A driveway is designed for passenger car and light truck use. A sidewalk is designed for pedestrian use.

**MATERIALS**

**Aggregates**
- aggregates shall conform to the physical properties of ASTM C33 – class 4S or MDOT specifications for concrete
- ASTM size #57 or #67 or MDOT size 6AA or 17A with MDOT 2NS should be specified in the mix design

**Portland Cement**
- Portland cement shall conform to ASTM C150 – use the same source for each project

**Supplemental Cementitious Materials**
- fly ash shall conform to ASTM C618, slag cement shall conform to ASTM C989

**Chemical Admixtures**
- chemical admixtures shall conform to the requirements of ASTM C494
- air entraining admixtures shall conform to ASTM C260

**CONCRETE PROPERTIES AND PROPORTIONS OF MATERIALS**

**Compressive Strength and Water/Cement Ratio**
- the minimum specified compressive strength ($f'_c$) shall be 4000 psi (28 days) – ACI 332
  - the maximum in-place water to cement (w/c) or water to cementitious ratio (w/cm) shall be 0.45

**Slump**
- the maximum slump at the point of placement shall not exceed 4 inches
- the maximum slump may be increased up to 7 inches by using a mid-range or high-range water reducing admixture

**Air Content**
- concrete shall be designed for a total air content, by volume, of 6.5% +/- 1.5%

**PREPARATION**

**Subgrade Preparation**
- the subgrade shall be free organic and unconsolidated material
- removal of unstable materials shall be to a minimum depth of 6 inches
  - replace with crushed stone, gravel, or sand - compacted to 95%
  - sub-base materials shall be a minimum of 4 inches in thickness compacted
- in warm or hot weather, the sub-base shall be dampened prior to concrete placement
- no standing water shall be present when concrete is placed
- in no case shall a driveway be constructed on frozen subgrade/sub-base materials.

**Drainage**
- a minimum slope of 1/8 inch per foot shall be maintained for drainage and the subgrade shall be drained to daylight or to a drainage system

**CONCRETE THICKNESS**
- the minimum concrete thickness for a driveway is 4 inches
- when traffic will include delivery vehicles, the minimum concrete thickness shall be 5 inches

**BATCHING and DELIVERY**
- concrete shall be batched, transported and discharged in accordance with ASTM C94.
- any water addition on job after delivery should be documented on the concrete delivery tickets

**FINISHING**
- it is recommended that at least one certified ACI flatwork finisher be involved in the finishing
- Use of fly ash or slag cement will change the time of finishing
- the recommended sequence for finishing includes strike-off, bull floating, edging, curing, jointing and texturing
  - do not perform finishing operations while bleed water is still visible
  - do not use steel trowels, fresnos or other tools that may seal the surface prematurely
  - do not sprinkle water onto the surface (blessing the concrete) to aid in finishing
  - edge the concrete around the perimeter (maximum radius = ½ inch) and at all tooled joints
  - using a stiff-bristle broom, apply a “broomed” texture
  - NOTE: the use of an evaporation retarder is recommended on low humidity and/or windy days

**CURING**
- curing requires the maintenance of proper temperature and moisture in the concrete
  - as the cement hydrates concrete gains strength
- curing shall begin within 30 minutes after texturing
- curing can be accomplished by covering the concrete with polyethylene, using spray on curing compounds or by continuous water application
  - curing by these methods must extend for a MINIMUM of three days
  - NOTE: when using polyethylene, discoloration may occur
- for residential construction, it is recommended that curing be accomplished by applying a product meeting ASTM C1315 within 30 minutes of texturing – apply uniform coverage according to the manufacturers’ recommendation

**JOINTING**

*Control Joints*
- shall be installed in both directions at intervals not exceeding two times the slab thickness
  - i.e. 8 ft. for a 4 inch thick slab
- panels should be as square as possible and in no case shall the ratio of length to width exceed 1.5 to 1
- control joints shall have a minimum depth equal to ¼ the slab thickness
  - i.e. 1 inch for a 4 inch thick slab
- control joints may be installed by pre-formed materials, hand tooling or by saw cutting

*Isolation Joints*
- isolation joints shall be installed at points of restraint to isolate freshly placed concrete from fixed objects
  - i.e. existing structures
- isolation joints shall extend the full depth of the slab

*Saw Cutting – NOTE:* the window for saw cutting is typically 8-12 hours, but will vary with weather and mix designs

**OPENING TO TRAFFIC**
- the driveway/sidewalk may be opened to traffic following 7 days of curing, or sooner, when testing confirms that a compressive strength of 2500 psi is reached

**SEALING**
- sealers protect the concrete by minimizing water and deicing salt penetration
- a penetrating sealer can be applied 30 days after initial placement and typically need to be reapplied every three to five years. NOTE: if a curing compound meeting ASTM 1315 is used, it must be worn off or removed prior to applying the sealer

**COLD WEATHER CONCRETING – (ACI 306R-10 Guide to Cold Weather Concreting)**
Concrete matures at a slower rate during cool/cold weather conditions
- concrete shall not be placed on a frozen subgrade
  - the subgrade temperature must be a minimum of 40°F
- the contractor shall take measures to protect the concrete (i.e. straw/hay, insulating blankets, etc.) to maintain the required curing temperature of at least 50°F for a minimum of three days
- to develop early strengths during cool/cold weather the mix may contain additional Type I cement, substitute Type III for Type I or contain an accelerator meeting ASTM C494
- the use of fly ash and slag cement will slow the rate of hydration

**HOT WEATHER CONCRETING (ACI 305R-10 Guide to Hot Weather Concreting)**
- concrete hydrates faster as ambient temperatures increase
- caution should not be placed when the concrete temperature is above 90°F
- moisten the subgrade prior to placement (no standing water should be present)
- place concrete when ambient temperatures are most favorable, i.e. early morning
- the use of fly ash and slag cement will slow the rate of hydration
- set retarding admixtures meeting ASTM C494 may be used
- to reduce the rate of evaporation from the surface resulting from low humidity, warm temperatures and moderate to high winds, the use of a evaporation retarding membrane is suggested

**SAFETY**
- provide Material Safety Data Sheets (MSDS) as requested
- avoid skin contact with fresh concrete by wearing gloves, boots, clothing and eye protection

**FOR MORE INFORMATION,** please visit our website at [www.miconcrete.org](http://www.miconcrete.org)