I. Introduction (1 min)
   a. Research goals:
      i. Identify how processes have changed and quality control improved, and determine at what level they affect the product.
      ii. Identify how these changes encourage the use of in-kind terra cotta replacement (over alternative materials) and improve the longevity of the restoration.

II. Current Production & Materials (3 mins)
   a. Production overview
      i. Major Manufacturers: Gladding McBean, Boston Valley Terra Cotta, Shaws of Darwen
      ii. Production Methods: Hand Pressing, Extrusion, RAM Pressing, Slip Casting
   b. Changes, Improvements, New Technology used in Manufacturing
      i. EDF/CNC Machines used in mold making
      ii. 3D Scanning/Printing
      iii. Temperature and humidity control for improved drying conditions
      iv. Computer controlled kiln temperatures – modern periodic kiln vs tunnel kiln
   c. Results of evolution of the production process:
      i. To make a better product – better QC
      ii. Terra cotta is more competitive/feasible as a replacement product (in-kind), but have the changes affected the product and its likeness to historic material

III. Material Analysis (2 mins)
   a. Goal: identify differences between hand-made and machine made products – are modern materials still “in kind” when used as replacement for historic material?
   b. Petrographic analysis of hand pressed, ram pressed, extruded, slip cast, and historic samples provided comparison between fabrication methods as well as historic vs modern materials.
   c. Findings:
      i. Very little difference within the matrix of hand-and machine-made products
      ii. Varied temper and clay components
      iii. Glaze interaction and degree of firing (historic vs. modern material)

IV. Installation (2 mins)
   a. Construction methods can affect the success of replacement in terms of visual impacts and longevity or performance of the material
   b. Current practices and goals of replacement/reinstallation can depend on original construction method and scale of replacement
      i. Current installation methods include: integrated masonry construction, hollow/no-fill construction, panelized installation
      ii. Replacement/reinstallation should include adequate provisions for movement, material expansion (new material), and drainage

V. Standards & Specifications (1 mins)
   a. Material requirements, testing procedures, and specifications for use of various building materials are typically directed by industry adopted standards or specification; the current terra cotta industry lacks industry-wide organization and guidance.
      i. Material Specifications
      ii. Testing Standards
   b. Material Specifications: may address questions of fill/no-fill, or attachment of extruded units, etc. but not standard across the industry.

VI. Conclusions & Takeaways (1 min)
a. While visual differences do exist between machine made terra cotta and historic or modern hand made products, the material characteristics suggest differences are minimal or superficial.

b. As our understanding of material limitations and characteristics has improved, modern construction should accommodate the needs of terra cotta – including provision for expansion, movement, and drainage. However, installation best practices, specifications, and material testing have not been established by industry-wide standards.

c. Implications for preservation: It can be tricky when integrating new and old material, and new and old construction methods. There may be some visual impact. However, terra cotta has historically been a material and industry driven by change and innovation. In humoring the stone, we accept the characteristic visual discrepancies, and should encourage continued innovation to make in-kind replacement more feasible and successful.
APTI 2014 Conference Outline

Working Title: Extruded Architectural Terra-Cotta: Considering a Modern Process for Historic Applications

Proposed Track: Track C: Tectonic: The Micro Scale

Presenter(s): Sarah Van Domelen & Matthew Haberling

I. Introduction (~3 min.)
   a. Potential advantages of extruded terra cotta
      i. Cost
      ii. Time
      iii. Quality control (maybe)
   b. Brief history/description of extrusion process

II. Design Limitations (~4 min.)
   a. Due to nature of extrusion process:
      i. No decorative relief, sculptural units, or corner pieces
      ii. No end walls/internal webs
   b. Size and shape limitations to:
      i. Ensure balanced clay flow through die
      ii. Limit drying cracks

III. Anchorage Design (~4 min.)
   a. Overall design should accommodate both hand-pressed and extruded units
      i. Biggest challenge: no end walls
      ii. Existing hand-pressed units adjacent to new extruded units
   b. Active collaboration with fabricators
   c. Limiting field modifications

IV. Water Management Design (~4 min.)
   a. Limited mortar joint depth/compaction due to lack of end walls
   b. Considerations to limit infiltration:
      i. Lead caps, flashings, etc.
      ii. Specialty mortars
      iii. Sealant joints
   c. Considerations to control path of water:
      i. Backup protection/flashings
      ii. Weeps

V. Material Compatibility (~3 min.)
   a. Compressive strength
   b. Absorption
   c. Room for future study

VI. Conclusion (~2 min.)
   a. Some applications may not be appropriate, such as:
      i. Units that cannot be successfully extruded
      ii. Projecting/overhanging units
   b. Many applications can be successful with:
      i. Careful consideration in design stages of project
      ii. Collaboration with fabricators
Session Track - Tectonic: The Micro Scale

Fabrication Techniques and Deterioration Mechanisms: Evaluating Robert W. Chanler's Decorative Outdoor Plaster Ceiling at Vizcaya Museum and Gardens

Lauren Hall, Conservator, Vizcaya Museum and Gardens, Miami, Florida, USA

I. Introduction
   - Brief introduction to Vizcaya, construction, history, and location
   - Discussion of the mural, its design, and fabrication
   - Discussion of the artist (Robert Winthrop Chanler), his working methods, material choices, and artistic intent

II. Statement of Problem
   - Siting
   - Inherent material vulnerabilities
   - Myriad of deterioration mechanisms
   - Previous interventions

III. Methodology for Study
   - Advisory Committee Panel
   - Documentation, imaging, and visualization
   - Structural and environmental investigations
   - Instrumental analyses
   - Material characterization
   - Finishes analyses (cross-section microscopy; exposures and overpaint removal tests)

IV. Challenges and Opportunities for Conservation and Interpretation
   - Stabilization
   - Restoration
   - Replication
   - Micro-climatization
   - Options for public access and exhibit

V. Summary and Conclusion
   - Ethical implications of treatment?
   - Expectations with regard to treatment and longevity?
   - Vizcaya’s responsibilities for stewardship and accessibility
   - Concluding remarks
Title: The Use of a Full Scale Mockup As a Tool in Defining Preservation Strategies: Wall Assembly Mockup on Covenant College’s Carter Hall atop Lookout Mountain, Georgia

I. Introduction

II. Brief History
   a. Original use as a Resort Hotel
   b. Presbyterian Church of America purchased to create Covenant College

III. Historic Configuration
   a. Structure
   b. Building Envelope

IV. Existing Condition
   a. Moisture Infiltration perceived by owner through wall assembly
   b. Windows replaced multiple times
   c. EIFS skin and support structure covers the building
      i. Punctures
      ii. Moisture Infiltration into the EIFS system
      iii. Failure of the EIFS system

V. Investigation/Assessment
   a. Access Panels in EIFS system reveal intact historic stucco beneath
   b. Remaining Uncovered Historic Stucco continues to perform

VI. Owner’s Criteria
   a. Performance of the building envelope
   b. Cost
   c. Stewardship of the Building

VII. Exploratory Mockup
   a. Wall Type 1: Proprietary Drainable System
   b. Wall Type 2: Rehabilitation of Historic Stucco

VIII. Water Testing
      a. Test 1 conducted at Project Completion
      b. Test 2 conducted one year after Completion
      c. Interpreting the Results
      d. Life Cycle Analysis
IX. Next Steps
   a. Rehabilitation of Historic Stucco Selection
   b. Progress since completion of the mockup

X. Questions
Mouvements, matériaux et conséquences à travers le temps : leur second souffle

Plan de la présentation

La présentation :
- Aidera à la compréhension du système de construction hybride et les détériorations s’y rattachant
- Montrera les méthodes d’investigations effectuées et exposera les détériorations des assemblages et matériaux
- Expliquera le développement de la stratégie d’intervention, les solutions et leur exécution

1. Le bâtiment (FACE), sa construction et ses détériorations (5 minutes)
   a. Description du client et mandat
   b. Description du bâtiment et sa composition
   c. Recherches et documentations générales et spécifiques

2. Détériorations et relations matérielles (7 minutes)
   a. Reconnaître les mouvements inhérents au design et construction d’origine
   b. Travaux antérieurs : addition, entretien
   c. Secrets d’observations reliés aux matériaux et leurs interactions
      i. Béton / Argile
      ii. Terracotta / Acier
      iii. Béton / Massif de brique d’argile / Terracotta / Remplissage

3. Stratégie d’interventions et solutions (7 minutes)
   a. Dans son ensemble
   b. Les interventions spécifiques
      i. Béton – Poutres et colonnes
      ii. Terracotta – Parapet, corniche

4. Conclusion (1 minute)
   a. La suite