Cornell University Stone Masonry Standards
- Bluestone
- Granite

February 2025

Stone Masonry Standards

1. Purpose and Need – Existing Conditions
2. Introduction of Standards Team
3. Geology
4. History
5. Standard & Appendices
6. Key Takeaways

Bluestone Campus Map

Bluestone Buildings

Cascadilla Hall
1866

Morrill Hall
1866

White Hall
1866

McGraw Hall
1868

Sibley Hall
1870

Baker Tower, North and South
1913, 1915

Founders Hall
1914

Barton Hall
1915

Baker Laboratory
1921

Bolt Hall & Tower
1921, 1928

Willard Straight Hall
1923

Lyon , War Memorial, McFaddin Hall
1928

Balch Hall
1929

Mennen Hall
1931

Myron Taylor Hall
1932

Ives Hall Faculty Wing
1938

Teagle Hall
1951

Anabel Taylor Hall
1953

Noyes Lodge/Tang Welcome Center
1958/2018

Ives Hall East & West
1962

Hughes Hall
1963/2024

Ward Center
1963

Noyes Community Center
2007

Forest Home Drive Garage
2011

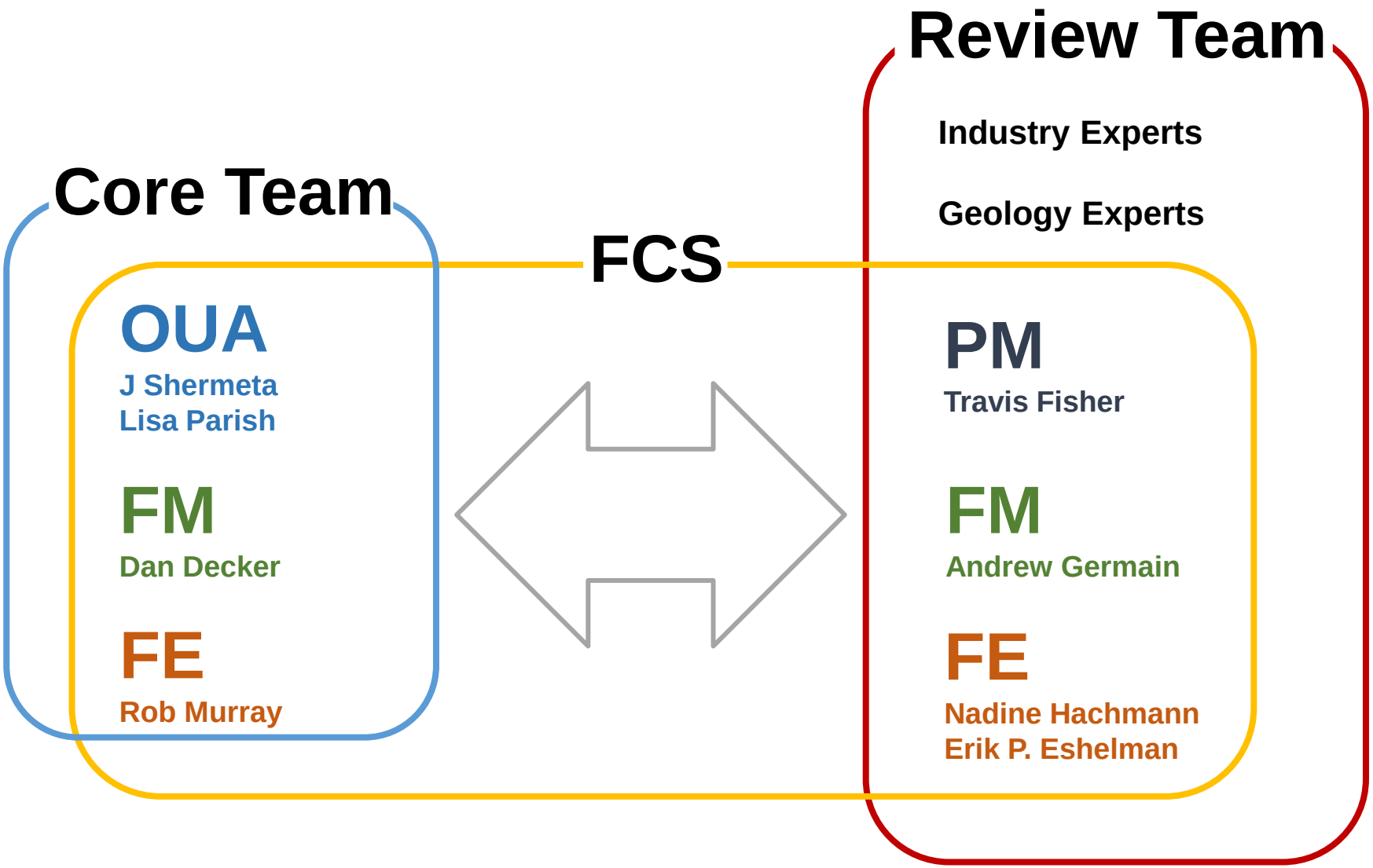
Purpose and Need – Existing Conditions

Purpose and Need – Existing Conditions

Purpose and Need – Existing Conditions

Purpose and Need – Existing Conditions

Team


Review Team
Industry Experts
Geology Experts
Core Team
FCS
OUA
J Shermeta
Lisa Parish
FM
Dan Decker
FE
Rob Murray
PM
Travis Fisher
FM
Andrew Germain
FE
Nadine Hachmann
Erik P. Eshelman

Collaborators – Geology Experts

Frank William Fletcher

Charles B. Degenstein Professor Emeritus of Environmental Science;
B.A. 1959, Lafayette College;
Ph.D. 1964, University of Rochester. (1962, 1999)
devoniandoc@gmail.com

Charles Ver Straeten, Ph.D.

Curator of Sedimentary Rocks
Devonian/Sedimentary Geologist
Director, NYSM Earth Science Teachers Workshop
Member, International Subcommission on Devonian Stratigraphy
Member, New York State Geological Planning and Advisory Council
Vice President, Eastern Section, Society for Sedimentary Geology (SEPM)
New York State Museum
Albany, NY 12230
Charles.VerStraeten@nysed.gov

J. Olaf Gustafson, Ph.D., P.G.

Professional Geologist, Cornell Facilities
gustafson@cornell.edu

Teresa Eileen Jordan

J. Preston Levis Professor of Engineering Emerita
Department of Earth and Atmospheric Sciences
Cornell University
teresa.jordan@cornell.edu

Collaborators – Industry Experts

Laurence Wilson & Lynn Webster

Mesick Cohen Wilson Baker **Architects**

Nancy O'Brien

New York Quarries, Inc

Jay Niedzialkowski

Alliance Masonry Corp.

Clive Copping, RIBA

CVM Engineering

George Sanford

President NYS Bluestone Association

Todd Schnatzmeyer

Executive Director – Indiana Limestone Institute

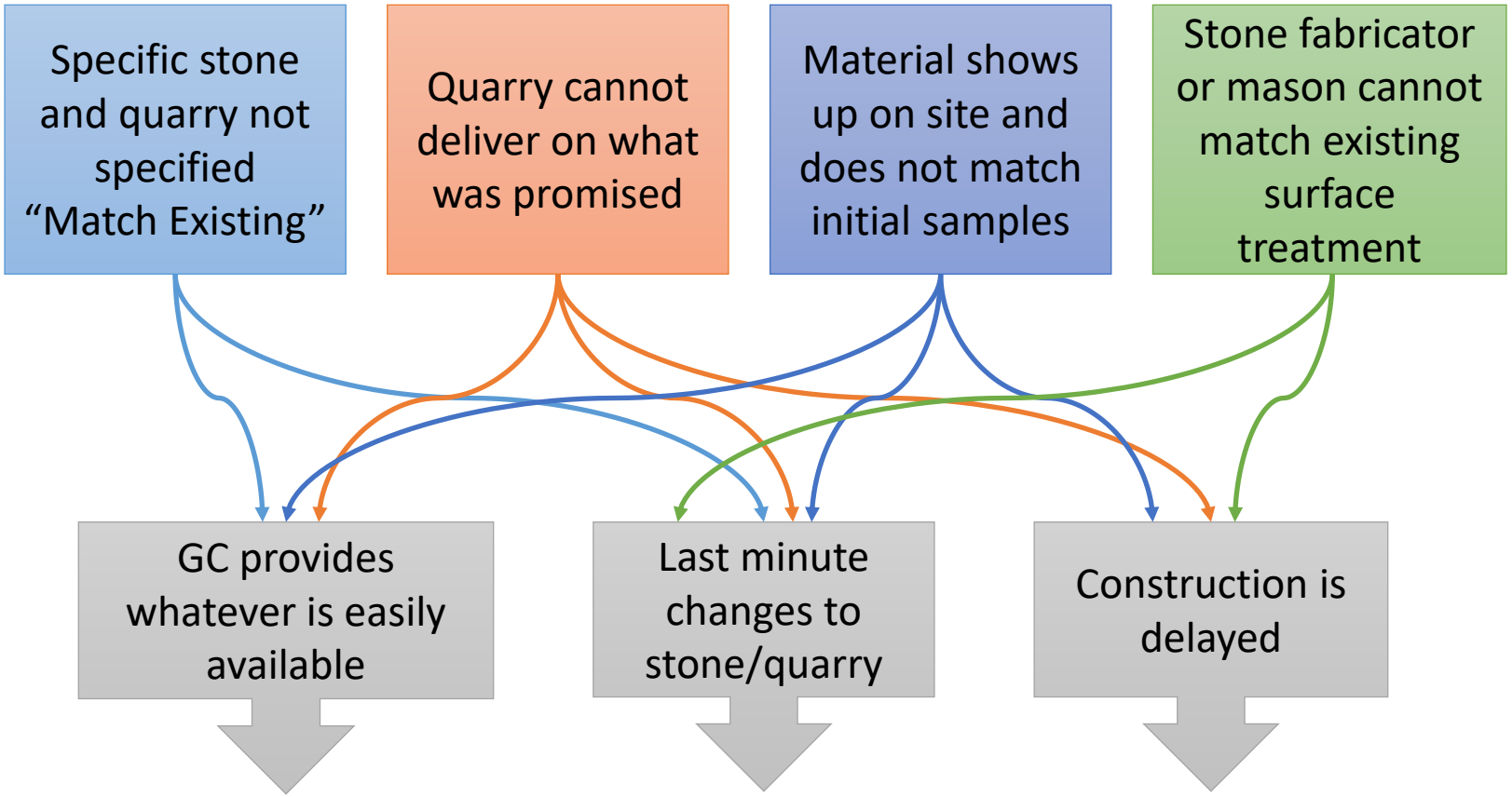
Vincent Roy

Regional Sales Manager at Polycor Inc.

Reid A Johnston

Rademann Stone & Landscaping

Lessons Learned



Stone installation does not match desired aesthetics or performance

Stone installation delayed until issue is resolved, or new quarry/fabricator/mason can be found

Key Aspects of the Standard

RFP Design Agreement

Engage FCS subject matter experts early!

Is an envelope consultant required?

Historical Preservation consultant?

ILPC review?

PreCon Masonry Consultant services, with Mock Up.

SD

Ensure Design Consultant has researched and included specific stone quarry and testing data in Specifications.

Review proposed with FCS subject matter experts.

Discussion regarding quarry vs fabricator.

DD

Review Test Data and Samples provided with FCS subject matter experts.

Ensure Envelope Consultant has needed materials for further testing.

Confirm quarry or fabricator has capacity with onsite visit.

CD

Review Test Data and Samples provided with FCS subject matter experts.

Confirm selected quarry or fabricator has capacity with onsite visit.

CA

Review masonry subcontractor

Review samples and test data provided by quarry with FCS subject matter experts.

Mock Up review and Approval

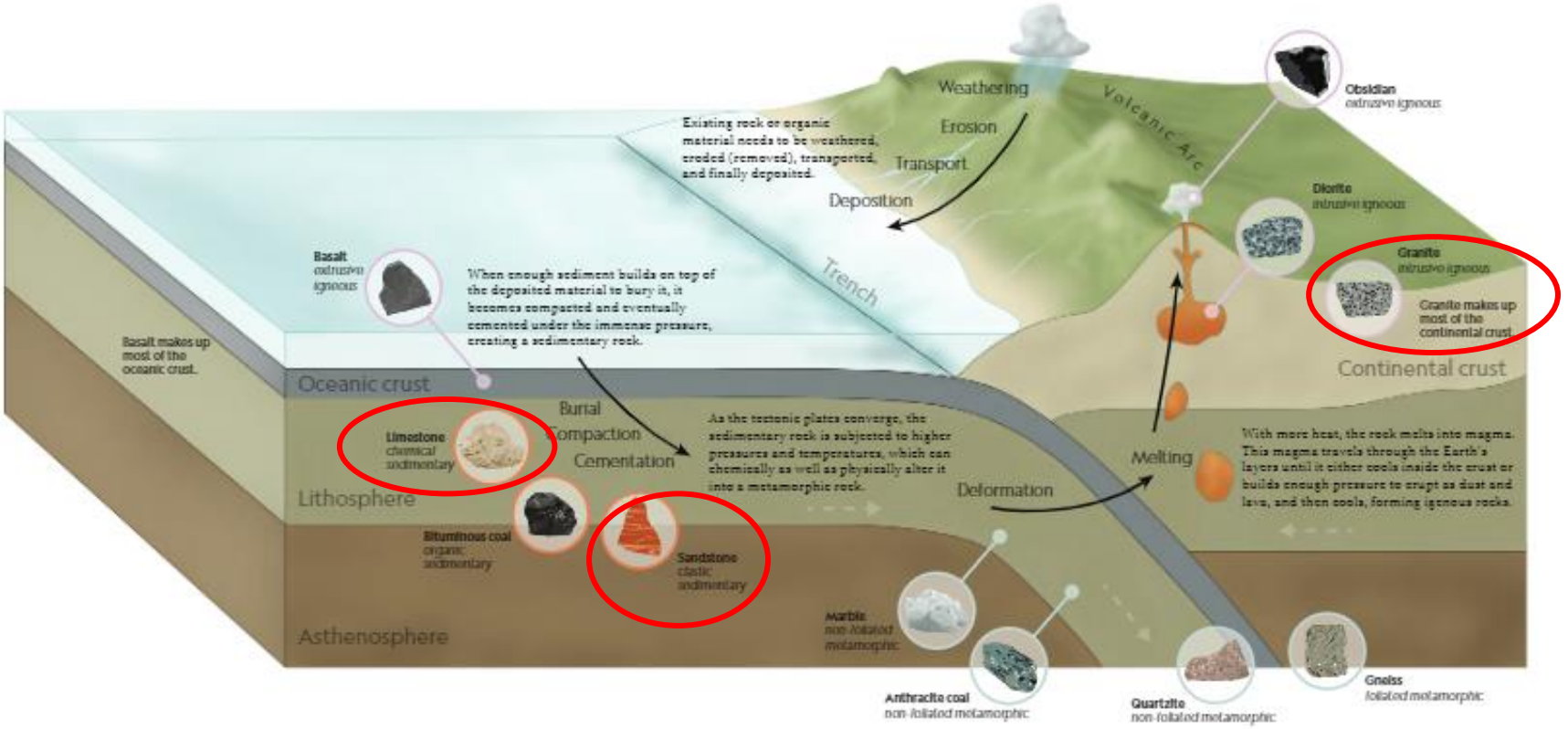
In-Situ Mock Up review and Approval

Ongoing QA/QC on site

Compliance with approved pattern. Workmanship, tooling, etc.

THE ROCK CYCLE

The rock cycle is a series of processes that transform one rock type into another. These processes create three main types of rocks: sedimentary, metamorphic, and igneous.



Rock Subtypes

Sedimentary

Clastic
Made of pre-existing rock and mineral grains

Organic
Formed from carbon-rich, biological material

Chemical
Formed by precipitation from chemical weathering

Metamorphic

Foliated
Multi-layered

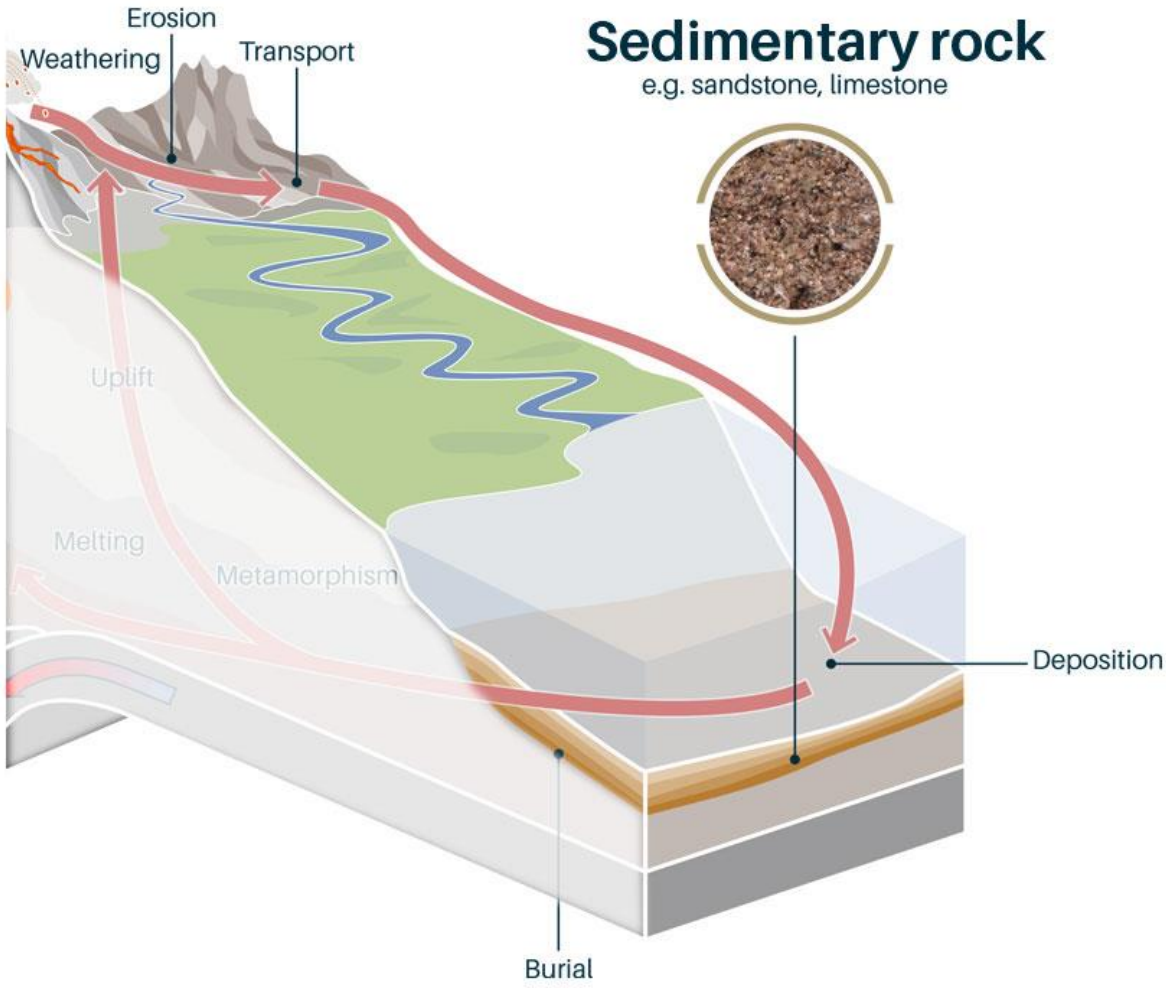
Non-foliated
Non-layered

Igneous

Intrusive
Formed inside the Earth

Extrusive
Formed at Earth's surface

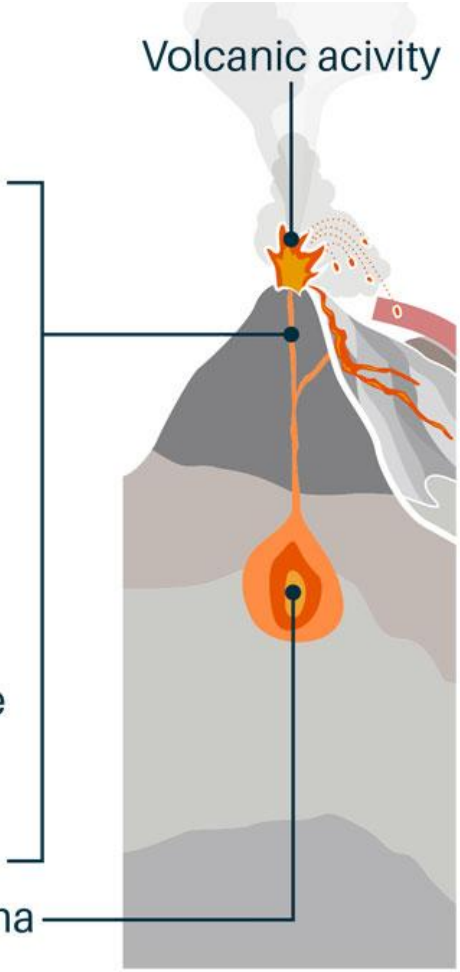
NATIONAL GEOGRAPHIC

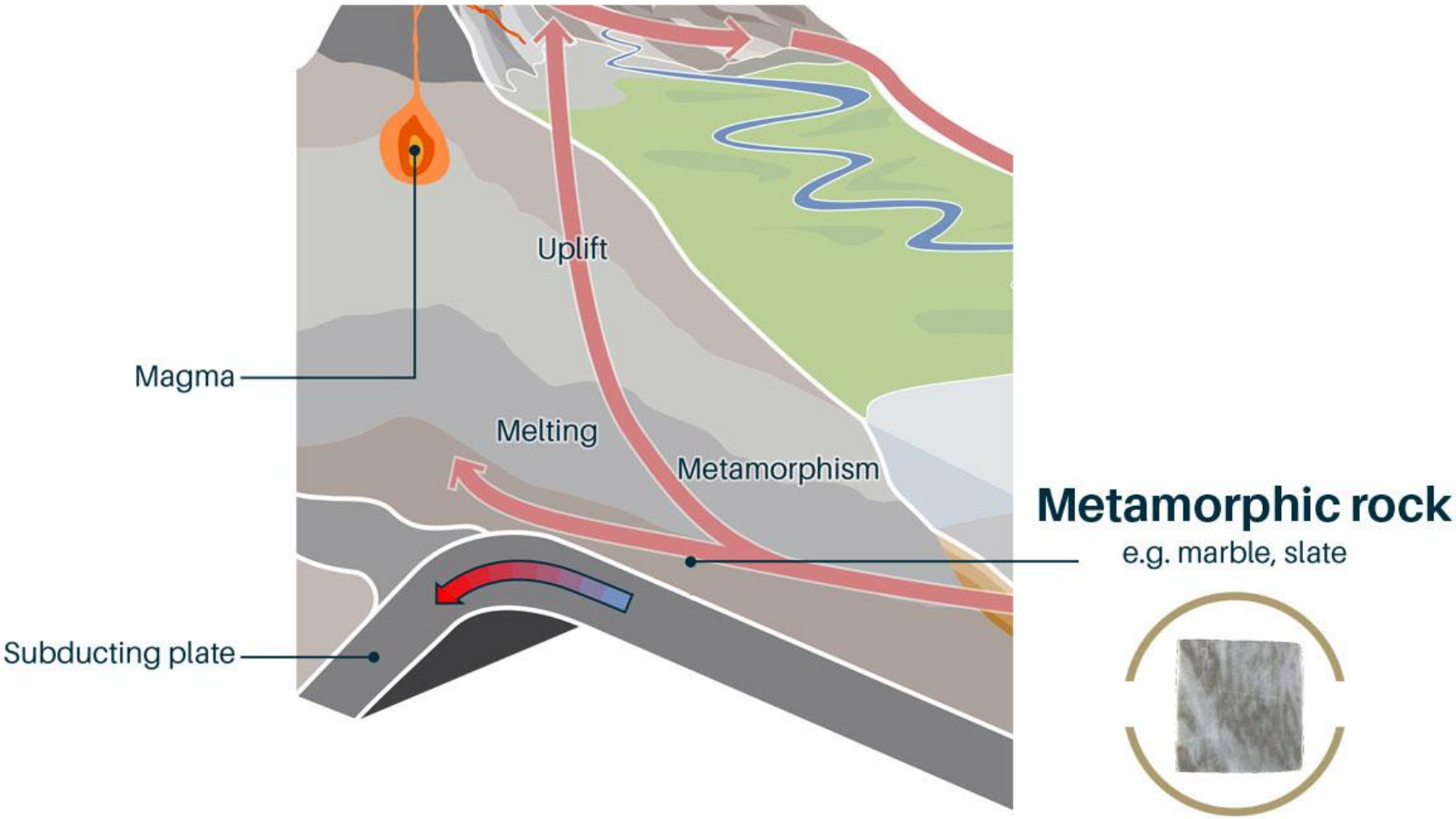

Erosion
Weathering
Transport
Sedimentary rock
e.g. sandstone, limestone
Uplift
Melting
Metamorphism
Deposition
Burial

Igneous rock

Fine crystalline texture
e.g. basalt

Coarse crystalline texture
e.g. granite




Uplift
Magma
Melting
Metamorphism
Subducting plate
Metamorphic rock
e.g. marble, slate

Types of Rocks

Igneous Rocks

Formation

Through solidification of magma or lava

Characteristics

No layers; Hardest of all

Types

Intrusive

(Slow cooling of magma)


Granite


Diorite


Gabbro

Extrusive

(Rapid cooling of lava)


Pumice


Obsidian


Basalt

Sedimentary Rocks

Formation

Through compaction of sediments

Characteristics

Distinctly layered; Easo to crumble

Types

Clastic

(Compaction of broken rocks)


Sandstone


Conglomerate

Chemical

(Compaction of dissolved minerals)


Iron ore


Rock salt

Organic

(Compaction of organic materials)


Coal


Limestone

Metamorphic Rocks

Formation

Through transformation of older rocks

Characteristics

May or may not have layers; relatively harder

Types

Foliated

(Distinguished by layers)


Slate


Gneiss


Phyllite

Non-foliated

(No distinguishable layers)


Marble


Quartzite


Hornfels

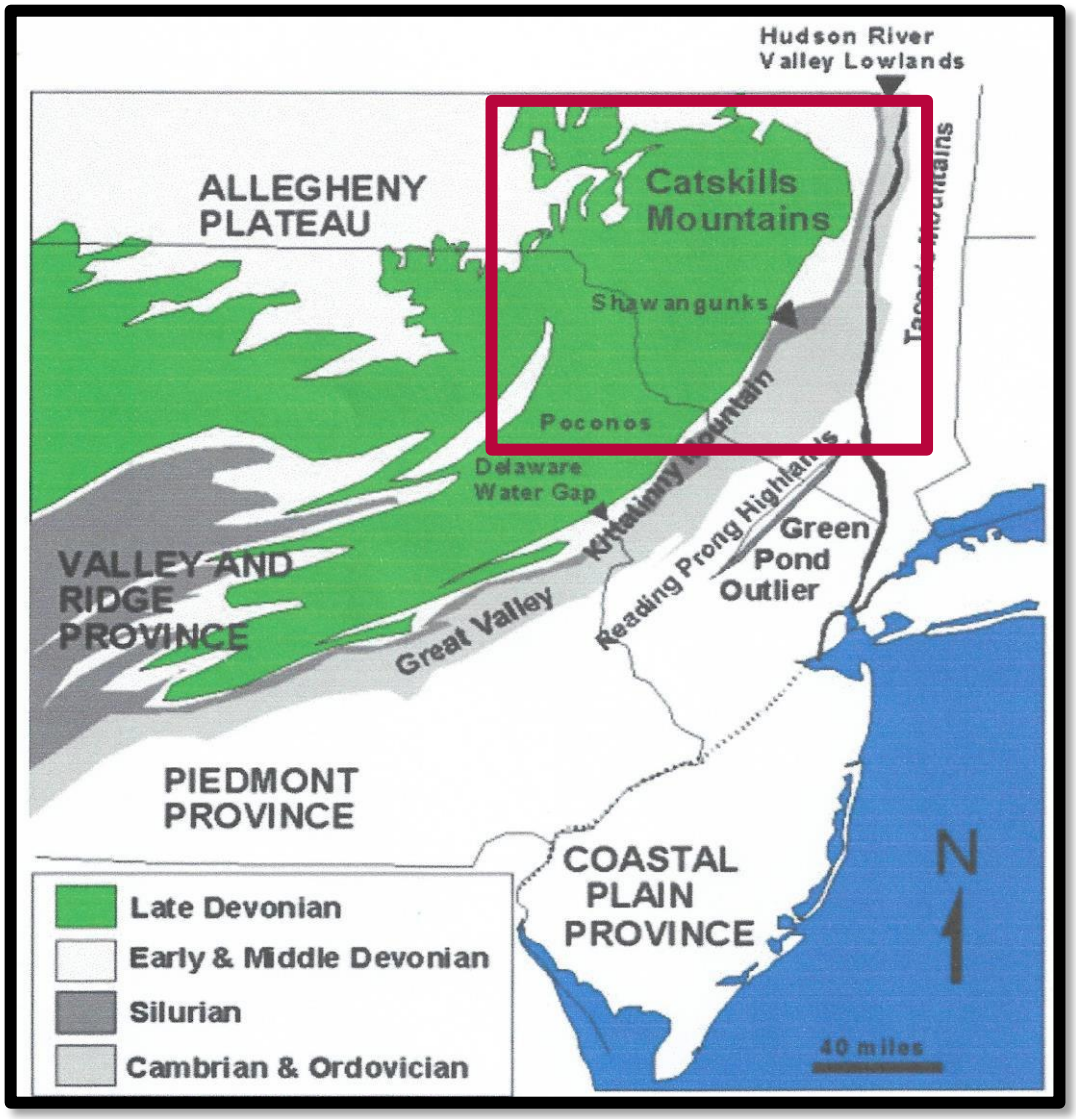
ScienceFacts.net

What is Bluestone?

Bluestone (commercial definition) is a dense, hard, fine-grained, **quartz/feldspathic** (containing the mineral feldspar) **sandstone of Devonian age**, which is commonly dark or slate grey, as well as blue, the term is applied to all varieties irrespective of color. New York and Pennsylvania are the only sources of commercially produced bluestone in the United States

Bluestone Geology

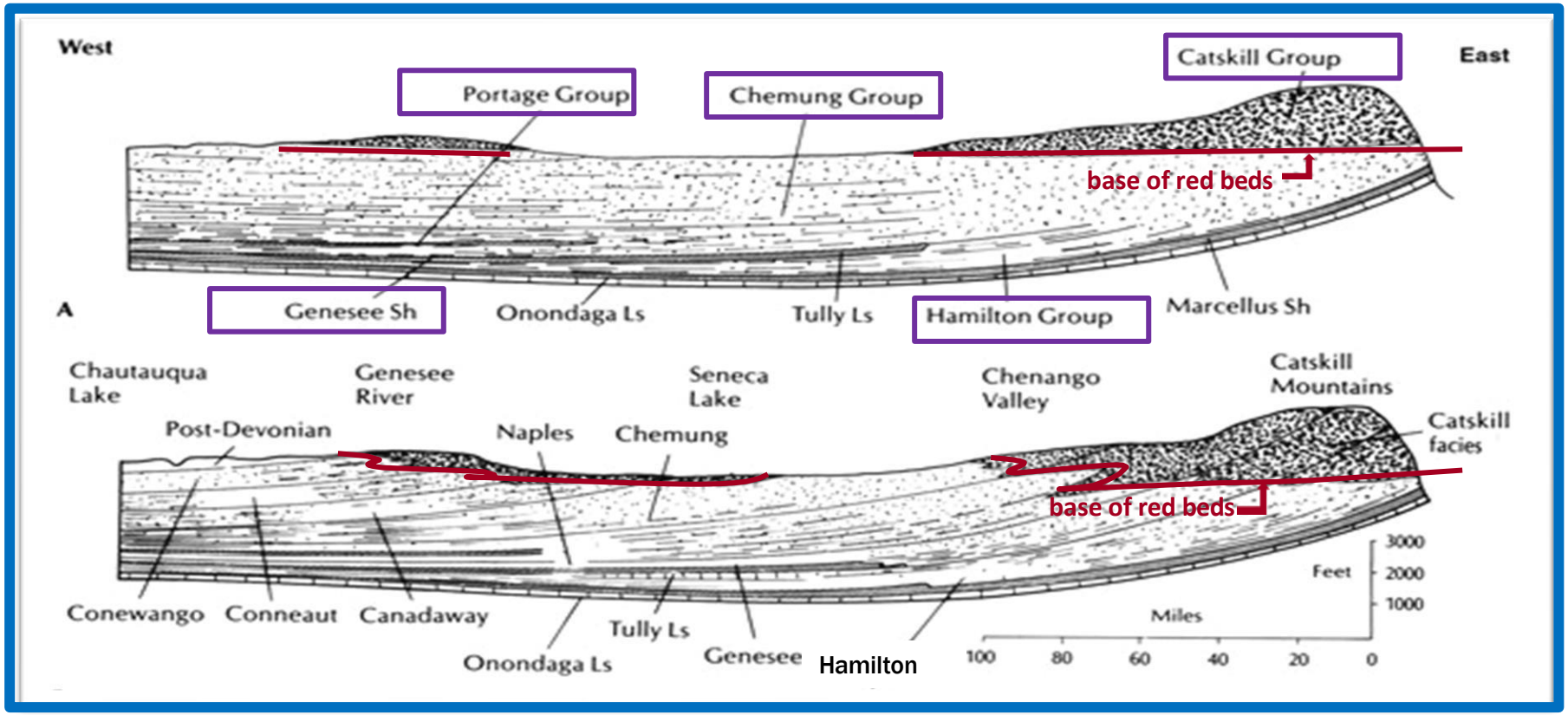
Rocks of the Catskill facies (Middle and Late Devonian) are roughly 7,500-8,000 feet thick and comprise more than 5,000 square miles in south-eastern New York and north-eastern Pennsylvania of the *central Appalachian foreland basin*.



Bluestone Geology

A common early view of the Middle and Upper Devonian (post-Onondaga) rocks of New York resembled the proverbial stack of pancakes. **They consisted of five major layers (from youngest to oldest): *Catskill, Chemung, Portage, Genesee and Hamilton Groups*.**

Beginning at the end of the 19th century but particularly following the work of G. A. Cooper and G. H. Chadwick in the 1930s, geologists recognized instead that the boundaries between the groups were roughly time planes (i. e., *isochronous surfaces*); the boundaries cut diagonally across the time planes. Catskill red beds were being deposited in the east while black shales were being laid down in the west.

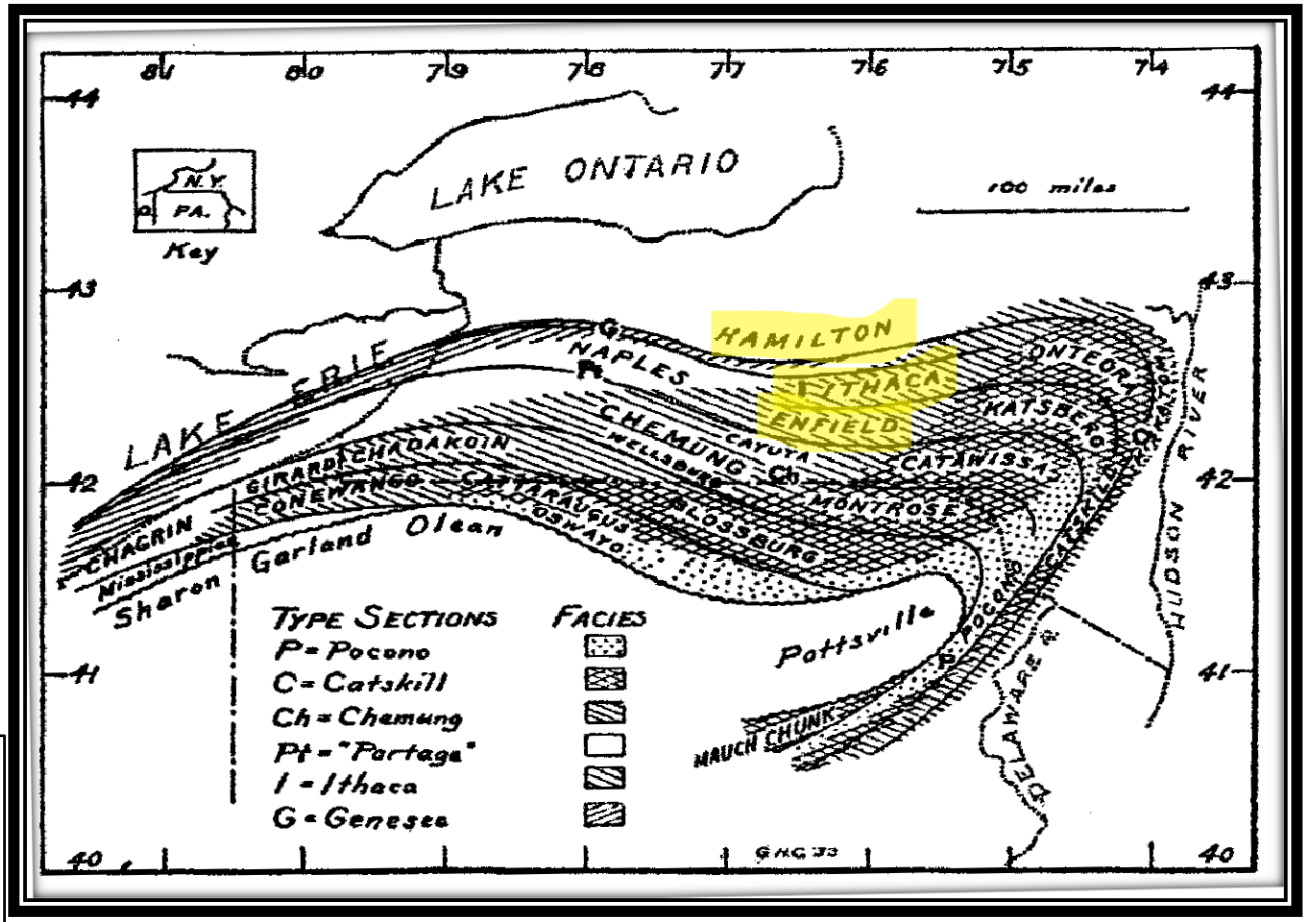


Cross-sections modified from Dunbar, C. O., and Rodger, J, 1967, *Principles of Stratigraphy,* John Wiley & Sons, Fig.71.

Bluestone Geology - Facies

1. Sedimentary facies are areally segregated parts of differing nature belonging to any genetically related body of sedimentary deposits.

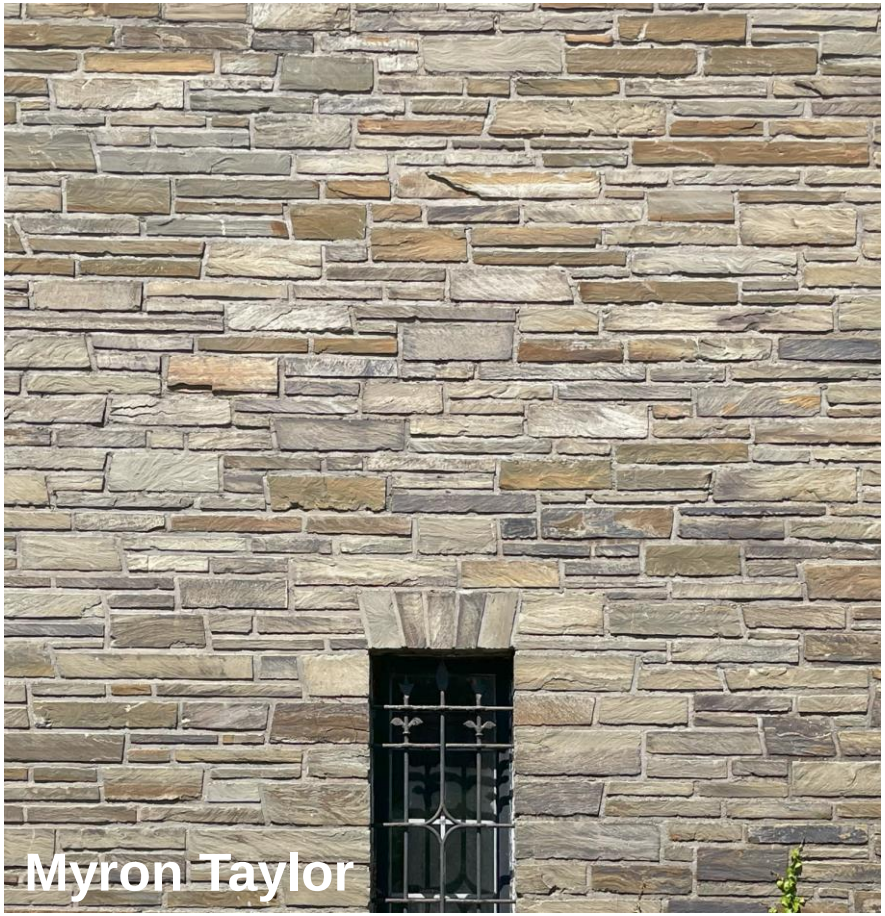
2. "Sedimentary facies" is defined as any areally restricted part of a designated stratigraphic unit which exhibits characters significant-ly different from those of other parts of the unit.



Text from Moore, R.C., 1949, *The meaning of facies,* Geological Society of America Memoir 39, p. 1, 32.
Map from Chadwick, G. H., 1933, *The great Catskill delta,* Pan-American Geologist, Vol. LX, Fig. 4.

Enfield

Greater range of colors and textures. Notable buildings using this stone include Baker Lab, Myron Taylor Hall, Barton Hall, and Willard Straight Hall.



Ithaca

Characterized by gray, beige and dark green colors. Some of the stone has visible fossils and mud occlusions. Fine-grained and has a greenish-gray tinge. Natural face block are apt to show stains and look rusty or dirty yellow.

Bluestone History at Cornell

BAKER COURT, THE GROUP OF THREE STUDENT RESIDENCE HALLS GIVEN TO THE UNIVERSITY BY MR. GEORGE F. BAKER
The central structure is Baker Tower. The two to left and right are North Baker Hall and South Baker Hall. At the extreme right of the picture, beyond the oak tree, is shown the fourth of the halls, now completed, the cost of which is to be met by appropriating a part of the Alumni Fund.
Day & Klauder, Architects *Photograph by J. P. Troy*

Bluestone History at Cornell – "Llenroc"

- The use of native bluestone (local sedimentary sandstone) as a construction material is a distinguishing characteristic of the Cornell campus and is the original building material seen on the earliest campus buildings…The stone for these and several other early campus buildings was quarried on site (Libe Slope).

- In the early 1900s, after the native Libe Slope quarry was depleted, campus buildings were constructed using regionally quarried bluestone. In the 1950s, campus construction projects began to rely on one local quarry in Ellis Hollow, referred to as the University Quarry. Today the quarry is known as the Finger Lakes Quarry.

- When the University Quarry ran out of seams of brown and tan stone, this quarry stone was marketed as "Lenroc".

- Notable buildings with "Lenroc" include Carpenter Hall, Mary Donlon Hall, and Ives Hall Faculty Wing. Following the removal of the stone from the quarry, masons turned the stone 90 degrees as they assembled the veneer walls. The bedding planes of the stone were made vertical. This stone was cut in modular units often of 2-1/4", 5", & 7-3/4" heights.

FINGER LAKES STONE CO. INC.

TB 63-8

TECHNICAL BULLETIN

LENROC DRESSED SAWED BED ASHLAR

SPECIFICATION AND DETAILING DATA

Art FILE NO. 5-B-5 or 5-B-6 (Dated 9-1-61)

GENERAL DESCRIPTION

Lenroc Dressed Sawed Bed Ashlar is a natural stone veneer designed to further the setting economies inherent in our Regular Sawed Bed Ashlar (see our technical bulletins TB58-2 and TB58-C). Because it is more economical, it supersedes the Multiple Length Ashlar described in the latter bulletin. It is designed especially for the three unit random Ashlar pattern.

USE OF THE BULLETIN:

This bulletin gives average production figures, coverage data, and other pertinent data necessary for intelligent installation cost estimating. Each contractor should use his experience with actual setting costs to adjust the figures in this bulletin to obtain accurate costs for his area.

MATERIAL DESCRIPTION:

The 2¾" rise is furnished to the job in long lengths, and cut on the job by the setting mason using either hand tools or a hydro-splitter machine. The 2¾" material is set without face dressing in lengths as required. These generally range from 8 to 14 inches.

The 5" and 7¾" rises are end jointed by the quarry, and should be set without any field cutting or dressing. Exception: The setting mason may have to cut closure pieces to meet returns on masonry openings. The 5" rise ranges in lengths from approximately 8 to 40 inches. The 7¾" rise ranges in lengths from approximately 12 to 28 inches.

EFFICIENCY BOND:

You will note that the stonework shown below is made up of a repeating pattern (cross hatched). This repeating pattern makes it easy to set the stone. However, because the stone comes in random lengths, the pattern of stonework will be so varied, that the observer cannot tell that there is a rote pattern of setting the stone. For variety, the 5" rise can consist of a single piece, or two, or three, which will vary the spacing of the "jumper" rise (7-¾"). The wider the spacing, the more horizontal is the character of the stonework.

The exact method of setting dressed ashlar is described on pages 2 and 3.

A — 2-¾" high B — 5" high C — 7-¾" high

Note: Base course is a special condition where certain pieces marked B are only 2-¾" rather than 5" and certain C pieces are 5" rather than 7-¾" to form a starter course.

THE ADVANTAGES OF THIS MATERIAL:

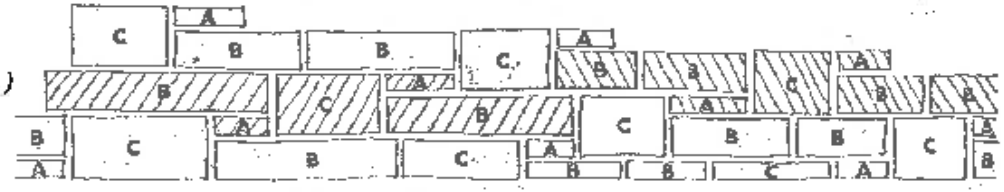
1. Setting is faster than conventional Sawed Bed Ashlar due to end-cutting and face-dressing done by the quarry.
2. Waste is minimized, thus increasing accuracy of material estimates.
3. Face color is not removed by the setting mason.
4. Labor costs are more accurately estimated and controlled.
5. Beds are held to a more uniform wall thickness.
6. Pattern automatically produces a handsome bonded wall by eliminating the tendency to stack the 2¾" rise, one on top of another.
7. Detailing is the same as for face brick, permitting stone base bids with brick alternates.

RECOMMENDED USES:

Lenroc Dressed Sawed Bed Ashlar is used wherever an ashlar facing with conventional masonry backup system is desired, particularly where wall thickness must be controlled. Applications include interior or exterior walls for school, church, institutional, commercial, and residential work.

SETTING PRINCIPLES:

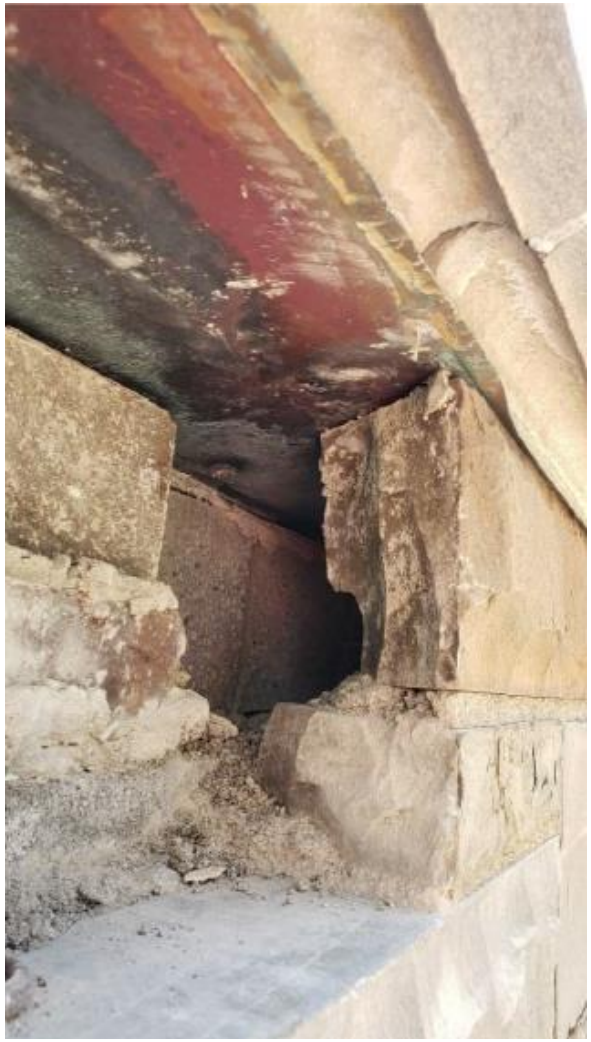
1. A very low percentage of 2¾" rise is necessary (5% versus the usual 15%). This speeds up setting.
2. The length of the 2¾" rise is controlled by the 5" rise. (See pages 2 & 3.)
3. Horizontal joints can run up to 16 feet long, which speeds up the setting.
4. Stone must be set level. However, joints do not need to be held to a uniform ½". Vertical joints can vary from ¾" to 1". Horizontal joints can vary, and if need be, can be spread to meet vertical courses points.
5. Mason can select stone by eye rather than by rule, since only the 2¾" rise is job cut to make the pattern.



From the quarries at Ithaca, N. Y. from which many famous buildings at Cornell University have been built.

Art FILE NO. 5-B-5 or 5-B-6 (Dated 9-1-61)

Hughes Hall - Bluestone



Top of loggia parapet wall. Note cavity and replacement block on roof side, and copper thru wall flashing under coping. MCWB Architects 2020

Face of loggia parapet wall showing severely deteriorated condition of veneer, including delamination of (Llenroc) bluestone. MCWB Architects 2020

Orientation

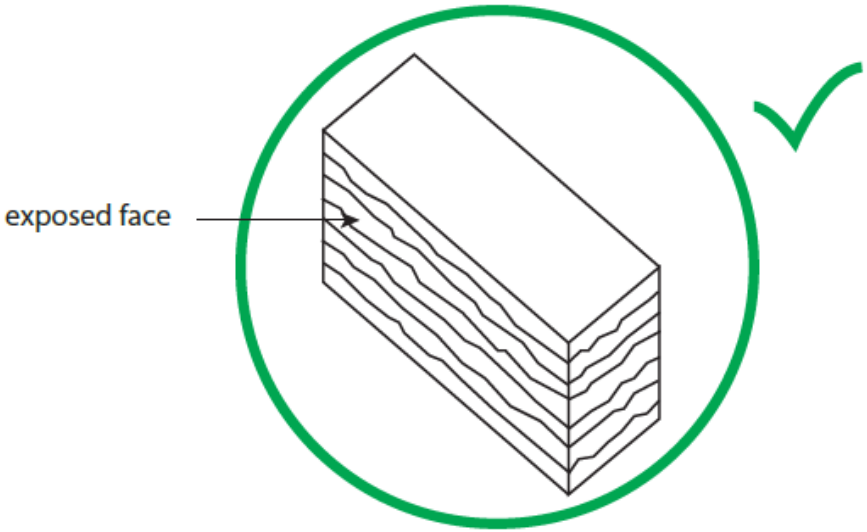


Fig. 1 Quarry Bedded Stone (horizontal orientation)

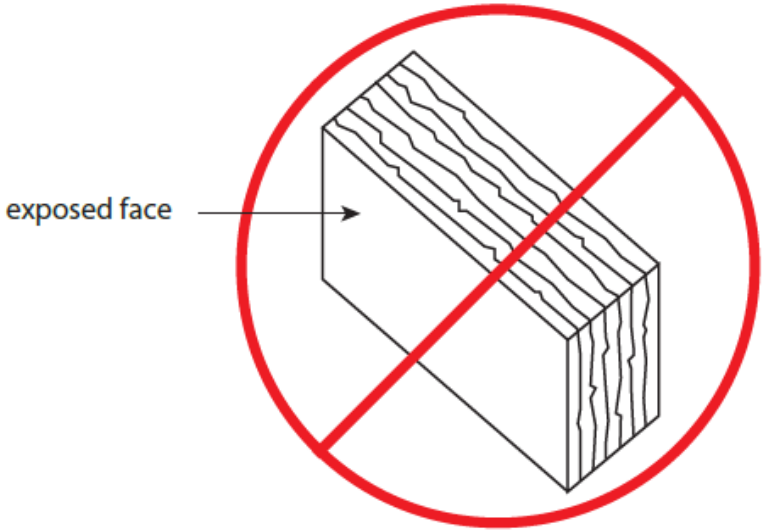


Fig. 2 Face Bedded Stone (vertical orientation)

Design Standards and Details

Expand all

Design Standards

Expand all

Division 1: General Design Requirements

Expand all

Division 2: Existing Conditions

Expand all

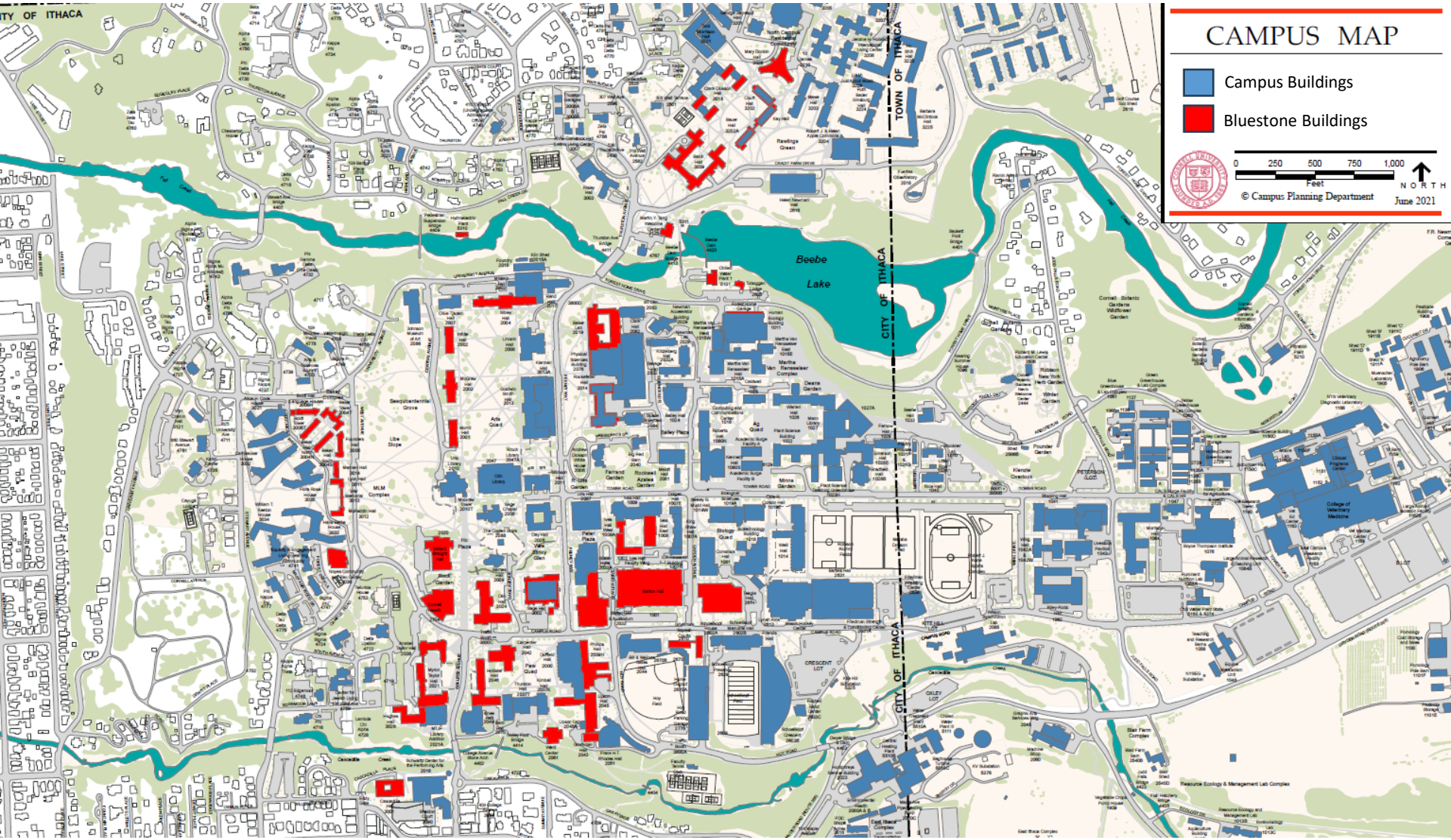
Division 3: Concrete

Expand all

Division 4: Masonry

Section #	Section Name	Date Reviewed	Date Revised
040300	Limestone Cleaning	Under Review	Under Review
042000	Masonry Assemblies	06-16-22	06-16-22
044300	Stone Masonry	06-30-17	06-30-17
044301	Stone Masonry - Bluestone	11-08-24	11-08-24
	Appendix A - Diagrams, Drawings & Photos		
	Appendix B - Individual Building Sheets		
	Appendix C - Testing		
044302	Stone Masonry - Limestone	11-08-24	11-08-24
044303	Stone Masonry - Granite	11-08-24	11-08-24

Bluestone Campus Map



Bluestone Campus Building List

Facility Code	Facility Name	Masonry Typ	Has Bluestone	Has Limestone	Building Stone	Stone Orientation & Beddinc	Bond & Pattern	Surface Treatment
3001	Cascadilla Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Broken Ashlar	Mixed
2001	Morrill Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Broken Ashlar	Pitched
2002	White Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Broken Ashlar	Pitched
2003	McGraw Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Broken Ashlar	Pitched
2004	Sibley Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Broken Ashlar	Pitched
3002	Sage Hall	Stone & Brick	Yes	Yes		Quarry Bedded	Broken Ashlar	Pitched
4716	Edgemoor Lane 107,Chi Phi	Wood and Masonr	Yes	No		Quarry Bedded	Broken Ashlar	Pitched
2014	Rockefeller Hall	Stone & Brick	Yes	Yes		Quarry Bedded	Random Ashlar	Dressed Faces
3004T	Baker Tower	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2602B	Schoellkopf Memorial	Brick	Yes	Yes		Quarry Bedded	Broken Ashlar	Mixed
3005	Founders Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3004N	Baker North	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3004S	Baker South	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
1001	Barton Hall	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2019	Baker Laboratory	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3006H	Boldt Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2020	Willard Straight Hall	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3006T	Boldt Tower	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3011	Lyon Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3012	McFaddin Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3013	War Memorial	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3009	Balch Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2605	Toboggan Lodge	Stone	Yes	No		Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3014	Mennen Hall	Stone	Yes Entire Building	Yes	Ithaca Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2021	Myron Taylor Hall	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
1003	Ives Hall Faculty Wing	Stone & Brick	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2024	Olin Hall	Stone & Brick	Yes	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3018	Clara Dickson Hall	Stone & Brick	Yes	No	Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2033	Statler Hall Auditorium	Stone	Yes	Yes Entire Building	Enfield Shale - Finger Lakes Quarry, Indiana Limestone	Quarry Bedded	Random Ashlar	Mixed
5310	Hydro Electric Plant Station A	Stone	Yes	No	Ithaca Shale	Quarry Bedded	Broken Ashlar	Natural Cleft Seam Face
2611	Teagle Hall	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2037K	Kimball Hall	Brick	Yes	Yes	Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2038	Anabel Taylor Hall	Stone	Yes Entire Building	Yes	Enfield Shale	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
2610	Grumman Squash Courts	Stone & Brick	Yes Entire Building	No	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2609	Moakley House Golf Course	Stone	Yes Entire Building	No	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2704	Cornell Health	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2039H	Phillips Hall	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
5326	Sage Substation Station D	Stone	Yes Entire Building	No	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2042	Carpenter Hall	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry, Limestone panels	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2043	Grumman Hall	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry, Limestone panels	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2046	Hollister Hall	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry, Limestone panels	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
3126	Noyes Lodge	Stone	Yes Entire Building	No	Enfield Shale - Finger Lakes Quarry,	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2047	Olin Library	Stone	Yes	Yes Entire Building	Limestone	Quarry Bedded		
3026	Mary Donlon Hall	Stone	Yes	No	Enfield Shale - Finger Lakes Quarry,	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
1008	Ives Hall East	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry,	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
1008A	Ives Hall West	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2070	Bard Hall	Brick	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
3028	Hughes Hall	Stone	Yes Entire Building	Yes	New York Quarry	Face Bedded	Random Ashlar	Mixed
2061	Ward Center	Stone	Yes Entire Building	No	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2616	Helen Newman Hall	Concrete	Yes					
5101	Chill Water Plant 1 Weinhold	Stone	Yes		Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2021A	Myron Taylor Jane Foster Add	Stone	Yes Entire Building	Yes	New York Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3202A	Bauer Hall	Stone & Brick	Yes	Yes	Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3202	Court Residence Hall	Brick	Yes		Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3202K	Kay Hall	Stone & Brick	Yes		Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
3036	Noyes Community and Rec Cen	Stone	Yes Entire Building		Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Dressed Faces
2076	Physical Sciences Building	Stone	Yes	Yes, Panels	Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Random Ashlar	Natural Cleft Seam Face
1011P	Forest Home Drive Garage	Stone	Yes Entire Building		Enfield Shale - Finger Lakes Quarry	Quarry Bedded	Coursed Ashlar	Quarry split
5215	Warren Rd Pumping Station	NA	Yes	No	Enfield Shale - Finger Lakes Quarry	Face Bedded	Dressed Sawn Bed Ashlar (Lenroc)	Mixed

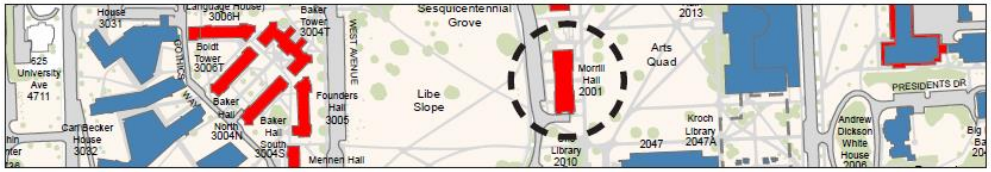
Buildings with Bluestone = 58

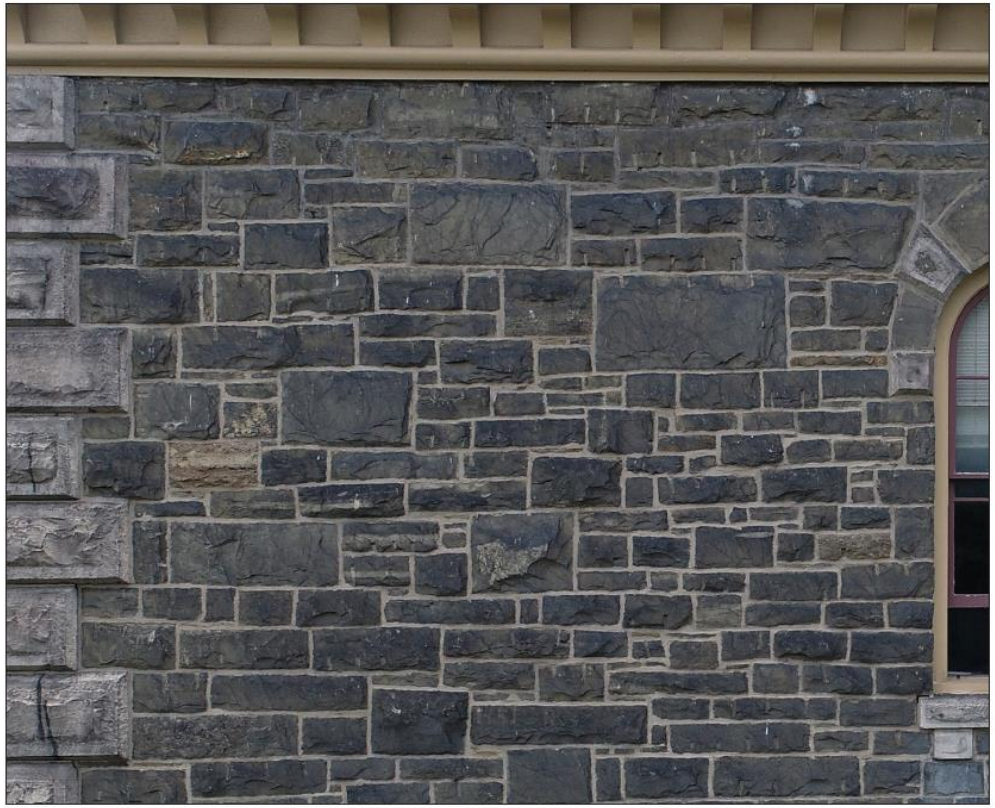
Bluestone Campus Building Info Sheets

MORRILL HALL

FACILITY NUMBER: 2001
FACILITY ADDRESS: 159 CENTRAL AVE
CONSTRUCTION DATE: 1866

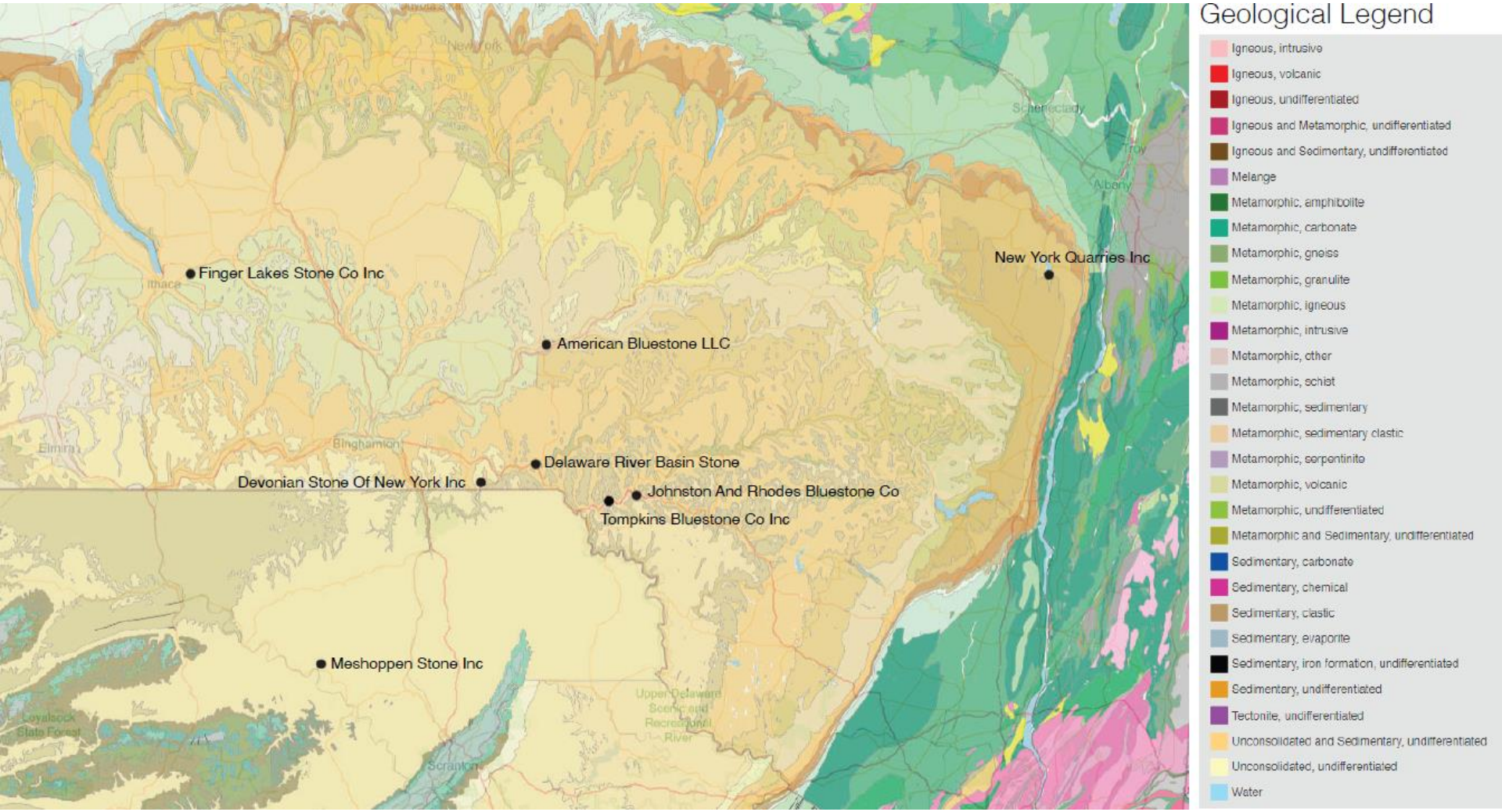
STONE TYPE: ITHACA SHALE
BEDDING/ORIENTATION: QUARRY BEDDED
BOND/PATTERN: BROKEN ASHLAR
SURFACE: PITCHED





Bluestone Quarry Map

- [Bluestone Map (arcgis.com)]



Bluestone Quarry Test Results

Stone Quarry Name	Silica Content %	Absorption by weight % (ASTM C97)	Density lbs/ft (ASTM C97)	Compressive Strength psi (ASTM C170)	Modulus of Rupture psi (ASTM C99)	Abrasion Resistance (ASTM C241/C1353)	Flexural Strength psi (ASTM C880)
New York Quarries	74.91	0.24	167.64	Perpendicular = 19,480 Parallel = 18,500	Perpendicular = 4,756.9 Parallel = 4,530.3	Natural Cleft Surface = 23.75 Thermaled Finish = 18.10 Honed Finish = 35.12	Perpendicular = 3,484 Parallel = 3,599.5
Johnston And Rhodes Bluestone Co	77.8	0.67	169.2	Dry Parallel, psi = Average of 23,230 Wet Parallel, psi = Average of 15,900 psi Dry Perpendicular psi = Average of 12,770 psi Wet Perpendicular, psi = Average of 11,240 psi	Dry Perpendicular, psi = Average of 3,050 psi Wet Perpendicular, psi = Average of 2 410 psi	ABRASION RESISTANCE (ASTM C241) = Average of 79.0	Average of 3,360 psi
Johnston Bluestone Industries		0.67	169.2	Dry Parallel, psi = Average of 23,230 Wet Parallel, psi = Average of 15,900 psi Dry Perpendicular psi = Average of 12,770 psi Wet Perpendicular, psi = Average of 11,240 psi	Dry Perpendicular, psi = Average of 3,050 psi Wet Perpendicular, psi = Average of 2 410 psi	ABRASION RESISTANCE (ASTM C241) = Average of 79.0	Average of 3,360 psi
Tompkins Bluestone Company		0.92	163.5	Dry Parallel = 10,390 psi Wet Parallel = 8660 psi Dry Perpendicular = 13,130 psi Wet-Perpendicular = 6,650 psi			
Finger Lakes Stone, NY	72.8	1.03		Dry Parallel to Bed = 14,882 Dry Perpendicular = 18,386 Wet Parallel to Bed = 12,958 Wet Perpendicular to Bed = 12,958	2194	Thermal Face = 27.0 Natural Cleft = 8.9	
Meshoppen Stone Inc.	72.8	1.08	162.74	Dry 14482 Dry 18386 Wet 12910 Wet 17283	2194 2856	27 8.9	
Delaware River Basin Stone LLC		1.27	163.2	Indeterminate (Face Loading) Wet 11,590 Dry 14,270 Indeterminate (Side Loading) Wet 14,040 Dry 17,470	Indeterminate Wet 2,350 Dry 2,770	62.7	Indeterminate Wet 1,730 Dry 2,290
American Bluestone LLC	73.8	1.46		parallel: 17,500 perpendicular:18,000	3057		perpendicular dry - 2301 psi wet- 1502 parallel dry - 2225 wet 1487
Devonian Stone Of New York Inc		1.9		over 19,000			2563

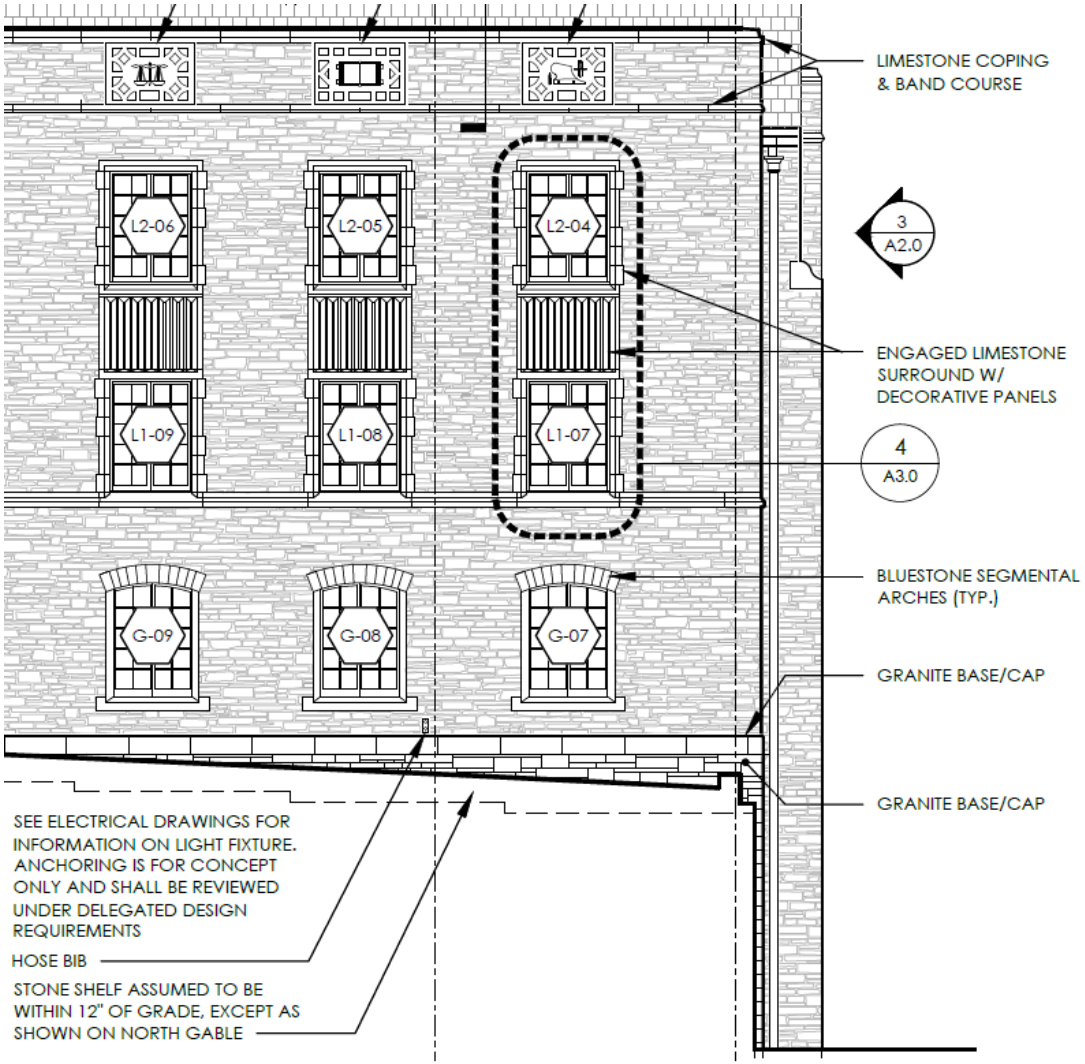
Class I (Sandstone): ≤ 8.0 Class II (Quartzitic Sandstone): ≤ Class III (Quartzite): ≤ 1.0	Class I (Sandstone): ≥125 Class II (Quartzitic Sandstone):≥150 Class III (Quartzite): ≥160	Class I (Sandstone): ≥4,000 Class II (Quartzitic Sandstone):≥10,000 Class III (Quartzite): ≥20,000	Class I (Sandstone): ≥350 Class II (Quartzitic Sandstone):≥1,000 Class III (Quartzite): ≥2,000	Class I (Sandstone): Ha ≥2 Class II (Quartzitic Sandstone): Ha ≥8 Class III (Quartzite): Ha ≥8

Bluestone Buildings

Current Projects:

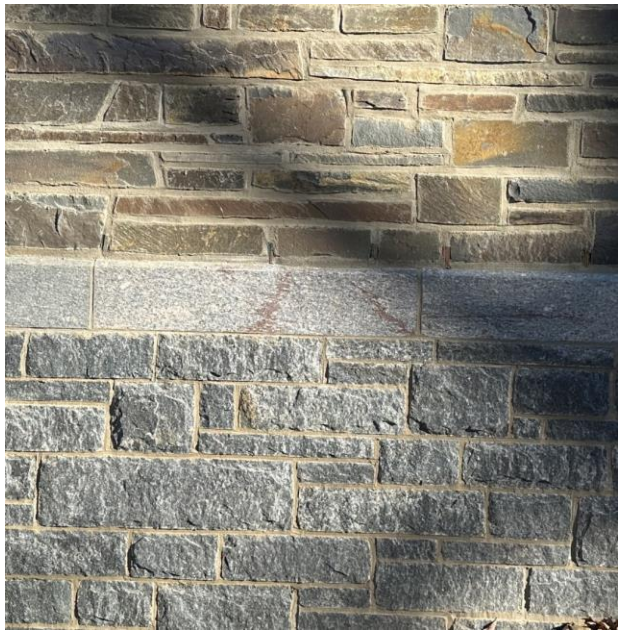
• Hughes Hall	Alcove Stone, NY	New Masonry Veneer on existing wall
• Balch Hall	Meshoppen Stone, PA	Salvage/Replacement
• McGraw Hall	TBD	New Construction/ Salvage/Replacement
• Gothics War Memorial	Finger Lakes Stone, NY	Replacement
• Ives Hall	TBD	Salvage/Replacement
• Sage Hall Tunnel	Delaware River Basin Stone LLC, NY	Salvage/New Masonry Veneer on Existing Wall
• Barton Hall Exterior Repairs	TBD	Salvage/Replacement
• Gothics – Exterior Work	TBD	

Hughes Hall



Granite Base:

- **Ashlar veneer pattern, mortar joints**
- **Heritage Granite by Adirondack Natural Stone in Whitehall NY**



Key Takeaways:

Reach out to subject matter experts – early! (FCS)

- When selecting a bluestone to match or for new construction, carefully select Quartzitic Sandstone/Bluestone Type II or III and avoid Type I
- Do not use Quartzitic Sandstone/Bluestone Type II or III or Limestone Type II at grade or up to 2ft above grade.
- Provide relieving angles to make stone replacement easier in the future
- Require ASTM test results from the quarry early in Schematic Design Phase (ideally done within the past 3 years)