Project:

Location:

Design By: ____ Checked By: ____

SECTION 1: PAVEMENT DESIGN

1. Strength Design: (Ref: TM 5-822-5 unless otherwise noted)

a. Road Class = _ (Table 1 or 2 in TM 5-822-2)

b. Traffic Category = ___ (Para 3-2a & b)

c. Design Index = _ (Para 3-2c)

d. Modulus of Subgrade Reaction = k = ___ pci (Based on Field Plate Bearing Tests) or(Based on Table 9-1 & Fig 9-1)

(1) If test results are not available, refer to para 9-4 and Table 9-1, Modulus of Soil Reaction, for typical values based on Unified Soils Classification System (USCS) soil classification symbol and on the in-situ moisture content of the soil. This yields a soil k-value = ___ psi.

(2) Read para 6-1a, Subgrade Conditions (Reinforced Concrete Pavements).

(3) When a base course is used, use Fig. 9-1, to determine the k-value on top of the base couse; as a function of the base course thickness. This yields a k-value = ___ psi on top of the __-inch base course. It is good practice to run field plate bearing tests to confirm this value.

e. Concrete 28-day Flexural Strength = ___ psi (based on local availability)

f. Pavement Thickness = ___ inches (Fig 12-1 or 12-2)

NOTE: Concrete pavement thickness shall be expressed to the nearest whole or half inch. Round up midway values. A minimum base course thickness of **4** inches is required for the strength design.

2. Frost Design:

a. Reduced Subgrade Strength Method (RSS):

(1) Design Index = __ (from 1c above)

(2) Concrete 28-day Flexural Strength = ___ psi (from 1e)

(3) Soil Frost Group = __ (Table 18-2)

(4) The following is an iterative process whereby base course thicknesses are assumed and reduce moduli of soil reaction are determined.

These values are used to determine the required pavement thickness. In no case should the reduced modulus of soil reaction exceed the value in 1d used for the strength design. A minimum base course thickness of **4** inches is required, except for **F3** and **F4** subgrade soils where a minimum **8** inches of base course is required consisting of 4 inches of rapid draining material directly below the concrete underlain by a minimum of 4 inches of filter material over the subgrade soils (Ref. para 5-1 and 5-4).

Trial Number	Assumed Base Course Thickness	Reduced Modulus of Soil Reaction (Fig. 18-5 of TM 5-822-5)	Pavement Thickness (Fig. 1 of TM 5-822-6)
1	8.0" (min)	50	
2	12.5"	75	
3	17.0"	100	
4	21.5"	125	
5	25.5"	150	

(5) Pavement Thickness = ___ inches

(6) Base Course Thickness = ___ inches

NOTE: The values of 2a(5) and 2a(6) above should represent the least expensive combination of base course and pavement thicknesses shown in the table of 2a(4) above.

b. Limited Subgrade Frost Penetration Method (LSFP): (NOTE: All quantities in parentheses are values normally assumed when more exacting values are not known or are not available.)

(1) Design Freezing Index = ____ (Fig 18-2)

(2) w = (4%)

(3) γ = (135) pcf

(4) Frost Penetration = a = ____ inches (Fig 18-3)

(5) Pavement Thickness = p = ____ inches (From 1f above)

(6) c = a - p = ____ - ____ = ___ inches

(7) r = (3)

(8) Design Base Thickness = b = ____ inches (Fig 18-4)

(9) Design Thickness = b + p = _____ + _____ = ____ inches

The frost design is controlled by either 2a or 2b, whichever is the least expensive. For this pavement the **(RSS)** (**LSFP)** method governs for the frost design.

3. The final pavement design is controlled by either the Strength Design (1) or by the Frost Design (2), whichever provides the stronger pavement section. For this pavement the **(RSS)(LSFP)(STRENGTH)** design provides the stronger section. However, if the frost design requires a greater pavement thickness than the strength design, the designer should contact the Facilities Engineer's Office to determine if a lesser thickness can be used based on past experience with similar pavements (similar traffic, similar groundwater conditions, similar soils, etc.) over a period of at least 10 winter seasons. In no case should the final pavement thickness be less than required by the strength design.

If a reduced thickness is used based on past experience with a similar pavement, a record of this experience must be included in this design analysis:

Name of Similar Road: _____

Traffic Conditions:

Road Class: _____

Traffic Category: _____

Soil Frost Group: _____

Approximate Groundwater Depth: _____

Description of Road's Condition: _____

_____

_____

_____

Person Contacted for Above Information: _____

Person's Title: _____

EXTERIOR CONCRETE PAVEMENT SECTION:

____" Concrete (___ psi flexural strength @ 28 days)
with _" **x** _" **- W__ x W__ WWM** placed __" below the concrete surface in the slabs shown to be reinforced on the drawings.
___" RDM Base Course (Rapid Drainage Material)
___" DGA Base Course (Dense Graded Aggregate)

[**12.0**" RDM (#57) Base Course {ASTM C33, #57 crushed stone stabilization layer}
Geotextile stabilization fabric placed directly on the subgrade]

REINFORCING REQUIRED:

Odd Shaped Slabs: Exterior concrete access road will have odd-shaped slabs; therefore in accordance with para 13-1c(1), we need 0.06% steel:

.0006 x ___" x 12"/' = _____ square inch steel per ft concrete

USE _" x _" - W_ x W_ WWM yields: _____ square inch steel per ft of concrete
(closes common stock size)

Maximum Slab Length (Maximum Joint Spacing):

$L=\{0.00047\ h_r\ (f_S S)^2\}^{1/3}$ Ref Eqn 16-1, para 16-1d,
L = ____ ft say **___ft** where: hr = ____" (reinf slab thickness)
fs = 56000 psi (steel yield strength)
S = % reinf steel
= (_____ sq in per ft / ___" x 12"/') 100%
= _____%

Reinforcing Around MH and Other Projections Through Pavement Surface: To minimize cracking around projections and to hold these cracks together, place the following additional reinforcing at the corners of all projections, with a min of 4 sets of bars around circular projections greater than 6 inches in diameter:

2 No. 4 Reinf Bars, each 4 feet long, Spaced 4 inches apart.
Place bars at the mid-point of the slab

Dowel Size and Spacing: (Ref Table 15-2)

___-inch Dia. Bar, __ inches long (min)
Spaced __ inches (min) center to center.

SUBGRADE AND SUBDRAINAGE REQUIREMENTS:

Compaction Requirements: [In-situ (Plate Bearing)(CBR) tests indicate a natural subgrade density of approximately (__)(85)% CE55 maximum laboratory density.] [Consequently, compaction of the in-situ subgrade soil will **not** be required.][To properly place the base course layers, a minimum of (6 inches of the in-situ cohesive subgrade soil shall be compacted to 90% Modified Proctor) (and) (12 inches of the in-situ cohesionless subgrade soil shall be compacted to 95% Modified Proctor) (and the following removal and recompaction will be required:

Soil Type:	Removal Depth:	Modified Proctor Compaction:
Cohesive	(6")	90%

Cohesionless (12") 95%)]

Subgrade Stabilization Note: Subgrade stabilization is required in all paved areas. The stone stabilization layer shall extend a minimum of 5 feet beyond all edges of the paved areas. The Contractor shall remove any surface mud and place the stabilization fabric directly on the undisturbed subgrade. The fabric shall extend up to the top of the sidewalls of the excavation required to install the stone stabilization layer and a minimum of 2 feet beyond the top of the excavated area. If more than one roll width of fabric is required, overlap the two widths a minimum of 2 feet. Do not drive directly on the fabric. Back dump the RDM (#57) base course material onto the stabilization fabric. Spread out the aggregate in the direction of any overlap of the fabric while maintaining a minimum of 12 inches of aggregate cover over the fabric at all times. All of the above work shall be done with tracked vehicles. Pneumatic-tired vehicles shall be kept to the minimum necessary to completely place the RDM (#57) base course material on the stabilization fabric. The Contractor shall operate on the stabilization layer at all times and shall minimize contamination of the surface with mud, soil, or construction debris. If the top of the stabilization layer is no longer essentially free draining at the time of placement of the overlying pavement base course layers, the Contractor shall remove the top 6 inches within these areas and replace it with satisfactory RDM (#57) base course material at no additional cost to the Government. "Free draining" shall mean that when a 1 gallon jug of water is poured slowly onto the surface of the stabilization layer, that quantity of water will drain through the surface within 1 minute; leaving a wetted surface area not greater than 1 square foot. Until the stabilization layers can be tied into the permanent subdrainage system, excavate temporary drainage trenches along the low end of the perimeter of the work areas to insure drainage of surface or subsurface water which collects in the stabilization layer. Refer to Specification Section 02710: SUBDRAINAGE for stabilization fabric requirements.

Subdrainage Requirements: The soils at the proposed construction sites are both frost susceptible and moisture sensitive. Therefore with the high in-place soil moisture contents and the high seasonally perched water conditions encountered at these sites, the subgrade soils will require a pavement subdrainage system. The subdrains will consist of a 6-inch minimum diameter pipe surrounded by a minimum of 3 inches of ASTM C33, #57 crushed stone on the bottom, 6 inches (minimum) on each side, and sufficient crushed stone above the top of the pipe to extend to the Rapid Drainage Material (RDM) Base Course within the pavement structure. The crushed stone filter material will be completely enveloped in a filter fabric. Refer to Specification Section 02710: SUBDRAINAGE for filter fabric requirements.