LANDSCAPE ARCHITECTURE FOUNDATION

Park Seventeen – Dallas, TX
Methodology for Landscape Performance Benefits
Prepared by:

Research Fellow: Ming-Han Li, PhD, PLA, PE, Associate Professor, Texas A+M University
Research Fellow: Bruce Dvorak, PLA, Assistant Professor, Texas A+M University
Research Assistant: Yi Luo, PLA, PhD Student, Texas A+M University

Environmental

Provides a recreational space that 78% of the 108 residential and commercial tenants surveyed enjoy using for recreation, relaxation, and socializing.

From July 6th to July 10th, 2012, the research team conducted a survey about residents' perception of the roof garden through SurveyMonkey. The survey was composed of 7 multi-choice questions and 2 open questions. The multi-choice questions focused on the frequency and typical time that respondents use the garden, the social value generated by the garden, how much the respondents enjoy using the garden and also the respondents' gender and age range, while the two open questions were about the microclimate condition on the roof garden, and general comments. Among the 108 respondents, 33% felt it was an invaluable resource, and 47% felt it was worthwhile. Also, 78% of residents and tenants surveyed stated they enjoy using the space.

Promotes social activities between neighbors, hosting approximately 44 resident socials each year for over 700 people, with an average attendance of 15-18.

Based upon an on-site capture of 350 or so residents within 292 units and an approximate current office population of 325 tenants, about 44 resident socials are programmed per year with an average attendance of 15-18 people. Assuming an average attendance of 17, this brings the total number of people engaged to 704 people (44x16=704).

In addition, to date, approximately 50% (+/- 160) of the total office tenant population has been included in office tenant events such as receptions, open houses, and tenant parties.

Reduces the average air temperature by 1.3°F and average surface temperature by 15.9 °F on a July day, as compared to the parking lot below.

Air and surface temperatures were measured on the Park 17 roof garden and the parking lot below the roof garden on July 11, 2012 between 2:31 PM and 3:10 PM. The weather prior to and during the temperature readings was partly cloudy with maximum temperatures for the day at 96 degrees at 3:50 in the afternoon, with average wind speeds of 8.4 (MPH) and relative humidity of 35 percent (NOAA, Climate Report).

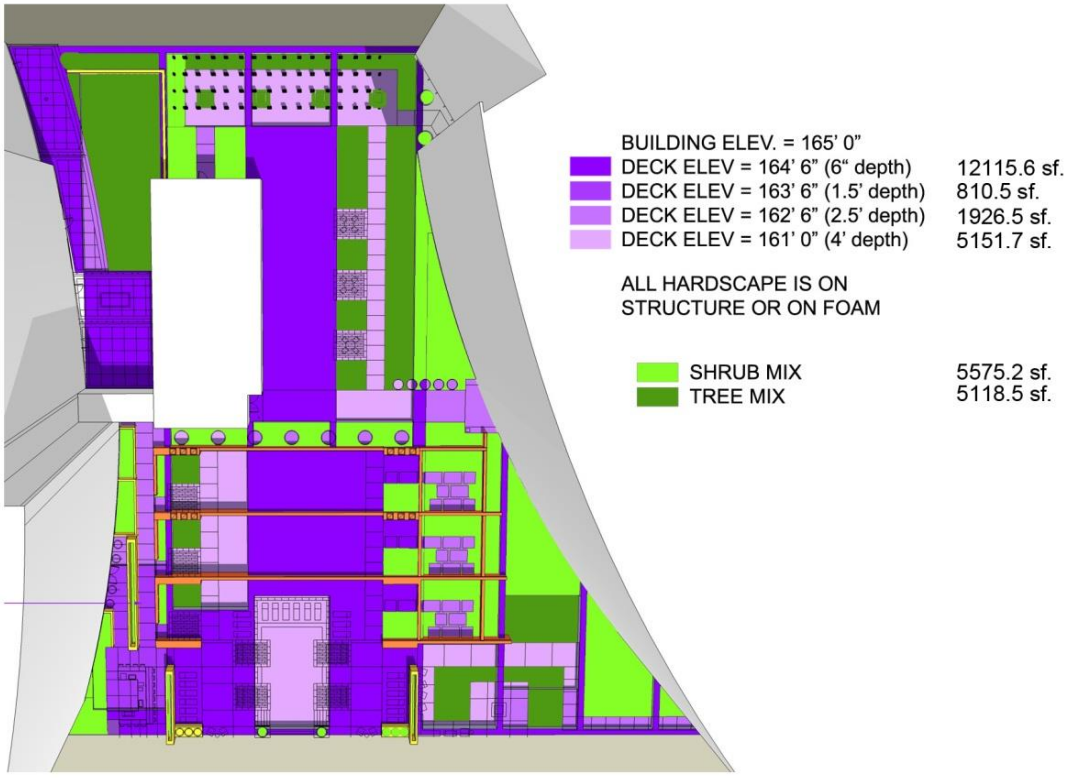
Surface temperatures were measured with an Extech IR thermometer. Several readings were averaged to represent the recorded temperatures. The IR thermometer was held approximately three feet (1 m) above the surfaces. Air temperatures were taken with a Radio Shack® digital Indoor/outdoor thermometer. Air temperatures were taken at approximately chest height. The air temperature thermometer was allowed to rest in place from location to location until the readings stabilized. Although it was a partly cloudy day, temperatures (air and surface) were taken only during sunny conditions.

Overall, the parking lot air and surface temperatures were greater than the roof garden (Table 1). The average parking lot air temperature was 97.2 °F and ranged from 97.0 to 97.4 °F. The average surface temperature was 145.8 °F and ranged from 142.7 to 150.0 °F. The average roof garden air temperature was 95.9 °F in areas open to the sky and ranged from 93.8 to 97.0 °F. The average surface temperature was 129.8 °F and ranged from 114.0 to 158.0 °F. It is interesting to note that the astro turf measured the highest surface temperature of all the surfaces recorded including the dark colored parking lot below. The coolest surface temperatures open to the sky were the white concrete roof tiles. In the shade, the average air temperature was 92.2 °F with a range of 92.0 to 93.0 °F and the average surface temperature was 90.5 °F with a range of 85.4 to 96.4 °F.

Table 1. Surface and air temperatures of the roof garden and parking lot below on a 96 °F *day.*

Location	Materials	Air Temperature (F)	Range (F)	Surface temperature (F)	Range (F)
Parking lot (Sun)	Pavement	97.2	97.0 - 97.4	144.6	142.7 - 150.0
Parking lot (Shade)	Pavement	94.8	97.4 - 95.0	96.8	96.5 - 97.0
Roof garden (Sun)	Average of all surfaces	95.9	93.8 - 97.0	129.8	114.0 -158.0
Roof garden (Shade)	Average of all surfaces	92.2	92.0 - 93.0	90.5	85.4 - 96.4

Holds the equivalent of a 2.52-inch rainfall in the engineered soil mix, which covers 37.5% of the roof garden's area.



According to the Green Roof Growing Media Analysis provided by TBG, water holding capacity of the intensive mix is 482 cubic inches of water per cubic foot of soil and water holding capacity of the semi-intensive mix is 354 cubic inches of water per cubic foot of soil. The intensive mix of 3 feet in depth was used at tree areas and the semi-intensive mix of 1.5 feet in depth was used at shrub areas.

Intensive mix:
Area of the intensive soil is 5118.5 square feet

$$5118.5 \times 3 = 15355.5 \text{ cubic feet}$$
$$15355.5 \times 482 = 7401351 \text{ cubic inches}$$

Semi-intensive mix:
Area of the semi-intensive soil is 5575.2 square feet

$$5575.2 \times 1.5 = 8362.8 \text{ cubic feet}$$
$$8362.8 \times 354 = 2960431.2 \text{ cubic inches}$$

Maximum water holding capacity: $7401351 + 2960431.2 = 10361782.2$ cubic inches
According to TBG, the total area of the roof garden is 28510 square feet.

$$28510 \text{ square feet} \times 12 \times 12 = 4105440 \text{ square inches}$$

Convert the maximum water holding capacity to an equivalent rainfall depth, that is, the maximum water holding capacity divided by the total roof deck area: $10361782.2/4105440 = 2.52$ inches

Therefore, for rainfalls of 2.52 inches or less, 100% of stormwater on the roof deck could be captured by the soil mixes, assuming that the drainage system would transport stormwater runoff to all soil areas. According to the Natural Resource Conservation Service, the 2-year, 24-hour rainfall in Dallas County is approximately 4 inches. Should a rainfall of such magnitude occur, 63% (2.52/4=0.63) of stormwater could be detained by the soil mixes.

Social

Provided educational opportunities to approximately 120 university students and 180 design and development professionals in 2011.

According to TBG, the total approximate number of students touring the project on an annual basis (2011) is 120, including ASLA student chapters, and program tours from Texas A&M, Texas Tech and UT Arlington; the total approximate number of professionals (real estate, design consultants) touring the project on an annual basis (2011) is 180, including USGBC tours (2), Institute of Real Estate Management (IREM), and CREW.

Cost Comparison Methods

The total size of the roof deck is 32,670 sf, and the cost to provide waterproofing, landscape, irrigation and pedestrian hardscape and amenities within this space was approximately $3,173,579, or $97.14/sf. In comparison, to acquire land for an at-grade park of the same size in uptown Dallas would cost approximately $63.54/sf or $2,075,852 in 2012 land costs. Considering the cost of landscape, irrigation, pedestrian hardscape and other amenities, the total cost of developing an on-the-ground park would have been higher than the cost of the roof garden.

For purposes of this study, we evaluated the change between the cost of a conventional structural garage deck versus the improved garden terrace condition presented herein.

The total area of the deck is 28,510 square feet, and the cost to provide waterproofing, landscape, irrigation and pedestrian hardscape and amenities within this space was approximately $1,800,000. This equates to a premium cost per square foot of $63 for the roof garden. A traditional parking deck, without any waterproofing, landscape, hardscape or amenities would cost approximately $712,500 to build (assuming $7,500 per space and a total of 95 spaces would be built). This is the base cost of approximately $25 per square foot ($712,500 / 28,510 square feet) for a parking deck, as opposed to $88 per square foot for a roof garden ($25 base cost plus the roof garden premium cost at $63).

Further, a property searched online (reference accessed on July 25th, 2012) approximately 0.6 mile away from Park Seventeen would cost $63.54 per square foot indicating that building a park on the ground level within the uptown Dallas area would cost $1,811,525 in land acquisition. Together with the cost of landscape, irrigation, pedestrian hardscape and other amenities, the total cost is higher than the roof garden.

The resultant change represented by the roof garden improvements was identified in the early stages of design, in collaboration between consultants and the general contractor. This early evaluation was done to ensure a cost impact that was within financeable limits and that could legitimately be determined as “recoupable” within a pre-determined period of time, based upon leasing projections for both residential as well as office tenants.

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