

TECH Data

A publication of the Oregon Concrete & Aggregate Producers Association's Concrete Technology Committee

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RESIDENTIAL CONCRETE

High quality flatwork on residential construction adds beauty and usefulness to a home. This TECHdata publication offers guidelines that, if followed, will minimize problems and help the residential contractor build quality concrete slabs that will last. These TECHdata topics cover the key points of quality concrete construction. However, communication with your ready mixed concrete supplier is a necessary and key ingredient in the success of any concrete job.

PLANNING

The best jobs start with planning, and the first step in planning is with communication. An early meeting with the owner, contractor and supplier will avoid many, if not most, of the normally encountered problems. In this meeting, plans, specifications, improvements, changes and/or revisions should be discussed. Use of the facility along with placing and jointing plans should be reviewed. Any potential problem areas should be discovered, and corrected, through this initial planning step.

SUBGRADE

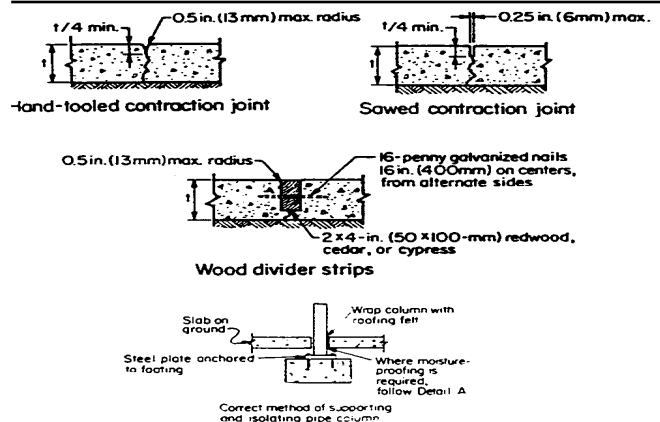
The key to proper sub-grade preparation is uniformity. Any inconsistent (soft or hard) areas should be excavated and either cross blended or replaced with sand or gravel to get uniform support for the concrete. Never place concrete on muddy or frozen ground.

Often, the sub-grade is proof rolled to reveal non-uniform areas. When the sub-grade is ready for the concrete, it will be uniformly firm, it will be moist but without areas of standing water, and it will be graded so there are neither high or low spots which would leave the concrete depth too thick or too thin. If the concrete thickness varies, random crack-

ing may result. The key words for sub-grade preparation are uniformly firm, moist and graded to the proper depth.

QUALITY CONCRETE

The Uniform Building Code requires 3,500 psi, air entrained concrete. However, strength is not the only issue to be concerned with. Durability means that the concrete is able to resist abrasion and freeze-thaw damage. For concrete to be durable, it should properly finished and cured. Often, ready mixed concrete suppliers will use water reducing admixtures to make high quality concrete. A slump of 4" is usually quite workable; slumps over 5" should not be allowed without using a water reducing admixture.



EQUIPMENT

All necessary equipment to perform all of the construction steps should be on the job, cleaned, checked, and in good working order before the work starts. Forms should be firm and unyielding, and staked adequately to prevent movement and set to final line and grade. Stakes should be driven 2 to 3 feet apart. Often, joints are marked on the forms to make sure joint location is as designed. Be ready to go by the time the truck shows up on the job!

PLACING, FINISHING AND CURING

Vibration will help consolidate low slump concrete. Use straightedges or bull floats to smooth out minor surface irregularities. Further finishing operations should not proceed until surface bleed water disappears. Then, keep finishing operations to the minimum necessary to obtain the desired surface. Finishing the bleed water into the surface of the concrete will increase the chances of map cracking or crazing and sacrifices part of the surface service life.

Adding water to the surface of the concrete during finishing will weaken and damage the surface!

Curing should begin as soon as finishing is complete. Curing is usually accomplished by using a sprayed-on liquid curing compound to hold the moisture in the concrete. Covering the concrete with plastic or waterproof paper will also work well, but can cause discoloration of the surface. Curing should also cover the exposed edges.

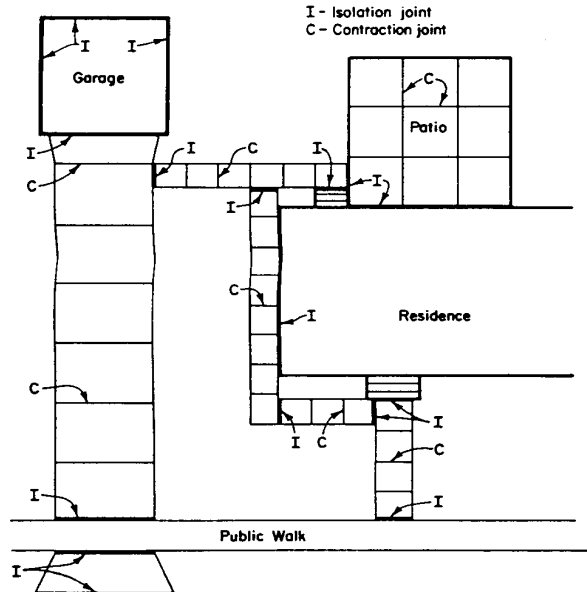
JOINTING

All concrete shrinks as it hardens and dries. As the concrete shrinks and tries to drag itself across the sub-grade, it cracks. However, a proper layout and system of joints will prevent the random cracks we find so unsightly. By following a few simple rules, joints will become easy and effective and problems will be replaced by compliments.

Control Joints - Control joints are placed in concrete to control cracking. They are made by creating a weakened plane in the slab; this is done by cutting the concrete part way through before the random cracks form. Joints are made in the hardened concrete with a concrete saw, or by making a groove in the concrete before it hardens. The cut must be at least 1/4 of the thickness of the slab (1" in a 4" thick slab). Spacing of these joints also depends on concrete thickness; the thicker the slab, the greater the spacing. Joint spacing in a 4" slab is 8' to 10'; in a 5" slab, 10' to 12'; 6", 12' to 15'; to a maximum spacing of 15'. The joints should be as close to a square pattern as possible, with care taken to avoid long, thin pieces or points, which will break off. Joints should also be located to intersect irregularities, such as light bases, manholes, catch basins, etc. Your ready mix supplier can help lay out a proper jointing plan.

Construction Joints - Any time it is necessary to interrupt placing for more than an hour or so, or when new concrete is to be placed against older, hardened concrete, the joint is called a construction joint. Thickening the slab edge at the construction joint will help support the concrete and give better performance. Keyways or tie bars may also be used on thicker slabs.

Isolation Joints - Isolation joints are also sometimes called expansion joints. Their purpose is to isolate one placement of concrete from another when those pieces are likely to move in different directions. Examples of this situation is where a garage floor meets the foundation or driveway, or where concrete is placed around a manhole or catch basin. These are formed by simply placing something between those two pieces of concrete which will prevent them from bonding together, such as tarpaper, building felt or "expansion joint" material.



Recommended locations of isolation and contraction joints in flatwork around residences

CONSTRUCTION PRACTICES

The smart contractor or owner will add a few simple procedures to his construction practices which will greatly minimize the chances of problems later. Adding water to the wet concrete, or troweling water into the surface damages or weakens the concrete.

But using moisture after finishing is complete to make sure the concrete does not dry out benefits the concrete. If it is warm, or if there is wind blowing when the concrete is to be placed, then fog sprays can be effectively used to combat drying of the concrete surface. Placing concrete on a moistened sub-grade benefits the concrete, but placing concrete in puddles can cause problems.

Make sure the sub-grade is uniformly firm, properly graded and moistened. Properly timed, minimum finishing also benefits the concrete; over-finishing weakens the surface. Joints must be installed before the concrete begins to crack; making the joint with grooves in the wet concrete is the surest way to avoid cracking problems. Use other people's knowledge; ask your ready mix supplier to review plans and to make suggestions or recommendations - it's his business. Use vibration and the proper equipment to place the stiffest mix possible; don't use wet, sloppy concrete. Ordering 3,500 psi air entrained concrete will help resist cold weather and deicing damage.

Following these few simple rules will result in quality concrete flatwork that will meet the owners needs for years to come. Quality concrete leads to customer satisfaction and a good reputation.

Tech Tips

- Plan and Communicate—consult your ready mixed concrete supplier
- Make sure sub-grade is uniform, firm, even and moist before concrete placement
- Specify quality concrete
 - ▶ 3,500 psi
 - ▶ 5% to 7% entrained air
 - ▶ Slump less than 5" (unless specially designed)
- Do not add water to the surface during finishing
- Use minimal, properly timed finishing for best results
- Keep equipment and tools in good working order
- Discharge concrete in a timely manner
- Moisten subgrade prior to placement
- Protect concrete from evaporation
- Proper joint spacing and timing is critical
- Curing must commence as soon as finishing is complete