Sport Courts Post-Tension Concrete Design
&
Do’s & Don’ts

By: Classic Turf & Tech-Con Systems, Inc.
DESIGN OF POST TENSION CONCRETE SLABS
Base Preparation

- Sub-base thickness and material will vary on the following;
- Geographic location
- Drainage of site
- Site surroundings
- Typical is 6” – 12” of compactable material
- 2” cushion course of gravel dust or stone dust. (3/8 -)
- Types of equipment
Poly Sheeting

- Two main purposes
  - Vapor barrier
  - Friction reduction
- Thickness is typically 6 mil – to 10 mil
Post Tension Cable Spacing

- The strength of post tension concrete slabs are determined by the amount of compression induced into the concrete by the steel cables.
- Desired P/A for tennis courts can range from 100psi – 150psi.

\[
\text{AVERAGE FORCE PER STRAND} = \frac{\text{SPACING OF TENDONS}}{\text{P/A} + 0.5\times L_S\times t\times 150\times 0.75}
\]

WHERE:
- P/A = DESIRED P/A @ MIDSPAN (PSI)
- A = SLAB THICKNESS (IN INCHES) * 12 INCHES (IN)
- LS = LENGTH OF SLAB (FEET)
- t = SLAB THICKNESS (FEET)
- AVG. FORCE/ STRAND = 27,000 LBS.
Encapsulated vs. Non-Encapsulated

- Encapsulated should be used in “aggressive environments” for slabs on grade.

- Aggressive environments – “An environment in which structures are exposed to direct or indirect applications of deicing chemicals, seawater, brackish water, or spray from these water sources, and salt laden air as occurs in the vicinity of seacoasts. Aggressive environments also include structures where stressing pockets are wetted or are directly in contact with soils.”
Slab Penetrations

- All footing penetrations should be placed prior to post tension slab. Footing should be under post tension slab.
- Expansion Material
- Shortening of 1/8” per 20’
Slab Penetrations

Center Anchor details:

Type 1

Type 2
Slab Penetrations
Crack Control
Crack Control

Saw Cutting:
Crack and Slab Length Control

Pour Strips
Crack and Slab Length Control
Metal Keyway and Saw Cut Layout
Perimeter Details

Perimeter Haunch

No Perimeter Haunch
Perimeter Details
Perimeter Details and Fencing System

Perimeter Concrete Curb

- Separates fence frame from post tension slab.
- Results in a concrete joint between slab and curb.
- Future recoating benefits.
- Protects edge and anchorage of post tension slab.
- Fence replacement.
- More Costly.

Fence Poured in Post tension slab

- Possibility of edge of slab issues long and short term.
- No concrete joint.
- May restrict slab from shortening.
- Makes fence frame repairs / replacements more costly.
- Edge of post tension slab exposed.
- Makes re-coating more costly.
- Initially more cost effective.
Perimeter Details and Fencing System
Perimeter Details and Fencing System
Perimeter Details and Fencing System
SPORT COURTS POST-TENSION CONCRETE
DO’S & DON’TS
Basic Installation Tools
Standard Tendon Assembly

- **WEDGE**
- **WOOD FORM**
- **PLASTIC SHEATHING**
- **BARE STEEL STRAND**
- **20d NAIL (MIN.)**
- **POCKET FORMER**
- **DRILL 1” DIA. HOLE**
- **STRESSING DIRECTION**

**FIXED END**
- 3/4"
- 10” - 12” STRIPPED SHEATHING AT FIXED END
- 1” MIN

**STRESSING END**
- 1 1/2”
- 20d NAIL (MIN.)
Stressing End Assembly
Prior to concrete placement
VERIFY STRESSING END ASSEMBLY
Application of Grease on the Pocket Former

Apply grease to the pocket former tip.

Do not apply grease on the tapered part.
Problems
Installation Errors

- Lack of control over tendon installation
- Improper stressing end assembly

Max 1”
Dead End Assembly

Dead ends need to be 1” from form board
California Corner Assembly

45 Degree pocket formers at California corners

- Insure that stressing end plastic sheathing is to anchor

- Verify that pocket former is tight, 8” long nails are required
Problems
Installation Errors

- Lack of control over tendon installation
- Improper placement

min. 6”
Improper Tendon Placement

Provide Coordination for Other Elements

min. 1 ½”
Tendon Placement

Provide Coordination for Other Elements

Sweep tendon around object or move tendon over 12” and keep tendon straight
Set Wedges With Vertical & Parallel Alignment

Visually inspect anchor cavity for concrete slurry and clean as needed
Hand Wedge Setter & Cavity Cleaner

Use of Hand Wedge Setter

PHOTO TO BE ADDED
Elongation Paint Mark 12” From Face Of Concrete
Install Grippers Parallel

![Image of grippers being installed parallel to each other.]
Tendon Elongation

- AT REST
- AT MAX PRESSURE 80% BREAKING STRENGTH
- AT FINAL PRESSURE 70% BREAKING STRENGTH
- ANCHOR SEATING LOSS < ¼ TO 3/8 INCH

PTI Specifications allow +- 10% for SOG

Good field procedures can achieve +- 7%
Field Data Sheet
Elongation Record

- On the placement drawings an identification number should be marked.
- The actual field elongation is recorded on the appropriate line.
- The field data is sent to the engineer of record for review.
- Only upon written approval should tendons be cut and patched.
Tendon Tail Finishing

- Plastic cap required to provide proper cover to the tendon end
- Grout pocket should be clean and free of debris
Stressing End Encapsulated Anchor With Grease Cap
Problems
Installation Errors

- Lack of control over tendon installation
- Improper placement
Problems
Thin Concrete

- Improper Grade
  - Slab thickness too thin
    - Tendons will be near the surface
    - Surface Cracks
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Problems
Improper Concrete Thickness: Grease Spots, Rusting and Cracking
Problems
Thin Concrete

- Improper Grade
- Slab thickness too thin
  - Tendons will be near the surface
  - Grease Spots
Problems

- Lack of control over concrete placement (out rigger of laser screed)
Problems
Improper Concrete Thickness: Grease Spots, Rusting and Cracking

Foreign object embedded in concrete
Repair
Improper Concrete Thickness

Large areas require dowels at the edge
Repair
Damage to sheathing prior to concrete placement and minimal concrete cover
Problems Of Cosmetic Nature
No Control Joints
No Partial Stress
Solution
Key Joint or Saw Cutting
Problems
Poor Site Drainage
Poor Maintenance
Problems
Consequence of Poor Site Drainage And
Poor Maintenance
Solution

Grout pockets 6” above ground
Solution
Encapsulated Anchoring System
Problems
Excessive Slab Length
Elastic Shorting, Long Term Creep
-1/8” PER 20’  200’=10/8”  OR 5/8’ EACH END
Problems
Excessive Slab Length

Top of all footings should be below post tension slab
Options
Styrofoam Fence Post Block Out

Thick enough to allow for movement
Options
Fence Post Radius Block Out
Options

Double Wrapped Fence Post
Square Concrete Block Out For Fence Post
Problem
Anchor too close to fence post
Radius Concrete Block Out For Fence Post
Court Slab Preparations

- Subgrade slope and compaction
- Form work
- Sleeves
- Base materials, compaction
- Uniform slab thickness
- Vapor Barrier

- Post-tension tendons and hardware
- Key Joint
- Isolating posts, fence, bench, shade structure, sleeves
- Access for concrete placement
- Staging for equipment
Installation Checklist

• Proper number of tendons
• Tendon locations
• Tendon spacing
• Edge details
• Vapor barrier taped

• Damaged tendon sheathing
• Tendons secured to forms
• Minimum tendon length beyond form 18”
• Tendon clearing posts, etc.
Stressing Checklist

- Clean anchor cavities
- Set wedges, vertical
- Mark tendons
- Stress tendons
- Measure elongations
- Cut tendon tails
- Paint ends, place grout caps
- Grout pockets with non-shrink grout