Listing and Technical Evaluation Report™

A Duly Authenticated Report from an Approved Agency

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QuickTie™ System (QTS) Post Tensioned Concrete Masonry Wall Applications

Trade Secret Report Holder:

QuickTie™ Products, Inc.

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CSI Designations:

DIVISION: 04 00 00 - MASONRY

Section: 04 05 19 - Masonry Anchoring and Reinforcement

Section: 04 22 00 - Concrete Masonry Unit

DIVISION: 06 00 00 - WOOD, PLASTICS AND COMPOSITES

Section: 06 00 90 - Wood and Plastic Fastenings

1 Innovative Products Evaluated[i]

1.1 QuickTie System (QTS)

1.1.1 QTBM(L) Blue $^{3}/_{16}$" QuickTie

1.1.2 QTGM(L) Green $^{1}/_{4}$" QuickTie

1.1.3 QTOM(L) Orange $^{5}/_{16}$" QuickTie

1.1.4 QTRM(L) Red $^{3}/_{8}$" QuickTie

2 Product Description and Materials

2.1 The innovative products evaluated in this report are shown in **Figure 1** through **Figure 8**.

2.2 *QuickTie System (QTS) Description*

2.2.1 The QTS serves as pre-stressing tendons for concrete masonry construction projects that involve a Registered Design Professional (RDP).

2.2.2 QuickTie cables are used as post-tensioning tendons in a hybrid wood-masonry wall system intended for use in light-frame construction.

2.2.2.1 The term "*hybrid wood-masonry wall system*" is used in this report to define the wall as a system constructed of both wood and masonry.

2.2.2.1.1 The wall consists of 8" hollow non-grouted masonry units with mortar set in a running bond pattern.

2.2.2.1.1.1 This report also provides special provisions for walls with grouted end-cells for in-plane load resistance.

2.2.2.1.2 A wood top plate is set on top of the masonry assembly and is used to collect and distribute loads into the masonry.

2.2.2.1.3 The hybrid wood-masonry wall system is post-tensioned with QuickTie cables.

2.2.3 The QTS applies an internal compressive stress to the masonry wall to counteract tension stresses resulting from wind uplift and/or laterally applied loads that result in overturning forces.

2.2.4 The QTS consists of a Polyvinyl Chloride (PVC) coated, hot-dipped galvanized wire QuickTie cable with threaded studs swaged to each end.

2.2.5 *Primary Connection:*

2.2.5.1 QuickTie cables with 1" threaded bottoms will be connected to the foundation via an embedded anchor bolt cast in place. The QuickTie cable will be attached to the anchor bolt by a mechanical coupling.

2.2.5.2 The other threaded stud is extended vertically within the interior of the masonry units to the top of the wall, inserted through a hole drilled through the wood top plates and attached to a steel plate and nut placed on the top surface of the uppermost plate on the wall. The nut is then tightened to post-tension the QTS.

2.2.6 *Alternative Connection:*

2.2.6.1 The end of the QuickTie cable with longer threads and no plate washers will be connected to the foundation via a formed or drilled hole in the foundation. The hole is filled with epoxy and the QuickTie cable is inserted into the hole and left to set.

2.2.6.2 The other threaded stud is extended vertically within the interior of the masonry units to the top of the wall, inserted through a hole drilled through the wood top plates and attached to a steel plate and nut placed on the top surface of the topmost plate on the wall. The nut is then tightened to post-tension the QTS.

2.2.7 Where one QuickTie cable does not provide sufficient capacity, multiple cables of the same type may be installed to increase the pre-stressing force and transfer of accumulated loads to the foundation.

2.3 *QTS Materials*

2.3.1 QuickTie QT_M(L) (note that the "L" indicates length in feet): PVC coated, galvanized aircraft wire rope, $^{3}/_{16}$" diameter (Blue), $^{1}/_{4}$" diameter (Green), $^{5}/_{16}$" diameter (Orange), or $^{3}/_{8}$" diameter (Red). Threaded studs in the following sizes are swaged onto each end of the wire rope:

2.3.2 *Primary Connection:*

2.3.2.1 Cast in Place QTBM(L) Blue $^{3}/_{16}$" diameter wire rope:

2.3.2.1.1 Top: $^{3}/_{8}$" x 6$^{1}/_{4}$" with 4" of threads

2.3.2.1.2 Bottom: $^{3}/_{8}$" x 3$^{1}/_{4}$" with 1" of threads

2.3.2.2 QTGM(L) Green $^{1}/_{4}$" diameter wire rope:

2.3.2.2.1 Top: $^{1}/_{2}$" x 6$^{1}/_{4}$" with 4" of threads

2.3.2.2.2 Bottom: $^{1}/_{2}$" x 3$^{1}/_{4}$" with 1" of threads

2.3.2.3 QTOM(L) Orange $^{5}/_{16}$" diameter wire rope:

2.3.2.3.1 Top: $^{5}/_{8}$" x 6$^{3}/_{4}$" with 3$^{5}/_{8}$" of threads

2.3.2.3.2 Bottom: $^{5}/_{8}$" x 4$^{1}/_{8}$" with 1" of threads

2.3.2.4 QTRM(L) Red $^{3}/_{8}$" diameter wire rope:

2.3.2.4.1 Top: $^{3}/_{4}$" x 9" with 6" of threads

2.3.2.4.2 Bottom: $^{3}/_{4}$" x 4" with 1" of threads

2.3.3 *Alternative Connection – Epoxy:*

2.3.3.1 QTB(L) Blue $^3/_{16}$" diameter wire rope:

2.3.3.1.1 Top: $^3/_8$" x 6$^1/_4$" with 4" of threads

2.3.3.1.2 Bottom: $^3/_8$" x 6$^1/_4$" with 4" of threads

2.3.3.2 QTG(L) Green $^1/_4$" diameter wire rope:

2.3.3.2.1 Top: $^1/_2$" x 6$^1/_4$" with 4" of threads

2.3.3.2.2 Bottom: $^1/_2$" x 6$^1/_4$" with 4" of threads

2.3.3.3 QTO(L) Orange $^5/_{16}$" diameter wire rope:

2.3.3.3.1 Top: $^5/_8$" x 6$^3/_4$" with 3$^5/_8$" of threads

2.3.3.3.2 Bottom: $^5/_8$" x 8$^3/_4$" with 6$^5/_8$" of threads

2.3.3.4 QTR(L) Red $^3/_8$" diameter wire rope:

2.3.3.4.1 Top: $^3/_4$" x 9" with 6" of threads

2.3.3.4.2 Bottom: $^3/_4$" x 9" with 6$^3/_4$" of threads

2.3.4 Individual wires are 0.030" diameter, or smaller, with minimum F_u = 268,000 psi. The length varies in 1" increments from 2' to 30'.

2.3.5 QTBM(L) and QTB(L) Blue ($^3/_{16}$" aircraft wire rope): $^3/_{16}$" diameter, 7x19, hot-dipped, galvanized steel wire with a minimum nominal strength of 4,200 lb per ASTM A1023/A1023M. Individual wires in the wire rope are galvanized with a minimum of 0.10 ounces per square foot of uncoated wire surface; a PVC vinyl coating (masonry only) is added to give a final diameter of $^1/_4$" (**Figure 1** and **Figure 2**).

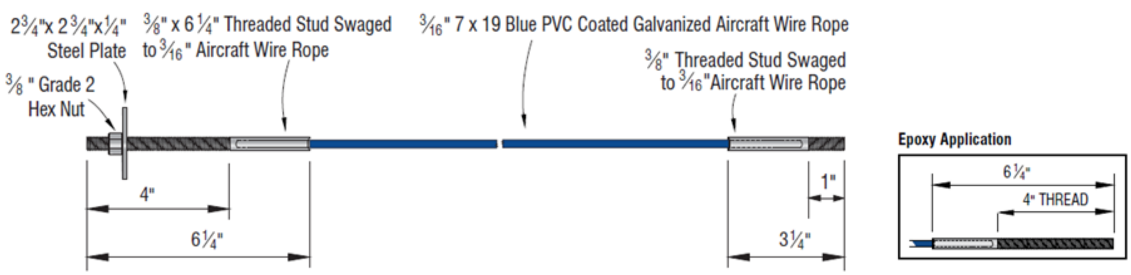

Figure 1. Typical QuickTie Part Detail – QTBM(L) Blue $^3/_{16}$″ Diameter

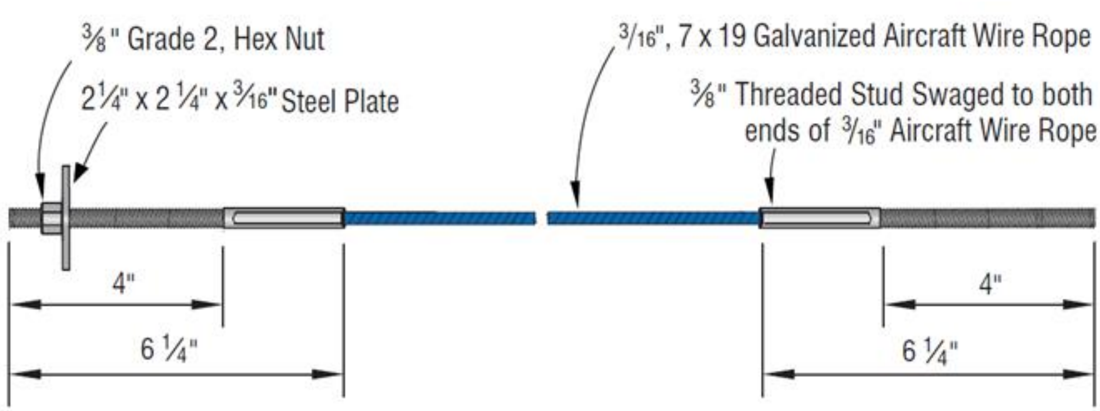

Figure 2. Typical QuickTie Part Detail – QTB(L) Blue $^3/_{16}$″ Diameter
(Alternative Epoxy Connection)

2.3.6 QTGM(L) and QTG(L) Green ($^1/_4$" aircraft wire rope): $^1/_4$" diameter, 7x19, hot-dipped, galvanized steel wire with a minimum nominal strength of 7,000 lb. per ASTM A1023/A1023M. Individual wires in the wire rope are galvanized with a minimum of 0.10 ounces per square foot of uncoated wire surface; a PVC vinyl coating (masonry only) is added to give a final diameter of $^5/_{16}$" (**Figure 3** and **Figure 4**).

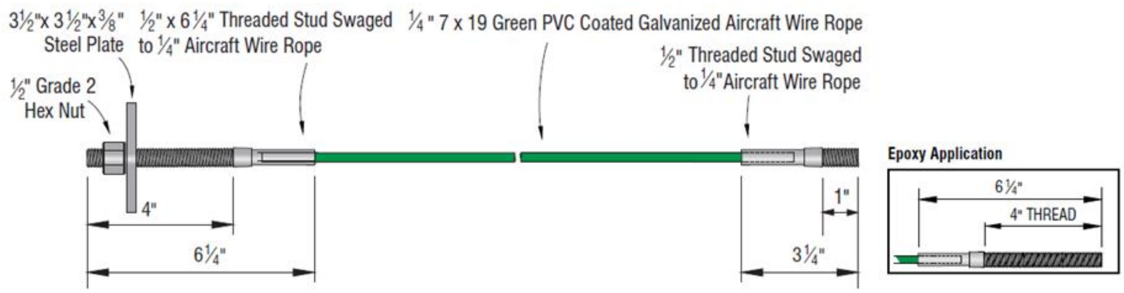

Figure 3. Typical QuickTie Part Detail – QTGM(L) Green $^1/_4$″ Diameter

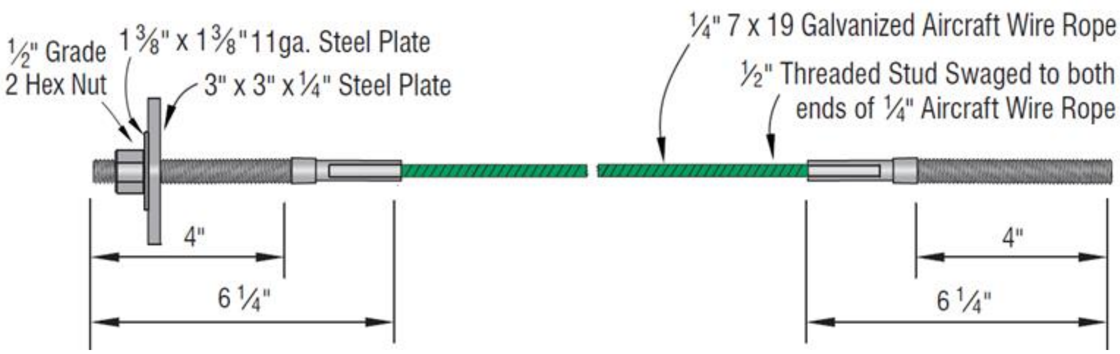

Figure 4. Typical QuickTie Part Detail – QTG(L) Green $^1/_4$" Diameter
(Alternative Epoxy Connection)

2.3.7 QTOM(L) and QTO(L) Orange ($^5/_{16}$" aircraft wire rope): $^5/_{16}$" diameter, 7x19, hot-dipped, galvanized steel wire with a minimum nominal strength of 9,800 lb per ASTM A1023/A1023M. Individual wires in the wire rope are galvanized with a minimum of 0.10 ounces per square foot of uncoated wire surface; a PVC vinyl coating (masonry only) is added to give a final diameter of $^3/_8$" (**Figure 5** and **Figure 6**).

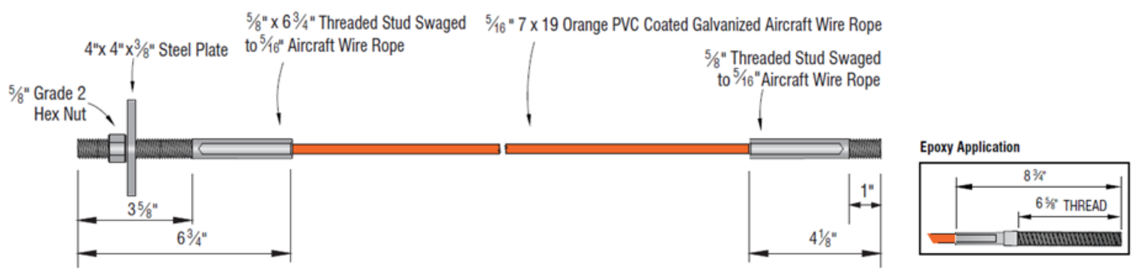

Figure 5. Typical QuickTie Part Detail – QTOM(L) Orange $^5/_{16}$″ Diameter

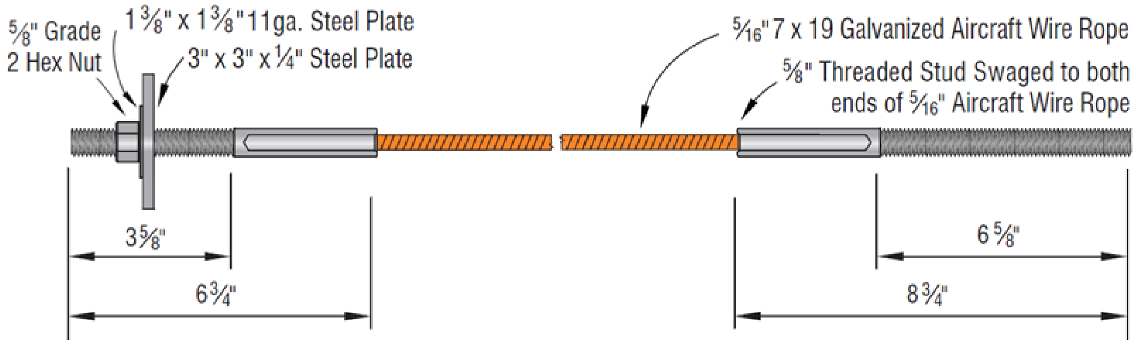

Figure 6. Typical QuickTie Part Detail – QTO(L) Orange 5/16″ Diameter (Alternative Epoxy Connection)

2.3.8 QTRM(L) and QTR(L) Red (3/8" aircraft wire rope): 3/8" diameter, 7x19, hot-dipped, galvanized steel wire with a minimum nominal strength of 14,400 lb per ASTM A1023/A1023M. Individual wires in the wire rope are galvanized with a minimum of 0.10 ounces per square foot of uncoated wire surface; a PVC vinyl coating (masonry only) is added to give a final diameter of 7/16" (**Figure 7** and **Figure 8**).

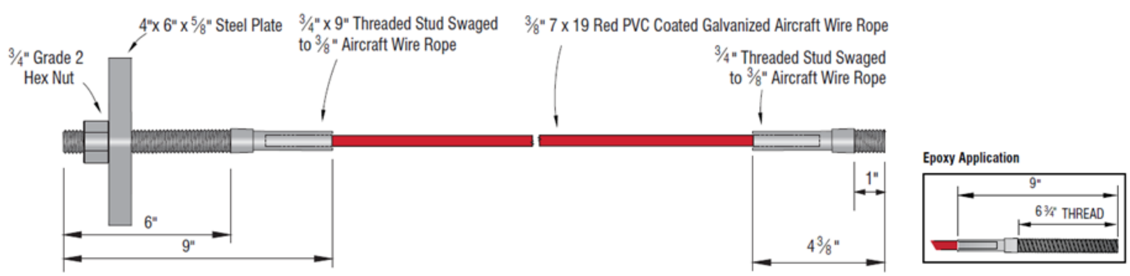

Figure 7. Typical QuickTie Part Detail – QTRM(L) Red 3/8″ Diameter

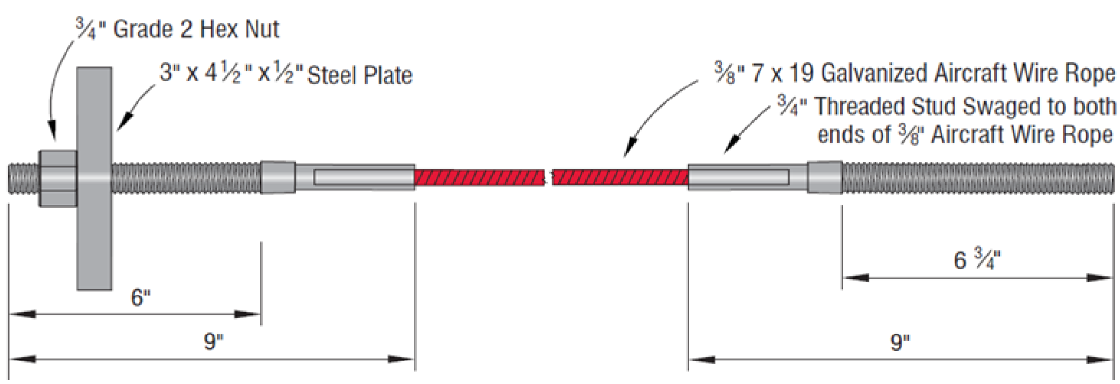

Figure 8. Typical QuickTie Part Detail – QTR(L) Red 3/8" Diameter (Alternative Epoxy Connection)

2.3.9 *Steel Plate Washers*: Washers are made from the following materials:

2.3.9.1 $2^{3}/_{4}$" x $2^{3}/_{4}$" x $^{1}/_{4}$" (masonry); $2^{1}/_{4}$" x $2^{1}/_{4}$" x $^{3}/_{16}$" (wood) ASTM A36 or A653 steel plate, with a minimum yield strength of 33 ksi and a minimum ultimate strength of 45 ksi (QTBM(L) and QTB(L) Blue $^{3}/_{16}$" diameter wire rope).

2.3.9.2 $3^{1}/_{2}$" x $3^{1}/_{2}$" x $^{3}/_{8}$" (masonry); 3" x 3" x $^{1}/_{4}$" & $1^{3}/_{8}$" x $1^{3}/_{8}$" x 11-gauge (wood) ASTM A36 or A653 steel plates, with a minimum yield strength of 33 ksi and a minimum ultimate strength of 45 ksi (QTGM(L) and QTG(L) Green $^{1}/_{4}$" diameter wire rope).

2.3.9.3 4" x 4" x $^{3}/_{8}$" (masonry); 3" x 3" x $^{1}/_{4}$" & $1^{3}/_{8}$" x $1^{3}/_{8}$" x 11-gauge (wood) ASTM A36 or A653 steel plates, with a minimum yield strength of 33 ksi and a minimum ultimate strength of 45 ksi (QTOM(L) and QTO(L) Orange $^{5}/_{16}$" diameter wire rope).

2.3.9.4 4" x 6" x $^{5}/_{8}$" (masonry); 3" x $4^{1}/_{2}$" x $^{1}/_{2}$" (wood) ASTM A36 or A653 steel plate, with a minimum yield strength of 33 ksi and a minimum ultimate strength of 45 ksi (QTRM(L) and QTR(L) Red $^{3}/_{8}$" diameter wire rope).

2.3.10 *Tension Indicator Device*: Tension Indicator Devices (TID) are made from the following materials:

2.3.10.1 Blue: ASTM A653, Grade 33 structural steel, 14-gauge, min. thickness 0.0821", painted.

2.3.10.2 Green: ASTM A653, Grade 33 structural steel, 12-gauge, min. thickness 0.1120", painted.

2.3.10.3 Orange: ASTM A653, Grade 33 structural steel, 10-gauge, min. thickness 0.1419", painted.

2.3.10.4 Red: ASTM A653, Grade 33 structural steel, 8-gauge, min. thickness 0.1718", painted.

2.3.11 *Nuts:*

2.3.11.1 $^{3}/_{8}$" Grade 2 Hex Nuts (QTBM(L) and QTB(L) Blue $^{3}/_{16}$" diameter wire rope)

2.3.11.2 $^{1}/_{2}$" Grade 2 Hex Nuts (QTGM(L) and QTG(L) Green $^{1}/_{4}$" diameter wire rope)

2.3.11.3 $^{5}/_{8}$" Grade 2 Hex Nuts (QTOM(L) and QTO(L) Orange $^{5}/_{16}$" diameter wire rope)

2.3.11.4 $^{3}/_{4}$" Grade 2 Hex Nuts (QTRM(L) and QTR(L) Red $^{3}/_{8}$" diameter wire rope)

2.3.12 *Masonry:*

2.3.12.1 The Concrete Masonry Units (CMU) shall be 8" hollow, non-grouted masonry units with mortar set in a running bond pattern, except as noted in **Section 6.11** of this report.

2.3.12.2 The specified compressive strength of masonry, f'_m, shall be a minimum of 1,500 psi.

2.3.12.3 The modulus of elasticity, E_m, for concrete masonry shall be calculated as 900 f'_m.

2.3.13 *Mortar:*

2.3.13.1 Mortar shall conform to ASTM C270, Type S with a minimum 28-day compressive strength of 1,500 psi.

2.4 As needed, review material properties for design in **Section 6** and to regulatory evaluation in **Section 8**.

3 Definitions

3.1 New Materials[ii] are defined as building materials, equipment, appliances, systems, or methods of construction not provided for by prescriptive and/or legislatively adopted regulations, known as alternative materials.[iii] The design strengths and permissible stresses shall be established by tests[iv] and/or engineering analysis.[v]

3.2 Duly Authenticated Reports[vi] and Research Reports[vii] are test reports and related engineering evaluations, which are written by an approved agency[viii] and/or an approved source.[ix]

3.2.1 These reports contain intellectual property and/or trade secrets, which are protected by the Defend Trade Secrets Act (DTSA).[x]

3.3 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is listed in the ANAB directory.

3.4 An approved source is "approved" when a professional engineer (i.e., Registered Design Professional) is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[xi]

3.5 Testing and/or inspections conducted for this Duly Authenticated Report were performed by an ISO/IEC 17025 accredited testing laboratory, an ISO/IEC 17020 accredited inspection body, and/or a licensed RDP.

3.5.1 The Center for Building Innovation (CBI) is ANAB[xii] ISO/IEC 17025 and ISO/IEC 17020 accredited.

3.6 The regulatory authority shall enforce[xiii] the specific provisions of each legislatively adopted regulation. If there is a non-conformance, the specific regulatory section and language of the non-conformance shall be provided in writing[xiv] stating the nonconformance and the path to its cure.

3.7 The regulatory authority shall accept Duly Authenticated Reports from an approved agency and/or an approved source with respect to the quality and manner of use of new materials or assemblies as provided for in regulations regarding the use of alternative materials, designs, or methods of construction.[xv]

3.8 ANAB is an International Accreditation Forum (IAF) Multilateral Recognition Arrangement (MLA) signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA with the appropriate scope, shall be approved.[xvi] Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[xvii]

3.9 Approval equity is a fundamental commercial and legal principle.[xviii]

4 Applicable Standards for the Listing; Regulations for the Regulatory Evaluation[xix]

4.1 *Standards*

4.1.1 *ACI 530: Building Code Requirements and Specification for Masonry Structures and Companion Commentaries*

4.1.2 *ANSI/AISC 360: Specification for Structural Steel Buildings*

4.1.3 *ANSI/AWC NDS: National Design Specification (NDS) for Wood Construction*

4.1.4 *ASCE/SEI 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures*

4.1.5 *ASCE/SEI 19: Structural Applications of Steel Cables for Buildings*

4.1.6 *ASTM A36: Standard Specification for Carbon Structural Steel*

4.1.7 *ASTM A653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*

4.1.8 *ASTM A1023/1023M: Standard Specification for Carbon Steel Wire Ropes for General Purposes*

4.1.9 *ASTM C270: Standard Specification for Mortar for Unit Masonry*

4.1.10 *TMS 402/602: Building Code Requirements for Masonry Structures*

4.2 *Regulations*

4.2.1 *IBC – 15, 18, 21: International Building Code®*

4.2.2 *IRC – 15, 18, 21: International Residential Code®*

4.2.3 FBC-B—20, 23: Florida Building Code – Building[xx] (FL 17106)

4.2.4 *FBC-R—20, 23: Florida Building Code – Residential[xx] (FL 17106)*

5 Listed[xxi]

5.1 A nationally recognized testing laboratory such as CBI, states that the materials, designs, methods of construction, and/or equipment have met nationally recognized standards and/or have been tested and found suitable for use in a specified manner.

6 Tabulated Properties Generated from Nationally Recognized Standards

6.1 Concrete masonry walls post-tensioned using QuickTie cables may be used to resist:

6.1.1 Transverse (out-of-plane)

6.1.2 Lateral (in-plane)

6.1.3 Uplift loads due to wind

6.1.4 Axial forces due to gravity (dead and live) loads

6.2 *QTS Anchorage*

6.2.1 The RDP responsible for the design of the building shall provide a connection to attach the QTS to the foundation.

6.2.1.1 The anchorage shall be sufficient to resist the design loads imposed by uplift and/or overturning plus the pre-stressing force in the QuickTie cable.

6.2.2 Installation of the QTS to the foundation will depend on the connection design chosen by the RDP. The QTS-to-foundation design considerations include, but are not limited to, the following:

6.2.2.1 Type of anchorage system used

6.2.2.2 Foundation strength

6.2.2.3 Anchorage embedment, as applicable

6.2.2.4 Wall construction

6.2.2.5 Edge distances and spacing of anchorage

6.2.2.6 Maximum allowable tensile loads of the QTS

6.2.3 The connection between the QTS and foundation is applied/installed per the RDP's specifications.

6.2.3.1 The QuickTie cable is pre-tensioned as specified per the QuickTie published installation instructions and this report.

6.2.3.1.1 The pre-tensioned level is dependent on the uplift requirements determined by the RDP but shall not exceed the nominal cable strength of the QuickTie cable listed in **Section 6.5.1** of this report.

6.2.3.2 In addition to providing positive anchorage for the walls and floors, the pre-tensioning of the QTS provides immediate verification of the adequacy of the connection between the QTS and the foundation, because the initial pre-tension load provides proof test verification of this connection.

6.3 *QTS Design Tables*

6.3.1 **Table 1** through **Table 6** give the allowable wind pressure, uplift load and shear forces for masonry walls with various QuickTie cable spacing and wall heights.

6.3.2 The design values in **Table 1** through **Table 6** were derived using the procedures given in **Section 6.4** through **Section 6.15** of this report.

6.3.3 Using **Table 1** through **Table 6**, the RDP responsible for the design of the building shall determine which type of loading is critical and design QuickTie cable spacing accordingly.

6.3.4 Alternatively, the RDP can use the procedures given in **Section 6.4** through **Section 6.15** of this report to calculate the allowable loads for a given wall configuration.

Table 1. Maximum Spacing for Out-of-Plane Wind Loads for One-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Maximum Spacing Between QuickTie Cables						
		ASD Wind Load (psf)						
		20	25	30	35	40	45	50
QTB (Blue)	7' 4"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	7' 4"	4' 0"
	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	5' 4"	3' 0"	2' 0"
	8' 8"	8' 0"	8' 0"	8' 0"	4' 8"	2' 8"	1' 8"	1' 4"
	9' 4"	8' 0"	8' 0"	5' 0"	2' 8"	1' 8"	1' 4"	1' 0"
	10' 0"	8' 0"	7' 0"	2' 8"	1' 8"	1' 0"	1' 0"	0' 8"
	10' 8"	8' 0"	3' 4"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	11' 4"	6' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	12' 0"	3' 4"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	12' 8"	2' 4"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"
	13' 4"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"	0' 4"
	14' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"	-
QTG (Green)	7' 4"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 8"
	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	5' 0"	3' 8"
	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	4' 4"	3' 0"	2' 4"
	9' 4"	8' 0"	8' 0"	8' 0"	4' 4"	3' 0"	2' 0"	1' 8"
	10' 0"	8' 0"	8' 0"	4' 8"	3' 0"	2' 0"	1' 8"	1' 4"
	10' 8"	8' 0"	5' 8"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	11' 4"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	12' 0"	5' 8"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 8"	4' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 8"
	13' 4"	3' 0"	1' 8"	1' 0"	1' 0"	0' 8"	0' 8"	0' 4"
	14' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	7' 4"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"
	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	7' 4"	5' 0"
	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	6' 4"	4' 4"	3' 4"

Table 1. Maximum Spacing for Out-of-Plane Wind Loads for One-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Maximum Spacing Between QuickTie Cables						
		ASD Wind Load (psf)						
		20	25	30	35	40	45	50
QTO (Orange)	9' 4"	8' 0"	8' 0"	8' 0"	6' 0"	4' 0"	3' 0"	2' 4"
	10' 0"	8' 0"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"	1' 8"
	10' 8"	8' 0"	8' 0"	4' 4"	3' 0"	2' 4"	1' 8"	1' 4"
	11' 4"	8' 0"	5' 4"	3' 4"	2' 4"	1' 8"	1' 4"	1' 4"
	12' 0"	8' 0"	4' 0"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
QTO (Orange)	12' 8"	5' 8"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"	0' 8"
	13' 4"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	14' 0"	3' 4"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"	0' 8"
QTR (Red)	7' 4"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"
	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	7' 4"
	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 4"	5' 0"
	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	6' 0"	4' 8"	3' 8"
	10' 0"	8' 0"	8' 0"	8' 0"	6' 0"	4' 4"	3' 4"	2' 8"
	10' 8"	8' 0"	8' 0"	6' 8"	4' 4"	3' 4"	2' 8"	2' 4"
	11' 4"	8' 0"	8' 0"	4' 8"	3' 4"	2' 8"	2' 0"	1' 8"
	12' 0"	8' 0"	5' 8"	3' 8"	2' 8"	2' 4"	1' 8"	1' 4"
	12' 8"	8' 0"	4' 4"	3' 0"	2' 4"	1' 8"	1' 4"	1' 4"
	13' 4"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"	1' 0"
	14' 0"	4' 8"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"	1' 0"

Table 1. Maximum Spacing for Out-of-Plane Wind Loads for One-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Maximum Spacing Between QuickTie Cables						
		ASD Wind Load (psf)						
		20	25	30	35	40	45	50

SI: 1" = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Spacing is function of nonlinear variables; therefore, interpolation is NOT allowed.
2. When used in a foundation stem wall application, spacing shall be limited to the maximum allowed by the applicable code for anchor bolt spacing.
3. For walls shorter than those shown above, spacing shall be limited to 8' or as further limited in table footnote 2 above.
4. Neglects gravity loads applied above wall, which may increase QT spacing.
5. Assumes cable eccentricity of $^3/_8$" due to misplacement during construction.
6. QTS cable spacing based on allowable wind load (0.6W) per ASCE 7-22.
7. Cable spacing may be limited to top plate span due to roof-to-wall connection. See **Table 5** for allowable uplift loads.
8. Wall bending assumes wind loads shall be calculated as C&C design loads using an effective area of H, times the greater of the cable spacing or H/3, where H = wall height to top of wood top plate.
9. The minimum specified compressive strength of masonry, f'm, is 1,500 psi.
10. Design assumes cables are installed at center of wood top plate ± $^3/_8$". Wood plate may be placed flush with one side of the masonry wall.

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
QTB (Blue)	8' 8"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	4' 0"	2' 4"	1' 8"
	9' 4"	8' 8"	8' 0"	8' 0"	8' 0"	5' 4"	2' 8"	1' 8"	1' 4"
	10' 0"	8' 8"	8' 0"	8' 0"	8' 0"	3' 4"	2' 0"	1' 4"	1' 0"
	10' 8"	8' 8"	8' 0"	8' 0"	4' 8"	2' 4"	1' 8"	1' 0"	1' 0"
	11' 4"	8' 8"	8' 0"	8' 0"	3' 0"	1' 8"	1' 4"	1' 0"	0' 8"
	12' 0"	8' 8"	8' 0"	5' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 8"	8' 8"	8' 0"	3' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	13' 4"	8' 8"	7' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"
	14' 0"	8' 8"	4' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	8' 8"	9' 4"	8' 0"	8' 0"	8' 0"	5' 8"	2' 8"	1' 8"	1' 4"
	9' 4"	9' 4"	8' 0"	8' 0"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"
	10' 0"	9' 4"	8' 0"	8' 0"	6' 4"	2' 8"	1' 8"	1' 4"	1' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	10' 8"	9' 4"	8' 0"	8' 0"	4' 0"	2' 0"	1' 4"	1' 0"	0' 8"
	11' 4"	9' 4"	8' 0"	7' 8"	2' 8"	1' 8"	1' 0"	0' 8"	0' 8"
	12' 0"	9' 4"	8' 0"	4' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 8"	9' 4"	8' 0"	3' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	13' 4"	9' 4"	6' 4"	2' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
	14' 0"	9' 4"	3' 8"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	8' 8"	10' 0"	8' 0"	8' 0"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"
	9' 4"	10' 0"	8' 0"	8' 0"	7' 0"	3' 0"	1' 8"	1' 4"	1' 0"
	10' 0"	10' 0"	8' 0"	8' 0"	4' 4"	2' 4"	1' 4"	1' 0"	0' 8"
	10' 8"	10' 0"	8' 0"	8' 0"	3' 0"	1' 8"	1' 4"	1' 0"	0' 8"
	11' 4"	10' 0"	8' 0"	6' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 0"	10' 0"	8' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	12' 8"	10' 0"	8' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	13' 4"	10' 0"	5' 8"	2' 0"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	14' 0"	10' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	8' 8"	10' 8"	8' 0"	8' 0"	6' 4"	2' 8"	1' 8"	1' 0"	1' 0"
	9' 4"	10' 8"	8' 0"	8' 0"	4' 4"	2' 4"	1' 4"	1' 0"	0' 8"
	10' 0"	10' 8"	8' 0"	8' 0"	3' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	10' 8"	10' 8"	8' 0"	7' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	11' 4"	10' 8"	8' 0"	4' 8"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 0"	10' 8"	8' 0"	3' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
QTB (Blue)	12' 8"	10' 8"	8' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"
	13' 4"	10' 8"	5' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	14' 0"	10' 8"	3' 4"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	8' 8"	11' 4"	8' 0"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"	0' 8"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	9' 4"	11' 4"	8' 0"	8' 0"	3' 0"	1' 8"	1' 0"	1' 0"	0' 8"
	10' 0"	11' 4"	8' 0"	7' 4"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	10' 8"	11' 4"	8' 0"	5' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	11' 4"	11' 4"	8' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	12' 0"	11' 4"	8' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	12' 8"	11' 4"	6' 8"	2' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
	13' 4"	11' 4"	4' 4"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	14' 0"	11' 4"	3' 0"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	8' 8"	12' 0"	8' 0"	8' 0"	2' 8"	1' 8"	1' 0"	0' 8"	0' 8"
	9' 4"	12' 0"	8' 0"	6' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"
	10' 0"	12' 0"	8' 0"	4' 8"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	10' 8"	12' 0"	8' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	11' 4"	12' 0"	8' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	12' 0"	12' 0"	8' 0"	2' 4"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
	12' 8"	12' 0"	5' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	13' 4"	12' 0"	3' 8"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	14' 0"	12' 0"	2' 8"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"
	8' 8"	12' 8"	8' 0"	4' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 4"
	9' 4"	12' 8"	8' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	10' 0"	12' 8"	8' 0"	3' 4"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"
	10' 8"	12' 8"	8' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	11' 4"	12' 8"	8' 0"	2' 4"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
	12' 0"	12' 8"	5' 8"	2' 0"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	12' 8"	12' 8"	4' 0"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	13' 4"	12' 8"	3' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	14' 0"	12' 8"	2' 4"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"	0' 4"
	8' 8"	13' 4"	8' 0"	3' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	9' 4"	13' 4"	8' 0"	2' 8"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"
	10' 0"	13' 4"	8' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"
	10' 8"	13' 4"	7' 4"	2' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
QTB (Blue)	11' 4"	13' 4"	5' 4"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	12' 0"	13' 4"	4' 0"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	12' 8"	13' 4"	3' 4"	1' 4"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	13' 4"	13' 4"	2' 8"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"
	14' 0"	13' 4"	2' 0"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"	0' 4"
	8' 8"	14' 0"	7' 4"	2' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"
	9' 4"	14' 0"	6' 8"	2' 0"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	10' 0"	14' 0"	5' 8"	2' 0"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"
	10' 8"	14' 0"	4' 8"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	11' 4"	14' 0"	3' 8"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"
	12' 0"	14' 0"	3' 0"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"
	12' 8"	14' 0"	2' 8"	1' 4"	0' 8"	0' 8"	0' 4"	0' 4"	0' 4"
	13' 4"	14' 0"	2' 0"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"	0' 4"
	14' 0"	14' 0"	1' 8"	1' 0"	0' 8"	0' 4"	0' 4"	0' 4"	0' 4"
QTG (Green)	8' 8"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	6' 8"	4' 0"	2' 8"
	9' 4"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	4' 8"	3' 0"	2' 4"
	10' 0"	8' 8"	8' 0"	8' 0"	8' 0"	5' 8"	3' 4"	2' 4"	2' 0"
	10' 8"	8' 8"	8' 0"	8' 0"	8' 0"	4' 0"	2' 8"	2' 0"	1' 8"
	11' 4"	8' 8"	8' 0"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"
	12' 0"	8' 8"	8' 0"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	12' 8"	8' 8"	8' 0"	5' 4"	2' 8"	2' 0"	1' 4"	1' 0"	1' 0"
	13' 4"	8' 8"	8' 0"	3' 8"	2' 4"	1' 8"	1' 0"	1' 0"	0' 8"
	14' 0"	8' 8"	6' 8"	3' 0"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	8' 8"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	4' 8"	3' 0"	2' 4"
	9' 4"	9' 4"	8' 0"	8' 0"	8' 0"	6' 4"	3' 8"	2' 8"	2' 0"
	10' 0"	9' 4"	8' 0"	8' 0"	8' 0"	4' 8"	3' 0"	2' 0"	1' 8"
	10' 8"	9' 4"	8' 0"	8' 0"	6' 8"	3' 4"	2' 4"	1' 8"	1' 4"
	11' 4"	9' 4"	8' 0"	8' 0"	4' 8"	2' 8"	2' 0"	1' 4"	1' 0"
	12' 0"	9' 4"	8' 0"	7' 4"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	12' 8"	9' 4"	8' 0"	5' 0"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
	13' 4"	9' 4"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	14' 0"	9' 4"	6' 4"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	8' 8"	10' 0"	8' 0"	8' 0"	8' 0"	6' 4"	3' 8"	2' 8"	2' 0"
	9' 4"	10' 0"	8' 0"	8' 0"	8' 0"	5' 0"	3' 0"	2' 0"	1' 8"
QTG (Green)	10' 0"	10' 0"	8' 0"	8' 0"	7' 8"	3' 8"	2' 4"	2' 0"	1' 4"
	10' 8"	10' 0"	8' 0"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"
	11' 4"	10' 0"	8' 0"	8' 0"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"
	12' 0"	10' 0"	8' 0"	6' 4"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"
	12' 8"	10' 0"	8' 0"	4' 4"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	13' 4"	10' 0"	8' 0"	3' 4"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	14' 0"	10' 0"	6' 0"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	8' 8"	10' 8"	8' 0"	8' 0"	8' 0"	4' 8"	3' 0"	2' 0"	1' 8"
	9' 4"	10' 8"	8' 0"	8' 0"	7' 8"	3' 8"	2' 4"	1' 8"	1' 4"
	10' 0"	10' 8"	8' 0"	8' 0"	5' 8"	3' 0"	2' 0"	1' 8"	1' 4"
	10' 8"	10' 8"	8' 0"	8' 0"	4' 4"	2' 8"	1' 8"	1' 4"	1' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	11' 4"	10' 8"	8' 0"	7' 8"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	12' 0"	10' 8"	8' 0"	5' 4"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
	12' 8"	10' 8"	8' 0"	4' 0"	2' 4"	1' 8"	1' 0"	1' 0"	0' 8"
	13' 4"	10' 8"	8' 0"	3' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	14' 0"	10' 8"	5' 8"	2' 8"	1' 8"	1' 0"	1' 0"	0' 8"	0' 8"
	8' 8"	11' 4"	8' 0"	8' 0"	6' 4"	3' 4"	2' 4"	1' 8"	1' 4"
	9' 4"	11' 4"	8' 0"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"
	10' 0"	11' 4"	8' 0"	8' 0"	4' 4"	2' 8"	1' 8"	1' 4"	1' 0"
	10' 8"	11' 4"	8' 0"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"
	11' 4"	11' 4"	8' 0"	6' 0"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"
	12' 0"	11' 4"	8' 0"	4' 8"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	12' 8"	11' 4"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	13' 4"	11' 4"	7' 0"	3' 0"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	14' 0"	11' 4"	5' 0"	2' 4"	1' 8"	1' 0"	0' 8"	0' 8"	0' 8"
	8' 8"	12' 0"	8' 0"	8' 0"	4' 8"	2' 8"	2' 0"	1' 4"	1' 0"
	9' 4"	12' 0"	8' 0"	8' 0"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"
	10' 0"	12' 0"	8' 0"	7' 8"	3' 4"	2' 0"	1' 8"	1' 4"	1' 0"
	10' 8"	12' 0"	8' 0"	6' 0"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"
	11' 4"	12' 0"	8' 0"	4' 8"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"
	12' 0"	12' 0"	8' 0"	3' 8"	2' 4"	1' 4"	1' 0"	1' 0"	0' 8"
	12' 8"	12' 0"	8' 0"	3' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	13' 4"	12' 0"	6' 0"	2' 8"	1' 8"	1' 0"	1' 0"	0' 8"	0' 8"
	14' 0"	12' 0"	4' 8"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"	0' 8"
QTG (Green)	8' 8"	12' 8"	8' 0"	7' 8"	3' 4"	2' 0"	1' 8"	1' 4"	1' 0"
	9' 4"	12' 8"	8' 0"	6' 4"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	10' 0"	12' 8"	8' 0"	5' 4"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"
	10' 8"	12' 8"	8' 0"	4' 8"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	11' 4"	12' 8"	8' 0"	4' 0"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	12' 0"	12' 8"	8' 0"	3' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 8"	12' 8"	6' 8"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	13' 4"	12' 8"	5' 0"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"	0' 8"
	14' 0"	12' 8"	4' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	8' 8"	13' 4"	8' 0"	5' 0"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"
	9' 4"	13' 4"	8' 0"	4' 8"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	10' 0"	13' 4"	8' 0"	4' 0"	2' 4"	1' 8"	1' 0"	1' 0"	0' 8"
	10' 8"	13' 4"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	11' 4"	13' 4"	8' 0"	3' 0"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 0"	13' 4"	7' 0"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	12' 8"	13' 4"	5' 4"	2' 4"	1' 8"	1' 0"	0' 8"	0' 8"	0' 8"
	13' 4"	13' 4"	4' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	14' 0"	13' 4"	3' 8"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	8' 8"	14' 0"	8' 0"	3' 8"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	9' 4"	14' 0"	8' 0"	3' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	10' 0"	14' 0"	8' 0"	3' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"
	10' 8"	14' 0"	7' 8"	3' 0"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	11' 4"	14' 0"	6' 4"	2' 8"	1' 8"	1' 0"	1' 0"	0' 8"	0' 8"
	12' 0"	14' 0"	5' 4"	2' 4"	1' 4"	1' 0"	0' 8"	0' 8"	0' 8"
	12' 8"	14' 0"	4' 4"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	13' 4"	14' 0"	3' 8"	2' 0"	1' 4"	1' 0"	0' 8"	0' 8"	0' 4"
	14' 0"	14' 0"	3' 0"	1' 8"	1' 0"	0' 8"	0' 8"	0' 4"	0' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
QTO (Orange)	8' 8"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	5' 8"	4' 0"
	9' 4"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	6' 8"	4' 4"	3' 4"
	10' 0"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	4' 8"	3' 4"	2' 8"
	10' 8"	8' 8"	8' 0"	8' 0"	8' 0"	5' 8"	3' 8"	2' 8"	2' 4"
	11' 4"	8' 8"	8' 0"	8' 0"	7' 4"	4' 4"	3' 0"	2' 4"	1' 8"
	12' 0"	8' 8"	8' 0"	8' 0"	5' 4"	3' 4"	2' 4"	2' 0"	1' 8"
	12' 8"	8' 8"	8' 0"	7' 4"	4' 0"	2' 8"	2' 0"	1' 8"	1' 4"
QTO (Orange)	13' 4"	8' 8"	8' 0"	5' 4"	3' 0"	2' 4"	1' 8"	1' 4"	1' 0"
	14' 0"	8' 8"	8' 0"	4' 0"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
	8' 8"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	6' 8"	4' 4"	3' 4"
	9' 4"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"
	10' 0"	9' 4"	8' 0"	8' 0"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"
	10' 8"	9' 4"	8' 0"	8' 0"	8' 0"	5' 0"	3' 4"	2' 8"	2' 0"
	11' 4"	9' 4"	8' 0"	8' 0"	6' 4"	4' 0"	2' 8"	2' 0"	1' 8"
	12' 0"	9' 4"	8' 0"	8' 0"	5' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	12' 8"	9' 4"	8' 0"	7' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	13' 4"	9' 4"	8' 0"	5' 0"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	14' 0"	9' 4"	8' 0"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	8' 8"	10' 0"	8' 0"	8' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"
	9' 4"	10' 0"	8' 0"	8' 0"	8' 0"	7' 0"	4' 4"	3' 0"	2' 4"
	10' 0"	10' 0"	8' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 0"
	10' 8"	10' 0"	8' 0"	8' 0"	7' 8"	4' 4"	3' 0"	2' 4"	1' 8"
	11' 4"	10' 0"	8' 0"	8' 0"	5' 8"	3' 4"	2' 4"	2' 0"	1' 8"
	12' 0"	10' 0"	8' 0"	8' 0"	4' 4"	3' 0"	2' 0"	1' 8"	1' 4"
	12' 8"	10' 0"	8' 0"	6' 4"	3' 8"	2' 4"	1' 8"	1' 4"	1' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	13' 4"	10' 0"	8' 0"	4' 8"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	14' 0"	10' 0"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	8' 8"	10' 8"	8' 0"	8' 0"	8' 0"	6' 4"	4' 0"	3' 0"	2' 4"
	9' 4"	10' 8"	8' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 0"
	10' 0"	10' 8"	8' 0"	8' 0"	8' 0"	4' 4"	3' 0"	2' 4"	1' 8"
	10' 8"	10' 8"	8' 0"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"
	11' 4"	10' 8"	8' 0"	8' 0"	5' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	12' 0"	10' 8"	8' 0"	7' 8"	4' 0"	2' 8"	2' 0"	1' 8"	1' 4"
	12' 8"	10' 8"	8' 0"	5' 8"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	13' 4"	10' 8"	8' 0"	4' 4"	2' 8"	2' 0"	1' 4"	1' 4"	1' 0"
	14' 0"	10' 8"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	8' 8"	11' 4"	8' 0"	8' 0"	8' 0"	4' 8"	3' 4"	2' 4"	2' 0"
	9' 4"	11' 4"	8' 0"	8' 0"	7' 4"	4' 4"	3' 0"	2' 4"	1' 8"
	10' 0"	11' 4"	8' 0"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"
	10' 8"	11' 4"	8' 0"	8' 0"	5' 0"	3' 4"	2' 4"	1' 8"	1' 4"
	11' 4"	11' 4"	8' 0"	8' 0"	4' 4"	2' 8"	2' 0"	1' 8"	1' 4"
QTO (Orange)	12' 0"	11' 4"	8' 0"	6' 4"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"
	12' 8"	11' 4"	8' 0"	5' 0"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	13' 4"	11' 4"	8' 0"	4' 0"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
	14' 0"	11' 4"	7' 4"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	8' 8"	12' 0"	8' 0"	8' 0"	6' 4"	3' 8"	2' 8"	2' 0"	1' 8"
	9' 4"	12' 0"	8' 0"	8' 0"	5' 8"	3' 4"	2' 4"	2' 0"	1' 8"
	10' 0"	12' 0"	8' 0"	8' 0"	5' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	10' 8"	12' 0"	8' 0"	8' 0"	4' 4"	2' 8"	2' 0"	1' 8"	1' 4"
	11' 4"	12' 0"	8' 0"	6' 8"	3' 8"	2' 4"	1' 8"	1' 4"	1' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	12' 0"	12' 0"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	12' 8"	12' 0"	8' 0"	4' 4"	2' 8"	2' 0"	1' 4"	1' 0"	1' 0"
	13' 4"	12' 0"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	14' 0"	12' 0"	6' 4"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	8' 8"	12' 8"	8' 0"	8' 0"	4' 8"	3' 0"	2' 4"	1' 8"	1' 4"
	9' 4"	12' 8"	8' 0"	8' 0"	4' 4"	2' 8"	2' 0"	1' 8"	1' 4"
	10' 0"	12' 8"	8' 0"	7' 8"	4' 0"	2' 8"	2' 0"	1' 8"	1' 4"
	10' 8"	12' 8"	8' 0"	6' 4"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	11' 4"	12' 8"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	12' 0"	12' 8"	8' 0"	4' 8"	2' 8"	2' 0"	1' 4"	1' 4"	1' 0"
	12' 8"	12' 8"	8' 0"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	13' 4"	12' 8"	7' 4"	3' 4"	2' 0"	1' 8"	1' 4"	1' 0"	0' 8"
	14' 0"	12' 8"	5' 8"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	8' 8"	13' 4"	8' 0"	7' 0"	3' 8"	2' 4"	2' 0"	1' 4"	1' 4"
	9' 4"	13' 4"	8' 0"	6' 4"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	10' 0"	13' 4"	8' 0"	5' 8"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"
	10' 8"	13' 4"	8' 0"	5' 0"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	11' 4"	13' 4"	8' 0"	4' 4"	2' 8"	2' 0"	1' 4"	1' 0"	1' 0"
	12' 0"	13' 4"	8' 0"	4' 0"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	12' 8"	13' 4"	7' 8"	3' 4"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"
	13' 4"	13' 4"	6' 0"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	14' 0"	13' 4"	5' 0"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	8' 8"	14' 0"	8' 0"	5' 4"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	9' 4"	14' 0"	8' 0"	5' 0"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	10' 0"	14' 0"	8' 0"	4' 8"	2' 8"	2' 0"	1' 4"	1' 0"	1' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
QTO (Orange)	10' 8"	14' 0"	8' 0"	4' 0"	2' 8"	1' 8"	1' 4"	1' 0"	1' 0"
	11' 4"	14' 0"	8' 0"	3' 8"	2' 4"	1' 8"	1' 4"	1' 0"	1' 0"
	12' 0"	14' 0"	7' 4"	3' 4"	2' 0"	1' 8"	1' 4"	1' 0"	0' 8"
	12' 8"	14' 0"	6' 4"	3' 0"	2' 0"	1' 4"	1' 0"	1' 0"	0' 8"
	13' 4"	14' 0"	5' 4"	2' 8"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
	14' 0"	14' 0"	4' 4"	2' 4"	1' 8"	1' 4"	1' 0"	0' 8"	0' 8"
QTR (Red)	8' 8"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 0"
	9' 4"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 4"	5' 0"
	10' 0"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	7' 4"	5' 0"	4' 0"
	10' 8"	8' 8"	8' 0"	8' 0"	8' 0"	8' 0"	5' 8"	4' 0"	3' 4"
	11' 4"	8' 8"	8' 0"	8' 0"	8' 0"	6' 4"	4' 4"	3' 4"	2' 8"
	12' 0"	8' 8"	8' 0"	8' 0"	7' 8"	5' 0"	3' 8"	3' 0"	2' 4"
	12' 8"	8' 8"	8' 0"	8' 0"	6' 0"	4' 0"	3' 0"	2' 4"	2' 0"
	13' 4"	8' 8"	8' 0"	8' 0"	4' 8"	3' 4"	2' 8"	2' 0"	1' 8"
	14' 0"	8' 8"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	8' 8"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 8"	5' 0"
	9' 4"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	7' 8"	5' 4"	4' 4"
	10' 0"	9' 4"	8' 0"	8' 0"	8' 0"	8' 0"	6' 4"	4' 8"	3' 8"
	10' 8"	9' 4"	8' 0"	8' 0"	8' 0"	7' 4"	5' 0"	3' 8"	3' 0"
	11' 4"	9' 4"	8' 0"	8' 0"	8' 0"	5' 8"	4' 0"	3' 0"	2' 8"
	12' 0"	9' 4"	8' 0"	8' 0"	7' 4"	4' 8"	3' 4"	2' 8"	2' 4"
	12' 8"	9' 4"	8' 0"	8' 0"	5' 8"	3' 8"	3' 0"	2' 4"	2' 0"
	13' 4"	9' 4"	8' 0"	7' 8"	4' 8"	3' 4"	2' 4"	2' 0"	1' 8"
	14' 0"	9' 4"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	8' 8"	10' 0"	8' 0"	8' 0"	8' 0"	8' 0"	7' 8"	5' 4"	4' 0"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	9' 4"	10' 0"	8' 0"	8' 0"	8' 0"	8' 0"	6' 4"	4' 8"	3' 8"
	10' 0"	10' 0"	8' 0"	8' 0"	8' 0"	8' 0"	5' 4"	4' 0"	3' 0"
	10' 8"	10' 0"	8' 0"	8' 0"	8' 0"	6' 4"	4' 4"	3' 4"	2' 8"
	11' 4"	10' 0"	8' 0"	8' 0"	8' 0"	5' 4"	3' 8"	3' 0"	2' 4"
	12' 0"	10' 0"	8' 0"	8' 0"	6' 8"	4' 4"	3' 4"	2' 8"	2' 0"
	12' 8"	10' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 4"	1' 8"
	13' 4"	10' 0"	8' 0"	7' 4"	4' 4"	3' 0"	2' 4"	2' 0"	1' 8"
	14' 0"	10' 0"	8' 0"	5' 8"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	8' 8"	10' 8"	8' 0"	8' 0"	8' 0"	8' 0"	6' 0"	4' 4"	3' 4"
QTR (Red)	9' 4"	10' 8"	8' 0"	8' 0"	8' 0"	8' 0"	5' 4"	4' 0"	3' 0"
	10' 0"	10' 8"	8' 0"	8' 0"	8' 0"	6' 8"	4' 8"	3' 4"	2' 8"
	10' 8"	10' 8"	8' 0"	8' 0"	8' 0"	5' 8"	4' 0"	3' 0"	2' 4"
	11' 4"	10' 8"	8' 0"	8' 0"	7' 4"	4' 8"	3' 4"	2' 8"	2' 4"
	12' 0"	10' 8"	8' 0"	8' 0"	6' 0"	4' 0"	3' 0"	2' 4"	2' 0"
	12' 8"	10' 8"	8' 0"	8' 0"	5' 0"	3' 4"	2' 8"	2' 0"	1' 8"
	13' 4"	10' 8"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"	1' 8"	1' 8"
	14' 0"	10' 8"	8' 0"	5' 4"	3' 4"	2' 8"	2' 0"	1' 8"	1' 4"
	8' 8"	11' 4"	8' 0"	8' 0"	8' 0"	7' 0"	5' 0"	3' 8"	3' 0"
	9' 4"	11' 4"	8' 0"	8' 0"	8' 0"	6' 4"	4' 4"	3' 4"	2' 8"
	10' 0"	11' 4"	8' 0"	8' 0"	8' 0"	5' 4"	4' 0"	3' 0"	2' 4"
	10' 8"	11' 4"	8' 0"	8' 0"	7' 4"	4' 8"	3' 4"	2' 8"	2' 4"
	11' 4"	11' 4"	8' 0"	8' 0"	6' 4"	4' 0"	3' 0"	2' 4"	2' 0"
	12' 0"	11' 4"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 0"	1' 8"
	12' 8"	11' 4"	8' 0"	7' 8"	4' 4"	3' 0"	2' 4"	2' 0"	1' 8"
	13' 4"	11' 4"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables						
			ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	14' 0"	11' 4"	8' 0"	5' 0"	3' 4"	2' 4"	2' 0"	1' 8"	1' 4"
	8' 8"	12' 0"	8' 0"	8' 0"	8' 0"	5' 8"	4' 0"	3' 0"	2' 4"
	9' 4"	12' 0"	8' 0"	8' 0"	8' 0"	5' 0"	3' 8"	3' 0"	2' 4"
	10' 0"	12' 0"	8' 0"	8' 0"	7' 4"	4' 8"	3' 4"	2' 8"	2' 0"
	10' 8"	12' 0"	8' 0"	8' 0"	6' 4"	4' 0"	3' 0"	2' 4"	2' 0"
	11' 4"	12' 0"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 4"	1' 8"
	12' 0"	12' 0"	8' 0"	8' 0"	4' 8"	3' 4"	2' 4"	2' 0"	1' 8"
	12' 8"	12' 0"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	13' 4"	12' 0"	8' 0"	5' 8"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	14' 0"	12' 0"	8' 0"	4' 8"	3' 0"	2' 4"	1' 8"	1' 4"	1' 4"
	8' 8"	12' 8"	8' 0"	8' 0"	7' 0"	4' 8"	3' 4"	2' 8"	2' 0"
	9' 4"	12' 8"	8' 0"	8' 0"	6' 4"	4' 4"	3' 0"	2' 4"	2' 0"
	10' 0"	12' 8"	8' 0"	8' 0"	5' 8"	4' 0"	3' 0"	2' 4"	2' 0"
	10' 8"	12' 8"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 0"	1' 8"
	11' 4"	12' 8"	8' 0"	8' 0"	4' 8"	3' 4"	2' 4"	2' 0"	1' 8"
	12' 0"	12' 8"	8' 0"	7' 0"	4' 0"	3' 0"	2' 4"	1' 8"	1' 8"
	12' 8"	12' 8"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	13' 4"	12' 8"	8' 0"	5' 0"	3' 4"	2' 4"	2' 0"	1' 8"	1' 4"
QTR (Red)	14' 0"	12' 8"	8' 0"	4' 4"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	8' 8"	13' 4"	8' 0"	8' 0"	5' 8"	3' 8"	2' 8"	2' 4"	1' 8"
	9' 4"	13' 4"	8' 0"	8' 0"	5' 4"	3' 8"	2' 8"	2' 0"	1' 8"
	10' 0"	13' 4"	8' 0"	8' 0"	4' 8"	3' 4"	2' 8"	2' 0"	1' 8"
	10' 8"	13' 4"	8' 0"	7' 8"	4' 4"	3' 0"	2' 4"	2' 0"	1' 8"
	11' 4"	13' 4"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	12' 0"	13' 4"	8' 0"	6' 0"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"

Table 2. Maximum Spacing for Out-of-Plane Wind Loads for Two-Story Walls with QuickTie Cables[1,2,3,4,5,6,7,8,9,10]

Cable Type	First Story Height, H_1	Second Story Height, H_2	Maximum Spacing Between QuickTie Cables – ASD Wind Load (psf)						
			20	25	30	35	40	45	50
	12' 8"	13' 4"	8' 0"	5' 0"	3' 4"	2' 4"	2' 0"	1' 8"	1' 4"
	13' 4"	13' 4"	8' 0"	4' 8"	3' 0"	2' 4"	1' 8"	1' 4"	1' 4"
	14' 0"	13' 4"	7' 8"	4' 0"	2' 8"	2' 0"	1' 8"	1' 4"	1' 0"
	8' 8"	14' 0"	8' 0"	7' 8"	4' 4"	3' 0"	2' 4"	2' 0"	1' 8"
	9' 4"	14' 0"	8' 0"	7' 4"	4' 4"	3' 0"	2' 4"	2' 0"	1' 8"
	10' 0"	14' 0"	8' 0"	6' 8"	4' 0"	3' 0"	2' 4"	1' 8"	1' 4"
	10' 8"	14' 0"	8' 0"	6' 4"	3' 8"	2' 8"	2' 0"	1' 8"	1' 4"
	11' 4"	14' 0"	8' 0"	5' 8"	3' 4"	2' 8"	2' 0"	1' 8"	1' 4"
	12' 0"	14' 0"	8' 0"	5' 0"	3' 4"	2' 4"	1' 8"	1' 4"	1' 4"
	12' 8"	14' 0"	8' 0"	4' 8"	3' 0"	2' 0"	1' 8"	1' 4"	1' 0"
	13' 4"	14' 0"	7' 8"	4' 0"	2' 8"	2' 0"	1' 8"	1' 4"	1' 0"
	14' 0"	14' 0"	6' 8"	3' 8"	2' 4"	2' 0"	1' 4"	1' 4"	1' 0"

SI: 1" = 25.4 mm, 1 psf = 0.0479 kN/m^2

1. Spacing is function of nonlinear variables; therefore, interpolation is NOT allowed.
2. When used in a foundation stem wall application, spacing shall be limited to the maximum allowed by the applicable code for anchor bolt spacing.
3. For walls shorter than those shown above, spacing shall be limited to 8' or as further limited in table footnote 2.
4. Neglects gravity loads applied above wall, which may increase QT spacing.
5. Assumes cable eccentricity of 3/8" due to misplacement during construction.
6. QTS cable spacing based on allowable wind load (0.6W) per ASCE 7-22.
7. Cable spacing may be limited to top plate span due to roof-to-wall connection. See **Table 5** for allowable uplift loads.
8. Wall bending assumes wind loads shall be calculated as C&C design loads using an effective area of H, times the greater of the cable spacing or H/3, where H = wall height to top of wood top plate.
9. The minimum specified compressive strength of masonry, f'm, is 1,500 psi.
10. Design assumes cables are installed at center of wood top plate ± 3/8". Wood plate may be placed flush with one side of the masonry wall.

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
2' 0"	1' 4"	696	-	-	-	1,018	-	-	-	1,340	-	-	-
	2' 8"	779	997	1,215	-	1,069	1,433	1,796	-	1,360	1,869	2,377	-
	4' 0"	878	1,085	1,291	1,498	1,154	1,498	1,841	2,185	1,429	1,910	2,392	2,873
	5' 4"	987	1,186	1,386	1,585	1,253	1,585	1,918	2,251	1,519	1,985	2,451	2,916
	6' 8"	1,054	1,294	1,489	1,685	1,359	1,685	2,010	2,336	1,620	2,075	2,531	2,987
	8' 0"	1,085	1,364	1,598	1,790	1,470	1,790	2,110	2,431	1,726	2,175	2,623	3,072
	9' 4"	1,115	1,394	1,673	1,899	1,583	1,899	2,216	2,533	1,836	2,279	2,723	3,166
	10' 8"	1,144	1,424	1,703	1,979	1,697	2,011	2,325	2,639	1,948	2,388	2,827	3,266
	12' 0"	1,172	1,453	1,733	2,009	1,789	2,124	2,436	2,747	2,062	2,498	2,934	3,370
	12' 8"	1,187	1,467	1,747	2,024	1,804	2,182	2,492	2,803	2,120	2,555	2,989	3,424
	13' 4"	1,201	1,481	1,762	2,038	1,819	2,239	2,549	2,858	2,177	2,611	3,044	3,478
	14' 0"	1,215	1,496	1,776	2,052	1,833	2,293	2,606	2,915	2,235	2,667	3,100	3,532
2' 8"	1' 4"	526	707	888	1,069	767	1,069	1,370	1,672	1,008	1,431	1,853	1,966
	2' 8"	590	754	917	1,081	808	1,081	1,353	1,626	1,026	1,408	1,789	2,171
	4' 0"	668	822	977	1,132	874	1,132	1,390	1,648	1,080	1,442	1,803	2,164
	5' 4"	751	901	1,051	1,200	951	1,200	1,450	1,700	1,151	1,500	1,849	2,199
	6' 8"	824	984	1,131	1,277	1,033	1,277	1,522	1,766	1,229	1,570	1,912	2,254
	8' 0"	854	1,063	1,215	1,359	1,119	1,359	1,599	1,840	1,311	1,647	1,984	2,320
	9' 4"	883	1,092	1,301	1,443	1,206	1,443	1,681	1,918	1,396	1,728	2,061	2,393
	10' 8"	911	1,121	1,330	1,530	1,294	1,530	1,765	2,000	1,483	1,812	2,142	2,471
	12' 0"	939	1,150	1,359	1,565	1,384	1,617	1,851	2,085	1,571	1,898	2,225	2,552
	12' 8"	953	1,164	1,373	1,579	1,416	1,661	1,894	2,127	1,615	1,941	2,267	2,593
	13' 4"	967	1,178	1,388	1,593	1,430	1,706	1,938	2,170	1,659	1,985	2,310	2,635
	14' 0"	981	1,192	1,402	1,608	1,445	1,750	1,982	2,214	1,704	2,028	2,353	2,677
3' 4"	1' 4"	423	568	713	858	616	858	1,099	1,340	809	1,147	1,485	1,574

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	2' 8"	477	608	739	870	652	870	1,088	1,306	826	1,131	1,436	1,742
	4' 0"	541	665	789	913	706	913	1,119	1,325	871	1,160	1,449	1,738
	5' 4"	610	730	850	970	770	970	1,169	1,369	930	1,209	1,489	1,768
	6' 8"	682	799	916	1,033	838	1,033	1,228	1,424	994	1,267	1,541	1,814
	8' 0"	715	870	985	1,100	908	1,100	1,293	1,485	1,062	1,331	1,600	1,869
	9' 4"	743	911	1,056	1,170	980	1,170	1,360	1,550	1,132	1,398	1,664	1,930
	10' 8"	772	939	1,107	1,241	1,053	1,241	1,429	1,618	1,203	1,467	1,730	1,994
	12' 0"	800	968	1,135	1,298	1,126	1,313	1,500	1,687	1,276	1,537	1,799	2,061
	12' 8"	813	982	1,149	1,313	1,163	1,349	1,536	1,722	1,312	1,573	1,834	2,095
	13' 4"	827	996	1,163	1,327	1,198	1,386	1,572	1,757	1,349	1,609	1,869	2,129
	14' 0"	841	1,009	1,176	1,341	1,211	1,423	1,608	1,793	1,385	1,645	1,904	2,164
4' 0"	1' 4"	355	-	-	-	516	-	-	-	677	-	-	-
	2' 8"	402	511	620	-	547	729	910	-	692	947	1,201	-
	4' 0"	457	560	663	766	594	766	938	1,110	732	973	1,214	1,454
	5' 4"	516	616	716	816	649	816	982	1,148	782	1,015	1,248	1,481
	6' 8"	577	675	773	870	707	870	1,033	1,196	838	1,065	1,293	1,521
	8' 0"	622	736	832	928	768	928	1,088	1,248	896	1,120	1,344	1,569
	9' 4"	651	790	893	988	829	988	1,146	1,304	956	1,178	1,399	1,621
	10' 8"	679	818	954	1,048	892	1,048	1,205	1,362	1,017	1,237	1,456	1,676
	12' 0"	706	846	985	1,110	954	1,110	1,266	1,422	1,079	1,297	1,515	1,733
	12' 8"	720	860	999	1,135	986	1,141	1,297	1,452	1,110	1,328	1,545	1,762
	13' 4"	734	874	1,012	1,149	1,018	1,173	1,327	1,482	1,142	1,358	1,575	1,792
	14' 0"	748	888	1,026	1,162	1,050	1,204	1,358	1,513	1,173	1,389	1,605	1,822
4' 8"	1' 4"	306	410	513	617	444	617	789	961	582	823	1,065	1,125
	2' 8"	348	441	535	628	472	628	784	940	597	815	1,033	1,251

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	4' 0"	397	485	574	662	515	662	809	957	633	839	1,045	1,252
	5' 4"	449	534	620	706	563	706	848	991	677	877	1,076	1,276
	6' 8"	503	586	670	754	614	754	893	1,033	726	921	1,117	1,312
	8' 0"	556	640	722	805	667	805	942	1,079	777	970	1,162	1,354
	9' 4"	584	695	776	857	722	857	993	1,129	830	1,020	1,210	1,400
	10' 8"	612	732	830	911	777	911	1,045	1,180	884	1,072	1,261	1,449
	12' 0"	640	760	877	965	832	965	1,099	1,232	939	1,126	1,312	1,499
	12' 8"	653	773	891	993	860	993	1,126	1,259	966	1,152	1,339	1,525
	13' 4"	667	787	905	1,020	888	1,020	1,153	1,286	994	1,179	1,365	1,551
	14' 0"	681	801	918	1,035	915	1,048	1,180	1,313	1,021	1,207	1,392	1,577
5' 4"	1' 4"	270	360	451	541	390	541	692	843	511	722	933	985
	2' 8"	308	389	471	553	417	553	689	825	526	716	907	1,098
	4' 0"	351	429	506	584	455	584	713	842	558	738	919	1,100
	5' 4"	398	473	548	623	498	623	748	873	598	773	947	1,122
	6' 8"	447	520	593	667	545	667	789	911	642	813	984	1,155
	8' 0"	496	568	640	712	592	712	833	953	688	857	1,025	1,193
	9' 4"	534	617	688	760	641	760	878	997	736	902	1,068	1,235
	10' 8"	562	667	737	808	690	808	926	1,043	784	949	1,114	1,279
	12' 0"	590	694	787	857	740	857	973	1,090	833	997	1,160	1,324
	12' 8"	603	708	811	881	765	881	998	1,114	858	1,021	1,184	1,347
	13' 4"	617	722	824	906	790	906	1022	1,138	883	1,045	1,208	1,370
	14' 0"	631	735	838	931	815	931	1047	1,162	908	1,070	1,232	1,394
6' 0"	1' 4"	241	-	-	-	349	-	-	-	456	-	-	-
	2' 8"	276	349	421	-	373	494	615	-	470	639	809	-
	4' 0"	316	385	454	523	408	523	637	752	500	660	821	981

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	5' 4"	359	426	492	559	448	559	670	781	537	692	847	1,003
	6' 8"	403	469	534	599	490	599	707	816	577	729	881	1,033
	8' 0"	448	512	576	641	534	641	747	854	619	769	918	1,068
	9' 4"	494	557	620	684	578	684	789	895	663	810	958	1,106
	10' 8"	523	602	665	728	623	728	832	937	707	853	1,000	1,146
	12' 0"	551	643	710	772	668	772	876	980	751	897	1,042	1,188
	12' 8"	564	657	733	795	691	795	898	1,002	774	919	1,064	1,209
	13' 4"	578	670	755	817	714	817	920	1,023	796	941	1,085	1,230
	14' 0"	592	684	775	840	737	840	943	1,046	819	963	1,107	1,251
6' 8"	1' 4"	219	291	363	436	315	436	556	677	412	580	749	788
	2' 8"	251	316	382	447	338	447	556	665	425	578	731	883
	4' 0"	288	350	412	474	371	474	577	680	453	598	742	887
	5' 4"	328	388	448	508	408	508	607	707	488	627	767	907
	6' 8"	369	427	486	544	447	544	642	740	525	662	798	935
	8' 0"	410	468	525	583	487	583	679	775	564	698	833	968
	9' 4"	452	509	566	623	528	623	718	813	604	737	870	1,003
	10' 8"	492	551	607	663	569	663	758	852	645	776	908	1,040
	12' 0"	520	592	648	705	611	705	798	891	686	817	948	1,078
	12' 8"	533	613	669	725	632	725	818	912	707	837	967	1,098
	13' 4"	547	629	690	746	653	746	839	932	727	857	988	1,118
	14' 0"	561	643	711	767	674	767	859	952	748	878	1,008	1,137
7' 4"	1' 4"	200	266	332	397	288	397	507	617	375	529	683	717
	2' 8"	230	290	349	409	310	409	508	607	389	528	666	805
	4' 0"	265	322	378	434	340	434	528	622	415	547	678	809
	5' 4"	302	357	411	466	375	466	556	647	447	574	702	829

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	6' 8"	340	393	447	500	411	500	589	678	482	607	731	855
	8' 0"	379	431	484	536	449	536	623	711	519	641	763	886
	9' 4"	418	470	521	573	487	573	660	746	556	677	798	919
	10' 8"	457	508	560	611	525	611	697	782	594	714	833	953
	12' 0"	494	547	598	649	564	649	734	819	632	751	870	989
	12' 8"	508	567	618	668	584	668	753	838	652	770	889	1,007
	13' 4"	521	586	637	688	603	688	772	857	671	789	907	1,026
	14' 0"	535	606	657	707	623	707	791	876	690	808	926	1,044
8' 0"	1' 4"	184	-	-	-	265	-	-	-	345	-	-	-
	2' 8"	213	268	322	-	286	377	468	-	359	486	613	-
	4' 0"	246	298	349	401	315	401	487	573	384	504	624	745
	5' 4"	281	331	381	431	347	431	514	597	414	530	647	763
	6' 8"	316	365	414	463	382	463	544	626	447	561	675	788
	8' 0"	353	401	449	497	417	497	577	657	481	593	705	817
	9' 4"	389	437	484	532	453	532	611	690	516	627	738	848
	10' 8"	426	473	520	567	489	567	646	724	552	661	771	881
	12' 0"	463	510	556	603	525	603	681	759	588	697	806	915
	12' 8"	481	528	575	621	544	621	699	777	606	714	823	932
	13' 4"	500	546	593	639	562	639	717	794	624	732	841	949
	14' 0"	513	565	611	658	580	658	735	812	642	750	858	966
8' 8"	1' 4"	171	227	283	338	246	338	431	524	320	450	580	607
	2' 8"	199	249	299	350	266	350	434	517	333	450	568	685
	4' 0"	230	278	325	373	293	373	452	532	357	468	579	690
	5' 4"	263	309	355	401	324	401	478	555	386	493	601	708
	6' 8"	296	342	387	432	357	432	507	582	417	522	627	732

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	8' 0"	331	375	419	464	390	464	538	612	449	552	656	759
	9' 4"	365	409	453	497	424	497	570	643	482	584	687	789
	10' 8"	400	443	487	530	458	530	603	675	516	617	718	820
	12' 0"	435	478	521	564	492	564	636	708	550	650	751	852
	12' 8"	452	495	538	581	510	581	653	725	567	667	768	868
	13' 4"	470	513	555	598	527	598	670	741	584	684	784	884
	14' 0"	487	530	573	615	544	615	687	758	601	701	801	901
9' 4"	1' 4"	160	212	263	315	229	315	401	488	298	419	539	564
	2' 8"	186	233	280	327	249	327	404	482	311	420	529	638
	4' 0"	216	260	304	349	275	349	422	496	334	437	540	643
	5' 4"	247	290	333	376	304	376	447	518	361	461	561	661
	6' 8"	279	321	363	405	335	405	475	544	391	488	586	684
	8' 0"	312	353	394	435	367	435	504	573	422	518	614	710
	9' 4"	344	385	426	467	399	467	534	602	453	548	643	738
	10' 8"	377	418	458	498	431	498	566	633	485	579	673	767
	12' 0"	411	451	491	531	464	531	597	664	517	611	704	798
	12' 8"	427	467	507	547	480	547	613	680	534	627	720	813
	13' 4"	444	484	523	563	497	563	629	696	550	643	736	829
	14' 0"	460	500	540	579	513	579	646	712	566	659	752	844
10' 0"	1' 4"	150	-	-	-	215	-	-	-	279	-	-	-
	2' 8"	176	219	263	-	234	306	379	-	292	394	495	-
	4' 0"	204	245	287	328	259	328	397	465	314	410	507	603
	5' 4"	234	274	314	354	287	354	420	487	340	433	527	620
	6' 8"	264	303	342	382	316	382	447	512	368	460	551	642
	8' 0"	295	334	372	411	347	411	475	539	398	488	577	667

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	9' 4"	327	365	403	441	377	441	504	567	428	517	605	694
	10' 8"	358	396	433	471	408	471	534	596	458	546	634	722
	12' 0"	390	427	464	502	439	502	564	626	489	576	664	751
	12' 8"	405	443	480	517	455	517	579	641	505	592	679	766
	13' 4"	421	458	496	533	471	533	595	656	520	607	694	780
	14' 0"	437	474	511	548	486	548	610	672	536	622	709	795
10' 8"	1' 4"	142	187	232	277	202	277	353	428	262	368	472	493
	2' 8"	166	207	248	289	221	289	357	425	275	371	466	561
	4' 0"	193	232	271	310	245	310	374	438	297	387	477	567
	5' 4"	222	259	297	334	272	334	397	459	322	409	497	584
	6' 8"	251	288	325	361	300	361	422	483	349	434	520	605
	8' 0"	281	317	353	389	329	389	449	509	377	461	545	629
	9' 4"	311	347	382	418	358	418	477	537	406	489	572	655
	10' 8"	341	376	412	447	388	447	506	565	435	518	600	682
	12' 0"	371	406	441	476	418	476	535	593	465	546	628	710
	12' 8"	386	421	456	491	433	491	549	608	480	561	643	724
	13' 4"	401	436	471	506	448	506	564	622	494	576	657	738
	14' 0"	417	451	486	521	463	521	579	637	509	590	671	753
11' 4"	1' 4"	134	177	219	262	191	262	333	404	248	347	445	465
	2' 8"	158	196	235	273	209	273	337	402	260	350	440	530
	4' 0"	184	221	257	293	233	293	354	415	281	366	451	536
	5' 4"	212	247	282	317	259	317	376	435	306	388	470	552
	6' 8"	240	274	309	343	286	343	401	458	332	412	493	573
	8' 0"	268	302	336	370	314	370	427	483	359	438	517	596
	9' 4"	297	331	364	398	342	398	454	509	387	465	543	621

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	10' 8"	326	359	392	426	370	426	481	536	415	492	570	647
	12' 0"	355	388	421	454	399	454	509	564	443	520	597	674
	12' 8"	370	402	435	468	413	468	523	578	457	534	611	687
	13' 4"	384	417	450	482	428	482	537	592	472	548	625	701
	14' 0"	399	431	464	497	442	497	551	606	486	562	639	715
12' 0"	1' 4"	128	-	-	-	181	-	-	-	235	-	-	-
	2' 8"	151	187	223	-	199	260	320	-	247	332	417	-
	4' 0"	176	210	245	279	222	279	336	394	268	348	428	508
	5' 4"	202	236	269	302	247	302	358	413	291	369	446	524
	6' 8"	230	262	295	327	273	327	381	436	316	392	468	544
	8' 0"	257	289	321	353	300	353	407	460	343	417	492	567
	9' 4"	285	316	348	380	327	380	433	485	369	443	517	591
	10' 8"	313	344	375	407	355	407	459	511	396	470	543	616
	12' 0"	341	372	403	434	382	434	486	538	424	496	569	642
	12' 8"	355	386	417	448	396	448	500	551	437	510	582	655
	13' 4"	369	400	431	461	410	462	513	565	451	524	596	675
	14' 0"	383	414	444	475	424	475	527	578	465	537	609	681
12' 8"	1' 4"	122	160	198	236	172	236	299	363	223	312	399	416
	2' 8"	144	178	213	247	190	247	305	362	236	316	396	477
	4' 0"	168	201	234	266	212	266	321	375	255	331	407	483
	5' 4"	194	226	257	289	236	289	341	394	278	352	425	499
	6' 8"	220	251	282	313	262	313	364	416	303	375	447	519
	8' 0"	247	277	308	338	287	338	389	439	328	399	470	540
	9' 4"	274	304	334	364	314	364	414	464	354	424	494	564
	10' 8"	301	330	360	390	340	390	439	489	380	449	519	588

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	12' 0"	328	357	387	416	367	416	465	515	406	475	544	613
	12' 8"	341	371	400	430	381	430	479	528	420	488	557	626
	13' 4"	355	384	414	443	394	443	492	541	433	502	570	638
	14' 0"	368	398	427	456	407	456	505	554	446	515	583	651
13' 4"	1' 4"	116	152	189	225	164	225	285	345	213	297	379	395
	2' 8"	138	171	203	236	182	236	291	345	225	301	378	454
	4' 0"	162	193	224	255	203	255	306	358	244	317	389	461
	5' 4"	187	217	247	277	227	277	326	376	267	336	406	476
	6' 8"	212	241	271	300	251	300	349	398	290	359	427	496
	8' 0"	238	267	296	324	276	324	373	421	315	382	449	517
	9' 4"	264	292	321	349	302	349	397	444	340	406	473	539
	10' 8"	290	318	346	375	328	375	422	469	365	431	497	563
	12' 0"	316	344	372	400	354	400	447	494	391	456	522	587
	12' 8"	329	357	385	413	367	413	460	506	404	469	534	599
	13' 4"	342	370	398	426	380	426	472	519	417	482	547	612
	14' 0"	356	383	411	439	393	439	485	532	430	495	559	624
14' 0"	1' 4"	111	-	-	-	157	-	-	-	203	-	-	-
	2' 8"	133	164	195	-	174	226	278	-	216	288	361	-
	4' 0"	156	185	215	244	195	244	293	343	234	303	372	441
	5' 4"	180	209	237	266	218	266	313	361	256	323	389	456
	6' 8"	205	233	261	288	242	288	335	381	279	344	409	474
	8' 0"	230	257	285	312	266	312	358	404	303	367	431	495
	9' 4"	255	282	309	336	291	336	382	427	327	391	454	517
	10' 8"	280	307	334	361	316	361	406	451	352	415	478	540
	12' 0"	306	332	359	386	341	386	430	475	377	439	501	564

Table 3. Maximum In-Plane ASD Shear Loads for Non-Grouted Cells[1,2,3,4,5,6]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables				Number of QuickTie Cables				Number of QuickTie Cables			
		2	3	4	5	2	3	4	5	2	3	4	5
	12' 8"	318	345	372	398	354	398	443	487	389	452	514	576
	13' 4"	331	358	384	411	367	411	455	499	402	464	526	594
	14' 0"	344	370	397	423	379	423	467	512	414	476	538	600

SI: 1" = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m

1. All values assume that cables are located 4" from the ends of the wall (i.e. d = 4", see **Figure 9**).
2. For greater than two (2) QuickTie cables, table assumes cables are evenly spaced.
3. For wall lengths between the given values, linear interpolation for allowable shear is acceptable.
4. Allowable QuickTie tension applied as P_{ps} for axial load.
5. ASD shear loads above were converted to ultimate loads for LRFD analysis.
6. Shear and uplift loads assumed to be MWFRS loads.

Table 4. Maximum In-Plane ASD Shear Loads for Walls with Grouted End-Cells[2,3,4,5,6,7]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables[1]				Number of QuickTie Cables[1]				Number of QuickTie Cables[1]			
		2	3	4	5	2	3	4	5	2	3	4	5
8' 0"	1' 4"	231	-	-	-	360	-	-	-	483	-	-	-
	2' 8"	273	340	407	-	416	525	631	-	555	703	847	-
	4' 0"	305	373	441	508	452	564	674	782	597	751	901	1,047
	5' 4"	334	403	471	539	484	597	709	819	632	788	941	1,092
	6' 8"	363	432	500	569	513	627	740	852	663	821	976	1,130
8' 8"	1' 4"	215	275	332	389	334	427	516	599	448	570	683	786
	2' 8"	256	318	379	440	388	488	586	682	516	653	785	912
	4' 0"	288	351	413	475	423	526	628	728	557	699	837	972
	5' 4"	317	380	443	506	455	559	662	764	591	735	876	1,016
	6' 8"	345	409	472	535	484	589	693	796	622	767	911	1,053
9' 4"	1' 4"	202	257	310	-	312	398	480	-	417	531	635	-
	2' 8"	241	299	356	412	363	457	548	637	483	610	732	850
	4' 0"	273	331	389	446	399	494	588	681	523	654	782	908
	5' 4"	302	360	419	477	429	526	622	716	556	690	821	950
	6' 8"	330	389	448	506	459	556	653	748	587	722	855	986
10' 0"	1' 4"	190	241	291	340	293	373	450	522	391	497	594	684
	2' 8"	229	282	335	388	343	430	515	597	454	572	686	797
	4' 0"	260	314	368	422	377	466	554	640	493	615	735	852
	5' 4"	288	343	398	452	408	498	587	675	526	650	773	893
	6' 8"	316	372	426	481	437	528	618	707	556	682	806	929
10' 8"	1' 4"	180	228	275	320	276	351	423	491	368	467	558	642
	2' 8"	218	268	318	367	324	406	485	563	429	539	646	750
	4' 0"	248	299	350	400	358	442	524	605	467	582	694	803
	5' 4"	277	328	379	430	389	473	557	639	499	616	731	844
	6' 8"	305	357	408	459	418	503	587	671	530	647	764	878

Table 4. Maximum In-Plane ASD Shear Loads for Walls with Grouted End-Cells[2,3,4,5,6,7]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables[1]				Number of QuickTie Cables[1]				Number of QuickTie Cables[1]			
		2	3	4	5	2	3	4	5	2	3	4	5
	1' 4"	170	216	260	302	261	332	399	463	348	441	526	605
	2' 8"	208	255	302	348	308	385	460	533	406	511	611	708
11 4"	4' 0"	238	286	334	381	342	420	498	574	444	552	657	760
	5' 4"	267	315	363	411	372	451	530	608	476	586	694	800
	6' 8"	295	343	392	440	401	481	560	639	506	617	726	834
	1' 4"	162	205	247	287	248	315	378	438	330	417	498	573
	2' 8"	199	244	288	331	294	366	437	506	387	485	580	671
12 0"	4' 0"	229	275	320	364	327	401	474	546	423	525	625	722
	5' 4"	258	303	349	394	357	432	506	579	455	559	661	761
	6' 8"	286	331	377	422	386	461	536	610	485	590	693	795
	1' 4"	155	196	235	273	236	299	360	416	313	396	473	543
	2' 8"	191	234	275	317	281	349	416	481	369	462	552	638
12' 8"	4' 0"	221	264	307	349	314	384	453	521	405	501	596	688
	5' 4"	250	293	336	378	344	415	485	554	437	535	631	726
	6' 8"	277	321	364	407	372	444	515	585	466	565	663	759
	1' 4"	149	187	224	260	225	286	343	397	299	378	450	517
	2' 8"	184	225	264	303	269	334	398	460	353	441	526	608
13' 4"	4' 0"	214	255	295	335	302	369	434	499	389	480	569	657
	5' 4"	242	283	324	365	332	399	466	531	420	513	604	694
	6' 8"	270	311	352	393	360	428	495	562	449	543	636	728
	1' 4"	143	-	-	-	216	-	-	-	286	-	-	-
	2' 8"	178	216	254	-	259	321	381	-	338	422	503	-
14' 0"	4' 0"	208	246	285	323	291	355	417	478	374	461	546	629
	5' 4"	236	275	314	352	321	385	448	511	405	493	580	666
	6' 8"	264	303	342	380	349	414	478	541	434	523	612	699

Table 4. Maximum In-Plane ASD Shear Loads for Walls with Grouted End-Cells[2,3,4,5,6,7]

Cable Type		QTB (Blue) Maximum Shear (plf)				QTG (Green) Maximum Shear (plf)				QTO (Orange) Maximum Shear (plf)			
Height	Length	Number of QuickTie Cables[1]				Number of QuickTie Cables[1]				Number of QuickTie Cables[1]			
		2	3	4	5	2	3	4	5	2	3	4	5

SI: 1" = 25.4 mm, 1 lb = 4.45 N, 1 lb/ft = 0.0146 kN/m

1. CMU cells containing QuickTie cables for in-plane shear reinforcement shall be fully grouted.
2. All values assume that cables are located 4" from the ends of the wall (i.e., d = 4", see **Figure 9**).
3. For greater than two (2) QuickTie cables, table assumes cables are evenly spaced.
4. For wall lengths between the given values, linear interpolation for allowable shear is acceptable.
5. Allowable QuickTie cable tension applied as P_{ps} for axial load.
6. ASD shear loads above were converted to ultimate loads for LRFD analysis.
7. Shear and uplift loads assumed to be MWFRS loads

Table 5. Top Plate Allowable Uplift Load[1,2,3,4,5,6,7,8]

QuickTie Spacing	Uplift Load (lb)
2' 0"	2,680
2' 8"	1,505
3' 4"	970
4' 0"	670
4' 8"	380
5' 4"	220
6' 0"	140
6' 8"	90
7' 4"	60
8' 0"	45

SI: 1" = 25.4 mm, 1 lb = 4.45 N

1. Uplift capacity is governed by bending capacity of top plate ($f_b/F'_b < 1.0$) up to 3'-4" spacing.
2. Top plate deflection limit of 0.25" governs for spans 4' 0" o.c. and greater (2-span condition, unbalanced wind load).
3. Capacities do not consider bending forces in combination with other loads.
4. A load duration factor of 1.6 was applied.
5. A flat use factor of 1.15 was applied.
6. Assumes floor/roof trusses spaced at 2' o.c. For other spacings, multiply by adjustment factor [spacing (ft) / 2].
7. Assumes double 2x8 No. 2 SYP visually graded top plate. F_b = 925 psi, F_a = 1,350 psi
8. Determination of roof-to-wall uplift load is the responsibility of the RDP responsible for the design of the building.

Table 6. Maximum Top Plate Shear Forces[1,2,3]

Allowable F_2 Load per QuickTie in Wall[4] (lb)	Allowable F_1 Load per QuickTie in Wall (lb)[4]		
	QTBM (Blue)	QTGM (Green)	QTOM (Orange)
0	841	1,401	1,962
200	641	1,201	1,762
400	441	1,001	1,562
600	241	801	1,362
800	41	601	1,162
1000	N/A	401	962

SI: 1 lb = 4.45 N
1. Shear friction coefficient between wood and masonry is assumed to be 0.4 (F_v = 0.4TQT).
2. Capacities do not consider shear forces in combination with other loads.
3. Load duration factor not applied.
4. F_1 = shear parallel to wall; F_2 = shear perpendicular to wall.

6.4 *General Design Provisions*

6.4.1 **Table 7** lists the nominal cable strength and the maximum allowable tensile capacity, based on Allowable Stress Design (ASD) of the QTS.

6.4.1.1 Where one QuickTie cable is not sufficient, multiple QuickTie cables of the same type may be used together to apply pre-stressing force.

6.4.1.2 Construction documents shall include the information required by ASCE 19 Section 2.

6.4.2 QuickTie cables shall be tightened to seventy percent (70%) of their nominal cable strength at the time of installation.

6.4.2.1 The QuickTie cable force, P_{ps}, shall be seventy percent (70%) of the nominal cable strength for flexural and stability checks.

6.4.2.2 For in-plane shear design, the QuickTie cable force, P_{ps}, shall be seventy-one and one-half percent (71.5%) of the initial pre-stress load, as twenty-eight and one-half percent (28.5%) of the pre-stress load in QuickTie cable is assumed to be relaxed within a few months after installation.

Table 7. Maximum Allowable Tensile Capacity of the QTS[1]

Cable Type	Cable Diameter (in)	Cable Area (in^2)	Cable Modulus of Elasticity (psi)	Nominal Cable Strength, T_n (lb)
QTBM(L) Blue	3/16	0.01407	19,500,000	4,200
QTGM(L) Green	1/4	0.02388	16,300,000	7,000
QTOM(L) Orange	5/16	0.03886	15,500,000	9,800
QTRM(L) Red	3/8	0.06387	12,600,000	14,400

SI: 1" = 25.4 mm, 1 lb = 4.45 N, 1 psi = 0.00689 MPa
1. Allowable loads determined in accordance with ASCE 19 and a safety factor of 2.2.

6.4.2.3 The elongation of the QuickTie cable necessary to achieve the initial pre-stress load of seventy percent (70%) of the nominal cable strength is given in **Table 8**.

Table 8. Cable Elongation at Pre-Stress Load

Cable Length, L	Elongation (in)			
	QTBM(L) (Blue)	QTGM(L) (Green)	QTOM(L) (Orange)	QTRM(L) (Red)
Initial Pre-stress (lbs)	2,940	4,900	6,860	10,080
Final Pre-stress (after losses) (lbs)	2,102	3,504	4,905	7,207
2' 0"	1/4	3/8	5/16	5/16
2' 8"	3/8	7/16	3/8	7/16
3' 4"	7/16	9/16	1/2	1/2
4' 0"	9/16	11/16	9/16	5/8
4' 8"	5/8	13/16	11/16	3/4
5' 4"	3/4	15/16	13/16	13/16
6' 0"	13/16	1 1/16	7/8	15/16
6' 8"	15/16	1 3/16	1	1 1/16
7' 4"	1	1 1/4	1 1/16	1 1/8
8' 0"	1 1/8	1 3/8	1 3/16	1 1/4
8' 8"	1 3/16	1 1/2	1 1/4	1 3/8
9' 4"	1 5/16	1 5/8	1 3/8	1 7/16
10' 0"	1 3/8	1 3/4	1 7/16	1 9/16
10' 8"	1 1/2	1 7/8	1 9/16	1 11/16
11' 4"	1 9/16	2	1 11/16	1 3/4
12' 0"	1 11/16	2 1/8	1 3/4	1 7/8
12' 8"	1 3/4	2 3/16	1 7/8	2
13' 4"	1 7/8	2 5/16	1 15/16	2 1/16
14' 0"	1 15/16	2 7/16	2 1/16	2 3/16
SI: 1" = 25.4 mm, 1 lb = 4.45 N				

6.4.2.4 The net section properties used for calculating design capacities are based on standard face shell thicknesses and full mortar bedding.

6.4.3 Masonry design shall be performed in accordance with TMS 402 Chapter 10.

6.4.4 For in-plane loads, the size and quantity of QuickTie cables for the masonry wall shall be selected using the strength design provisions and then checked to insure that the allowable stresses are not exceeded, in accordance with TMS 402 Section 10.1.2.

6.4.4.1 Calculation of the nominal moment strength of masonry walls post-tensioned using the QTS shall be determined using TMS 402 Section 10.4.3.

6.4.4.2 For non-grouted cells, calculation of the nominal shear strength of masonry walls post-tensioned using the QTS shall be determined using TMS 402 Section 9.2.6a, 9.2.6b, 9.2.6c, and 9.2.6e.

6.4.4.3 For grouted cells, calculation of the nominal shear strength of masonry walls post-tensioned using the QTS shall be determined using TMS 402 Section 9.3.4.1.2, 9.3.4.1.2.1, and 9.3.4.1.2.2.

6.4.4.4 Checks to insure that masonry walls using the QTS do not exceed the allowable stress for axial compression and flexure under service loads shall be conducted in accordance with TMS 402 Section 8.2.4.

6.4.5 For out-of-plane loads, the size and quantity of QuickTie cables for the masonry wall shall be selected using the allowable stress design provisions, in accordance with TMS 402 Section 8.2.

6.4.5.1 Checks to insure that masonry walls using the QTS do not exceed the allowable stress for axial compression and flexure under service loads shall be conducted in accordance with TMS 402 Section 8.2.4.

6.4.5.2 Calculation of the nominal shear strength for out-of-plane loads shall be determined using TMS 402 Section 9.2.6a, 9.2.6b, 9.2.6c, and 9.2.6e.

6.4.6 The methods of analysis in this report follow design procedures provided in NCMA TEK 14-20A "*Post Tensioned Concrete Masonry Wall Design*".

6.4.7 Wood top plate design shall be performed in accordance with the NDS. Flat use and load duration factors should be applied to wood plate design.

6.4.8 Calculations shall be performed using the first principles of engineering mechanics for wood and masonry.

6.5 *Applied Load Considerations for the RDP*

6.5.1 Loads shall be calculated using the methods contained in ASCE 7 in accordance with IBC Chapter 16.

6.5.2 Wind load tributary width shall be based on the spacing of the QuickTie cables. Wind loads shall be calculated as C&C design loads using an effective area of H, times the greater of the cable spacing or H/3, where H = wall height to top of wood top plate.

6.5.3 For masonry design using the provisions in TMS 402 for ASD, the equations in ASCE 7 Section 2.4.1 shall be used to factor the loads.

6.5.4 For masonry design using the provisions in TMS 402 for strength design, the load combination equations in ASCE 7 Section 2.3.2 shall be used to factor the loads.

6.5.5 Externally applied loads are the only loads that affect the post-tensioned design.

6.5.5.1 The addition of QuickTie cables to second-story wood-framed walls will not affect the QuickTie cables in the first-story masonry walls, provided that the uplift and overturning forces from the second floor QuickTie cables do not exceed allowable tensile capacity of the QuickTie cables in the masonry walls.

6.5.6 The RDP responsible for the design of the building shall consider each of the load combinations in IBC Section 1605 and determine the controlling case. The combination of axial (tension and/or compression), flexure, and shear loads on the masonry wall shall be considered to determine the maximum effect. The capacity of the masonry wall shall be sufficient to resist the design loads imposed.

6.6 *Masonry Design Considerations for IN-Plane Loads for the Building Designer*

6.6.1 The in-plane shear capacity of the QTS post-tensioned masonry walls shall be determined in accordance with TMS 402 Chapter 10.

6.6.2 A non-grouted post-tensioned CMU wall with in-plane shear loads can be analyzed in a manner similar to that of a typical CMU wall with grouted cells and vertical mild reinforcing, with a few notable differences:

6.6.2.1 The post-tensioning force will contribute to the compressive force normal to the shear surface in addition to the dead load.

6.6.2.2 The depth of the equivalent compression zone will not maintain a rectangular profile in all cases, due to the lack of a grouted cell at the ends of the wall. This must be addressed per TMS 402 Section 10.4.3.4.

6.6.3 A post-tensioned CMU wall with grouted end-cells with in-plane shear loads can be analyzed in a manner similar to that of a typical CMU wall with grouted cells and vertical mild reinforcing, with the exception that the post-tensioning force will contribute to the compressive force normal to the shear surface in addition to the dead load.

6.6.3.1 The depth of the equivalent compression zone for a grouted CMU block will maintain a rectangular profile.

6.7 *Nominal Moment Strength Considerations for In-Plane Loads for the Building Designer*

6.7.1 In accordance with TMS 402 Section 10.4.3.5.2, the ultimate tension force in the QuickTie cable due to overturning moments shall be calculated by using a free body diagram and the principles of static moment equilibrium.

6.7.2 There are two conditions to consider in the free body diagram analysis:

6.7.2.1 The wall is assumed to behave according to the Euler-Bernoulli beam theory, since it is narrow compared to its height.

6.7.2.2 Although **Figure 9** shows only one QuickTie cable at each end of the wall, the designer may use additional QuickTie cables, as needed, to increase the axial force in the wall.

(1) The compression block fully is confined to within face shell.

(2) The compression block exceeds face shell thickness.

6.7.3 Loads are factored using strength design equations of IBC Section 1605.1.[xxii]

6.7.4 **Figure 9** shows a free body diagram of a typical masonry wall that can be used to analyze a wall with in plane shear loads.

6.7.4.1 The wall is assumed to behave according to the Euler-Bernoulli beam theory, since it is narrow compared to its height.

6.7.4.2 Although **Figure 9** shows only one QuickTie cable at each end of the wall, the designer may use additional QuickTie cables, as needed, to increase the axial force in the wall.

6.7.4.3 The variables shown in **Figure 9** are defined as follows:

d = distance from extreme tension fiber to centroid of post-tensioned QuickTie cables (in)

T = tension force in post-tensioned QuickTie cable (lb)

C = compression force in compression face of wall (lb)

L = length of wall (ft)

a = depth of an equivalent compression zone (in)

M = maximum moment at the section under consideration (in-lb)

n_{cable} = number of QuickTie cables in the wall

W = self-weight of the wall (lb)

P_{ps} = pre-stressing force (lb)

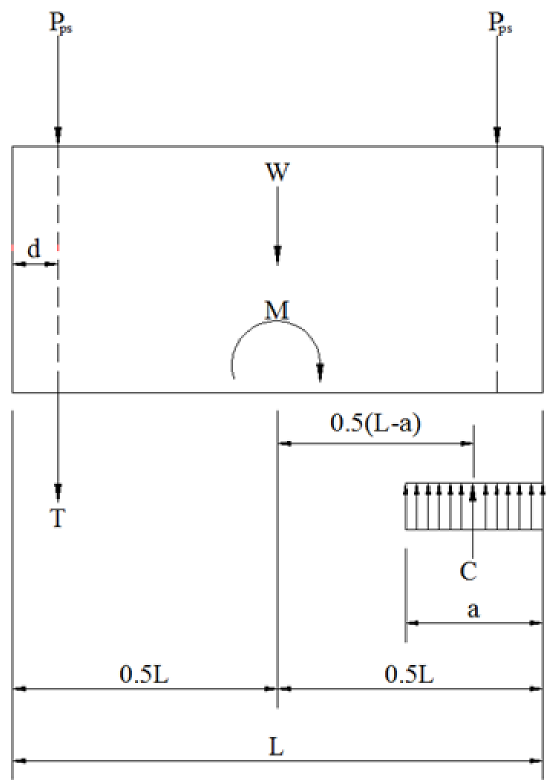

Figure 9. Free Body Diagram (FBD) of Shear Wall

6.7.5 For in-plane shear design, the allowable load of the QuickTie cable given in **Table 5** shall be used as the value of P_{ps} in **Figure 9**, because the additional forty percent (40%) of the allowable load in the QuickTie cable at the time of installation is assumed to be mitigated within a few months after installation.

6.7.6 The QuickTie cable spacing is assumed to be symmetric, therefore the analysis is not affected by the number of QuickTie cables in the wall.

6.7.7 By combining the static equilibrium equations for the sum moments about the centroid and the sum of the vertical forces for the wall in **Figure 9**, the equation for the tension force in the QuickTie cable can be shown as:

$$T = C - 0.9W - 0.9n_{cable}P_{ps}$$

6.7.8 The compression force, C, can be determined based on an equivalent compression zone depth (in). Since the wall is non-grouted, the depth of an equivalent compression zone will not maintain a rectangular cross section once the depth exceeds the shell thickness, t_s, of the CMU unit. Thus, two cases must be considered.

6.7.8.1 In cases where the end-cells are grouted, the depth of the equivalent compression zone will maintain a rectangular cross section. For grouted cells, the equations of Case 1 (**Section 6.7.12**) apply.

6.7.9 For Case 1, the equivalent compression zone depth, a, remains within the shell thickness, ts, as shown in **Figure 10**.

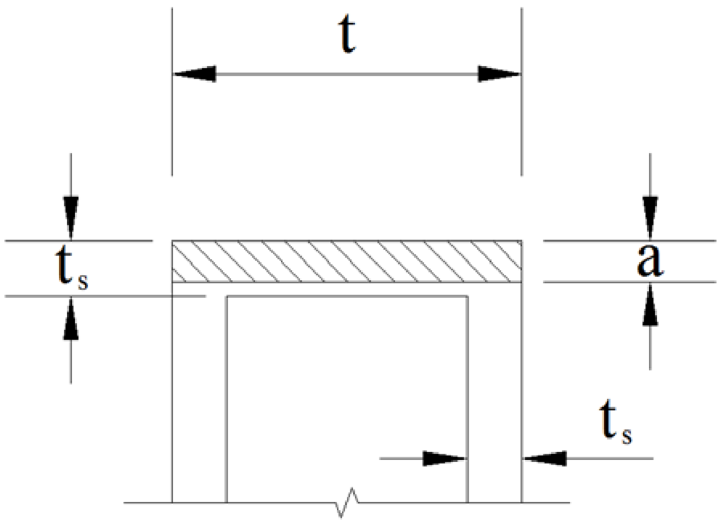

Figure 10. Case 1 Equivalent Compression Zone Depth Diagram (in)

Where:

a = depth of an equivalent compression zone (in)

t = overall width of CMU unit (in)

t_s = shell thickness of CMU unit (in)

6.7.10 For Case 1, the equivalent compression zone depth (in), a, maintains a rectangular profile; thus the compression force, C, can be shown to be:

$$C = 0.80 \cdot f'_m \cdot t \cdot a$$

Where:

f'_m = specified compressive strength of masonry (psi)

6.7.11 By summing moments about the centroid of **Figure 9** and substituting in the equations for T and C, the following equation for the equivalent compression zone depth (in), a, can be found:

$$0 = 0.80f'_m \cdot t \cdot a\left(\frac{L}{2} - \frac{a}{2}\right) + \left(0.80f'_m \cdot t \cdot a - 0.9W - 0.9n_{cable} \cdot P_{ps}\right)\left(\frac{L}{2} - d\right) - M$$

6.7.12 The equivalent compression zone depth (in), a, can then be found using the quadratic equation using the values for A, B, and C shown in **Table 9**:

$$a = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

Table 9. Variables for Calculating the Equivalent Compression Zone Depth, a, for Case 1

A terms:	B terms:	C terms:
$-0.40f'_m ta^2$	$+0.80f'_m taL$	$-0.45WL$
–	$-0.80f'_m tad$	$+0.9Wd$
–	–	$-0.45n_{cable}P_{ps}L$
–	–	$+0.9n_{cable}P_{ps}d$
–	–	$-M$

6.7.13 For Case 2, the equivalent compression zone depth, a, exceeds the shell thickness, t_s, as shown in **Figure 11**.

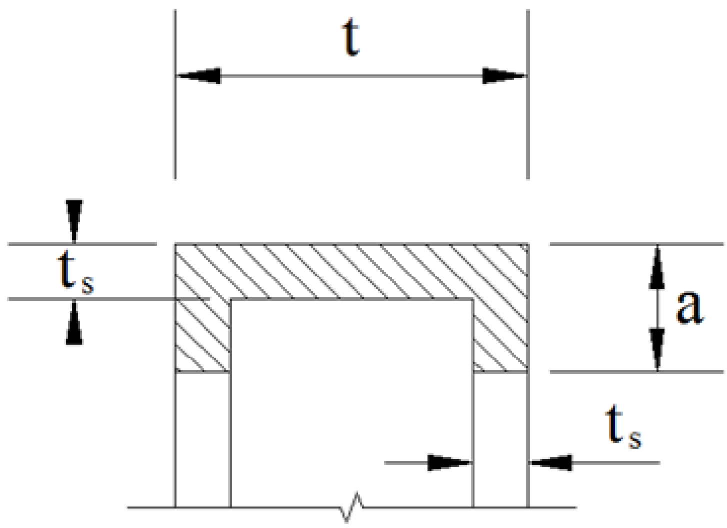

Figure 11. Case 2 Equivalent Compression Zone Depth Diagram

6.7.14 For Case 2, the equivalent compression zone depth, a, does not maintain a rectangular profile. Thus, in accordance with TMS 402 Section 10.4.3.4. The equation for the compression force, C, must be expressed as:

$$C = 0.80f'_m[t \cdot t_s + 2 \cdot t_s(a - t_s)]$$

6.7.15 By summing moments about the centroid of **Figure 9** and substituting in the equations for T and C, the following quadratic equation for the equivalent compression zone depth, a, can be found:

$$0 = 0.80f'_m[t \cdot t_s + 2t_s(a - t_s)]\left(\frac{L}{2} - \frac{a}{2}\right) + \left(0.80f'_m[t \cdot t_s + 2t_s(a - t_s)] - 0.9W - 0.9n_{cable} \cdot P_{ps}\right)\left(\frac{L}{2} - d\right) - M$$

6.7.16 The equivalent compression zone depth, a, can then be found using the quadratic equation using the values for A, B, and C shown in **Table 10**:

$$a = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

Table 10. Variables for Calculating the Equivalent Compression Zone Depth, a, for Case 2

A terms:	B terms:	C terms:
$-0.80f'_m t_s a^2$	$-0.40f'_m t t_s a$	$+0.80f'_m t t_s L$
–	$+0.80f'_m t_s^2 a$	$+1.6f'_m t_s^2 d$
–	$+1.6f'_m t_s La$	$-1.6f'_m t_s^2 L$
–	$-1.6f'_m t_s da$	$-0.80f'_m t t_s d$
–	–	$-0.45WL$
–	–	$+0.9Wd$
–	–	$-0.45n_{cable}P_{ps}L$
–	–	$+0.9n_{cable}P_{ps}d$
–	–	$-M$

6.7.17 The required tension load, T_u, shall be calculated as the tension stress in the QuickTie cable, due to the overturning moment plus the QuickTie cable pre-stress as follows:

$$T_u = T + P_{ps}$$

6.7.18 The design QuickTie cable strength, ϕT_n, is the nominal cable strength, T_n, multiplied by the strength reduction factor, ϕ, where $\phi = 0.80$ per TMS 402 Section 9.1.4.5.

6.7.19 The appropriate QuickTie cable shall be selected such that the design QuickTie cable strength, ϕT_n, is greater than or equal to the required tension load due to the overturning moment.

$$\phi T_n \geq T_u$$

6.7.20 Per TMS 402 Section 10.4.3.6, the ratio of a/d shall not exceed 0.38.

6.8 *Non-Grouted Masonry: Shear Considerations for In-Plane Loads for the Building Designer*

6.8.1 Per TMS 402 Section 10.6.1, the shear capacity of pre-stressed walls shall be calculated using the provisions of Section 9.2.6a-c.

6.8.2 TMS 402 Section 9.2.6a-c states that the nominal shear strength, V_n, is the smallest of the following equations where A_n is the net cross-section area of masonry (in^2) and N_u is the factored compressive force acting normal to the shear surface (lb):

1. $3.8\, A_n \sqrt{f'_m}$
2. $300\, A_n$
3. $56\, A_n + 0.45\, N_u$

6.8.3 The design shear strength, ϕV_n, is the nominal strength, V_n, multiplied by the resistance factor, where ϕ = 0.80 per TMS 402 Section 9.1.4.5.

6.8.4 The design shear strength must be greater than or equal to the required shear strength, V_u per TMS 402 Section 9.1.3 as follows:

$$\phi V_n \geq V_u$$

6.8.5 V_u shall be determined using LRFD (factored) load combinations.

6.9 *Grouted Masonry: Shear Considerations for In-Plane Loads for the Building Designer*

6.9.1 This section applies to walls where the end-cells with QuickTie cables are fully grouted.

6.9.2 Per TMS 402 Section 10.6.2, the shear capacity of pre-stressed walls shall be calculated using the provisions of Section 9.3.4.1.2.

6.9.3 TMS 402 Section 9.3.4.1.2 states that the nominal shear strength, V_n, is equal to the shear strength provided by masonry (V_m) plus the shear strength provided by shear reinforcement (V_s):

$$V_n = (V_m + V_s)\,\gamma_g$$

6.9.3.1 Shear strength provided by the masonry is calculated as follows:

$$V_m = \left[4.0 - 1.75\left(\frac{M_u}{V_u\, d_v}\right)\right] A_n \sqrt{f'_m} + 0.25P_u$$

Where:

M_u = factored moment, in-lb

V_u = factored shear force, in-lb

d_v = actual depth of member in direction of shear considered, in

A_n = net cross-section area of masonry, in^2

P_u = factored axial load on wall, including prestress force from QuickTie cable, lb

γ_g = 0.75 for partially grouted walls

$M_u/(V_u\, d_v)$ shall be taken as a positive number less than or equal to 1.0.

6.9.3.2 Shear strength provided by the reinforcement is calculated as follows. If no shear reinforcement is provided, V_s is equal to zero:

$$V_s = 0.5\frac{A_v}{s} f_y\, d_v$$

6.9.3.3 V_n shall not be taken greater than the following limits:

Where $M_u/(V_u\, d_v) \leq 0.25$: $V_n \leq 6 A_n \sqrt{f'_m}\ \gamma_g$

Where $M_u/(V_u\, d_v) \geq 1.0$: $V_n \leq 4 A_n \sqrt{f'_m}\ \gamma_g$

The maximum value of V_n for $M_u / (V_u d_v)$ between 0.25 and 1.0 shall be linearly interpolated.

6.9.4 The design shear strength, ϕVn, is the nominal strength, V_n, multiplied by the resistance factor, where ϕ = 0.80 per TMS 402 Section 9.1.4.5.

6.9.5 The design shear strength must be greater than or equal to the required shear strength, V_u per TMS 402 Section 9.1.3 as follows:

$$\phi V_n \geq V_u$$

6.9.6 V_u shall be determined using LRFD (factored) load combinations.

6.10 *Combined Axial Compression and Flexure for In-Plane Load Considerations for the Building Designer*

6.10.1 Per TMS 402 Section 10.4.1.1, walls subjected to axial compression, flexure or combined axial compression and flexure shall be designed according to the provisions of TMS 402 Section 8.2.4.

6.10.2 TMS 402 Section 2.2.3 is for the design of unreinforced masonry by the ASD method, so the ASD load combinations of ASCE 7-10 and 7-16 Section 2.4.1 and IBC Section 1605.2[xxiii] are used to calculate the loads.

6.10.3 Axial-flexural unity and stability must both be satisfied per TMS 402 Section 8.2.4.1 as follows:

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1$$

$$P \leq \left(\frac{1}{4}\right) P_e$$

Where:

f_a = compressive stress in masonry due to axial load only (psi)

f_b = compressive stress in masonry due to flexure only (psi)

P = axial load (lb)

P_e = Euler buckling load (lb)

6.10.4 The allowable compressive stress available to resist axial load only, F_a, shall equal:

6.10.4.1 For members with an h/r ratio not greater than 99:

$$F_a = \left(\frac{1}{4}\right) f'_m \left[1 - \left(\frac{h}{140r}\right)^2\right]$$

6.10.4.2 For members with an h/r ratio greater than 99:

$$F_a = \left(\frac{1}{4}\right) f'_m \left(\frac{70r}{h}\right)^2$$

Where:

h = effective height of wall (in)

r = radius of gyration (in)

6.10.5 The allowable compressive stress available to resist flexure only, F_b, shall equal:

$$F_b = \left(\frac{1}{3}\right) f'_m$$

6.10.6 The Euler buckling load, P_e, shall equal:

$$P_e = \frac{\pi^2 E_m I_n}{h^2}\left(1 - 0.577\frac{e}{r}\right)^3$$

Where:

E_m = modulus of elasticity of masonry in compression (psi)

I_n = moment of inertia of net cross-sectional area of wall (in^2)

e = eccentricity of axial load (in)

6.10.7 The tension stress in the masonry wall due to in-plane bending shall not exceed the allowable flexure tension stress, in accordance with TMS 402 Section 8.2.4.2.

6.10.7.1 For wind load cases, the allowable tensile stress shall be limited to 33 psi (25 psi x 1.33 = 33 psi) in accordance with TMS 402 Table 8.2.4.2.

$$f_b - f_a < 33 \text{ psi (wind + pre-stressing loads)}$$

6.10.7.2 For dead and pre-stress loads, tensile stress shall not be permitted per TMS 402 Section 10.4.1.3.

$$f_b - f_a < 0 \text{ (dead + pre-stressing only)}$$

6.10.8 The initial pre-stressing load, P_{ps}, for determining the flexural stresses immediately after transfer of pre stress shall be seventy percent (70%) of the nominal cable strength for the QuickTie cables given in **Table 5**.

6.10.9 Per TMS 402 Section 10.4.1.2, the allowable compressive stresses due to axial loads, F_a, and flexure, F_b, may be increased by twenty percent (20%) for the stress condition immediately after transfer of pre-stress.

6.10.10 The pre-stressing load, P_{ps}, a long time after the transfer of pre-stress shall be seventy-one and one-half percent (71.5%) of the initial pre stress load (i.e., fifty percent [50%] of the nominal cable strength), as twenty-eight and one-half percent (28.5%) of the pre-stress load in QuickTie cable is assumed to be relaxed within a few months after installation.

6.11 *Masonry Design Considerations for Out-of-Plane Loads for the Building Designer*

6.11.1 A non-grouted post-tensioned CMU wall with out-of-plane wind loads can be analyzed in a manner similar to that of a typical unreinforced masonry walls with hollow cells.

6.11.1.1 The pre-stress of the QuickTie cables is treated as a compression load on the top of the wall that counter acts the tension due to the out-of-plane wind loads.

6.11.1.2 Pinned supports are assumed at the top and bottom of the wall.

6.11.1.3 An eccentricity of $^3/_{16}$" is assumed for calculating the Euler buckling load.

6.11.1.4 The actual tensile stress in the face shell must be less than 33 psi, per TMS 402 Table 2.2.3.2.

6.11.1.5 The wall is assumed to behave according to the Euler-Bernoulli beam theory.

6.11.1.6 The axial load due to the self-weight of the wall can be considered to help offset the bending stress due to out-of-plane loads. Additional axial dead load from a floor system, second level wall and second level roof cannot be considered unless it is applied before the cables are tensioned.

6.11.1.7 Dead load from a floor system, second level wall, and second level roof system will increase the capacity of the wall considerably.

6.11.1.8 **Figure 12** shows the basic load diagram used for analyzing walls with out-of-plane loads.

6.11.1.9 The variables shown in **Figure 12** are defined as follows:

q_w = applied wind load (psf)

e = eccentricity of axial load (in)

H = effective height of wall (in)

t = overall width of CMU unit (in)

W = self-weight of wall (lb)

P_{ps} = pre-stressing force (lb)

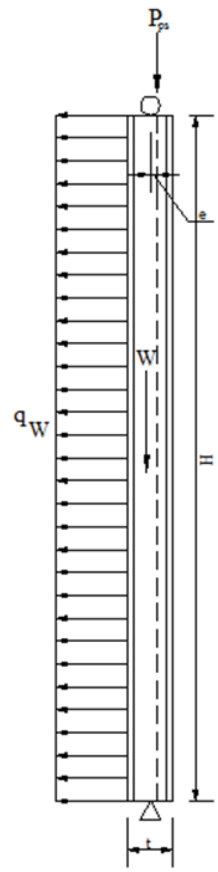

Figure 12. Free Body Diagram of Wall Subject to Out-of-Plane Loads

6.12 *Axial Compression, Flexure and Combined Axial Compression and Flexure Considerations for Out-of-Plane Loads for the Building Designer*

6.12.1 The design for combined axial compression and flexure, due to out-of-plane loads, shall follow the same provisions as given for combined axial compression and flexure, due to in-plane loads, in **Section 6.9**.

6.12.2 The QuickTie cable force for design, P_{ps}, shall be fifty percent (50%) of the nominal cable strength to account for losses in the pre-stress force.

6.12.3 The cable pre-stress force shall be considered as an axial load and added to the self-weight of the wall to calculate the compressive stress in the masonry, f_a.

6.12.4 Additional axial dead load from a floor system, second level wall, and second level roof cannot be considered except as provided in **Section 6.10.1**.

6.13 *Shear Considerations for Out-of-plane Loads for the Building Designer*

6.13.1 The design for shear due to out-of-plane loads shall follow the same provisions as given for shear, due to in plane loads, in Section **6.8** of this report.

6.14 *Top Plate Design*

6.14.1 The wood top plate assembly is comprised of a pressure treated bottom member and an untreated top member connected with 10d fasteners at 12" o.c. The assembly is considered an independent component subject to uplift and lateral wind loads in addition to compressive forces from the QuickTie cable. The top plate is secured to the masonry by way of friction and compressive bearing at the QuickTie cable.

6.14.2 *Top Plate Bending:*

6.14.2.1 Top plate bending was analyzed considering bending from loads in one direction, as well as combined bending and axial load from loads in more than one direction.

6.14.2.2 The top plate assembly shall be designed as a two-span continuous beam.

6.14.2.3 The top plate shall be designed based on the NDS, with all applicable adjustment factors given in NDS Table 4.3.1.

6.14.2.4 A load duration factor, C_D, of 1.6 shall be used for the load combinations containing wind loads.

6.14.2.5 The free body diagram of a two-span double 2x8 top plate is shown in **Figure 13**.

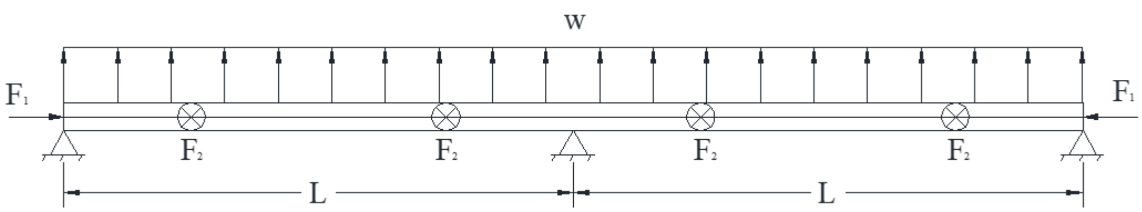

Figure 13. Free Body Diagram of Top Plate

6.14.2.6 For uplift loading due to wind, the top plate can be considered pin-supported at each post-tensioning QuickTie cable location.

6.14.2.7 The QuickTie cables are commonly spaced 2', 4', 6' and 8' o.c., but other cable spacings may be used depending on the loading conditions.

6.14.2.8 In most residential applications, second-order effects can be deemed negligible and therefore, will be neglected in the combined bending and axial equations. Thus, the unity equations from NDS Section 3.3 and Section 3.9 are presented as follows:

$$\frac{f_b}{F'_b} \leq 1.0$$

$$\left(\frac{f_b}{F'_b} + \left(\frac{f_a}{F'_a}\right)^2\right) \leq 1.0$$

6.14.2.9 For the two-span beam shown in **Figure 13**, the maximum bending stress occurs at the center support and is governed by the case where both spans are loaded. Using the principles of mechanics, the maximum bending stress can be calculated as:

$$f_b = \frac{M_{max}}{S} = \frac{wL^2}{8S}$$

Where:

w = uniform uplift load (plf)

S = section modulus of top plate (in^3)

L = spacing between QuickTie cables (ft)

6.14.2.10 By substituting the maximum bending stress into the unity equations and rearranging, the allowable QuickTie cable spacing for a given wind uplift load can be calculated as the minimum distance from the following two equations:

$$L \le \sqrt{\frac{8 \cdot F'_b \cdot S}{w}}$$

$$L \le \sqrt{\left[(1) - \left(\frac{f_a}{F'_a}\right)^2\right] * \frac{8 \cdot F'_b \cdot S}{w}}$$

6.14.3 *Top Plate Shear:*

6.14.3.1 The top plate assembly shear capacity shall be limited to friction resistance developed from the post tension compression provided by the QuickTie cables.

6.14.3.2 Shear friction shall be based on a shear friction coefficient of 0.4 between wood and masonry.

6.14.3.3 Shear friction shall be separately analyzed for combined loading from both in and out-of-plane wind loads simultaneously.

6.14.3.4 The failure state is limited to a maximum friction load to not allow slip that would impose additional tension load on post-tensioning QuickTie cables.

6.14.3.5 Both F_1 (in-plane axial loads due to diaphragm chord forces) and F_2 (out-of-plane point loads, typically due to horizontal loading of roof or floor trusses) loads shall be considered.

6.14.3.6 The unity equation for shear load shall be as follows:

$$\left(\frac{F_1}{F_v} + \frac{F_2}{F_v}\right) \le 1.0$$

6.14.3.7 The allowable shear force, F_v, is calculated as the shear friction coefficient of 0.4 multiplied by the allowable tensile force in the QuickTie cable, T_{QT}, as follows:

$$F_v = 0.4 \cdot T_{QT}$$

6.14.3.8 By combining the two equations above, the allowable F_1 load for a given F_2 load can be calculated for each QuickTie cable as follows:

$$F_1 \le 0.4T_{QT} - F_2$$

6.14.4 *Top Plate Deflection:*

6.14.4.1 The top plate assembly vertical deflection shall be limited to 0.25".

6.14.4.2 Top plate assembly deflection shall be analyzed considering two continuous spans over pin supports with only one span loaded by a uniform uplift load.

6.14.4.3 The allowable uplift load can be calculated using the following equation:

$$w = \frac{\Delta_{\max} EI}{0.0092L^4}$$

Where:

Δ_{max} = 0.25" at 0.472L from the first support

6.14.5 *Top Plate Bearing:*

6.14.5.1 Plate washers have been sized to prevent crushing of Southern Pine top plates.

6.14.5.2 If other material is used, a bearing failure analysis shall be performed, to verify the QTS plate washer does not cause top plate crushing.

6.15 *General Top Plate Considerations for the Building Designer*

6.15.1 Roof-to-wall connectors should be selected so as to attach to both top plate members.

6.15.2 Connectors may be installed on the inside or outside face of the wall.

6.15.3 The effects of chord tension shall be assessed by the RDP responsible for the design of the building to determine whether to include as part of the evaluation.

6.16 Where the application falls outside of the performance evaluation, conditions of use and/or installation requirements set forth herein, alternative techniques shall be permitted in accordance with accepted engineering practice and experience. This includes but is not limited to the following areas of engineering: mechanics or materials, structural, building science, and fire science.

7 Certified Performance[xxiv]

7.1 All construction methods shall conform to accepted engineering practices to ensure durable, livable, and safe construction and shall demonstrate acceptable workmanship reflecting journeyman quality of work of the various trades.[xxv]

7.2 The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur.[xxvi]

8 Regulatory Evaluation and Accepted Engineering Practice

8.1 QTS comply with the following legislatively adopted regulations and/or accepted engineering practice for the following reasons:

8.1.1 This report examines the QTS for the following:

8.1.1.1 Structural performance of post-tensioned masonry walls under axial, shear and flexural load conditions.

8.1.1.2 Compliance with the building codes and standards listed in **Section 4**.

8.1.1.3 Compliance for use in buildings assigned to Seismic Design Categories (SDC) A through F.

8.1.1.4 Compliance for use in buildings located where the maximum design wind speed is not more than 170 mph in accordance with ASCE 7-05, and not more than 215 mph in accordance with ASCE 7-10 and ASCE 7-22.

8.1.1.4.1 Use of the QTS for masonry columns, beams and lintels are outside the scope of this report.

8.2 Any building code, regulation, and/or accepted engineering evaluations (i.e., research reports, Duly Authenticated Reports, etc.) that are conducted for this Listing were performed by DrJ Engineering, LLC (DrJ), an ISO/IEC 17065 accredited certification body and a professional engineering company operated by RDP/approved sources. DrJ is qualified[xxvii] to practice product and regulatory compliance services within its scope of accreditation and engineering expertise, respectively.

8.3 Engineering evaluations are conducted with DrJ's ANAB accredited ICS code scope of expertise, which are also its areas of professional engineering competence.

8.4 Any regulation specific issues not addressed in this section are outside the scope of this report.

9 Installation

9.1 Installation shall comply with the approved construction documents, the manufacturer installation instructions, this report and the applicable building code.

9.2 In the event of a conflict between the manufacturer installation instructions and this report, the more restrictive shall govern.

9.3 A copy of the manufacturer published installation instructions shall be available at all times on the jobsite during installation.

9.4 The QuickTie cables shall be laterally restrained where required. The method of providing lateral restraint is the responsibility of the installer, unless a method is specified by the RDP.

9.5 The QuickTie cables shall be installed at the center of the wood top plate $\pm^{3}/_{16}$".

9.6 A QuickTie cable shall be located a maximum of 12" from each end of the wall. This allows the cable not to be placed in the corner void to allow better access for epoxying the cable to the foundation and prevents interference with roof framing members at the top plate.

9.7 For walls with more than two (2) QuickTie cables, the QuickTie cables shall be evenly spaced except where multiple cables are required at one location for hold-down or other load-requirement applications

9.8 The QuickTie cable spacing shall be symmetric about the wall or as close to symmetric as possible.

9.9 QuickTie cables shall be tightened to seventy percent (70%) of the nominal cable strength at the time of installation.

9.10 *Installation Procedure*

9.10.1 *Primary Connection – Anchor Bolt Cast in Place:*

9.10.1.1 Lay out anchor bolt locator brackets according to spacing specified in building design prior to forming foundation. Tack into place on form boards and insert anchor bolt and coupler through the bracket (**Figure 14**).

Figure 14. Anchor Bolt Installation

9.10.1.2 Fill foundation forms with concrete and let set. Continue down the foundation line (**Figure 15**).

Figure 15. Fill Foundation Forms Around the Anchor Bolts

9.10.1.3 Once foundation concrete is set, lay CMU block wall in a running bond pattern. For the first course, place CMU with openings at each QuickTie cable location (**Figure 16**).

Figure 16. Place CMU with Openings at QuickTie Anchor Bolt Locations

9.10.1.4 Once all walls of the structure are erected and set, install the double top plates using a minimum splice of $7^{1}/_{4}$" with twelve (12) 3" x 0.131" nails at the joint (4 rows of 3) and at 12" o.c. down both sides of the length of the double top plate (**Figure 17**).

Figure 17. Installation of the Double Top Plate

9.10.1.5 Once the double top plates are set and nailed, locate holes for drilling above each anchor bolt in the foundation (**Figure 18**).

Figure 18. Drill a Hole Above Each Anchor Bolt

9.10.1.6 After all holes have been drilled in top plates around the perimeter of the structure, feed the correct QTS cable down through the hole and CMU block to the bottom of the wall at each anchor location at the foundation (**Figure 19**). Ensure the bottom of the cable has 1" of thread and the top has the steel plate washer with nut.

Figure 19. Feed the QTS Cable through the Hole to the Anchor Bolt

9.10.1.7 Connect the bottom of the cable within the wall to the anchor bolt using the mechanical coupling (**Figure 20**).

Figure 20. Connecting the Cable to the Anchor Bolt

9.10.1.8 Tighten the bolt on the top plates to take out the slack in the cable but do not overtighten (**Figure 21**).

Figure 21. Tighten the Bolt on the Top Plate to Remove the Slack from the Cable

9.10.1.9 Tension the cables to the specified load using an air compressor and tensioning bridge (**Figure 22**).

Figure 22. Tension the Cables to the Specified Load

9.10.2 *Alternative Connection – Epoxy:*

9.10.2.1 Lay out anchor bolt locator brackets according to spacing specified in building design prior to forming foundation. Tack into place on form boards and insert anchor bolt and coupler through the bracket (**Figure 23**).

Figure 23. Layout Anchor Brackets and Install Bolts with Proper Spacing

9.10.2.2 Fill foundation forms with concrete and let set. Continue down the foundation line (**Figure 24**).

Figure 24. Fill Foundation Forms with Concrete

9.10.2.3 Once the foundation concrete has set, back out the anchor, ensuring the hole is free of debris, and cap the hole (**Figure 25**).

Figure 25. Backing out the Anchor Bolt and Capping the Hole

9.10.2.4 Once foundation concrete is set, lay CMU block wall in a running bond pattern. For the first course, place CMU with openings at each QuickTie cable location (**Figure 26**).

Figure 26. Orient CMU with Openings at Each Cable Location

9.10.2.5 Once all walls of the structure are erected and set, install the double top plates using a minimum splice of $7^1/_4$" with twelve (12) 3" x 0.131" nails at the joint (4 rows of 3) and at 12" o.c. down both sides of the length of the double top plate (**Figure 27**).

Figure 27. Install Double Top Plate

9.10.2.6 Once the double top plates are set and nailed, locate holes for drilling above each anchor bolt in the foundation (**Figure 28**).

Figure 28. Drill a Hole above each Anchor Bolt

9.10.2.7 After all holes have been drilled in top plates around the perimeter of the structure, feed the correct QTS cable down through the hole and CMU block to the bottom of the wall at each anchor location at the foundation. Ensure the bottom of the cable has the longer threaded length (QTG and QTB cables have the same threaded length on both ends) and the top has the steel plate washer with nut (**Figure 29**).

Figure 29. Feed each Cable through the Holes

9.10.2.8 Uncap the anchor hole in the foundation, ensuring it is still free of debris, and fill with epoxy. Insert the bottom of the cable into the hole. The entire threaded portion shall be buried in epoxy (**Figure 30**).

Figure 30. Fill the Anchor Hole with Epoxy

9.10.2.9 Once epoxy is set, tighten the bolt on the top plates to take out the slack in the cable; do not overtighten (**Figure 31**).


Figure 31. Tighten the Cables once the Epoxy has Set

9.10.3 Grout placement shall be per TMS 402 Specification Section 3.5.

9.10.4 Tension the cables to the specified load using an air compressor and tensioning bridge (**Figure 32**).


Figure 32. Tension the Cables to the Specified Load

10 Substantiating Data

10.1 Testing has been performed under the supervision of a professional engineer and/or under the requirements of ISO/IEC 17025 as follows:

10.1.1 Data from the following test reports were used to verify the engineering calculations:

10.1.1.1 Test Report for Evaluation of QuickTie (QT) System and Quick Connectors for QT Assembly's Tension Load Strength and Elongation Properties (Pre-load and 30+ Day Relaxation), an ISO/IEC 17025 accredited testing laboratory under contract with Qualtim, Inc

10.1.1.2 Test Report for Evaluation of QuickTie (QT) System and Quick Connectors for QT Assembly's Tension Load Strength and Elongation Properties (Lateral Loads after 30+ Day Relaxation), an ISO/IEC 17025 accredited testing laboratory under contract with Qualtim, Inc

10.1.1.3 Evaluation of the QuickTie System (QT) for Tensile Testing of Wire, an ISO/IEC 17025 accredited testing laboratory under contract with Qualtim, Inc

10.1.2 Engineering calculations, prepared by DrJ Engineering:

10.1.2.1 Calculations on the QuickTie System (QTS) Allowable Design Load QTB(X) Blue $^{3}/_{16}$" Diameter

10.1.2.2 Calculations on the QuickTie System (QTS) Allowable Design Load QTG(X) Green $^{1}/_{4}$" Diameter

10.1.2.3 Calculations on the QuickTie System (QTS) Allowable Design Load QTO(X) Orange $^{5}/_{16}$" Diameter

10.1.2.4 Calculations on the QuickTie System (QTS) Allowable Design Load QTR(X) Red $^{3}/_{8}$" Diameter

10.2 Information contained herein may include the result of testing and/or data analysis by sources that are approved agencies, approved sources, and/or RDPs. Accuracy of external test data and resulting analysis is relied upon.

10.3 Where pertinent, testing and/or engineering analysis are based upon provisions that have been codified into law through state or local adoption of regulations and standards. The developers of these regulations and standards are responsible for the reliability of published content. DrJ's engineering practice may use a regulation-adopted provision as the control. A regulation-endorsed control versus a simulation of the conditions of application to occur establishes a new material as being equivalent to the regulatory provision in terms of quality, strength, effectiveness, fire resistance, durability, and safety.

10.4 The accuracy of the provisions provided herein may be reliant upon the published properties of raw materials, which are defined by the grade mark, grade stamp, mill certificate, or Duly Authenticated Reports from approved agencies and/or approved sources provided by the supplier. These are presumed to be minimum properties and relied upon to be accurate. The reliability of DrJ's engineering practice, as contained in this Duly Authenticated Report, may be dependent upon published design properties by others.

10.5 Testing and engineering analysis: The strength, rigidity, and/or general performance of component parts and/or the integrated structure are determined by suitable tests that simulate the actual conditions of application that occur and/or by accepted engineering practice and experience.[xxviii]

10.6 Where additional condition of use and/or regulatory compliance information is required, please search for QTS on the DrJ Certification website.

11 Findings

11.1 As outlined in **Section 6**, QTS have performance characteristics that were tested and/or meet applicable regulations and are suitable for use pursuant to its specified purpose.

11.2 When used and installed in accordance with this Duly Authenticated Report and the manufacturer installation instructions, QTS shall be approved for the following applications:

11.2.1 Data and engineering analysis review has found that the QTS, as described in this report, conform to that specified in the code references listed in **Section 4**.

11.2.2 QTS is approved for use where the maximum design wind speed is not more than 170 mph in accordance with ASCE 7-05, and not more than 215 mph in accordance with ASCE 7-10 and ASCE 7-22.

11.3 Unless exempt by state statute, when QTS are to be used as a structural and/or building envelope component in the design of a specific building, the design shall be performed by an RDP.

11.4 Any application specific issues not addressed herein can be engineered by an RDP. Assistance with engineering is available from QuickTie™ Products, Inc.

11.5 IBC Section 104.11 (IRC Section R104.11 and IFC Section 104.10[xxix] are similar) in pertinent part states:

> **104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons the alternative was not approved.

11.6 **Approved**:[xxx] Building regulations require that the building official shall accept Duly Authenticated Reports.[xxxi]

11.6.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited.

11.6.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce.

11.6.3 Federal law, Title 18 US Code Section 242, requires that where the alternative product, material, service, design, assembly, and/or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved. Denial without written reason deprives a protected right to free and fair competition in the marketplace.

11.7 DrJ is a licensed engineering company, employs licensed RDPs and is an ANAB-Accredited Product Certification Body – Accreditation #1131.

11.8 Through the IAF Multilateral Agreements (MLA), this Duly Authenticated Report can be used to obtain product approval in any jurisdiction or country because all ANAB ISO/IEC 17065 Duly Authenticated Reports are equivalent.[xxxii]

12 Conditions of Use

12.1 Material properties shall not fall outside the boundaries defined in **Section 6**.

12.2 As defined in **Section 6**, where material and/or engineering mechanics properties are created for load resisting design purposes, the resistance to the applied load shall not exceed the ability of the defined properties to resist those loads using the principles of accepted engineering practice.

12.3 Calculations showing compliance with this report must be submitted to the code official. The calculations must be prepared by an RDP.

12.4 The conditions within this report are applicable to SDC A through F. For SDC C and higher, the shear walls must meet additional detailing provisions as described in ACI 530, which includes specially reinforced pre-stressed masonry shear walls with minimum amounts of rebar and full or partial grouting of the cells of the masonry wall to insure the intended level of inelastic ductility is provided.

12.5 Design loads on the QTS are determined based on the most critical load combination resulting from the load combinations in IBC Section 1605.2.[xxxiii]

12.6 Loads applied shall not exceed those recommended by the manufacturer as defined in this report.

12.7 Structural framing members (i.e., wood, masonry, concrete, steel, etc.) connected with the QTS and Quick Connectors shall be designed in accordance with the requirements of their specific design standards/specifications as referenced in the building code adopted by the jurisdiction in which the project is to be constructed.

12.8 Each QTS shipment shall contain the manufacturer installation instructions. A copy of the installation instructions must be available at the jobsite at all times during installation.

12.9 The QTS shall be installed by contractors trained and certified by QuickTie Products, Inc.

12.10 Each QTS that is exposed directly to weather, or subject to salt corrosion in coastal areas, as determined by the local building official, shall be protected in accordance with the building code adopted by the jurisdiction in which the project is to be constructed.

12.11 When required by adopted legislation and enforced by the building official, also known as the authority having jurisdiction (AHJ) in which the project is to be constructed:

12.11.1 Any calculations incorporated into the construction documents shall conform to accepted engineering practice and, when prepared by an approved source, shall be approved when signed and sealed.

12.11.2 This report and the installation instructions shall be submitted at the time of permit application.

12.11.3 These innovative products have an internal quality control program and a third-party quality assurance program.

12.11.4 At a minimum, these innovative products shall be installed per **Section 9** of this report.

12.11.5 The review of this report by the AHJ shall comply with IBC Section 104 and IBC Section 105.4.

12.11.6 These innovative products have an internal quality control program and a third party quality assurance program in accordance with IBC Section 104.4, IBC Section 110.4, IBC Section 1703, IRC Section R104.4, and IRC Section R109.2.

12.11.7 The application of these innovative products in the context of this report is dependent upon the accuracy of the construction documents, implementation of installation instructions, inspection as required by IBC Section 110.3, IRC Section R109.2, and any other regulatory requirements that may apply.

12.12 The approval of this report by the AHJ shall comply with IBC Section 1707.1, where legislation states in part, "*the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new material or assemblies as provided for in Section 104.11*," all of IBC Section 104, and IBC Section 105.4.

12.13 Design loads shall be determined in accordance with the regulations adopted by the jurisdiction in which the project is to be constructed and/or by the building designer (i.e., owner or RDP).

12.14 The actual design, suitability, and use of this report for any particular building, is the responsibility of the owner or the authorized agent of the owner.

13 Identification

13.1 The innovative products listed in **Section 1.1** are identified by a label on the board or packaging material bearing the manufacturer name, product name, this report number, and other information to confirm code compliance.

13.2 Additional technical information can be found at www.quicktieproducts.com.

14 Review Schedule

14.1 This report is subject to periodic review and revision. For the latest version, visit drjcertification.org.

14.2 For information on the status of this report, please contact DrJ Certification.

15 Approved for Use Pursuant to U.S. and International Legislation Defined in Appendix A

15.1 QuickTie System (QTS) are included in this report published by an approved agency that is concerned with evaluation of products or services, maintains periodic inspection of the production of listed materials or periodic evaluation of services. This report states either that the material, product, or service meets recognized standards or has been tested and found suitable for a specified purpose. This report meets the legislative intent and definition of being acceptable to the AHJ.

Appendix A

1 Legislation that Authorizes AHJ Approval

1.1 **Fair Competition**: State legislatures have adopted Federal regulations for the examination and approval of building code referenced and alternative products, materials, designs, services, assemblies, and/or methods of construction that:

1.1.1 Advance innovation,

1.1.2 Promote competition so all businesses have the opportunity to compete on price and quality in an open market on a level playing field unhampered by anticompetitive constraints, and

1.1.3 Benefit consumers through lower prices, better quality, and greater choice.

1.2 **Adopted Legislation**: The following local, state, and federal regulations affirmatively authorize these innovative products to be approved by AHJs, delegates of building departments, and/or delegates of an agency of the federal government:

1.2.1 Interstate commerce is governed by the Federal Department of Justice to encourage the use of innovative products, materials, designs, services, assemblies, and/or methods of construction. The goal is to "*protect economic freedom and opportunity by promoting free and fair competition in the marketplace*."

1.2.2 Title 18 US Code Section 242 affirms and regulates the right of individuals and businesses to freely and fairly have new products, materials, designs, services, assemblies, and/or methods of construction approved for use in commerce. Disapproval of alternatives shall be based upon non-conformance with respect to specific provisions of adopted legislation and shall be provided in writing stating the reasons why the alternative was not approved, with reference to the specific legislation violated.

1.2.3 The federal government and each state have a public records act. In addition, each state also has legislation that mimics the federal Defend Trade Secrets Act 2016 (DTSA),[xxxiv] where providing test reports, engineering analysis and/or other related IP/TS is subject to prison of not more than ten years[xxxv] and/or a $5,000,000 fine or 3 times the value of[xxxvi] the Intellectual Property (IP) and Trade Secrets (TS).

1.2.3.1 Compliance with public records and trade secret legislation requires approval through the use of Listings, certified reports, Technical Evaluation Reports, Duly Authenticated Reports, and/or research reports prepared by approved agencies and/or approved sources.

1.2.4 For new materials[xxxvii] that are not specifically provided for in any regulation, the design strengths and permissible stresses shall be established by tests, where suitable load tests simulate the actual loads and conditions of application that occur.

1.2.5 The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design using accepted engineering practice.[xxxviii]

1.2.6 The commerce of approved sources (i.e., registered PEs) is regulated by professional engineering legislation. Professional engineering commerce shall always be approved by AHJs, except where there is evidence provided in writing, that specific legislation have been violated by an individual registered PE.

1.2.7 The AHJ shall accept Duly Authenticated Reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in IBC Section 104.11.[xxxix]

1.3 **Approved**[xl] **by Los Angeles**: The Los Angeles Municipal Code (LAMC) states in pertinent part that the provisions of LAMC are not intended to prevent the use of any material, device, or method of construction not specifically prescribed by LAMC. The Department shall use Part III, Recognized Standards in addition to Part II, Uniform Building Code Standards of Division 35, Article 1, Chapter IX of the LAMC in evaluation of products for approval where such standard exists for the product or the material and may use other approved standards that apply. Whenever tests or certificates of any material or fabricated assembly are required by Chapter IX of the LAMC, such tests or certification shall be made by a testing agency approved by the Superintendent of Building to conduct such tests or provide such certifications. The testing agency shall publish the scope and limitation(s) of the listed material or fabricated assembly.[xli] The Superintendent of Building Approved Testing Agency Roster is provided by the Los Angeles Department of Building and Safety (LADBS). The Center for Building Innovation (CBI) Certificate of Approval License is TA24945. Tests and certifications found in a DrJ Listing are LAMC approved. In addition, the Superintendent of Building shall accept Duly Authenticated Reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the California Building Code (CBC) Section 1707.1.[xlii]

1.4 **Approved by Chicago**: The Municipal Code of Chicago (MCC) states in pertinent part that an Approved Agency is a Nationally Recognized Testing Laboratory (NRTL) acting within its recognized scope and/or a certification body accredited by the American National Standards Institute (ANSI) acting within its accredited scope. Construction materials and test procedures shall conform to the applicable standards listed in the MCC. Sufficient technical data shall be submitted to the building official to substantiate the proposed use of any product, material, service, design, assembly, and/or method of construction not specifically provided for in the MCC. This technical data shall consist of research reports from approved sources (i.e., MCC defined Approved Agencies).

1.5 **Approved by New York City**: The 2022 NYC Building Code (NYCBC) states in part that an approved agency shall be deemed[xliii] an approved testing agency via ISO/IEC 17025 accreditation, an approved inspection agency via ISO/IEC 17020 accreditation, and an approved product evaluation agency via ISO/IEC 17065 accreditation. Accrediting agencies, other than federal agencies, must be members of an internationally recognized cooperation of laboratory and inspection accreditation bodies subject to a mutual recognition agreement[xliv] (i.e., ANAB, International Accreditation Forum [IAF], etc.).

1.6 **Approved by Florida**: Statewide approval of products, methods, or systems of construction shall be approved, without further evaluation by:

1.6.1 A certification mark or listing of an approved certification agency,

1.6.2 A test report from an approved testing laboratory,

1.6.3 A product evaluation report based upon testing or comparative or rational analysis, or a combination thereof, from an approved product evaluation entity, or

1.6.4 A product evaluation report based upon testing, comparative or rational analysis, or a combination thereof, developed, signed and sealed by a professional engineer or architect, licensed in Florida.

1.6.5 For local product approval, products or systems of construction shall demonstrate compliance with the structural wind load requirements of the Florida Building Code (FBC) through one of the following methods:

1.6.5.1 A certification mark, listing or label from a commission-approved certification agency indicating that the product complies with the code,

1.6.5.2 A test report from a commission-approved testing laboratory indicating that the product tested complies with the code,

1.6.5.3 A product-evaluation report based upon testing, comparative or rational analysis, or a combination thereof, from a commission-approved product evaluation entity which indicates that the product evaluated complies with the code, 1.6.5.4 A product-evaluation report or certification based upon testing or comparative or rational analysis, or a combination thereof, developed and signed and sealed by a Florida professional engineer or Florida registered architect, which indicates that the product complies with the code, or

1.6.5.5 A statewide product approval issued by the Florida Building Commission.

1.6.6 The Florida Department of Business and Professional Regulation (DBPR) website provides a listing of companies certified as a Product Evaluation Agency (i.e., EVLMiami 13692), a Product Certification Agency (i.e., CER10642), and as a Florida Registered Engineer (i.e., ANE13741).

1.7 **Approved by Miami-Dade County (i.e., Notice of Acceptance [NOA])**: A Florida statewide approval is an NOA. An NOA is a Florida local product approval. By Florida law, Miami-Dade County shall accept the statewide and local Florida Product Approval as provided for in Florida legislation 553.842 and 553.8425.

1.8 **Approved by New Jersey**: Pursuant to the 2018 Building Code of New Jersey in IBC Section 1707.1 General,[xlv] it states: "*In the absence of approved rules or other approved standards, the building official shall accept duly authenticated reports from approved agencies in respect to the quality and manner of use of new materials or assemblies as provided for in the administrative provisions of the Uniform Construction Code (N.J.A.C. 5:23)*".[xlvi] Furthermore N.J.A.C 5:23-3.7 states: "*Municipal approvals of alternative materials, equipment, or methods of construction*."

1.8.1 **Approvals**: Alternative materials, equipment, or methods of construction shall be approved by the appropriate subcode official provided the proposed design is satisfactory and that the materials, equipment, or methods of construction are suitable for the intended use and are at least the equivalent in quality, strength, effectiveness, fire resistance, durability, and safety of those conforming with the requirements of the regulations.

1.8.1.1 A field evaluation label and report or letter issued by a nationally recognized testing laboratory verifying that the specific material, equipment, or method of construction meets the identified standards or has been tested and found to be suitable for the intended use, shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.8.1.2 Reports of engineering findings issued by nationally recognized evaluation service programs such as but not limited to, the Building Officials and Code Administrators (BOCA), the International Conference of Building Officials (ICBO), the Southern Building Code Congress International (SBCCI), the International Code Council (ICC), and the National Evaluation Service, Inc., shall be accepted by the appropriate subcode official as meeting the requirements of the above.

1.8.2 The New Jersey Department of Community Affairs has confirmed that technical evaluation reports, from any accredited entity listed by ANAB, meets the requirements of item the previous paragraph, given that the listed entities are no longer in existence and/or do not provide "*reports of engineering findings*."

1.9 **Approved by the Code of Federal Regulations Manufactured Home Construction and Safety Standards**: Pursuant to Title 24, Subtitle B, Chapter XX, Part 3282.14[xlvii] and Part 3280,[xlviii] the Department encourages innovation and the use of new technology in manufactured homes. The design and construction of a manufactured home shall conform to the provisions of Part 3282 and Part 3280 where key approval provisions in mandatory language follow:

1.9.1 "*All construction methods shall be in conformance with accepted engineering practices*."

1.9.2 "*The strength and rigidity of the component parts and/or the integrated structure shall be determined by engineering analysis or by suitable load tests to simulate the actual loads and conditions of application that occur*."

1.9.3 "*The design stresses of all materials shall conform to accepted engineering practice*."

1.10 **Approval by US, Local and State Jurisdictions in General**: In all other local and state jurisdictions, the adopted building code legislation states in pertinent part that:

1.10.1 For new materials that are not specifically provided for in this code, the design strengths and permissible stresses shall be established by tests.[xlix]

1.10.2 For innovative alternatives and/or methods of construction, the building official shall accept Duly Authenticated Reports from approved agencies with respect to the quality and manner of use of new materials or assemblies.[l]

1.10.2.1 An approved agency is "approved" when it is ANAB ISO/IEC 17065 accredited. DrJ Engineering, LLC (DrJ) is in the ANAB directory.

1.10.2.2 An approved source is "approved" when an RDP is properly licensed to transact engineering commerce. The regulatory authority governing approved sources is the state legislature via its professional engineering regulations.[li]

1.10.3 The design strengths and permissible stresses of any structural material…shall conform to the specifications and methods of design of accepted engineering practice performed by an approved source.[lii]

1.11 **Approval by International Jurisdictions**: The USMCA and GATT agreements provide for approval of innovative materials, designs, services, and/or methods of construction through the Agreement on Technical Barriers to Trade and the IAF Multilateral Recognition Arrangement (MLA), where these agreements:

1.11.1 State that conformity assessment procedures (i.e., ISO/IEC 17020, 17025, 17065, etc.) are prepared, adopted, and applied so as to grant access for suppliers of like products originating in the territories of other Members under conditions no less favourable than those accorded to suppliers of like products of national origin or originating in any other country, in a comparable situation.

1.11.2 **Approved**: The purpose of the MLA is to ensure mutual recognition of accredited certification and validation/verification statements between signatories to the MLA and subsequently, acceptance of accredited certification and validation/verification statements in many markets based on one accreditation for the timely approval of innovative materials, designs, services, and/or methods of construction.

1.11.3 ANAB is an IAF-MLA signatory where recognition of certificates, validation, and verification statements issued by conformity assessment bodies accredited by all other signatories of the IAF MLA, with the appropriate scope, shall be approved.[liii]

1.11.4 Therefore, all ANAB ISO/IEC 17065 Duly Authenticated Reports are approval equivalent.[liv]

1.12 Approval equity is a fundamental commercial and legal principle.[lv]

Issue Date: January 7, 2021
Subject to Renewal: April 1, 2026

FBC Supplement to Report Number 1404-06

REPORT HOLDER: QuickTie™ Products, Inc.

1 Evaluation Subject

1.1 QuickTie System (QTS)

2 Purpose and Scope

2.1 Purpose

2.1.1 The purpose of this Report Supplement is to show QTS, recognized in Report Number 1404-06, have also been evaluated for compliance with the codes listed below as adopted by the Florida Building Commission.

2.2 *Applicable Code Editions*

2.2.1 FBC-B—20, 23: Florida Building Code – Building (FL 17106)

2.2.2 *FBC-R—20, 23: Florida Building Code – Residential (FL 17106)*

3 Conclusions

3.1 QTS, described in Report Number 1404-06, comply with the FBC-B and FBC-R and are subject to the conditions of use described in this supplement.

3.2 Where there are variations between the IBC and IRC and the FBC-B and FBC-R applicable to this report, they are listed here:

3.2.1 FBC-B Section 104.4 and Section 110.4 are reserved.

3.2.2 FBC-R Section R104 and Section R109 are reserved.

3.2.3 FBC-B Section 1605.1 replaces IBC Section 1605.1.

3.2.4 FBC-B Section 1605.2 replaces IBC Section 1605.2.

4 Conditions of Use

4.1 QTS, described in Report Number 1404-06, must comply with all of the following conditions:

4.1.1 All applicable sections in Report Number 1404-06.

4.1.2 The design, installation, and inspections are in accordance with additional requirements of FBC-B Chapter 16 and Chapter 17, as applicable.

Notes

i For more information, visit drjcertification.org or call us at 608-310-6748.

ii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1702

iii Alternative Materials, Design and Methods of Construction and Equipment: The provisions of any regulation code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by a regulation. Please review https://www.justice.gov/atr/mission and https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11

iv https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=the%20design%20strengths%20and%20permissible%20stresses%20shall%20be%20established%20by%20tests%20as

v The design strengths and permissible stresses of any structural material shall conform to the specifications and methods of design of accepted engineering practice. https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706:~:text=shall%20conform%20to%20the%20specifications%20and%20methods%20of%20design%20of%20accepted%20engineering%20practice

vi https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies

vii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1703.4.2

viii https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_agency

ix https://up.codes/viewer/wyoming/ibc-2021/chapter/2/definitions#approved_source

x https://www.law.cornell.edu/uscode/text/18/1832 (b) Any organization that commits any offense described in subsection (a) shall be fined not more than the greater of $5,000,000 or 3 times the value of the stolen trade secret to the organization, including expenses for research and design and other costs of reproducing the trade secret that the organization has thereby avoided. The federal government and each state have a public records act. To follow DTSA and comply state public records and trade secret legislation requires approval through ANAB ISO/IEC 17065 accredited certification bodies or approved sources. For more information, please review this website: Intellectual Property and Trade Secrets.

xi https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

xii https://www.cbitest.com/accreditation/

xiii https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104:~:text=to%20enforce%20the%20provisions%20of%20this%20code

xiv https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#104.11:~:text=Where%20the%20alternative%20material%2C%20design%20or%20method%20of%20construction%20is%20not%20approved%2C%20the%20building%20official%20shall%20respond%20in%20writing%2C%20stating%20the%20reasons%20why%20the%20alternative%20was%20not%20approved AND https://up.codes/viewer/colorado/ibc-2021/chapter/1/scope-and-administration#105.3.1:~:text=If%20the%20application%20or%20the%20construction%20documents%20do%20not%20conform%20to%20the%20requirements%20of%20pertinent%20laws%2C%20the%20building%20official%20shall%20reject%20such%20application%20in%20writing%2C%20stating%20the%20reasons%20therefore

xv https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1707.1:~:text=the%20building%20official%20shall%20accept%20duly%20authenticated%20reports%20from%20approved%20agencies%20in%20respect%20to%20the%20quality%20and%20manner%20of%20use%20of%20new%20materials%20or%20assemblies%20as%20provided%20for%20in%20Section%20104.11

xvi https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

xvii True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

xviii https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission

xix Unless otherwise noted, all references in this Listing are from the 2021 version of the codes and the standards referenced therein. This material, product, design, service and/or method of construction also complies with the 2000-2021 versions of the referenced codes and the standards referenced therein.

xx All references to the FBC-B and FBC-R are the same as the 2021 IBC and 2021 IRC unless otherwise noted in the Florida Supplement at the end of this report.

xxi https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#p-3280.2(Listed%20or%20certified); https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#listed AND https://up.codes/viewer/colorado/ibc-2021/chapter/2/definitions#labeled

xxii 2018 IBC Section 1605.3.1

xxiii 2018 IBC Section 1605.3

xxiv https://up.codes/viewer/colorado/ibc-2021/chapter/17/special-inspections-and-tests#1703.4

xxv https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=All%20construction%20methods%20shall%20be%20in%20conformance%20with%20accepted%20engineering%20practices%20to%20insure%20durable%2C%20livable%2C%20and%20safe%20housing%20and%20shall%20demonstrate%20acceptable%20workmanship%20reflecting%20journeyman%20quality%20of%20work%20of%20the%20various%20trades

xxvi https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280#:~:text=The%20strength%20and%20rigidity%20of%20the%20component%20parts%20and/or%20the%20integrated%20structure%20shall%20be%20determined%20by%20engineering%20analysis%20or%20by%20suitable%20load%20tests%20to%20simulate%20the%20actual%20loads%20and%20conditions%20of%20application%20that%20occur

xxvii Qualification is performed by a legislatively defined Accreditation Body. ANSI National Accreditation Board (ANAB) is the largest independent accreditation body in North America and provides services in more than 75 countries. DrJ is an ANAB accredited product certification body.

xxviii See Code of Federal Regulations (CFR) Title 24 Subtitle B Chapter XX Part 3280 for definition.

xxix 2018 IFC Section 104.9

xxx Approved is an adjective that modifies the noun after it. For example, Approved Agency means that the Agency is accepted officially as being suitable in a particular situation. This example conforms to IBC/IRC/IFC Section 201.4 where the building code authorizes sentences to have an ordinarily accepted meaning such as the context implies.

xxxi https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1707.1

xxxii Multilateral approval is true for all ANAB accredited product evaluation agencies and all International Trade Agreements.

xxxiii 2018 IBC Section 1605.3.1

xxxiv http://www.drjengineering.org/AppendixC AND https://www.drjcertification.org/cornell-2016-protection-trade-secrets

xxxv https://www.law.cornell.edu/uscode/text/18/1832#:~:text=imprisoned%20not%20more%20than%2010%20years

xxxvi https://www.law.cornell.edu/uscode/text/18/1832#:~:text=Any%20organization%20that,has%20thereby%20avoided

xxxvii https://up.codes/viewer/wyoming/ibc-2021/chapter/17/special-inspections-and-tests#1706.2

xxxviii IBC 2021, Section 1706.1 Conformance to Standards

xxxix IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General

xl See Section 11 for the distilled building code definition of

Approved

xli Los Angeles Municipal Code, SEC. 98.0503. TESTING AGENCIES

xlii https://up.codes/viewer/california/ca-building-code-2022/chapter/17/special-inspections-and-tests#1707.1

xliii New York City, The Rules of the City of New York, § 101-07 Approved Agencies

xliv New York City, The Rules of the City of New York, § 101-07 Approved Agencies

xlv https://up.codes/viewer/new_jersey/ibc-2018/chapter/17/special-inspections-and-tests#1707.1

xlvi https://www.nj.gov/dca/divisions/codes/codreg/ucc.html

xlvii https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3282/subpart-A/section-3282.14

xlviii https://www.ecfr.gov/current/title-24/subtitle-B/chapter-XX/part-3280

xlix IBC 2021, Section 1706 Design Strengths of Materials, 1706.2 New Materials. Adopted law pursuant to IBC model code language 1706.2.

l IBC 2021, Section 1707 Alternative Test Procedure, 1707.1 General. Adopted law pursuant to IBC model code language 1707.1.

li https://www.nspe.org/resources/issues-and-advocacy/professional-policies-and-position-statements/regulation-professional AND https://apassociation.org/list-of-engineering-boards-in-each-state-archive/

lii IBC 2021, Section 1706 Design Strengths of Materials, Section 1706.1 Conformance to Standards Adopted law pursuant to IBC model code language 1706.1.

liii https://iaf.nu/en/about-iaf-mla/#:~:text=it%20is%20required%20to%20recognise%20certificates%20and%20validation%20and%20verification%20statements%20issued%20by%20conformity%20assessment%20bodies%20accredited%20by%20all%20other%20signatories%20of%20the%20IAF%20MLA%2C%20with%20the%20appropriate%20scope

liv True for all ANAB accredited product evaluation agencies and all International Trade Agreements.

lv https://www.justice.gov/crt/deprivation-rights-under-color-law AND https://www.justice.gov/atr/mission