be planted between tree stands. Ground covers of native and introduced species are appropriate for slope erosion control.

When possible, locate trees in swale areas to more closely reflect natural conditions and gather surface runoff for plant irrigation.

K. Common Areas.

Common open spaces and landscaped areas maintained by homeowners associations are subject to review under these guidelines when proposed in connection with a subdivision, Master Plan or other discretionary permit. Open space easements may be required for new development to protect sensitive lands, consistent with the policies of the Countywide Plan**.**

L. Hillside Plant Selection.

- Plant materials should be selected for their effectiveness of erosion control, fire resistance and drought tolerance.

- Hillside plant selection should consider neighbors' views and observe the following principles:

  > Where views have been established, follow the downhill alignment of taller trees.

  > Use less dense, open trees that provide shade but do not block views, solar access or light at maturity.

M. Public Rights-of-Way

All public rights-of-way areas between the property and the sidewalk or street edge that have been disturbed by development shall be revegetated to prevent erosion or be fully landscaped. Certain species of trees may be planted in street rights-of-way with County Department of Public Works approval.

N. Planting and Defensible Space for High Fire Hazard Areas

Defensible space is the managed landscape around a home that helps it withstand a wildfire by limiting the availability of fuel. This space provides firefighters with more time to respond to an incident and provides an area to work safely and effectively. The table in Appendix JI is a fire hazard assessment matrix that defines the recommended extent of defensible space based on site features that include aspect (hillside orientation), slope (hillside steepness), and vegetation type. Defensible space should not encroach onto permanently dedicated (or preserved) open space open space or adjoining lots where feasible.

Appendix M

Plant Selection Guide
(Draft for Central Marin Hillside Areas)
and Non-native Invasive Plants

Appendix M

Plant Selection Guide (Draft for Central Marin Hillside Areas) And Non-native Invasive Plants

The table on the ensuing pages includes suggested plant species that are compatible with the native landscape, appropriate for Marin County's varied climate zone, drought and fire resistant, low maintenance, and have aesthetic qualities. A list of non-native invasive plants to avoid has also been included.

GENERAL HILLSIDE PLANT LIST

BOTANICAL NAME	COMMON NAME	Drought Toleran	Screen Backgrnd.	Slope/ Ero.Cont.	Low Fuel Volume	Drainage Ravine	Deer Resistant	Freeze Damaged
TREES:								
Aesculus californica*	California Buckeye	X		X		X	X	
Ailanthus altissima	Tree of Heaven	X					X	
Alnus cordata	Italian Alder					X	X	
Arbutus unedo*	Strawberry Tree	X	X	X	X	X		
Cedrus deodara	Deodar Cedar	X	X				X	
Ceratonia siliqua	Carob Tree	X			X			X
Cercis occidentalis*	Western Redbud	X		X	X	X	X	
Cupressocyparis leylandii	Leyland Cypress	X	X	X			X	
Eriobotrya japonica	Loquat	X						
Fraxinus o. 'Raywood'	Raywood Ash	X						
Geijera parviflora	Australian Willow	X					X	
Leptospermum laevigatum	Australian Tea Tree	X					X	
Leptospermum scoparium	New Zealand Tea Tree	X					X	X
Liquidambar styraciflua	Sweet Gum						X	
Lyonothamnus f.'Asplenifolius'*	Fernleaf Ironwood	X	X				X	
Maytenus boaria	Mayten Tree	X					X	
Melia a. 'Ubraculiformis'	Texas Umbrella Tree	X					X	
Melaleuca linariifolia	Flaxleaf Paperbark	X					X	X
Metrosideros excelcus	New Zealand Christmas Tree	X			X		X	
Myoporum laetum	Myoporum		X	X	X		X	X
Olea europea	European Olive	X					X	
Pinus pinea	Italian Stone Pine	X	X	X			X	
Pistacia chinensis	Chinese Pistache	X					X	
Platanus a.'Bloodgood'	London Plane Tree					X	X	

* DENOTES NATIVE SPECIES

BOTANICAL NAME	COMMON NAME	Drought Toleran	Screen Backgrnd.	Slope/ Ero.Cont.	Low Fuel Volume	Drainage Ravine	Deer Resistant	Freeze Damaged
Populus fremonti*	Fremont Poplar		X			X	X	
Prunus carolliniana	Carolina Cherry	X	X	X	X	X	X	
Prunus lyonii*	Catalina Cherry	X	X	X	X	X	X	
Pyrus c. 'Bradford'	Bradford Pear						X	
Quercus agrifolia*	Coast Live Oak	X		X		X	X	
Quercus chrysolepis*	Canyon Live Oak	X				X	X	
Quercus ilex	Holly Oak	X					X	
Rhus lancea	African Sumac	X			X		X	
Robinia a. 'Idahoensis'	Idaho Locust	X					X	
Schinus terebinthifolius	Brazilian Pepper	X			X		X	
Sequoia sempervirens*	Coast Redwood		X	X		X	X	
Tilia e. 'Redmond'	Crimean Linden						X	
Tristania laurina	Swamp Myrtle	X					X	
Umbellularia californica*	California Laurel	X		X		X	X	

SHRUBS:

Abelia grandiflora	Glossy Abelia			X				
Acacia decurrens	Green Wattle	X			X			X
Agonis flexuosa	Peppermint Tree	X	X					
Arbutus u. 'Compacta'*	Dwarf Strawberry Tree	X	X		X	X	X	
Arctostaphylos spp.*	Manzanita	X		X	X	X		
Berberis thunbergii	Japanese Barberry						X	
Caesalpinia spp.	Bird of Paradise	X						
Callistemon citrinus	Lemon Bottlebrush	X	X				X	
Ceanothus spp.*	Ceanothus	X		X	X		X	
Chaenomeles spp.	Flowering Quince			X			X	
Chamelaucium uncinatum	Waxflower		X	X				
Cistus spp.	Rockrose	X		X	X		X	
Cotoneaster spp.	Cotoneaster			X			X	
Dabocia cantabrica	Daboecia			X	X			
Diosma pulchra	Pink Diosma			X				

BOTANICAL NAME	COMMON NAME	Drought Toleran	Screen Backgrnd.	Slope/ Ero.Cont.	Low Fuel Volume	Drainage Ravine	Deer Resistant	Freeze Damaged
VINES:								
Bougainvillea spp.	Bougainvillea	X		X			X	X
Clytostoma callistegioides	Lavender Trumpet Vine							X
Gelsemium sempervirens	Carolina Jessamine						X	
Hibbertia scandens	Guinea Gold Vine						X	
Jasminum polyanthum	Pink Jasmine						X	X
Rosa 'Cecile Brunner'	Cecile Brunner Rose	X		X				
Solanum jasminoides	Potato Vine	X					X	X
Wisteria sinensis	Chinese Wisteria	X					X	
GROUNDCOVER/PERENNIALS:								
Acacia redolens	Acacia	X		X	X			
Achillea tomentosa	Wooly Yarrow	X			X		X	
Agapanthus spp.	Lily of the Nile				X		X	X
Arctostaphylos 'E. Carpet"	Manzanita	X		X				
Baccharis p. 'Twin Peaks"	Dwarf Coyote Bush	X		X	X		X	
Ceanothus spp.*	Ceanothus	X		X	X		X	
Centaurea cineraria	Dusty Miller							
Chorizema cordatum	Flame Pea			X				
Cistus salvifolius	Sageleaf Rockrose	X		X	X		X	
Convolvulus cneorum	Bush Morning Glory	X		X	X			
Coprosma kirkii	Creeping Coprosma	X		X	X		X	
Correa pulchella	Australian Fuchsia			X			X	X
Cotoneaster spp.	Cotoneaster			X	X		X	
Daboecia spp.	Daboecia			X				
Dietes vegeta	Fortnight Lily						X	
Gazania 'Mitsuwa Yellow'	Gazania	X		X	X			
Hemerocallis hybrids	Daylily			X	X		X	
Hypericum calycinum	St. John's Wort			X	X		X	
Iris douglasiana*	Douglas Iris	X					X	
Lantana montevidensis	Trailing Lantana			X			X	X

BOTANICAL NAME	COMMON NAME	Drought Toleran	Screen Backgrnd.	Slope/ Ero.Cont.	Low Fuel Volume	Drainage Ravine	Deer Resistant	Freeze Damaged
Lavandula spp.	Lavender	X					X	X
Lobularia maritima	Sweet Alyssum							
Myoporum parvifolium	Myoporum	X		X	X			X
Narcissus spp.	Daffodil						X	
Oenothera berlandieri	Mexican Evening Primrose	X						X
Osteospermum fruticosum	African Daisy			X	X			
Ribes viburnifolium*	Evergreen Currant	X		X		X	X	
Salvia leucantha*	Creeping Sage	X		X	X		X	
Santolina virens	Santolina			X	X		X	
Solilya heterophylla	Australian Bluebell	X		X			X	X
Trachelospermum jasminoides	Star Jasmine			X			X	
Vinca spp.	Periwinkle			X	X		X	
Zauschneria californica*	California Fuchsia	X		X	X		X	

* Indicates native California species.

BOTANICAL NAME	COMMON NAME	Drought Toleran	Screen Backgrnd.	Slope/ Ero.Cont.	Low Fuel Volume	Drainage Ravine	Deer Resistant	Freeze Damaged
Dodonaea viscosa	Hopseed Bush		X	X			X	
Echium fastuosum	Pride of Madeira	X		X			X	
Elaeagnus pungens	Silverberry	X	X	X			X	
Escallonia spp.	Escallonia		X					
Fallugia paradoxa*	Apache Plume	X		X				
Feijoa sellowiana	Pineapple Guava	X	X	X	X			
Fremontodendron spp.*	Flannel Bush	X	X	X				
Garrya fremontii*	Coast Silk Tassle	X	X	X	X			
Grevillea canberra	Grevillea		X	X			X	
Heteromeles arbutifolia*	Toyon	X	X	X	X	X	X	
Juniperus spp.	Juniper	X		X			X	
Lonicera pileata	Privet Honeysuckle		X	X				
Mahonia spp.*	Mahonia			X			X	
Myrica californica*	Pacific Wax Myrtle	X	X	X			X	
Nandina domestica	Heavenly Bamboo		X				X	
Nerium oleander	Oleander	X	X	X	X		X	X
Photinia fraseri	Photinia		X					
Pittosporum t.'Wheelers Dwarf'	Dwarf Pittosporum				X			
Pittosporum tenuifolium	Pittosporum		X		X			
Plumbago auriculata	Cape Plumbago	X	X	X			X	
Prunus ilicifolia*	Holly Leaf Cherry	X	X	X	X			
Rhamnus californica*	California Coffeeberry	X	X	X	X			
Rhaphiolepis indica	Pink India Hawthorn	X		X				
Rhus integrifolia*	Lemonade Berry	X	X	X	X		X	
Rosmarinus 'Prostratus'	Rosemary	X		X	X		X	
Sophora secundiflora	Mountain Laurel	X	X	X				
Symphoricarpos albus*	Common Snowberry	X		X	X	X		
Trichostema lanatum	Woolly Blue Curls	X		X	X			
Xylosma congestum	Shiny Xylosma		X	X				

NON-NATIVE INVASIVE PLANTS

Non-native plants that invade parks, preserves, and other wildlands in California are widespread and severe. Although fewer than 10% of the weeds that have established here are recognized as serious threats, they have dramatically changed our ecological landscape. These weeds displace native plants depriving our wild animals of food and shelter. They alter the ecosystem, increase the frequency of wildfires, damage our waterways, and choke out other plants essential to wildlife. They can do this because the natural pests, diseases or weather conditions which kept the plants in check in their homeland are missing in California. Many of these invasive plants [and their seeds] are even toxic to domestic animals and livestock. Invasive plants present numerous and complex issues that are difficult to manage. The good news is that many non-native plant invasions can be halted or slowed through public awareness and education.

The following non-native plants are invasive and **should not** be used as landscape materials.

Black acacia, Silver wattle, Green wattle, etc	*Acacia species*
Black locust	*Robinia pseudo-acacia*
Brazilian pepper tree	*Schinus terebinthifolius*
Cape ivy	*Delairea odorata*
Capeweed	*Arctotheca calendula*
Cherry plum	*Prunus cerasifera*
Cotoneaster	*Cotoneaster species*
Creeping saltbush	*Atriplex semibaccata*
English ivy	*Hedera helix*
Fennel	*Foeniculum vulgare*
French broom	*Genista monospessulana*
Giant reed	*Arundo donax*
Gorse	*Ulex europaeus*
Harding grass	*Phalaris aquatica*
Himalayan blackberry	*Rubus discolor*
Iceplant or Hottentot fig	*Carpobrotus edulis*
Jubata grass, Pampas grass	*Cortaderia species*
Kikuyu grass	*Pennisetum clandestinum*
Oblong spurge	*Euphorbia oblongata*
Pennyroyal	*Mentha pulegium*
Perennial pepperweed	*Lepidium latifolium*
Periwinkle	*Vinca major*
Purple loosestrife	*Lythrum salicaria*
Red valerian	*Centranthus ruber*
Scarlet wisteria	*Sesbania punicea*
Scotch broom	*Cytisus scoparius*
Spanish broom	*Spartium junceum*
St. Johnswort	*Hypericum perforatum*
Tamarisk, Athel tree	*Tamarix species*
Tree-of-heaven	*Ailanthus altissima*
Wild sweet pea, Everlasting pea	*Lathyrus latifolius*

For more information about appropriate plants to use for landscaping, consult:
California Invasive Plant Council www.cal-ipc.org
Marin Chapter California Native Plant Society www.marin.cc.ca.us/cnps
MSWMAA www.marinsonomaweedmanagement.org

Appendix N-1

Resource Conservation for Single-family Residential Development

Appendix N-1

Resource Conservation for Single-family Residential Development

The policy of Marin County is to encourage home construction and remodeling that are energy-efficient, healthy and durable. This strategy is better known as "green building."

Green building is a continuously-evolving science and ongoing research to find new ways to improve the quality, efficiency, health, and durability of buildings. Marin County's Green Building guidelines are based on other widely-accepted standards such as those in use by other local municipalities, the State of California, Build It Green, or the U.S. Green Building Council. As the science of green building evolves, the County's guidelines will be updated to reflect new information. For instance, the guidelines contained in this Appendix may be augmented by additional guidelines from the State of California that may be adopted in the future.

The following section summarizes green building techniques that apply the principles of sustainability to residential buildings. In addition, the green building guidelines and rating system located in Appendices N-2 and N-3 provide homebuilders with a range of recommended practices to choose from in applying the above principles and techniques. Because larger homes typically require more resources and energy to build and maintain, the green building rating system is based on a graduated point system that reflects home size.

Summary of Green Building Benefits

Best Green Building Principles	Benefits
A. Community Design Issues	
1. Orient homes on East/West Axis for Solar Access	Reduces the need for energy and lowers utility bills.
2. Orient Living Rooms and Porches to Streets and Public Spaces	Fosters community living.
3. Build Mixed-Use, Residential/Commercial	Creates walkable communities, reduces smog and automobile use.
4. Design for Diverse Family Types	Opens housing market to wider range of buyers.
5. Provide second units	Creates more affordable housing.
6. Build in Close Proximity to Public Transit Hub	Reduces dependence on automobiles and reduces smog.
7. Minimize Street Widths	Slows traffic.
B. Site	
1. Recycle Job Site Construction and Demolition Waste	Reduces pressure on landfills, saves money by reducing landfill fees, and provides raw materials for future building products.
2. Donate Unused Materials	Reduces landfill deposits, helps local charitable organizations. Donations may be tax deductible.
3. Install Drip Irrigation or Other Water Efficient System	Reduces landscape water use and lowers water costs.
4. Minimize Disruption of Existing Plants and Trees	Helps prevent soil erosion, maintains existing sources of natural cooling, diverts waste from landfills, and maintains a unique character to the community.
5. Incorporate Permeable Paving	Reduces the volume of polluted water that flows into rivers, streams, creeks, or the Bay. Slows the rate of runoff. Reduces irrigation requirements as well as lowers risk of flooding.
6. Design Resource-Efficient Landscapes and Gardens	Helps conserve water, reduces use of chemicals, and creates healthier soil and plants.
7. Provide for On-Site Water Catchment / Retention (where appropriate given site size and topography)	Reduces the need to use treated, potable water for lawns and gardens.
C. Foundation	
1. Incorporate Recycled Flyash in Concrete	Increases the strength and durability of the concrete and reduces the amount of cement needed.

Best Green Building Principles	Benefits
2. Reuse Form Boards	Saves money and conserves resources as solid sawn lumber is becoming increasingly expensive and scarce.
3. Use Recycled Content Rubble for Backfill Drainage	Saves money and natural resources by using recycled materials.
4. Insulate Foundation Before Backfill	Reduces energy loss and utility bills by minimizing heat loss.
5. Use Aluminum Forms	Reduces wood use, and despite higher initial cost, will pay for themselves quickly with reuse.
6. Install Rigid Foam, Insulated Concrete Forms (ICFs)	ICFs are not subject to rot and results in a better insulated foundation.

D. Structural Frame

1. Substitute Solid Sawn Lumber with Engineered Lumber	Reduces demand for virgin lumber, is stronger, straighter, and more durable.
2. Use FSC Certified Wood for Framing	Guarantees long-term availability of precious woods.
3. Use Wood I-Joints for Floors and Ceilings	Uses 50% less wood fiber, will not twist, warp or split, stronger and lighter than 2x10s or 2x12s and can span greater distances.
4. Use OSB for Subfloor and Sheathing	Reduces the need for large diameter old-growth trees, is as strong as traditional plywood sheet material and is less expensive.
5. Use Finger-Jointed Studs	Uses recycled content materials, is straighter and stronger than solid sawn studs, and eliminates crooked walls, thereby reducing material waste.
6. Use Structural Insulated Panels (SIPs) for Walls/Roof	Reduces infiltration relative to frame construction, is energy-efficient, provides excellent soundproofing, is erected quickly, and saves wood by eliminating much of the conventional framing lumber.

Best Green Building Principles	Benefits
7. Use Reclaimed Lumber	Reduces resource consumption and landfill deposits, and is often of higher quality than new lumber.
E. Exterior Finish	
1. Use Sustainable Decking Materials	Contains recycled content materials, is more durable and reduces demand for old-growth timbers.
2. Use Treated Wood that does not contain Chromium or Arsenic for Decking and Sill Plates	Reduces exposure to chromium and arsenic, which are particularly harmful to children who play on structures built with treated wood.
3. Use Alternative Siding Materials	Lasts longer, is fire-resistant, and reduces maintenance costs.
F. Plumbing	
1. Insulate Hot and Cold Water Pipes	Saves energy and water, and reduces water heating costs.
2. Install Flow Reducers in Faucets and Showerheads	Lowers water bills, saves water and is a low cost options.
3. Install Chlorine Filter on Showerhead	Eliminates chlorine absorbed by skin.
4. Install Tankless Water Heaters	Saves energy, is quicker and more reliable.
5. Install Graywater System	Cuts down on the use of potable water for outside irrigation and lawn watering.
6. Install Water Filtration units at Faucets connected to Wells	Reduces contaminants in water.
7. Install On-Demand Hot Water Circulation Pump	Hot water arrives quicker to fixture, saving water and energy.
G. Electrical	
1. Install Compact Fluorescent Light Bulbs	Lowers energy bills and reduces need for energy production.
2. Install Insulation-Compatible Recessed Lighting (CODE)	Reduces the amount of heat loss/gain.
3. Install Lighting Controls (Automatic or Motion-sensor)	Reduces need for energy and lowers energy bills.
4. Install Ceiling Fans	Reduces the need for air conditioning.
H. Appliances	
1. Install ENERGY STAR* Dishwasher	Reduces water and energy use, and lowers utility bills.
2. Install Horizontal Axis (Front Loading) Washing Machine	Uses 40% less water and 50% less energy than conventional top loading washers.
3. Install Energy-Efficient Refrigerator	Reduces energy and can save over 10% on utility bills.

Best Green Building Principles	Benefits
I. Roofing	
1. Select Light Colored Roofing (if appropriate to the community setting)	Reduces heat buildup through the roof, increases occupancy comfort, roofing lasts longer and decreases air conditioning bill.
2. Select Safe and Durable Roofing Materials	Reduces landfill deposits and saves money on replacement costs.
J. Insulation	
1. Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirements	Lowers utility bills, improves comfort, decreases heating and cooling requirements and makes home quieter.
2. Install Recycled Content, Formaldehyde-Free Fiberglass Insulation	Reduces indoor air quality problems due to formaldehyde binders, and can contain up to 30% recycled glass.
3. Use Advanced Infiltration Reduction Practices	Reduces drafts, and lower bills.
4. Use Cellulose Insulation	Lowers recyclable materials, uses recyclable materials, and contains no formaldehyde.
5. Use Natural Building Materials such as Straw-bales	Lowers utility bills, positive use for renewable, agricultural products.
K. Windows	
1. Install Energy-Efficient Windows	Lowers utility bills, and provides greater comfort.

Best Green Building Principles	Benefits
L. Heating, Ventilation and Air Conditioning (HVAC)	
1. Use Duct Mastic on all Duct Joints (CODE)	Improves indoor air quality and keeps the homes more comfortable
2. Install Ductwork within Conditioned Space	Reduces energy loss and improves occupant comfort.
3. Vent Range Hood to the Outside	Improves indoor air quality.
4. Clean all Ducts Before Occupancy	Reduces dust around the house after occupancy.
5. Install Attic Ventilation Systems	Increases comfort and reduces air conditioning use.
6. Install Whole House Fan	Reduces electricity usage, and moves large volumes of air to achieve comfort at higher temperatures without air conditioning.
7. Install 13 SER or Higher AC	Saves money and energy, reduces peak load problems, and non-HCFC refrigerants reduce ozone layer depletion.
8. Install 90% or Greater Efficiency Gas Forced Air Furnace	Reduces air emissions, costs less to operate, and saves natural resources.
9. Eliminate Wood Burning Fireplaces	Reduces pollutant particulate matter by 75-90%.
10. Install Zoned, Hydronic, Radiant Heating	Saves energy by only heating the zone that requires heat.
11. Install High Efficiency Particulate Air (HEPA) Filter	Makes living space healthier, and reduces microparticulates from the air.
12. Install Heat Recovery Ventilation Unit (HRV)	Improves indoor air quality and reduces energy.
13. Install Separate Garage Exhaust Fan	Creates healthier indoor environments.
M. Renewable and Solar Energy	
1. Incorporate Natural Cooling	Reduces need for air conditioning, and is a low cost item to incorporate into home and yard.
2. Incorporate Passive Solar Heating	Reduces heating requirements by 30-50%, saves energy and money.
3. Pre-Plumb for Solar Water Heating	Saves money if a solar system is to be installed in the future.
4. Install Solar Water System	Reduces the use of gas or electricity, and pay-back is in as little as seven years.
5. Install Photovoltaic (PV) Panels	Decreases reliance on conventional power plants, reduces greenhouse gas emissions and is cost effective in areas that require night-lighting such as outdoor lights.
N. Indoor Air Quality / Finishes	

Best Green Building Principles	Benefits
1. Use Low/No-VOC and Formaldehyde-Free Paint	Improves indoor air quality, reduces smog, and is healthier for installers and occupants.
2. Use Low VOC, Water-Based Wood Finishes	Reduces smog and is healthier for home installers and occupants.
3. Use Solvent-Free Adhesives	Improves indoor air quality, and are healthier for occupants and installers.
4. Substitute Particleboard with Formaldehyde-Free Materials	Reduces formaldehyde exposure to occupants.
5. Use Exterior Grade Plywood for Interior Uses.	Reduces formaldehyde exposure to occupants.
6. Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Material	Improves indoor air quality.
7. Seal all Exposed Particleboard or MDF	Reduces exposure of harmful emissions to occupants.
8. Use FSC Certified Trim Material	Assures the long-term availability of these precious woods while protecting ancient, old-growth forests.
9. Use Finger-Jointed Trim	Uses material more effectively, saves money and resources, and is straighter and more stable than conventional lumber.
O. Flooring	
1. Select FSC Certified Wood Flooring	Assures the long-term availability of woods while protecting ancient, old-growth forests.
2. Use Rapidly Renewable Flooring Materials	Reduces demand for old-growth hardwood.
3. Use Recycled Content Ceramic Tile	Uses recycled content materials and is easy to maintain.
4. Use Natural Linoleum in Place of Vinyl Flooring	Reduces exposure to toxins, and is healthier for occupants and installers.
5. Use Exposed Concrete as Finish Floor	Eliminates the need for additional flooring materials, is easy to maintain, and very durable
6. Install Recycled Content Carpet and Underlayment	Saves resources, diverts waste from landfills, is more resilient and colorfast than carpet made from virgin fibers.

Appendix N-2

New Home Green Building Residential Design Guidelines

Appendix N-2

New Home Green Building Residential Design Guidelines

Marin Green Home

Green building is a whole systems approach to the design, construction and operation of buildings. This approach benefits both builders and homeowners by reducing resource consumption, increasing livability, and saving money in operation and maintenance.

Below is a list of green building guidelines that apply the principles of sustainability to residential buildings. A point system has been developed to indicate the level of importance for each guideline. Points are located in the right hand column and indicated in parentheses. The higher the number of points the better the project rating. These guidelines are a self-documenting procedure. Please write a brief statement (including quantities) for each measure you are implementing. This checklist is intended to assist applicants and project reviewers in demonstrating the extent to which a project conserves energy and protects natural resources.

A. Site

1. Reuse or recycle job site construction and demolition waste. _____
   Reduces pressure on landfills, saves money by reducing landfill fees, and provides materials for future building projects. (50% required. 75% = 4 points; 85% = 8 points)

2. Donate unused materials to local charitable organizations. _____
   Reduce landfill deposits. Donations may be tax deductible. (6 points)

3. Minimize disruption of existing plants and trees. _____
   Helps prevent soil erosion, maintains existing sources of natural cooling, diverts waste from landfills, and adds character to communities. (2 points)

4. Design native and resource-efficient landscapes and gardens. _____
   This conserves water, reduces the use of chemicals, and creates healthier soil and plants. (6 points)

5. Install no turf grass lawn on project. _____
   Lowers water and energy use. (2 points)

6. If irrigation is needed use drip irrigation. _____
   Reduces water use and costs. (3 points)

7. If in a sunny area, plant deciduous trees to south and/or west. _____
   Trees provide shade from summer sun and let winter sun through. (3 points)

8. Incorporate storm water infiltration and retention. _____
Reduces the volume of polluted water that flows into rivers or the bay, reduces irrigation requirements, and lowers risk of flooding. (4 points)

B. Foundation

1. Incorporate at least 25% recycled flyash in concrete. _____
Adds strength and durability to the concrete and reduces the energy used in production. (4 points)

2. Use reusable form boards. _____
Saves money and conserves resources. (2 points)

3. Use recycled content rubble for backfill drainage. _____
Saves money and natural resources by using recycled materials. (1 point)

4. Insulate foundation before backfill. _____
Reduces energy loss and lowers utility bills. (2 points)

5. Install insulated concrete forms (ICFs). _____
ICFs are energy efficient and are not subject to rot. (4 points)

C. Structural Frame

1. Substitute "solid sawn lumber" with "engineered lumber". _____
Reduces demand for virgin lumber and is stronger, straighter, and more durable. (3 points)

2. Use Forest Stewardship Council (FSC) certified wood for framing. _____
FSC wood is not clear-cut and comes from well-managed forests. (2 points for every 10% of FSC lumber used for framing; up to 10 points)

3. Use wood I-joists, for floors and ceilings. _____
I-joists use 50% less wood fiber, will not twist, warp or split, and are stronger and lighter than 2x10s or 2x12s. (2 points; if no more than 10% is 2x lumber)

4. Use OSB for sub-floor and sheathing. _____
OSB reduces the need for large diameter old growth trees, is as strong as traditional plywood sheet material, and is less expensive. (1 point for subfloor; 1 for sheathing).

5. Use "finger-jointed studs". _____
Uses recycled content materials, are straighter and stronger than solid sawn studs, and eliminate crooked walls thereby reducing material wastes. (2 points)

6. Use structural insulated panels (SIPs) for walls/roof. _____
SIPS reduce infiltration, increase energy efficiency, and provide excellent soundproofing. They are erected quickly and save wood by eliminating much of the conventional framing lumber. (5 points)

7. Use reclaimed/salvaged lumber. _____
Reduces resource consumption and landfill deposits, and is often of higher quality than new lumber. (5 points)

D. Exterior Finish

1. For decking materials use recycled/reclaimed wood, recycled composite lumber, or FSC Certified wood. _____ (3 points)
   Reduces the use of old-growth lumber.

2. Use treated wood that does not contain chromium or arsenic. _____ (1 point)
   Reduces "toxic exposure" which is particularly harmful to children who play on structures built with treated wood.

3. Use sustainable siding materials such as mineral fiber board. _____ (3 points)
   These last longer, are fire-resistant, and reduce maintenance costs.

4. Use earth-based plaster. _____ (2 points)
   This non-toxic exterior uses local materials.

5. Use formaldehyde-free composite materials for paintable trim instead of wood. _____ (2 points)

E. Water Efficiency

1. Install flow reducers in faucets and showerheads. _____ (3 points)
   Saves water and money.

2. Pre-plumb for a graywater system. _____ (4 points)
   Cuts down on the use of potable water for outside irrigation and lawn watering.

3. Provide for on-site water catchment/retention with a cistern or other system(s). _____ (5 points)
   Reduces the need to use treated, potable water for lawns and gardens.

F. Plumbing

1. Insulate hot water pipes. _____ (2 points)
   Saves energy and water, and also reduces water-heating costs.

2. Install chlorine filters on showerheads. _____ (2 points)
   Reduces chlorine absorbed by the skin.

3. Install tankless water-heaters. _____ (2 points)
   Saves energy and are quicker and more reliable.

4. Install water filtration units at faucets. _____ (4 points)
   Reduces contaminants in water.

5. Install on-demand hot water circulation pump. _____ (4 points)
   Allows hot water arrives more quickly to fixture while simultaneously saving water and energy.

G. Electrical

1. Install compact fluorescent light bulbs. _____ (>6 bulbs = 2 points; >12 bulbs = 4 points)
   Saves energy and money.

2. Install insulation-compatible recessed lighting. _____ (4 points)
   Reduces heat loss/gain.

3. Install lighting controls.
   Saves money and energy.
   _____ (1 point per fixture, up to 3 points)

4. Install ceiling fans in Climate Zone 2.
   Reduces the need for air-conditioning.
   _____ (1 point per fan, up to 3 points)

5. Meet the BEST incentive program requirements by exceeding Title 24 by 20%.
   _____ (5 points)

H. Appliances

1. Install a "Energy Star" dishwasher.
   Reduces water and energy use.
   _____ (1 points)

2. Offer an "Energy Star" horizontal axis washing machine.
   Uses 40% less water and 50% less energy than conventional top loading washers.
   _____ (2 points)

3. Offer an "Energy Star" refrigerator.
   Reduces energy and utility costs.
   _____ (2 points)

I. Roofing

1. Use durable, fire safe roofing materials such as metal, concrete tile, clay tile, or mineral fiber tile.
   _____ (4 points)

J. Insulation

1. Upgrade wall and ceiling insulation to exceed title 24 requirements.
   Lowers utility bills, improves comfort, decreases heating and cooling requirements.
   _____ (6 points for R-30 attic; 4 for R-24 crawl space; 4 for R19 walls)

2. Install recycled content, formaldehyde-free fiberglass insulation.
   This reduces indoor air quality problems and increases use of recycled glass.
   _____ (1 point)

3. Use cellulose insulation.
   Cellulose lowers energy bills, uses recyclable materials, and reduces the use of formaldehyde.
   _____ (3 points)

4. Use natural building materials such as strawbale and rammed earth.
   Provides a higher insulation value, and a positive use for agricultural by-products and local materials.
   _____ (10 points)

K. Windows and Doors

1. Install energy-efficient low-E2 double-glazed windows and doors lower.
   Lowers utility bills and provides greater comfort.
   _____ (8 points)

2. Use wood or thermal break metal frames for windows and sliding doors.
   _____ (2 points)

L. Heating, Ventilation and Air-Conditioning (HVAC)

1. Use duct mastic on all duct joints. _____
   Improves indoor air quality and saves energy by preventing heating losses. (2 points)

2. Install ductwork within conditioned space. _____
   Reduces energy loss and improves occupant comfort. (1 point)

3. Vent range hood to the outside. _____
   Improves indoor air quality (IAQ). (1 point)

4. Clean all ducts before occupancy. _____
   Reduces dust in the house after occupancy. (2 points)

5. Install attic ventilation systems. _____
   Increases comfort and reduces air conditioning use. (2 points)

6. Install whole house fan. _____
   Reduces energy usage and achieves comfort at higher temperatures without A/C. (2 points)

7. Install 90% or greater efficiency gas forced air furnace. _____
   Saves energy and money. (8 points)

8. Install zoned, hydronic, radiant heating and insulate under entire slab and at edges. _____
   Saves energy by only heating the zone that requires heat. (5 points)

9. Install high efficiency particulate air (HEPA) filter. _____
   Reduces micro-particulates from the air. (3 points)

10. Install heat recovery ventilation unit (HRV). _____
    Improves indoor air quality and reduces heat losses. (3 points)

M. Renewable and Solar Energy

1. Design for natural cooling to eliminate air conditioning. _____
   This is a low cost item to incorporate into the home and site. (2 points)

2. Incorporate passive solar heating. _____
   Reduces heating requirements by 30-50%. (5 points)

3. Pre-plumb for solar water heating. _____
   Saves money if a solar system is to be installed in the future. (3 points)

4. Install solar water system. _____
   Reduces the use of gas or electricity and has a payback in as little as seven years. (7 points)

5. Install a grid-intertied photovoltaic (PV) or wind energy system. _____
   Decreases reliance on fossil fuel power plants. (>1.2 kw = 8 points; >2.4 = 14 points; >3.6 kw = 20 points)

N. Indoor Air Quality / Finishes

1. Use low/no-VOC and formaldehyde-free paint. _____
   Improves indoor air quality (IAQ) and is healthier for installers and occupants. (2 points)

2. Use low VOC, water-based wood finishes. _____
Improves IAQ and is healthier for installers and occupants. (2 points)

3. Use solvent-free adhesives. _____
Improves IAQ and is healthier for installers and occupants. (2 points)

4. Substitute particleboard with formaldehyde-free materials. _____
Improves IAQ and is healthier for installers and occupants. (2 points per application; up to 6 points)

5. Use exterior grade plywood for interior uses. _____
Reduces urea-formaldehyde exposure to occupants. (2 points)

6. Seal all exposed particleboard or MDF. _____
Reduces exposure of harmful emissions to occupants. (3 points)

7. Use FSC certified trim material. _____
Protects ancient, old-growth forests. (4 points)

8. Use finger-jointed trim. _____
This uses material more effectively, saves money and resources, and is straighter and more stable than conventional wood. (1 points)

9. Utilize an alternative to PVC. _____
Production and burning of PVC is highly toxic. (2 points per application up to 6 points)

10. Install a central vacuum system. _____
Improves IAQ. (2 points)

11. Air out project with natural ventilation for at least one week between end of construction and occupancy. _____ (2 points)

O. Flooring

1. Select FSC certified or reclaimed/salvaged wood flooring. _____
Protects ancient, old-growth forests. (6 points)

2. Use rapidly renewable (bamboo or cork) flooring materials. _____
Reduces the demand for old-growth hardwoods. (5 points)

3. Use recycled content ceramic tile. _____
Reduces the use of virgin materials and is easy to maintain. (4 points)

4. Install natural linoleum in place of vinyl flooring. _____ (2 points)

5. Use exposed concrete as a finished floor. _____
Eliminates the need for additional flooring materials, is easy to maintain, and is very durable. (4 points)

6. Install Low VOC carpet with recycled content carpet and non-toxic adhesive. _____ (2 points)

7. Install natural fiber floor coverings such as jute and wool. _____ (2 points)

P. Community Design

1. Utilize passive solar design. _____
   This reduces the need for energy and lowers utility bills. (reduce heating load by 20% = 4 points, by 40% = 6 points, by 60% = 10 points)

2. Orient living rooms and porches to streets and public spaces. _____
   Enhances the sense of community. (5 points)

3. Locate building in a mixed use, residential/commercial area. _____
   Supports walkable/bikeable communities, and reduces automobile use. (8 points)

4. Design for diverse family types to offer housing to a wider range of buyers. _____
   (5 points)

5. Provide residential second units. _____
   Creates affordable housing. (5 points)

6. Build within 1/2 mile of public transit hub. _____
   Reduces dependence on automobile. (5 points)

7. Minimize street widths. _____
   Calms traffic. (5 points)

Total # of points: **Total # _____**

Site:	35
Foundation:	13
Structural Frame:	29
Exterior Finish:	11
Water Efficiency:	12
Plumbing:	14
Electrical:	19
Appliances:	5
Roofing:	4
Insulation:	28
Windows and Doors:	12
HVAC	29
Renewable Energy	41
Indoor Air Quality/Finishes	32
Flooring	23
Community Design	43
Total	**350**

Green Building Ratings:

The Marin Countywide Plan and Development Code require resource efficiency. Homes designed to meet the following ratings shall comply with these requirements.

Homes with conditioned square footage indicated in the far left column are required to meet or exceed the number of points in the "Certified Column".

	Certified	Silver	Gold	Platinum
<3500 sf	50–75	76–100	101–125	126+
3501–6500 sf	76–100	101–125	126–150	151+
6501–9500 sf	101–125	126–150	151–175	176+
> 9501 sf	126–150	151–175	176–200	201+

These guidelines are based on a collaborative effort undertaken in Alameda County among developers, builders, purchasing agents, architects, building officials, green building experts and county staff. For more information, please refer to the New Home Green Building Guidelines or the Home Remodeling Green Building Guidelines available from the Marin County Community Development Agency. These guidelines were also created with the input of Sim Van der Ryn Architects, County staff, and other *local green building experts. Experienced green building professionals are available to assist in the planning, design and construction of your project.*

Appendix N-3

Remodeling Green Building
Residential Design Guidelines

Appendix N-3

Remodeling Green Building Residential Design Guidelines

Green building is a whole systems approach to the design, construction and operation of buildings. This approach benefits both builders and homeowners by reducing resource consumption, increasing livability, and saving money in operation and maintenance.

Below is a list of green building measures that apply the principles of sustainability to residential buildings. A point system has been developed to indicate the level of importance for each guideline. Points are located in the right hand column and indicated in parentheses. The higher the number of points the better the project rating. These guidelines are a self-documenting procedure. Please indicate the number of points both, as designed and as constructed. **These guidelines are intended to assist applicants in complying with sections 22.42.010.B and 22.42.060.G of the Marin County Development Code by demonstrating how the project conserves energy and protects natural resources**.

Applicant: _____ Phone: _____Email: _____

Project Address: _____ APN: _____

Project Description: _____
_____

Statement of Conformance (To be signed and submitted concurrently with the Building Permit application)

I hereby certify under penalty of perjury that the submitted project is designed to include the items indicated in this rating system to meet or exceed the "Certified" rating.

Signed: _____ _____
(Applicant) (Date)

Statement of Completion (To be stamped and signed prior to approval of Final inspection)

I hereby certify under penalty of perjury that the items indicated in this rating system have been installed and/or utilized as part of the approved project to meet or exceed the "Certified" rating.

Signed: _____ _____
(Applicant) (Date)

Reviewed By CDA: _____ _____
(Planner) (Date: As Designed)

_____ _____
(Planner) (Date: As Completed)

Green Building Measures	*Designed*	*Completed*
A. Site		
1. Reuse or recycle job site construction and demolition waste. *Reduces pressure on landfills, saves money by reducing landfill fees, and provides materials for future building projects.*	_____ (50% required. 75% = 4 points; 85% = 8 points)	_____ (50% required. 75% = 4 points; 85% = 8 points)
2. Donate unused materials to local charitable organizations. *Reduce landfill deposits. Donations may be tax deductible.*	_____ (6 points)	_____ (6 points)
3. Minimize disruption of existing plants and trees. *Helps prevent soil erosion, maintains existing sources of natural cooling, diverts waste from landfills, and adds character to communities.*	_____ (2 points)	_____ (2 points)
4. Design native and resource-efficient landscapes and gardens. *This conserves water, reduces the use of chemicals, and creates healthier soil and plants.*	_____ (6 points)	_____ (6 points)
5. Install no turf grass lawn on project. *Lowers water and energy use.*	_____ (2 points)	_____ (2 points)
6. If irrigation is needed use drip irrigation. *Reduces water use and costs.*	_____ (3 points)	_____ (3 points)
7. If in a sunny area, plant deciduous trees to south and/or west. *Trees provide shade from summer sun and let winter sun through.*	_____ (3 points)	_____ (3 points)
8. Incorporate storm water infiltration and retention. *Reduces the volume of polluted water that flows into rivers or the bay, reduces irrigation requirements, and lowers risk of flooding.*	_____ (4 points)	_____ (4 points)
B. Foundation		
1. Incorporate at least 25% recycled flyash in concrete. *Adds strength and durability to the concrete and reduces the energy used in production.*	_____ (4 points)	_____ (4 points)
2. Use reusable form boards. *Saves money and conserves resources.*	_____ (2 points)	_____ (2 points)
3. Use recycled content rubble for backfill drainage. *Saves money and natural resources by using recycled materials.*	_____ (1 point)	_____ (1 point)
4. Insulate foundation before backfill. *Reduces energy loss and lowers utility bills.*	_____ (2 points)	_____ (2 points)
C. Structural Frame		
1. Substitute "solid sawn lumber" with "engineered lumber". *Reduces demand for virgin lumber and is stronger, straighter, and more durable.*	_____ (3 points)	_____ (3 points)
2. Use Forest Stewardship Council (FSC) certified wood for framing. *FSC wood is not clear-cut and comes from well-managed forests.*	_____ (2 points for every 10% of FSC lumber used for framing; up to 10 points)	_____ (2 points for every 10% of FSC lumber used for framing; up to 10 points)
3. Use wood I-joists, for floors and ceilings. *I-joists use 50% less wood fiber, will not twist, warp or split, and are stronger and lighter than 2x10s or 2x12s.*	_____ (2 points; if no more than 10% is 2x lumber)	_____ (2 points; if no more than 10% is 2x lumber)

Green Building Measures	***Designed***	***Completed***
4. Use OSB for sub-floor and sheathing. *OSB reduces the need for large diameter old growth trees, is as strong as traditional plywood sheet material and is less expensive.*	_____ (1 point for subfloor; 1 for sheathing).	_____ (1 point for subfloor; 1 for sheathing).
5. Use "finger-jointed studs". *Uses recycled content materials, are straighter and stronger than solid sawn studs, and eliminate crooked walls thereby reducing material wastes.*	_____ (2 points)	_____ (2 points)
6. Use structural insulated panels (SIPs) for walls/roof. *SIPS reduce infiltration, increase energy efficiency, and provide excellent soundproofing.* *They are erected quickly and save wood by eliminating much of the conventional framing lumber.*	_____ (5 points)	_____ (5 points)
7. Use reclaimed/salvaged lumber. *Reduces resource consumption and landfill deposits, and is often of higher quality than new lumber.*	_____ (5 points)	_____ (5 points)
D. Exterior Finish		
1. For decking materials use recycled/reclaimed wood, recycled composite lumber, or FSC Certified wood. *Reduces the use of old-growth lumber.*	_____ (3 points)	_____ (3 points)
2. Use treated wood that does not contain chromium or arsenic. *Reduces "toxic exposure" which is particularly harmful to children who play on structures built with treated wood.*	_____ (1 point)	_____ (1 point)
3. Use sustainable siding materials such as mineral fiber board. *These last longer, are fire-resistant, and reduce maintenance costs.*	_____ (3 points)	_____ (3 points)
4. Use earth-based plaster. *This non-toxic exterior uses local materials.*	_____ (2 points)	_____ (2 points)
5. Use formaldehyde-free composite materials for paintable trim instead of wood.	_____ (2 points)	_____ (2 points)
E. Water Efficiency		
1. Install flow reducers in faucets and showerheads. *Saves water and money.*	_____ (3 points)	_____ (3 points)
2. Pre-plumb for a graywater system. *Cuts down on the use of potable water for outside irrigation and lawn watering.*	_____ (4 points)	_____ (4 points)
3. Provide for on-site water catchment/retention with a cistern or other system(s). *Reduces the need to use treated, potable water for lawns and gardens.*	_____ (5 points)	_____ (5 points)
F. Plumbing		
1. Insulate hot water pipes. *Saves energy and water, and also reduces water-heating costs.*	_____ (2 points)	_____ (2 points)
2. Install chlorine filters on showerheads. *Reduces chlorine absorbed by the skin.*	_____ (2 points)	_____ (2 points)
3. Install tankless water-heaters. *Saves energy and are quicker and more reliable.*	_____ (2 points)	_____ (2 points)
4. Install water filtration units at faucets. *Reduces contaminants in water.*	_____ (4 points)	_____ (4 points)

Green Building Measures	***Designed***	***Completed***
5. Install on-demand hot water circulation pump. *Allows hot water arrives more quickly to fixture while simultaneously saving water and energy.*	_____ (4 points)	_____ (4 points)
G. Electrical		
1. Install compact fluorescent light bulbs. *Saves energy and money.*	_____ (>6 bulbs = 2 points; >12 bulbs = 4 points)	_____ (>6 bulbs = 2 points; >12 bulbs = 4 points)
2. Install insulation-compatible recessed lighting. *Reduces heat loss/gain.*	_____ (4 points)	_____ (4 points)
3. Install lighting controls. *Saves money and energy.*	_____ (1 point per fixture, up to 3 points)	_____ (1 point per fixture, up to 3 points)
4. Install ceiling fans in Climate Zone 2. *Reduces the need for air-conditioning.*	_____ (1 point per fan, up to 3 points)	_____ (1 point per fan, up to 3 points)
5. Meet the BEST incentive program requirements by exceeding Title 24 by 20%.	_____ (5 points)	_____ (5 points)
H. Appliances		
1. Install a "Energy Star" dishwasher. *Reduces water and energy use.*	_____ (1 points)	_____ (1 points)
2. Offer an "Energy Star" horizontal axis washing machine. *Uses 40% less water and 50% less energy than conventional top loading washers.*	_____ (2 points)	_____ (2 points)
3. Offer an "Energy Star" refrigerator. *Reduces energy and utility costs.*	_____ (2 points)	_____ (2 points)
I. Roofing		
1. Use durable, fire safe roofing materials such as metal, concrete tile, clay tile, or mineral fiber tile.	_____ (4 points)	_____ (4 points)
J. Insulation		
1. Upgrade wall and ceiling insulation to exceed title 24 requirements. *Lowers utility bills, improves comfort, decreases heating and cooling requirements.*	_____ (6 for R-30 attic; 4 for R-20 crawl; 4 for R19 walls)	_____ (6 for R-30 attic; 4 for R-20 crawl; 4 for R19 walls)
2. Install recycled content, formaldehyde-free fiberglass insulation. *This reduces indoor air quality problems and increases use of recycled glass.*	_____ (1 point)	_____ (1 point)
3. Use cellulose insulation. *Cellulose lowers energy bills, uses recyclable materials, and reduces the use of formaldehyde.*	_____ (3 points)	_____ (3 points)
4. Use natural building materials such as strawbale and rammed earth. *Provides a higher insulation value, and a positive use for agricultural by-products and local materials.*	_____ (10 points)	_____ (10 points)

K. Windows and Doors

1. Install energy-efficient low-E2 double-glazed windows and doors lower. *Lowers utility bills and provides greater comfort.*	_____ (8 points)	_____ (8 points)
2. Use wood or thermal break metal frames for windows and sliding doors.	_____ (2 points)	_____ (2 points)

L. Heating, Ventilation and Air-Conditioning (HVAC)

1. Use duct mastic on all duct joints. *Improves indoor air quality and saves energy by preventing heating losses.*	_____ (2 points)	_____ (2 points)
2. Install ductwork within conditioned space. *Reduces energy loss and improves occupant comfort.*	_____ (1 point)	_____ (1 point)
3. Vent range hood to the outside. *Improves indoor air quality (IAQ).*	_____ (1 point)	_____ (1 point)
4. Clean all ducts before occupancy. *Reduces dust in the house after occupancy.*	_____ (2 points)	_____ (2 points)
5. Install attic ventilation systems. *Increases comfort and reduces air conditioning use.*	_____ (2 points)	_____ (2 points)
6. Install whole house fan. *Reduces energy usage and achieves comfort at higher temperatures without A/C.*	_____ (2 points)	_____ (2 points)
7. Install 90% or greater efficiency gas forced air furnace. *Saves energy and money.*	_____ (8 points)	_____ (8 points)
8. Install zoned, hydronic, radiant heating and insulate under entire slab and at edges. *Saves energy by only heating the zone that requires heat.*	_____ (5 points)	_____ (5 points)
9. Install high efficiency particulate air (HEPA) filter. *Reduces micro-particulates from the air.*	_____ (3 points)	_____ (3 points)
10 Install heat recovery ventilation unit (HRV). *Improves indoor air quality and reduces heat losses.*	_____ (3 points)	_____ (3 points)

M Renewable and Solar Energy

1. Design for natural cooling to eliminate air conditioning. *This is a low cost item to incorporate into the home and site.*	_____ (2 points)	_____ (2 points)
2. Incorporate passive solar heating. *Reduces heating requirements by 30-50%.*	_____ (5 points)	_____ (5 points)
3. Pre-plumb for solar water heating. *Saves money if a solar system is to be installed in the future.*	_____ (3 points)	_____ (3 points)
4. Install solar water system. *Reduces the use of gas or electricity and has a payback in as little as seven years.*	_____ (7 points)	_____ (7 points)
5. Install a grid-intertied photovoltaic (PV) or wind energy system. *Decreases reliance on fossil fuel power plants.*	_____ (>1.2 kw = 8 points; >2.4 = 14 points; >3.6 kw = 20 points)	_____ (>1.2 kw = 8 points; >2.4 = 14 points; >3.6 kw = 20 points)

N. Indoor Air Quality / Finishes

1. Use low/no-VOC and formaldehyde-free paint. *Improves indoor air quality (IAQ) and is healthier for installers and occupants.*	_____ (2 points)	_____ (2 points)
2. Use low VOC, water-based wood finishes. *Improves IAQ and is healthier for installers and occupants*.	_____ (2 points)	_____ (2 points)
3. Use solvent-free adhesives. *Improves IAQ and is healthier for installers and occupants.*	_____ (2 points)	_____ (2 points)
4. Substitute particleboard with formaldehyde-free materials. *Improves IAQ and is healthier for installers and occupants.*	_____ (2 points per application; up to 6 points)	_____ (2 points per application; up to 6 points)
5. Use exterior grade plywood for interior uses. *Reduces urea-formaldehyde exposure to occupants.*	_____ (2 points)	_____ (2 points)
6. Seal all exposed particleboard or MDF. *Reduces exposure of harmful emissions to occupants.*	_____ (3 points)	_____ (3 points)
7. Use FSC certified trim material. *Protects ancient, old-growth forests.*	_____ (4 points)	_____ (4 points)
8. Use finger-jointed trim. *This uses material more effectively, saves money and resources, and is straighter and more stable than conventional wood.*	_____ (1 points)	_____ (1 points)
9. Utilize an alternative to PVC. *Production and burning of PVC is highly toxic.*	_____ (2 points per application up to 6 points)	_____ (2 points per application up to 6 points)
10 Install a central vacuum system. *Improves IAQ.*	_____ (2 points)	_____ (2 points)
11 Air out project with natural ventilation for at least one week between end of construction and occupancy.	_____ (2 points)	_____ (2 points)

O. Flooring

1. Select FSC certified or reclaimed/salvaged wood flooring. *Protects ancient, old-growth forests*.	_____ (6 points)	_____ (6 points)
2. Use rapidly renewable (bamboo or cork) flooring materials. *Reduces the demand for old-growth hardwoods.*	_____ (5 points)	_____ (5 points)
3. Use recycled content ceramic tile. *Reduces the use of virgin materials and is easy to maintain.*	_____ (4 points)	_____ (4 points)
4. Install natural linoleum in place of vinyl flooring.	_____ (2 points)	_____ (2 points)
5. Use exposed concrete as a finished floor. *Eliminates the need for additional flooring materials, is easy to maintain, and is very durable.*	_____ (4 points)	_____ (4 points)
6. Install Low VOC carpet with recycled content carpet and non-toxic adhesive.	_____ (2 points)	_____ (2 points)
7. Install natural fiber floor coverings such as jute and wool.	_____ (2 points)	_____ (2 points)

P. Community Design

1. Utilize passive solar design. *This reduces the need for energy and lowers utility bills.*	_____ (reduce heating load by 20% = 4 points, by 40% = 6 points, by 60% = 10 points)	_____ (reduce heating load by 20% = 4 points, by 40% = 6 points, by 60% = 10 points)
2. Provide residential second units. *Creates affordable housing.*	_____ (5 points)	_____ (5 points)
Q. Innovation Points – Use a green building measure not currently included in the rating system	_____ (5 points each, up to 15)	_____ (5 points each, up to 15)
Total Number of Points for All Green Building Measures #	_____	_____

Total # of points:		
Site:		35
Foundation:		13
Structural Frame:		29
Exterior Finish:	11	
Water Efficiency:	12	
Plumbing:		14
Electrical:		19
Appliances:		5
Roofing:		4
Insulation:		28
Windows and Doors:		12
HVAC		29
Renewable Energy		41
Indoor Air Quality/Finishes		32
Flooring	23	
Community Design		15
Innovation		15
Total		**337**

Green Building Ratings:

The Marin Countywide Plan and Development Code require resource efficiency. Homes designed to meet the following ratings shall comply with these requirements.

Homes with conditioned square footage indicated in the far left column are required to meet or exceed the number of points in the "Certified Category".

	Certified	Silver	Gold	Platinum
<3500 sf	50–75	76–100	101–125	126+
3501–6500 sf	76–100	101–125	126–150	151+
6501–9500 sf	101–125	126–150	151–175	176+
> 9501 sf	126–150	151–175	176–200	201+

These guidelines are based on a collaborative effort undertaken in Alameda County among developers, builders, purchasing agents, architects, building officials, green building experts and county staff. For more information, please refer to the New Home Green Building Guidelines or the Home Remodeling Green Building Guidelines available from the Marin County Community Development Agency. These guidelines were also created with the input of Sim Van der Ryn Architects, County staff, and other *local green building experts. Experienced green building professionals are available to assist in the planning, design and construction of your project.*

Appendix N-4

Home Remodeling Green Building Guidelines

Appendix N-4

Home Remodeling Green Building Guidelines

Home Remodeling
Green Building Guidelines

HOME REMODELING

GREEN BUILDING GUIDELINES

HOME REMODELING

GREEN BUILDING GUIDELINES

Marin County Community Development Agency

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Gwen Johnson, Community Education

Acknowledgements

In October 2001 the Marin County Board of Supervisors unanimously approved a comprehensive set of programs designed to increase energy efficiency and the use of solar and other renewable resources. This program, known as Building Energy Efficient Structures Today (BEST), also provides technical assistance to encourage green building techniques.

Members of the Marin County Board of Supevisors:

John Kress	District 1
Hal Brown, Jr.	District 2
Annette Rose	District 3
Steve Kinsey	District 4
Cynthia Murray	District 5

Special thanks to the following building professionals for their commitment, input and direction in developing these Guidelines:

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Contact: David Johnston

	For information on energy saving programs contact Marin County Planning at 415.507.2659 or PG&E's Smarter Energy Line at 800.933.9555 or www.pge.com
	For information on water, saving programs contact Marin Municipal Water District at 415.945.1455 or www.marinwater.org; North Marin Water District at 415.897.4133 or www.nmwd.org
	For information on recycling, construction, and demolition contact Marin Resource Recovery Center at 415.485.5647 or www.marinrecycles.org

Disclaimer

Thank you to the Alameda County Waste Management Authority and Recycling Board (ACWMA) for offering their guidelines.

The information provided in these Guidelines should be considered by contractors, architects and other professionals as well as by owners, in the course of designing and constructing new or modified structures. They are provided as a public service by the ACWMA and Marin County Community Development Agency (CDA) in an attempt to provide environmental benefits and reduce costs. The Guidelines are not a substitute for the exercise of sound judgment in particular circumstances and are not intended as recommendations for particular products or processes.

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Related Marin County Programs

Building Energy Efficiency Structures Today (BEST)
BEST is an incentive based energy program that provides:

- Permit fast tracking and Title 24 fee waivers (if applicable) for projects which:
  a. Exceed Title 24 by 10%
  b. Install renewable energy that produces 75% of energy use, or
  c. Comply with the BEST checklist.
- Free green building technical assistance available through the planning division.
- A green building resources exhibit located at the CDA Planning office highlighting the latest green products, the fundamentals of energy efficient design & construction and local sources for energy efficiency & green materials.
- Workshops and training sessions, planned for the fall of 2002 and the spring of 2003.
- A BEST reference section located in the Marin Civic Center Free Library containing books and periodicals on energy efficiency, green building, and sustainable living.

The BEST Program and a review of regulatory constraints to energy efficiency were prepared with the assistance of Sim Van der Ryn Architects.

Rebates are also available for qualifying energy efficient installations in unincorporated Marin County until funds are depleted.

Contact: Sam Ruark
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Green Business
Marin County has launched a green business certification program in partnership with the Association of Bay Area Governments (ABAG). Businesses who choose to comply with standards that reduce energy and water use and waste generation receive:

- Economic savings.
- A Green Business certificate and window decal awarded by the Board of Supervisors in a public ceremony.
- Enhanced marketing through local advertising and public events.

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Website
www.co.marin.ca.us; Search “green building” or “green business”

These following guidelines are designed for the residential building industry

The guidelines offer:

- Cost-effective suggestions to minimize construction-related waste, create healthier and more durable homes, reduce operating costs for homeowners and support local manufactures and suppliers of resource-efficient building materials.
- Methods to reduce the impacts of building in Marin County for water conservation, energy efficiency, resource conservation, and solid waste management.

Table of Contents

Chapter One:
Introduction

This section gives an overview of the basic concepts and elements of green building. Contractors can use the Guidelines as a way to describe green building practices and benefits – highlighting the unique expertise and services they can provide to the homeowner. Homeowners can use the Guidelines to gain information on green building options and to define the objectives of their project.

Introduction

Green building is just applied common sense. To demystify the process and move forward with your construction project, it is helpful to think of green building as the convergence of three fundamental objectives:

1. **Conserve natural resources**
2. **Increase energy efficiency**
3. **Improve indoor air quality**

Natural Resource Conservation

Conventional building practices consume large quantities of wood, plastic, cardboard, paper, water and other natural resources that lead – unnecessarily – to their depletion.

For example, wood is one of the most common building materials, but is often used wastefully. We have already harvested 95% of the nation's old-growth forests – a trend that simply cannot continue. Engineered lumber products such as wood I-joists, wood fiber laminates and oriented strand board, utilize fast growing farm trees as an alternative to old-growth forests. These products can use as little as 50% of the wood fiber to perform the same structural functions and are typically stronger, straighter and lighter than solid-sawn lumber.

Remodelers have a rapidly expanding range of green building materials from which to choose. Recycled-content decking, insulation, reclaimed lumber and other products divert waste from landfills, while providing quality and durability that often exceed conventional materials. For example, decking material made out of recycled plastic resins mixed with wood waste fibers can last up to five times longer than wood decks, and never need to be treated or painted.

Water conservation is another important issue. Wise water usage reduces the strain on resources as well as lowers expenses. Today, remodelers can take advantage of a new generation of high-efficiency washers, dishwashers, and landscape water management systems.

CONTRACTOR TIP | **PROVIDE A HOMEOWNER'S MANUAL OF PRODUCTS INSTALLED**

Provide homeowners with a product manual that describes the benefits of the various green materials installed and how to maintain them. Informing the homeowner about the green features and products will ensure the effective use and maintenance of the features for many years after the project is completed.

Energy Efficiency

Energy efficiency is a cornerstone of any green building project. Generation and use of energy are major contributors to air pollution and global climate change. Improving energy efficiency and using renewable energy sources are effective ways to improve air quality and reduce the impacts of global warming.

Improving energy efficiency is also an economically effective choice for consumers. Lowering utility expenses allows residents to enjoy the financial benefits year after year.

The first step to increase energy efficiency is to add insulation and weather stripping wherever possible, install double-glazed/low-E windows and upgrade to high-efficiency appliances. Other energy upgrades/choices include installing solar water heaters, photovoltaic panels, and purchasing "green power" generated from renewable sources like the sun, wind and biomass (when available).

Indoor Air Quality

The United States Environmental Protection Agency (EPA) reports that the air in new homes can be ten times more polluted than outdoor air. According to the New England Journal of Medicine, 40% of children will develop respiratory disease, in part, due to the chemicals in their homes. Poor indoor air quality is caused by the offgassing of chemicals found in many building materials as well as mold and mildew that build up in homes due to poorly designed and maintained heating and cooling systems.

One of the most common indoor pollutants is formaldehyde, a suspected human carcinogen. Kitchen cabinets, countertops, shelving and furniture are typically made from particleboard held together by formaldehyde-based adhesives. The formaldehyde is released into the home for years after these products have been installed. Many paints and floor finishes also contain unhealthy volatile organic compounds (VOCs). That "new house smell" is actually the odor of these volatile compounds offgassing and is a telltale sign that there are harmful chemicals in the indoor environment.

The building products industry has responded to these indoor pollution problems by developing alternative paint, finish, and adhesive products. For example, solvent-free adhesives used in flooring and countertops can eliminate many of the suspected and known human carcinogens. Paints, varnishes, and cleaners that don't utilize volatile compounds are now commonly available from most major manufacturers at costs comparable to conventional products.

In addition to the growing number of readily available and cost-effective green materials – an increasing number of builders and remodelers are also using natural building materials such as straw-bale, rammed earth, adobe and cob. While less common in their use, natural building products have a positive impact on the environment as they are renewable and abundant; energy-efficient in production, transport and use; non-polluting; durable and long lasting.

Benefits of Green Building

There are many reasons to build green. These include a concern for the environment, an interest in building more efficiently, health considerations or a desire to create an environmentally friendly image for your business. By applying a sustainable perspective to design, construction and remodeling, green building brings the benefits of resource conservation, energy savings and healthy living.

Each of the features listed in these Green Building Guidelines benefit the environment by addressing one or more of the following: resource conservation, energy efficiency, indoor air quality.

Cost Considerations

While green building and its environmental benefits are becoming more mainstream, it is commonly assumed that green building features and products translate into additional costs. What is often overlooked is the added value that green building contributes to the home: energy-efficiency, improved indoor air quality, healthier homes for the family, and durability. These Guidelines recommend methods and materials that range in cost–some of them cost no more or even less than conventional options.

Often the homeowner focuses on the "up-front" costs (materials and installation) to incorporate green features into a home. When other factors are considered, such as lower maintenance and operation costs, many of the recommended strategies in these Guidelines offer tangible economic benefits to the homeowner. Energy upgrades alone usually result in a payback through lower monthly energy costs.

When considering green building measures, it is very important to balance product and installation costs with other significant benefits such as energy savings, increased durability, enhanced air quality and healthier homes for occupants.

Chapter Two:
Green Building Methods and Materials

This section provides more detailed descriptions of green building practices, material applications, as well as the associated environmental benefits. The items are ordered by ease of implementation as well as cost effectiveness.

A. Site

1. Recycle Job Site Construction and Demolition Waste

Description:

Construction waste generally consists of wood, drywall, metals, concrete, dirt and cardboard – materials that can be reused or recycled if prepared properly. Each year millions of tons of construction and demolition debris are disposed of at county landfills in California.

Application:

Identify the types and quantities of materials generated at the job site. Contact local recycling facilities and haulers to identify terms and conditions required for recycling materials. Allocate space for recycling bins and containers. Contact your local recycling agency or green building program listed on Page 2 for more information.

Benefit:

Recycling reduces pressure on landfills, saves money by reducing tipping fees, and provides raw materials for future building products.

2. Salvage Reusable Building Materials

Description:

Various building materials can be salvaged and reused, such as flooring, doors and windows, tubs and sinks, cabinets, fixtures, etc.

Application:

When remodeling, consider salvage and deconstruction, by selectively and carefully removing materials for reuse. There are a number of licensed contractors that offer dismantling services to salvage materials for reuse. Many firms are non-profits and will provide itemized donation receipts. Usable items can also be dropped off at used building material stores. Contact your local recycling agency or green building program listed on Page 2 for more information.

Benefit:

Salvaging reusable building materials decreases disposal costs, saves natural resources and increases landfill capacity. Donations can be tax deductible.

3. Install Drip Irrigation

Description:

Drip irrigation systems provide a small but constant water supply to landscape, thus preserving soil moisture, and significantly reducing water waste from overspray.

Application:

Replace standard sprinkler systems with drip irrigation systems for all landscape applications except turf.

Benefit:

Drip irrigation systems dramatically reduce landscape water use and lower water costs.

4. Incorporate Permeable Paving

Description:

Permeable paving allows water to percolate into the soil. For driveways, walkways and paths, utilize gap-spaced unit pavers, decomposed granite, gravel or grass-stabilization systems.

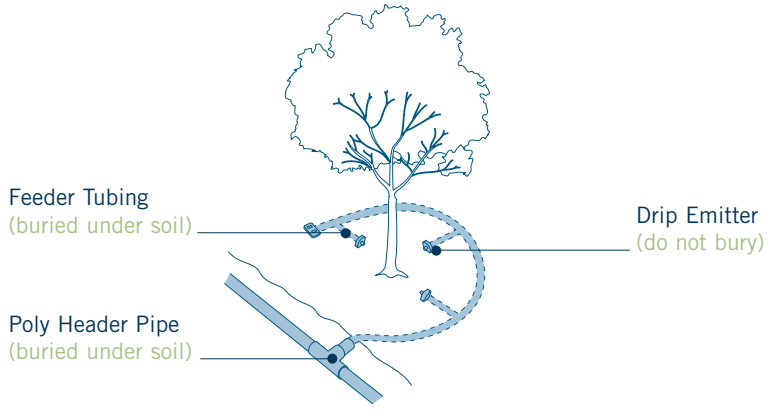
Application:

Use permeable paving for walkways, patios, and driveways. Installed like conventional pavers.

Benefit:

Allowing stormwater percolation reduces the volume of polluted water that flows into rivers or the Bay, while replenishing soil moisture and local aquifers. Additional benefits include reduction in irrigation requirements as well as lower risk of flooding.

Drip Irrigation System for widely-spaced plants and trees



5. Design Resource-Efficient Landscapes and Gardens

Description:

Conventional landscapes have high inputs of water and chemicals and are often overplanted or planted without regard for climate and soil conditions. This results in excess water use, water pollution and waste generation.

Application:

Specify plants that are appropriate for the climate and soil of the area; select slow growing, drought tolerant plants; design with perennials instead of annuals; and site plants appropriately – giving them plenty of room to mature and reducing the need for pruning. Recycle yard trimmings by grasscycling, mulching and composting.

Benefit:

Sustainable landscape techniques are in harmony with the local environment and help conserve water, reduce use of chemicals, create healthier soil and plants, and increase bio-diversity in landscape areas.

Resource-Efficient Garden

6. Provide for On-Site Water Catchment / Retention

Description:

Rainwater is channeled through gutters and downspouts to an above ground cistern or underground gravel dry well. Stored water is used for landscape irrigation.

Application:

Install wherever there is guttered roof runoff and room for the cistern.

Benefit:

Water catchment reduces the need to use treated, drinkable water for watering of lawns and gardens.

7. Remodel for Mixed Use, Adaptive Reuse and Historic Preservation

Description:

Reusing existing buildings is one of the most straightforward ways to conserve resources. Older buildings typically feature high-quality materials in the structure, doors, windows, and finishes. When working with historic buildings, remodelers should also review the Department of the Interior Standards for Historic Preservation.

Application:

Many high quality materials found in older structures can be left in place or reused. Large timbers, beams, columns, and trusses can be regraded and certified for use in structural applications.

Benefit:

The reuse of older buildings conserves resources, diverts demolition waste from landfills, and preserves neighborhood character.

HOMEOWNER TIP | **COMPOST FRUIT, VEGETABLE AND YARD TRIMMINGS**

Compost is nature's way of recycling. Turn fruit, vegetable and yard trimmings into a first rate soil conditioner. Use compost to replace store-bought soil conditioners. Compost adds nutrients and beneficial microbes to soil, improves soil fertility and reduces watering needs. Composting saves money by lowering garbage bills, increases the ability of soil to hold water, improves soil health, and helps extend the life of our landfills. Contact your local recycling agency listed on Page 2 for more information and discounts on compost bins.

B. Foundation

1. Incorporate Recycled Flyash in Concrete

Description:

Flyash is a byproduct of coal burning power plants and can be an inexpensive substitute for a portion of portland cement used in concrete.

Application:

Typically, 15-50% of cement can be replaced with flyash in residential concrete mixes, however it must be cured longer than standard concrete.

Benefit:

Flyash increases the strength and durability of the concrete. Using flyash also reduces the amount of cement needed, thereby decreasing the overall environmental impacts of cement production.

2. Reuse Form Boards

Description:

Form boards are often 2x10 or larger solid sawn lumber typically cut from old-growth trees.

Application:

Forms are used whenever concrete is poured. By carefully removing and separating the forms, they can be reused several times.

Benefit:

Reuse of forms saves money and conserves resources. Solid sawn lumber is becoming increasingly expensive and scarce.

3. Use Recycled Content Rubble for Backfill Drainage

Description:

Concrete and rubble can be crushed and used for backfill and drainage purposes at the base of foundations.

Application:

Use recycled materials for backfill.

Benefit:

Using recycled instead of virgin materials saves money and natural resources.

4. Insulate Foundation Before Backfill

Description:

All foundations, including slab floors, can be insulated to minimize heat loss.

Application:

Insulate foundation with extruded polystyrene insulation of at least R-4 (1" or greater).

Benefit:

Insulating the foundation minimizes heat loss from the floors and basement, reduces energy loss and therefore reduces utility bills.

5. Use Aluminum Forms

Description:

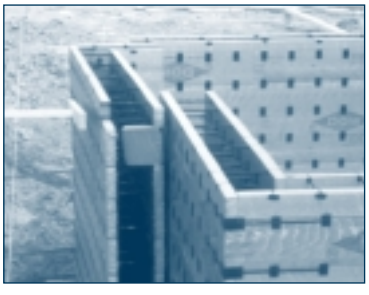
Aluminum forms come in all sizes and shapes and produce a smooth finished surface on the concrete. They can be used repeatedly.

Application:

Aluminum forms can be used in most applications to replace wood forms.

Benefit:

Because they can be reused many times, aluminum forms reduce wood use and, despite higher initial cost, pay for themselves quickly.



Insulated Concrete Forms (ICFs)

6. Install Rigid Foam, Insulated Concrete Forms (ICFs)

Description:

Rigid foam forming systems hold concrete in place during curing and remain in place afterwards to serve as thermal insulation for concrete walls.

Application:

Use rigid foam forming systems wherever an insulated foundation is desirable.

Benefit:

Unlike untreated lumber, ICFs are not subject to rot and result in a better insulated foundation.

C. Structural Frame

1. Substitute Solid Sawn Lumber with Engineered Lumber

Description:

Solid sawn lumber in sizes of 2x10 or greater typically comes from old-growth forests. Engineered lumber products, on the other hand, come from small-diameter and fast growing plantation trees. These products include glulams, laminated veneer lumber, wood I-joists, oriented strand board, parallel strand lumber, and other manufactured wood fiber structural materials.

Application:

A. Floor Joist

2x10 and larger lumber are typically used for floor and ceiling joists and some seismic applications. Large size lumber can be replaced with engineered lumber in most applications unless required by seismic codes.

B. Non-Load Bearing Header

Solid sawn 4x6 are often used for headers when smaller dimension lumber would suffice, such as double 2x6, unless solid 4x6 are required by seismic codes.

C. Structural Headers and Beams

Engineered lumber should be used whenever structural members are replaced. They substitute for 2x10 and 2x12 in most interior applications such as the structural framing of floors, walls and roofs.

Benefit:

Reducing demand for large dimensional lumber decreases pressure to cut down old-growth forests. Engineered lumber uses wood fiber more efficiently than conventional lumber, resulting in stronger and higher quality homes.

2. Use Forest Stewardship Council (FSC) Certified Wood for Framing

Description:

FSC certification assures that the forest from which the wood is produced is managed in an environmentally and socially responsible manner.

Application:

Use FSC wood whenever new wood framing is required. Certified framing materials and plywood are available.

Benefit:

FSC certification guarantees that forests are managed in a way that will assure the long-term availability of precious woods while protecting old-growth forests.

3. Use Wood I-Joists for Floors and Ceilings

Description:

Wood I-joists are engineered to use only the wood fiber necessary for the structural function required. They typically use oriented strand board (OSB) for the web and either laminated veneer lumber or solid sawn lumber for the chords (top and bottom pieces).

Application:

Replace solid sawn lumber with wood I-joists for floor and ceiling joists. Often they can be used at 19.2" centers to save material.

Benefit:

Wood I-joists use 50% less wood fiber to perform the same structural function as similar sized solid sawn lumber and will never twist, warp or split. They are stronger and lighter than 2x10 or 2x12 and can span greater distances.

Engineered Wood I-joist

4. Use Oriented Strand Board (OSB) for Subfloor and Sheathing

Description:

OSB is manufactured from fast growing farm trees. OSB comes in sheets and is used for sheathing and subfloors.

Application:

Use OSB as an alternative to plywood for sheathing or subfloors.

Benefit:

OSB is as strong as traditional plywood sheet material and is less expensive. OSB reduces the need for large diameter old-growth trees required for plywood. Some OSB uses lower formaldehyde content adhesives which contributes to a healthier indoor air quality.

5. Use Finger-Jointed Studs

Description:

Finger-jointed studs use short pieces of 2x4 or 2x6 material glued together to form standard stud lengths.

Application:

Use finger-jointed studs (graded equivalent to full dimensional studs – 1997 UBC Standard, Chapters 23 and 35) wherever conventional studs are typically used, in vertical applications. Use of finger-jointed studs may require code approval by your local jurisdiction, and may need to be submitted to the structural engineer of record for approval.

Benefit:

Finger-jointed studs reduce the use of solid sawn wood studs. They are straighter and stronger than solid sawn studs, eliminating crooked walls and reducing material waste.

6. Use Structural Insulated Panels (SIPs) for Walls and Roof

Description:

SIPs are a sandwich of rigid foam with OSB on either side. They come in nominal 4”-12” thickness and are about R-4 per inch.

Application:

Use SIPs for structural exterior walls and roofs in place of stick framing. SIPs can be designed to meet seismic Zone 4 requirements.

Benefit:

SIPs are more energy-efficient, provide excellent soundproofing and reduce infiltration relative to frame construction. They can be erected quickly, allowing for faster construction. They save wood by eliminating much of the conventional framing lumber.

7. Use Reclaimed Lumber

Description:

High quality dimensional lumber in long lengths can often be salvaged from old buildings that are being deconstructed or salvaged.

Application:

Use reclaimed lumber for non-structural applications, in place of new material. For structural applications, look for reclaimed lumber that is engineer-stamped and graded.

Benefit:

Reclaimed lumber from deconstructed buildings reduces resource consumption and landfill deposits. Reclaimed lumber is often of higher quality than new lumber.

Oriented Strand Board

D. Exterior Finish

1. Use Sustainable Decking Materials

A. Recycled Content Decking

Description:

There are two types of recycled content decking: plastic lumber and composite lumber. 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.

Application:

Use recycled content decking in all non-structural deck applications. Both products can be used in place of old-growth redwood, cedar and pressure treated pine. These products accept screws and nails, and cut like wood. Follow manufacturer recommendations closely regarding the amount of expansion that will occur when using plastic lumber.

Benefit:

The durability of these materials is greater than wood, providing cost savings to the homeowner over the life of the products. They will not rot, crack or splinter, do not require staining and are not treated with potentially toxic chemicals. Using recycled content decking also reduces pressure on old-growth forests.

B. Forest Stewardship Council (FSC) Certified Wood Decking

Description:

Certified, sustainably harvested lumber comes from forests managed in an environmentally and socially responsible manner.

Application:

Use FSC Certified lumber for all exterior decking applications or as structural deck members in conjunction with recycled content decking.

Benefit:

FSC certification guarantees that forests are managed in a way that will assure the long-term availability of precious woods while preserving old-growth forests.

2. Use Treated Wood That Does Not Contain Chromium or Arsenic for Decking and Sill Plates

Description:

Alkaline Copper Quartenary (ACQ) and Wolman Natural Select are alternative treated woods that do not contain chromium – a heavy metal – and arsenic, which are detrimental to human health. ACQ and Wolman Natural Select eliminates both of these components yet provide long-term protection.

Application:

Use non-chromium/arsenic treated wood for any application that specifies treated lumber including decking, fencing, and site furnishings.

Benefit:

ACQ and Wolman Natural Select use copper as its main component, and is a healthier alternative to lumber treated with chromium and arsenic, particularly for children who play on or near decks.

Recycled Content Decking

3. Use Alternative Siding Materials

A. Use Recycled Content Siding

Description:

Recycled content siding is often called hardboard. Hardboard includes varying amounts of recycled content materials and looks and performs like wood siding.

Application:

Use hardboard whenever wood siding is installed or replaced.

Benefit:

Siding that has been manufactured with recycled wood fiber will not crack, split or warp and holds paint longer than solid wood siding, therefore reducing maintenance costs and resources.

B. Use Fiber-Cement Exterior Siding

Description:

Fiber-cement siding is composed of cement, sand and cellulose fibers. It is available in shingles, planks or 4x8, 4x9, or 4x10 sheets. It is textured to look like wood siding or stucco finish.

Application:

Replace conventional wood siding or stucco finishes with fiber-cement siding. This product can be cut with a carbide-tipped saw blade, snapper shears or with a guillotine cutter. Dust protection and control are required when cutting with a circular saw.

Benefit:

Fiber-cement siding is more durable than wood, termite resistant, non-combustible and warranted to last 50 years. Using fiber-cement siding reduces the demand for old-growth redwood or cedar siding. It may also reduce homeowner's insurance rates due to fire resistance.

Fiber-Cement Siding

E. Plumbing

1. Install Hot Water Jacket Insulation

Description:
Water heater jacket insulation is an insulated wrapper that goes around the hot water tank and is secured in place.

Application:
Install on existing hot water heaters. For new water heaters, make sure that installation will not void warranty.

Benefit:
Jacket insulation reduces heat loss by about 10% and more on older water heaters.

2. Convert Gas to Tankless Water Heaters

Description:
Tankless water heaters (flash or on-demand heaters) heat water as needed rather than having a tank in which hot water is stored. Their capacity to provide hot water is virtually unlimited.

Application:
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. Gas tankless water heaters typically have more capacity than electric tankless heaters.

Benefit:
Typical water heaters lose 15% of their energy through standing tank losses, whereas tankless heaters use energy only for immediate hot water needs. Tankless water heaters often are quicker and more reliable.

3. Insulate Hot and Cold Water Pipes

Description:
Insulating water pipes reduces heat loss or gain in the pipes while the water is standing.

Application:
Insulate hot water pipes in all runs through unconditioned spaces: basements, crawl spaces, attics, etc. At a minimum, insulate both hot and cold pipes at least 6 feet from the hot water heater to prevent convective circulation from the heater through the pipes.

Benefit:
Insulated pipes save energy and water. The water does not need to run as long to get hot water to a distant faucet, thereby reducing hot water heating costs.

4. Retrofit all Faucets and Showers with Flow Reducers

Description:
Flow reducers fit into the aerator at the tip of the faucet and reduce the rate of water flow through the faucet. Low flow showerheads replace standard showerheads.

Application:
Use flow reducers on all faucets and showers that accept reducers. Old fixtures may not accept reducers if they do not have screw-on aerators.

Benefit:
Flow reducers can cut water usage of faucets and showers by as much as 40% with little noticeable effect.

5. Replace Toilets with Low Flow Models

Description:
New toilets use 1.6 gallons per flush compared with old toilets that require 5-7 gallons per flush.

Application:
Whenever possible, replace existing toilets with new 1.6-gallon models.

Benefit:
It is estimated that low flow toilets alone can save up to 22,000 gallons of water per year for a family of four.

6. Install Chlorine Filter on Showerhead

Description:
Water filters on showerheads reduce chemicals and particulates from the water stream.

Application:
Install the water filter between the pipe and the existing showerhead.

Benefit:
Chlorine is absorbed 6 times faster through the skin than through the digestive system. It has been shown that chlorine absorption can have adverse health effects on some people and especially children.

7. Pre-Plumb for Graywater Conversion

Description:

Graywater is wastewater from sinks, showers and washing machines that is not contaminated by human waste.

Application:

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. Check with your local building department for requirements.

Benefit:

Graywater utilization cuts down on the use of potable water for outside irrigation and lawn watering. It is essentially recycling water at home.

8. Install Water Filtration Units at Faucets

Description:

Water filtration units can be installed at individual faucets or for the whole house. They reduce chlorine and many other chemicals, particulates and microorganisms.

Application:

Whole house filters are for drinking water and plumbing (not for hosebibs or toilets). Install filtration system between the cold water line and the main drinking water faucets in the house.

Benefit:

Agricultural run-off, chemical leaching and microorganisms increasingly contaminate public water systems across the country. House filtration systems reduce the health threat of these contaminants.

9. Install On-Demand Hot Water Circulation Pump

Description:

An on-demand hot water circulation pump can send hot water to fixtures in seconds; without wasting water while waiting for it to get hot. It uses a pump to rapidly move water from a water heater to fixtures. It stops when water reaches a pre-set temperature.

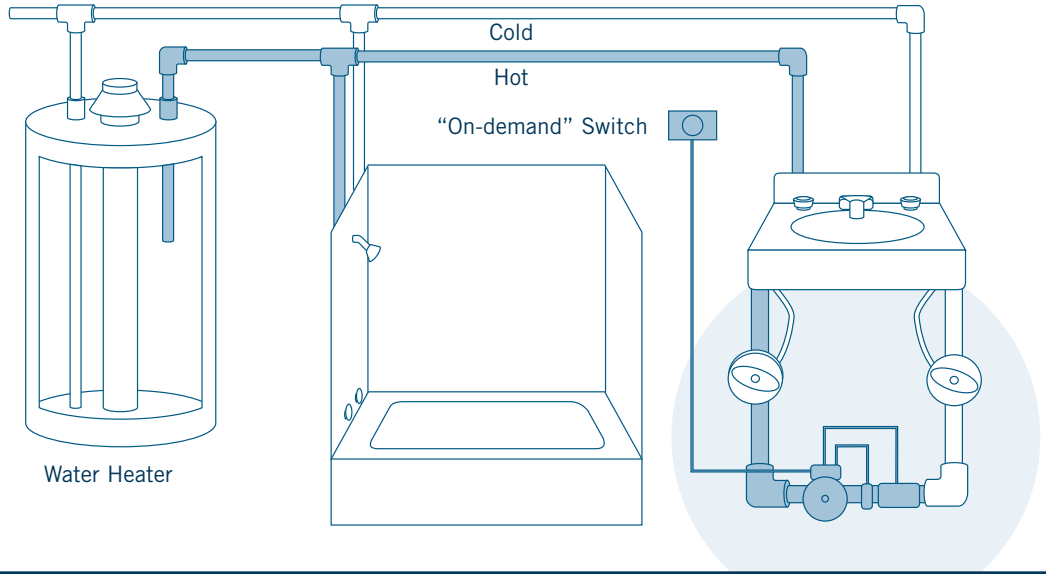
Application:

Install the pump at the furthest faucet from the water heater. Only one pump is needed to supply hot water to any fixture and can easily be installed.

Benefit:

Both water and energy are saved since water doesn't have to be wasted until it reaches the correct temperature for use. Hot water arrives to the fixture 5 times faster than on average.

On-Demand Water Circulation Pump



F. Electrical

1. Install Compact Fluorescent Light Bulbs (CFLs)

m:

CFLs screw in like conventional bulbs but consume up to one-fourth of the electricity used by incandescent bulbs to produce an equivalent amount of light.

Application:

Install CFLs in place of standard incandescent bulbs. CFLs are not recommended for fixtures that are turned on and off many times per day, i.e. a busy bathroom. Choose a CFL that is one-fourth the wattage of the incandescent bulb.

Benefit:

Compact fluorescent bulbs are a profitable investment, saving several times their purchase price through reduced electricity bills and fewer replacement bulbs because they last eight times longer.

2. Install Lighting Controls

Description:

Lighting controls use sensors and timers to turn lights off in unused areas or during times when lighting is not needed.

Application:

Install lighting controls either at specific locations or as a whole house system. Lighting controls are especially applicable for exterior uses but are not recommended for use in bathrooms with showers.

Benefit:

Lighting controls reduce energy use by having the lights on for shorter periods of time.

3. Install Ceiling Fans

Description:

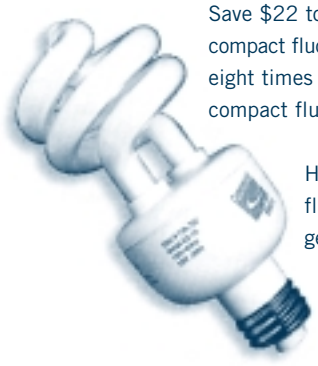
Ceiling fans improve interior comfort by circulating cold and warm air. They can be adjusted to either draw warm air upward during summer months or push it downward during the winter.

Application:

Preferable locations are bedrooms and living rooms where occupants spend time. Ceiling fans must be supported adequately between ceiling joists.

Benefit:

Ceiling fans can reduce the need for air conditioning.



ENERGY STAR® qualified compact fluorescent lighting lasts up to eight times longer than incandescent lighting. Save $22 to $65 in energy costs over the life of a compact fluorescent bulb. You'll replace an incandescent eight times to match the life expectancy of a single compact fluorescent.

How do you choose the right compact fluorescent bulb? The following is a general guide to assist you:

Source: www.pge.com

Existing Incandescent Lamp	Proposed ENERGY STAR® Compact Fluorescent Bulb	Savings over the life of the bulb
40 - 60 watts	11 - 15 watts	$22 - $35
75 watts	16 - 20 watts	$43 +
90 - 100 watts	23 - 40 watts	$52 +

G. Roofing

1. Select Light Colored Roofing

Description:

Dark roofing materials absorb heat making the house warmer in summer months, whereas light colored roofing reflects heat away from the building.

Application:

For pitched roof buildings, use light colored roofing. For flat roofs, the black asphalt or roofing material should be coated with light colored gravel or painted with light colored or reflective paint.

Benefit:

Light colored roofing reduces heat buildup through the roof, increasing occupancy comfort, and decreasing air conditioning bills. Light colored roofing can also last longer because it does not thermally expand and contract as much as darker colors.

2. Select Safe and Durable Roofing Materials

Description:

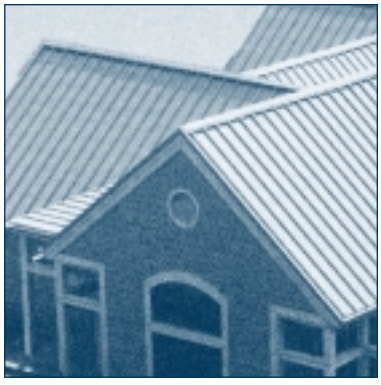
40-year asphalt composition, tile, slate, fiber-cement and metal are examples of safe and durable roofing materials. Avoid cedar and wood shake shingles.

Application:

Applicable anytime roofing material is specified.

Benefit:

A durable and safe roof is cost effective and reduces landfill deposits.



Standing Seam Metal Roof (top)
Fiber-Cement Roofing Tiles (above)
40-year Composition Roofing (below)

HOMEOWNER TIP | **INSTALL A REFLECTIVE WHITE COATING ON YOUR ROOF**

A reflective white coating can increase the roof's reflectivity and reduce energy consumption. A number of studies have begun to quantify possible energy savings with reflective roofing materials. One study by the Florida Solar Energy Center found that air conditioning energy use was reduced by an average of 23% in houses with increased roof reflectance.

H. Appliances

1. Replace Dishwasher

Description:

New model dishwashers use water and energy more efficiently.

Application:

Select ENERGY STAR® dishwashers when replacing older models.

Benefit:

Water-efficient dishwashers are also energy-efficient because most energy consumed by dishwashers is used to heat water. These dishwashers are at least 30% more efficient than 1994 standard washers.

Horizontal Axis Washing Machines

2. Install Horizontal Axis Washing Machine

Description:

Horizontal axis machines load from the front, spinning clothes in and out of the water to tumble them clean.

Application:

Install ENERGY STAR® horizontal axis washing machines when replacing older models.

Benefit:

Horizontal axis machines save resources by using less water and energy. They use up to 40% less water and 50% less energy than conventional top loading washers, translating into lower energy and water bills for the resident. Manufacturers claim that there is less wear and tear on clothes compared to the traditional agitator (top loading) machines

3. Install Energy-Efficient Refrigerator

Description:

Refrigerators and freezers are among the largest users of electricity in most homes. They can account for up to 25% of household energy use. New appliances are much more energy-efficient.

Application:

Use ENERGY STAR® rated refrigerators when replacing old units.

Benefit:

New, efficient refrigerators can save over 10% of the total annual electrical bill. Check with your local utility company for rebate programs.

You will find the ENERGY STAR® label on products that exceed energy performance guidelines for energy efficiency. If all consumers, businesses, and organizations in the United States chose ENERGY STAR® products over the next decade, the national annual energy bill would be reduced by about $200 billion. For more information, visit www.energystar.gov.

I. Insulation

1. Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirements

Description:

Insulation in exterior walls and ceilings can reduce the demand for air conditioning and heating and make homes more comfortable.

Application:

A. Wall Insulation

Insulate walls of existing wood frame houses to the capacity of the wall cavity, exceeding the Title 24 Standard of R-13 by 20%. Wall cavities with existing insulation can be blown full of new cellulose or fiberglass to increase the density, thereby increasing the R-value. Exterior walls can be wrapped with a minimum of 1" (R-4) rigid foam to increase R-value if total exterior refinish is being performed.

B. Ceiling Insulation

Increase ceiling insulation in existing structure to exceed Title 24 Standard of R-19 by 20%, where possible. Installation is generally intended to be in ceilings below attic space, with appropriate gable or soffit ventilation. If existing cathedral or flat ceilings are already insulated, it is not recommended to install more insulation in the cavity unless adequate insulation ventilation is provided. It is most cost-effective to add insulation to cathedral ceilings during construction or when remodeling other areas.

Benefit:

Increased wall and ceiling insulation improves comfort, decreases heating and cooling requirements, saves money, and makes the home quieter.

2. Install Recycled Content, Formaldehyde-Free Fiberglass Insulation

Description:

Many fiberglass insulation products include recycled glass, formaldehyde-free binders, no asphalt adhesives or colored dyes.

Application:

When using fiberglass insulation, specify recycled content and no formaldehyde. Fiberglass insulation can be used for any typical insulation installation.

Benefit:

Formaldehyde-free binders reduce indoor air quality problems and insulation contains up to 30% recycled glass.

Recycled Content, Formaldehyde-Free Fiberglass Insulation

3. Use Advanced Infiltration Reduction Practices

Description:

Expandable foam and caulk are used to prevent infiltration where wood connections are made or framing is drilled to provide plumbing and electrical runs.

Application:

These methods are especially important when fiberglass insulation is installed, since fiberglass does little to reduce infiltration. Seal holes between floors and between stud cavities around wire runs. Caulk top and bottom plates on all floors.

Benefit:

Reduction in infiltration increases comfort and reduces energy bills.

4. Use Cellulose Insulation

A. Walls

Description:

Cellulose is a highly effective insulation made out of recycled newspaper. Spray cellulose wall insulation is mixed with low-toxic binders to adhere to stud and joist cavity surfaces.

Application:

This installation is intended for new construction or total "gut" renovation, where existing wall surfaces have been removed to the studs. It is not cost effective in other applications.

Benefit:

Spray insulation completely fills cavities and penetrations, thus reducing air infiltration. The binder in the insulation also reduces the air movement within wall cavities, reducing moisture intrusion and flame spread. Using cellulose insulation makes the home quieter, more comfortable and energy-efficient.

B. Ceilings

Description:

Dry-blown or loose-fill cellulose is treated with borates for fire and insect resistance. Cellulose does not contain formaldehyde, which is common in many fiberglass insulations.

Application:

Spread cellulose over ceiling joists or blow into tight cavities to increase ceiling R-value. It is important to maintain attic or ceiling ventilation pathways, especially in cathedral ceiling applications.

Benefit:

Cellulose insulation is formaldehyde-free, fire-resistant, manufactured with recycled materials, reduces air leakage and contributes to a more comfortable and energy-efficient home.

Spray Cellulose Insulation

J. Windows

1. Install Energy-Efficient Windows

Windows play a big role in the energy efficiency of homes. In the summer, they can allow unwanted heat into the house, and in the winter, windows can account for as much as 25% of the heat loss. When replacing windows, look for models with the following energy saving features:

A. Double-Paned Windows

Description:

Double glazing insulates almost twice as well as single glazing.

Application:

Replace single-paned windows with double-paned windows whenever possible. Check with your local utility company for rebate programs.

Benefit:

High quality double-paned windows make the whole house quieter and more comfortable during all seasons, while saving energy and money.

B. Low-Emissivity (Low-E) Windows

Description:

Low-E coatings, virtually unnoticeable to the eye, are installed inside the air space of a double-paned window. The low-E coatings help prevent heat from escaping through the glass in winter and block heat from entering the home during summer.

Application:

Use low-E, double-paned windows whenever windows are replaced. Check with your local utility company for rebate programs.

Benefit:

Low–E windows reflect heat, making the home more comfortable in cold weather and on hot summer days. The cost premium of 10-15% for low-E glass typically pays for itself in a few years. Low-E, double-paned glass coating increases glass R-value to 3 compared to R-1 for single-glazed windows.

C. Low-Conductivity Frames

Description:

Most window frames and sashes are made of wood, vinyl, fiberglass or aluminum. Wood, vinyl and fiberglass generally insulate better than aluminum frames.

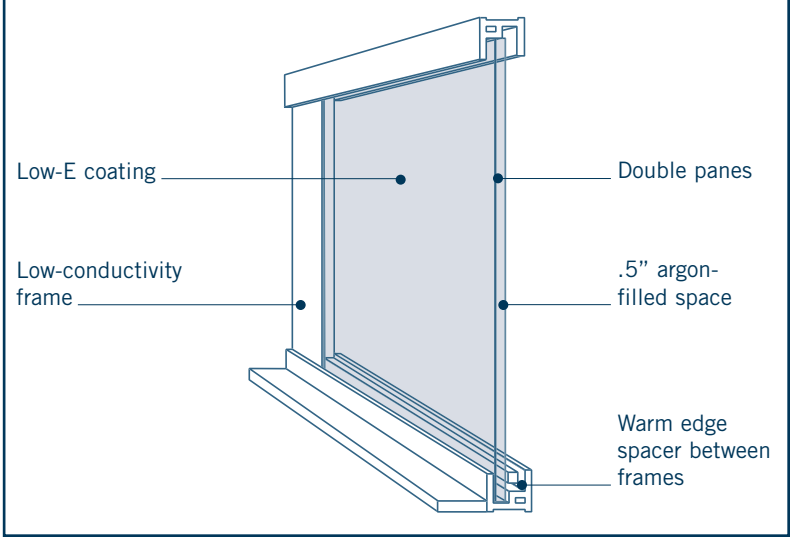
Application:

Consider wood windows for any window that is being replaced.

Benefit:

Wood windows create greater comfort and better energy efficiency and is an environmentally preferable material.

Low-E Glass and Window



2. Install Low Heat Transmission Glazing

Description:

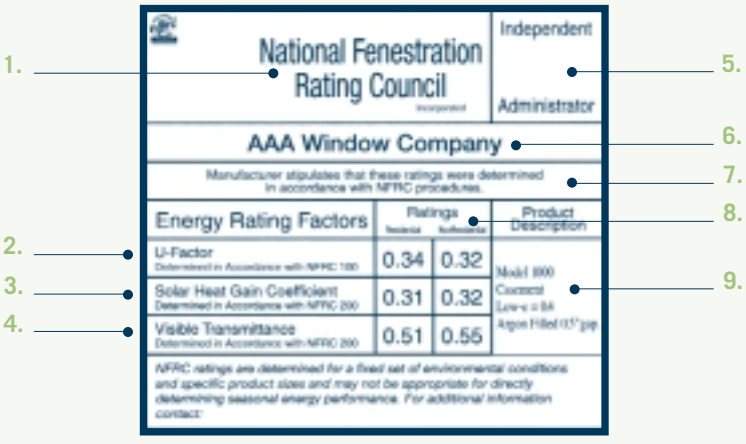
Reflective film reduces heat gain from the sun, particularly during late afternoon and evening hours in hot climate areas.

Application:

Any unshaded, single-glazed west windows are good candidates for film application.

Benefit:

Reflective film reduces overheating and is an inexpensive option that can significantly lower the need for additional cooling.



1. Look for this label as your assurance that this window has been independently rated using a procedure established by the NFRC. Although other labels may be present, the NFRC label is your best source of energy performance information.

2. U-factor is a measure of heat transferred by the entire window (frame, sash and glass) either into or out of the building. A smaller U-factor will provide a window which is more comfortable on cold days. Try to purchase a window with the lowest U-factor.

3. Solar Heat Gain Coefficient (SHGC) is a measure of the solar energy entering the building though the entire window. A lower SHGV will reduce air conditioning costs and provide more comfort on hot days.

4. Visible Transmittance (VT) is a measure of the amount of visible light entering the window. Try to select a window with a high VT. It will bring more natural day-light into your home.

5. Independent Certification and Inspection Agency (IA) selected by the window manufacturer. All testing is done by an NFRC-accredited laboratory, and results are sent to the IA for evaluation. Both laboratories and manufacturers are inspected annually to ensure that NFRC standards are maintained.

6. Name of the window manufacturer.

7. NFRC technical procedures by which the window was evaluated.

8. The NFRC "rating", a numerical value, represents the applicable energy performance characteristic. Residential (or "AA") and Non-residential (or "BB") are NFRC size designations. Representative test sizes are chosen for each product type and identical sizes are compared among different manufacturers.

9. Manufacturer's description of the labeled product.

Source: www.pge.com

HOMEOWNER TIP | INSULATING EXISTING WINDOWS

If existing windows are in relatively good shape, it may be hard to justify replacing them. Consider installing weatherstripping, caulking, inner or outer storm windows and insulating drapes or curtains to improve performance of existing windows.

K. Heating, Ventilation and Air Conditioning (HVAC)

1. Use Duct Mastic on all Duct Joints

Description:

Leaks in the joints between ductwork allow conditioned air to escape into attics and basements. Duct tape loses its effectiveness in 3-5 years. Mastic maintains the seal for decades.

Application:

Install mastic at every metal duct joint and around the bends in elbows. It is important for all ducts to be sealed.

Benefit:

Leaky air ducts can cause negative pressure in the house which can allow carbon monoxide from gas water heaters and furnaces into the home. Well-sealed ductwork also keeps the house more comfortable.

2. Install New Ductwork within Conditioned Space

Description:

Ducts in exterior walls, attics and in uninsulated spaces lose a significant amount of heated or cooled air capacity.

Application:

All ductwork for heating or cooling should be run through conditioned space inside the insulated envelope. Duct runs require chases to be designed into the project from the beginning.

Benefit:

Locating ducts in the conditioned space significantly reduces energy loss and improves occupant comfort.

3. Vent Range Hood to the Outside

Description:

Steams, gases, smoke and other combustion by-products (such as unburned hydrocarbons) can result from cooking. Stovetop range hoods expel these by-products to the outside.

Application:

Range hoods are particularly important for gas stoves and can be installed where stoves are adjacent to exterior walls.

Benefit:

Range hoods improve indoor air quality, prevent overheating and excess moisture build-up.

4. Install 90% or Greater Efficiency Gas Forced Air Furnace

Description:

High efficiency furnaces convert gas to heat with greater efficiency.

Application:

Replace conventional furnaces with high efficiency models. Installing the proper size of furnace for the home is just as important as its efficiency. Check with your local utility company for rebate information.

Benefit:

A properly sized, high efficiency furnace costs less to operate. It saves natural resources, reduces air emissions and helps create a cleaner environment.

5. Install Solar Attic Fan

Description:

Solar attic fans exhaust heat from attic spaces in summer and clear condensation in the winter.

Application:

Solar attic fans are powered by the sun and are most effective when placed on the southern side of the roof and centered between the roof rafters. Avoid installing under over-hanging trees or other structures creating shade.

Benefit:

In the summer, attics can reach up to 150ºF. That heat radiates into the home and increases the temperature inside. A solar attic fan removes this hot air and reduces the need for air conditioning by as much as 50%. Fans can also incease the life of the roof by decreasing condensation.

6. Clean all Ducts Before Occupancy

Description:

Debris and dust from construction can cause allergic reactions in occupants.

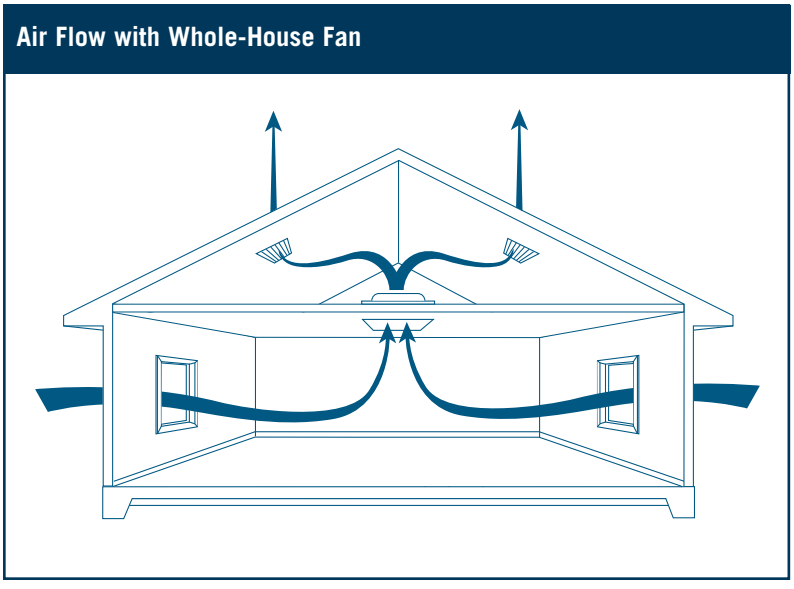
Application:

Clean or vacuum all ductwork before occupancy to eliminate dust. Clean ducts before carpet is laid and finishes are applied.

Benefit:

Children are especially sensitive to micro particulates like drywall dust. Cleaning and vacuuming ductwork reduces dust around the house after occupancy.

Air Flow with Whole-House Fan



7. Install Whole House Fan

Description:

Whole house fans work by continuously replacing warm indoor air with cooler outdoor air.

Application:

The fan must be mounted in a hallway ceiling on the top floor of a house. An insulated, airtight seal is required to prevent air infiltration or exfiltration in winter. Fans should be sized to produce between 4-5 air changes per hour within the home and should have two speeds: low speed for continuous ventilation and high speed.

Benefit:

An average whole house fan uses one-tenth the electricity of an air conditioning unit. Moving large volumes of air can achieve indoor comfort at higher temperatures without air conditioning.

8. Replace Electric Heaters and Wall-Mounted Gas Heaters with Through-the-Wall Heat Pumps

Description:

Wall-mounted electric and gas heating units are potential fire hazards. Gas units produce both unburned hydrocarbons and carbon monoxide, a deadly unnoticeable gas. A wall heat pump has an exterior compressor and an interior air handler that blows conditioned air throughout the home.

Application:

Replace any wall-mounted heater with a heat pump. Replacement with a heat pump is potentially expensive. Another option is to use the water heater as the heat source using a fan coil to distribute heat in the home.

Benefit:

Eliminating electric heaters and wall-mounted gas heaters results in greater safety and more energy efficiency.

HOMEOWNER TIP | **INSPECT AIR DUCTS REGULARLY**

Ducts should be inspected and sealed to ensure adequate airflow and eliminate loss of conditioned air. Ducts can leak as much as 15-20% of the air passing through them and can bring dust and humidity into living spaces. Thorough duct sealing can cut heating and cooling costs in many homes by 20%.

9. Install Zoned, Hydronic, Radiant Heating

Description:

Hydronic heating forces hot water through radiators located in different areas or zones throughout the house. It is typically installed as baseboards or in floors.

Application:

Use hydronic, radiant heating instead of forced air heating. The system must be designed before construction starts.

Benefit:

Hydronic heating is more comfortable and saves energy by heating only the zone that requires heat.

Radiant Floor Heating

10. Retrofit Wood Burning Fireplaces

Description:

The burning of wood in fireplaces is a major source of air pollution during the winter months, generating up to one-third of the particulate matter on cold evenings.

Application:

Retrofit wood burning fireplaces with EPA certified wood stoves or fireplace inserts, pellet stoves or natural gas units. These units should have direct outside combustion air vented into the insert.

Benefit:

The amount of pollutant particulate matter will be reduced by 75-90% compared a standard fireplace.

11. Install / Replace Dampers on Fireplaces

Description:

Dampers in the fireplace flue reduce down drafting and heat loss during cold weather.

Application:

Replace old damper if it no longer seals the flue due to mechanical failure, rust or soot buildup in the chimney.

Benefit:

A properly operating damper reduces drafts throughout the house when the fireplace is not in use.

12. Install Airtight Doors on Fireplaces

Description:

Open fireplaces suck air out of the house and extract more heat than they provide. Airtight doors reduce the amount of oxygen drawn from the house for combustion purposes.

Application:

Retrofit doors on fireplaces. Outside air, needed for combustion, should be brought in behind the doors. Some fireplaces provide for controlled air intake from inside the house that can be shut down when not in use.

Benefit:

When shut, airtight doors can reduce the heat taken from the house. They also reduce drafts when the fireplace is not in use.

13. Install Heat Recovery Ventilation Unit (HRV)

Description:

An HRV is a mechanical ventilation system that recovers heat from exhausted indoor air and transfers it to the incoming fresh air stream. HRV is an air-to-air exchanger in which outgoing exhaust air preheats or precools the incoming fresh air.

Application:

The unit should be designed into the HVAC system to capture heat out of exhausted air from the return ducts of the forced air furnace. Note: Use of this equipment is particularly appropriate with blower door test results of less than .35 Natural Air Changes per Hour (NACH).

Benefit:

Air to air heat exchangers provide for fresh air in winter while exhausting stale indoor air. Heat is captured from the exhausted air stream and transferred to the incoming air.

14. Install Separate Garage Exhaust Fan

Description:

According to the U.S. Environmental Protection Agency, an attached garage is the single most significant contributor to poor indoor air quality. Car exhaust contains many known carcinogens and can migrate into living spaces through doors and cracks in walls adjacent to the garage.

Application:

Install exhaust fan on the opposite wall from the door to the house. It can be wired to an electric garage door or put on a timer to run for 15 minutes after door has been opened or closed.

Benefit:

An exhaust fan creates a healthier indoor environment by reducing the potential hazard of car exhaust from entering the house.

15. Install High Efficiency Particulate Air (HEPA) Filter

Description:

HEPA filters remove over 90% of dust and particulates from the air.

Application:

HEPA filters are installed in the return air stream at the air handler, which should be sized to handle the reduced air pressure caused by the filter. Some units have an air conditioning setting for the fan that will handle the retrofit filter.

Benefit:

The EPA has identified microparticulates as a leading cause of respiratory discomfort. By removing these particles, the HEPA filter makes the living space healthier.

HOMEOWNER TIP | **WASH AND CHANGE FURNACE FILTERS OFTEN**

Furnace filters capture large particles of dust, pollen, and other indoor pollutants. Washable filters can be cleaned and reused. Non-washable filters must be replaced in keeping with the manufacturer's instructions. It is suggested to wash/change filters at least twice a year (preferably more often), preventing furnace air from becoming contaminated as it is blown into the living space.

L. Renewable and Solar Energy

1. Incorporate Natural Cooling

Description:

Natural cooling systems incorporate: shading from deciduous trees (for east and west-facing glass), window overhangs and awnings, and radiant heat-reflective barriers installed in the attic space.

Application:

Any combination of natural cooling techniques can be used to reduce overheating on homes. Use awnings and window overhangs primarily on south facing glass to provide a balance between summer cooling and winter heating through solar gain. Use landscaping to shade east and west-facing windows.

Benefit:

Natural cooling reduces the need for air conditioning, saves money on energy bills, and can make homes without air conditioning more comfortable.

2. Incorporate Passive Solar Heating

Description:

Passive solar systems provide heat to the structure through south facing windows in conjunction with thermal mass.

Application:

The house must incorporate windows that face within 30 degrees of due south and have the ability to store excess heat in massive elements such as a slab floor or stone fireplace.

Benefit:

Passive solar design can reduce heating requirements by 30-50%, saving energy and money.

3. Pre-Plumb for Solar Water Heating

Description:

Insulated copper pipes are installed from the attic to a hot water closet or mechanical room for future solar installation. This option allows the homeowner to install an active solar system at a later date if they desire.

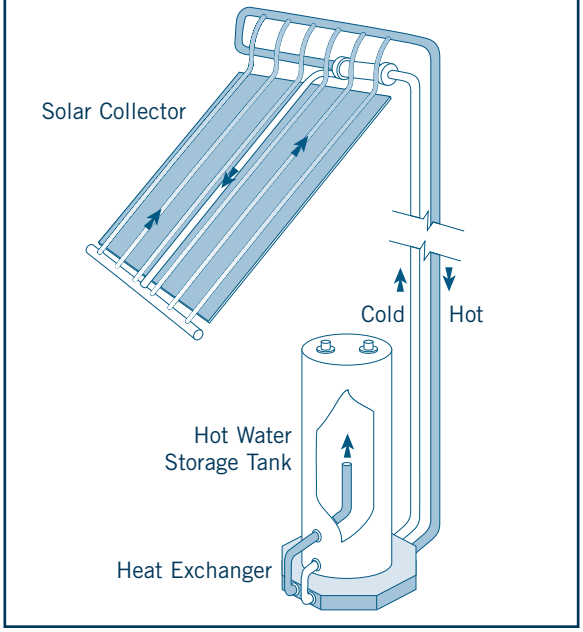
Application:

Provide south-facing roof area for collectors and access for piping to a mechanical room. This is primarily applicable to homes that are being extensively rehabilitated on the interior. The most cost-effective time to install this pre-plumbing is during construction.

Benefit:

Solar hot water pre-plumbing during the remodeling process can save money for the homeowner if, at some point in the future, they want to install a solar system.

Solar Hot Water and Space Heating System



4. Install Solar Water System

Description:

Solar water heating systems use solar panels to collect heat from the sun. The hot water is stored for use at a later time. Water pre-heated by a solar system can also supplement use of a standard water heater.

Application:

Provide sufficient south-facing roof area for collectors, and space in a hot water closet for the additional hot water storage tank.

Benefit:

Solar hot water systems can pay back in as little as seven years and reduce the use of gas or electricity for water heating.

5. Install Photovoltaic (PV) Panels

Description:

PV panels contain hundreds of small cells that collect the sun's energy and convert it into electricity. Excess electricity can be sent back into the utility grid for a credit on electric bills. The collected energy can also be stored in large batteries to meet the needs of nighttime energy requirements.

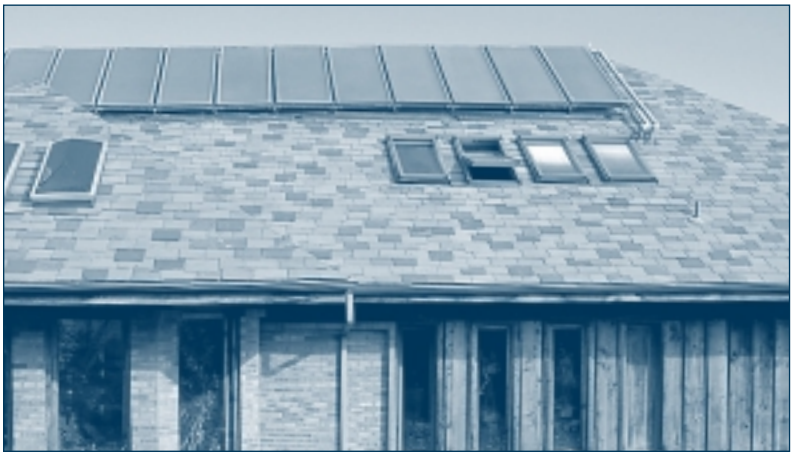
Application:

Mount photovoltaic panels on the roof or on the ground at an appropriate angle (usually 40-60º). The components for a residential, utility-tied system typically include panels, a power relay center, an inverter, and storage batteries. An alternative installation would be self-contained systems (battery included) for outside lighting, security lighting, or walkway illumination.

Benefit:

PV panels can be used as a means to decrease reliance on conventional power plants that contribute to air pollution. PV can be cost effective in areas that require night lighting such as outdoor lights.

Photovoltaic Panel System



HOMEOWNER TIP | **CONSIDER THE BENEFITS OF INSTALLING PHOTOVOLTAIC (PV) PANELS**

Reliability: Generate your own electricity using renewable resources. Your electric utility can "store" and buy the extra electricity you generate or supply it if your system does not generate enough. **Security:** PV Panels provide a secure source of electricity. **Environmentally Friendly:** PVs are a clean, replenishable resource that do not contribute to global warming. **Sustainability:** Use PVs to help ensure our energy future by tapping into an "infinite" power supply. Contact the California Energy Commission at 800.555.7794 for information on cash rebates on eligible renewable energy electric-generating systems.

M. Indoor Air Quality / Finishes

1. Use Low/No-VOC and Formaldehyde-Free Paint

Description:

Most paint releases volatile organic compounds (VOCs), a major indoor air pollutant, into the home. Once outside, VOCs react with other pollutants, producing ground-level ozone that also affects human health. Often low/no-VOC products are manufactured without mercury or mercury compounds, or pigments of lead, cadmium, chromium, or their oxides.

Application:

Paint with low/no-VOCs is available from most major manufacturers and is applied like traditional paint products. High washability should be specified for bathrooms, kitchens and children's bedrooms. Every finish and most colors are available in low/no-VOC paints.

Benefit:

Low/No-VOC paint reduces the emissions of VOCs into the home, improving indoor air quality and reducing the formation of urban smog.

2. Use Low VOC, Water-Based Wood Finishes

Description:

Conventional solvent-based wood finishes can offgas for months, and can be harmful to children. Low VOC finishes, such as water-borne urethane and acrylic, are lower in toxic compounds compared to conventional solvent-based finishes while providing similar durability.

Application:

Low VOC wood finishes can be used in most applications where solvent-based finishes are typically used. If solvent-based wood finishes must be used, they should be left to offgas for three to four weeks prior to occupancy.

Benefit:

Using low VOC wood finishes reduces offgassing into the home, improving indoor air quality, and reducing the formation of urban smog.

Low/No-VOC paint

3. Use Solvent-Free Adhesives

Description:

Unlike solvent-based adhesives that offgas toxic compounds for months, solvent-free adhesives reduce toxic gasses such as aromatic hydrocarbons or solvents that contribute to air pollution.

Application:

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.

Benefit:

Solvent-free adhesives are often stronger, emit fewer pollutants, and reduce the potential harmful impacts on the health of the occupants and installers.

HOMEOWNER TIP | **PROPERLY DISPOSE OF HOUSEHOLD HAZARDOUS WASTES**

Contact your local Household Hazardous Waste facility (listed on page 2) for more information on ways to dispose of household hazardous wastes (paints, stains, adhesives, etc.)

4. Substitute Particleboard with Formaldehyde-Free Materials

Description:

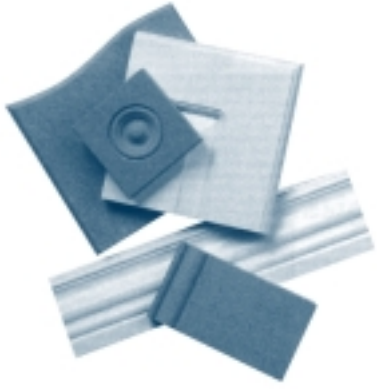
Particleboard is made from wood fibers and an adhesive that contains urea formaldehyde, a suspected human carcinogen. The formaldehyde is continuously released, referred to as "off-gassing", for years after installation. Formaldehyde offgassing contributes to poor indoor air quality. Particleboard is typically used for cabinets, counter tops, stair treads, and shelving.

Application:

Whenever possible, eliminate new particleboard inside houses by using solid wood for stair treads, certified exterior grade plywood or formaldehyde-free medium density fiberboard (MDF) for shelving, cabinets and substrate for countertops.

Benefit:

Elimination of particleboard reduces formaldehyde exposure to residents, particularly children, who are most susceptible.



Formaldehyde-Free Medium Density Fiberboard (MDF)

5. Use Exterior Grade Plywood for Interior Uses

Description:

Exterior plywood uses phenolic resins that offgas one-tenth as much as interior plywood. Interior plywood typically uses urea-formaldehyde glue which offgasses into the house.

Application:

Substitute interior plywood with exterior plywood for custom cabinets and shelving.

Benefit:

Formaldehyde is a suspected human carcinogen and should be avoided whenever possible.

6. Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Materials

Description:

Most MDF is made from sawdust and an adhesive that contains urea formaldehyde, a suspected human carcinogen. MDF without formaldehyde binders is now available. Other alternatives include boards made from agricultural waste, such as wheatboard, a straw-based particleboard manufactured with non-formaldehyde and emission-free binder.

Application:

Whenever possible, eliminate formaldehyde-based MDF inside the home. MDF is typically used for cabinets, trim, and shelving. Use alternatives such as certified plywood, formaldehyde-free MDF, wheatboard, tile and stone for shelving, cabinets and countertops.

Benefit:

Reduces formaldehyde exposure to residents, particularly children, who are more susceptible. Some boards made from agricultural waste are superior to wood-based particleboard in moisture resistance and structural properties, and provides for the reuse of a former waste product.

HOMEOWNER TIP | **SELECT LOW-TOXIC OR CITRUS-BASED CLEANING SUPPLIES**

High-quality, non-toxic and environmentally responsible cleaning products are readily available. Choose products that are non-toxic, ammonia and chlorine-free, as well as biodegradable. These cleaning products are as effective as conventional cleaners, without harsh chemicals that can lead to health problems and atmospheric ozone loss.

7. Use Forest Stewardship Council (FSC) Certified Trim Material

Description:

FSC certified trim material comes from forests that are managed in accordance with sustainable forest practices. It is particularly important to specify certified wood instead of clear, knot-free trim as this material is typically harvested from non-sustainable, old-growth forests.

Application:

Use certified trim in any application that normally uses conventional stain-grade trim.

Benefit:

Sustainable forest certification assures that the forest from which the trim is produced is managed in a way that will assure the long-term availability of these precious woods while protecting ancient, old-growth forests.

Forest Stewardship Council

The FSC logo on a product provides consumers with an assurance that the wood they use comes from forests managed in an environmentally and socially responsible manner.

Smart Wood and Scientific Certification Series

These groups verify that forest management is accomplished according to the FSC program.

8. Seal all Exposed Particleboard or MDF

Description:

Using non-toxic, low permeability paint or sealer to seal exposed particleboard or MDF will reduce the release of harmful gasses and is the next best solution to elimination of particleboard.

Application:

Whenever MDF or particleboard is used, seal all exposed edges of cabinets, undersides of countertops, stairs, shelving, etc. with at least two coats of less-toxic, low permeability paint or sealer prior to installation.

Benefit:

Sealing all exposed particleboard reduces exposure of harmful emissions to residents, particularly children, who are most susceptible.

9. Use Finger-Jointed Trim

Description:

Finger-jointed trim is manufactured from short pieces of clear wood glued together to create finished trim.

Application:

Use finger-jointed trim in any application where trim is to be painted.

Benefit:

Finger-jointed trim is straighter and more stable than conventional clear wood, uses material more effectively, and saves both money and resources.

HOMEOWNER TIP | **PURCHASE VACUUM CLEANER WITH HEPA FILTER**

High efficiency particulate air (HEPA) filters catch small dust particles that are typically blown around the house during vacuuming. The EPA has determined that indoor particulate dust is a significant health hazard. HEPA filters reduce exposure to these harmful particulates. Children, asthmatics, senior citizens and others with respiratory diseases can benefit from reduced dust in the living environment.

N. Flooring

1. Select Forest Stewardship Council (FSC) Certified Wood Flooring

Description:

Certified wood flooring comes from forests that are managed in accordance with sustainable forest practices. Certified wood flooring products are available in a wide variety of domestic and exotic species.

Application:

Use FSC certified wood in place of conventional hardwood flooring.

Benefit:

Sustainable forest certification assures that the forest from which the flooring is produced is managed in a way that will assure the long-term availability of these precious woods while protecting ancient, old-growth forests.

2. Use Rapidly Renewable Flooring Materials

Description:

Bamboo and cork flooring are alternatives to hardwood flooring. Bamboo is a fast growing grass that can be harvested in three to five years. Cork is a natural flooring material that is obtained from the outer bark of the cork oak tree that is regenerated every 10 years.

Application:

Use these alternative flooring materials in place of conventional hardwood.

Benefit:

Fast growing, rapidly renewable floor substitutes are attractive and reduce pressure on hardwood forests. Bamboo is as durable as wood; cork is naturally fire and moisture resistant as well as sound absorbing.

3. Use Recycled Content Ceramic Tile

Description:

Recycled content ceramic tile can contain up to 70% recycled glass. Originally developed for high traffic commercial conditions, recycled content tiles are very durable and wear well in residential applications.

Application:

Install recycled content tiles wherever conventional tiles are specified.

Benefit:

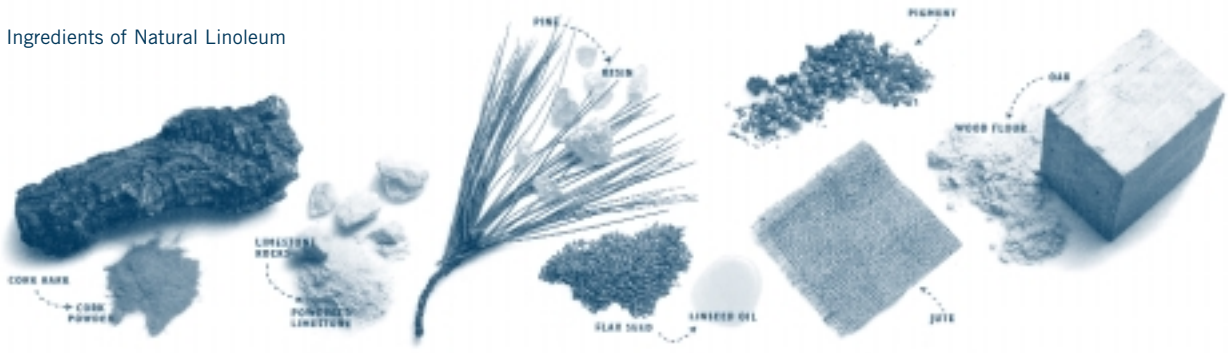
Some recycled content ceramic tile is very dense which significantly reduces the amount of moisture and stains that are absorbed into the tile, making it more durable and easier to maintain.

Bamboo Flooring

CONTRACTOR TIP | **MINIMIZING OFFGASSING FROM ADHESIVES**

Use low VOC, water-based sealants and solvent-free adhesives when installing flooring. When installing laminate flooring, use glueless installation to minimize offgassing from adhesives.

Ingredients of Natural Linoleum



4. Replace Vinyl Flooring with Natural Linoleum

Description:

Natural linoleum is manufactured from natural materials such as cork and linseed oil. Unlike vinyl, linoleum does not contain petroleum-based products or chlorinated chemicals such as PVC, which may be a source of VOC offgassing. There is also concern of byproducts such as cancer causing dioxins, which may be produced during the manufacturing of vinyl.

Application:

Use natural linoleum in place of vinyl flooring.

Benefit:

Linoleum is low-toxic, easy to repair, durable, and stain resistant. Linoleum can last up to 40 years whereas vinyl lasts typically 7-10 years.

5. Use Exposed Concrete as Finish Floor

Description:

For slab-on-grade additions, the concrete can be polished, finished with expansion joints in various patterns or stained with pigments to make an attractive finish floor. This approach is especially appropriate for radiant, in-floor heating systems.

Application:

Use this approach for finished basements or additions on slab construction. Finish must be designed and constructed when slab is being poured.

Benefit:

When using the slab as a floor finish, it eliminates the need to use other flooring materials. Additionally, it is durable and easy to clean.

6. Install Recycled Content Carpet and Underlayment

Description:

Recycled content carpet is made from recycled plastic bottles, recycled wool or recycled cotton. Recycled content carpet does not differ in appearance or performance and the price is comparable to conventional carpet. Recycled content underlayment and padding are also available.

Application:

Use recycled content carpet, underlayment and padding in all applications where conventional carpet is installed.

Benefit:

Recycled content carpet saves resources and diverts waste from landfills. Approximately 40 two-liter soda bottles are recycled per square yard of carpeting. Recycled carpet is often more resilient and colorfast than carpet made from virgin fibers.

HOMEOWNER TIP — PLACE ALL DOORMATS AT ALL EXTERIOR DOORS

Dust, dirt-borne contaminants, and chemicals such as fertilizer and pesticides are tracked into the house on shoes. Using a doormat, or preferably leaving shoes at the door, reduces this source of toxic contaminants. A doormat is an easy and inexpensive method to reduce toxic materials that would otherwise be brought into the home.

Chapter Three:
Green Building Checklist and Illustrations

The checklist and illustrations are intended to serve as tools for project planning and design, materials selection, and construction. When building or remodeling, it is important to look carefully at the type of project and incorporate as many green features as possible. The items listed on the checklist represent a variety of green building opportunities; however, not all of them may apply to your remodeling project. There is no standard definition for what constitutes a "green building", but in general, a green project will incorporate as many items on this checklist that is practical and applicable to your project.

Green Remodeler Checklist

A. Site

- [ ] 1. Recycle Job Site Construction and Demolition Waste
- [ ] 2. Salvage Reusable Materials
- [ ] 3. Install Drip Irrigation
- [ ] 4. Incorporate Permeable Paving
- [ ] 5. Design Resource-Efficient Landscapes and Gardens
- [ ] 6. Provide for On-Site Water Catchment / Retention
- [ ] 7. Remodel for Mixed Use, Adaptive Reuse, and Historic Preservation

B. Foundation

- [ ] 1. Incorporate Recycled Flyash in Concrete
- [ ] 2. Reuse Form Boards
- [ ] 3. Use Recycled Content Rubble for Backfill Drainage
- [ ] 4. Insulate Foundation Before Backfill
- [ ] 5. Use Aluminum Forms
- [ ] 6. Install Rigid Foam, Insulated Concrete Forms (ICFs)

C. Structural Frame

- [ ] 1. Substitute Solid Sawn Lumber with Engineered Lumber
- [ ] 2. Use FSC Certified Wood for Framing
- [ ] 3. Use Wood I-Joists for Floors and Ceilings
- [ ] 4. Use OSB for Subfloor and Sheathing
- [ ] 5. Use Finger-Jointed Studs
- [ ] 6. Use Structural Insulated Panels (SIPs) for Walls / Roof
- [ ] 7. Use Reclaimed Lumber

D. Exterior Finish

- [ ] 1. Use Sustainable Decking Materials
- [ ] 2. Use Treated Wood that Does Not Contain Chromium or Arsenic for Decking and Sill Plates
- [ ] 3. Use Alternative Siding Materials

E. Plumbing

- [ ] 1. Install Hot Water Jacket Insulation
- [ ] 2. Convert Gas to Tankless Water Heaters
- [ ] 3. Insulate Hot and Cold Water Pipes
- [ ] 4. Retrofit all Faucets and Showers with Flow Reducers
- [ ] 5. Replace Toilets with Low Flow Models
- [ ] 6. Install Chlorine Filter on Showerhead
- [ ] 7. Pre-Plumb for GrayWater Conversion
- [ ] 8. Install Water Filtration Units at Faucets
- [ ] 9. Install On-Demand Hot Water Circulation Pump

F. Electrical

- [ ] 1. Install Compact Fluorescent Light Bulbs
- [ ] 2. Install Lighting Controls
- [ ] 3. Install Ceiling Fans

G. Roofing

- [ ] 1. Select Light Colored Roofing
- [ ] 2. Select Safe and Durable Roofing Materials

H. Appliances

- [ ] 1. Replace Dishwasher with Low Water Use Model
- [ ] 2. Install Horizontal Axis Washing Machine
- [ ] 3. Install Energy-Efficient Refrigerator

I. Insulation

- [ ] 1. Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirements
- [ ] 2. Install Recycled Content, Formaldehyde-Free Fiberglass Insulation
- [ ] 3. Use Advanced Infiltration Reduction Practices
- [ ] 4. Use Cellulose Insulation

J. Windows

- [ ] 1. Install Energy-Efficient Windows
- [ ] 2. Install Low Heat Transmission Glazing

K. Heating, Ventilation and Air Conditioning (HVAC)

- [ ] 1. Use Duct Mastic on all Duct Joints
- [ ] 2. Install New Ductwork within Conditioned Space
- [ ] 3. Vent Range Hood to the Outside
- [ ] 4. Install 90% or Greater Efficiency Gas Forced Air Furnace
- [ ] 5. Install Solar Attic Fan
- [ ] 6. Clean all Ducts Before Occupancy
- [ ] 7. Install Whole House Fan
- [ ] 8. Replace Electric and Wall-Mounted Gas Heaters with Heat Pumps
- [ ] 9. Install Zoned, Hydronic, Radiant Heating
- [ ] 10. Retrofit Wood Burning Fireplaces
- [ ] 11. Install / Replace Dampers on Fireplaces
- [ ] 12. Install Airtight Doors on Fireplaces
- [ ] 13. Install Heat Recovery Ventilation Unit (HRV)
- [ ] 14. Install Separate Garage Exhaust Fan
- [ ] 15. Install High Efficiency Particulate Air (HEPA) Filter

L. Renewable and Solar Energy

- [ ] 1. Incorporate Natural Cooling
- [ ] 2. Incorporate Passive Solar Heating
- [ ] 3. Pre-Plumb for Solar Water Heating
- [ ] 4. Install Solar Water System
- [ ] 5. Install Photovoltaic (PV) Panels

M. Indoor Air Quality / Finishes

- [ ] 1. Use Low/No-VOC and Formaldehyde-Free Paint
- [ ] 2. Use Low VOC, Water-Based Wood Finishes
- [ ] 3. Use Solvent-Free Adhesives
- [ ] 4. Substitute Particleboard with Formaldehyde-Free Materials
- [ ] 5. Use Exterior Grade Plywood for Interior Uses
- [ ] 6. Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Materials
- [ ] 7. Use FSC Certified Trim Material
- [ ] 8. Seal all Exposed Particleboard or MDF
- [ ] 9. Use Finger-Jointed Trim

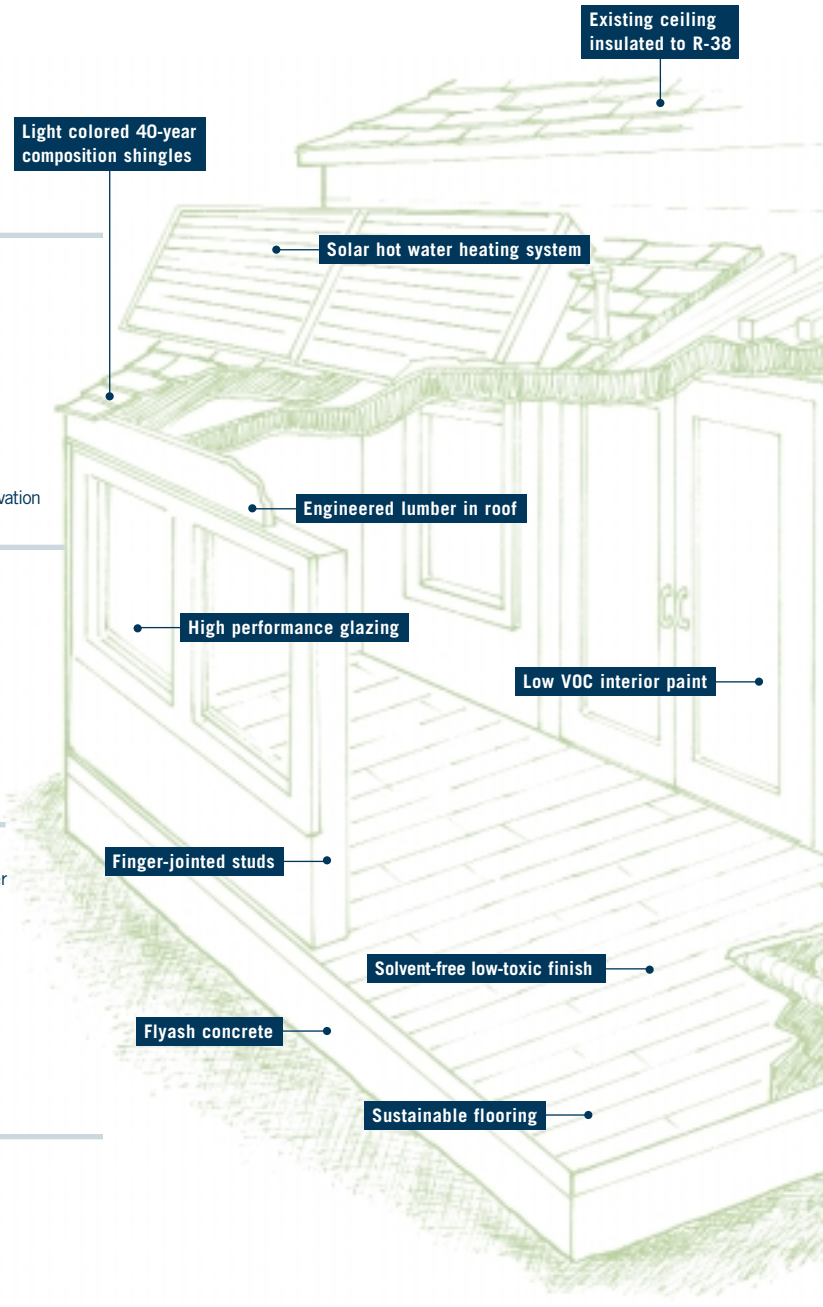
N. Flooring

- [ ] 1. Select FSC Certified Wood Flooring
- [ ] 2. Use Rapidly Renewable Flooring Materials
- [ ] 3. Use Recycled Content Ceramic Tile
- [ ] 4. Replace Vinyl Flooring with Natural Linoleum
- [ ] 5. Use Exposed Concrete as Finish Floor
- [ ] 6. Install Recycled Content Carpet and Underlayment

	For information on energy saving programs, refer to your local utility listed on Page 2
	For information on water-saving programs, refer to your local utility listed on Page 2
	For information on construction and demolition, recycling and composting, refer to your city/county recycling agency listed on Page 2

New Addition

Consider the following green remodeling options in a new addition.



Site

- Recycle Job Site Construction and Demolition Waste
- Salvage Reusable Materials
- Install Drip Irrigation
- Incorporate Permeable Paving
- Design Resource-Efficient Landscapes and Gardens
- Provide for On-Site Water Catchment / Retention
- Remodel for Mixed Use, Adaptive Reuse, and Historic Preservation

Foundation

- Incorporate Recycled Flyash in Concrete
- Reuse Form Boards
- Use Recycled Content Rubble for Backfill Drainage
- Insulate Foundation Before Backfill
- Use Aluminum Forms
- Install Rigid Foam, Insulated Concrete Forms (ICFs)

Structural Frame

- Substitute Solid Sawn Lumber with Engineered Lumber
- Use FSC Certified Wood for Framing
- Use Wood I-Joists for Floors and Ceilings
- Use OSB for Subfloor and Sheathing
- Use Finger-Jointed Studs
- Use Structural Insulated Panels (SIPs) for Walls / Roof
- Use Reclaimed Lumber

Exterior Finish

- Use Sustainable Decking Materials
- Use Treated Wood that Does Not Contain Chromium or Arsenic for Decking and Sill Plates
- Use Alternative Siding Materials

Plumbing

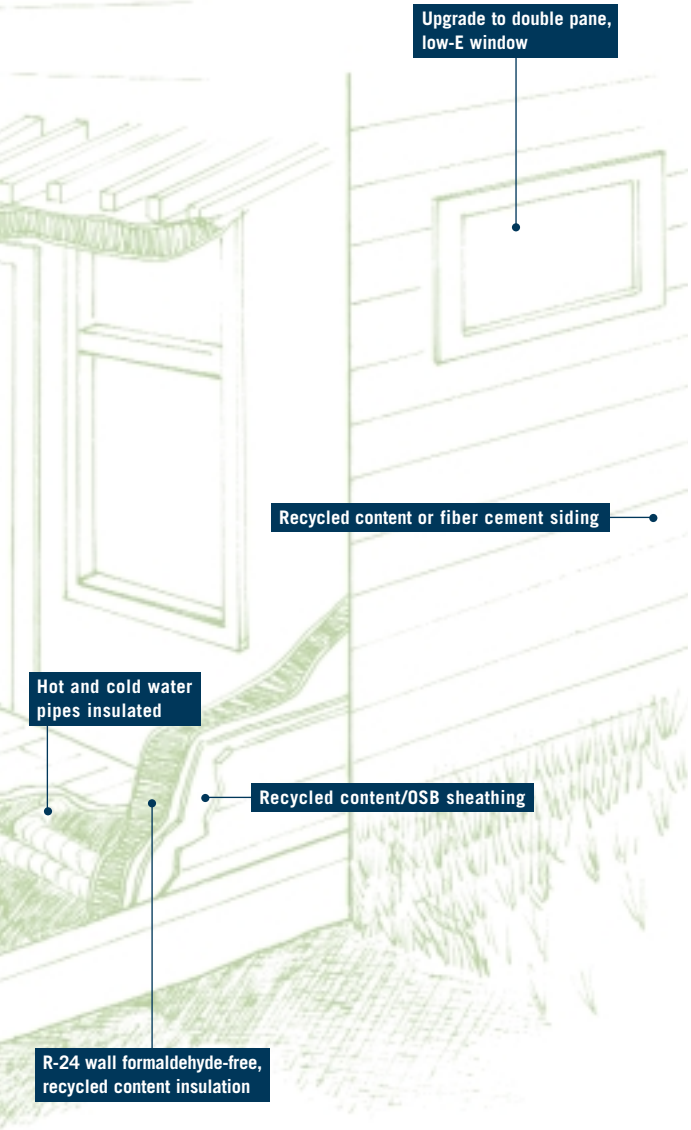
- Install Hot Water Jacket Insulation
- Convert Gas to Tankless Water Heaters
- Insulate Hot and Cold Water Pipes
- Retrofit all Faucets and Showers with Flow Reducers
- Replace Toilets with Low Flow Models
- Install Chlorine Filter on Showerhead
- Pre-Plumb for Graywater Conversion
- Install Water Filtration Units at Faucets
- Install On-Demand Hot Water Circulation Pump

Electrical

- Install Compact Fluorescent Light Bulbs
- Install Lighting Controls
- Install Ceiling Fans

Roofing

- Select Light Colored Roofing
- Install Minimum 40-Year Composition Roofing



Insulation

- Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirements
- Install Recycled Content, Formaldehyde-Free Fiberglass Insulation
- Use Advanced Infiltration Reduction Practices
- Use Cellulose Insulation

Windows

- Install Energy-Efficient Windows
- Install Low Heat Transmission Glazing

Heating, Ventilation and Air Conditioning (HVAC)

- Use Duct Mastic on all Duct Joints
- Install New Ductwork within Conditioned Space
- Vent Range Hood to the Outside
- Install 90% or Greater Efficiency Gas Forced Air Furnace
- Install Solar Attic Fan
- Clean all Ducts Before Occupancy
- Install Whole House Fan
- Replace Electric and Wall-Mounted Gas Heaters with Heat Pumps
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- Install / Replace Dampers on Fireplaces
- Install Airtight Doors on Fireplaces
- Install Heat Recovery Ventilation Unit (HRV)
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Renewable and Solar Energy

- Incorporate Natural Cooling
- Incorporate Passive Solar Heating
- Pre-Plumb for Solar Water Heating
- Install Solar Water System
- Install Photovoltaic (PV) Panels

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- Use Low VOC, Water-Based Wood Finishes
- Use Solvent-Free Adhesives
- Substitute Particleboard with Formaldehyde-Free Materials
- Use Exterior Grade Plywood for Interior Uses
- Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Materials
- Use FSC Certified Trim
- Seal all Exposed Particleboard or MDF
- Use Finger-Jointed Trim

Flooring

- Select FSC Certified Wood Flooring
- Use Rapidly Renewable Flooring Materials
- Use Recycled Content Ceramic Tile
- Replace Vinyl Flooring with Natural Linoleum
- Use Exposed Concrete as Finish Floor
- Install Recycled Content Carpet and Underlayment

Second Floor

Consider the following green remodeling options in a second floor.

Site

- Recycle Job Site Construction and Demolition Waste
- Salvage Reusable Materials

Structural Frame

- Substitute Solid Sawn Lumber with Engineered Lumber
- Use FSC Certified Wood for Framing
- Use Wood I-Joists for Floors and Ceilings
- Use OSB for Subfloor and Sheathing
- Use Finger-Jointed Studs
- Use Structural Insulated Panels (SIPs) for Walls / Roof
- Use Reclaimed Lumber

Exterior Finish

- Use Treated Wood that Does Not Contain Chromium or Arsenic for Decking and Sill Plates
- Use Alternative Siding Materials

Plumbing

- Insulate Hot and Cold Water Pipes
- Install Chlorine Filter on Showerhead
- Pre-Plumb for GrayWater Conversion
- Install Water Filtration Units at Faucets
- Install On-Demand Hot Water Circulation Pump

Electrical

- Install Compact Fluorescent Light Bulbs
- Install Lighting Controls
- Install Ceiling Fans

Roofing

- Select Light Colored Roofing
- Install Minimum 40-Year Composition Roofing

Insulation

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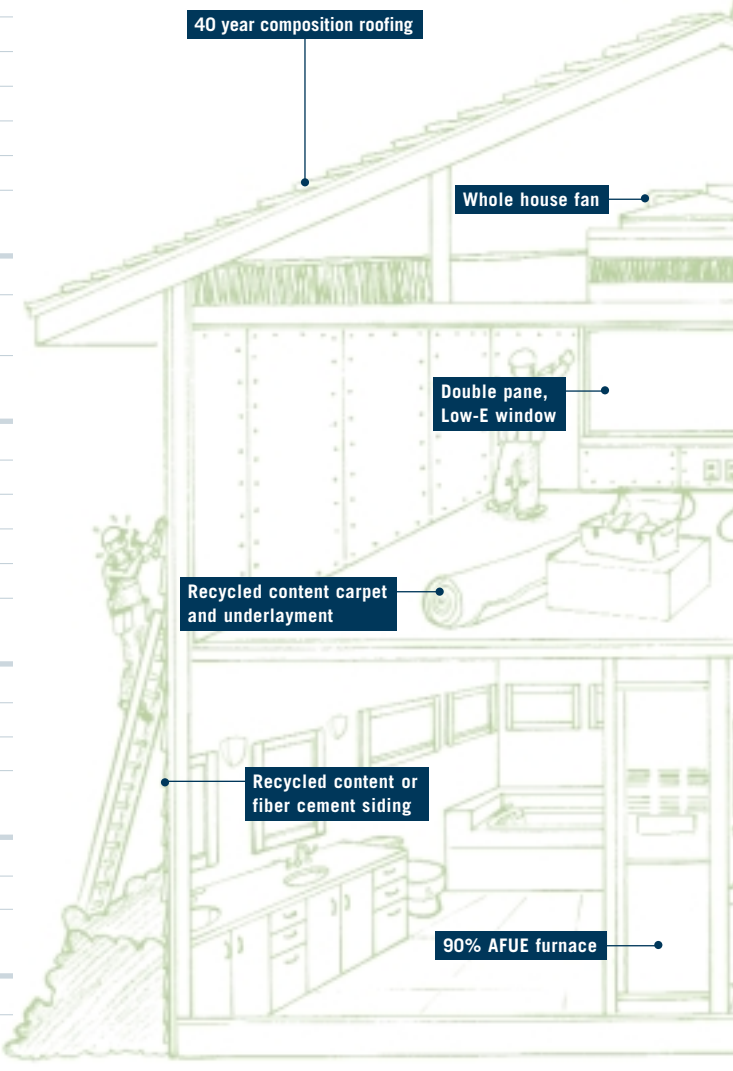

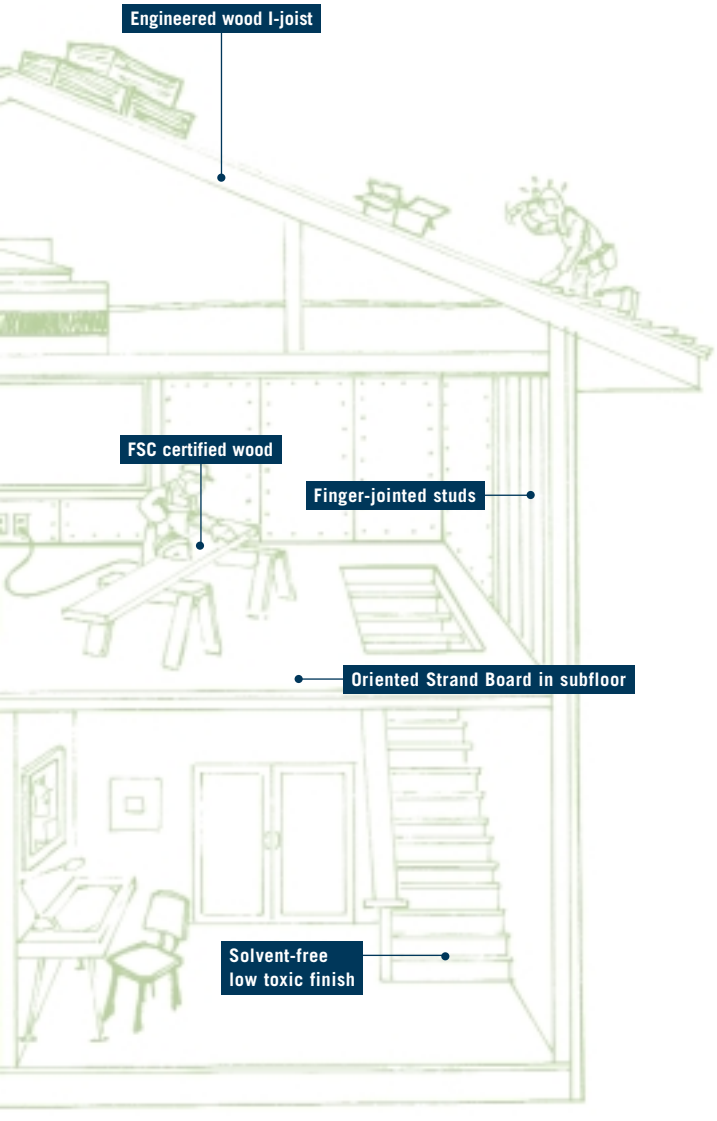

Windows

- Install Energy-Efficient Windows
- Install Low Heat Transmission Glazing

Heating, Ventilation and Air Conditioning (HVAC)

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- Install Photovoltaic (PV) Panels

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- Use FSC Certified Trim Material
- Seal all Exposed Particleboard or MDF
- Use Finger-Jointed Trim

Flooring

- Select FSC Certified Wood Flooring
- Use Rapidly Renewable Flooring Materials
- Use Recycled Content Ceramic Tile
- Replace Vinyl Flooring with Natural Linoleum
- Install Recycled Content Carpet and Underlayment

Bathroom

Consider the following green remodeling options in a bathroom.

Site

- Recycle Job Site Construction and Demolition Waste
- Salvage Reusable Materials

Structural Frame

- Substitute Solid Sawn Lumber with Engineered Lumber
- Use FSC Certified Wood for Framing
- Use Wood I-Joists for Floors and Ceilings
- Use OSB for Subfloor and Sheathing
- Use Finger-Jointed Studs
- Use Reclaimed Lumber

Plumbing

- Install Hot Water Jacket Insulation
- Convert Gas to Tankless Hot Water Heaters
- Insulate Hot and Cold Water Pipes
- Retrofit all Faucets and Showers with Flow Reducers
- Replace Toilets with Low Flow Models
- Install Chlorine Filter on Showerhead
- Pre-Plumb for Gray Water Conversion
- Install Water Filtration Units at Faucets
- Install On-Demand Hot Water Circulation Pump

Electrical

- Install Compact Fluorescent Light Bulbs
- Install Lighting Controls
- Install Ceiling Fans

Insulation

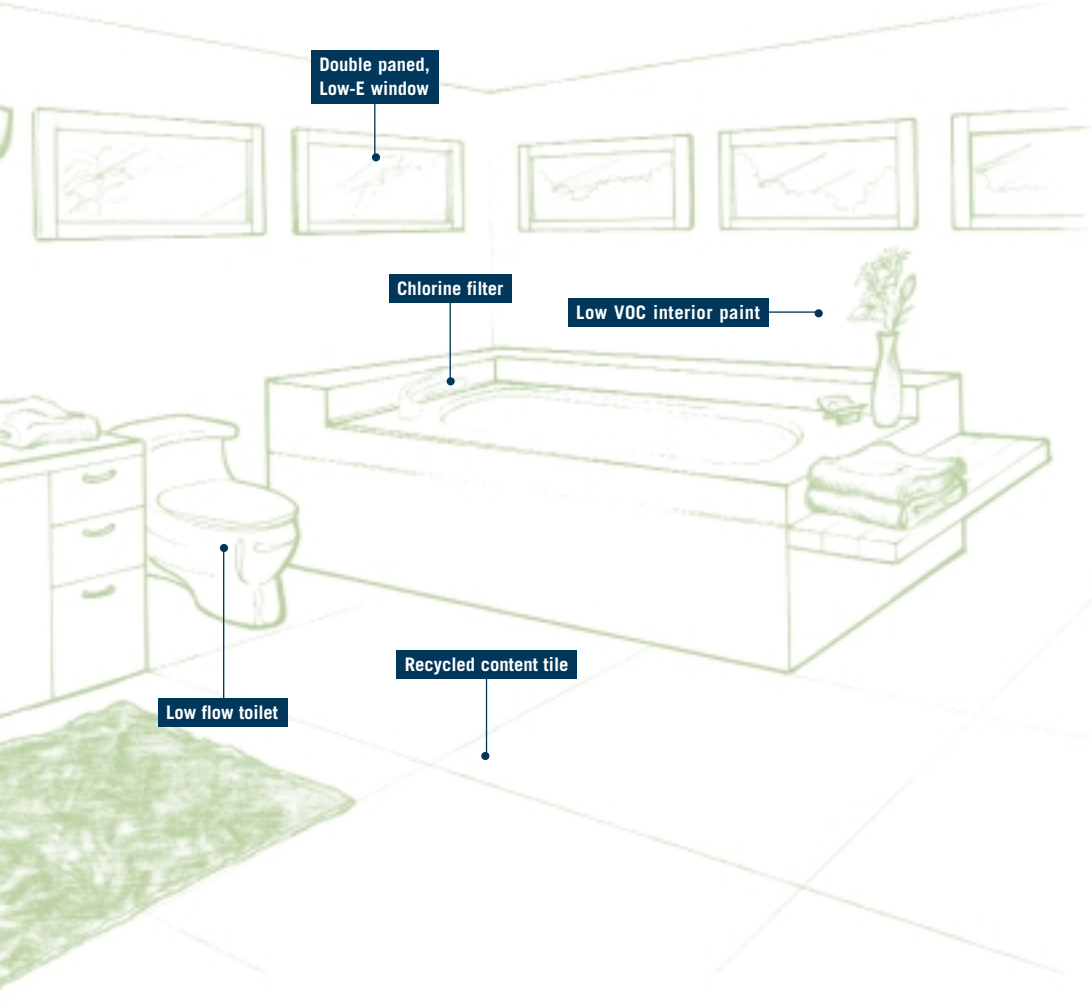
- Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirements
- Install Recycled Content, Formaldehyde-Free Fiberglass Insulation
- Use Advanced Infiltration Reduction Practices
- Use Cellulose Insulation

Windows

- Install Energy-Efficient Windows
- Install Low Heat Transmission Glazing

Heating, Ventilation and Air Conditioning (HVAC)

- Use Duct Mastic on all Duct Joints
- Install New Ductwork within Conditioned Space
- Clean all Ducts Before Occupancy



Indoor Air Quality / Finishes

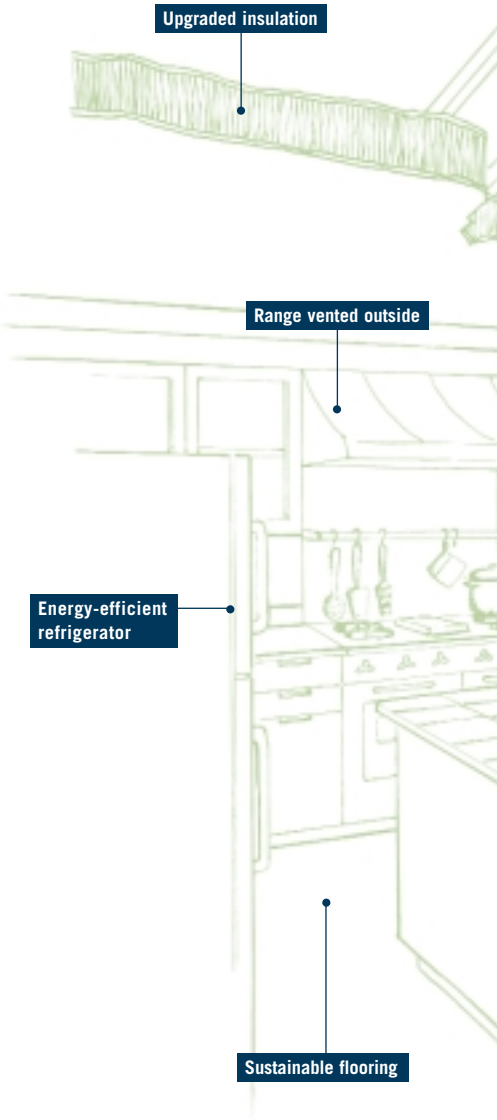
- Use Low/ No-VOC and Formaldehyde-Free Paint
- Use Low VOC, Water-Based Wood Finishes
- Use Solvent-Free Adhesives
- Substitute Particleboard with Formaldehyde-Free Materials
- Use Exterior Grade Plywood for Interior Uses
- Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Materials
- Use FSC Certified Trim Material
- Seal all Exposed Particleboard or MDF
- Use Finger-Jointed Trim

Flooring

- Select FSC Certified Wood Flooring
- Use Rapidly Renewable Flooring Materials
- Use Recycled Content Ceramic Tile
- Replace Vinyl Flooring with Natural Linoleum
- Use Exposed Concrete as Finish Floor
- Install Recycled Content Carpet and Underlayment

Kitchen Remodel

Consider the following green remodeling options in a kitchen remodel.



Site

- Recycle Job Site Construction and Demolition Waste
- Salvage Reusable Materials

Plumbing

- Insulate Hot and Cold Water Pipes
- Retrofit all Faucets with Flow Reducers
- Install Water Filtration Units at Faucets
- Install On-Demand Hot Water Circulation Pump

Electrical

- Install Compact Fluorescent Light Bulbs
- Install Lighting Controls
- Install Ceiling Fans

Appliances

- Replace Dishwasher with Low Water Use Model
- Install Horizontal Axis Washing Machine
- Install Energy-Efficient Refrigerator

Insulation

- Upgrade Wall and Ceiling Insulation to Exceed Title 24 Requirement
- Install Recycled Content, Formaldehyde-Free Fiberglass Insulation
- Use Infiltration Reduction Practices
- Use Cellulose Insulation

Windows

- Install Energy-Efficient Windows
- Install Low Heat Transmission Glazing

Heating, Ventilation and Air Conditioning (HVAC)

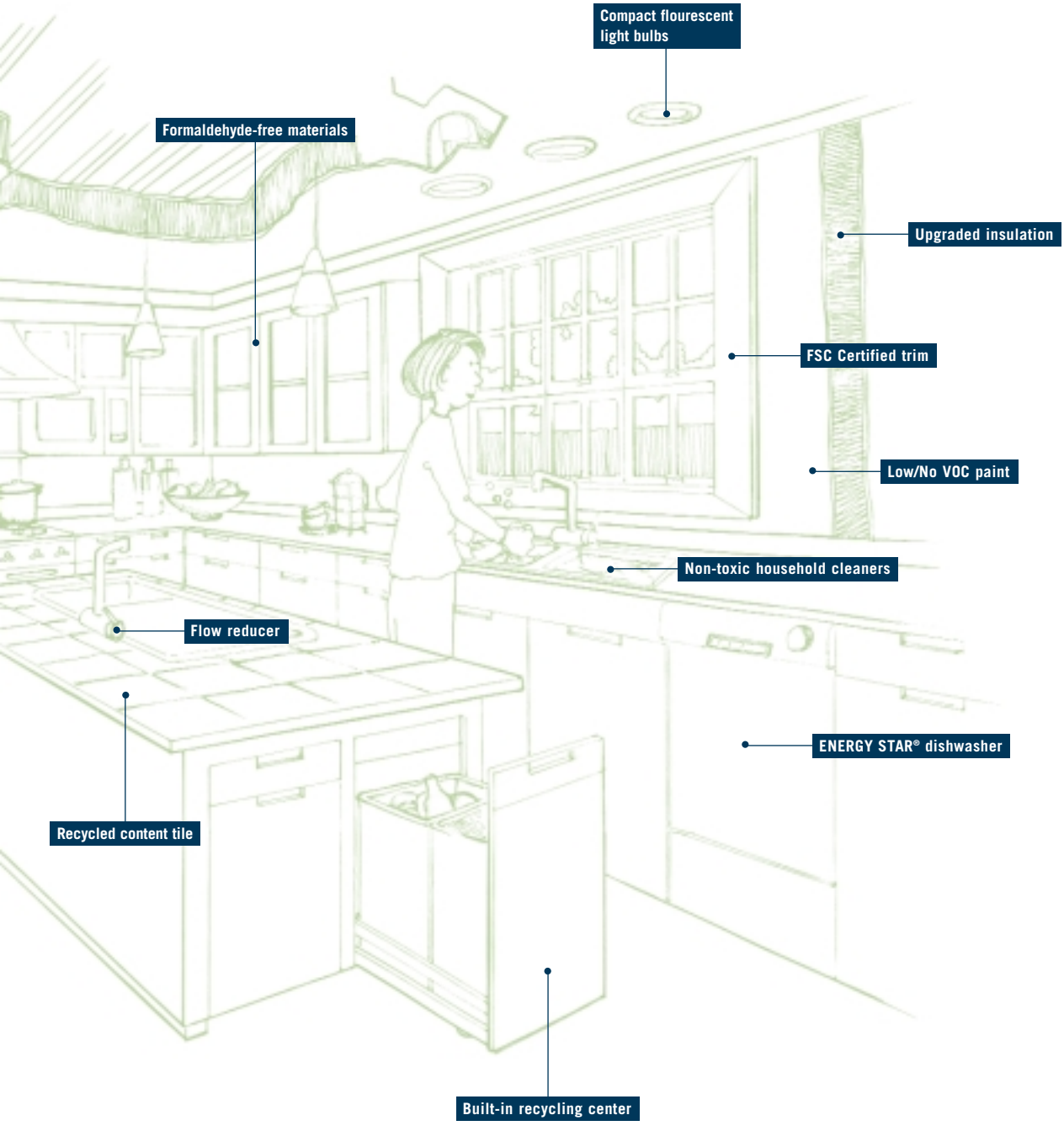
- Use Duct Mastic on all Duct Joints
- Vent Range Hood to the Outside

Flooring

- Select FSC Certified Wood Flooring
- Use Rapidly Renewable Flooring Materials
- Use Recycled Content Ceramic Tile
- Replace Vinyl Flooring with Natural Linoleum
- Use Exposed Concrete as Finish Floor
- Install Recycled Content Carpet and Underlayment

Indoor Air Quality / Finishes

- Use Low/No-VOC and Formaldehyde-Free Paint
- Use Low VOC, Water-Based Wood Finishes
- Use Solvent-Free Adhesives
- Substitute Particleboard with Formaldehyde-Free Materials
- Use Exterior Grade Plywood for Interior Uses
- Substitute Formaldehyde-Based Medium Density Fiberboard (MDF) with Formaldehyde-Free Materials
- Use FSC Certified Trim Material
- Seal all Exposed Particleboard or MDF
- Use Finger-Jointed Trim


Compact flourescent light bulbs
Formaldehyde-free materials
Upgraded insulation
FSC Certified trim
Low/No VOC paint
Non-toxic household cleaners
Flow reducer
ENERGY STAR® dishwasher
Recycled content tile
Built-in recycling center

Notes

Appendix O

Universal Design Principles

Appendix O

Universal Design Principles

Universal design consists of operating principles that promote the design of buildings and spaces that meet the needs of all people, young and old, abled and disabled. By incorporating universal design principles at the design phase, a number of benefits are obtained, including making it possible for seniors and persons with disabilities to remain in their homes and communities and for residents to "age in place." Listed below are a few general concepts that should be considered in the design of buildings and spaces. Please note that the application of universal design concepts should also take into consideration economic, engineering, cultural, gender, and environmental factors.

1. Buildings should be made usable for everyone taking into account factors such as security, privacy, safety, and convenience. Some means of accomplishing this include:

    - Designing entrances without steps to promote equitable access and use;
    - Leaving door openings wide enough to accommodate persons seated in a wheel chair;
    - Avoiding shag carpets, uneven brick floors, and other floor surfaces that could pose slipping and tripping hazards; and
    - Designing showers that can accommodate a wheelchair.

2. The building's design should allow people to use its design features in more than one way, including accommodating both right and left-handed use. Some means of accomplishing this include:

    - Designing hallways and doors that comfortably accommodate strollers and wheelchairs;
    - Installing adjustable shower heads to accommodate people of different heights; and
    - Providing bedrooms and full bathrooms on the ground floor to accommodate those persons who are less mobile.

3. The purpose and method of use for each design feature should be made easy for everyone to use. Some means of accomplishing this include:

    - Providing washroom lavatory faucets that make their method of operation readily apparent and relatively easy;
    - Locating electrical outlets that can be accessed without having to move furniture;
    - Installing grab bars in the shower and beside the toilet; and
    - Providing a full-length mirror that can be viewed by all people, including children.

4. The building's design should employ design features that require little or no physical force to use them. Some means of accomplishing this include:

    - Using door handles that do not require the ability to grasp and turn the wrist;
    - Using doors of the appropriate weight; and
    - Providing rocker action light switches to aid people with a loss of finger dexterity.

5. The building's design features should provide an adequate amount of space that is appropriately arranged to enable anyone to use them. Some means of accomplishing this include:

    - Providing knee space under a washroom lavatory to enable use by someone in a seated position;
    - Providing tables and kitchen counters with varying heights to accommodate standing, seating, and a range of different tasks; and
    - Mounting bathroom sinks of sufficient height and providing shelves and a medicine cabinet that can be reached by persons seated in a wheel chair.

Source: "Principles of Universal Design," The Center for Universal Design, North Carolina State University

Appendix P

Case Studies in Building Stepbacks

Appendix P

Case Studies in Building Stepbacks

Case studies A through D illustrate in more detailed fashion different design scenarios for implementing the Stepback Zone technique under varied circumstances for lot area, lot slope, and lot configuration.

CASE STUDY A

Flat topography

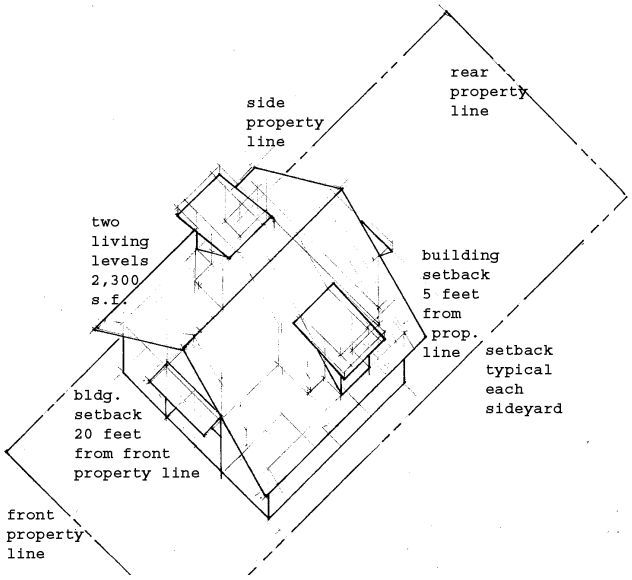
6,000 square foot lot

2,300 s.f. Floor Area

25 foot front setback

5 foot side yard setback

Building stepback at upper levels from sideyard property line



CASE STUDY B

Flat topography

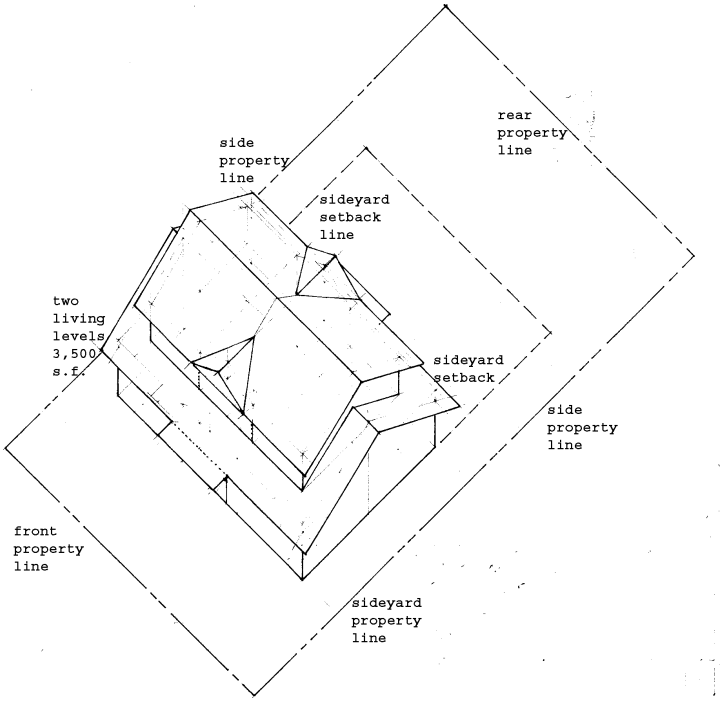
10,000 square foot lot

3,500 s.f. Floor Area

25 foot front setback

10 foot side yard setback

Building stepback at upper levels from sideyard property line



CASE STUDY C

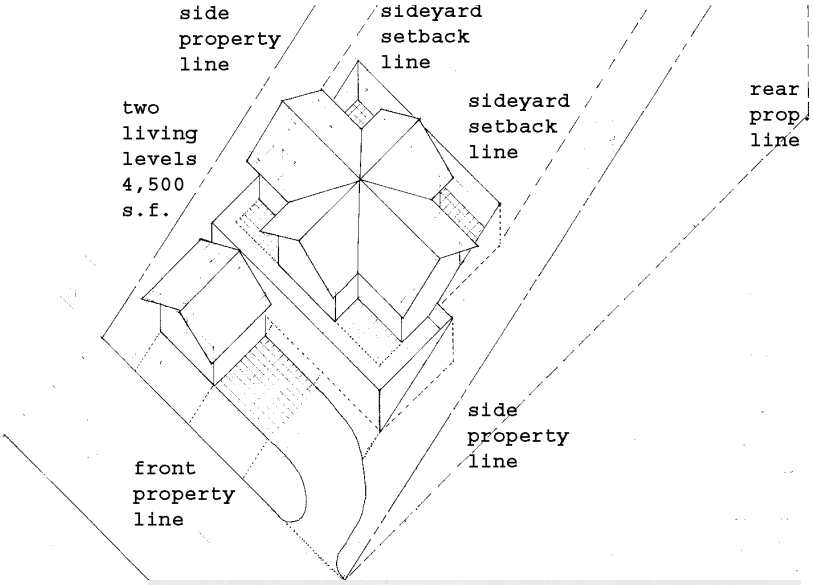
Hillside topography

20,000 square foot lot

4,500 s.f. Floor Area
reduced front setback to
reduce driveway length

10 foot side yard setback

Building stepback at upper
levels from sideyard property
line



CASE STUDY D
Hillside topography

7,500 square foot lot

2,250 s.f. Floor Area

Reduced front setback to
reduce driveway length

6 foot side yard setback

Building stepback at
lower levels from
sideyard property line