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**Whitacre Greer Dry-Pressed Clay Brick Pavers
Flexible Pavement / Sand Setting Bed**

SECTION 02780

BRICK PAVERS

This specification is intended to assist the Design Professional/Specifier in selecting appropriate products and preparing the project specification section for hand laid flexible clay brick pavements. Base course materials and installation are not included in this specification. The Design Professional/Specifier is responsible for the use and application of this information.

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Clay Brick Pavers
2. Bedding and Jointing Sand
3. Edge Restraints
4. Geotextiles

B. REFERENCED SECTIONS

1. Section 01310 – Project Coordination and Project Meetings
2. Section 01600 – Product Requirements

C. RELATED SECTIONS

1. [Section: [02300] - Earthwork]
2. [Section: [02710] - Bound Base Courses]
3. [Section: [02720] - Unbound Base Courses]
4. [Section: [02740] - Flexible Pavements]
5. [Section: [02750] - Rigid Pavement]
6. [Section: [02770] - Curbs and Gutters]

Consult a qualified civil engineer for pavement designs subject to vehicular traffic. Pavement design shall be in accordance with established pavement design procedures, BIA's Flexible Vehicular Brick Paving and Flexible Brick Paving Design Guides and Technical Note Series.

1.02 REFERENCES

A. American Society for Testing and Materials

1. ASTM C 33, Standard Specification for Concrete Aggregates
2. ASTM C 136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
3. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
4. ASTM C 902, Standard Specification for Pedestrian and Light Traffic Paving Brick.
5. ASTM C 1272, Standard Specification for Heavy Vehicular Paving Brick.
6. ASTM D 698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
7. ASTM D 1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
8. ASTM D 2940, Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports

Use article below to include requests for data to be provided by Contractor, before, during or after construction.

1.03 SUBMITTALS

A. In accordance with General Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Clay Brick Pavers:

1. Submit manufacturer's product literature, installation instructions, and material safety data sheets.

Typically, small samples are used for preliminary selection and may not exactly represent the complete color and texture range encountered in production runs. Final selections should be made from a mock-up or field sample.

2. Submit sample units of each paver type representative of size, shape, color and finish, indicating color variation and texture range expected in finished installation. Color will be selected by [Architect] [Engineer] [Landscape Architect] [Owner] from manufacturer's available color palette.
3. Submit test results from [qualified] [approved] independent testing laboratory indicating [ASTM C 902] [ASTM C 1272] compliance, as applicable.
4. Submit manufacturer's certification of conformance to ASTM standards.

C. Submit shop drawings and details: Indicate [*materials,*] [*thicknesses,*] [*sizes,*] [*finishes,*] [*shapes,*] [*edge restraints,*] [*perimeter conditions,*] [*expansion and control joints*].

1. Indicate layout [and pattern] describing materials, expansion joints, geotextile location, layout and drain locations and installation details and methods.
2. Indicate relationships of paving joints to adjoining materials, fixtures and assemblies.

D. Bedding and Jointing Sand:

1. Submit sieve analysis results in accordance with ASTM C 136 for bedding and joint sand.
2. Provide supplier name, source and type of sands used for bedding and jointing.

E. Paving Installer: Job references from projects similar in size and design to this project. Provide [*Owner*] [*Client*] [*General Contractor*] names, postal address, phone, fax and email address.

1.04 QUALITY ASSURANCE

A. Paving Installer Qualifications:

1. Five years experience with at least 100,000 square feet of sand set brick pavers installed.
2. Successful completion of [*five*] brick paver installations similar in design, material and extent indicated on this project.

Delete paragraph below if there are no licensing, insurance, bonding or regulatory agency requirements.

B. Regulatory Requirements:

1. Installer shall be able to provide bonds required for the Work.

Use mock-ups or field samples for assessing systems and for review of construction, work co-ordination of several sections, testing, or observation of operation. A mock-up or field sample may also be used for assessing workmanship quality. If Owner or owner's representative elects not to have a mock-up erected, the first 100 square feet of actual construction may serve as a field sample.

C. Mock-Ups:

1. Install a [*10 ft by 10 ft*] [*6 ft by 6 ft*] [*4 ft by 4 ft*] area of pavers on a prepared substrate including [*edge restraint*] [*geotextile material*] [*drains*] to illustrate component application including pattern and edge details.
2. When required, provide a separate mock-up for each paver type and bonding pattern.
3. Use mock-up to determine pre-compaction bedding sand level, joint sizes, lines, laying pattern(s), and color and texture range.

4. Do not start Work until [Architect] [Engineer] [Landscape Architect] [Owner] has approved mock-up.
5. Approved mock-up is the standard by which appearance, workmanship, substrate preparation and material application will be judged.
6. Document approved mock up with photographs or retain until completion of work.
7. Approved field sample may be retained as part of finished work. Remove mock-up and dispose of materials when directed by [Architect] [Engineer] [Landscape Architect] [Owner].

Delete paragraph below if Work of this Section does not require a pre-installation meeting to coordinate materials and techniques, and to sequence related work.

D. Pre-Installation Meeting(s):

1. Conduct pre-installation meeting [two weeks] prior to commencing work of this Section to verify project requirements, substrate condition, coordination with other trades and installation instructions.
2. Confirm status of ordered material.
3. Coordinate with Section 01310.

1.05 DELIVERY, STORAGE AND HANDLING

Comply with supplier's ordering instructions and lead-time requirements to avoid construction delays. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

A. General:

1. Deliver, store and handle in accordance with Section 01600.
2. Deliver, store and handle in accordance with [manufacturer's] [supplier's] recommendations.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with identification labels intact.

1. Unload pavers with proper equipment, so no damage occurs to pavers.

C. Storage: Store materials so they are protected from contamination by foreign substances and excessive moisture.

1. Store pavers to prevent damage and staining.
2. Do not store bedding sand and jointing sand on compacted aggregate base course or in areas that channel water into the sand.
3. Cover bedding sand and jointing sand with waterproof covering. Secure the covering in place.

1.06 PROJECT CONDITIONS

A. Environmental Requirements:

1. Do not install sand or pavers during rain or snowfall.
2. Do not install sand or pavers over frozen base course.
3. Do not install frozen materials.
4. Do not install pavers on frozen or saturated sand.

1.07 MAINTENANCE

A. Extra Materials:

1. Furnish [*specify quantity*] additional pavers to Owner for future maintenance and repair.

PART 2 PRODUCTS

2.01 BRICK PAVERS

A. Paver Type: Dry-Pressed Clay Brick Pavers. **Select one:** [*Bevel & Lug Standard*][*Rolled Edge Plate Texture w/ Lugs*][*Straight Edge Standard*][*Old World Cobble*][*Bevel No Lug*][*Kerf w/Lugs*][*ADA/Tactile*][*Boardwalk w/Lugs*][*Boardwalk w/o Lugs*]. Manufactured by Whitacre Greer Company, 1400 South Mahoning Ave, Alliance, OH 44601. Phone (800)947-2837. Email wgcustservice1@wgpaver.com

B. Material Standard: In accordance with [ASTM C 902] [ASTM C 1272], as applicable.

4x8x2¾ bevel with spacing lugs installed in herringbone are recommended for vehicular traffic areas.

Clay pavers are classified according to the severity of weather exposure and traffic they will experience, as well as intended use and method of installation. Consult ASTM C 902 or ASTM C 1272 as applicable for descriptions of paver classifications.

C. Classification: Specify weathering, traffic and application classifications.

1. Specify Class: SX
2. Specify Type: I
3. Specify Application: PS [*PA for Old World Cobble*] [*PX available on request, consult manufacturer, not all products are available*]

Brick pavers may have lugs or chamfers on each unit. Verify with manufacturers that overall dimensions are inclusive of lugs and exclusive of chamfers when present.

D. Dimensions: *Select as appropriate. Consult www.wgpaver.com for available type/size combinations.* [4 x 8 x 1 ½] [4 x 8 x 2 ¼][4 x 8 x 2 ¾][8 x 8 x 2 ¼][8 x 8 x 2 ¾][3 5/8 x 7 5/8 x 1 ¼][3 5/8 x 7 5/8 x 2 ¼][6 x 3 x 2 ¼][6 x 3 x 2 ¾][6 x 6 x 2 ¼][6 x 6 x 2 ¾][6 x 9 x 2 ¼][6 x 9 x 2 ¾][6 x 12 x 2 ¼][2 ¼ x 9 x 2 ¼][2 ¼ x 9 x 3][3 x 9 x 2 ¼][3 x 9 x 3]

E. Color [*and blend*]: *Specify color and blend if applicable.* [30 Clear Red][32 Antique][33 Dark Antique][34 Mulberry][36 Red Sunset][41 Caribbean]

[42 Cinnamon][43 Tangerine][44 Mahogany] [46 Riverwood] [50 Ivory][52 Majestic][53 Cimmerian][54 Chocolate][56 Desert Gray]

Pavers, especially lighter colors, in vehicular areas may be stained by oil drips, road residue and tire marks.

Where brick pavers are subject to vehicular traffic, utilize sands that are stable and as hard as practically available. Siliceous sands composed of higher percentages of durable minerals such as quartz and very little fine material are attributed with best results. Refer to Heavy Vehicular Design Guide for guidance.

2.02 JOINTING AND BEDDING SAND

A. Provide jointing sand and bedding sand as follows:

1. Clean, well graded, sand free from soluble salts and other deleterious or foreign matter. Sand shall be natural silica sand or sand manufactured from crushed rock.
2. Do not use screenings or stone dust for jointing sand or bedding sand.

*Coarser sand than specified in ASTM C 144 may be used for jointing sand, including ASTM C 33 material with grading requirements shown below. ASTM C 33 sand is recommended for joint filling in **heavy vehicular pavements**. ASTM C 33 sand may require significant effort during joint filling in order to completely fill joints. Larger particles often will not enter joints and should be swept off the surface. Success has been obtained by passing ASTM C 33 sand through a No. 8 sieve. ASTM C 144 sand is more finely graded and more susceptible to removal from joints. Joint sand stabilizers should be considered when ASTM C 144 sand is used for joint filling in heavy vehicular pavements.*

B. Joint Sand Material Requirements: Comply with ASTM C 33.

ASTM C 33 Grading Requirements	
Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	80 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	5 to 30
No. 100 (0.150 mm)	0 to 10
No. 200 (0.075 mm)	0 to 3

C. Bedding Sand Material Requirements:

1. Comply with ASTM C 33 requirements for fine aggregate.
2. Do not use mason's sand, or sand conforming to ASTM C 144 for bedding sand.

*Note: Retain paragraph above for pavements **NOT** subject to heavy channelized traffic, or paragraph below for applications subject to heavy channelized traffic, such as at bus stations.*

D. Bedding Sand Material Requirements (Pavements Subject To Heavy Channelized Traffic):

1. Use only naturally occurring, washed silica sand with no silt content.
2. Conform to grading requirements of table below:

Grading Requirements for Bedding Sand Subject to Channelized Traffic	
Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	75 to 100
No. 16 (1.18 mm)	55 to 90
No. 30 (0.600 mm)	35 to 70
No. 50 (0.300 mm)	0 to 35
No. 100 (0.150 mm)	0 to 5
No. 200 (0.075 mm)	Less than 0.3

Note: Retain Substitutions paragraph below if allowed.

2.03 EDGE RESTRAINTS

A. Furnish edge restraints as follows:

1. Material Type and Description: [*Specify material type and description*]
2. Material Standard: [*Specify material standard*]
3. Manufacturer: [*Specify manufacturer*]

B. Install edge restraints per manufacturer's instructions.

2.04 ACCESSORIES

Provide accessory materials as follows:

A. Geotextile Fabric:

1. Material Type and Description: [*Specify material type and description*]
Geotextile fabric shall have a minimum 0.2 mm (No. 70) apparent opening size and permit water passage without allowing sand or soil migration.
2. Material Standard: [*Specify material standard*]
3. Manufacturer: [*Specify manufacturer*]

Delete article below if cleaners, sealers or joint sand stabilizers are not specified.

Note: Joint sand stabilizers prevent sand loss and maintain interlock where sand loss could be a problem. Some situations typically requiring joint sand stabilizers are areas where rain water runoff is not caught by gutters or crosswalks, at the bottom of a grade, channeled pavement areas and areas regularly cleaned by mechanical equipment or pressure washing. When a potential for excessive sand loss is identified, joint sand stabilizers should be considered. Test joint sand stabilizers on a small inconspicuous area before applying to entire project.

B. [Cleaners] [Sealers] [Joint Sand Stabilizers]:

1. Material Type and Description: [Specify material type and description]
2. [Cleaner] [Sealer] [Joint sand stabilizer] shall not cause discoloration, noticeable sheen, or reduce pavement slip or skid resistance below specified value.
3. Material Standard: [Specify material standard]
4. Manufacturer: [Specify manufacturer]

All Whitacre Greer pavers are treated at the time of manufacture with a siloxane penetrating sealer. Field applications of sealers or other treatments must be compatible. Contractor must test in an inconspicuous area all sealers and treatments prior to wholesale use.

PART 3 EXECUTION

3.01 EXAMINATION

Surface tolerances of the finished pavement are largely reliant on base course surface. The Installer cannot correct deficiencies in the base course surface with additional bedding sand or by other means.

Verification of Site Conditions:

A. General Contractor shall inspect and certify in writing to Installer that site conditions meet the following prior to bedding sand and paver installation:

When necessary, subgrade should be drained and protected against flooding and ground water by sub-soil drainage. Sub-soil drainage, pipe and underground service installation should be completed before beginning base course or subbase construction.

1. Remove organic, unstable or unconsolidated material from site.

*Local authorities use various standards to establish minimum subgrade soil compaction. **Subgrade** compaction to at least 95% modified Proctor density per ASTM D 1557. Subgrade or base course stabilization may be necessary with weak or saturated subgrade soils.*

2. Verify conformance of subgrade preparation, compacted density and elevations to specified requirements.
3. Verify geotextile placement in accordance with Project Drawings and specifications.

*Base course materials conforming to local Department of Transportation requirements for highway pavements or ASTM D 2940 are recommended. Verify that **base course** is compacted to at least 98% maximum density. Compaction per ASTM D 1557, modified Proctor density, is recommended for areas subject to heavy vehicular loads. Small compaction equipment such as tampers are necessary to achieve adequate compaction near curbs, pavement edges, protrusions or other areas that are not accessible to large compaction equipment.*

4. Verify base course conformance to specified requirements. Do not use bedding sand to correct deficiencies in base course surface.
5. Verify written density test results for soil subgrade and base course.
6. Verify type, location and elevations of edge restraints, [concrete collars around] utility structures and drainage inlets.
7. Verify that base course [and geotextile fabric] is ready to support sand, [edge restraints,] pavers and imposed loads.

*Depressions in the base course surface should be brought up to the specified profile by **base course** material addition and compaction. Bedding sand should not be used to correct deficiencies in the base course surface.*

- D. Do not proceed with bedding sand or paver installation until satisfactory [subgrade soil and] base course conditions are verified by Contractor.
- C. Verify that base course is dry and certified by General Contractor as meeting material, installation and grade specifications.
- D. Field Measurements:
 1. Determine actual paver dimensions (including tolerances) and coordinate with dimensions for pavement areas indicated on Contract Drawings prior to any pavement installation. Adjust pavement area dimensions to eliminate unnecessary paver cutting.

3.02 PREPARATION

- A. Edge Restraint Preparation:
 1. Install edge features and penetrations including curbs, planters, surrounds and bases prior to placing bedding sand layer.
 2. Install edge restraints as indicated on Project Drawings and in accordance with manufacturer's recommendations

Add the two following items when edge restraints are anchored into the base course by spikes

3. Mount directly on finished base course. Do not install on bedding sand.
4. Locate spikes not less than [6 inches (150 mm)] [a distance equal to the base course thickness] within the prepared base area.

B. Geotextile: Install geotextile where indicated on Contract Drawings. Lap ends and edges a minimum of 12 inches. (300 mm.)

3.03 INSTALLATION

A. Spread bedding sand evenly over base course and screed rails. Screed to 1 inch (25 mm) thickness.

1. Do not spread bedding sand beyond area to be covered by pavers the same day.
2. Prior to re-commencement of work remove, replace and re-screed bedding sand not covered with pavers the previous work day.
3. Do not disturb screeded sand. Re-screed disturbed bedding sand.

B. Lay pavers in pattern(s) shown on Project Drawings.

1. Lay full pavers first.
2. Mix pavers from at least three [cubes] [pallets] to produce uniform color blends. [Follow manufacturer's recommendations for color blending]
3. [Place units by hand without using hammers]

Joint width spacing is critical to establishing interlock and minimizing paver chippage. Studies show that 1/8 inch is optimal. Joint widths and bond lines are adjusted to meet specifications as paving proceeds. Pavers with insufficient joint spacing are subject to chipping during installation or service. Pavers with lugs may be placed in contact with each other.

Depending on the selected pattern and paver type, optimum joint widths are not always possible. This is something to be discussed in the pre-construction meeting. It is recommended that no more than 5% of joints exceed 1/4 inch (6 mm) wide.

C. Provide 1/16 inch to 3/16 inch (2 to 5 mm) wide joints between pavers.

D. Adjust pavers to form straight bond lines and appropriate joint widths. Maximum bond line variation shall be $\pm 1/2$ inch (13 mm) over a 50 foot (15 m) string line.

Specify requirements for edge treatment in paragraph below.

E. Fill gaps at paved area edges with cut pavers.

1. Cut pavers at edges as indicated on Contract Drawings with a double blade paver splitter or wet cut masonry or vacuum saw.

2. Cut pavers shall be no smaller than one-third of a whole paver [*except where pattern is to be maintained and smaller pieces are surrounded by a full paver and field paver border course*]. Vehicular pavements shall have no pieces less than one-third size of the full paver.

F. Do not permit traffic, including construction equipment, on pavers before initial compaction and joint filling. Disturbed areas of pavers should be taken up, the sand re-screeded and pavers re-laid.

G. Vibrate pavers into sand using a high frequency/low-amplitude plate compactor capable of 3,000 lbf to 5,000 lbf (13 to 22 kN) at a 75 to 100 Hz frequency. Protect pavers from chipping during compaction by using a plate compactor with a rubber matt, rubber rollers or other approved materials placed over pavers. Do not compact within 6 feet (2 m) of unrestrained edges. Remove cracked or damaged pavers and replace with new units.

H. After pavers are fully settled and free from movement simultaneously spread, sweep and compact dry jointing sand into joints until they are completely filled and sand no longer falls into joints.

I. Protect areas not covered with cut and compacted pavers with waterproof covering overnight.

J. Discontinue laying operations, align and compact pavers prior to work suspension when weather conditions are such that pavement performance may be compromised.

K. On laying operations recommencement, verify acceptable setting bed condition before further pavers are laid. If water has entered bedding sand, remove pavers and saturated bedding sand, install unsaturated sand replace and compact pavers.

L. Sweep excess sand from pavement when installation is complete.

General Contractor is responsible for controlling access and finished pavement area use by other trades. Allowing excess jointing sand to remain on the pavement surface may aid in protecting their surface during subsequent construction. If this is the case, delete paragraph above and use the paragraph below.

M. Allow excess joint sand to remain on surface to help protect pavers from damage from other trades. Sweep excess sand from pavement when directed by [Architect] [Engineer] [Landscape Architect].

Installer is generally not responsible for maintaining full sand joints when the pavement is cleaned by power equipment unless a joint stabilizer has been applied.

N. [Return to site over a period of up to one year to add sand to fill joints as needed]

3.04 FIELD QUALITY CONTROL

Measure surface tolerances on flat slopes with a rigid straightedge. Measure tolerances on complex contoured slopes with a flexible straightedge capable of conforming to complex curves on the pavement surface.

A. Finished pavement surface shall not deviate more than $\pm 3/8$ inch (10 mm) from specified elevations.

B. Check final surface profile for conformance to Project Drawings.

For installations on a compacted aggregate base course and soil subgrade, the pavement surface may be 1/8 to 1/4 inch (3 to 6 mm) above specified elevations after compaction. This helps compensate for minor settling normal to pavements.

C. Pavement surface elevation shall be [*flush with adjacent construction*] 1/8 inch to 1/4 inch (3 to 6 mm) above adjacent [*construction*] [*drainage inlets, concrete collars or channels*]

D. Maximum variation from a specified surface profile shall be $\pm 3/16$ inch (5 mm) in 10 feet.

E. Height difference between adjacent pavers shall not exceed 1/8 inch (3 mm).

Note: Use the article below if needed to specify requirements for cleaning, sealing or sand stabilization. These procedures are not necessary for all applications. Delete article below if cleaners, sealers, and or joint sand stabilizers will not be applied.

3.05 CLEANING, SEALING, JOINT SAND STABILIZATION

A. [*Clean*] [*Seal*] [*Apply joint sand stabilization materials between*] brick pavers in accordance with manufacturer's written recommendations.

B. Sealers and treatments must be compatible with sealer applied during the manufacturing process. Test all products prior to use.

3.06 PROTECTION

A. After work in this Section is complete, General Contractor shall protect work from damage due to subsequent construction activity on site.