

Sustainability is Nothing New

Reroofing Few Hall At Duke University

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High Performance

Michael Crosby in *Architecture Week* magazine:

“In a nutshell, a high-performance commercial building is energy-efficient, has low short-term and long-term life-cycle costs, is healthy for its occupants, and has a relatively low impact on the environment.”

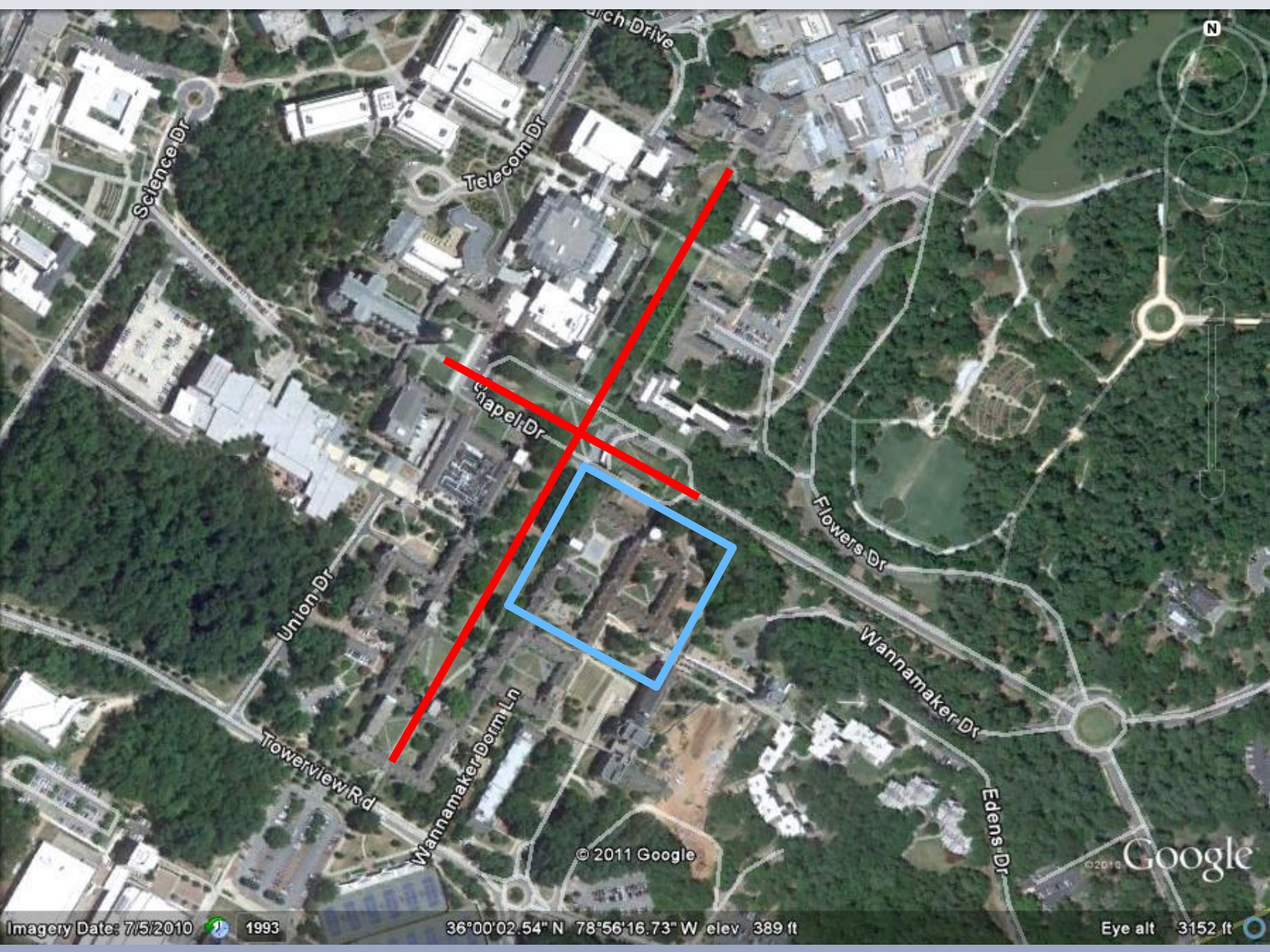
High Performance

- Quality aesthetics
- Materials can be repurposed upon end of service life
- Future design is not limited in materials or energy used today

High Performance does not equal High Tech



Project Background



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Imagery Date: 7/5/2010 1993

36°00'02.54" N 78°56'16.73" W elev 389 ft

Eye alt 3152 ft

Campus Motif



Academic and
Residential as one
visual unit



Pre-Design Conditions

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Tile



Broken

Chipped

Loose

Missing tiles

Copper Work

Built-in gutters
Flat dormers
Tower roofs
previously
covered in EPDM



Detail Work

Craftsmanship
21 unique
conductor heads



Aged Accessories

Old copper
flashings

Missing ridges

Crushed hanging
gutters

Balconies



Clay Tile Reuse

Standard of judgment for:

Breakage

Absorption

Few's tiles broke too easily so
reuse was not feasible

Project Team

Owner:

Duke University

AOR:

WJE

GC:

Baker Roofing

Material Supplier:

Ludowici Tile



Demolition

Sorting

Copper
Tile
Aluminum
All other





Material Embodied Energy

Clay Tile Manufacturing

- Dig raw materials
- Form: by hand or machine
- Dry and glaze
- Fire
- Deliver

Dig

New Lexington,
OH

Clay layer below
topsoil in farming
country





Form

By mechanical
press

By hand (valleys)

5 gradations in
field



Dry and Fire



Ship



Installation Technique

Re-Roofing System

- Existing gypsum decking panels
- Primer
- New self-adhered membrane
- New clay tile

Copper details, gutters and low-slope portions

Installation

Limited
scaffolding
around trees

Small lifts and
carts



Installed System

- Two on-site fab shops for metal work
- Individual measurements taken at site to reduce waste
- Only what was needed for the week was delivered
- Hand trucks to move tiles around site



Tree protection

Tree protection

- No construction traffic within tree bulb boundary
- Not just trees but irrigation system required protection as well
- Careful trimming of trees over roof system

Tree Control





Community Approach

Labor force

180 days of
construction
employment

At times, 70 men
on site



The image shows two ornate outdoor light fixtures lying on a bed of dry, brown leaves. The fixture on the left is made of polished copper and is still partially wrapped in clear bubble wrap. It has a square, recessed central panel and four decorative circular medallions on the sides. The fixture on the right is made of a dark, possibly cast iron or bronze, material and is also square-shaped with a recessed center and decorative side panels. A semi-transparent white banner with the text "Connection To the Past" is overlaid at the bottom of the image.

Connection To the Past



Merge with Full Campus

Future Plans

First step in full
campus overhaul





High Performance?

Long Term Expectations





Bottom Line

\$\$\$\$\$

\$3,610,000

\$50,000 for
recycled copper

Take out flat
copper work and
\$60.50 per sqft



Future Investment

Large first cost undoubtedly

However, this historically durable roof can reasonably be expected to outlive three replacements of lesser quality.




Potential Improvements

Improvement Opportunity


- Gas powered lifts for tiles to roof
- Self adhered membrane and primer use and selection
- Insulation
- Solar reflectivity

Leed & Energy Star rated colors Available on all Ludowici tile profiles


Ludowici SRI steep slope



Burgundy
SRI=31



Slate Red
SRI=30



Sunset Red
SRI=33




Summer Rose
SRI=39



Santiago Rose
SRI=55



Dark Terra Cotta
SRI=36



Terra Cotta
SRI=45



Dark Tuscany
SRI=42



Tuscany
SRI=72



Villagio
SRI=50



Desert Sand
SRI=56



Barcelona Buff
SRI=72



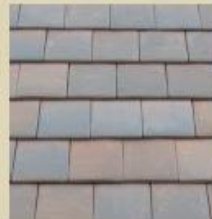
Hawaiian Gold
SRI=49



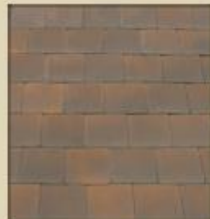
Provence
SRI=64



Ant. Brunswick
Black SRI=34



Antiqued Slate
Gray SRI=47



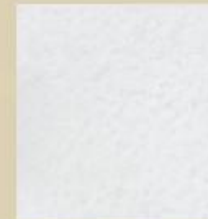
Antiqued Mont.
Green SRI=47



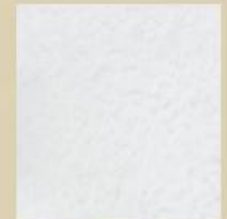
Sienna
SRI=30



Antique Gray
SRI=32



Matte White
SRI=98



Gloss White
SRI=98



Field Green
SRI=30



Forest Green
SRI=29



Empire Green
SRI=51



Vintage Green
SRI=39



Bright Green
SRI=48



Mont Green
SRI=35

Conclusions

Maintained an
aesthetic
Continued a
sustainable option
Achieved High
Performance



Questions?