Table of Contents

THE BUILDBRACE ICF BRACING AND ALIGNMENT SYSTEM .............................................................................................................. 2
Product Overview .....................................................................................................................................2
BuildBrace Products ......................................................................................................................2
Build1 - All-IN-ONE FOLDING ICF ALIGNMENT SYSTEM ...........................................................................................3
Build3 - 3-PIECE ICF ALIGNMENT SYSTEM ..................................................................................................................3
Transport & Storage Crates ........................................................................................................................4
Storage Crate Customization .........................................................................................................4
24-Foot Adapter Kit ..................................................................................................................................4
BuildBrace Features ...................................................................................................................................4
Alignment Control at Platform Level ...............................................................................................4
Enclosed Adjustment .....................................................................................................................5
3 Way Anchor Foot - Screw-Rebar-Stake .......................................................................................5
Sizes ...........................................................................................................................................5
Safety Rail Post Mount ..................................................................................................................5
Light Weight ................................................................................................................................5
Heavy Duty ..................................................................................................................................5
BuildBrace Components .............................................................................................................................5
Strongback ..................................................................................................................................5
Outrigger ....................................................................................................................................5
Platform Bracket ...........................................................................................................................5
Performance and Specific Requirements ......................................................................................................5
Bracing Setup & Usage .............................................................................................................................6
Usage Notes ............................................................................................................................................6
Stacking and Installing bracing ........................................................................................................7
Wind Resistance ...............................................................................................................................8
Bracing Spacing and Other Considerations ................................................................................................8
Handling and Maintenance ...................................................................................................................8
Inspection .................................................................................................................................................8
BuildBrace Engineering .............................................................................................................................9
Design Loads .....................................................................................................................................9
Constraints ..................................................................................................................................9
Tall Wall Engineering .......................................................................................................................12
THE BUILDBRACE ICF BRACING AND ALIGNMENT SYSTEM

PRODUCT OVERVIEW

The BuildBrace ICF Bracing and Alignment System manufactured by Plumwall is a comprehensive system to brace and align ICF walls. The system provides support for contractors during stacking and pouring of the walls. It also provides a way to plumb and straighten walls during and immediately after the pour.

Utilizing BuildBrace allows a contractor to build ICF walls fast and straight, while ensuring a safe work environment and providing a professional job site appearance.

BuildBrace is a leading innovator in the field of high quality, easy-to-use ICF bracing systems. ICF braces are engineered with an exclusive one-person alignment control at platform level and are durably built to support ICF walls of any thickness up to 24-feet in height.

The BuildBrace system is available in two configurations: The Build1 all-in-one and Build3 three-piece system. The systems are nearly identical once assembled and provide the same level of safety and performance.

BuildBrace provides a superior system to ensure walls are straight and plumb in the safest working environment.

Available transportation and storage crates hold 24 BuildBrace ICF braces, are stackable and available in a selection of standard or custom colors.

<table>
<thead>
<tr>
<th>BUILDBRACE PRODUCTS</th>
<th>BUILDBRACE PRODUCTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>8' Build1 All-In-One Brace</td>
<td>24' Using 1 10' All in One 1 10ft Build 3 and 4' adapter kit (includes 3 outrigger extensions)</td>
</tr>
<tr>
<td>9' Build1 All-In-One Brace</td>
<td>24' Build 3 Using 2 10' Braces and 4' adapter kit (includes 3 outrigger extensions)</td>
</tr>
<tr>
<td>10' Build1 All-In-One Brace</td>
<td>4' Adapter Kit for 14' (includes 1 outrigger extension) No Platform included</td>
</tr>
<tr>
<td>12' Build1 All-in-One Brace</td>
<td>4' Adapter Kit for 16' (includes 2 outrigger extensions) No Platform included</td>
</tr>
<tr>
<td>8' Build3 Brace</td>
<td>4' Adapter Kit for 24' (includes 3 outrigger extensions) No Platform included</td>
</tr>
<tr>
<td>9' Build3 Brace</td>
<td>Build 3 Platform</td>
</tr>
<tr>
<td>10' Build3 Brace</td>
<td>Standard 10' Transport Crate</td>
</tr>
<tr>
<td>12' Build3 Brace</td>
<td>Standard 12' Transport Crate (Build1 Only)</td>
</tr>
<tr>
<td>14' Build3 using 1 10' Brace and 4' adapter kit (includes 1 outrigger extension)</td>
<td>14' All-In-One using 1 10' Brace and 4' adapter kit (1 outrigger extension and Build 3 Platform)</td>
</tr>
</tbody>
</table>
BUILD1 - ALL-IN-ONE FOLDING ICF ALIGNMENT SYSTEM

The Build1 system folds together in one unit for storage and transport. Build1 is designed for quick setup, easy alignment at platform level, storage and transport, delivering unparalleled productivity and efficiency.

BuildBrace Build1 is always ready for use. No missing parts to locate, just unfold and begin working.

Build1 Braces are easy to set up, with no assembly required. Simply unfold the brace, position it and fasten it to the walls and floor. The bracing should be attached through the slots in the strongback using a pan head or duplex screw.

The foot bracket should be solidly anchored to the floor or soil with appropriate fasteners, or pins. Each brace should be fully inspected following installation, to ensure it is firmly affixed to the floor and the wall.

Walkboards should be installed and safety railing added to conform to applicable local safety standards. All safety equipment should be inspected regularly for damage and repaired or replaced as necessary.

BUILD3 - 3-PIECE ICF ALIGNMENT SYSTEM

Build3 combines BuildBrace’s exclusive alignment control at platform level with the simplicity and durability of a conventional three-piece system. The pin-on platform bracket mounts to the 14-gauge galvanized steel strongback with the outrigger connecting to the platform bracket.

This system is also easily transported to the job site and is easy to carry. The versatile nature of the 3-piece system allows missing or damaged components to be easily replaced.

BuildBrace Build3 is assembled by attaching the strongback to the ICF forms, and then installing the triangular shaped angle bracket and the extension leg with the supplied pins.

The foot bracket should be solidly anchored to the floor or soil with appropriate fasteners, or pins. Each brace should be fully inspected following installation, to ensure it is firmly affixed to the floor and the wall.

Walkboards should be installed and safety railing added to conform to applicable local safety standards. All safety equipment should be inspected regularly for damage and repaired or replaced as necessary.
TRANSPORT & STORAGE CRATES

From job site to job site or floor to floor, BuildBrace Storage Crates provide quick and safe transport of your braces. Crates are available for both Build1 and Build3 models.

- Holds 24 Braces
- Lifting Lugs
- Durable Powder Coated Finish
- Stackable
- Forklift Accessible from All Sides
- Custom End Plates and Color Options Available

STORAGE CRATE CUSTOMIZATION

Customize the appearance of your brace crates. Pick from a selection of colors or ask us about matching your company colors for an additional charge.

24-FOOT ADAPTER KIT

Take ICF to the next level with the BuildBrace Adapter Kit giving you 24-feet in perfect alignment. By integrating flush with both the Build1 and Build3 bracing systems, the Adapter Kit is a 4-foot strongback extension that connects two 10-foot braces together.

This allows you to build and align walls at 10-feet, 14-feet and 24-feet. The Adapter Kit’s extended outrigger holds sturdy with double-walled tubing that is easy to assemble.

BUILDBRACE FEATURES

ALIGNMENT CONTROL AT PLATFORM LEVEL

One person, one drill. That’s all it takes to adjust the alignment on a BuildBrace ICF brace. Designed for single person use, you can measure and make adjustments without leaving the platform.

This revolutionary alignment control is designed to minimize setup time and maximize worker efficiency.
ENCLOSED ADJUSTMENT
Enclosed unit is protected from concrete spillage and mud.

3 WAY ANCHOR FOOT - SCREW-REBAR-STAKE
Whether aligning the basement foundation or second story, the brace holds firm with anchor holes for rebar, wooden stakes or screws.

8’-12’
BuildBrace ICF Braces are available in 8’, 9’, 10’ or 12’ strongback heights.

SAFETY RAIL POST MOUNT
Integrated into the platform bracket is a 2” x 6” mount for safety rail posts.

LIGHT WEIGHT
BuildBrace braces are easy for one person to carry and setup.

HEAVY DUTY
All BuildBrace strongbacks are built with 14-gauge, galvanized steel.

BUILDBRACE COMPONENTS
Careful consideration has been given to the variety of applications that job site conditions and wall forming create to develop a product well suited for the intended use.

The basic system is represented by the following fundamental components:

STRONGBACK
The vertical component of the system is a galvanized steel channel intended to be secured to the footing or slab at the base of the wall and to the wall forms through the provided 1 ½” x 3/16” slots with two screws every course. Use #10 screws to fasten the strongback to the ICF form. Holes drilled 3”o.c. through the sides of the strongback provide locations for mounting the Platform bracket and outrigger using the supplied pins.

OUTRIGGER
The diagonal component of the system has 6 fixed adjustment positions. The outrigger can be placed at different angles, within the engineered standards within this document, to accommodate irregular excavation elevations. The enclosed adjustment system can be used for fine adjustments, and is accessible from the platform.

PLATFORM BRACKET
The platform bracket provides secure attachment of the outrigger to the strongback. The platform bracket is designed to accept two 2x10 scaffold planks and a 1-inch toeboard.

Secure the overlapping planks together with screws. An integral 2x6 slot can be used to add a vertical support for a hand rail. Place handrails to the inside of the vertical support.

BUILDBRACE PRODUCT MANUAL

PERFORMANCE AND SPECIFIC REQUIREMENTS
BuildBrace is designed for supporting walls in winds up to 60kmph (37 mph). The platform should be unoccupied at wind speeds above 40kmph (25mph). Any use outside of this range is at the contractors risk.

This manual provides minimum requirements, and additional federal, state, and local codes may apply. The contractor is responsible for researching and meeting these codes.

Spacing of the bracing product should be determined by the installing contractor in accordance with federal, state and local codes for wind bracing and scaffold. The maximum spacing for each BuildBrace product is not to exceed 6 feet.

Scaffold planking and handrail materials should be:
• American – Number 1 Southern Pine or Douglas Fir.
• Approved laminated structural or manufactured planks and stages are recommended.

BuildBrace Build1 erected and staked.
Contractor is responsible for meeting all applicable codes for anchoring the system, as well as ensuring that all fasteners provide the performance required to meet those standards.

BuildBrace is designed to accommodate a platform load of 2.4kPa (50PSF) or a point load of 2.2KN (500LBS) only.

RELEVANT CODES AND STANDARDS

The user is responsible to review and apply the requirements of federal, state and local regulations for wind bracing and scaffolding as defined by the above code agencies. The BuildBrace is designed to be in compliance with all applicable Ontario Occupational Health and Safety Act regulations.

This system has been tested and complies with:

1. CAN/CSA-S269.1, Falsework for Construction Purposes
2. CAN/CSA-S269.2-M87, Access Scaffolding for Construction Purposes
3. CAN/CSA-S269.3-M92, Concrete Formwork CSA A371-04
5. 2010 Structural Commentaries (Part 4 of Division B), NBCC 2010

These standards could be compared against others if required by another agency. This system is also engineered to meet the standards set forth in the accompanying engineering documentation.

BRACING SETUP & USAGE

Build1 Braces are easy to set up, with no assembly required. Simply unfold the brace, position it and fasten it to the walls and floor. The bracing should be attached through the slots in the strongback using a pan head or duplex screw.

BuildBrace Build3 is assembled by attaching the strongback to the ICF forms, and then installing the triangular shaped angle bracket and the extension leg with the supplied pins.

The foot bracket should be solidly anchored to the floor or soil with appropriate fasteners, or pins. Each brace should be fully inspected following installation, to ensure it is firmly affixed to the floor and the wall.

Walkboards should be installed and safety railing added to conforms to applicable local safety standards. All safety equipment should be inspected regularly for damage and repaired or replaced as necessary.

USAGE NOTES

- Do not place the unit on snow, ice, loose gravel, mud, leaves or other slippery surfaces.
- Be sure the vertical strongback channel, foot and base clips are properly secured to avoid slipping.
- Do not place boxes, ladders or other scaffolding on top of the plank to gain additional height.
- This unit IS NOT to be used independent of a rated plank or stage.
- Be sure all locking devices are secure.
- Do not use the unit beyond a plank height of 20 feet off the ground or floor.
- Be sure the plank or stage is supported a minimum of 12 to 18 inches on each end.
- The recommended spacing for the unit is not to exceed 6 feet.
- Never set the units in front of unlocked doors or in other locations where the units could be bumped or kicked.
- Barricades must be used where necessary.
- Do not apply side loads to the unit or plank.
- Never pull or push anything while working on the units.
- Do not use the unit without an appropriately rated scaffold plank or stage.
- **DANGER!** Steel braces conduct electricity! Keep unit away from uninsulated electrical circuits and wires. Use extreme caution when working near electrical wires. Failure to comply may result in serious injury or death.
- Maximum scaffold height is 24 feet.
- **SECURELY ENGAGE ALL PINS BEFORE CLIMBING.**
- Be sure to use fall restraint devices as prescribed by local, state and federal authorities.
- Failure to comply with all local, state and federal requirements may result in serious injury or death.
- Never drop or apply an impact load to the unit.
- Do not use the unit if you are not in good physical condition or are under the influence of any substance (including prescription medicine) that may impair your ability to use the unit properly and safely.
- Do not leave the unit set up when unattended.
- Do not use in high winds.
- Keep your body center in the work platform.
- Do not overreach.
- Never hoist anything from the scaffold plank.
- Do not bounce or run on the scaffold plank.
- Keep the unit clean and free of all foreign material. Do not store any material on the unit.
- The units should be properly supported and secured during transport. Always store in a clean, dry place.
- **WARNING:** All accessories must be installed in accordance with the manufacturers recommended procedure.

• Do not exceed the duty rating of this unit.
• The maximum safe weight load for each unit is 500 pounds. Over loading could cause serious injury or death.
• Place the unit on a firm surface where footing is solid, rigid and capable of carrying the maximum intended load without slipping.
STACKING AND INSTALLING BRACING

1. Snap all lines for locations of forms, or set string lines for reference.

2. Stage all materials and bracing inside the wall location, leaving about 6 ft for workspace minimum inside the perimeter.

3. Stack 4 ft (3 courses) of ICFs before installing the Bracing.

4. Locate the positions for the braces, and center them on the form ties.

5. Stand the strongback in position and secure it to the footing through 2 of the four attachment holes at the base of the channel.

6. Using two #10 coarse thread, pan head, wood screws every of block, secure the strongback to the ICF forms by screwing into the form ties through the slotted holes in the back of the strongback. The screws should be located at the top of the slot and tightened enough to hold the strongback to the forms and prevent the forms from floating upwards, but allow the forms to settle as they are filled with concrete.

7. Attach the Platform Bracket to the strongback using the supplied pins, and then attach the outrigger to the platform bracket. Refer to the BuildBrace drawing in the back of this user manual. Hold a level held parallel to the strongback at eye-level and bring the strongback to within 1.5 degrees of plumb with the wall leaning in towards the brace. Adjust the length of the outrigger, first at the fixed adjustment locations, then with the enclosed adjustment, and anchor the hinged foot brace.

8. Complete bracing set up prior to installing planking. Inspect each brace to ensure no steps were missed.

9. As additional courses are stacked, affix the blocks, every course, to the strongback with 2 screws. Screwing into the BB hardpoint will yield the most strength. Starting in 2015, BuildBrace strongbacks will have additional slots to make it easier to hit the BB hardpoints.

10. OSHA requires scaffolding; handrails and toe board if the workers feet are 6’ or more off the ground. When the wall is fully stacked, reinspect all braces and planks to ensure they are properly installed and attached.

11. An initial tilt of the wall toward the brace (1/4” or less) will allow the wall to be pushed to plumb, using the full bearing of the strongback, rather than pulled, using the tensile strength of the screws. The wall should be adjusted to plumb continuously before concrete in the wall sets.

12. Once the wall has been poured, the final adjustment to plumb can be completed with the enclosed adjustment system and accessibility from the work platform.

WIND RESISTANCE
The BuildBrace is designed and engineered to resist wind loads from winds of up to 60kmph (37mph). Normal construction limits the potential wind resistance to that which foundation resistance will allow.

When used to provide wind bracing where the strut is staked to soil, the brace unit shall be installed on two sides of the wall. The mass of normal strip footings available to resist wind uplift limits safe occupancy of the scaffold to concurrent winds of 60kmph (37mph).

Where scaffold members are anchored to soil, at wind speeds in excess of 40 kmph (25mph) the scaffold should be evacuated by all personnel.

Where the competent founding materials are available to develop anchor loads, the brace may be installed on one side only.

BRACING SPACING AND OTHER CONSIDERATIONS
• Determine the number of braces required, based on wall length, corners and openings.
• Maximum spacing of the brace is 6 feet.
• Braces should be placed each direction at corners, either inside or outside, and at each side of an opening. Bracing spacing should be maintained for larger openings, placing braces as needed within the opening distance to allow for straightening and alignment of the header.
• Braces should be distributed evenly along the wall, with additional braces for corners and openings interspersed.
• When bracing to the inside of a corner, the first brace should be set at normal height, and the second brace placed lower, to clear the first.
• For longer and taller walls, bracing on both sides of the wall is recommended.
• Wood “Kickers” may be required at the corner to support the walk boards. A board may also be screwed horizontally to the forms above the kickers for more support.

HANDLING AND MAINTENANCE
BuildBrace alignment systems are made of the finest materials and coatings. The bracing components should be thoroughly cleaned of any concrete overspill with a small putty knife and a sponge with water, as soon as the pour is completed, for ease of cleaning. If the concrete hardens on the braces, it may require more aggressive cleaning methods. Do not use acid water to clean the bracing.

Reasonable handling and maintenance will result in years of dependable service.

The enclosed adjustment system should not require excessive cleaning or maintenance. It is recommended to grease the adjuster thread as required, typically once per year.

WARNING! FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS MAY RESULT IN SERIOUS INJURY OR DEATH.

INSPECTION
Inspect each unit for damage when setting up, and when taking down the bracing. Any units found to be damaged should be set aside and marked, for repair or replacement.
Scaffold platform conforms to Ontario Health and Safety Act requirements for a scaffold and work platform. This is not intended to be used to support masonry.

**DESIGN LOADS**
Platform Live Load = 2.4KPa (50PSF)
Horizontal Live Load = 0.50KPa (10PSF)

**CONSTRAINTS**
1. To be used in conjunction with Insulated Concrete Forms (ICF) up to 24 feet when using the 24-foot adapter.
2. Vertical uprights are not to be coupled to achieve greater heights unless using the 24-foot adapter.
3. Any cutting, welding, bolting, and or adjustment of brace’s design is not recommended, and will void any warranty and/or liability by PLUMWALL™ in relation to any further use of the product.
4. Vertical upright and brace assembly must be secured to ICF wall with 2 #10 x 38mm (3/16” x 1-1/2”) screws and slotted bracket on every ICF course.
5. Braces should be no more than 1820mm (6’-0”) apart and doubled up in corners.
6. Scaffolding should be constructed to conform to Ontario Occupational Health and Safety Act regulations.
7. Brace and scaffold is designed to accommodate a platform load of 2.4KPa (50PSF) or a point load of 2.2KN (500LBS) only.
8. Brace should not be used when wind velocities exceed 60KPH (37MPH).
9. Maximum brace extension to be 9’6” and the base anchorage shall be a minimum of 3’6” from the face of the vertical upright.
10. The anchorage of the Plumb Wall brace is site specific and must be verified by an engineer.
11. The base anchorage shall be level with the base of the vertical upright.
12. All bracing and ICF connectors should be inspected by personnel trained in ICF construction before erection and prior to concrete pour.
13. Bracing that has been damaged in any way should be painted a bright cautionary red and set aside for repair or disposal.
14. Any bracing that has been damaged during shipping should be immediately returned for replacement.
15. Failure to comply with the above noted installation and design instructions immediately absolves PLUMWALL™ and BuildBlock Building Systems from any and all liability claims.
**NOTES:**

Approved for use as ICF forming brace with the following restrictions:

- All details of testing and compliance with required codes can be found in Breukelman Design Inc. report.
- Prior to any use, all components to be inspected for corrosion, deformation or other damage.
- Platform to be unoccupied by personal or wind speeds greater than 40 Kph.
- No more than 25 psf vertical loading on platform in combination with 500 lb of worker load per brace.
- No more than 52 psf vertical loading on platform in combination with 500 lb of worker load per brace.
- Brace to have 6' spacing between braces. No sag greater than 6" shall be used.
- Braces to have 6' spacing maximum. All components to be inspected for corrosion, deformation or other damage.
- Prior to any use, all components to be inspected for corrosion, deformation or other damage.
- Platform to be unoccupied by personal or wind speeds greater than 40 Kph.
- No more than 25 psf vertical loading on platform in combination with 500 lb of worker load per brace.
- No more than 52 psf vertical loading on platform in combination with 500 lb of worker load per brace.
- Brace to have 6' spacing maximum. All components to be inspected for corrosion, deformation or other damage.
- Prior to any use, all components to be inspected for corrosion, deformation or other damage.
- Platform to be unoccupied by personal or wind speeds greater than 40 Kph.
- No more than 25 psf vertical loading on platform in combination with 500 lb of worker load per brace.
June 26, 2003

Excallbur
940 Brock Rd.
Pickering, ON.
L1W 2A1

Attn: Tom Summerville, President

Re: Structural Review of the PLUMB Wall™ ICF brace.

Our File: 103532

Dear Sir,

Our office has analyzed the PLUM Wall™ brace to determine its adequacy to be used for insulated concrete wall form support in accordance with the provisions of the Ontario Occupational Health and Safety Act.

Our analysis considered the PLUM Wall™ braces erected at 1830mm (6'-0") on center with 2.4 KPa (50 PSF) uniform load applied to a supported platform acting simultaneously with wind pressure of 0.5 KPa (10 PSF) acting against the supported insulated concrete wall form. As well, we considered a point load of 2.2 KN (500lbs) on the platform support in conjunction with the same horizontal wind pressure. All applied loads were factored in accordance with the National Building code and the Ontario Occupational Health and Safety Act.

Our analysis has resulted in limitations imposed on the range of use and erection of the PLUM Wall™ brace. These limitations have been depicted in the attached plan. These restrictions include a maximum brace length of 2900mm (9'-6") and a minimum anchorage distance of 1000mm (3'-6") from the face of the vertical upright.

Should you have any question regarding this report, please feel free to contact our office at your convenience.

Yours truly,

D.G. Biddle & Associates Ltd.

D.D. Biddle, P.Eng
Tall Wall ICF Brace System

The Plumwall wall brace system is designed to comply with Canadian codes and regulations. The design takes into account normal loading conditions, such as dead and live loads and wind loading.

Summary

The design criteria for the ICF wall brace system is based on the following design requirements:

- CAN/CSA-S269.1, Falsework for Construction Purposes
- CAN/CSA-S269.2-M87, Access Scaffolding for Construction Purposes
- CAN/CSA-S269.3-M92, Concrete Formwork
- CSA A371-04, Masonry Construction for Buildings
- National Building Code of Canada, 2010
- Structural Commentaries (Part 4 of Division B), NBCC 2010

For this analysis, it was assumed that the bracing would be supporting only the top 2.43 metres (8 feet) of the reinforced concrete wall design, as the bottom 16 feet will have already been placed and had a minimum of 3 days to cure.

The Plumwall brace is described as a 38mm by 38mm (1.5”) steel tube inside of a 45mm by 45mm (1.75”) steel tube. The brace was made of 1750mm (69”) sections of each size of tube offset from each other by 500mm (20”) and fully welded together. The braces were joined with 12mm (½”) pins every 102mm (4”) which allowed the two members to act together compositely which increases the carrying capacity of the brace.

Results

Through analysis of the structures geometry and specified loading cases, as provided in design assumptions, it was found that the Plumwall 7.3 m (24-feet) bracing would be required to carry a load of 268 kg (591 lbs). Through testing of the bracing it was demonstrated that the brace would be able carry a load of 294kg (650 lbs.) Therefore, it has been demonstrated that the 24-foot brace is appropriate for use in ‘normal’ loading situations as included in the report.

Limitations & Usage Requirements

- Workers are expected to leave the scaffold before wind speeds reach 40 km/hour
- For buildings in large open terrain and/or with very long walls, spacing between bracing must be reduced to 915mm (3’).
- As per A317-04 Annex D, temporary bracing should be installed using material that is maintained in good condition. Therefore, if bracing is visibly deformed before installing it is to not be used. Also, if after installing, the brace deforms more that one foot without loads applied it is to be removed and another brace that is in good condition is to be used.
- The following text is to be placed on a sticker on each brace length:
Legal Disclaimer (Please Read): PlumwallTM 4 Ft. Tall Wall Adapter is designed to brace Insulated Concrete Forms (ICF) for walls to 24’ (7.3m) high. For full limitations refer to PlumwallTM 4 Ft. Tall Wall Adapter engineering report, available by contacting us at www.plumwall.com or 1-888-928-6676. Tall wall braces are to be spaced a maximum of 6’ apart, except at corners where the spacing shall be reduced to 3’. In cases where the tall wall is very long (>80’ length) or where the wall is adjacent to an open field or parkland (for 150’ distance from the new wall), the spacing shall be reduced to 3’ for the length of the wall. Maximum height of 24’ wall is allowed only when the first two segments (8’ and 16’ high) have been placed and have a minimum cure of three (3) days. All other required bracing (for the lower wall segments) must be maintained in addition to the tall wall brace. Adequate staking of the base of the tall wall brace is required – a minimum of 2 (two) 4’ long steel stakes must be driven into the base at opposing angles to provide pullout support. If the soil conditions are sandy or soft soils, a qualified geotechnical engineer must advise as any additional base support requirements. All workers must leave the scaffold and work-site when wind speeds reach 40 km/hr.

Testing

Pictures are included in Appendix A to show results of testing of the tall wall brace.

Test Procedure:
1. Created connecting points at either end of the brace material, with one fixed to the ground and the other at the 20 foot connection point as specified by Plumwall for the bracing of the 7.3m (24’) ICF wall:
   a. On an angle as to allow brace to deform under its own weight
   b. Not in a situation as to allow additional support, such as the ground would could act as a restraint in buckling
2. Using a tensioning device to measure axial load, initiated test by incrementally adding axial load, waiting before continuing test to allow for load to adjust for any elastic deformation.
3. Ended test when bracing deformed permanently, noting that even with permanent deformation brace still held maximum tested load.

Design Assumptions

1. Load Cases

   a. Wind Loading for ‘Normal’ Loading
      i. Importance Factor = 1, normal importance
      ii. Exposure Factor = 0.5, rough terrain (suburban and urban areas)
      iii. Gust Effect Factor = 2, main structural member
      iv. Force Coefficient = 1.3; free standing wall on the ground with a long wall length
      v. 1/50 Hourly Wind Pressure = 0.55 kPa, where 0.55 kPa is equal to or greater than the 1/50 wind pressure for 96% of Ontario

   b. Live Loading for platform intended to support workers and their hand tools exclusively
      i. A load of 3.63 kN per linear metre of platform width applied vertically and uniformly across an independent platform section along an imaginary line drawn perpendicular to the platform edge anywhere along the length of the section
      ii. A minimum uniformly distributed load of 1.20 kN/m², acting simultaneously with the concentrated load specified in (i)
2. Support Conditions

The supporting foundation is assumed to be slab-on-grade. The slab is assumed to have sufficient strength to support the wall. The wall is considered to be restrained from translation in both directions (along the wall and transverse to the wall). The base 4.87 m (16’) of the 7.3m (24’) wall is assumed to be cured for a minimum of 7 days, and will be able to support all of the wind loading applied to its height. The top 2.43 m (8’) of the 7.3m (24’) wall is assumed to hinged where it connects to the base 16 feet, allowing the wind to rotate it against the scaffold brace.

The Plumwall brace is assumed to be restrained against uplifting; i.e. assumed to be anchored to the slab and the surrounding soil as specified by Plumwall.

3. Material Properties

a. Bracing Steel
   i. Steel – 38mm x38mm x2.2mm & 45mm x45mm x2.5mm
   The brace was be made of 4’ sections of each size, 45 mm wide with 38 mm wide inside, of tube offset from each other by 500mm (20”). The braces was joined with with 12mm (½”) pins every 102mm (4”).

4. Structural Model

a. Load Cases Considered
   i. Dead, D, structural self weight
   ii. Wind, W, 0.65 kN/m acting perpendicular to wall
   iii. Live, L, 7.13 kN/m acting perpendicular to scaffold platform.

b. Load Combinations Considered
   i. 1.25D + 1.25W + 0.5L, 1.25 wind load as per CSA A317-04

Wind Load Calculation

\[ p = \frac{I_w C_e C_g C_q}{}, \text{ using assumptions shown above} \]
\[ = (1.0)(0.5)(2.0)(1.3)(0.55kPa) \]
\[ = 0.72kPa \]

As per CSA A317-04, “the anticipated wind load should be assumed to be 50% of the load based on a probability of the one-in-fifty year wind pressure.”

\[ p = 0.72kPa \times 50\% \]
\[ = 0.36kPa \]

\[ udl = p \times \text{tributary width, using 6 foot spacing specified by Plumwall} \]
\[ = 0.36kPa \times 1.83 \text{ m} \]
\[ = 0.66 \text{ kN/m, acting perpendicular to ICF wall being formed} \]

Live Load Calculation

\[ udl_1 = 3.63 \text{ kN x 0.84 m, width of platform} \]
\[ = 3.05 \text{ kN/m}^2 \times 1.83 \text{ m, tributary width due to bracing spacing} \]
\[ = 5.6 \text{ kN/m} \]

\[ udl_2 = 1.20 \text{ kN/m}^2 \times 1.83 \text{ m, tributary width due to bracing spacing} \]
\[ = 2.2 \text{ kN/m} \]
udf = 5.6 kN/m + 2.2 kN/m
= 7.8 kN/m

Test Results

A total of four (4) braces were tested as outlined above with a minimum test load of 640 lbs.

<table>
<thead>
<tr>
<th>Test</th>
<th>Test Conditions</th>
<th>Maximum Loading Results kN (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical</td>
<td>Loading condition as given in appropriate codes, see above for details</td>
<td>2.6 (591)</td>
</tr>
<tr>
<td>1</td>
<td>Test was completed at specified at design length, without the use of the Tele Brace, and the adjustable brace foot</td>
<td>3.05 (686), consistently</td>
</tr>
<tr>
<td>2</td>
<td>Test was completed at specified at design length, with the use of the Tele Brace, and the adjustable brace foot</td>
<td>4.0 (900), consistently</td>
</tr>
<tr>
<td>3</td>
<td>Test was completed at specified at design length, with the use of the Tele Brace, and the adjustable brace foot</td>
<td>2.88 (650), consistently</td>
</tr>
<tr>
<td>4</td>
<td>Test was completed at specified at design length, with the use of the Tele Brace, and the adjustable brace foot</td>
<td>2.84 (640), consistently</td>
</tr>
</tbody>
</table>
Appendix A
<table>
<thead>
<tr>
<th>Photo</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo 1</td>
<td>Crane Scale used to measure axial loading</td>
</tr>
<tr>
<td>Photo 2</td>
<td>Crane Scale used to measure axial loading</td>
</tr>
<tr>
<td>Photo 3</td>
<td>1.5” and 1.75” Material Used</td>
</tr>
<tr>
<td>Photo 4</td>
<td>5” Spacing Used between End of Member and First Pin</td>
</tr>
<tr>
<td>Photo 5</td>
<td>6” Spacing Used between Pins</td>
</tr>
<tr>
<td>Photo 6</td>
<td>Dimension of 1.50” Material</td>
</tr>
<tr>
<td>Photo 7</td>
<td>Wall Thickness of 1.50” Material</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>Photo 8</td>
<td>Dimension of 1.75” Material</td>
</tr>
<tr>
<td>Photo 9</td>
<td>Wall Thickness of 1.75” Material</td>
</tr>
<tr>
<td>Photo 10</td>
<td>Test #1 Set Up</td>
</tr>
<tr>
<td>----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Photo 11</td>
<td>Ground Level Connection</td>
</tr>
<tr>
<td>Photo 12</td>
<td>Test #1 Set Up</td>
</tr>
<tr>
<td>Photo 13</td>
<td>Deformation after Test Completion</td>
</tr>
<tr>
<td>Photo 14</td>
<td>Deformation after Test Completion</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------</td>
</tr>
</tbody>
</table>

Deformation after Test Completion
<table>
<thead>
<tr>
<th>Test #2</th>
<th>Photo 15</th>
<th>Photo 16</th>
<th>Photo 17</th>
<th>Photo 18</th>
<th>Photo 19</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Test #2 Set Up</td>
<td>Test #2 Set Up</td>
<td>Crane Scale Connection</td>
<td>Deformation After Completion of Test with Load Applied</td>
<td>Deformation After Completion of Test with Load Removed</td>
</tr>
<tr>
<td>Photo 20</td>
<td>904 lbs Maximum Load</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>----------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

904 lbs Maximum Load
<table>
<thead>
<tr>
<th>Test#3</th>
<th>Photo 21</th>
<th>Test #3 Set Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo 22</td>
<td>652 lbs Maximum Load</td>
<td></td>
</tr>
</tbody>
</table>