National Concrete Masonry Association
Summary of Potential Projects
And Research Concepts
Last Revised January 4, 2014

Project Description	Overview
Development of a Precision Statement for ASTM D6638	**Project Summary** Objective – This project involves the evaluation of a series of tests conducted in accordance with ASTM D6638, Standard Test Method for Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks) to determine the precision of the testing protocol. The results of this investigation will be used to develop a precision statement for ASTM D6638. Potential Significance and Impact – Moderate. Approximate Timeframe – 4 to 6 months. **Background** ASTM D6638 was first introduced as a standard in 2001 to evaluate the connection strength and performance between Segmental Retaining Wall (SRW) units and geosynthetics. The test method is used to evaluate the connection properties between a layer of geosynthetic reinforcement and SRW units used in construction of reinforced soil retaining walls. ASTM D6638 requires that the connection strength be determined for each unit unit/geogrid combination at five different normal loads, with one normal load test repeated twice to assess the testing repeatability. The variability range in between test determinations at the same normal load is required to be within +/-10% of the average of the three tests conducted at the same normal load. Currently, however, ASTM D6638 does not include a precision statement for the testing procedure, raising questions as to whether the +/-10% criterion is appropriate. ASTM test methods generally include (and are often required to have) precision and bias values. Because there is no 'reference standard' SRW unit or geosynthetic material, a bias value cannot be developed. This project would help to determine the variability of the test results obtained using this standardized testing procedure. **Implementation** Establishment of a precision statement for inclusion into ASTM D6638. Depending on the results of the research, the precision determined could be specific to a setup and equipment or indicate modifications are necessary to ASTM D6638 to increase testing consistency.
Using Pulverized Glass to Reduce Void Structure in Manufactured Concrete Products	**Project Summary** Objective – This project involves the production and evaluation of a series of manufactured concrete products containing varying amounts of very fine glass particles to investigate and assess the impact on the units' absorption, density, compressive strength, and freeze-thaw durability in accordance with ASTM C140 and ASTM C1262. Potential Significance and Impact – Good/Excellent. Approximate Timeframe – 12 to 16 months. **Background** This project is a pilot study to investigate the viability of using pre-consumer and post-consumer glass waste as a method for increasing the density and decreasing the absorptive properties of manufacture concrete products. It has been suggested that introducing very fine glass particles into concrete mixtures may fill latent voids, which in turn may reduce unit absorption and increases unit density. Reducing the void structure of SRW and paver units can be particularly beneficial when considering: • A tighter surface texture increases the aesthetics; • An increased unit density may correlate to decreased absorption, which in turn may increase freeze-thaw performance; and

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	• Smaller capillaries in the concrete matrix may result in a reduced efflorescence potential. There is a secondary benefit of using recycled glass in the production of manufactured concrete products, which can contribute to the sustainability and LEED credits afforded to units manufactured using waste products such as glass. According to the Environmental Protection Agency (EPA), 13.6 million tons of glass was deposited in landfills in 2007, which represents nearly 74% of the total glass consumed in the U.S. over the same time period. **Implementation** Due to the innovative nature of this research project, this investigation is considered a pilot study to ascertain the impact on physical properties of units manufactured with pulverized glass. Pending the successful use of pulverized glass in the production of manufactured concrete products, additional research may be necessary to more fully quantify other potential physical impacts on the suitability of incorporating pulverized glass into production; including potential alkali-silica reactivity.
Utilizing Recycled Replacements in SRW Mixes	**Project Summary** Objective – Determine the basic properties (absorption, density, compressive strength, and freeze-thaw durability in accordance with ASTM C140 and ASTM C1262) of SRW units produced using recycled replacements, including alternative cementitious materials and aggregates. Potential Significance and Impact – Good. Approximate Timeframe – 12 to 18 months. **Background** The current trends in the markets are requiring more sustainable products and "greener" options that reuse or divert products from landfills. To introduce alternative products into zero slump manufactured concrete products it is necessary to conduct a pilot study that analyzes different alternative products based on the performance of the final product. This research project would investigate the properties of SRW units manufactured using alternative cementitious materials (such as fly ash and blast furnace slag) and alternative sources of aggregate substitutes; evaluating the units through compression, absorption and freeze-thaw tests. **Implementation** Due to the innovative nature of this research project, this investigation is considered a pilot study to ascertain the impact on physical properties of SRW units manufactured alternative constituent materials. Pending the successful use of one or more of the investigated materials, additional research may be necessary to more fully quantify other potential physical impacts on the suitability of incorporating such materials into the production stream. It should be noted that the results of this research are potentially transferrable to other manufactured concrete products (including concrete masonry units), however, additional research would likely be necessary to quantify the impact on the structural, fire resistance, energy efficiency, sound attenuation, and other important properties.
Durability of SRWs in Varying Deicing Salt Exposure Conditions	**Project Summary** Objective – Determine the impact of freeze-thaw performance of SRW units when exposed to various deicing materials at different concentrations. Potential Significance and Impact – Moderate. Approximate Timeframe – 12 to 18 months. **Background** Winter maintenance exposes most northern SRW applications to a variety of deicing chemicals, due to the freeze-thaw cycles combined with the chemical deicing action, the appearance or performance of SRW systems could be degraded. The ASTM C1262 test to evaluate freeze-thaw durability for SRWs exposes the samples to water or a 3% saline solution that can't be related to the wide variety of deicing chemicals that are currently in use. This research project would evaluate different responses of the SRWs to the freeze-thaw action combined with various deicing chemicals. Including magnesium chloride, calcium chloride, sodium chloride and calcium magnesium acetate. **Implementation** Based on the findings of this study, revisions to ASTM C1262 and/or ASTM C1372 may be

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	warranted to reflect performance attributes that simulate real-world conditions.
Investigation of Alternative Freeze/Thaw Evaluation Techniques	**Project Summary** Objective – Evaluate methods other than mass loss for determining freeze-thaw performance of segmental retaining wall (SRW) units. Potential Significance and Impact – Moderate. Approximate Timeframe – 12 to 36 months. **Background** As part of a freeze-thaw research program conducted at Cornell University, methods of assessing freeze-thaw test performance other than mass loss were evaluated. Methods used included moisture gain, surface scaling, relative dynamic modulus (RDM), pulse velocity and modulus of rupture. Of these, moisture gain and changes in RDM proved to be promising methods of evaluating freeze-thaw test performance. Additional research and analysis are required, however, to verify these preliminary findings. **Implementation** Based on the results obtained through this project, potential changes to ASTM C1262 could be developed to add other performance evaluation methods. Alternatively, revisions to ASTM C1372 could be introduced to establish alternative limits for unit durability using different assessment methods.
Development of Prediction Models for Freeze/Thaw Durability	**Project Summary** Objective – Investigate, review, and refine analytical methods of predicting freeze-thaw durability of segmental retaining wall units. Potential Significance and Impact – Excellent. Approximate Timeframe – 12 to 24 months. **Background** Several methods for predicting the freeze-thaw durability of segmental retaining wall units have been investigated in the past. One such tool is the frost durability index, which factors into account the compressive strength, absorption, and density of SRW units to predict freeze-thaw performance. These prediction methods, however, do not accurately assess freeze-thaw durability on a consistent basis. **Implementation** The end goal is to develop a more reliable prediction method for freeze-thaw prediction. It is expected that this method will be published as an industry recommendation and may possibly be implemented in unit specifications in the future.
Development of Aggregate Freeze Thaw Test Method	**Project Summary** Objective – Develop and refine a test method for evaluating the freeze-thaw durability of aggregates used in the production of segmental retaining wall (SRW) units. Potential Significance and Impact – Good. Approximate Timeframe – 8 to 12 months. **Background** Past research has demonstrated that the freeze-thaw durability of segmental retaining wall units is directly influenced by the durability of aggregates used in production. While there are existing test methods to assess the soundness of aggregates, such as ASTM C88, these methods do not evaluate aggregate durability in freezing and thawing applications. A rudimentary aggregate test and rating system was developed some years ago by NCMA. Further research and analysis would be necessary to refine this method and to correlate results to durability of units produced with aggregates. **Implementation** Develop industry guidelines for selecting and evaluating aggregates in terms of durability. Based on the results of testing, there is a potential to develop a new test method within ASTM for assessing aggregate freeze/thaw durability.

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Carbon Scrubbing Attributes of Manufactured Concrete Products	**Project Summary** Objective – To quantify the amount of carbon dioxide (CO_2) that concrete masonry and landscape products absorb over their life-cycle. Potential Significance and Impact – Excellent. Approximate Timeframe – 12 to 24 months. **Background** Due to the environmental concerns associated with the amount of CO_2 emitted in the production of portland cement and with the increasing usage of life cycle assessments to quantify the full impact of using different products, it has become imperative to fully assess the full life cycle impact of manufactured concrete products in order to better identify and communicate the environmental issues associated with the use of portland cement. This research project intends to quantify the re-absorption of CO_2 by dry-cast manufactured concrete products over the intended life of the product. Based upon similar research on wet-cast concrete products, it is known that concrete will absorb carbon dioxide from the atmosphere. However, given the void structure of wet-cast concrete the process tends to take decades, if not centuries, depending upon the exposure conditions. The goal of this project is to document the speed at which dry-cast products carbonate, which according to preliminary research may be on the order of years rather than decades. **Implementation** Possible incorporation into life cycle and environmental assessment databases as well as promotional materials showing the 'carbon neutrality' of manufactured concrete products.
Use of Non-Potable Water in Manufactured Concrete Products	**Project Summary** Objective – Determine the viability of using waster water from various sources in the production of manufactured concrete products and the resulting impact on physical properties. Potential Significance and Impact – Moderate. Approximate Timeframe – 6 to 12 months. **Background** There are several processes in the production and augmentation of concrete masonry units that result in the creation of waste water, which includes but is not limited to: • Wet grinding • Post cure run off water • Wash water from the production of exposed aggregate slabs There is potential to reuse this waste water in unit production. Providing a use for this water would reduce the overall consumption of fresh water, thereby reducing the environmental impact of production. It is necessary however, to assess the potential impact on unit properties when using post-production water. **Implementation** Due to the nature of this research project, this investigation is considered a pilot study to ascertain the impact on physical properties of units manufactured with post process water. Pending the successful use of post process water in the production of manufactured concrete products, additional research may be necessary to more fully quantify other potential physical impacts on the suitability of incorporating post process water into production; including, but not limited to efflorescence potential.
Assessment of Batching and Curing Variables on Production Efficiency and Quality	**Project Summary** Objective – Investigate the influence of different mixing processes, temperatures and curing conditions on production efficiency and quality of concrete masonry units. Potential Significance and Impact – Excellent. Approximate Timeframe – 6 to 12 months. **Background**

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	Production operations generally run regardless of ambient moisture conditions or temperatures. Due to the increased awareness of the benefits of proper moisture control, plants are much more informed in understanding when the material is too wet to run. In terms of temperature, most plants are unaware of the negative effects of units produced using materials at extreme temperatures. Varying mix temperatures can have detrimental effects on the finished quality of concrete masonry units. The curing temperatures and times can have either a detrimental effect, or potentially improve the quality of a hot or cold mix. For example, a concrete masonry unit produced from a mix at 40° F, and ramped to standard curing conditions too fast, has an increased potential for the exterior of the unit to harden from cement hydration, effectively blocking cement hydration inside the unit. When cured with a slower ramp time, however, it is possible to produce a quality unit, even from a cold or hot mix. The intent of this project is to quantify the effects of mix temperature and curing conditions on final concrete masonry unit properties. **Implementation** Based on the results of this investigation, establish industry guidelines and recommendations regarding producing and curing concrete masonry units using source materials that are at elevated and depressed temperatures.
Utilization of Manufacturing Waste in Production	**Project Summary** Objective – Categorize and create a best practice for the use of plant manufacturing wastes with an emphasis on utilizing crushed culled units, immediate waste, and waste stored for use at a later date Potential Significance and Impact – Good. Approximate Timeframe – 8 to 12 months. **Background** As no-slump concrete is batched and introduced to production equipment a small percentage of that material is lost due to physical action or equipment set-up. This excess material usually ends up on the floor, later in a cull pile, and eventually shipped to a landfill or waste site. Costs incurred can include: • Material Disposal Fees • Loss of material investment cost. • Lost labor hours The utilization of this waste material could reduce these costs as well as divert this material from landfills, however, evaluation of the effects of reusing this material on finished properties of CMU is necessary. **Implementation** Due to the innovative nature of this research project, this investigation is considered a pilot study to ascertain the impact on physical properties of units manufactured with material waste. Pending the successful use of material waste in the production of manufactured concrete products, additional research may be necessary to more fully quantify other potential physical impacts on the suitability of incorporating waste material into production.
Lightweight Grout Feasibility Study	**Project Summary** Objective – Evaluate the potential for lightweight grout to be utilized as an insulating material for concrete masonry wall systems through computer modeling and analytical techniques. If shown to be feasible, conduct additional physical research in the future to evaluate the structural implications associated with using lightweight grout. Potential Significance and Impact – Excellent. Approximate Timeframe – 4 to 6 months. **Background** All reinforced concrete masonry construction must be at least partially grouted. Although this increases the structural strength of an assembly, it is detrimental to its energy efficiency. If masonry grout can be made with a higher R-value, this could benefit the overall building assembly.

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	It is likely that the most benefit could be gained from using lightweight aggregates in the production of grout. Given the potential structural implications, current building codes do not allow for the use of lightweight grout. Therefore, in addition to developing a lightweight grout with insulating properties, structural testing is probably also necessary to evaluate the potential effect on the structural properties of wall assemblies when using a lightweight grout. This project would be the first phase of research, investigating the feasibility of a lightweight grout and subsequently, its effects on the measured R-values of wall assemblies. **Implementation** Based on results, formulate a plan to perform structural testing using lightweight grout. Provided satisfactory results, develop potential changes for implementation into building codes. Following inclusion of lightweight grout in building codes, develop R-value tables and related information for use of lightweight grout and insulating benefits.
Investigation of Grout Head Pressure During Construction	**Project Summary** Objective – Document the lateral pressure generated within concrete masonry assemblies when placing masonry grout using different grout slumps and types, delivery methods, and reinforcement congestion scenarios. Based on the results of this research, develop construction guidelines to reduce potential for blow outs during grouting. Potential Significance and Impact – Moderate. Approximate Timeframe – 12 to 18 months. **Background** With the recent introduction of self-consolidating grout into building codes and standards, questions have been raised as to whether different construction practices need to be implemented in the field to minimize the potential for blowouts. Past research has shown a sharp increase in pressure when placing or consolidating conventional grout. These internal pressures were greatly diminished in piers with horizontal reinforcement. Further research into internal grout pressure based on type of grout (conventional or self-consolidating), height of grout column, and presence of reinforcement may provide insight into pressures developed within concrete masonry assemblies during grout placement and help to develop guidelines for placement to avoid blow outs and similar problems. ACI Committee 237 Self-Consolidating Concrete is preparing a document that addresses head pressure in both formed concrete and concrete masonry. **Implementation** This research may lead to industry recommendations or code revisions to limit the likelihood of grout blowouts during construction.
Use of Limestone Dust as Cement Replacement	**Project Summary** Objective – This investigation is aimed at determining the best use and potential impacts of using high replacement limestone dust instead of portland cement in the production of concrete masonry units. Potential Significance and Impact – Excellent. Approximate Timeframe – 8 to 12 months. **Background** Due to a host of environmental concerns combined with the growth of the LEED program and similar sustainability ratings systems, the market has been searching for means and methods of reducing the impact of CO_2 emissions associated with the production of concrete and to find ways of using industrial by-products that will decrease the volume of landfill materials. This project will examine the effect of using large replacement volumes of limestone dust and fly ash as supplementary cementitious materials. Potential recognizable benefits include: • Use of pre-consumer recycled material to create more sustainable products; • Reduction of concrete masonry unit life-cycle CO_2 emissions; and

Project Description	Overview
	• The evaluation of limestone dust as an economical supplementary cementitious material. **Implementation** Due to the innovative nature of this research project, this investigation is considered a pilot study to ascertain the impact on physical properties of units manufactured with cement replacements. Additional research may be necessary to more fully quantify other potential physical impacts, such as including shrinkage, durability, and efflorescence, on the suitability of incorporating supplemental cementitious materials into production.
Update NCMA's Inspection and Testing Manual	**Project Summary** Objective – Update the existing NCMA Inspection and Testing Manual to reflect revisions incorporated into the 2015 International Building Code (IBC) and the documents referenced by the IBC. Potential Significance and Impact – Moderate. Approximate Timeframe – 6 to 8 months. **Background and Product Summary** The current NCMA inspection and testing manual is based on the 2006 edition of the IBC. With the recent finalization of the 2015 edition of the I-Codes, jurisdictions across the country will begin the process of reviewing and adopting these latest design and construction provisions. The update to this manual will provide users with a guide to help them understand and transition between the various editions of these codes. **Implementation** Upon completion, the updated manual will be available at no charge in PDF format through member sponsored NCMA Solutions Center sites and for purchase through NCMA and other industry allied partners. Additionally, this manual is used as a reference source to various seminar and education courses, including NCMA's laboratory technician certification program.
Development of Precision Statement for ASTM C140	**Project Summary** Objective – Develop a precision statement for the test methods contained in ASTM C140 using concrete masonry units. Potential Significance and Impact – Moderate. Approximate Timeframe – 6 to 8 months. **Background** All ASTM standards are required to have a precision and bias statement. In the absence of the required data for generating this statement, a clause containing information that no precision and bias has been created for this method is incorporated into the standard. ASTM C140, *Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units*, does not have a calculated precision statement, and because there is no reference material, a bias statement cannot be determined. Developing a precision statement provides users of standards with acceptable limits for within-test variability. This can be used to determine whether differences in tested values are expected, or if there are potential problems with the obtained values. There is data available through the Cement and Concrete Reference Laboratory (CCRL) CMU Proficiency Sample Program that can be used to develop this statement with little associated cost. This information, however, is based on units with nominal dimensions of 4 x 8 x 8 inches. Anecdotal and limited evidence suggests that tests on smaller units tend to have larger variability in test results than larger units. As such, a precision statement based on test results using 4 inch units may inherently result in larger variability. As such, it is potentially desirable to develop a precision statement on a larger and more common size unit, such as 8 x 8 x 16 inches. **Implementation** Incorporate into ASTM C140 upon completion.

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Education – College and Professional	**Project Summary** Objective – Create a startup course for masonry design applicable to both students and practitioners. Potential Significance and Impact – Excellent. Approximate Timeframe – 6 to 8 months. **Background** Masonry design courses at the university level are often offered as an elective, if offered at all. The new model many universities are implementing is to offer design courses in the evenings that are open to both students and practicing designers. These courses are often taught by adjunct professors that have little to no teaching resources available to them. This project would develop such resources. **Implementation** Once developed, offer course resources for free to any university or organization willing to establish a masonry design course.
Investigate the Seismic Limits on Mortar Type	**Project Summary** Objective – Asses the need/appropriateness of existing code limits on mortar type in high seismic design categories. Potential Significance and Impact – Good. Approximate Timeframe – 12 to 16 months. **Background** Currently building codes limit the use of Type N and masonry cement mortars in regions of high seismicity. Because structures in these regions are also required by code to be reinforced, thereby making the mortar properties structurally irrelevant, the question has been raised as to the technical need for maintaining these limits on mortar type. **Implementation** Revise existing code requirements based on the results of this investigation.
Environmental Data Collection	**Project Summary** Objective – This project is focused on an industry-wide data collection for determining life cycle impacts of manufactured concrete products. The data could be used for updating life-cycle databases and evaluation tools, and potentially to create industry or sector-wide environmental product declarations. Potential Significance and Impact – Excellent. Approximate Timeframe – 12 to 24 months. **Background** The increased focus on sustainable design objectives and transparency in reporting drives need for a large-scale effort to collect industry data for the creation of EPDs to be used in LCA analyses. Material transparency has risen to the forefront of the green construction movement, especially for sourcing of materials. Requirements for using products with environmental product declarations (EPD) have emerged in rating systems (such as LEED), and it is likely similar requirements will eventually be included in project specifications and the IgCC. Additionally, other declarations, such as Health Product Declarations, are being discussed as well. These declarations are based on life cycle assessments of materials and products. Several years ago, the NCMA Foundation funded a life-cycle inventory project for the concrete masonry industry. While some beneficial information was obtained, there were problems with the collected data, making the results not usable for purposes of updating life-cycle databases, or as the basis for an industry-wide EPD. This project would focus on a new data collection effort to provide the industry with average environmental impacts of manufactured concrete products. **Implementation** The data collected in this project could be used for updating existing life-cycle databases or analysis tools such as Athena Eco-Collector. If desired, such data could also be used to develop an industry-

<table>
<tr><th>Project Description</th><th>Overview</th></tr>
<tr><td></td><td>average environmental product declaration or similar documents.</td></tr>
<tr><td>Fire Ratings Using Non-Traditional Materials</td><td>Project Summary
Objective – Investigate how the fire resistance rating of concrete masonry assemblies is affecting by using ‘non-traditional’ aggregates in the concrete.
Potential Significance and Impact – Good.
Approximate Timeframe – 18 to 24 months.

Background
Fire resistance ratings for concrete masonry assemblies can be calculated in accordance with the ACI 216.1/TMS 0216 standard. This calculation determines fire rating based on the equivalent thickness of a unit and the aggregates used in the mix design. Only certain aggregates are listed in the standard. These aggregates are:
Calcareous or siliceous gravel;
Limestone, cinders, or air-cooled slag;
Expanded clay, shale, or slate;
Pumice, scoria, or expanded slag.
When a unit is produced with a constituent material that is not currently recognized in the standard, a fire rating cannot be calculated, and another route, such as ASTM E119 testing is necessary. Such a test can be very expensive, and the results limited to a single mix design and unit configuration.

This project is aimed at developing a method for calculating fire ratings units with non-traditional materials. Such calculation may be based on the physical characteristics of the constituent materials (thermal expansion, high temperature stability), so that the calculation can be applicable to a wider range of units and materials.

Actual fire testing (ASTM E119) has several potential end points. Most concrete masonry assemblies that have been tested reach the heat transfer end point, but there are some potential structural stability end points as well. With non-traditional aggregates, high temperature stability and the implications on structural stability of the overall assembly during a fire would need to be considered as well.

Implementation
The results of this research will be used to update the fire resistance calculation method for concrete masonry assemblies.</td></tr>
<tr><td>Updating the Method Used for Evaluating the Linear Drying Shrinkage of Concrete Masonry Units</td><td>Project Summary
Objective – Research the procedure for determining the linear drying shrinkage of concrete masonry units to simplify the procedure, reduce variability in results, and take advantage of more contemporary testing equipment.
Potential Significance and Impact – Moderate.
Approximate Timeframe – 6-12 months.

Background
ASTM C426 is the test method for determining linear drying shrinkage of concrete masonry units. This method, while accurate, has not been significantly modified in many decades. The required equipment is fairly rudimentary, and is not necessary inclusive of newer state-of-the-art equipment available currently. The testing procedure is fairly rigorous, requiring evaluation every 48 hours over multiple weeks. This project would look critically at the method used for linear drying shrinkage and develop revisions to the method to make it easier and simpler to perform. Care must be taken, however, during such revision, that the results obtained from the new method are comparable to historical results obtained from the current method.

Implementation
This project will result in an updated ASTM standard test method for determining linear drying shrinkage. The hope is an updated method may make testing less costly for laboratories, with savings</td></tr>
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	also passed on to clients.
Verifying the Specified Compressive Strength of Concrete Masonry	**Project Summary** Objective – Develop a statistical evaluation method for verifying the specified compressive strength of masonry, f'_m. Potential Significance and Impact – Good. Approximate Timeframe – 12 to 18 months. **Background** The *Specification for Masonry Structures* provides several methods for verifying compliance with the specified compressive strength of masonry (f'_m). One method performs testing on constructed concrete masonry prisms. The other method, the Unit Strength Method, correlates the strength of the CMU used, along with the mortar type, to a given f'_m. The Unit Strength Method relies on the actual tested compressive strength of units, rather than historical test data available for most producers. The building code for structural concrete (ACI 318) permits qualification of a concrete mix design through statistical evaluation of past compression testing results on a mix design. This allows for a given mix design to be approved without actual physical testing. It may be possible to develop a similar statistical correlation and means of approving a given concrete masonry mix design and the Unit Strength Method. In concept, this would allow a producer to qualify their units to a given f'_m based on past test results of that mix, adding in a statistical evaluation of the results to provide a confidence interval. This would allow a producer to meet project requirements without having to test actual units for that given job, so long as enough historical data of that mix design is available. **Implementation** The end product of this research would be new provisions for the masonry building code allowing approval of a CMU mix design to a specified compressive strength of masonry, while providing a statistical analysis basis of previous testing of that mix.
Development of Masonry Energy Design Standard	**Project Summary** Objective – This project will collect necessary data and develop a new method for designing the thermal envelope of masonry assemblies. This method is intended to a simplified design method, making thermal envelope design easier for masonry construction. Potential Significance and Impact – Excellent. Approximate Timeframe – 24 to 36 months. **Background** With increased focus on energy efficiency is buildings, the code requirements for thermal envelopes continues to increase in stringency. Prescriptive energy compliance has become less practical and more conservative in most climate zones. Other methods, such as trade-offs and whole building analyses, are costly and not practical for some buildings. For structural design, a simplified method called "Direct Design" was developed several years ago to simply design for certain structures. A similar simplified method for the building envelope could be developed, using data from various modeling studies performed in recent years. This project would mine existing data to develop a database as the background for this method. The actual design methodology would also be created. **Implementation** This project would result in a design method for building thermal envelope that could be developed into an ANSI standard, which would in turn be referenced in the International Energy Conservation Code. This would provide an alternative method for envelope design for concrete masonry assemblies in the Code.