SeamTek® Concrete Slab Design

Introduction

Seamless Technologies, Inc. (sti) has developed the following **Guidelines For Concrete Slab Design** to help owners and specifiers better understand the importance that slab design has in a quality **SeamTek Flooring System** installation. These guidelines should be incorporated in Division 3 to help assure a quality substrate to receive the new seamless floor.

Mix Designs

Poured in place concrete shall be of sufficient strength to handle the structural load requirements. Concrete strengths should typically be 3000 psi (*20.69 MPa*) or greater. Since the bond strength of **SeamTek Flooring System** to the concrete slab is critical to long term performance, mix designs should incorporate high cement factors (5-bag minimum) and lower water/cement ratios (.4 or lower). Generally, this combination will produce less bleed water and a stronger cement matrix at the surface where the **SeamTek Flooring System** is bonded. A licensed structural engineer to determine their structural suitability for a particular use should approve all concrete mix designs.

The **Preferred Concrete Finish** shall be light steel troweled.

Type I Portland Cement Concrete is proportioned to hydrate and develop its design strength in 28 days. Minimum cure time prior to installation of **SeamTek Flooring Systems** is 28 days.

Fly Ash Concrete is proportioned to develop its design strength in 56 days. Minimum cure time prior to installation of **SeamTek Flooring Systems** is 56 days. Fly ash concrete also has a tendency to set very inconsistently, creating finishing problems for the concrete contractor. These finishing problems may result in areas of weak surface strength that will affect the bond and long term durability. ***Suggestion***: *All fly ash concrete should be vacuum blasted to help identify and repair substrate deficiencies*.

Lightweight Structural Concrete (LSC) incorporates a shale aggregate that has a much greater porosity than standard concrete aggregates. This porosity leads to greater retention and absorption of water and moisture vapor. Slabs must be tested for moisture content prior to installation of **SeamTek Flooring Systems**. (*See **SeamTek Surface Preparation Guidelines** - Testing for Moisture Content and Moisture Effects on Flooring Systems*...) **LSC** should not be used in buildings with high humidity or aggressive chemical environments. **LSC** is also more susceptible to outgassing problems during installation of **SeamTek Flooring Systems**. Owner or General Contractor must keep slab temperature from rising and driving off moisture vapor. Specifications should require a mandatory pre-job conference with Owner and/or Construction Manager and/or General Contractor and sti Contractor to review moisture testing, cure times, slab and ambient temperature controls and any other jobsite requirements.

Composite Metal Decks with concrete cast into a metal pan should require a vented metal pan to help entrapped moisture escape through the bottom after installation of **SeamTek Flooring Systems**.

Lightweight Insulating Concrete such as vermiculite or perlite concrete is not suitable substrates for **SeamTek Flooring Systems**.

Self-Leveling Underlayments are not suitable substrates for any thick build **SeamTek Flooring Systems**. Thin-mil **SeamTek Coating Systems** may be applied over some higher strength cement based materials. **SeamTek Flooring Systems *should never*** be applied over gypsum based underlayments.

Curing

All concrete slabs shall be cured in accordance with ACI-308 and ACI-302.1. Proper curing of concrete slabs is necessary to help retain moisture to allow the cement time to achieve the maximum hydration and attain the desired physical properties of concrete. The length of cure time between pour and covering with a flooring system is not necessarily related to subsequent vapor emission rates. The concrete industry views curing as a means to achieve strength gain.

It is a popular misconception that by using High Early Cement, which hydrates at a much quicker rate, the concrete can be surfaced with resinous flooring much sooner. This may or may not be true. The drying rate of High Early Concrete may be no better than conventional concrete. ***Suggestion:*** *If floors or patching materials need to be resurfaced before the standard 28 day cure, consult your sti representative or contractor.*

Joint Design

There are various types of joints located in concrete slabs. Treatment at these joints is critical in many applications to maintain a sealed, sanitary, seamless floor installation. In reviewing the various types of joints outlined below, the most important decision is to define whether the joint condition is moving or non-moving. Ideally, the architect and structural engineer should review all concrete joint conditions and determine whether movement is anticipated. Once movement parameters are determined the appropriate joint treatment may be selected.

Construction Joints are joints that separate different pours of concrete within a given panel. If these cold joints align with standard locations of control joints, they should be defined and treated as control joints. True construction joints typically are not moving and therefore, may be covered with the **SeamTek Flooring System**. These joints are pre-treated with a flexible resin and/or fiberglass reinforcement prior to the installation of the **SeamTek Flooring System**.

Control Joints are joints either saw-cut or formed in the concrete to control the plastic shrinkage in the concrete as it cures. Control joints are designed to help concrete crack at known locations in a clean, straight line, rather than random cracks, which may occur throughout the pour. In theory, control joints become static (non-moving) once the concrete has completed its volume change. In reality, control joints can become mini-expansion joints where they are improperly designed or installed, or where there is significant temperature (thermal) cycling in a building. *Moving control joints* should be referenced through the **SeamTek Flooring System**. *Non-moving control joints* may be referenced or treated like a construction joint and covered.

Note to Specifier*: The seamless flooring should be installed when permanent HVAC systems are operational in the building. Control joints covered during installations with temporary*

heat may go through significant thermal cycling prior to permanent operation of the HVAC system. This cycling will cause movement that could induce cracks, which cannot be prevented by the ***sti Contractor****.*

Isolation Joints are located at load bearing columns and walls, or at equipment pads where the floor slab is independently supported. The wall and columns are isolated because of anticipated differential movement at that location. Isolation Joints should be treated as expansion joints with the joint referenced through the **SeamTek Flooring System**. (See **sti Isolation Joint Details**)

Expansion Joints are true structural expansion joints separating different sections of the building. These joints will move and need to be detailed with expansion joint systems designed specifically for the load, movement, and fire rating required.

Vapor Barrier Design

Moisture vapor transmission has been recognized for years as a problem in slab-on-grade and split-slab construction. Excessive vapor transmission can create condensation problems, corrosion problems and air quality problems, as well as adhesion problems for many finishes. Seamless floors are dense and impermeable by nature and do not readily allow vapor transmission. An excessive transmission rate through the slab will create large hydraulic pressures just below the concrete/seamless flooring bond line and lead to blistering and disbonding of the seamless system.

Opinions regarding vapor barriers are varied. Generally the industry agrees that properly installed vapor barriers help to reduce vapor emission problems but they are certainly not a guarantee against such problems. (See *"Moisture Effects on Flooring Systems"* in this STI Binder) Polyethylene vapor barriers should have overlapped and taped seams. They should also be durable enough to prevent puncturing during concrete installation. Properly installed bentonite waterproofing products are excellent vapor barriers where site water problems may exist. Where vapor barriers are not present in existing slabs to receive resinous flooring, consult your local **sti** representative or contractor.

Hydrostatic Pressure is the presence of a distinct head of water pressure. This term is misused in the industry to refer to problems related to vapor transmission.

Flatness/Levelness

SeamTek Flooring Systems are installed in the field directly onto existing concrete slabs. Regardless of the type of system installed, the **SeamTek Flooring System** will mirror or reflect undulations in the slab. In the past, specifiers have used the "straight edge" method for monitoring floor flatness. Irregularities in slabs to receive seamless flooring were not to exceed "1/8" in 10 feet," (*.32 cm in 3.05 meters*) using the straight edge method. Inconsistencies in this measuring technique have lead ACI to adopt a new measuring system called the *F Numbering System*. Concrete floors to receive **SeamTek Flooring Systems** should have a minimum **F25** value for both flatness and levelness.

Slope to Drain

In many applications, **SeamTek Flooring Systems** are used in environments that are often exposed to wash downs, water or process liquids. **SeamTek Finished Flooring Systems** will follow the contour of the structural slab. Unless slope is built into the structural design or the seamless floor system, bird baths and ponding water is inevitable. In many environments this ponding water is unacceptable due to safety and health concerns. **sti** offers two systems to create positive slope-to-drain on top of the structural slab: **SeamTek UnderTop E** and **SeamTek UnderTop A**. Consult your **sti** representative and contractor for specific information on design and specification of these systems. **Please not that we recommend the use of polymer drains as opposed to metal drains when ever possible.**

Drain Location

All drains shall be set so that the finish elevation of the drain grate is at the final finish elevation of the **SeamTek Flooring Systems**. In some applications, a sump or depressed area is desirable to help remove water from floor. Sump detail should be cross-referenced with Plumbing, Concrete and Seamless Flooring Sections.

Waterproofing (Positive Side)

A number of applications of Seamless Flooring require the application of an elastomeric waterproofing membrane between the flooring and the slab. The intent is that elastomeric membranes will bridge potential cracks and prevent leaking. Standard seamless epoxy floors are waterproof; however, they have limited crack bridging capabilities. In multi-story facilities where the slabs cannot leak water onto building occupants below, a waterproofing membrane may be incorporated into the **SeamTek Flooring System**. (See **SeamTek FlexProof**)

Moisture Proofing See "*Moisture Effects on Flooring Systems*" in this section of the STI binder**.**

Important Notice

This document has been prepared as general information to help owners, design professionals and construction managers design, specify and complete successful projects. While the information in this document is based on sources and procedures which **sti** *believes reliable, construction project results depend upon the specific circumstances of each project and cannot be guaranteed. This document is not intended to replace the knowledge and experience of construction professionals, nor does this document constitute an assumption by* **sti** *of responsibility for the design of structural concrete, nor any warranty or any other contract on* **sti***'s part.* **sti***'s product warranty is made solely on the* **sti Single Source Warranty for Labor and Material***, which is available from your* **sti** *Associate Contractor.*