PAVING YOUR WAY TO REDEVELOPMENT

An intro to paving materials and their uses

Presented by: Adam Rossmell, Burkhardt Construction, INC.

WHY YOU SHOULD CARE ABOUT WHAT I'M ABOUT TO SAY!!!!

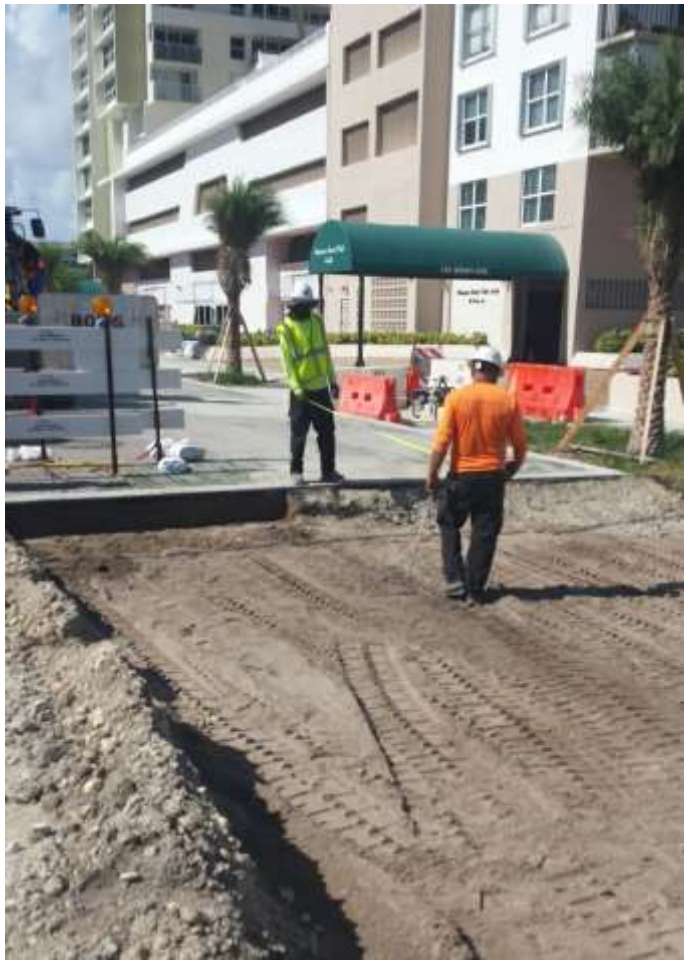
- Know your design options and offer material ideas during the design phase.
- Make informed decisions to meet needs of communities (drainage, noise, aesthetics, cost).
- Be better able to communicate with your contractor.
- Understand the differences in paving materials and their uses.
- Understand what the design team is talking about when they describe different paving materials.

TYPES OF EXTERIOR PAVING MATERIALS

- Pavers
- Asphalt
- Concrete

FIRST THINGS FIRST:
IT'S ALL ABOUT THAT BASE!

- Base preparation for pedestrians or vehicles follows the same steps for each of the paving materials we'll cover today, but the difference is the thickness of the base material and the thickness of the finish paving material itself (pavers, asphalt, concrete).
- Remove the existing material that is in the area the finish paving material is going to be put down or installed.
- Excavate down to the proper depth for your base material and the finish paving material based on the thickness of each.
- Compact the subgrade after excavation has been completed.



IT'S STILL ALL ABOUT THAT BASE!

- Once the subgrade has been compacted, begin bringing in the base material. Base material is usually limerock, unless you're putting down a porous material. If it's a porous material, you'll need to put down rocks or stones that are large enough to leave a void that allows water to go through.
- Typical thicknesses of base material:
  - 8 " - 12" for vehicular applications
  - 6" – 9" for pedestrian applications
- Once the base material has been installed and compacted (if it's limerock), you're ready to begin putting in your finish material.

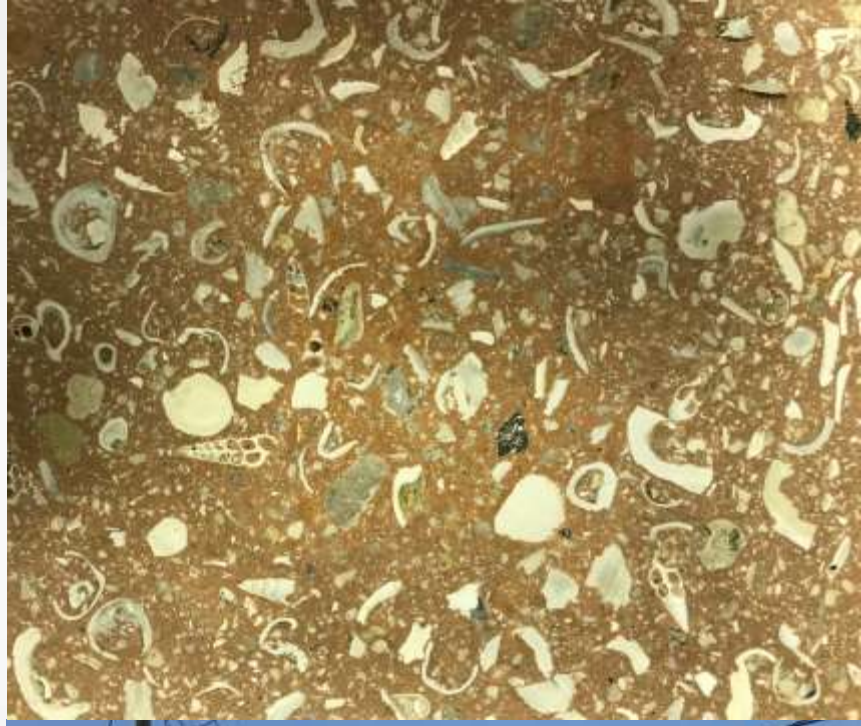
PAVERS

- Paving has been around for almost 5000 years and the oldest paved road was discovered in Egypt! Then the Romans!
- Pavers are easy to install once they arrive onsite, but preparations must be completed beforehand before installation can begin.
- Pavers can be made of many different materials, but the two we're going to cover today are:
  - Concrete Pavers
  - Clay Pavers
- Pavers come in many different thicknesses, but the two most common are:
  - 60 MM or 2 3/8" – Used more in NON-Vehicular Areas
  - 80 MM or 3 1/8" – More commonly used in vehicular areas

CONCRETE PAVERS

- Concrete pavers are made in a factory and arrive on site ready to install on a base.
- They can be made to specific shapes, sizes, and colors to fit the needs of your project.
- Common sizes are 12”x12” and 4”x8”
- Different aggregates can be added to the paver (glass, stone, mixture of both).

EXAMPLES OF CONCRETE PAVERS



EXAMPLES OF CONCRETE PAVERS

EXAMPLES OF CONCRETE PAVERS

EXAMPLES OF CONCRETE PAVERS

CLAY PAVERS

- Solid clay brick pavers are made in a temperature controlled kilns.
- They can be made to specific shapes and sizes. Colors are limited with clay pavers because you're using materials coming from the earth. Like a fine wine, clay pavers are typically in the red family of colors. There's some variations, but browns, reds, tans, and combinations of browns, reds, and tans are the most common colors.
- Common size for clay pavers are 4"x8". Again, they can be custom made, but standard sizes are 4"x8".

EXAMPLES OF CLAY PAVERS

EXAMPLES OF CLAY PAVERS

PAVER INSTALLATION

- Paver installation consists of a few steps once the base has been completed.
  - Spread leveling sand
  - Take pavers off pallet and begin setting them in the specified pattern
  - Spread sand back over the pavers after they've all been laid to fill the small voids in between pavers.
  - Pressure clean and seal

COSTS FOR PAVER CONSTRUCTION

- Costs for paver areas should be calculated as follows:
  - Demolition of existing material
  - Excavate and grade of area to receive pavers
  - Base Material for Pavers (concrete or limerock)
  - Pavers
  - Pressure Cleaning and Sealing
  - Cost = $8.00 – $15.00 per SF
  - Why the big range of costs?

PROS AND CONS FOR PAVER CONSTRUCTION

PROS

- Easy to replace
- Easy to install
- Decorative pavers are less expensive than decorative concrete (generally speaking)
- Can be made to different thicknesses to suit your specific needs.
- Extremely durable if the base underneath was constructed properly.

CONS

- Continual maintenance (pressure cleaning and sealing)
- Cumbersome to move around if you receive a large shipment.
- In general, installation takes slightly longer than pouring concrete
- Depending on the material, it may not be readily available. Usually a long lead time if it's something custom made.

ASPHALT

- The first recorded use of asphalt as a road building material was in Babylon in 615 BCE.
- Asphalt covers 94% of the paved roads in the U.S. and is the most versatile method of paving.
- Popular uses include driveways, parking lots, roads, racetracks, tennis courts and outdoor basketball courts.
- Different types of asphalt include: Perpetual Pavement, Porous Asphalt, Quiet Asphalt, and Warm Mix. There are different mixes for each asphalt as well (FC-12.5, FC-9.5, Type S-III).
- Asphalt is composed of 5% asphalt cement and 95% aggregate (stones, sand, and gravel).
- Typical thickness for asphalt is between 2 ½" and 3", which is normally spread in two lifts.

PERPETUAL PAVEMENT

Mostly commonly used in roadway construction.

A multi-layer paving process useful for extending the life of a roadway.

Reduces maintenance as it only requires the top layer to be removed and patched or replaced, which saves money long term.

Improves visual contrast with road lines and marking.

Pre-mixed at a plant and delivered to the jobsite via truck.

PERPETUAL PAVEMENT CONT.

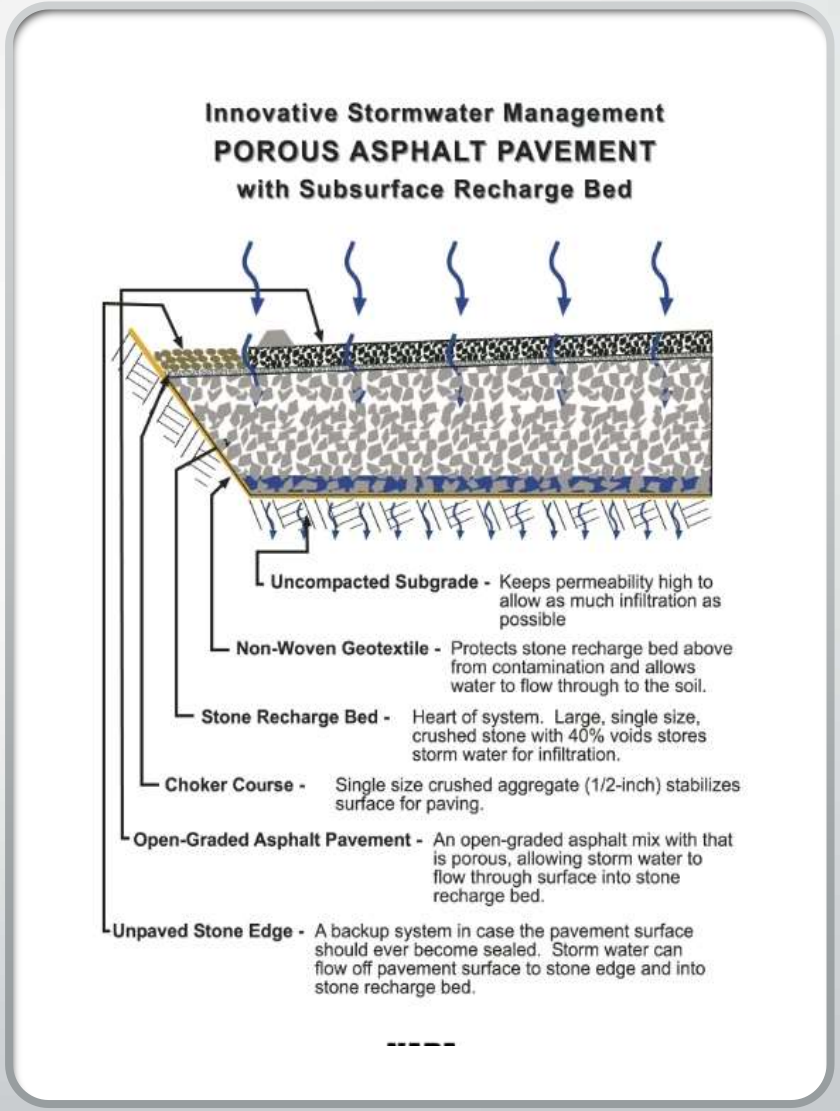
- When the asphalt arrives at the jobsite, it must be put down quickly. The asphalt is extremely hot and needs to be put down before the temperature drops below a certain degree.
- Dumped out of a truck and into a paving machine (top photo).
- Paving occurs in lifts and in 8-12’ wide passes.

POROUS ASPHALT

- Most commonly used in parking lots to allow water to drain through the surface into a stone recharge bed and infiltrate into the soils below the pavement.
- Reduces runoff and with proper installation can reduce your annual runoff by 80%.
- Requires low maintenance which reduces costs
- Is environmentally beneficial by reducing storm system basins, requires less energy to manufacture.
- Tends to be more coarse than standard pavement but is smooth enough to meet ADA requirements.

POROUS ASPHALT

- Biggest difference between porous asphalt and regular asphalt (perpetual pavement) is the aggregate size in the asphalt mix and subgrade and base material used underneath.



QUIET ASPHALT

- Commonly used when road ways with high traffic volume are constructed next to residential areas.
- Reduces road noise significantly. Research has shown that resurfacing a noisy road with stone-matrix asphalt or open-graded friction course mix will reduce highway noise by 3 to 5 dB(A) or more, which is the same as doubling the distance between the source of the noise and their location.
- Quiet asphalt is more cost effective than installing noise barrier walls.
- Again, the difference between quiet asphalt and regular asphalt is the way it is made. Different chemicals/aggregates are used in quiet asphalt when compared to perpetual pavement.

WARM MIX ASPHALT

- Warm mix asphalt is the generic name of the technologies that allow the producers of hot-mix asphalt pavement material to lower the temperatures at which the material is mixed and put on the road.
- Reductions of 50 to 100 degrees Fahrenheit have been documented.
- These reductions have the benefit of cutting fuel production, which in turn decreases the production of greenhouse gases.

ASPHALT PAVING

- Once the base is completed, asphalt paving begins at the plant where the asphalt is mixed and loaded on to dump trucks.
- The dump trucks arrive on site and dump the asphalt into an asphalt paving machine
- The paving machine then spreads the asphalt onto the prepared surface.
- After the asphalt is spread, it gets compacted using a roller and plate compactor.

ASPHALT PAVING

- Once all of the areas have been paved with asphalt, it is a good idea to stay off the asphalt for 24-48 hours to let it cure.
- Paint parking stall lines and parking lot markings after a week or so of the asphalt curing. Some government agencies have different rules or standards for how soon striping can be put down.

HOW CAN YOU MAKE ASPHALT LOOK PRETTY?

- Paint/Coating
- Stamped Asphalt
- Seal Coating

COSTS FOR ASPHALT

- Costs for asphalt should be calculated as follows:
  - Demolition of existing material
  - Excavate and grade of area to receive asphalt
  - Base material for asphalt (limerock or stone)
  - Asphalt
  - Cost = $45.00 - $55.00 per SY – note the unit
  - Why the big range of costs?

PROS AND CONS FOR ASPHALT

PROS

- Cheap compared to pavers or concrete
- Easy to overlay or mill and re-surface
- Sealcoating will extend the life, which is a cheaper alternative to completely re-paving.
- Readily accessible and available on short notice
- Easy to repair
- Last a long time.
- Very quick installation compared to concrete or pavers.

CONS

- HOT!!! - Think about when you walk through a parking lot barefoot…are you stepping on the asphalt or the white parking stall lines?
- It's not really environmentally friendly based on the reason above. It traps and absorbs heat.
- Need to seal coat every so often (2-5 years).
- Any sort of surfacing will wear down over time.

CONCRETE

- Ancient Romans were the first to develop concrete as a building material.
- Concrete is one of the most versatile paving materials available.
- Popular uses:
  - Sidewalks
  - Curbs
  - Patios
  - Sub slabs
- PSI (Pounds per Square Inch)
  - Is the rating that is used when describing the strength of concrete. The greater the PSI, the stronger the concrete and depending on the application, there may be a specific PSI you need to use.
  - Most sidewalks and curbs use 3000 PSI concrete.
  - Thicknesses of sidewalks and driveways, like the other materials, depend on the intended uses, but common thicknesses are 4" for sidewalks and 6" for driveways.
- Today we'll review sidewalks and curbs!!!!!

SIDEWALKS

- Are EVERYWHERE!!!
- Width depends on location and space. Typical sidewalk widths are 5’-6’. ADA requires 4’.
- Sidewalks can be finished many different ways.
  - They can be topped with a cement based product
  - Exposed aggregate
  - Colored

EXAMPLES OF CONCRETE TOPPING

EXAMPLES OF CONCRETE TOPPING

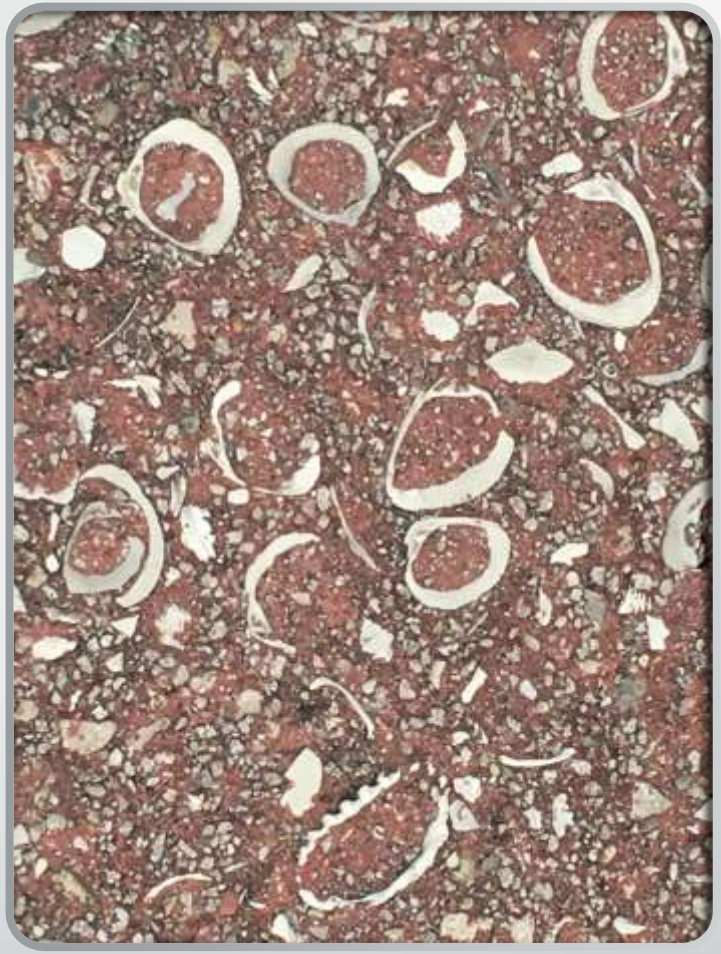
EXAMPLES OF EXPOSED AGGREGATE CONCRETE

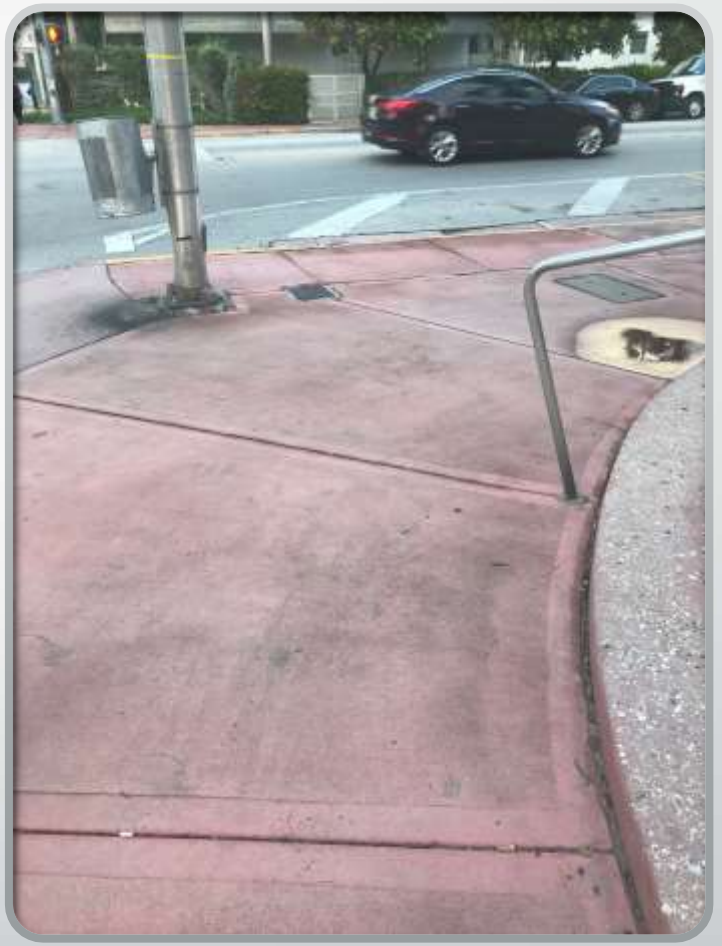
EXAMPLES OF EXPOSED AGGREGATE CONCRETE

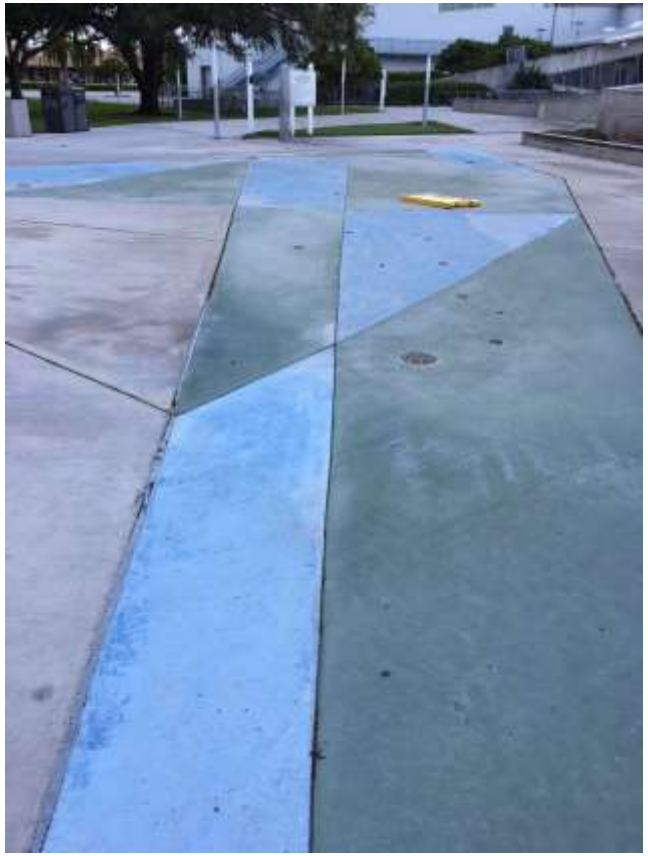
EXAMPLES OF EXPOSED AGGREGATE CONCRETE

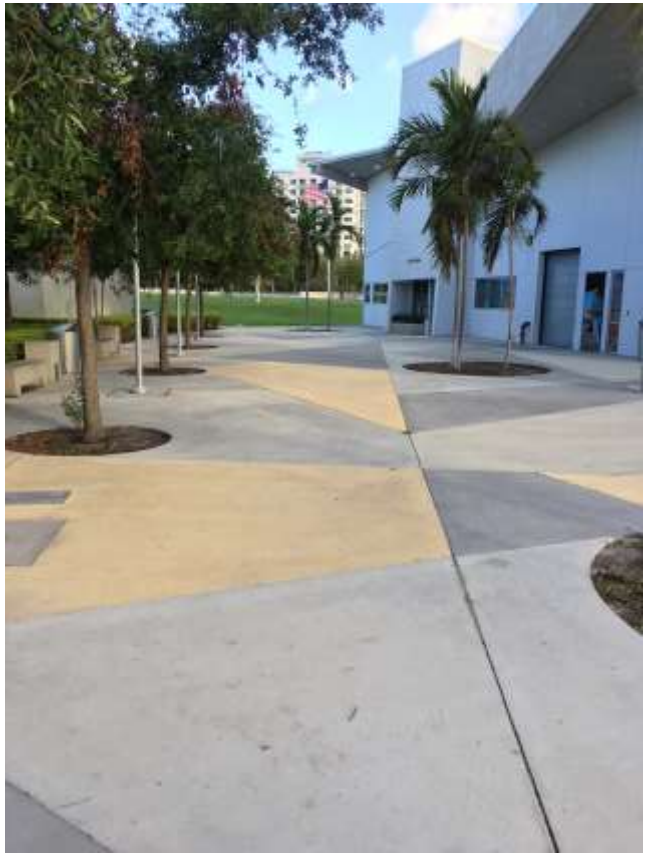
EXAMPLES OF EXPOSED AGGREGATE CONCRETE

EXAMPLES OF COLORED CONCRETE





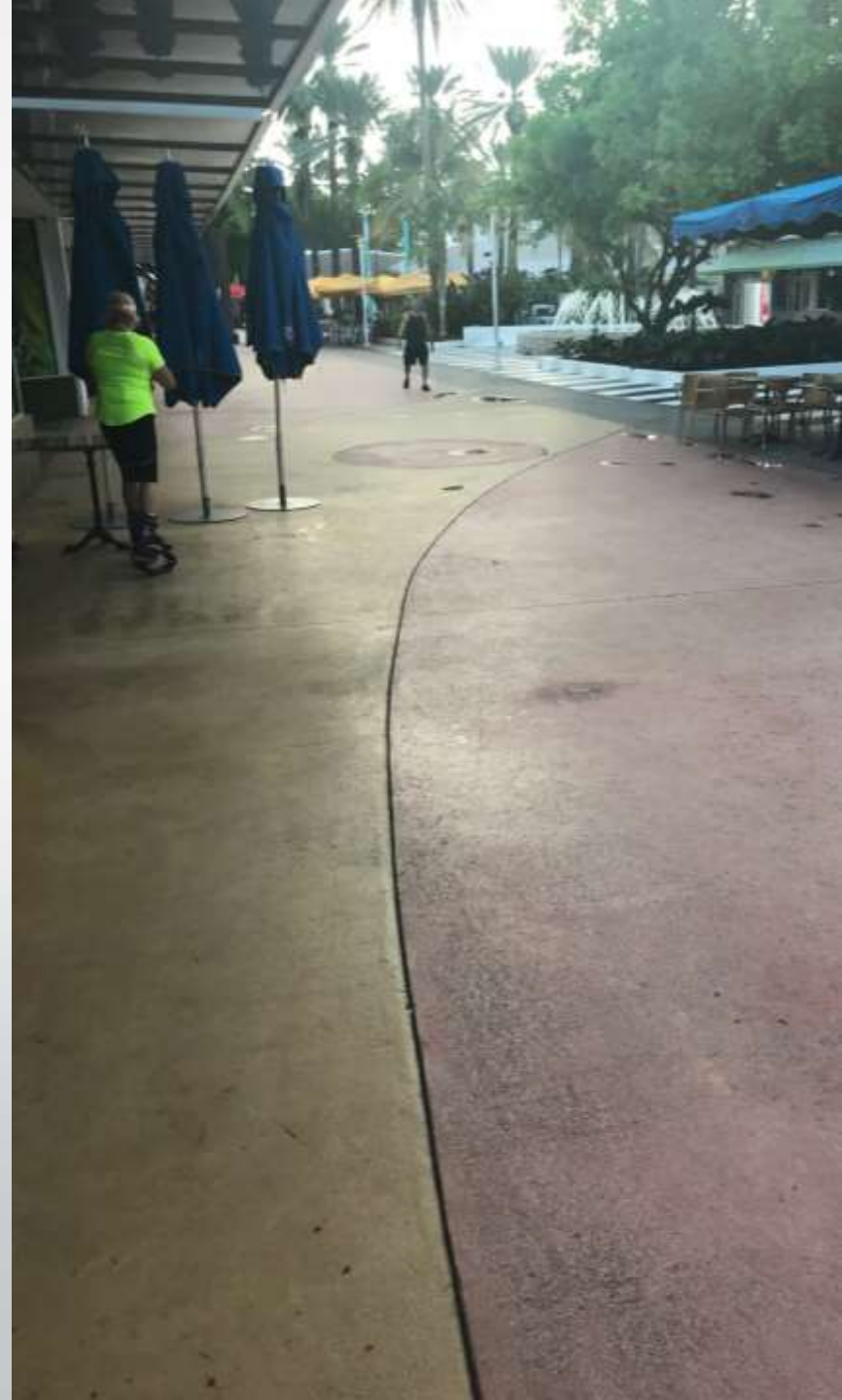




EXAMPLES OF COLORED CONCRETE

EXAMPLES OF COLORED CONCRETE

EXAMPLES OF COLORED CONCRETE



EXAMPLES OF COLORED CONCRETE

POURING CONCRETE

- Compact the area one last time before you begin forming
- Begin forming after all of your base work has been completed. Form size depends on thickness of concrete.

POURING CONCRETE

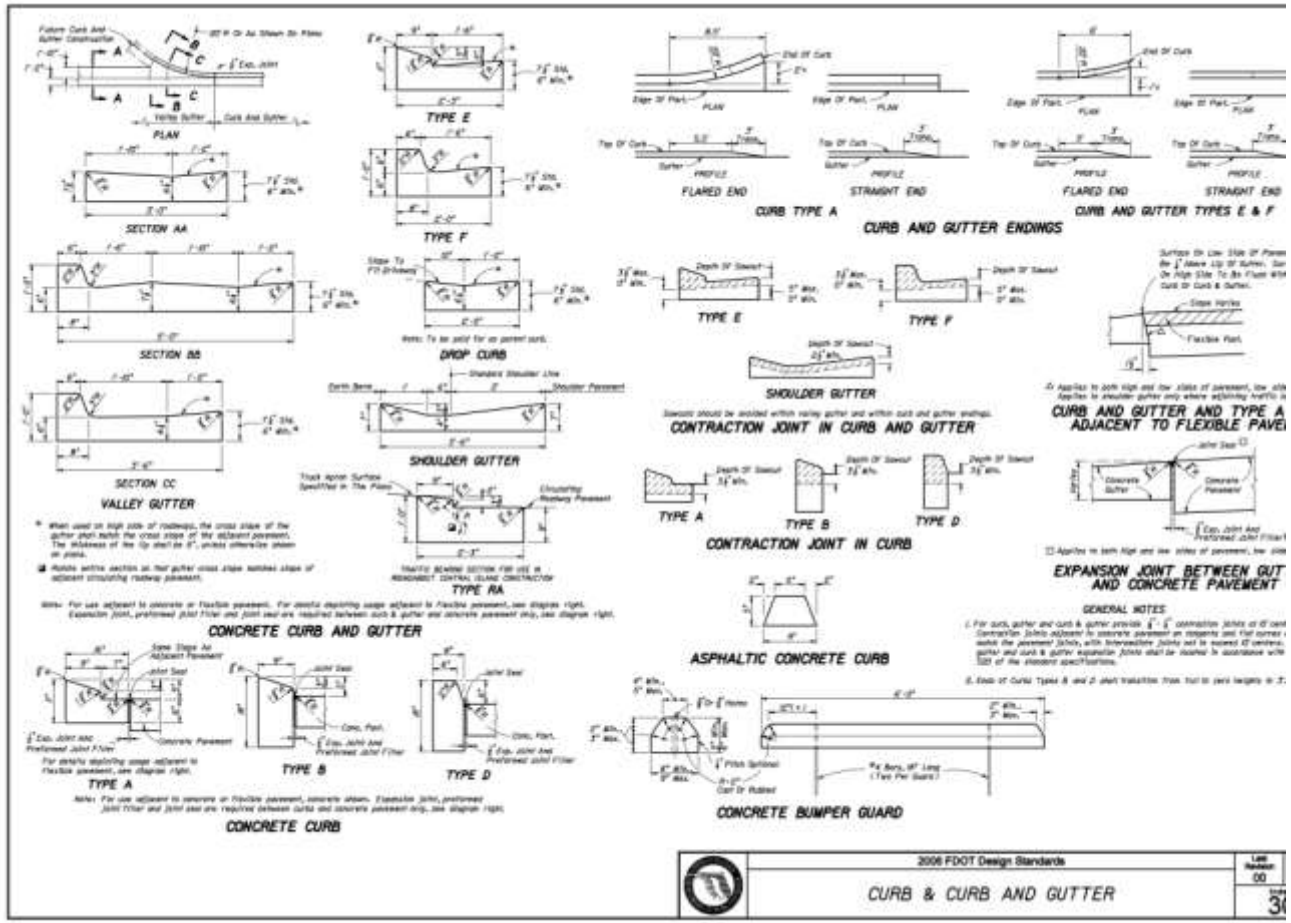
- After formwork has been installed, the area is ready for concrete! Concrete comes pre-mixed from a concrete plant and is delivered in a concrete truck.
- The concrete trucks arrive onsite and get close to the area that needs concrete.
- The concrete truck begins pouring in the designated area.
- Once the concrete pour is complete, the concrete crew begins finishing the concrete while it's still slightly wet. Broom finish is the most common type of finish for concrete.

WHAT ABOUT THE DIFFERENT FINISHES WE COVERED?!?!?!?!?

- A concrete topping with a design is done after the concrete has dried completely.
- If the concrete finish is to be exposed aggregate, the aggregate is broadcast after the concrete is poured and pressed down into the concrete using a tool called a "float".
- After the concrete dries, the aggregate is exposed using 1 of 3 methods:
  - Brushing and Washing
  - Surface Retarder
  - Abrasive Blasting
- Colored concrete comes straight from the plant as colored concrete, so no other work needs to be done to it.

CURBS!!

- Curb is defined as "a stone or concrete edging to a street or path".
- Curbs are used on roadways to divert water into drainage areas or catch basins and to separate sidewalks and roadways.
- Different types of curbs
  - Type A, B, D, E, F
  - Valley Gutter
- Most common for roadway construction are D, F, and Valley Gutter



EXAMPLES OF CONCRETE CURB

EXAMPLES OF CONCRETE CURB

EXAMPLES OF CONCRETE CURB

COSTS FOR CONCRETE

- Costs for concrete should be calculated as follows (sidewalks are measured in SF and curb is measured in LF):
  - Demolition of existing material
  - Excavate and grade of area to receive concrete
  - Base material for concrete (limerock or stone)
  - Concrete
  - Cost = $11.00 - $15.00 per SF for sidewalks/driveways. $25.00 - $32.00 LF for curb, depending on the type.
  - Why the big range of costs?

PROS AND CONS FOR CONCRETE

PROS

- Readily accessible and available on short notice if it's just grey concrete
- Easy to repair
- Lasts a long time.
- Little to no maintenance
- About the same costs as pavers for regular grey concrete
- Extremely versatile for design

CONS

- More expensive than asphalt
- If it's decorative, it's extremely hard to repair/replace
- At some point it will crack no matter what you do

SO WHAT MATERIAL SHOULD YOU USE FOR YOUR PROJECT?!?!?!?!?!

Answer: IT DEPENDS!

OTHER PAVING MATERIALS

- Mulch
- Crushed Stone – Small and Large
- Slate or large walking stones
- Wood
- Mosaics
- Rubberized Surface (like you see on playgrounds)

Sources

- https://brick.com/clay-pavers
- https://www.thespruce.com/kinds-of-stone-pavers-2132529
- https://www.concretenetwork.com/concrete/pavers/
- https://www.oldcastlecoastal.com/clay_pavers.htm
- http://www.asphaltpavement.org/index.php?option=com_content&view=article&id=359&Itemid=863
- http://driveasphalt.org/noise
- http://www.patternpaving.com/stampedasphalt.html
- http://www.bigdpaving.com/seal-coating/
- https://www.thespruce.com/pros-and-cons-of-asphalt-driveway-1398080
- Lift 504 Drone Company YouTube Channel
- https://www.concretenetwork.com
- http://www.thebluebook.com/fn/htm/0024877500012.shtml
- http://louissmithconstruction.com/project_gallery/collegiate-school/
- http://www.ibigroup.com/projects/young-circle-arts-park
- https://greenpiece1.wordpress.com/2013/04/08/6-ways-to-color-concrete/
- http://www.fdot.gov/roadway/ds/06/idx/300.pdf
- http://www.forconstructionpros.com/asphalt/article/10297263/why-tracking-temperatures-is-key-to-successful-asphalt-paving
- http://www.gopavers.com/history-of-pavers/