5.5 BRICK PAVEMENT DESIGN

This section shall govern the installation of new brick pavement and the repair of existing brick pavement on city streets.

a. Brick Pavement Repair
   1. Repair of existing brick streets shall be performed in accordance with the enclosed standard details.

b. New Brick Pavement
   1. New Brick Paving, installed by contractors, shall conform to the standard Brick Unit Paving specification below assembled for specific projects.

PART 1- GENERAL **SECTION _____**

BRICK UNIT PAVING

1.1 SUMMARY

A. Section Includes:

1. All labor, materials and equipment necessary to install brick pavers, set in mortar on reinforced concrete base for:
   a. New brick paving
   b. Brick paving repair

B. Deviations from this City of Stephenville Standard Specification
   1. Concrete base for Brick Unit Paving ahall be measured and paid for under separate Concrete Paving Section.
   2. Existing brick pavers may be reused only if approved by the Engineer. Existing bricks that do not meet the required specifications for re-use shall be delivered to the City of Stephenville stockpile located at the city's Municipal Service Center at 1201 Glen Rose Road.

C. Related Specification Sections include, but may not be limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract
   2. Division 1 - General Requirements
   3. Section _____ - Concrete Paving

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment
   1. New Brick Paving
      a. Measurement
         1) Measurement for this Item shall be by the square yard of Brick Paving.
      b. Payment
         1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard of Brick Paving completed and accepted in its final position per Drawings
      c. The price bid shall include:
         1) Sample panels
         2) Shaping and fine grading the roadbed
         3) Furnishing and applying all water required
         4) Furnishing, loading and unloading, storing, hauling, handling, mixing, placing, finishing and curing all concrete ingredients for concrete base material
         5) Furnishing and installing all reinforcing steel for concrete base
         6) Furnishing, mixing and placing all setting materials including mortar
            1. setting bed, wet mortar joint filler and high bond mortar mix
         7) Furnishing and setting all brick unit pavers
         8) Sealing joints

2. Existing Brick Paving Repair

a. Measurement
   1) Measurement for this Item shall be by the square yard of Brick Paving repaired.

b. Payment
   1) The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per square yard of Brick Paving Repair completed and accepted in its final position per Drawings.

c. The price shall include
   1) Sample panels
   2) Shaping and fine grading the roadbed
   3) Furnishing and applying all water required
   4) Furnishing, mixing and placing all setting materials including mortar setting bed, wet mortar joint filler and high bond mortar mix
   5) Furnishing and setting all brick unit pavers
   6) Sealing joints

1.3 REFERENCES

A. Reference Standards
   1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of thisSpecification, unless a date is specifically cited.
   2. ASTM International (ASTM):
      a. C67, Test Methods of Sampling and Testing Brick and Structural Clay Tile
      b. C144, Aggregate for Masonry Mortar
      c. C150, Portland Cement
      d. C207, Specification for Hydrated Lime for Masonry Purposes
      e. C902, Specification for Pedestrian and Light Traffic Paving Brick
      f. C1602, Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
   3. The Brick Industry Association, Technical Notes
      a. No. 1, Cold and Hot Weather Construction

1.4 ADMINISTRATIVE REQUIREMENTS

A. Permitting
   1. Obtain Street Use Permit to make utility cuts in the street from the appropriate city Department in conformance with current ordinances.
   2. The Public Works Department will inspect paving repair after construction

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data for each manufactured product, including certification that each product complies with specified requirements.

B. Samples
   1. For material verification purposes submithte following:
      a. Manufacturer's testing certification conforming to ASTM C67 testing methods for:
         1) Compressive strength, pounds per square inch
         2) Absorption, 5 hour and 24 hour submersion in cold water
         3) Maximum saturation coefficient
         4) Initial rate of absorption (suction)
         5) Abrasion index
         6) Freeze-thaw
         7) Efforesence
      b. Masonry paving unit samples for each type of masonry paving required. Include in each set the full rance of exposed color and texture to be expected in the completed work.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]·

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Installer: If pavers are installed by a contractor and not installed by City, brick paver and any subcontractors shall have experience in brick paving and previous work will be reviewed by the City prior to start of work.

B. Sample Panel: Prior to installation of masonry paving work, fabricate sample panel using materials, pattern and joint treatment indicated for project work, including special features for expansion joints and contiguous work.

1. Include color range, size, texture, bond, expansion jointing, pattern, finish, and workmanship.
2. Make 6 feet x 6 feet minimum.
3. Provide range of color, texture and workmanship to be expected in the completed work.
4. Sample panel shall be inspected by the City. If the sample is not acceptable, construct additional panels at no cost to the City until an acceptable panel is constructed.
5. Obtain City's acceptance of visual qualities of the panel before start of masonry paving work.
6. Maintain the sample panel as the standard of minimal quality for approval of all proposed brick pavement work required for the project. Locate sample panel near the pavement work to facilitate comparison.
7. Do not change source of brands for masonry units, setting materials, or grout during progress of work.
8. Remove sample panel from the site at completion of project.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Brick pavers and associated installation materials shall be delivered to thejob adequately protected from damage during transit.

1. Brick paver shall be carefully packed by the supplier for shipment with name of manufacturer and identification of contents.
2. Pavers damaged in any manner will be rejected and replaced with new materials at no additional cost to the City.

B. Storage: Protect grout and mortar materials during storage and construction against wetting by rain, snow or ground water and against soilage or intermixture with earth or other types of materials.

1. Protect grout and mortar materials from deterioration by moisture and temperature.
2. Store in a dry location or in waterproof container.
3. Keep containers tightly closed and away from open flame. Protect liquid components from freezing.

1.11 FIELD CONDITIONS

A. Ambient Conditions

1. Normal construction: temperatures between 40 degrees and 100 degrees Fahrenheit.
2. Cold Weather Construction: temperatures below 40 degrees Fahrenheit.
   a. Comply with requirements for masonry construction in cold weather from the BIA Technical Notes on Brick Construction, No. 1, Cold and Hot Weather Construction, Table No. 1 as summarized in the following table:

COLD WEATHER CONSTRUCTION – BELOW 40°F			
Temp[1]	**Preparation Requirements (Prior to Work)**	**Construction Requirements {Work in Progress)**	**Protection Requirements (After Masonry is Placed)**
40 °F to 32 °F	Do not lay masonry units having either a temperaturebelow 20 degrees F or containing frozen moisture, visible ice, or snow on their surface. Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do notresult in damage.	Heat mixing water or sand to produce mortar between 40 °F - 120 °F. Do not heat water or aggregates used in mortar or grout above 140 °F. Heat grout materials when their temperature is below 32°F.	Completely cover newly constructed masonry with a weather-resistive membrane for 24 hr afterconstruction.
32 °F to 25 °F	Comply with cold weather requirements above.	Comply with cold weather requirements above. Maintain mortar temperature above freezing until used in masonry. Heat grout materials so grout is at a temperature between 70° and 120 °F during mixing and placed at a temperature above 70°F.	Comply with cold weather requirementsabove.
25 °F to 20 °F	Comply with cold weather requirements above.	Comply with cold weather requirements above. Heat masonry surfaces under construction to 40 °F and use wind breaks or enclosures when the wind velocity exceeds 15 mph. Heat masonry to a minimum of 40 °F prior to grouting.	Completely cover newly constructed masonry with weather-resistive insulating blankets or equal protection for 24 hrafter completion of work. Extend time period to 48hr for grouted masonry, unless the only cement in the grout is Type Ill Portland cement.
20 °F and Below	Comply with cold weather requirements above.	Comply with cold weather requirements above.	Maintain newly constructed masonry temperature above 32 degrees F for at least 24 hr after being completed by using heated enclosures, electric heating blankets, infraredlamps, or other acceptable methods. Extend time period to 48hr for grouted masonry, unless the only cement in the grout is Type Ill Portland cement.

1. **Preparation** and **Construction** requirements are based on *ambient temperatures.*
2. **Protection** requirements, after masonry is placed, are based on *mean daily temperatures.*

1.12 WARRANTY [NOT USED]

3. Hot Weather Construction: temperatures above 100 degrees Fahrenheit.
   a. Comply with requirements for masonry construction in hot weather from the BIA Technical Notes on Brick Construction, No 1., Cold and Hot Weather Construction, Table No. 1 as summarized in the following table:

HOT WEATHER CONSTRUCTION – ABOVE 100°F

Temp[1]	Preparation Requirements (Prior to Work)	Construction Requirements {Work in Progress)	Protection Requirements (After Masonry is Placed)
Above 115 °F or 105 °F with a wind velocity over 8 mph	Shade materials and mixingequipment from direct sunlight. Comply with hot weather requirements. below.	Use cool mixing water for mortar and grout. Ice must be melted or removed before water is added to other mortar or grout materials. Comply with hot weatherrequirements below.	Comply with hot weather requirements below.
Above 100 °F or 90 °F with 8 mph wind	Provlde necessary conditions and equipment toproduce mortar having a temperature below 120 °F. Maintain sand piles in adamp, loose condition.	Maintain mortar and grout at a temperature below 120 °F. Flush mixer, mortar transport container, and mortar boardswith cool water before they come into contact with mortaringredients or mortar. Maintain mortar consistency by retempering with cool water. Use mortar within 2 hr of initialmixing.	Fog spray newly constructed masonry untildamp, at least 3 times a day until the masonry is 3 days old.

1. **Preparation** and **Construction** requirements are based on *ambient temperatures.*
2. **Protection** requirements, after masonry is placed, are based on *mean daily temperatures.*

PART 2- PRODUCTS

2.1 OWNER-FURNISHED PRODUCTS

A. Historic Thruber Brick shall be used for new brick paving, if available, as directed by the City.

2.2 MATERIALS

A. Rigid Concrete Base: See Section _____.
B. Reinforcing Steel: Section _____.
C. Paving Brick for Heavy Vehicular Traffic: Standard Solid (uncored) Paving Brick of modular size, 2-1/4 inches x 3-5/8 inches x 7-5/8 inches except as indicated, as per ASTM C1272, Type R, Application PX.
D. Setting Materials
    1. The mortar setting bed shall consist of:
        a. 1 part Portland cement -ASTM Cl 50, Type 1
        b. 1/4 part hydrated lime by volume -ASTM C207, Type 5
        c. 3 parts damp sand-ASTM C144 (for high-bond mortar, gradation in accordance with additive manufacturer's recommendations).
        d. Add water to obtain stiff mix -ASTM C1602.

    2. The wet mortar joint filler shall consist of:
        a. 1 part Portland cement -AS1M Cl50, Type 1
        b. 3 parts dry sand-ASTM C144.
        c. Add water to obtain a wet mix - ASTM C1602

    3. High bond mortar mix shall consist of:
        a. 1 sack Portland cement - ASlM C150, Type 1
        b. 50 pounds workability additive - "A" Marble Dust by Armco Steel Corporation, Piqua Quarries, or Ute Dolomite Limestone by U.S. Lime Division of Flintkote Corporation, or Micro Fill No. 2 by Pure Stone Company, Marble Falls, Texas or city-approved equal
        c. 3-1/4 cubic feet of sand -ASTM C144
        d. 4 gallons of high bond additive -Sarabond Liquid Mortar Additive by the Dow Chemical Corporation or approved equal
        e. Mix with water in accordance with High Bond Additive manufacturer's recommendations.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. Place 10-inch reinforced concrete base under proposed brick pavement for Arterial Streets.
   1. Concrete base: See applicable Rigid Concrete Base Section.
      a. Design concrete mix design for a minimum compressive strength of 3,000 pounds per square inch at the age of 2 days for either type I or type III cement
   2. Reinforcing Steel: Section _____.
      a. No. 4 bars at 18-inches on center both directions
   3. Keep concrete surfaces to receive pavers dry, clean, free of oily or waxy films and level.

B. Protect adjacent finished surfaces from soiling, staining, and other damage during construction. Clean and restore any damage or stains to adjacent surfaces to equal or better than original condition.

C. Spread and screed setting bed mixture to a true plane and limit bed mixture to an amount that can be covered with pavers before initial set.

D. Set pavers in the patterns shown in the field with uniform tight joints (1/4-inch).

E. Do not use pavers with chips, cracks, or voids.

F. Set paver in 1-inch layer of neat cement paste over setting bed.

G. Tolerances: Tolerances shall be checked continuously as work progresses so that nonconforming areas can be corrected before mortar sets.
   1. Alignment tolerances: maximum 1/4 inch in 20 feet; 1/2 inch in 40 feet
   2. Surface tolerance: maximum plus or minus 1/8 inch in 8 feet noncumulative
   3. surface tolerances will be checked and enforced. The Contractor shall make provisions that brick pavers can meet these tolerances as they are supplied. Imperfections in the brick dimensions and surfaces will not constitute as reasons to accept inferior paving and the work will be rejected.

H. Tamp pavers into full contact with the mortar bed to a level plane. Do not set large areas of pavers for later leveling.

I. After pavers are set and cleaned free of mortar, fill joints with mortar, completely filling voids.

J. Remove excess dry joint filler mixture and fog surface with fine water spray.

K. Cut pavers with motor driven masonry saw with a sharp diamond blade. Exposed broken edges will not be allowed.

L. A 7 day damp cure is required. Employ barricades to restrict traffic during the 7 day cure period. After the 7 day damp cure period, clean the surface with stiff brush and brick manufacturer's recommended cleaning solution in increments not exceeding 100 square feet, leaving surface clean and free of mortar and grout stains.

M. At the end of each day, spray paved areas with a fine mist of water. Fill joints within three (3) days after the pavers are set. Spray paved areas until the joints are filled.

N. Sweep and keep brick surfaces clean at all times in order to avoid penetration of cement into the brick surface.

3.5 REPAIR

A. General
   1. Remove and replace masonry paving units as directed by the City that are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended.
   2. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment to eliminate evidence of replacement.
   3. Pointing: during tooling of joints, enlarge voids or holes and completely fill with mortar or grout. Point-up joints at sealant type joints to provide a neat, uniform appearance, properly prepared to application of sealant.

4. Cleaning: Remove excess mortar/grout from exposed brick surfaces, wash and scrub clean.
5. Protect masonry paving installations from deterioration, discoloration or damage during subsequent constructions and until acceptance of work, in compliance with recommendations of installer and paving unit manufacturer.

B. Trench Repair
1. Preparation
   a. Replace a continuous section if multiple repairs are closer than 10 feet apart from edge of one repair to the edge of a second repair.
   b. Surface Preparation: mark pavement cut repairs for approval by the CITY.
2. Removal
   a. Use care in removing brick pavers to be repaired to prevent damage to
3. Installation: See Article 3.4.

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

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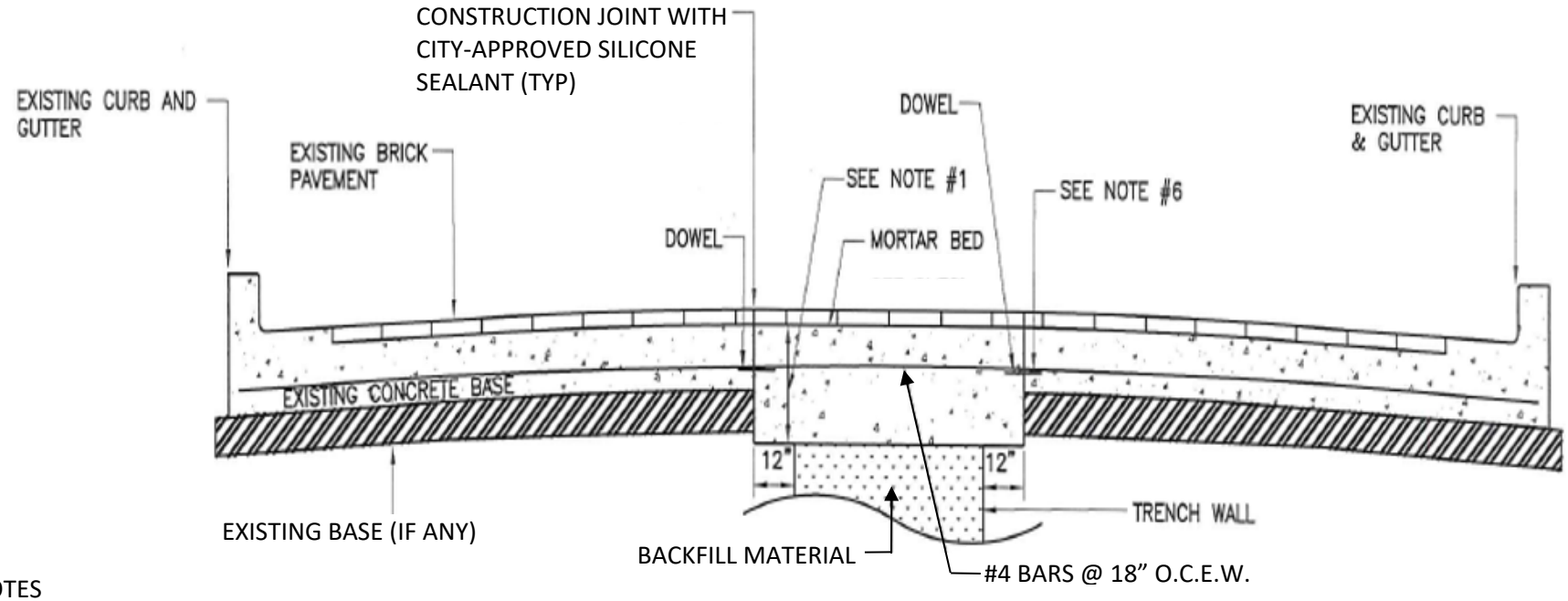
ALL CONSTRUCTION SHALL BE IN ACCORDNCE
WITH CITY OF STEPHENVILLE STANDARDS

BRICK STREET REPAIRS FOR STREETS WITH CONCRETE BASE



NOTES

1. REINFORCED CONCRETE BASE SHALL BE REPLACED TO A MINIMUM DEPTH OF 9-INCHES FOR RESIDENTIAL STREETS OR 11-INCHES FOR ARTERIAL AND INDUSTRIAL STREETS.
2. CONCRETE SHALL BE 4,000 PSI AT 28 DAYS PER CITY OF STEPHENVILLE STANDARDS.
3. FLOWABLE FILL IS REQUIRED TO BACKFILL ALL TRENCHES IN DOWNTOWN STREETS, AND OPTIONAL IN OTHER AREAS. BACKFILL SHALL MEET STANDARD SPECIFICATION.
4. EXISTING BRICK SHALL BE REMOVED CAREFULLY TO AVOID DAMAGE. DAMAGED BRICK IS TO BE REPLACED WITH UNDAMAGED BRICK TO MATCH ADJACENT BRICK.
5. MORTAR BED AND WET MORTAR JOINT FILLER PER CITY-APPROVED SPECIFICATION.
6. FOR RESIDENTIAL STREETS, USE #4X18-INCH LONG PREFORMED BARS, DOWELED AND EPOXYED A MIN. 6-INCHES INTO EXISTING PAVEMENT AT 18-INCHES ON CENTER AND 12-INCHES ON CENTER FOR ATERIAL AND HEAVY LOAD STREETS (TYP).

BRICK STREET REPAIRS FOR
STREETS WITH FLEXIBLE BASE