

INTRODUCTION

Green roofs or perhaps more accurately, vegetative roofs, have been used in Europe for years but have only recently started to catch on in the United States. Such roofs offer a number of benefits compared with conventional roofs because the growing medium and plants that comprise the green roof provide insulating and water retention advantages. In addition, a green roof can prolong the life of the roof membrane, which is a standard item on both green and conventional roofs. With these and other potential benefits, why aren't there more green roofs in the U.S.?

Green Roofs for Healthy Cities (www.greenroofs.org) is an organization based in Toronto, Ontario, Canada that serves as an ambassador for green roofs and is a recognized leader in facilitating information exchange, education, promotion, and development of green roofs. In October 2007, the City of Omaha and Douglas County teamed to bring a local market development symposium, produced by Green Roofs for Healthy Cities (GRHC), to Omaha. The purpose of the event was two-fold: first, to provide a basic education and understanding of green roofs and second, to identify obstacles and barriers to green roof use in the Omaha metropolitan area.

From that symposium a local committee, subsequently named the Green Roof Working Committee (GRWC), was formed with the intent of taking the information from the October 2007 symposium and devising action plans that could address the obstacles and barriers to green roof use. The GRWC met eight times in 2008 and plans to meet on a quarterly basis in the future. Summaries of the meetings can be found at the Douglas County Environmental Services website, <http://www.dcplanning.org/templates/greenroof.dwt>. At the first meeting, the committee divided its work among six subcommittees: Stormwater Design Manual, Covenants, Building Codes, Appraisal and Financing, Outreach and Education, and Overall Policy Development. Subcommittees met independently of the GRWC and reported back to the GRWC at the regular meetings. Subcommittee work plans, if submitted, and members are listed in Appendix A. Appendix B is an article about the GRWC written by Kent Holm, acting GRWC chair.

The recommendations of the six subcommittees are presented in the following sections:

- Stormwater Design Manual
- Covenants
- Building Codes
- Appraisal and Financing
- Education and Outreach
- Overall Policy Development

STORMWATER DESIGN MANUAL SUBCOMMITTEE REPORT

Paul Woodward, Subcommittee Chair

The Stormwater Design Manual Subcommittee of the GRWC was formed to investigate and recommend design criteria for green roof systems for inclusion in the Omaha Regional Stormwater Design Manual. The initial work of the subcommittee was to search for and review other Stormwater Design Manuals throughout the nation to identify potential green roof design standards. Subcommittee members performed internet searches for available green roof design information and were able to identify the following references for use in selecting appropriate design criteria for the Omaha region:

- Minnesota Stormwater Manual. Created by the Minnesota Stormwater Steering Committee. Version 2, January 2008. Copyright 2005, Minnesota Pollution Control Agency.
- Green Roof Specifications and Standards, Establishing an Emerging Technology. Christopher G. Wark and Wendy W. Wark. The Construction Specifier. August 2003. Vol. 56, No.8
- Minnesota Urban Small Sites BMP Manual, Stormwater Best Management Practices for Cold Climates. Metropolitan Council/Barr Engineering Co. Chapter 3: Impervious Surface Reduction, Green Rooftops. 2001.
- Eugene, OR BMP Manual. Linda Harris. Chapter 2 (Part 2). July 5, 2002.

- The subcommittee met to collectively review the available design standards. It was quickly realized that there were very few jurisdictions or states that had prepared design recommendations for green roofs. Of those that had, most design criteria were simple and fairly generic. The subcommittee concluded that these recommendations were generic to prevent limitations from being set on effective green roof solutions.

Next, the subcommittee reviewed the existing Omaha Regional Stormwater Design Manual in an effort to identify other best management practices (BMPs) that could compliment or hinder the implementation of green roofs. Chapter 8 of the design manual contains criteria for Stormwater Best Management Practices and provided a format for organizing green roof design recommendations. The subcommittee determined that there were no existing obstacles to green roofs in the Design Criteria Manual and decided that a section should be added to Chapter 8 for green roof BMPs.

Utilizing information provided from applicable references, the subcommittee identified the following pluses associated with green roofs:

- Green roofs are not new technology and have been used for hundreds of years to help buildings stay warmer in cold conditions and cooler in warm conditions. They conserve energy by providing additional insulation, using the evapotranspiration process of plants to cool the roof during the summer, and reducing the heat lost to wind convection during the winter.
- Green roofs reduce the volume of stormwater runoff.
- Green roofs offset urban heat islands by reducing the amount of heat typically absorbed by a conventional roof and thus lowering the ambient temperature of the roof.
- Green roofs can extend the life of a conventional roof by protecting the roof surface from UV light, large temperature fluctuations, and normal wear and tear associated with exposed surface roofs.
- Green roofs can be used for food gardens and can provide wildlife habitat.
- Green roofs can improve the aesthetics of a building and help meet landscaping requirements.
- Green roofs are effective sound insulators which can reduce the impact of noise from HVAC and other equipment on the roof and/or other outside noises.
- Plants on green roofs use carbon dioxide and produce oxygen.

The subcommittee also identified special considerations that should be included in the design manual:

- All designs for new or existing roofs must account for the dead and live loads associated with a green roof in addition to the requirements of existing building codes. Additional roof loads will require an enhanced structural design and may limit the retrofit of existing buildings.
- Every green roof needs an overflow outlet to accommodate stormwater runoff from larger rainfall events which cannot be handled by the drainage system.
- All green roofs should have a root barrier membrane.
- If leaks occur, they can be hard to locate and repair.
- Conditions can be harsh for vegetation establishment.
- Maintenance costs can be higher than conventional roof systems.

Based on the relevant data and information collected and reviewed from various references, it is the opinion of the GRWC Stormwater Design Manual Subcommittee that a new section be added to Chapter 8 of the Omaha Regional Stormwater Design Manual. The purpose of introducing this new BMP to the manual is to encourage the development of green roofs while acknowledging the special considerations for their use. The subcommittee makes these design criteria recommendations realizing that very detailed or specific criteria may limit or prevent green roof development. Appendix C contains the recommended language to be introduced as a new section of the Omaha Regional Stormwater Design Manual.

COVENANTS SUBCOMMITTEE REPORT

Derek Miller, Subcommittee Chair

Summary

Covenants are designed to protect property values and amenities, and bring a sense of uniformity, integrity, and character to a neighborhood or commercial area. Commercial covenants are typically more concerned with uses whereas residential covenants tend to lean toward building appearance. When looking at “roofs” in covenants, they are typically addressed through the type of roof material. Covenants have an important role in community design and appearance, however communities are not yet specifically addressing alternative technologies in subdivision covenants. These covenants could be barriers to incorporation of green technologies.

Challenges

1. Amending existing covenants.

Changes to original covenants can only be made when such changes are permitted by the covenant agreement. Lacking that type of “change these covenants” provision, the original covenant cannot be amended.

If the change provision is present, the original covenant can be amended, but the amendment cannot create a “new” provision. For example, if an existing covenant does not, in some form, address roof material then the covenant cannot be amended to include the new provision of roof material (e.g. vegetated roof material).

The scope of how roof material can be addressed in covenant language is broad, as evidenced in the recent Nebraska case of Regency Homes Association v. Jeffrey L. Schrier (23 January 2009). In this case the original covenants used broad language contemplating control over general appearance, and it was decided that general appearance would include roofing materials. General appearance leads to compatibility with surrounding lots etc.

The easier covenant to amend would be one that stated, “the roof of all ...shall be covered with wood cedar shingles or shakes, slate, tile...etc.” This specifically addresses roof materials and could easily be amended to include a vegetated type of material.

Amendments have to be passed by a vote of the membership. This would be an opportunity to educate the homeowners association.

The newer covenants automatically renew for successive ten-year periods unless a stated percentage of owners file to end. Older covenants had an end date and dissolved. So if a newer covenant (with renewal provision) did not address general appearance/roof material, it cannot be amended to include the new provision. This could be an obstacle, even for retrofit.

2. Architectural Review Board

The covenants/by-laws state some type of Architectural Review Board must approve or disapprove all building plans “as to harmony of external design and location in relation to surroundings, topography, and other relevant architectural factors of concern...” (typical language).

If the formation of the Review Board is from the membership (i.e. homeowners, etc.), this could introduce bias, pro or con. A better structure would be to designate a professional architectural firm as a third-party review board. They would be compensated through the fee associated with the submittal of building plans. This provides an additional advantage of having a professional team who probably is current with new technology.

3. Support of Planning Department

The support of the Planning Department in their recommendations to Planning Board/Council would be beneficial for the adoption of “green” strategies in covenants. If Planning Department staff is resistant to alternative designs, this could be an obstacle.

Recommendations

1. Develop standard industry language that could be incorporated in all new covenant language. This must start with a well-accepted definition of “green roofs” so as to distinguish the term from roof color. An example: “Green roof” means a professionally designed roofing system that allows for the propagation of rooftop vegetation and the retention of storm water [and for energy conservation] while maintaining the integrity of the underlying roof structure and membrane, having a growing medium or soil depth of at least 2.54 cm (1 inch) planted with sedums, grasses or other vegetation that can withstand drought and excess water. (Excerpt from Richmond, B.C., Canada, www.richmond.ca/__shared/assets/Bylaw_838521490.pdf)

The standard language must be written so as to not be vulnerable to legal challenge. In addition, the development community’s agreement with the standard language is essential.

2. Coordinate with Education and Outreach Subcommittee on disseminating the standard covenant language for green roofs.
3. Recommend the use of a professional architectural firm as the Review Board to parties involved in developing and approving covenants.
4. Initiate dialogue with developers, associations, SID Boards, to see if there is interest in amending existing covenants where that option is legally available.

BUILDING CODES SUBCOMMITTEE REPORT

Dennis E. Bryers, APA, ASLA, Subcommittee Chair

Summary

The City of Omaha currently uses the 2006 International Building Code for the protection of the health, safety and welfare of the public for all building construction in the city. At the present time, the building code does not address green roofs specifically. There is nothing in the current code that would prohibit a green roof from being installed on any roof in the city. This is shown by the few green roofs that have been constructed already, ones currently under construction, and those that are in the planning stages. Currently there is a green roof being installed on the new Saddlebrook Joint Use Facility, an elementary school, public library and community recreation center being built in northwest Omaha. The federal courthouse has a small lawn turf green roof and there is a small residential green roof on a residence at S. 80th and Pacific Streets. There are also a number of “underground” homes in the area that one could consider as having a green roof as well. Additionally, green roof construction is being considered in the design phase of three projects. They are the new building at the Gallup headquarters, the new office building for DLR, and the renovation of a condominium building on Park Place.

It is important that building code officials keep abreast of any standards that might be developed so that there are no obstacles to designing and installing green roofs in the area.

The main issues that the building code would address pertaining to green roofs would be structural standards, wind standards, and fire standards.

Structural Standards

Any green roof must be designed to support the weight of the plant material, growing medium and other related components just like any other roof must be designed to support its components. It is very important that the appropriate dead and live loads are used when designing a roof that will have a green roof installed on top of it. The designer must be certain to use the appropriate weights for all green roof components that will be installed on the roof. One mistake that designers often make is using the weight of topsoil as the growing medium. Regular soil is almost never used as the growing medium for a green roof. Regular soil weighs much more than the specifically designed growing media that are used on green roofs.

Wind Standards

There are no wind standards at the present time that address green roofs. The current concern regarding wind is wind uploading that can “scour” the roof. This usually occurs near the edges of roofs, although it can affect an entire roof. One approach regarding scouring is to either install an erosion mat on the vegetation while it establishes itself or to stop the vegetation a few feet from the edge of the roof and install a typical roof or pavers, etc. in this area.

The green roof industry is currently developing a wind design standard which is being built off of the "Wind Design Standard for Ballasted Single-ply Roofing Systems", the ANSI/ SPRI RP-4 2008 national standard. The vegetative area is treaded as being equivalent to the #2 ballast so one should apply the green roof under the design provisions of this ballast. If the vegetation covers less than 80% of the soil media and a #2 ballasted system design or greater is required, then a wind erosion mat is required, a design item that applies generally to new garden roofs. The RP-4 is available from the website <http://www.spri.org/>.

Fire Standards

Currently there are no fire code standards for green roofs. This is because of the variation in green roof design. Most vegetation used on green roofs, if they were to catch fire, would burn very quickly without producing a lot of heat.

Factory Mutual Global (FM Global) is a commercial and industrial property insurance and risk management organization. They have issued guidelines for fire control of green roofs. The guidelines deal with the design and installation of fire breaks in green roofs. Fire breaks are to be made of non-combustible materials such as stone or pavers and should be a minimum of 6 feet wide between the vegetation and a combustible structure such as walls, roof top equipment, etc. They also recommend that if the green roof is longer than 1500 feet, a fire break is installed across the garden area to control a fire. Again, these are only guidelines from this company and are not industry wide standards at this time. Information on their recommendations should be available on the Factory Mutual website (www.fmglobal.com).

Non-Building Code Standards And Guidelines

While no building code currently addresses green roofs specifically, there are guidelines and standards that have been developed by non-governmental organizations. They are the German Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V (FLL), the American Society for Testing and Materials International (ASTM), and Factory Mutual Global (FM Global).

FLL is the German industries' non-profit research and standard setting body. They published a set of guidelines for the quality and method of construction of green roofs in Germany called "Guidelines for the Planning, Execution and Upkeep of Green Roof Sites". These are a set of guiding principles used by designers to determine which green roof systems are best suited to different buildings and climate in Germany. Many of the guidelines being established in the United States by other non-governmental organizations are based on the FLL documents.

ASTM is an international organization based in the United States that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services. Currently ASTM has published four Green Roof Performance Standards and one standard guide for the design and construction of green roofs. The four performance standards are:

- ASTM E2396-05 “Standard Test Method for Saturated Water Permeability of Granular Drainage Media [Falling-Head Method] for Green Roof Systems”
- ASTM E2397-05 “Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems”
- ASTM E2398-05 “Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems”
- ASTM E2399-05 “Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems”

The standard guide that has been published is:

- ASTM E2400-06, “Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems”

ASTM (<http://www.astm.org/>) is working on four additional standards for green roof systems.

FM Global has published a document titled “Property Loss Prevention Data Sheets 1-35, Green Roof Systems,” January 2007. The document is based heavily on the FLL Guidelines and also draws on other FM Global data sheets to establish standards for an FM Global “Approved Green Roof Assembly.”

While these three non-governmental organizations have produced documents that address standards for green roofs, these are only guidelines. They have not been legally incorporated into the 2006 International Building Code that is used by the City of Omaha. In the end, when designing and installing green roofs, the green roofs must be built to local codes and ordinances.

APPRAISAL AND FINANCING SUBCOMMITTEE REPORT

Karen Klein, Subcommittee Chair

Our conclusion is that the appraisal and valuation of green roofs is an evolving area, intertwined with green building as a larger concept. There are some appraisal guidelines that have been developed, but they are not universally known or adopted. This is understandable, as many localities may want to see evidence in their community of value based on sales data.

We have learned that, locally, green roof valuation may be based on its value as a roof garden, which can result in a taxable valuation that is high enough to discourage their construction. Incentives such as phased tax credits, rebates, or credits for stormwater fees are needed to overcome the initial cost and taxes based on the higher valuation. Legislative changes are needed through the state to provide for any of these incentives.

The Green Design and Construction Council of the Green Omaha Coalition is working to implement the inclusion of a section detailing green features in the multiple listing service data.

Attachments and links found in Appendix D are references to information about appraisal and valuation, and related financial aspects such as insurance, in regard to green roofs or green building in general.

EDUCATION AND OUTREACH SUBCOMMITTEE REPORT

Addie Kinghorn, Subcommittee Chair

The primary goal of the Education and Outreach Subcommittee is to distribute information on green roofs throughout the Omaha Metropolitan Statistical Area (MSA). This information includes but should not be limited to, the general and specific recommendations of the GRWC subcommittees, general information from the Green Roofs for Healthy Cities organization, and site specific project information (i.e. projects in existence or planned for the Omaha MSA).

Outreach Activities

1. GRWC meeting summaries and subcommittee information is available on the Douglas County Environmental Services website, <http://www.dcplanning.org/templates/greenroof.dwt>.
2. A tabletop display board was purchased using Douglas County Stormwater Management Plan Program grant funds.
 - a. Douglas County Cooperative Extension (Bobbi Holm, Clean Lakes Program Coordinator) used the display for general stormwater education at the World O’ Water event on September 14, 2008.
 - b. Kent Holm used the display for general stormwater education and to show examples of green roofs and rain gardens at the 2008 River City Roundup and Douglas County Fair (September 24-27, 2008).

- c. The display was modified to provide more specific information on green roofs and used at the Green Expo (joint conference of the Nebraska Turfgrass Association and the Nebraska Nursery and Landscape Association), January 12-14, 2009, and at the Nebraska Arborist's Association 2009 Great Plains Tree Conference in Lincoln on February 2-3, 2009.
 - d. The display will be available for the Speakers Bureau (see item 4a below) and Extension personnel to use for stormwater related education programs. Karin Caldwell with Douglas County Environmental Services will administer the scheduling of the display board.
3. Kent Holm drafted an article about the GRWC for general distribution to various organizations, local and regional publications, etc. The article was also distributed to the GRWC for individual members' use. The article is attached as Appendix B.
 4. The subcommittee will provide outreach and education in the following areas:
 - a. The subcommittee will establish a "speaker's bureau," providing information to local and regional civic groups and other organizations by request. The speaker's bureau appearances will be coordinated by Karin Caldwell with Douglas County Environmental Services.
 - b. The subcommittee will assemble a PowerPoint presentation that can be used by the speaker's bureau. The speaker's bureau will distribute information about the service to area organizations, civic groups, and others.
 - c. Appearances at Earth Day and other public events.
 5. The subcommittee will continue to compile information on green roofs and related stormwater management technology and in particular will gather information on:
 - a. The maintenance of green roofs since this is one area where there appears to be minimal research information available. We particularly want examples of maintenance issues from contractors who have installed green roofs.
 - b. The emerging market for turf grasses on green roofs, along with succulents (sedums, etc.), native grasses, and alpine species.
 6. Compile examples of green roofs in the metropolitan area:
 - a. Saddlebrook joint use facility
 - b. W. Dale Clark downtown library
 - c. Residential green roof (approx. 80th and Pacific)
 7. Communicate the GRWC Final Technical Memorandum recommendations to the various political jurisdictions in the Omaha metropolitan statistical area.
 8. Encourage training of professionals to work in the green roof industry. Green Roofs for Healthy Cities has established a training program leading to Green Roof Professional (GRP) Accreditation. Information on the courses and the exam can be found at their website
http://www.greenroofs.org/index.php?option=com_content&task=view&id=170&Itemid=86.

OVERALL POLICY DEVELOPMENT SUBCOMMITTEE

Amanda Grint, Subcommittee Chair

The objective of our subcommittee was to develop a recommendation for a Green Roof Policy encouraging the Omaha metropolitan area to incorporate green roof construction into current guidelines and procedures. During the investigation stage the group looked at other communities' green roof policies, mainly those found at websites for Green Roofs for Healthy Cities, the City of Chicago, the City of Toronto, and the City of Portland. While the group wanted to compare policies for similar sized cities in the Midwest, it was realized that the majority of in place green roof policies are from larger cities. The leaders in green roof policy are Portland, Toronto, Chicago and like-sized communities. While other Midwestern cities are encouraging and building green roofs, they do not have a published policy.

This investigation found that the policies in place mainly provide direct financial incentives, indirect financial incentives, development regulations, or a combination of these. Direct financial incentives range from grants, green roof tax incentive programs, or funding up to 50% of eligible costs. Indirect incentives vary and can be a reduction in stormwater fees, waived fees and expedited permit times, tax exemptions and tax credits as well as ordinance waivers on density and impervious coverage. Development regulations for communities with green roof policies are varied and range from requiring green roofs on all new city owned buildings of a certain size to requiring energy and LEED (Leadership in Energy and Environmental Design) standards where green

roofs are not required but help to meet the regulation. All of these practices were reviewed to determine if they could be a practical addition in the Omaha metro area regulations. See Appendix E. Green Roof Policy Comparison.

Obstacles were analyzed within Omaha's current policy in order to obtain an understanding of how these example policies could fit within the unique situation in our area. The obstacles identified were:

1. Lack of a stormwater fee – we do not have the capability at the current time to provide financial incentives beyond grant money for construction of green roofs
2. Presently there are no cost-benefit determinations for energy savings in this area
3. Currently, utility companies do not offer rebates
4. Building codes and the Omaha design manual need to be revised
5. The expense of a green roof is an obstacle for private development
6. We are lacking specific performance data (energy savings, storm water reduction, etc.) and demonstrated feasibility (contractors and cost efficiency)

As an attempt to address these potential obstacles, the subcommittee has formed the following list of recommendations.

1. Provide tax increment financing (TIF) for green roofs in certain overlay areas, for example the combined sewer overflow (CSO) area
2. Encourage or participate in a local (or regional, if possible) analysis to determine performance data
3. Meet with Omaha Public Power District personnel to determine if any incentives could be utilized
4. Update building codes and design manual to incorporate green roof construction or at least eliminate requirements that might restrict them
5. For new construction, require all public buildings of a certain size, over 10,000 square feet, for example, to incorporate green roof design. Assess existing public buildings to determine if retrofits are possible
6. Monitor pilot programs to provide feasibility and performance data and public outreach materials
7. Provide guidelines for design, construction, and maintenance of green roofs

COMMITTEE'S NEXT STEPS

The final report will be distributed to the Papillion Creek Watershed Partnership representatives and they will be encouraged to recommend it to their respective communities. The Green Omaha Coalition will also receive the report along with the Metropolitan Area Planning Agency and Metropolitan Omaha Builders Association. The Outreach and Education Subcommittee will be responsible for these transmittals and will produce a cover letter to accompany the report. The transmittal/cover letter will encourage each recipient to review the findings of the GRWC and, at a minimum, bring the report before their respective Planning Board/Commission and elected Council/Board for discussion.

APPENDIX A. SUBCOMMITTEE WORK PLANS/LISTS OF MEMBERS

The following work plans were submitted by the respective subcommittees.

Stormwater Design Manual:

1. Collect relevant information (1 month)
 - a) Search and review other stormwater design manuals throughout the nation to identify potential green roof design standards.
2. Review existing Omaha regional stormwater design manual (1 month)
 - a) Review existing design standards in comparison to others collected throughout the nation
 - b) Identify missing or contradictory design standards relating to green roofs.
3. Meet to discuss collected information and review existing design manual.
4. Produce report which identifies missing design standards for green roofs and recommends potential updates to the existing manual (2 months).

Subcommittee members: Kevin Flecky (The Schemmer Associates), Brad Young (HDR), Mike Oestmann (City of Omaha), Paul Woodward (Olsson Associates), and Emily Holtzclaw (CH2MHill).

Covenants:**1. Outreach and Education**

The targeted audience would be developers, land-use/real estate attorneys, SID Boards, neighborhood associations and organizations such as the Metropolitan Omaha Builders Association.

The action would be to educate these groups on the basics of green roof technology and the benefits realized in stormwater management and energy conservation (heat island effect etc.). Introduce them to the idea of “eco-roofs” as a type of stormwater-mitigation system.

The goal is to arm these groups with an understanding of green roofs such that they would incorporate the option for this type of roof material in subdivision covenants.

These activities will be accomplished through collaboration with the GRWC Education/Outreach Subcommittee.

2. Case Studies

The intent was to develop a compendium of case studies showing how green roofs were incorporated into subdivision covenants. No examples were found to produce a case studies list. This item will stay on hold pending further research.

3. Draft covenant language

The intent is to make changes to the language of a “model” covenant to allow green roof materials in existing and proposed subdivisions. Barbi Hayes is working with Mr. James Lang, of the firm Laughlin, Peterson & Lang, to develop standard language on green roofs that developers and others are comfortable with and that can be included in all covenants.

Subcommittee members: Derek Miller and Barbi Hayes (Hayes Environmental).

Building Codes:

Subcommittee members: Dennis Bryers and Mike Ruma.

Appraisal and Financing:

Subcommittee members: Karen Klein (City of Omaha Planning), Brad Young, Jim Anderson, and Jason Fischer.

Education and Outreach:

1. Distribute information on current technology regarding green roofs to interested parties. This might include information on soil media, plant selection, etc. for both modular and built-in-place roofs.
2. Distribution of Green Roof Working Committee (and subcommittee) meeting information, summaries, and documents/technical information.
3. Distribution of information on the Saddlebrook green roof project and other demonstration projects that have a green roof component or have components such as the re-use of stormwater (from roofs) for irrigation or other use.
4. Supply information to publications in the metro-Omaha and/or Omaha MSA.
5. Identify potential speaking opportunities such as the Nebraska Nursery and Landscape Association (NNLA), Nebraska Turfgrass Association (NTA), and Nebraska Arborists Association (NAA) conferences or other sponsored events. This could include displays in trade shows or other opportunities for education/outreach associated with these organizations.
6. Utilize similar opportunities for education/outreach at River City Roundup, Douglas County Fair, etc.
7. Distribution of information could be facilitated by working with the Metropolitan Area Planning Agency (MAPA) and/or the Green Omaha Coalition (GOC), both of which have networks that can distribute information to the Omaha MSA.

Subcommittee members: Kent Holm (Douglas County Environmental Services), Pam Tusa (Douglas County Commissioner), Addie Kinghorn, Barbi Hayes (Hayes Environmental), Todd Morrissey, Alan Weiss, Andy Szatko, and Kim Davidson.

Overall Policy Development:

1. Investigate Green Roof Policies in other Midwest communities
2. Identify barriers and obstacles in current policies
3. Provide recommendations on policies and/or incentives (energy grants, modeling efforts, etc.) to include in the Green Roof Working Committee report
4. Coordinate recommendations with policy groups in Green Omaha Coalition

Subcommittee members: Nina Cudahy (City of Omaha Public Works), Karen Klein (City of Omaha Planning), Barbi Hayes (Hayes Environmental), and Amanda Grint (Papio Missouri River Natural Resources District).

APPENDIX B. GREEN ROOF WORKING COMMITTEE GENERAL INFORMATION ARTICLE.**Metro Omaha Green Roof Working Committee Looks To Expand The Use Of Green Roofs**

by Kent E. Holm, Douglas County Environmental Services Director and Acting Chair of the Green Roof Working Committee.

Private and public sector professionals are meeting monthly to discuss a variety of green roof issues with the overall goal of increasing the use of green roofs in the metropolitan Omaha statistical area. Green roofs are just one of the Low Impact Development (LID) tools that can be used to mimic natural hydrology in the urban environment and minimize the negative impacts of stormwater runoff.

The Green Roof Working Committee grew out of focus groups that met as part of a green roof market development symposium that was held in Omaha on October 25, 2007. The symposium, produced by Green Roofs for Healthy Cities (www.greenroofs.org), was co-sponsored by Douglas County and the City of Omaha and hosted by Metropolitan Community College at their Fort Omaha campus. The charge of the symposium focus groups was to identify barriers to, and incentives and opportunities for, green roof development in the Omaha metropolitan area. The Working Committee used that focus group information as a starting point for further discussions and action.

The Committee has identified the following six subcommittees that are looking at different green roof issues.

1. Omaha Regional Stormwater Design Manual. The Design Manual needs to be updated to include appropriate “green roof” technical information, including estimated costs for different green roof designs.
2. Subdivision (and other) covenants and similar documents. Existing covenants may prohibit green roof applications. Existing covenants should be reviewed and recommendations made to encourage/allow green roofs and related water reuse/recycling. The primary deliverable here would be a standard “covenants” template that would, at a minimum, allow green roof applications in all new development and substantial redevelopment.
3. Building codes review. The building codes review would be specific to “green roof” applications and identifying barriers in the existing building codes to green roof applications.
4. Appraisal and financing. There is a significant problem in obtaining financing for green roof (and other green building) applications because of the way the pre-financing appraisals are conducted. The deliverable here is to identify an alternative(s) to the current appraisal method so that financing can be obtained for green roof improvements. TIF and other financing options should also be identified.
5. Overall policy development. The deliverable is an overall green roof policy and draft regulation/ordinance that can be adopted and implemented by all jurisdictions in the Omaha MSA.
6. Outreach/education. On-going and long term effort to provide appropriate green roof education and outreach to builders, developers, the general public, and others.

Monthly Committee meetings are held on the 4th Thursday of each month at 1pm at the Environmental Services offices at 3015 Menke Circle in Omaha. Summaries of the Committee’s meetings and subcommittee work plans are posted on the Environmental Services website (www.dcplanning.org).

The Committee would like to have more participation from the private sector, including but not limited to those in the nursery and landscape field, roofing contractors, insurance representatives, lenders, appraisers, general contractors, builders, engineers, and developers as well as, public utility and other public sector representatives. If you are interested in joining the Green Roof Working Committee please contact Kent Holm at kent.holm@douglascounty-ne.gov.

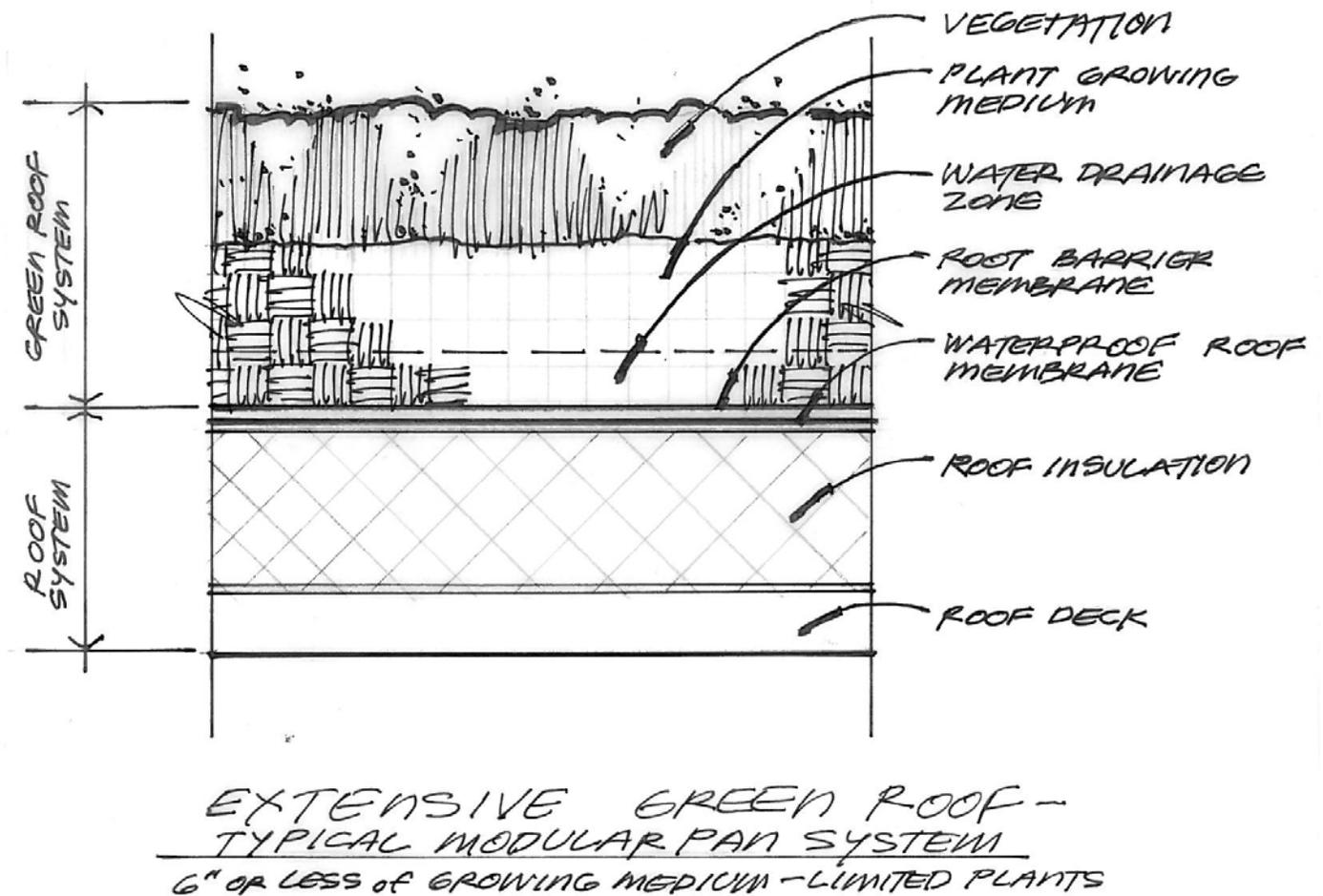
APPENDIX C. PROPOSED GREEN ROOF SECTION FOR THE STORMWATER DESIGN MANUAL

8.3.4.10 Green Roofs

Green Roofs (also referred to as vegetated roof covers, living roofs, nature roofs and eco-roofs) consist of a series of layers that create an environment suitable for plant growth without damaging the underlying roof system. These veneers of living vegetation can be installed on top of new or existing conventional roofs provided they have the structural capacity necessary to support the additional load. A typical green roof includes a waterproof and root repelling surface, an under drain system, a lightweight growing medium, and specially selected plants. Green roofs are not new technology and have been used for hundreds of years to help buildings stay warmer in cold conditions and cooler in warm conditions.

There are two basic types of green roof systems, extensive and intensive:

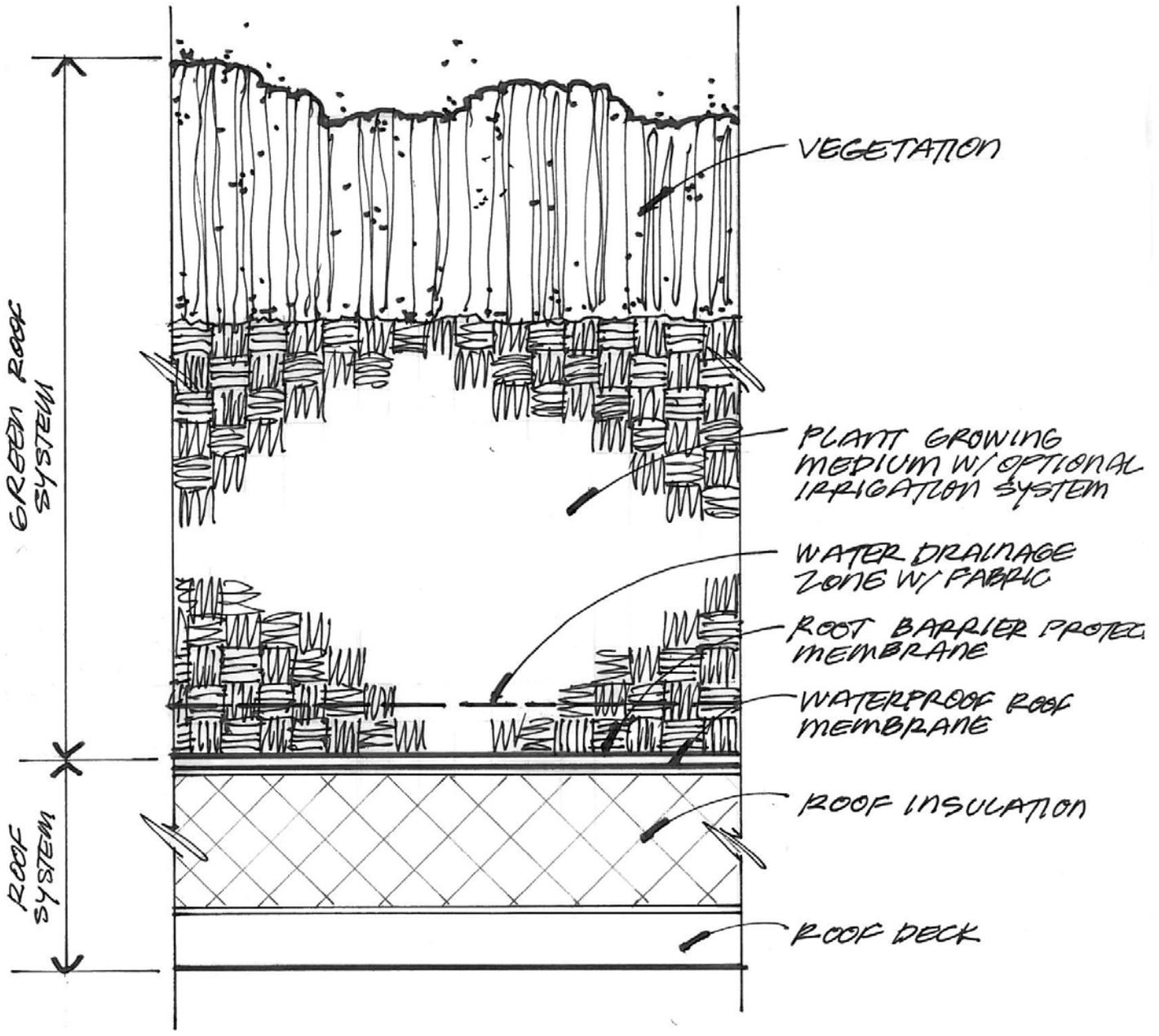
1. Extensive – Lighter systems which typically have 4 inches or less of growing medium, use drought tolerant vegetation, and can structurally support limited uses (such as maintenance personnel).



Drawing by Kevin Flecky

Figure 8-14. Extensive Green Roof.

- 2. Intensive – Heavier systems that have a greater soil depth which can support a wider range of plants and increased pedestrian traffic.



INTENSIVE GREEN ROOF
MORE THAN 6" GROWING MEDIUM TO SUPPORT VARIETY OF PLANT LIFE.

Drawing by Kevin Flecky

Figure 8-15. Intensive Green Roof.

General Applicability and Experience with Technique Elsewhere**a. Typical Applications**

- Conserve energy by providing additional insulation, using the evapotranspiration process of plants to cool the roof during the summer, and reducing the heat lost to wind convection during the winter.
- Treat and reduce the volume of stormwater runoff.
- Offset urban heat island effect by reducing the amount of heat typically absorbed by a conventional roof and thus lowering the ambient temperature of the roof.
- Extend the life of a roof by protecting the roof surface from UV light, large temperature fluctuations, and normal wear and tear associated with exposed surface roofs.
- Use as food gardens
- Provide wildlife habitat.
- Improve the aesthetics of a building
- Meet landscaping requirements.
- Sound insulation to reduce the impact of noise from HVAC and other equipment on the roof and/or other outside noises.

b. Design Considerations

- All designs for new or existing roofs must account for the dead and live loads associated with a green roof in addition to the requirements of existing building code.
- An overflow drain should be included to handle excessive stormwater runoff from larger rainfall events.
- All green roofs should have a root barrier membrane.

Reported pollutant removal efficiencies

Removal rates apply only to volume of runoff treated.

<u>Pollutant</u>	<u>Removal Rate (%)</u>
Total Phosphorus	100
Lead	80
BOD	NA
Total Suspended Solids	90
Total Nitrogen	20
Zinc	80
COD	NA
Bacteria	65

Minnesota Stormwater Manual. Created by the Minnesota Stormwater Steering Committee. Version 2, January 2008. Copyright 2005, Minnesota Pollution Control Agency.

Advantages

- Green roofs treat and reduce the volume of stormwater runoff.
- Green roofs conserve energy by providing additional insulation, using the evapotranspiration process of plants to cool the roof during the summer, and reducing the heat lost to wind convection during the winter.
- Green roofs offset urban heat island effects by reducing the amount of heat typically absorbed by a conventional roof and thus lowering the ambient temperature of the roof.
- Green roofs can extend the life of a conventional roof by protecting the roof surface from UV light, large temperature fluctuations, and normal wear and tear associated with exposed surface roofs.
- Green roofs can be used for food gardens and can provide wildlife habitat.
- Green roofs can improve the aesthetics of a building and help meet landscaping requirements.
- Green roofs are effective sound insulators that can reduce the impact of noise from equipment on the roof or other outside noises.
- Plants on green roofs use carbon dioxide and produce oxygen.

Special Considerations

- Additional roof loads will require an enhanced structural design and may limit the retrofit of existing buildings.
- If leaks occur, they can be hard to locate and repair. Conditions can be harsh for vegetation establishment
- Maintenance costs can be higher than for conventional roof systems.

Maintenance/Monitoring/Enforcement Considerations

- Conduct annual surveys to verify that the waterproofing system remains watertight below the vegetated cover.
- Green roof outlets or overflows should be inspected and cleaned regularly to ensure the flow of excess stormwater from the roof surface.

APPENDIX D. RESOURCES FROM THE APPRAISAL AND FINANCING SUBCOMMITTEE

These links are references to information about appraisal, valuation, and insurance in regard to green roofs or green building in general.

- Environmental Valuation & Cost-Benefit News - Category Green Roofs
<http://www.envirovaluation.org/index.php/c3/c29/c129/>
- Green Real Estate Education Appraisal Course
<http://www.greenrealestateeducation.com/appraiser.html>
- Waterproof! Magazine, Green Roofs
http://www.waterproofmag.com/back_issues/200801/green_roofs.php
- BNET Business Network. The greening of real estate appraisal: as sustainable building gains momentum through standards, legislation and public desire, the appraisal community responds.
http://findarticles.com/p/articles/mi_m0JDE/is_2_12/ai_n25008279/pg_3?tag=artBody;col1
- GreenSource, Appraising Green in Vancouver
<http://greensource.construction.com/news/070716appraising.asp>
- Cascadia Region Green Building Council, Cascadia Green Building Value Initiative
<http://www.cascadiagbc.org/education/finance-initiative/cascadia-finance-initiative/>
- SFGate.com, Firemen's Fund offers green rebuilding option.
http://sfenvironment.org/downloads/library/7.6.08_firemans_fund_offers_green_rebuilding_option.pdf

APPENDIX E. GREEN ROOF POLICY COMPARISON

City	Goal	Direct Financial Incentive	Indirect Financial Incentive	Development Regulations
Toronto	Reduce urban heat island effect	Grants	Reduction in stormwater fees/low interest loans	New construction required to manage SW/retrofit has funding available *
Chicago	Reduce urban heat island effect and air quality	50% eligible costs up to \$100k		Solar reflection standard for all new construction*
New York City	PlaNYC 2030 to green New York	Green Roof Tax incentive program - 30% of capital cost	Density bonuses for green roofs	
Portland	Water quality		Reduced stormwater fees	Required on all new City-owned buildings
Nashville	Encourage green building			New construction required to be LEED Silver*
Costa Mesa	Protect resources and reduce negative effects of urbanism		Waives building fees for green roofs & expedites	
Washington DC	Energy conservation			District owned bldgs of 10,000sf or more must meet green standards*
Maryland	Energy conservation			Energy requirements in certain districts*
Boston	EO Relative to Climate Action			Municipal properties analyzed for feasibility of green roofs
New Jersey	Utilize clean/renewable energy			Environmental permitting may require green roofs
Ohio	Energy conservation/Climate Protection Agreement	Grants for energy efficiency	Tax exemptions for energy conversion	
Philadelphia	Specific green roof ordinance to increase number in city		25% tax credit up to \$100,000	
Houston	Encourage green building			City facilities required to comply with LEED Certification*

*These regulations do not specifically require green roofs, however green roofs are one way to attain these standards.

Note: Many Midwestern cities have grants and funding available to subsidize green roofs and other green practices. Many communities also provide waivers to the zoning ordinances (ex. impervious coverage) for green practices.