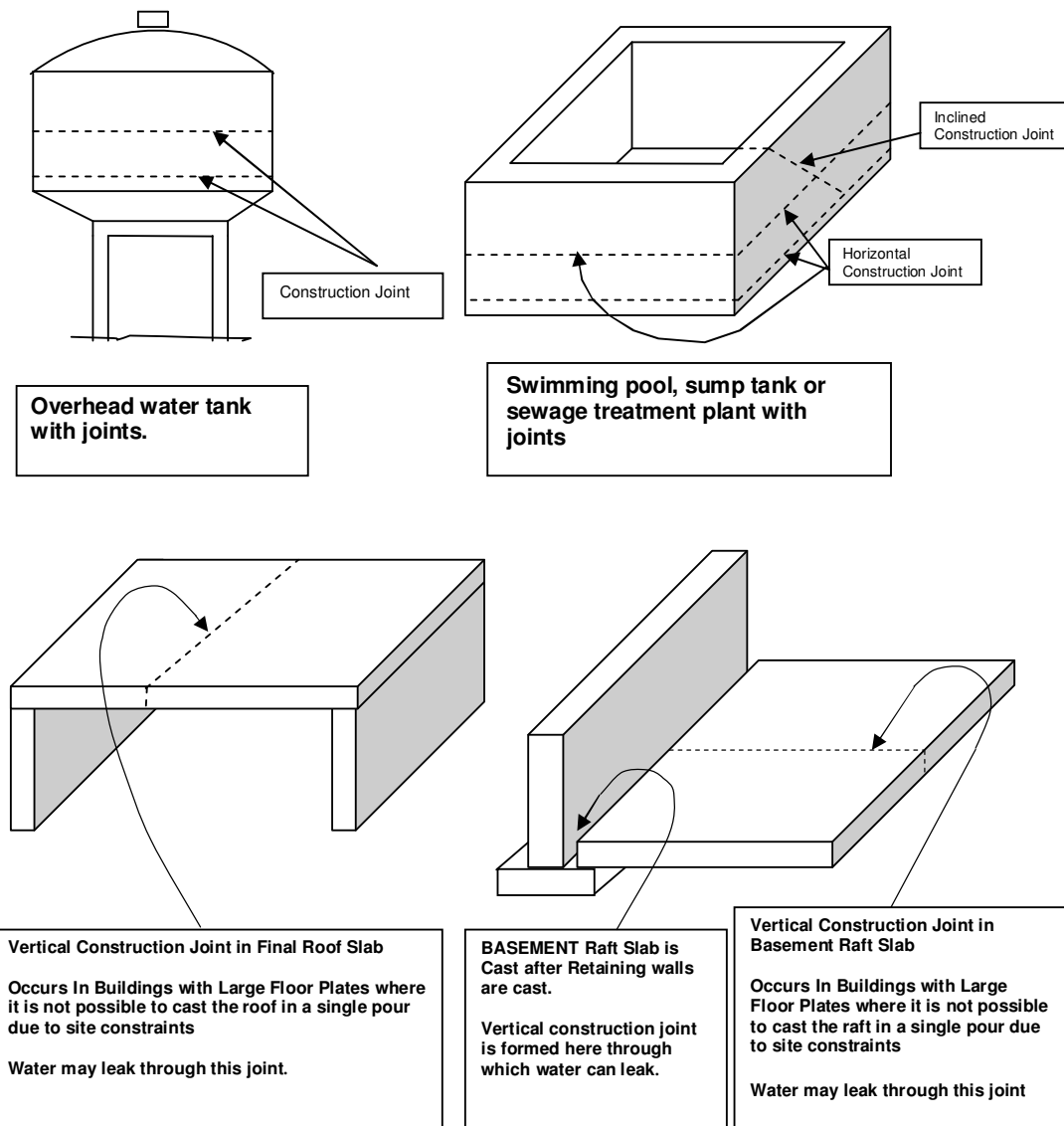
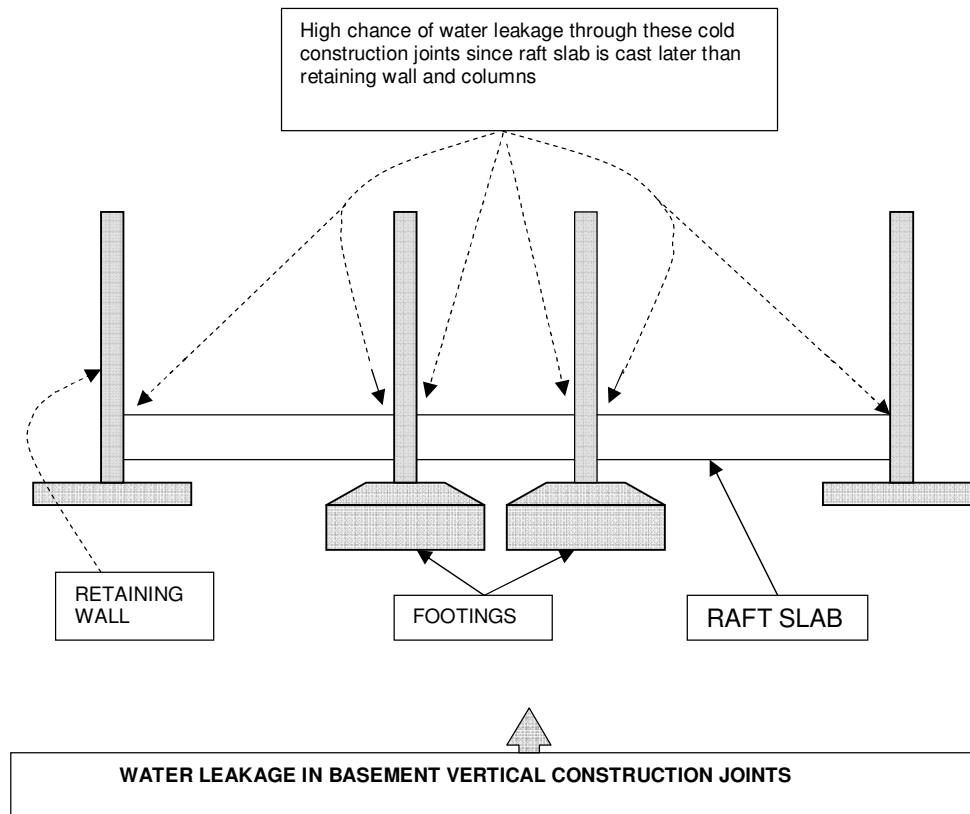


# Preventing Water Leakage through Construction Joints using SYNKOFLEX Preformed Compressible Waterstop

## Introduction

A typical problem in most Water Retaining Structures is the leakage of water through Construction and Cold Joints. A construction joint is formed when concrete is cast in different stages successively. These joints may be horizontal, vertical, inclined or curved depending on how the concrete is cast.





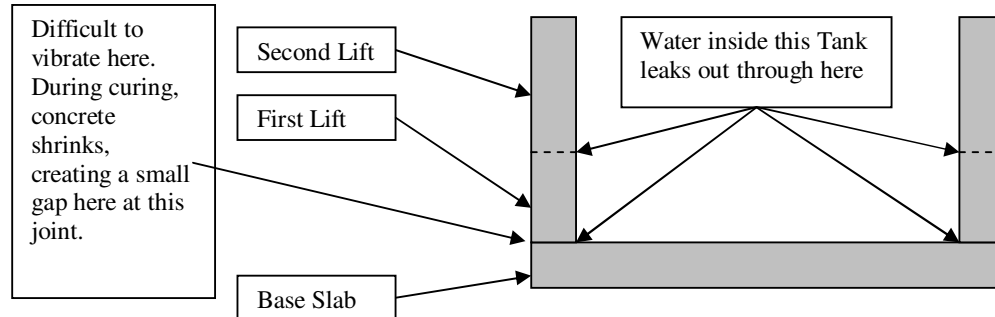
### **Structures which are prone to leak through their construction joints:**

Water Tanks and Swimming Pools	Sump Tanks, Overhead Water Tanks
Basement Wall and Floor perimeter joint	Basement column and floor slab joint
Vertical joints in basement retaining walls	Sewage Treatment Plants
Potable water Reservoirs, Fish hatcheries	Septic tanks, Utility vaults
Raft Slabs cast in more than one pour	Final roof slabs cast in more than one pour
Pipe intrusions in concrete walls	Pedestrian and below grade tunnels
Precast structures such as box culverts	Butt joint between old roof and new roof
Raw Water tanks in Water Treatment Plants	Raw and Treated Water Tanks in Factories
Concrete lined storm water channels	Concrete lined Irrigation water channels

**Harmful effects of Leakage:** In the case of water retaining structures like overhead water tanks and swimming pools, water leakage is unsightly and leads slowly to corrosion

of the steel in the concrete. In addition there is loss of water. In basements, rise in water level outside the structure allows water inside the basement and the basement may become unfit for use. Final roof slabs which have joints allow water to leak into the building which may destroy expensive interiors.

### **Why does water leak through construction joints?**



Leakage occurs because of two reasons.

(a) Generally, after the base slab is cast, when the first lift of concrete is being placed for the wall of the water retaining structure, it is very difficult to vibrate at the bottom of the lift (floor and wall joint). Because of this, an unfilled joint approximately 1 mm – 5 mm in height is created at the floor wall joint. (b) cement shrinkage further widens this joint marginally. Water then leaks through this open joint.

Traditionally, engineers have tried to solve the problem by various means. These include using PVC Waterstops, (sketch) applying epoxy adhesive to the joint, (sketch) grouting into the joint using cement grout (sketch) etc. However, each of these methods has its own problems and may not be hundred percent effective. Hence engineers are highly divided on the effectiveness of each method. In fact, most engineers prefer not to use any of the above methods. They prefer to leave the joint as it is (knowing that there is a problem) and look for a solution only after the entire water retaining structure has been completed.

### **Existing Methods and Problems associated with them**

#### **a. PVC Waterstops**

PVC Waterstops have been used for many years to try to prevent leakage in Construction joints. They have succeeded in some places and have failed in many places. Basically, PVC is incompatible with concrete and hence will never bond hundred percent effectively with concrete. A thin line of delamination is always present through which water will try to leak. The idea of introducing a PVC

waterstop is to increase the path of the water flow and make the water lose its head before it exits from the construction joint. This is not always effective because of other problems during placement. For eg., in heavily reinforced areas, conventional PVC waterstops are difficult to insert and maintain while concrete is being poured. PVC waterstops are meant to be welded at joints using a PVC welding machine. This is not done in most of the sites. Most “PVC Waterstops” available in the market are actually made from Recycled Rubber to lower costs. Skilled labour is required to place PVC waterstops on the site and a lot of care needs to be taken during concreting. Carelessness will lead to a “tunnel” being formed when the PVC waterstop folds thus allowing water to leak even more. Because of the above problems engineers today are reluctant to use PVC Waterstops.

***b. Epoxy Coatings in Construction Joints***

Epoxy Coatings have been suggested many times as a solution to prevent leakage in construction joints. These will not work all the time. The problem that we are attempting to solve is not of bonding but of filling the opened joint. If the joint has opened by 4 mm, an epoxy coating of 200 microns will not be able to fill up the gap. Hence the joint will continue to leak.

***c. Cement Grouting***

Engineers have also tried grouting cement into construction joints after the water retaining structure has been constructed to stop possible leakage. This method is totally dependent on the skill of the grouting expert. More often than not, the “grouting expert” is interested in drilling as many holes as possible and putting in the maximum number of grouting nipples possible since he charges “per drilled hole” and “per nipple” that he has inserted. Consideration is not at all given to the diameter of the hole to be drilled, depth of the hole to be drilled, angle of drilling or anything else that is remotely technical. In this method, most of the holes end up as blind holes, i.e., the holes end up not inside the crack (where they are actually meant to be) but as a dead end in actual good concrete. Thus, when grouting is attempted, no grout goes in. The grout that actually goes in fills up the hole that has been drilled. Hence this method is also not successful. Repeated drilling of holes in a weak joint will actually destroy the integrity of the concrete and weaken the joint even further.

***d. Epoxy or other chemical grouting***

Epoxy can be grouted into leaking joints. Other than epoxy, hydrophobic and hydrophilic polyurethane and various other acrylic solutions can also be grouted into leaking construction joints. Most are time consuming and expensive.

***e. Swelling Type Waterstops***

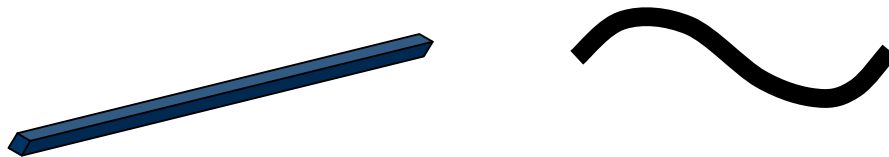
Bentonite/butyl based “rope type” waterstops which swell in contact with water have been used successfully on many projects. These have been successful whenever a skilled workforce is able to place it in dry condition and is able to ensure that no water falls on it before concreting is carried out. Unfortunately, in our country, ideal conditions are not maintained. After laying the waterstop, wall shuttering is to be erected and then wall concreting is to be carried out. Water used for curing may fall

on waterstops which are already in place. During this time, unexpected rain water may enter and make the waterstop wet before concreting. Such incidents will render the swelling type of waterstop ineffective since it will expand even before the concreting is carried out.

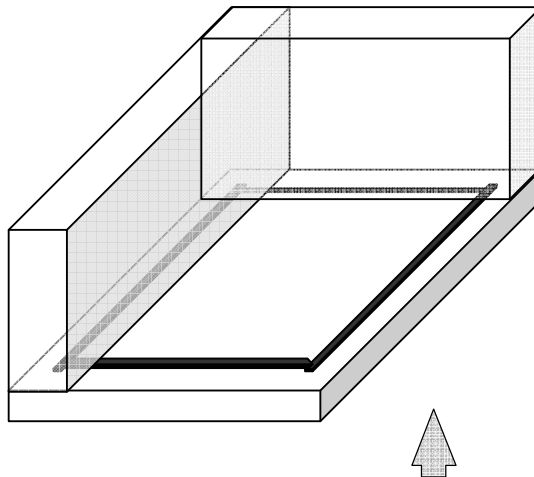
If none of the above methods are successful, is there actually a method to solve the above problem ?

### **Preformed Flexible Waterstop**

It is now recognized that **Preformed Flexible Compressible Waterstops** are the best answer to prevent leakage in Construction joints. Preformed Waterstops are a specially formulated flexible material in the form of a strip (or rope) which needs to be placed in the construction joints before concreting. The waterstop gets compressed in the joint and does not allow water to pass through.



PREFORMED WATERSTOP APPROX 25 MM X 25 MM CROSS SECTION X 1 METRE LONG  
Waterstop is flexible and can be bent into any shape



LAYING WATERSTOP IN A HORIZONTAL CONSTRUCTION JOINT TO PREVENT WATER LEAKAGE

### **Laying Waterstop in a horizontal construction joint:**

1. Cast the base slab. Cure for three days.
2. Clean the joint where the wall is to be cast using a cloth. Apply primer 25 mm wide along the length of the joint. Lay the preformed waterstop end to end with an overlap of about 25 mm. Press firmly at the overlap so that there is no airgap below the waterstop.
3. Install wall shuttering.
4. Cast concrete wall.
5. Make sure that dust does not fall inside the shuttering before concreting takes place.

### **How do Preformed Waterstops work?**

Preformed Waterstops work like a pressure cooker gasket. Typically, the waterstop has **a thick cross section of approximately 20 mm x 25 mm**. When concrete is poured onto the joint, it is designed to deform slightly and seal the joint. Since most construction joint gaps are 1 – 5 mm, the joint gets effectively filled up by the waterstop and the structure remains watertight for the rest of its life. The waterstop fuses with fresh concrete thus forming a lasting watertight bond.

Placement is very easy with no skill being required to place the waterstop in the joint. These waterstops are not to be inserted during concreting. They can be placed after the first placement of concrete **but before the second lift**.

### **Where can Preformed Compressible Waterstops be used?**

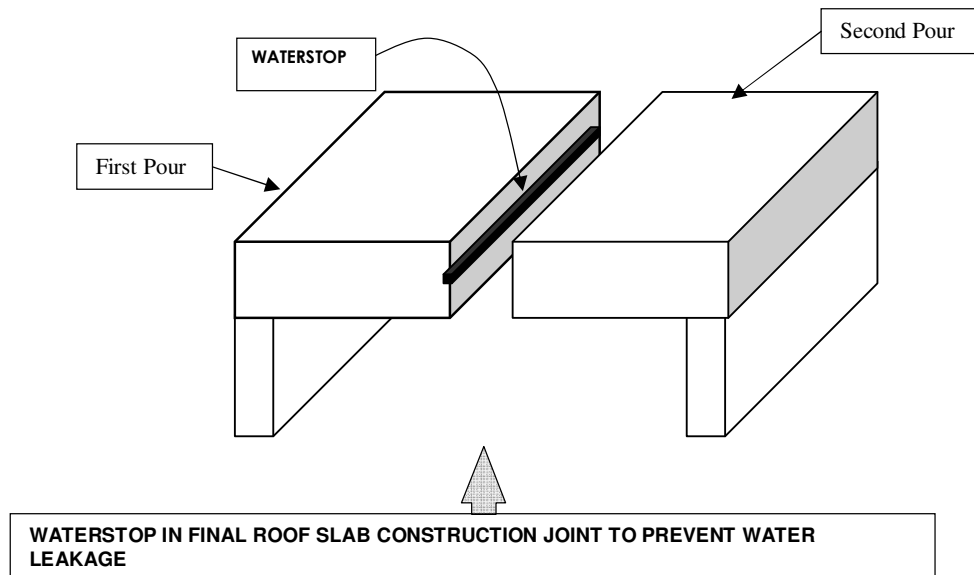
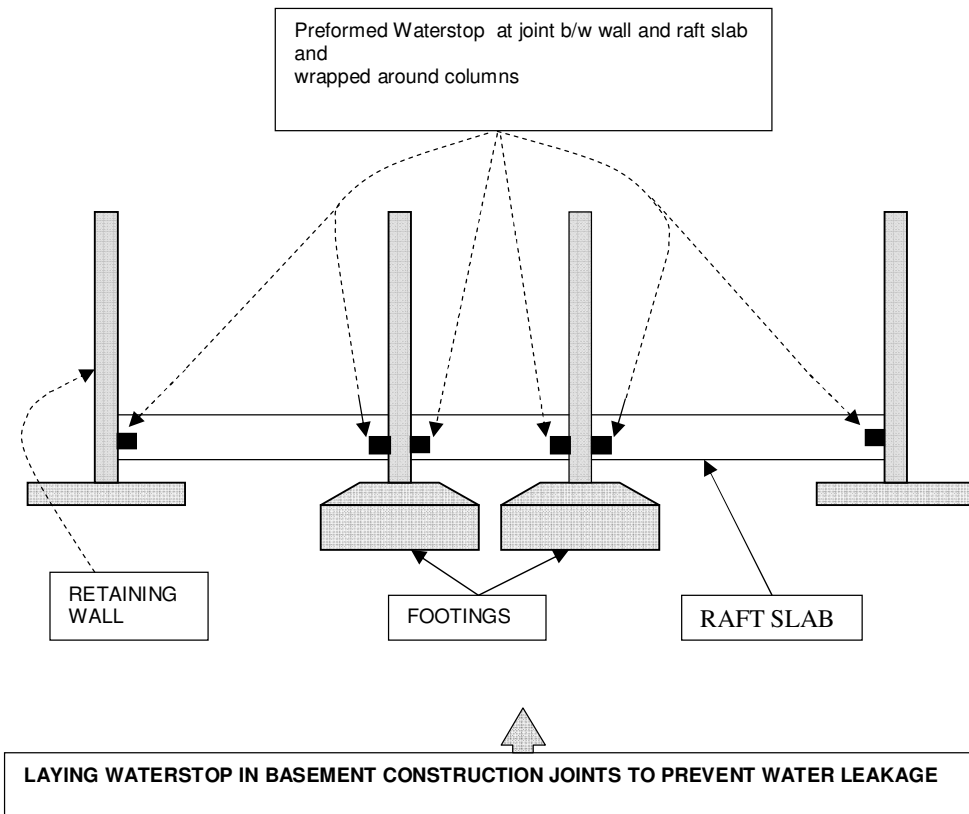
Preformed Compressible Waterstops can be effectively used for horizontal, vertical, inclined and curved joints (pipe intrusions through concrete).

They can be used in water reservoirs, sewage treatment plants, basements, swimming pools, fish hatcheries and other structures where entry or exit of water is a problem to contend with. It can easily resist a water head of 20 metres.

Preformed Compressible Waterstops can be laid even when the joint is wet. In fact, in extreme conditions, it can even be laid underwater and will still function effectively provided it is prevented from sliding out of alignment by nailing it in position.

Preformed Compressible Waterstops are flexible and can be bent like a rope. Its consistency is like clay and it is compressible. In vertical joints, it can be nailed in position if it does not stick to the surface. As long as it is kept in position and is not displaced during concreting, such waterstops will work perfectly.

Minimum recommended clear cover to Preformed Waterstops is 50 mm from the outer face of the concrete.



### **Invest in SYNKOFLEX Preformed Compressible Waterstop**

Professional engineers know that it is always cheaper to prevent water leakage than try to solve it after it starts leaking. SYNKOFLEX Preformed Compressible Waterstops are a 100 percent solution which do not rely on the skill of any individual for successful application and performance. It can be easily laid by an unskilled worker.

Experienced engineers have relied on Preformed compressible waterstops for more than thirty years for preventing water leakage through various structures. Tabulate the cost of leaking water, subsequent grouting or other methods and the risk of not being able to stop leakage fully. Compare it with your investment in Preformed Compressible Waterstop which guarantees a 100 percent watertight joint. You will find that your investment is fully rewarded with the satisfaction of having professionally executed a successful job.

#### **Notes:**

Always check full technical details from the manufacturer before using any waterstop. Check for use in contact with potable water tanks. Check for use with any other type of liquid to be stored.

**Precautions during concreting:** Preformed Compressible Waterstops can be damaged if vibrators are thrust into them directly during concreting. Care should be taken to see that vibrators are kept away by about 200 mm while vibrating concrete.

**SYNKOFLEX IS THE LEADING PREFORMED COMPRESSIBLE WATERSTOP IN INDIA TODAY. SYNKOFLEX IS MANUFACTURED BY THE HENRY COMPANY, USA AND IS IMPORTED AND DISTRIBUTED IN INDIA BY NUHA CONSTRUCTION SOLUTIONS, BANGALORE**