

TingWall™ Advantages

Topic	Stick Systems	Unitized Systems	TingWall
In-place cost	Low	High	Medium/Low
Maintenance cost	High	Medium	Low
Durability Against Water Leakage	Worst	Fair	Best
Large Tolerance for Story Drifts	Worst	Fair	Best
Large Tolerance for Inter-Floor Deflection	Worst	Fair	Best
Effects of structural movements on water leakage potential	High	Medium	None
Ease of incorporating Decorative design features	Worst	Fair	Best
Demand for skilled erection labor	Medium	High	Low
Degree of supervision required for erection	High	Medium	Low

Architects/Owners Advantages

- Eliminates water & air infiltration concerns.
- Eliminates concern for façade material boundary interface.
- Enhanced building appearance. No exposed exterior caulking. No staining or streaking on exterior surfaces due to caulking.
- Reduced maintenance.
- Ease of panel and/or glass replacement in case of damage.
- Retrofit of existing buildings made easy by adaptability to existing vertical /horizontal mullion supports

Contractor Advantages

- Erection speed expedites enclosure of building.
- Reduced erection crew training time. Same installation procedure regardless of facing material (stone, plate, glass, etc.)
- Ease and speed of erection reduces field labor costs by up-to 60%.
- Non-directional erection: bay by bay; course by course; skip and back fill.
- Field safety: Panels engaged in vertical mullions and adjacent panels prior to securing fasteners.
- Minimal panel weight, compared to conventional unitized systems.

The combined factors of no perfect seal requirement, dry open joints, minimal field caulking, and non-directional erection result in a system with unprecedented flexibility in construction schedule management.

~ Hsieh Hung Tsai, Huaku Construction Company, Owner and Builder of e-Park 1



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TingWall™
A Revolution In Curtainwall Technology™



Introduction

TingWall™ is on the leading edge of curtainwall technology. Invented by Dr. Raymond Ting, TingWall™ addresses virtually every major concern of building owners, architects, and general contractors, offering performance and flexibility in design and construction unavailable with conventional technologies. Dr. Ting, a Professional Engineer with over 30 years' experience, is one of the world's leading experts in the field of structural and building material performance in severe weather and seismic conditions.

First used in 1988, the TingWall™ design emphasizes the long-term performance of buildings. TingWall™ is both an ideal product for new construction, as well as a uniquely capable product for the retrofit market.

Within this brochure is the barest listing of the many TingWall™ advantages, with a brief overview of only a few of these. We invite you to learn more by contacting TingWall Inc., or one of our dealers, for a personal presentation and by visiting us on the web at www.tingwall.com.

For the more you know about it, the more you will realize that TingWall™ truly is "A Revolution in Curtainwall Technology"™.

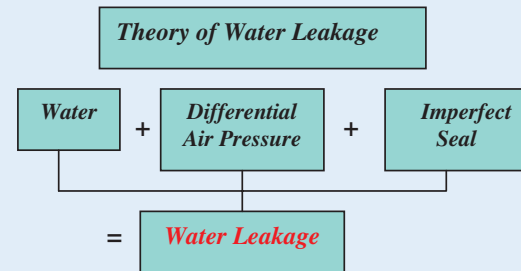


1.

Evolution of Curtainwall Technology

Curtainwall has evolved through four generations of design:

1. Wet seal systems - perfect critical seals are required
2. Internal gutter systems - utilizing a principle of controlled leakage (perfect critical seals are required)
3. Conventional "Unitized" systems - multiple defenses and rain screen principle (perfect critical seals are required)
4. **TingWall™** -- utilizing the Airloop Principle involves no critical seals



The presence of both water (rain) and differential air pressure (wind) at the point of event the slightest imperfection in a critical seal results in water leakage. The differential air pressure will force the water into and through the flaw. Any system that involves critical seals - that is, a single seal for both water and air - is subject to the potential for water leakage. It is only a matter of when and where the wall will leak, and how expensive and difficult the repair.

The first three generations of curtainwall design all rely on critical seals to prevent water infiltration, with both water and air sealed at the same locations. However, relying on perfect seals cannot prevent water leakage for several reasons:

- a. Critical seals cannot be thoroughly inspected for perfection. Whether a seal is perfect cannot be determined by visual inspection. Undetected flaws can later become leak points.
- b. Critical seals require consistent perfect workmanship. No matter what efforts are made to assure perfect critical seals, consistent and permanently perfect quality is unattainable.
- c. Material degradation inevitably leads to imperfect critical seals and water leakage. Degradation of sealing material used for critical seals (from UV light and stress fatigue) is unavoidable.

Pictures

1. Omega Corporate Center, Pittsburgh, PA - Completed in 1999 - Approx. 80,000 s.f.
2. Technology Park Bldgs. 1 & 2, Portland, OR - Completed in 2001 - Approx. 84,000 s.f.
3. E-Park Office Tower, Taipai, Taiwan - Completed in 2001 - Approx. 150,000 s.f.
4. SUNY Stadium Boxes, Stony Brook, NY - Completed in 2002 - Approx. 9,000 s.f.
5. IBM Renovation Project, Rochester, MN - Phases on going - Approx. 880,000 s.f.

Some of the products shown may be protected by one or more of the following U.S. Patents 5,452,552; 5,596,851; 5,598,671; 5,687,524, and foreign patents based on these U.S. Patents. In addition, other related patents are pending. Copyright 2003, TingWall Inc., All rights reserved. 505A McKnight Park Drive, Pittsburgh, PA 15237

TingWall™ -- Airloop Principle™

- No critical seals -- Instead of employing critical seals like its predecessors, TingWall™ separates the locations where water and air are sealed. Thus, with no differential air pressure at the water seals and no water in contact with air seals, the effect is an environment equivalent to having no rain or wind.
- No sealant stress from structural movements (thermal, wind, seismic, inter-floor deflection, and inter-floor story drift) in the primary seal lines. This is accomplished by using the joint space and foam tape or gaskets instead of curable caulking.
- Instantaneous drainage and rebounding air pressure within Airloops™ -- of greater importance, the taller the building.

TingWall™ -- is based on a dual Airloop™ equipped with an Outer Airloop™ and a pressure equalized Inner Airloop™.

1. 1st Outer Airloop™ (1st OAL)

The 1st Outer Airloop™ is a wet loop designed with instantaneous drainage capability. A continuous perimeter airspace, open to the exterior air, is formed in the panel extrusion frame around each individual panel and between adjacent panels on all sides.

2. Inner Airloop™ (IAL)

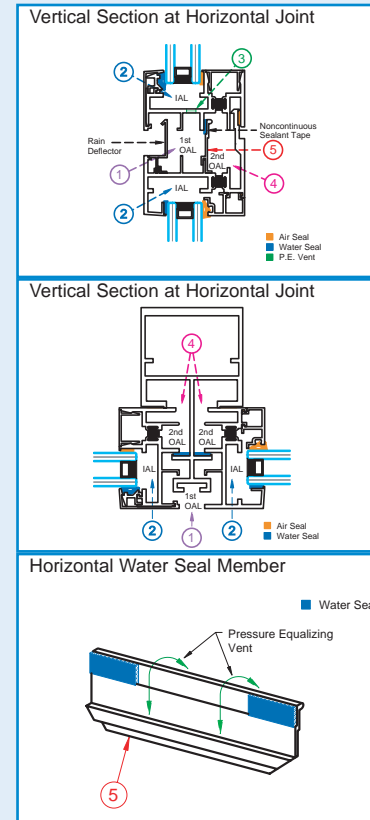
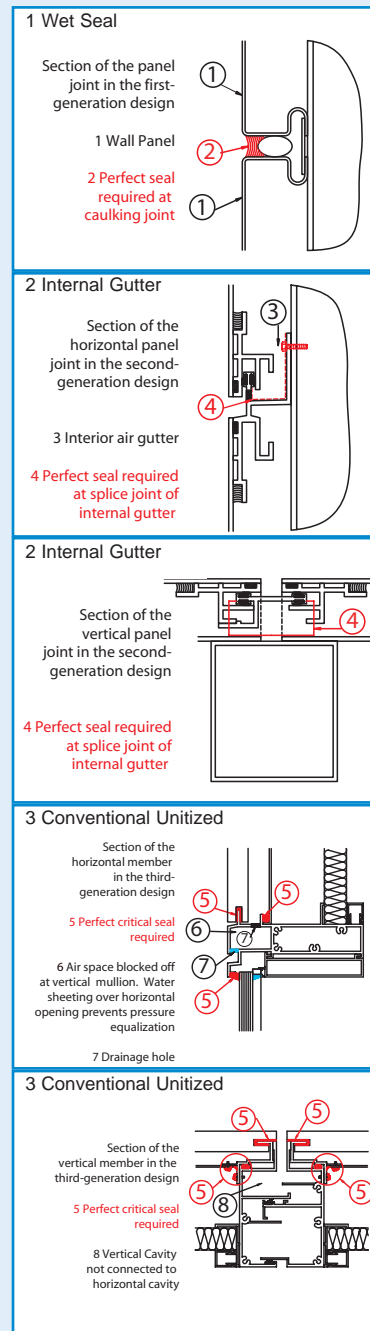
The inner Airloop™ is a dry loop. This airspace is formed between the perimeter extrusion and the facing material of each panel. Horizontal cavities are connected to vertical cavities through miter-matched corners, allowing pressure-equalized air around all sides within each individual panel.

3. Pressure Equalization Vent

The Inner Airloop™ is pressure equalized with the exterior air via vent holes connecting the Inner Airloop™ with the 1st Outer Airloop™, beyond the water path.

4. 2nd Outer Airloop™ (2nd OAL)

The 2nd Outer Airloop™ is also a dry loop. This airspace is formed around each panel -- between adjacent panels and between panels and mullions. This airspace is pressure equalized via a noncontinuous sealant tape attached to the horizontal water seal member (#5), which connects the 1st Outer Airloop™ and the 2nd Outer Airloop™, beyond the water path.



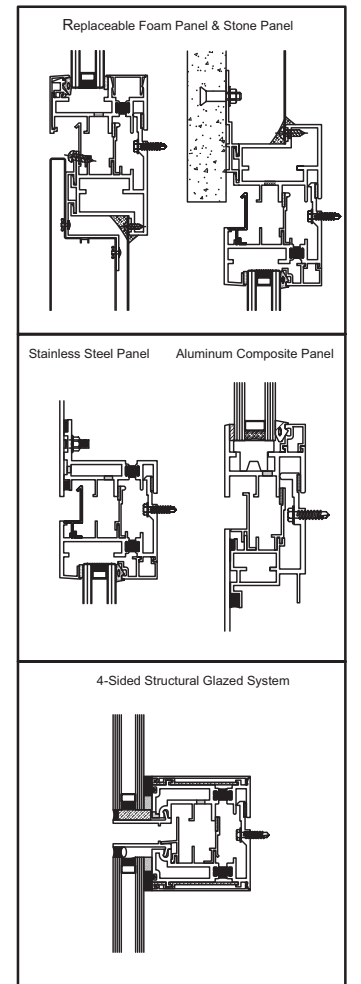
Results of the Airloop™ System

- The functions of sealing water and air are completely separated throughout the system, thus TingWall™ eliminates the use of critical seals.
- Water seals are always sealing pressure-equalized cavities in the panel frame extrusion. Because there is no differential air pressure to force water through the water seal, water does not penetrate into the dry Airloops™.
- Air seals are located beyond the dry Airloops™ where water cannot reach.

We found the engineering principles utilized in the TingWall design, in conjunction with its cost effectiveness, to be major factors in the initial selection of this curtain wall system. Now after three years, there have been no problems of note with the curtain wall, and we firmly believe that TingWall will maximize the life cycle of our building. Based on our experience, we plan to use TingWall on our future buildings. ~ Curtis Kossman, Kossman Development Company, owner of Omega Corporate Center

Design Versatility

The TingWall™ Universal Joint system allows the curtain wall designer complete flexibility to mix and match any type of facing material. The simple, fast erection procedure is exactly the same for all of these different materials



Exterior Fixtures

The TingWall™ mullion head is designed for easy adaptation of anchoring clips for securing any exterior fixture without affecting performance. Unlike conventional curtain wall systems, addition of exterior fixtures to TingWall™ does not involve problematic curtain wall penetrations. (see photo on back)

