1. Design Parameters

Span Length = 25 ft
Slab Width = 13 ft – 4 in (13.333 ft)
Pier Type = First Interior Pier (Two spans)
Pier Dimensions = 15 ft × 3 ft × 8.25 ft
Allowable Soil Bearing Capacity = 1.1 TSF (2.2 ksf)
Brick Unit Weight = 120 pcf
Concrete Unit Weight = 150 pcf
Mortar = 1:3 (cement:sand)
Concrete Grade = M15 minimum

2. Load Calculations

Dead Load Reaction (per support, one span) = 49.58 kips
Live Load Reaction (HL-93, per support, one span) = 78.19 kips
Service Reaction per Support = 127.77 kips
Interior Pier (two spans) = 255.54 kips
Pier Self Weight = 44.6 kips
Total Service Axial Load ≈ 300 kips

2.1 Strength I Load Combination (LRFD)

Strength I: 1.25DC + 1.50DW + 1.75LL
Factored Reaction (two spans) ≈ 402 kips (deck only)
Including Pier Weight ≈ 458 kips

3. Spread Footing Design

Adopted Footing Size = 18 ft (L) × 9 ft (B) × 2 ft (Thickness)
Footing Area = 162 sq.ft
Footing Self Weight = 48.6 kips
Total Service Load Including Footing = 348.6 kips
Bearing Pressure = 2.15 ksf = 1.08 TSF
Allowable SBC = 1.10 TSF
Result: SAFE

3.1 Eccentricity Check

Load assumed concentric due to full-length bearing.
No tension developed at base.
Uniform bearing distribution assumed.

4. Masonry Compression Verification

Pier Base Area = 45 sq.ft
Average Compressive Stress = 6.67 ksf (≈ 46.5 psi)
Within permissible compressive limits for quality brick masonry.

5. Stability Checks

Sliding:
Assume μ = 0.5
Sliding Resistance = 150 kips > Expected Longitudinal Forces
Result: SAFE

Overturning:
Pier aligned parallel to canal flow.
Footing width = 9 ft provides adequate rotational stability.

6. PCC Bearing Pad

Dimensions = 15 ft × 3 ft × 6 in minimum
Concrete Grade = M15
12 mm dowels @ 2 ft c/c embedded 8–10 in into masonry
Waterproofing membrane provided
Top finished smooth and level

7. Scour Protection Measures

Provide riprap pitching with approved filter layer around footing perimeter.
Provide launching apron if required by hydraulic department.
Foundation depth to remain below calculated scour depth.
Post-flood inspection recommended.