

# DRIVEWAY & SIDEWALK

## ► DESIGN AND PLACEMENT GUIDELINES



## 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 – or ASTM C595 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 of 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 needs 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 an 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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