

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 = 1/2 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

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