All things Stone ... and more

Installation Guidelines for Adhered Natural Thin Stone Veneer

Information included in these guidelines are intended for use with the brands of Natural Thin Stone Veneers (NTSV) distributed by CSI - All Things Stone (CSI). Building code requirements may vary by City, State/Province.
Be sure to check with local authorities for code requirements in your area before proceeding with your installation.

Estimating Stone Required

Calculate the total square footage of flat stone required by multiplying the width x height of the area to be covered. Deduct the square footage for openings such as doors & windows. Calculate the linear footage of outside corners and deduct 3/4 of a sq.ft. for each linear foot of corners. Add additional stone to allow for cutting & trimming if required.

Note: *For TerraCraft™ products refer to corner coverage by product type.*

FORMULA:

Length x Height = Wall Area
Opening Width x Opening Height = Opening Area
Lin.Ft. of Corners Required X .75 = Wall Area Covered by Corners
Wall Area - Opening Area - Wall Area Covered by Corners = Sq.Ft. Flats Required

Allow for type of joint selected. NTSV packaging coverage's may vary by manufacturer and type of stone. Example: Coverage may be based on installation with 1/2" joints or with tight fitted joints. Be sure to consider the manufacturer's packaging yield for the brand of stone you are using when estimating total square footage required. *Additional stone may be required to allow for cutting and trimming.*

Recommended Tools

- Safety Glasses & Gloves
- Dust Mask
- Tape Measure
- Hammer Type Stapler
- Power Staple Gun
- Wheelbarrow & Hoe
- Hock & Trowel
- Mason's Trowel
- Margin Trowel
- Grout Bag
- Whisk Broom
- Masonry Brush
- Level
- Metal Jointing Tool or Wood Stick

CUTTING TOOLS: **With Diamond Blade*

- Saw* – Masonry, Circular, Table or Wet
- Grinder
- Hatchet
- Hardened Steel Chisel

Select the tools required for your specific application.

Additional Materials Required

Sheathing Membrane – Breather Type: ***General Information*** **—** Referred to in the National Building Code of Canada as "Sheathing Membrane – Breather Type" it is often referred to by different names within the industry including Weather Resistant Barrier, Water Resistive Barrier, and House Wrap. *These guidelines will reference this as Sheathing Membrane - Breather Type (SM-BT).*

Sheathing Membrane – Breather Type: ***Requirements*** **—** The use and requirements of Sheathing Membrane – Breather Type may vary by region. Note: Some regional building codes may require 2 layers of SM-BT, check local building codes for requirements in your area. The National Building Code of Canada states – Sheathing Membranes shall conform to the performance requirements of CAN/CGSB-51.32M.

Mortar — Adhered NTSV should be installed using Type S or Type N mortar that meets the requirements of CAN/CSA-A179 Mortar and Grout for Unit Masonry or ASTM C 270.
Note: *For TerraCraft™ products the use of mortars that meet the requirements of ANSI A118.4 or ANSI A118.15 is recommended.*

Mortar Bonding Agents/Bond Enhancing Modifiers — If required, should comply with ASTM C1384.

Flashings — Flashings should be of corrosion resistant materials. Flashing type and locations should comply with applicable building codes.

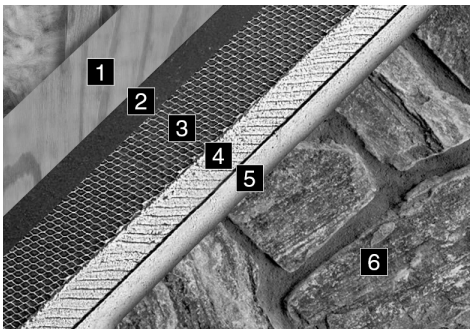
Weep Screeds — Local building codes may require the use of a weep screed on exterior installations. If required, weep screeds should be of corrosion resistant materials and comply with local code requirements and be installed as per the manufacturer's installation instructions.

Metal Lath — Lath should be galvanized 2.5, 3.4 or 3.4 3/8" Diamond Mesh Metal Lath, or Rib Metal Lath meeting the requirements of ASTM C 847.

Fasteners for Attaching Metal Lath — Must meet the requirements of ASTM C1063 (Standard Specification for Installation of Lathing and Furring).

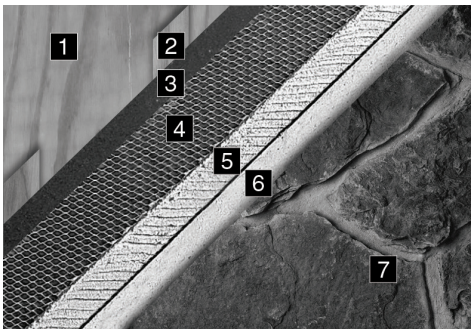
Types of Surface Preparation

Fig 1. Wood or Steel Stud Wall



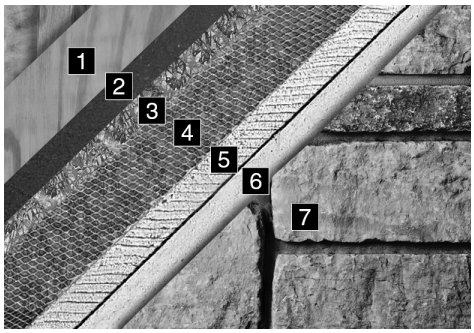
[1] Sheathing, [2] SM-BT, [3] Galvanized metal lath, [4] Mortar/scratch coat, [5] Mortar setting bed, [6] NTSV

Fig 2a. Rainscreen – Strapping



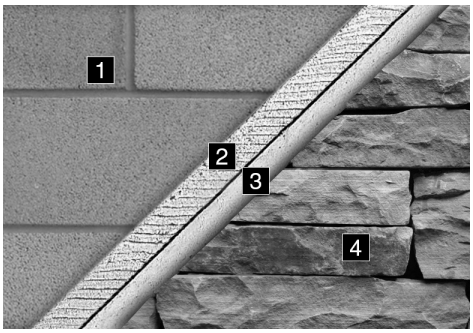
[1] Sheathing, [2] 10mm P.T. wood strapping, [3] SM-BT, [4] Galvanized metal lath, [5] Mortar/scratch coat, [6] Mortar setting bed, [7] NTSV

Fig 2b. Rainscreen – Drainage Mat



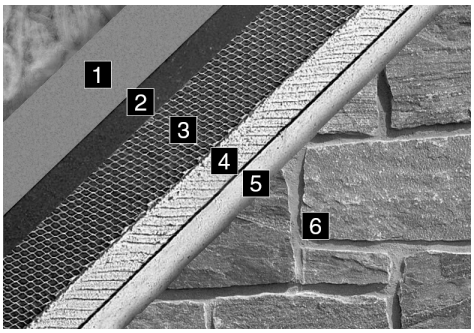
[1] Sheathing, [2] SM-BT, [3] Drainage mat, [4] Galvanized metal lath, [5] Mortar/scratch coat, [6] Mortar setting bed, [7] NTSV

Fig 3. Concrete & Masonry



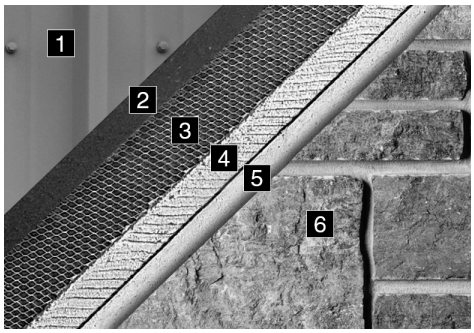
[1] Untreated/unpainted masonry concrete, [2] Mortar/scratch coat, [3] Mortar setting bed, [4] NTSV

Fig 4. Rigid Foam Insulation



[1] Rigid foam insulation, [2] SM-BT, [3] Galvanized metal lath, [4] Mortar/scratch coat, [5] Mortar setting bed, [6] NTSV

Fig 5. Metal Building



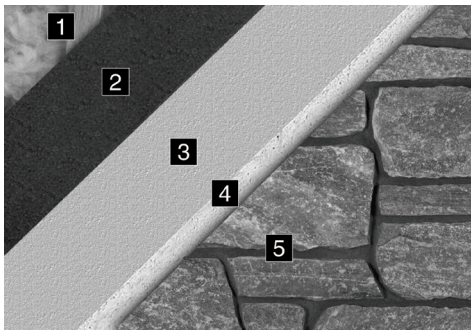
[1] Metal building, [2] SM-BT, [3] Galvanized metal lath, [4] Mortar/scratch coat, [5] Mortar setting bed, [6] NTSV

SM-BT — Sheathing Membrane - Breather Type.
P.T. — Pressure treated strapping.
Mortar setting bed — Can be applied to the scratch coat, back of the stone or both.

Note: Some regional building codes may require 2 layers of SM-BT. Please check local building codes for requirements in your area.

ADDITIONAL DRAWINGS THAT MAY BE OF ASSISTANCE — For your convenience CSI - All Things Stone has assembled a collection of detail drawings showing generally accepted methods of specific surface preparations and wall assemblies for the installation of NTSV. To access these drawings please visit **www.AllThingsStone.com**.

Fig 6. Cement Board



[1] Wood or steel studs, [2] SM-BT, [3] Cement board, [4] Mortar setting bed*, [5] NTSV

**Mortars that meet the requirements of ANSI A118.4 or ANSI A118.15*

Fig 1. Wood or Steel Stud Wall

Exterior & Interior surface preparation: *Interior applications are prepared the same as below, except no clearances or weep screeds are required.*

1. Sheathing Membrane – Breather Type (SM-BT)

Install code approved sheathing membrane – breather type (SM-BT) using galvanized fasteners (staples) onto sheathing. Overlap horizontal joints a minimum of 2" and vertical joints a minimum of 6". Sheathing membrane should be integrated with all flashing accessories, doors, windows, penetrations, and cladding transitions. A sheathing membrane is required on both interior and exterior applications. Note: Some regional building codes may require 2 layers of SM-BT. Be sure to check with local building codes in your area.

2. Attach Metal Lath

Install 2.5 lb. or 3.4 lb. galvanized metal lath meeting the requirements ASTM C847 over the Sheathing Membrane. Installation should be in accordance with IBC Sections 2510.3 (ASTM C 1063) and 2511.1.1. Install lath overlapping a minimum of 1" on both horizontal & vertical joints adjoining at corners or intersections. Overlap outside and inside corners a minimum of 6". **Do not butt at joints.** Install lath with cups facing up (smooth when felt from bottom up, rough when felt top down.) *Tip — To assist in keeping the sheets of lath flat and avoid bulges, fasten lath sheets from the center of each sheet and work outward.*

Fasteners for Attaching Lath — Attach lath using galvanized fasteners conforming to ASTM C 1063 placed 6" on center vertically and 16" on center horizontally. Fasteners should penetrate wood studs a minimum of 1" or 3/8" into metal studs or panels. Lath should be furred out 1/4" (6.4 mm) from the framing members or solid substrates. For Masonry Walls fasten with concrete screws or powder actuated fasteners (or cap fasteners), with heads or washers large enough to not pull through lath.

3. Clearances

On exterior walls, stone veneer should be held a minimum of 4" above finished grade or 2" above pavement. This can be reduced to 1/2" if the paved surface is a walking surface supported by the same foundation supporting the wall.

4. Weep Screed

In some areas local building codes may require the installation of a weep screed at the base of the wall or foundation on exterior applications. If required, weep screeds and other base flashings should have the same clearances as detailed in 3. Clearances (mentioned above).

Fig 2a & 2b. Rainscreen Wall Assembly

Some applications of NTSV may require a Rainscreen Wall Assembly.

Rainscreen Requirements

Rainscreen design and assembly options often vary by project and specific applications within the project (such as window openings). Installations may require engineered design criteria, materials and assemblies, or regional specific applications. Be sure to select the options that are right for your specific application. Materials and installation methods should conform to local building codes, Architectural/Engineering specifications and details, and product Manufacturer's Installation Instructions.

For additional information on Rainscreen requirements refer to *The National Building Code of Canada - Protection of Cladding from Moisture 9.27.2.4 through 9.27.3.4.*

CSI - All Things Stone has assembled a collection of suggested Rainscreen details complete with engineered details covering a wide variety of Rainscreen applications for NTSV. Sections in this guide include: 10mm Pressure Treated Wood Strapping, Drainage Mat, Exterior Insulated Wood Framed, Exterior Insulated Steel Framed, Interior & Exterior Steel Framed. To access these drawings please visit **www.AllThingsStone.com**.

Fig 3. Concrete & Masonry Wall

A) Concrete Walls – New or Untreated:

Note: *A Rainscreen system may be required in some regions.*

Inspect new concrete to ensure there are no release agents, form oils, dirt or dust on the surface that may inhibit bonding. If present, *see Cleaning Surfaces below*.

B) CMU Walls – New or Untreated:

Note: *A Rainscreen system may be required in some regions.*

If the CMU surface is untreated (no paint or other coatings) there is no additional preparation required prior to installation. If the wall will be exposed to excessive moisture check to see if a cementicious or other waterproofing agent or a Rainscreen system is required.

CMU's that have been water proofed during the manufacturing process will require preparation with a SM-BT, lath, and scratch coat prior to installing stone. Be sure to fasten lath with galvanized concrete screws or powder actuated fasteners (or cap fasteners) or with heads or washers large enough to not pull through lath.

C) Existing Concrete or Masonry Walls:

Note: *A Rainscreen system may be required in some regions.*

Inspect existing concrete to ensure there are no release agents, form oils, dirt or dust on the surface that may inhibit bonding. If present, remove prior to installation *(see Cleaning Surfaces below)*. If a treatment other than a cementicious water proofing agent has been applied, or if CMU's were water proofed during the manufacturing process, a SM-BT, lath, and scratch coat should be installed. Be sure to fasten lath with galvanized concrete screws or powder actuated fasteners (or cap fasteners); or with heads or washers large enough to not pull through lath.

Cleaning Surfaces — If the wall requires cleaning, sandblast or water blast the surface to remove materials that may inhibit bond. *Caution: If cleaning with a pressure sprayer do not use excessive water pressure that may damage the wall surface.* You may also etch the surface of the concrete with muriatic acid. If so, rinse thoroughly after treatment. Painted surfaces should be sand blasted or otherwise stripped of paint.

If the wall surface cannot be cleaned to accept a good bond, install a SM-BT, lath, and scratch coat.

Existing Brick Walls — If installing stone over existing brick such as a fireplace facing, evaluate the surface texture of the brick to determine if metal lath and a scratch coat is required. If surface is smooth or painted then lath and scratch coat is required. If surface is rough, porous, or unpainted, and mortar joints are in good condition, clean the surface and apply metal lath and a scratch coat *(refer to "Installing a Scratch Coat").*

Fig 4. Rigid Insulation

Fig. 4 illustrates one example of a "typical" Wall Assembly over a framed stud wall with rigid sheathing. Check the requirements for your specific installation such as local building codes, Architectural/Engineering specifications and details, as well as product manufacturer's installation instructions.

Fig 5. Metal Buildings

Fig 5. illustrates a typical exterior wall surface preparation over a metal building. Individual projects may require regional engineered design criteria, materials and assemblies specific to your local building code requirements.

Fig 6. Cement Board

Cement board may be used in place of lath and scratch coat. When used, cement board must comply with ASTM C1325 and must also be evaluated for interior or exterior use in accordance with ICC-ES AC376 based on the desired applications. Do not use conventional mortars (Type S or N) with cement board installations. Refer to ASTM C1780 and manufacturer recommendations for additional details on cement board installations.

Stone Installation

Preparation

Note: *Protect surface areas or plants that could be damaged during the stone installation.*

Prepare the Work Area — Layout stone and materials near the installation area prior to application (25 to 30 sq.ft. of stone is typical). Layout stone to the desired blending of sizes shapes and colors similar to how it will be applied to the wall. Be sure to mix stones from different boxes and wash stone before installation (if required) to remove dust or dirt that may have gathered (especially for interior applications).

Clearances — On exterior framed walls stone should be kept a minimum 4" clearance above grade or 2" above pavement. On concrete or CMU walls maintain 2" above grade or 1/2"above pavement.

Weep Screeds — If required by local building codes, weep screeds should be of corrosion resistant materials and installed as per the manufacturer's instructions.

Flashings — Flashings and fasteners should be of corrosion resistant materials. All flashing material should be integrated with SM-BTs to prevent moisture penetration into the structure. Install in accordance with the prevailing building code, manufacturer's instructions, and or engineered details for flashing installation.

Mortar

Mortar Types

Use Type N or Type S mortar (ASTM 270 or CAN/CSA-A179). For more information see National Building Code of Canada 9.20.4.3. Types A, B, C. Premixed mortars meeting these criteria are preferred as ingredients are pre-measured and blended to meet code requirements. For all TerraCraft™ products the use of mortars that meet the requirements of ANSI A118.4 or ANSI A118.15 is recommended. **Do not use conventional mortars (Type S or N) with cement board installations.**
(Important Note: Before selection and use of mortars refer to the mortar manufacturers specification and installation instructions to ensure compatibility with your installation and the type of natural thin stone veneer stone you are installing.)

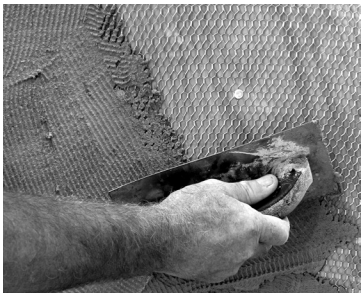
Mixing Mortar

Mortar can be mixed in a mortar tray, wheelbarrow, or mortar mixer. Mix to a firm, moist consistency. Mortar that is too dry and crumbly will not bond properly. Mortar that is too wet will be weak and messy. *Tip — Mortar that sticks to the trowel when held vertically is a good indicator of the right consistency.* Ingredient proportions and water ratio are important. Mix in accordance with the manufacturer's instructions. *Tip — Mix mortar at the rate it can be used. If the mortar dries and stiffens before use, restore workability by adding water and remixing.* Re-tempering may slightly reduce mortar's compressive strength, but bond is typically more important than compressive strength. **Do not re-temper colored mortar as it may lighten the mortar's color.**

Thin Set Mortar — (ANSI 118.4). On interior projects a thin set mortar may be used when applied over a properly prepared substrate. Note: Be sure to refer to the thin set manufacturer's recommendations to ensure selection of the correct type of thin set mortar, and for mixing and application instructions. *For TerraCraft™ products see Stone Installation & Mortar Types section of this document.*

Bonding Agents — If using bond enhancing modifiers or bonding agents, agents/modifiers should comply with the requirements of ASTM C1384. Polymer modified mortars, modifiers, and bonding agents should be used and applied in accordance with the manufacturer's recommendations. Polymer modified mortar meeting the requirements of ANSI 118.4 is acceptable.

Installing A Scratch Coat



Apply a 1/2" to 3/4" thick layer of Type N or Type S *mortar to the properly prepared surface* ensuring the lath is completely encapsulated with mortar. When the mortar is thumb print dry score the surface horizontally to create a roughened (grooved) surface that will assist in achieving a good mechanical bond between the scratch coat and mortar setting bed. After the scratch coat has set up, use a fog spray technique to keep scratch coat damp during the curing process. Cure for a minimum of 24 hours before installing stone. Set and cure time will vary depending on weather and climatic conditions. Scratch coating can be done in its entirety before adhering stone, but it is also acceptable to "scratch-as-you-go".

Applying Stone

Select Joint Type

Your choice of joint and finish type along with the grout/mortar color can have a significant impact on the appearance of the finished wall. The two most commonly used joint options are a "Standard" Grout Joint (1/2" avg.) and a "Tight Fitted" (Dry stacked) Joint. Note: *If installing with a tight fit application, see "Installing with a tight fitted joint"*. Depending on the architectural style and desired overall look, using an "Over-Grout" joint is another option.

Over-Grout Joints — More irregular, typically wider than 1/2". Mortar is filled in flush or overlapping the surface of adjacent stones. Finishing can be achieved by smoothing the joints with a soft bristle brush, trowel, burlap sack or other finishing devise. Sometimes called a sacked finish, over-grouting is a commonly used method of achieving a rustic or old-world look.

Coloured Mortar Joints — The use of complementary or contrasting mortar colors can dramatically enhance the overall look of the finished wall. Colored mortar joints are frequently specified by architects and designers as an important element of the stone application. Premixed colored mortars are available in some regions. Color oxide manufacturers also provide recommended blending proportions that can be followed to help ensure color consistency throughout mortar mixes. Your local dealer can assist you with mortar color options.

Prior to Stone Installation

Dampen the Wall & Stone — Mist or brush the prepared substrate (scratch coat, masonry or concrete), and back of the stone *(especially in hot weather)*. Surfaces should be damp but free of surface water. This will assist in preventing excessive moisture being drawn from the mortar. Note: Moisture absorption rates depend upon weather conditions, type of stone, and substrate.

Cold or Freezing Conditions — Protect applications from temperatures below 4° Celsius (40° Fahrenheit) as mortar will not cure properly under such conditions. **Do not use antifreeze compounds to lower the freezing point of mortar.**

Cutting & Trimming

Note: *Safety glasses and a dust mask should always be worn when cutting stone.*

To cut or trim stones, a hatchet or a chisel and hammer is often used. For straight cuts a handheld grinder or masonry saw with a diamond cutting blade can be used. After cutting or trimming ensure any residue and dust is removed prior to installation.

Tip — Lay stone on a firm surface (lying on concrete may cause the stone to break in the wrong place). Mark the cutting line with chalk, pencil, or scratch awl. Use a hardened stone chisel to score the cut by positioning the blade of the chisel

along the intended line and tapping lightly with a hammer. Move the chisel along the score line while striking with a heavy hammer or mallet. You may need to repeat setting the chisel in the groove and gradually increasing the score line depth. When the score line is deep enough, strike a sharp blow to break the stone. You can also create a score line by making a cut approximately 1/8" in depth using a grinder with a masonry blade.

Tip — Placing a metal pipe or wood strip under the stone beside the score line before striking may be helpful. Remove unwanted jagged edges with a point chisel.

Starting Point

If applying stone using a mortar setting bed – Do not spread mortar on more than a workable area (8 to 10 sq.ft.), this will avoid mortar setting up before the stone is applied. *Tip — The setting bed and stones can be installed from the top down or the bottom up. Starting at the top will help avoid mortar droppings from staining the stone below. Starting from the bottom allows placement of a level temporary starter strip such as a 2"x4".*

A. Apply Mortar Setting Bed — A min 1/2" mortar setting bed should be applied to the scratch coat or buttered on to the back of the stone (or both). Note: If applying mortar to the back of the stone, cover completely with mortar to avoid open pockets that may allow for the accumulation of water build up. *See image on the right.*

B. Place Corner Stones First — Alternate the long and short ends of each corner stone.

C. Flat Stone Placement — Install flat stones working inward from the corner stones towards the center of the wall. *Tip — A temporary starter strip will assist in maintaining a uniform straight line and consistent clearance from grade and also help avoid stone slippage prior to the mortar setting up.*

D. Setting Stones — Set stones firmly onto the scratch coat or setting bed applying modest pressure and wiggling slightly until you feel the mortar begin to "grab" with the scratch coat. Apply enough pressure so that mortar extrudes out around the stones edges. Note: Moving stones after the initial grab will result in breaking the bond. If this occurs the stone and mortar should be removed and mortar replaced before resetting.

Installing with a Tight Fitted Joint – Tight fitted stones should be applied from bottom up. *Tip — Install a temporary level starter strip, such as a 2"x4", at the bottom course. This will help maintain a uniform straight line, a consistent clearance and avoid stone slippage prior to the mortar setting up.* Place the first corner pieces and the adjacent bottom (first) course of flat stones. Remove excess mortar on the top edges to allow tight fitting of the next course. Then, alternating the long and short ends of corner stones, place the remaining courses of corner and flat stones working inward towards the center of the wall. Be sure to stagger flat stones to avoid long running vertical joints. *Tip — When installing horizontally shaped stones like ledgestones, run a level horizontal chalk line every 12" or 16" up the wall as a check point to keep horizontal joints aligned consistently.*

Grouting & Finishing

Grouting

When installing stone with a mortar joint, use a grout bag to fill in joints. Cut the bag at the tip to produce the desired opening (approx. 1/2" is commonly used) and fill the bag half full with grout mixture. *Tip — Fold over (or twist) the top end of the bag and fold (or twist) and squeeze until the grout extrudes smoothly out of the opening. If necessary, adjust grout for flow consistency.* Joint widths should be as consistent as possible. Take care to avoid smearing mortar on the surface of the stone.

After joints have become firm or "thumb-print" dry, use a dry whisk broom or masonry brush to remove excess mortar or droppings, compact and finish joints using a jointing tool. *See image on the right.* Note: Setting time will vary depending on climatic conditions and the surfaces applied to. **Do not use a wire brush. Do not use a wet sponge to finish joints as this may because staining that will be difficult or impossible to remove.**

Finishing Your Wall

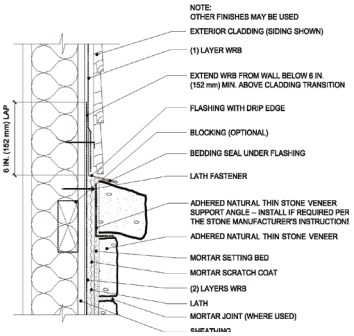
After mortar is sufficiently set up, the finished job should be brushed (or washed if needed) to remove remaining loose mortar or dust. **Do not use acid or acid-based products.** If additional cleaning is required contact your dealer for information regarding appropriate cleaning products.

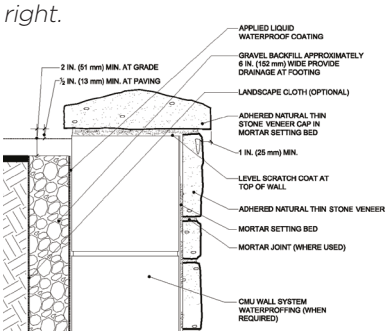
ADDITIONAL DRAWINGS THAT MAY BE OF ASSISTANCE — For your convenience CSI - All Things Stone has assembled a collection of detail drawings showing generally accepted methods and details of specific surface preparations and wall assemblies for the installation of Natural Thin Stone Veneer. To access these drawings please visit **www.AllThingsStone.com**.

Additional Considerations

Installing Watertable/Sills

Watertable/Sills are typically used as a wainscot cap/transition piece or a window sill. Install using galvanized metal support brackets (such as Simpson Strong Tie A21) or other galvanized right angle supports with a 5 lb./lin.ft. holding capacity. Fasten brackets with galvanized screws or nails penetrating studs 1" at a minimum of 16" on center. Use construction adhesive to bond sill to support brackets. Flash & caulk. Flashing should extend to the surface of the exterior wall finish. Use code approved flashing & installation methods. *See drawing on the right.*





Installing Cap Stones & Retaining Walls

Wall & Pier caps are functional and provide a finished architectural finish. Caps should extend 1" to 2" beyond the finished surface below them. Set caps onto a minimum 1/2" full mortar bed over properly prepared surfaces. Ensure mortar bed is free of voids or open pockets that could allow water to accumulate. Mortar joints between wall caps should be completely filled and compacted to minimize moisture penetration. Use peaked caps in areas with heavy water run off. *See drawing on the left.*

Applying Over Existing Stucco Walls

Evaluate the wall surface to determine if metal lath and a scratch coat are needed. If the stucco surface is damaged, has cracking, is painted or too smooth, a lath and a scratch coat is required. Be sure to evaluate flashings and surfaces at all openings such as windows and doors. If there are any indications of moisture penetration, the wall should be repaired before stone can be applied. **Do not apply stone over a stucco wall that has any of the above defects. When the wall surface has been properly prepared, apply stone as in Fig 1. on page 2.**

Expansion/Control Joints

NTSV should not be installed over these joints. Check with local building codes or the project architect/engineer for specifications or details for expansion/control joint requirements.

Applying Over Cement Board

As an alternative to a SM-BT and metal lath system, cement board products can be used for interior applications such as to accommodate stone for a fireplace facing. Install cement board (rough side out) over studs. Drywall is not required, but can be left in place. Place fastening screws every 16" horizontally on center, and minimum 6" vertically, ensuring 1" of stud penetration. Tape cement board seams with fiberglass tape and seal with thin set mortar. Ensure surface is clean and free of debris. Use of an appropriate thin set mortar is recommended. If using portland cement mortar, a bonding agent is recommended. If the cement board surface is smooth, or for complete assurance of adequate bonding, metal lath and a scratch coat is recommended. *Note: Recommendations for choosing a mortar for TerraCraft™ are found in the Stone Installation – Mortar Types section of this document.*

Sealing Stone

A sealer may be specified to assist in preventing stains from gutter runoff, splashing water, smoke, or other contaminants. If required, use a Silane based breathable type sealer that is non film forming. Note: Some sealers may cause a yellowing effect on the stone surface. Sealers may need to be reapplied periodically and may alter the appearance of the stone. *Tip — We recommend applying a small test area prior to complete application. Refer to the sealer manufacturer's information for appropriate use and installation instructions.*

Cleaning & Maintenance

To remove dust or light dirt, wash the surface with a garden hose starting at the top and working down. To remove concentrated dirt, wet the stone thoroughly, apply a strong mixture of detergent or granulated soap and water and scrub lightly with a soft bristle brush. Rinse off immediately with clean water. Caution: High pressure washing or sand blasting may damage the stone and mortar joints and is not recommended. If using a power washer be sure to select a nozzle that produces a wash type spray versus a concentrated blast of water. Keep the spray nozzle far enough away from the stone to wash thoroughly but not so close as to blast the surface and cause damage. **Do not use harsh chemicals, such as acid. Do not use abrasive tools such as a wire brush.**

Overhead Applications

Installation of NTSV on overhead, horizontal or sloped applications may require approval and/or inspection by local building code authorities. Consult with your project Architect or Engineer for design assistance and additional information.

ADDITIONAL CONSIDERATIONS - *Continued*

EFFLORESCENCE

Efflorescence is a water-soluble salt that may occasionally appear on the surface of stone, and other masonry products caused by the evaporation of water from the wall. On rare occasions, efflorescence may occur at the joints or on the surface of NTSV. To remove, allow the stone and mortar joints to dry completely, then scrub affected areas with a stiff bristle brush and clean water. **Do not use a wire brush. Rinse thoroughly right away washing from the top down. For difficult efflorescence occurrences apply a mixture of 5 parts water to 1 part white vinegar, scrub thoroughly and rinse immediately with clean water.**

INSTALLATION BELOW OR AT WATER LEVELS

While NTSV is extremely durable, surface staining may occur on installations where stone is submerged or exposed to dirty water or water that has been treated with chemicals.

INSTALLATION OVER INSULATED CONCRETE FORMS

Applications over Insulated Concrete Forms (ICF) vary depending on the ICF manufacturer and the products configuration. For specific details on installing NTSV over ICF we recommend contacting the ICF manufacturer or your local ICF supplier.

ACCENT & TRIM STONES

Provide attractive additions to the overall finished look of any project. Trim Stones are commonly used to trim out window and door openings. Trim Stones are applied the same as flat stones (see stone application section). Watertable/Sills are often used for a wainscot cap or as a window sill or as a separate transition add an attractive design accent to a wall surface *(See - Installing Watertable/Sills).*

DISCLAIMER

These Guidelines are a provided as a collection of commonly used methods and materials for the installation of adhered NTSV. CSI makes no expressed or implied warranty or guarantee of the installation techniques, materials, construction procedures or methods included in the guidelines. Alternative means or methods may be required and/or recommended based on specific code requirements, construction project conditions, manufacturers or product recommendations. Information provided in these guidelines is not intended as specific recommendations for construction procedures or uses of the building materials or structures included in the guidelines. Users are responsible to ensure their installations conform to local building codes for materials and installation procedures incorporated on their project.

NOTE: Drawings provided in this Installation Guideline for adhered NTSV are designed to assist in the installation of adhered NTSV products distributed by CSI and may not apply to every design circumstance. These drawings may require modifications to meet your particular project requirements. CSI accepts no responsibility or liability for the use of these or other construction drawings. Refer to the applicable building code and manufacturer's installation guidelines for specific requirements.

To learn more about CSI - All Things Stone's Natural Thin Stone Veneer products, visit **www.AllThingsStone.com** or call **1.800.977.8663**.

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