Analysis of Existing Brick Pavers on US-281 and US-136 in Red Cloud

Objective:
To evaluate condition of existing brick for potential re-use in reconstruction of US-281 and US-136

Existing Structure:

- 3" brick on 1" sand bedding on 5" concrete
- Constructed 1917 (96 years old)
- An estimated 750,000 bricks present within project limits

Current Condition:

- A majority of bricks exhibit corner breaks and/or rounded edges from nearly 100 years of traffic and weather. Photos 1 and 2.
- Areas of significantly deteriorated bricks are present. Photo 3.
- Areas of vertical and horizontal displacement are present. Photo 4.
- Many bricks exhibit significant damage on bottom face and/or middle of brick. This damage is not visible from the surface. Photos 5-8.
- Some bricks have asphaltic material present that would require removal. Photo 6.

Structural Laboratory Testing:

- Bricks tested for Compressive Strength, Flexural Strength, Freeze/Thaw Resistance, Absorption, and Abrasion Resistance
    - All bricks tested passed structural testing with two exceptions
    - Only reasonably whole bricks were tested. Bricks with visible cracks, large corner breaks, etc. were **not** tested as they were deemed unusable.

Physical Requirements for Interlock:

- Brick pavements rely on interlock between bricks to distribute loads
- Interlock is achieved through significant friction between bricks, jointing sand and a fixed edge
- Appropriate interlock is critical to avoid vertical, horizontal and rotational displacement
- Bricks require a minimum 2-5/8" thickness for interlock, exclusive of rounding, breaks, etc.
- A majority of the bricks no longer conform to required physical dimensions and tolerances for the required interlock under truck traffic.
    - **Approximately 65%-75%, do not meet the minimum 2-5/8" thickness needed for interlock** when damage is considered
    - **Approximately 60% do not meet Dimensional Tolerances for Pavers** (length and width varies excessively). Brick with larger tolerances are difficult to install and may not provide adequate interlock

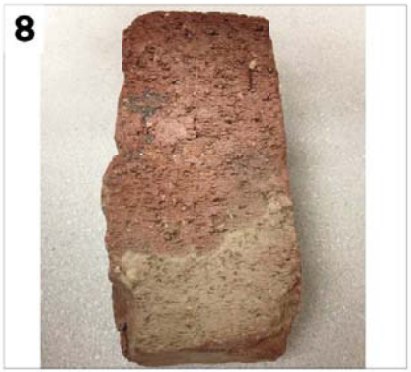
References:

- Flexible Vehicular Brick Paving, A Heavy Duty Applications Guide, The Brick Industry Association
- ASTM C 1272, Standard Specification for Heavy Vehicular Paving Brick
- ASTM C 67, Sampling and Testing Brick and Structural Clay Tile

Corner Breaks & Rounded Edges

Significant Deterioration

Horizontal & Vertical Displacement



Damage Not Visible from Surface

NDOR
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