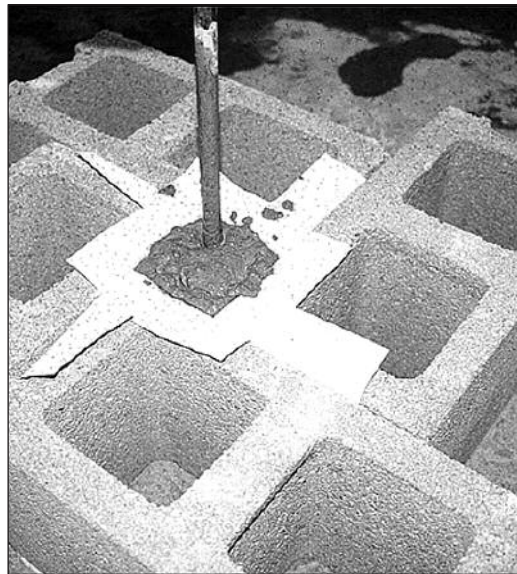


Research and Testing Services

The Laboratory is dedicated to the scientific testing and research of concrete masonry products and systems. Staffed by professional engineers and technicians with over 50 years of experience in the masonry industry, the Laboratory is equipped to perform nearly any physical testing of masonry units and assemblages. The Laboratory performs research and development work for both the Association and individual companies. The Laboratory staff is also available for consultation on developing a research program to demonstrate the performance characteristics of a specific material, product, or masonry system.



Lab Capabilities

Unit Testing

- Concrete Masonry Units
- Segmented Retaining Wall Units
- Pavers and Paving Slabs
- Clay Brick

Product Certifications

- Prism Testing
- Mortar Testing
- Grout Testing
- Aggregate Testing
- Wall Testing

Unit Manufacturing

A state of the art manufacturing line is available for the production of almost any unit for evaluating mix designs, admixtures, or other variables.

Quality Assurance Testing

Many NCMA members take advantage of the Laboratory's masonry testing expertise for quality assurance testing. Our rates are cost competitive and the small investment in shipping the materials to NCMA headquarters for testing is often justified by the assurance that the testing will be performed and reported accurately and correctly.

Product Development Research

Do you have a product, material, system or even an idea for the masonry industry that is worth the investment to develop? The NCMA Research and Development Laboratory is available for assistance in developing products, materials, and systems for use in the masonry marketplace. Research and testing programs are recommended as necessary.

Masonry Product and Masonry System Testing

The Laboratory staff is available for consultation on developing a research program to demonstrate the performance characteristics of a specific material, product, or masonry system.

Building Code Evaluations

Products that do not conform to the general assumptions of building codes are typically evaluated by an independent agency for use under the alternative materials and systems section of the building code. The NCMA Laboratory has considerable experience in working with the evaluation services provided by these independent agencies. The Laboratory can assist in defining and performing the testing and research that may be necessary to demonstrate the performance properties of the evaluated product or system to the evaluation service.

Aggregate Analysis for Developing Mix Designs

Do you have a material that you think may be appropriate for the production of concrete masonry units? The Laboratory determines the physical properties of products made with various aggregates. In-house block production capability is used by the lab to evaluate the effects that various mix designs have on masonry unit properties.

Cost Schedule

Listed on the following pages are the typical costs for conducting some of the more frequently requested standard tests. If you don't see a service listed, please call for a consultation based on your specific needs.

Research and Testing Services

Typical Test Method Capabilities

- ACI 216.1/TMS0216.1 – Determining Fire Resistance of Concrete and Masonry Construction Assemblies
- ASTM C29 – Bulk Density ("Unit Weight") and Voids in Aggregate
- ASTM C40 – Organic Impurities in Fine Aggregates for Concrete
- ASTM C67 – Sampling and Testing Brick and Structural Clay Tile
- ASTM C114 – Chemical Analysis of Hydraulic Cement
- ASTM C117 – Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C128 – Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
- ASTM C136 – Sieve Analysis of Fine and Coarse Aggregate
- ASTM C140 – Sampling and Testing Concrete Masonry Units and Related Units
- ASTM C142 – Clay Lumps and Friable Particles in Aggregates
- ASTM C151 – Autoclave Expansion of Hydraulic Cement
- ASTM C157 – Length Change of Hardened Hydraulic-Cement Mortar and Concrete
- ASTM C185 – Air Content of Hydraulic Cement Mortar
- ASTM C305 – Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
- ASTM C418 – Abrasion Resistance of Concrete by Sandblasting
- ASTM C426 – Linear Drying Shrinkage of Concrete Masonry Units
- ASTM C641 – Staining Materials in Lightweight Concrete Aggregates



- ASTM C780 – Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
- ASTM C1019 – Sampling and Testing Grout
- ASTM C1072 – Measurement of Masonry Flexural Bond Strength
- ASTM C1262 – Evaluating the Freeze-Thaw Durability of Manufactured Concrete Masonry Units and Related Concrete Units
- ASTM C1314 – Compressive Strength of Masonry Prisms
- ASTM C1357 – Evaluating Masonry Bond Strength
- ASTM C1506 – Water Retention of Hydraulic Cement-Based Mortars and Plasters
- ASTM D6638 – Determining Connection Strength Between Geosynthetic Reinforcement and Segmental Concrete Units (Modular Concrete Blocks)
- ASTM D6916 – Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks)

- ASTM E72 – Conducting Strength Tests of Panels for Building Construction
- ASTM E514 – Water Penetration and Leakage Through Masonry
- ASTM E518 – Flexural Bond Strength of Masonry
- ASTM E519 – Diagonal Tension (Shear) in Masonry Assemblages
- ASTM E2178 – Air Permeance of Building Materials
- TMS 0302-00 – Determining Sound Transmission Class Rating for Masonry Units

Typical Specification Compliance Capabilities

- ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
- ASTM C33 – Concrete Aggregates
- ASTM C55 – Concrete Brick
- ASTM C73 – Calcium Silicate Brick (Sand-Lime Brick)
- ASTM C90 – Loadbearing Concrete Masonry Units
- ASTM C91 – Masonry Cement
- ASTM C129 – Nonloadbearing Concrete Masonry Units
- ASTM C144 – Aggregates for Masonry Mortar
- ASTM C216 – Facing Brick (Solid Masonry Units Made from Clay or Shale)
- ASTM C270 – Mortar for Unit Masonry
- ASTM C331 – Lightweight Aggregates for Concrete Masonry Units
- ASTM C387 – Packaged, Dry, Combined Materials for Mortar and Concrete
- ASTM C404 – Aggregates for Masonry Grout
- ASTM C476 – Grout for Masonry
- ASTM C744 – Prefaced Concrete and Calcium Silicate Masonry Units
- ASTM C936 – Solid Concrete Interlocking Paving Units
- ASTM C1319 – Concrete Grid Paving Units
- ASTM C1329 – Mortar Cement
- ASTM C1372 – Dry Cast Segmental Retaining Wall Units
- ASTM C1384 – Admixtures for Masonry Mortars
- ASTM C1491 – Concrete Roof Pavers
- ASTM C1623 – Manufactured Concrete Masonry Lintels
- ASTM D6684 – Materials and Manufacture of Articulating Concrete Block (ACB) Revetment Systems
- CSA STD A165.1 – Concrete Block Masonry Units
- CSA STD A165.2 – Concrete Brick Masonry Units
- CSA STD A165.3 – Prefaced Concrete Masonry Units
- CSA STD A231.1 – Precast Concrete Paving Slabs
- CSA STD A231.2 – Precast Concrete Pavers



Testing Services Schedule

1. Listed materials required are minimums. Some units may break or be damaged during shipping, so it is recommended to send extra units when possible.
2. Prices include basic saw cutting. Additional fees may apply for special unit configurations and other test preparation.

CONCRETE MASONRY UNITS

	Materials Required	Member	Professional	Retail
ASTM C90 / C55 Compliance Package ASTM C140 & C426				
Compression, Absorption, Unit Weight, Dimensional Tolerances, Shrinkage	9 units	\$650	\$750	\$910
ASTM C140				
Compression (Net Area), Absorption, Unit Weight, Dimensional Tolerances	6 units	\$295	\$340	\$415
Absorption, Unit Weight	3 units	\$160	\$185	\$225
Compressive Strength (Net Area)	3 units	\$160	\$185	\$225
ASTM C426				
Drying Shrinkage	3 units	\$460	\$530	\$645
ASTM C744				
Resistance to Cracking, Cracking, or Spalling	3 units	\$200	\$230	\$280
Resistance to Chemicals	3 units	\$500	\$575	\$700
Adhesion of Facing	3 units	\$250	\$290	\$350
Soiling and Cleansability	3 units	\$500	\$575	\$700
Water Repellency Tests				
Water Uptake	3 units	\$175	\$205	\$245
Spray Bar	3 units	\$275	\$320	\$385

SEGMENTAL RETAINING WALL UNITS

	Materials Required	Member	Professional	Retail
ASTM C1372 Compliance Package ASTM C140 and C1262				
1. Freeze Thaw in Water 2. ASTM C140 Compression Tests 3. ASTM C140 Absorption Tests 4. Dimensional Tolerances	5 units	\$1040	\$1200	\$1460
Complete Freeze Thaw Testing Program ASTM C140 and C1262				
Includes C1372 Compliance Package plus Freeze Thaw in Saline	5 units	\$1265	\$1455	\$1775
ASTM C140				
Compression (Net Area), Absorption, Unit Weight, Dimensional Tolerances	3 units	\$410	\$475	\$575
ASTM C140 & C1262				
Freeze Thaw in Saline Only	5 units	\$900	\$1035	\$1260
ASTM C1262				
Freeze Thaw in Water and Saline	5 units	\$960	\$1105	\$1345
Freeze Thaw in Water Only	5 units	\$680	\$785	\$955
Freeze Thaw in Saline Only	5 units	\$580	\$670	\$815
ASTM D6638				
SRW Connection*	Call for info	\$900/set	\$1035/set	\$1260/set
ASTM D6916				
SRW Shear*	Call for info	\$900/set	\$1035/set	\$1260/set

*A set consists of six (6) tests conducted on the identical setups (i.e. shear strength test for a specific block-grid-block combination or connection test for a specific grid-block combination) for four (4) specific normal loads.

Testing Services Schedule

PAVERS AND PAVING SLABS

	Materials Required	Member	Professional	Retail
Complete ASTM C936 Compliance Package ASTM C67, C140 and C418				
1. C67 Freeze Thaw in Water (50 cycles)	15 units	\$1750	\$2015	\$2450
2. C418 Abrasion Resistance				
3. C140 Compression Tests				
4. C140 Absorption Tests				
5. Dimensional Tolerances				
ASTM C140				
Compression (Net Area), Absorption, Unit Weight, Dimensional Tolerances	6 units	\$295	\$340	\$415
ASTM C418				
Abrasion Resistance (per unit)	1 unit	\$300	\$345	\$420
ASTM C67				
Freeze Thaw in Water (50 cycles)				
2 sets or more	5 units	\$980	\$1130	\$1375
single set	5 units	\$1550	\$1785	\$2170
ASTM C1645				
Freeze Thaw and De-icing Salt Durability				
2 sets or more	5 units	\$980	\$1130	\$1375
single set	5 units	\$1550	\$1785	\$2170
Concrete Paving Slab Evaluation				
Combination of Flexural Strength and Surface Scaling	6 units	\$1370	\$1575	\$1920
Flexural Strength, Dimensional Variations	3 units	\$220	\$255	\$310
Scaling Resistance Test	3 units	\$1250	\$1440	\$1750
<i>Note: Additional six specimens required to be provided, and testing on these units will be contingent on test results of the first set. Additional fees may apply.</i>				
Splitting Tensile				
Splitting Tensile	3 units	\$285	\$330	\$400

CLAY BRICK

	Materials Required	Member	Professional	Retail
ASTM C67				
Compression	5 bricks	\$160	\$185	\$225
Absorption	5 bricks	\$200	\$230	\$280
Initial Rate of Absorption	5 bricks	\$200	\$230	\$280
Efflorescence	5 bricks	\$290	\$335	\$410
Void Area Calculation	5 bricks	\$100	\$115	\$140
Freeze Thaw				
2 set minimum	5 bricks	\$980	\$1130	\$1375
single set	5 bricks	\$1550	\$1785	\$2170
Modulus of Rupture (Flexure Test)	5 bricks	\$160	\$185	\$225
<i>All tests include measurement of dimensions. Coordinate total number of specimens as needed prior to shipping.</i>				

OTHER CONCRETE PRODUCTS

Contact the Research and Development Laboratory for information and price quotes for testing other concrete products not listed above.

Concrete Masonry Performance Product Certifications**

	Materials Required	Member	Professional	Retail
Certifications Package				
Fire Ratings	One CMU	\$185	\$215	\$260
Thermal Factors-CMU (U-Factor, R-Value, Heat Capacity)	Unit mix design (kept confidential)			
Sound Transmission Classification				
Thermal Properties Integrally Insulated CMU	Call for information	Call for quote		
<i>**Note: These certificates are valid for a period of one year. Certificates can be renewed provided that no changes have been made to the unit mix design, manufacturing process, or curing process. Renewal fee: Member: \$100 / Professional: \$115 / Retail: \$140</i>				

Testing Services Schedule

AGGREGATE ANALYSES

		Materials Required	Member	Professional	Retail
Sieve Analysis (Gradation)	ASTM C136	10 lbs aggregate	\$110	\$130	\$155
Unit Weight Analysis	ASTM C29	15 lbs aggregate	\$85	\$100	\$120
Organic Impurities	ASTM C40	5 lbs aggregate	\$95	\$110	\$135
Clay Lumps and Friable Particles	ASTM C142	5 lbs aggregate	\$110	\$130	\$155
Loss on Ignition	ASTM C114	5 lbs aggregate	\$90	\$105	\$130
Staining Materials	ASTM C641	2 lbs aggregate	\$190	\$220	\$270
Shrinkage (28 and 100 days)	ASTM C157 (modified)	10 lbs aggregate	\$495	\$570	\$695
Pop-Out Materials	ASTM C151 (modified)	10 lbs aggregate	\$240	\$280	\$340
Material Passing 200 Mesh	ASTM C117	10 lbs aggregate	\$80	\$95	\$115
Specific Gravity and Absorption	ASTM C128	10 lbs aggregate	\$110	\$130	\$155
NCMA Aggregate Freeze Thaw Test		20 lbs aggregate	\$260	\$300	\$365
Pop-Out Materials - Investigation of CMU of lightweight materials		1 CMU	\$130	\$150	\$185
Lightweight Aggregate Evaluation	ASTM C331	50 lbs aggregate	\$920	\$1060	\$1290
Includes: Sieve Analysis, Unit Weight, Organic Impurities, Clay Lumps and Friable Particles, Loss on Ignition, Shrinkage (28 and 100 days)					

MORTAR AND GROUT

		Materials Required	Member	Professional	Retail
ASTM C270 – Lab mortar evaluation					
Included: 28 day cube compressive strength water retention, air content		20 lbs mortar sand 5 lbs each cementitious material job specifications	\$275	\$320	\$385
Compressive strength at additional ages			\$60	\$70	\$85
ASTM C387 – Lab mortar evaluation					
Included: 28 day cube compressive strength, water retention, air content		20 lbs combined mortar materials	\$275	\$320	\$385
Compressive strength at additional ages			\$60	\$70	\$85
ASTM C780 – Lab evaluation of field consistency mortar					
Includes: 28 day cube compressive strength consistency by cone penetration, water retention		100 lbs mortar sand 20 lbs each cementitious material job specifications	\$205	\$235	\$290
Compressive strength at additional ages			\$60	\$70	\$85
Mortar Aggregate Ratio (Cement to Aggregate Ratio)		2 mortar samples (500-700 g) 1 sand sample (500+ g)	\$240	\$280	\$340
Additional Mortar Testing available on request		Call for more information		Call for quote	
ASTM C1019 – Sampling and Testing of Grout					
Includes: Compressive Strength at 28 days		100 lbs mortar sand 30 lbs each cementitious material job specifications	\$225	\$260	\$315
Compressive strength at additional ages			\$85	\$100	\$120
Compressive strength of delivered specimens		single specimen set of 3 specimens	\$65 \$170	\$75 \$200	\$95 \$240
ASTM C1384 – Mortar admixtures evaluation					
		Call for more information		Call for quote	

MASONRY PRISMS - COMPRESSIVE STRENGTH

The prices below reflect the evaluation of the maximum compressive load. Current specifications and building codes require that net area strengths be reported. To calculate net area compressive strengths on hollow, ungrouted prisms, an ASTM C140 test must be performed on representative units used in prism construction, or a C140 test report must be provided.

	Materials Required	Member	Professional (based on 3 specimens)	Retail
ASTM C1314				
Prisms delivered to laboratory, up to 16 inch high				
8 inch or less hollow, half length	delivered prisms	\$200	\$230	\$280
10 inch or greater hollow, half length	delivered prisms	\$225	\$260	\$315
Grouted prism surcharge, per set		\$50	\$50	\$50
Full length prism surcharge, per set		\$50	\$50	\$50
Prism heights between 16 inches and 24 inches surcharge, per set		\$100	\$100	\$100
Laboratory Constructed Prisms				
Includes: prism compression testing Mortar testing – 28 day compression (C780) Unit testing – compression absorption, unit weight (C140)	12 CMUs and specified mortar type	\$760	\$875	\$1065
<i>Note: Additional fees may be charged for delivered prisms that require special "trimming" or "dressing" prior to capping.</i>				

Testing Services Schedule

PRISM – FLEXURAL BOND

All testing involving prism fabrication includes mortar testing per ASTM C780.

	Materials Required	Member	Professional	Retail
ASTM C1072 – Bond Wrench				
Brick Prisms (fabrication, testing of 1 prism, 5 joints)	6 brick, mortar materials	\$380	\$440	\$535
Brick Prisms (fabrication, testing of 6 prisms, 30 joints)	36 brick, mortar materials	\$1250	\$1440	\$1750
Brick Prisms delivered	delivered prisms	\$30/joint	\$35/joint	\$45/joint
CMU Prisms (fabrication, testing of 5 prisms, 5 joints)	10 CMUs, mortar materials	\$570	\$655	\$800
CMU Prisms (fabrication, testing of 30 prisms, 30 joints)	60 CMUs, mortar materials	\$1500	\$1725	\$2100
CMU Prisms delivered (testing of 1 prism)	delivered prisms	\$45/joint	\$55/joint	\$65/joint
CMU Prisms delivered (testing of 30 prisms, 30 joints)	delivered prisms	\$1110	\$1280	\$1665
ASTM E518 Modulus of Rupture by 3rd Point Loading				
CMU or Brick Pier/Prism (fabrication, testing)	Call for more information		Call for quote	

STRUCTURAL WALL TESTS

The following is a listing of the more commonly requested structural wall testing. Additional standard and custom testing can also be performed or request. Typical testing fees including specimen fabrication and testing, as well as documentation of mortar, grout, and unit properties are shown below. Contact the laboratory for specific pricing for your project.

	Materials Required	Typical Testing Fee
ASTM E72 Flexural Strength		
4 foot x 8 foot specimens tested vertical with transverse load from an airbag. Optional method: specimens testing horizontal with 1/4 point loading	30 full size CMUs 12 half length CMUs Mortar/grout (as needed) Reinforcement (as needed)	\$1500-\$2500 per wall call for quote
Compressive Strength		
4 foot x 8 foot specimens tested in compression with an eccentric axial loading at a distance of t/3 from centroid.	30 full size CMUs 12 half length CMUs Mortar/grout (as needed) Reinforcement (as needed)	\$1500-\$2500 per wall call for quote
In-Plane Shear Strength		
	CMUs based on wall dimensions Mortar/grout (as needed) Reinforcement (as needed)	call for quote
ASTM E519 Diagonal Tension (Shear)		
Testing of 4 foot x 4 foot specimens	15 full size CMUs 6 half length CMUs Mortar/grout (as needed) Reinforcement (as needed)	\$1500-\$2500 per wall call for quote
ASTM E514 Water Penetration		
Water penetration testing of wall panels	27 full size CMUs 9 half size CMUs Mortar/grout (as needed) Reinforcement (as needed)	\$1500-\$2500 per wall call for quote
ASTM E2178 Air-Barrier Testing		
CMU wall section for air permeance Approx. 4 foot x 4 foot wall specimens 5 specimens per material	24 full size CMUs 8 half length CMUs Mortar/grout (as needed) Reinforcement (as needed)	\$2500-\$3000 per set (5 specimens) call for quote
<i>Note: Material quantities are for walls only. Additional materials may be needed for unit, mortar, and grout testing.</i>		

UNIT MANUFACTURING

A state of the art concrete unit production machine is available, capable of manufacturing concrete block, concrete pavers, segmented retaining wall units, concrete brick, and other related concrete products. The production line is outfitted with an automated batching system with manual control override for the ability to adjust and control mixes by hand, while also keeping the system as close to a production facility as possible. The manufacturing facility can be used for many applications including:

- Trial mix designs
- Recycled material evaluation
- Admixture influences
- Influence of cementitious materials
- Prototype unit production
- Curing influences
- Pigment/color evaluation

Available in Spring 2007. Call the laboratory today for a consultation including cost and scheduling estimates.

Testing Services Schedule in Accordance with Canadian Standards Association

1. Listed materials required are minimums. Some units may break or be damaged during shipping, so it is recommended to send extra units when possible.
2. Prices include basic saw cutting. Additional fees may apply for special unit configurations and other test preparation.

	Materials Required	Member	Professional	Retail
CSA Standard A165.1 / A165.2 Compliance Package				
ASTM C140 & C426				
Compression, Absorption, Unit Weight, Shrinkage, Dimensional Tolerances	13 units	\$650	\$750	\$910
ASTM C140 / CSA Standard A165.1 / A165.2				
Compression (Net Area), Absorption, Unit Weight, Dimensional Tolerances	8 units	\$295	\$340	\$415
Absorption, Unit Weight	3 units	\$160	\$185	\$225
Compressive Strength (Net Area)	5 units	\$160	\$185	\$225
ASTM C426 / CSA Standard A165.1 / A165.2				
Drying Shrinkage	5 units	\$460	\$530	\$545
CSA Standard A165.3 Compliance Package				
Bond Strength or Adhesion of Facing, Dimensional Tolerances	3 units	\$250	\$290	\$350
Resistance to Freeze-Thaw Cycles	5 units	\$680	\$785	\$955
CSA Standard A231.1 Compliance Package				
Combination – Flexural Strength and Surface Scaling, Dimensional Tolerances	6 units	\$1370	\$1575	\$1920
Flexural Strength, Dimensional Variations	3 units	\$220	\$255	\$310
Scaling Resistance Test	3 units	\$1250	\$1440	\$1750
<i>Note: Additional six specimens required to be provided, and testing on these units will be contingent on test results of the first set. Additional fees may apply.</i>				
CSA Standard A231.2				
Combination – Compression and Freeze-Thaw Durability	8 units	\$1750	\$2015	\$2450
Compression and Dimensions	5 units	\$300	\$345	\$420
De-icing Salt Freeze-Thaw Durability				
2 sets or more	3 units	\$980	\$1130	\$1375
single set	3 units	\$1550	\$1785	\$2170
<i>Note: Additional sixteen specimens required to be provided, and testing on these units will be contingent on test results of the first set. Additional fees may apply.</i>				

OTHER CONCRETE PRODUCTS

Contact the Research and Development Laboratory for information and price quotes for test other concrete products, including mortar, grout, and prisms, not listed above.