DUR-O-WAL
BY DAYTON SUPERIOR

BUILDING STRENGTH

MASONRY REPAIR

HANDBOOK

For over six decades, Dur-O-Wal masonry construction products have been used. Many masonry structures built in the early 1900's exist as a testimony to the effectiveness of Dur-O-Wal's product quality and design. Dur-O-Wal's knowledge and experience with the engineering of masonry structures performance, has provided the talent required to create this manual.

The functional aspect of masonry construction are an integral part of its beauty and design longevity. Considerations for the restoring of existing structures require the same diligence as that of a building to be newly constructed.

Years of exposure to natures elements, improved corrosion protective coatings, code changes, and sub-standard quality construction, constitutes a growing need to fortify and preserve existing masonry buildings. For years, Dur-O-Wal has been involved with the science of rehabilitating and refortifying existing buildings. This manual was developed to simplify the designers needs when they are faced with a masonry restoration situation.

Typical masonry restoration can involve any or all of the following:

— Restabilizing or reanchoring an existing veneer.

— Replacing or adding brick to existing structures.

— Improving or adding to the moisture control system within cavity walls.

— Improving the water permeance characteristics of the existing masonry structure.

The contents of this manual will provide the designer products that will accommodate masonry anchoring scenarios. It is by using these products together with Dur-O-Wal, expertise the preservation of our masonry heritage can continue on for generations to come.

Warranty

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Anchor Selection Guide

Dur-O-Wal's years of masonry repair experience has provided a valuable resource in developing a veneer stabilization anchor selection chart. This guide provides a numerical index to assist the designer in selecting an anchoring system suitable to his/her needs.

The charts format is broken down into three basic anchoring fundamentals. One is the Dur-O-Wal repair anchor, which is a totally mechanical anchoring system. Another is the Dur-O-Wal friction pin which utilizes a threaded friction fit connection. And finally, the use of Dur-O-Wal resins for chemically attaching components.

In order to use this as a selection guide, the designer must know the materials to which stabilization is required, and, select any or all of the features most desired for an application. Determine the numeric index number for the feature column. Add both indices, the higher sum for the index is a first choice.

For example: A high rise structure, with significant live loads, brick veneer with block (Hollow) backup.

Using "Live Loads" as our feature benefit – the index provides the following:

Repair Anchor –	brick = 4 block = 4	+	=	total 8
Friction Pin –	brick = 4 block = 2	+	=	total 6
Resin Anchor –	brick = 5 block = 5	+	=	total 10

This section would be – Resin, First Choice Mechanical, Second Choice If we add site "Quality Control" (QC) and "Installed Cost" (IC) as an additional "Feature" requirement, the selection becomes:

		L.L.		**Q/C**		**I.C.**		
Repair Anchor –	brick	4	+	5	+	4	= 13	+ = 25
	block	4	+	5	+	3	= 12	
Friction Pin –	brick	4	+	3	+	5	= 12	+ = 22
	block	2	+	3	+	5	= 10	
Resin Anchor –	brick	5	+	3	+	2	=10	+ = 20
	block	5	+	3	+	2	=10	

The first choice selection is repair anchors, with a total of 25 points, second, would be a friction pin with 22.

If an application was a brick veneer with a wood stud backup, loading is relatively low (a two story structure) and "Installed Cost" was our only feature criteria. The index provides:

		I.C.	
Repair Anchors –	brick wood	= 4 = 3	+ = 7
Friction Pin –	brick wood	= 5 = 4	+ = 9
Resin Anchor –	brick wood	= 2 = 1	+ = 3

This process would provide the first choice as a friction pin, and the second choice – repair anchor.

With this information, the designer should refer to the individual section of the specific anchor type and develop details and specifications for the product.

Anchor Selection Guide*

MATERIALS TO BE ANCHORED		PERFORMANCE REPEATABILITY	QUALITY CONTROL	LIVE LOADS	INSTALLATION EASE	INSTALLED COST	IN-PLANED DUCTILITY	FACADE AESTHETICS	VENEER SEISMIC RETROFIT
DUR-O-WAL REPAIR ANCHOR	Brick	4	5	4	4	4	4	4	Y
	Soft Brick	3	5	4	4	2	3	3	Y
	Hollow Block	4	5	4	4	3	4	1	Y
	Solid Block	5	5	4	4	3	4	4	N
	Concrete	5	5	5	4	3	4	4	N
	Clay Tile	2	5	3	3	2	3	1	N
	Stone	3	5	3	3	3	4	4	N
	Terra Cotta	2	5	3	3	2	3	3	N
	Wood Stud	4	5	5	3	3	3	0	N
	Wood Sheathing	3	5	3	4	4	2	0	N
	Structural Steel	5	5	5	3	2	4	0	N
	Steel Stud	4	5	4	2	2	3	0	N
DUR-O-FLEX FRICTION PIN	Brick	2	3	3	5	5	5	5	N
	Soft Brick	1	3	2	5	5	5	5	N
	Hollow Block	1	3	2	5	5	5	5	N
	Solid Brick	3	3	3	5	5	5	5	N
	Concrete	3	3	4	5	5	5	5	N
	Clay Tile	1	3	2	5	5	4	5	N
	Stone	1	3	2	5	5	5	5	N
	Terra Cotta	2	3	2	5	5	4	5	N
	Wood Stud	3	3	4	5	4	5	0	N
	Wood Sheathing	3	3	3	5	5	4	0	N
	Structural Steel	0	0	0	0	0	0	0	N
	Steel Stud	0	0	0	0	0	0	0	N
DUR-O-PAIR RESIN ANCHOR	Brick	5	3	5	2	2	1	2	Y
	Soft Brick	4	3	4	2	1	1	2	Y
	Hollow Block	4	3	5	2	2	1	1	N
	Solid Block	4	3	5	2	2	1	3	N
	Concrete	5	3	5	2	2	1	4	N
	Clay Tile	5	3	4	4	1	1	2	N
	Stone	4	3	5	2	2	1	2	N
	Terra Cotta	3	3	5	2	1	1	2	N
	Wood Stud	1	3	1	1	1	0	0	N
	Wood Sheathing	1	3	1	1	1	1	0	N
	Structural Steel	0	0	0	0	0	0	0	N
	Steel Stud	0	0	0	0	0	0	0	N

*Created by Dur-O-Wal Engineering, based on years of experience thru application.

WORK SHEET TOTAL

		ANCHOR TYPE					
		DUR-O-WAL REPAIR ANCHOR		DUR-O-WAL FRICTION PIN		DUR-O-WAL RESIN ANCHOR	
		VENEER MATERIAL	BACK-UP MATERIAL	VENEER MATERIAL	BACK-UP MATERIAL	VENEER MATERIAL	BACK-UP MATERIAL
	PERFORMANCE REPEATABILITY						
ANCHORING FEATURE	QUALITY CONTROL						
ANCHORING FEATURE	LIVE LOAD						
ANCHORING FEATURE	INSTALLATION EASE						
ANCHORING FEATURE	INSTALLED COST						
ANCHORING FEATURE	IN-PLANE DUCTILITY						
ANCHORING FEATURE	FACADE AESTHETICS		N/A		N/A		N/A
	VENEER SEISMIC RETROFIT						
		SUM TOTAL	SUM TOTAL	SUM TOTAL	SUM TOTAL	SUM TOTAL	SUM TOTAL
	TOTAL						

1. Insert the appropriate index number from the selection guide chart for the materials to be anchored per the feature you require.
2. Sum the column of features per respective anchor type.
3. Feature totals with the greatest sum provides you with the best solution for your connection.

Veneer Reanchoring Design Considerations
Tension Load vs. Deflection

Besides brick veneers formidable yet warm appearance, it contributes significantly to the rain screen performance of the building. The water tight integrity of the veneer then becomes a very important element to the long term performance of the structure. It is for this reason, most all building codes have adopted requirements for veneer anchoring, ventilation, drainage, intrinsic material properties, etc., to assure quality construction, and moisture control.

Dur-O-Wal has developed many veneer anchoring systems that meet code requirements for new construction. These products are not only concerned with anchoring strength, but also the “stiffness” of the anchor. The stiffness contributes to the veneers ductility restrictions thereby minimizing the deflection of veneers when resisting live loads. Excess veneer movement may cause cracking in the veneer. The designers must consider this requirement in the veneers design.

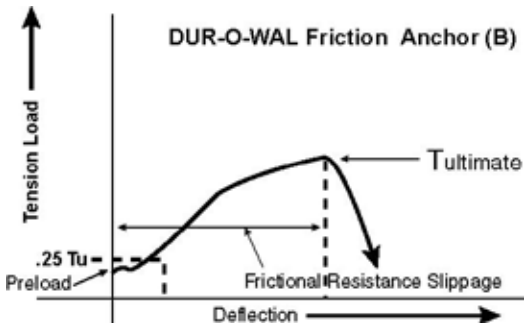
Retrofitting or reanchoring an existing veneer must also consider the relative stiffness requirements of the connecting wythes. The quantity and type of post anchoring techniques are many. This makes the selection process more quantitative, but the end result should comply with performance requirements of the veneer. Whether the anchor is a friction fit, mechanically activated, or an adhesive system, they should be evaluated based on a number of design considerations which have been included in this guide. The load vs. deflection characteristics are also important to review.

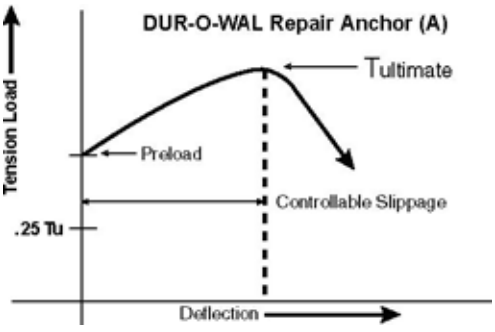
The accompanying charts illustrate “typical” deflection curves indicative of anchoring characteristics as tension loads are applied to various Dur-O-Wal fastener types.

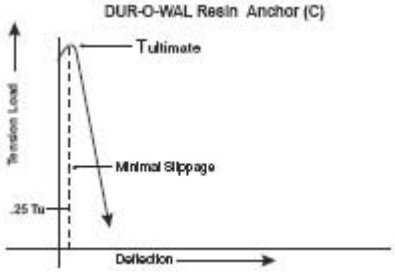
(A) The Dur-O-Wal mechanical systems (Repair Anchors), exhibit a form of stiffness similar to many bolting applications. That is, as torque is applied to activate the anchor, a preload is established. With this style anchor, the safe working load (1/4 the ultimate) is often 1/2 the preload. This value of preload is adjustable and is usually a function of installed torque. As increased tension loading occurs, slip (deflection) occurs after the preload is exceeded. The slippage is gradual and influenced by base material density. The material, steel tensile failures, or excessive slippage. The quality of the anchorage base will also control the failure mechanism.

(B) Friction Pin (dry fix) Anchors are activated as tension loads are applied. Typically, the pins will exhibit a small deflection when exposed to axial loading. This is a “Seating” process whereby the driving motion during installation is reversed as the pullout action is applied. The spiral configuration of the Dur-O-Flex Anchor becomes nested in the threaded configuration created during installation. Load resistance occurs similar to a wood screw in timber. The slip phenomena is influenced significantly by the base material density and quality. The Dur-O-Wal Friction Pin ultimate capacity is a direct function of base material quality, and density. That is, superior quality will provide excellent results. Failure methods are typically slippage and pullout of the anchor with little or no damage to the substrate.

(C) The Dur-O-Wal Resin Anchor System performs via a chemical bond between the anchor rod and base material. There are no preloads or stresses similar to mechanical or friction pins induced with this anchoring system. Tension load is transferred via the bond line created between the base material and anchorage system after the resin is hardened, and fully cured. The slippage under load is typically non-existent. Anchor rod elongation, and/or hardened resin deflection is evidenced prior to failure. Resin Anchors can fail by adhesion failure to base material or rod, bond line shear failure, anchor rod failure, or spalling of the base material.







Description: The Dur-O-Wal Repair Anchor is the closest replication of quality wall ties and anchors used in masonry construction. It is a mechanically activated re-anchoring system that utilizes torque and/or hammer set expansion to create preload within existing wythes of masonry. This style of fastening provides proof positive of anchorage and does not create tension forces between wythe. Anchor components are manufactured of non-corrosive materials, either brass or austenitic stainless steel. They are installed in pre-drilled holes of common sizes located at intersecting mortar joints in masonry facades. Typical installations leave no brick scars, or exposed hardware and are easily concealed by a matching mortar plug. Inspection and quality assurance are easily performed for the independently activated connectors without destroying the integrity of the fasteners.

Product Feature

- Exceeds performance characteristics of standard masonry ties and anchors.
- Unique design allowing independent wythe measurement of pre-load assuring field quality control.
- Engineered to secure wythes in existing position which uniquely inhibits additional lateral tensile loads.
- Installed either inside out or outside in providing minimal disturbance to building envelope.
- Multitude of variations to match specific field conditions with over 15 years of proven experience.
- Satisfies applicable code criteria for updating in sufficient construction practice.
- Environmentally safe – no hazardous material disposal concerns.
- Allows within-plane ductility.
- Seismic retrofit of unreinforced veneers.

Repair Anchor Selection Features – Veneers ≥ 3”
Selection features: The Dur-O-Wal Anchoring system has been tested and evaluated for multiple purposes and situations. As a designer your concerns are:

1) Performance Repeatability: The anchors 360 degrees of contact area, combined with an expansion potential of 125 - 136% of its diameter, create significant gripping action (more than any anchor of its type in the industry) to all base materials regardless of the materials density or porosity. As a result, the performance repeatability is influenced more by building material consistency than anchor design. Its mechanical activation and subsequent preload (clamping force to base material) provides a gage to assure performance. Threaded anchoring connections to wood and metal studs have performance similar to characteristics as self threaded fasteners typically used in these materials.

2) Quality Control: The unique design of the Dur-O-Wal Facade Stabilization Anchor requires the connection to the wythes be made independently. The independently torque controlled installation provides a positive connection between wythes and assures Quality Control via the measurement of torque. The recommended torque installs a preload that guarantees ultimate performance.

3) Live Loads: Test results illustrate significant capacity in different materials, resulting in high factors of safety. This data, incorporated within specifications, and matched to design wind load requirements will optimize spacing of anchors to satisfy code requirement.

4) Installation Ease: Standard hole sizes and simple hand tools provide for efficient installation techniques. Besides installing by hand, specialty installation tools can be used in conjunction with automatic screw guns, thereby, the installation time becomes a matter of seconds.

5) Installed Cost: True installed cost would take into consideration several factors that include but are not limited to anchor cost, drilling time and setting time. The Dur-O-Wal Facade Stabilization Anchor combines standard hole sizes for fast drilling, coupled with a moderately priced anchor that installs quickly.

6) In-Plane Ductility: Normally, all veneers exhibit some form of in-plane movement whether its created by plastic deformation (due to moisture absorption) or elastic elongation as a result of temperature change. A good anchoring system will provide anchorage between wythes and accommodate differential wall movement. The Dur-O-Wal Repair Anchor and Stainless Steel Shaft (which connects the two fasteners) is approximately the size of a standard 3/16 wire tie. Its behavior is similar to wire ties, and using standard jointing details, the dynamic influence of thermal wall movement is not a factor to consider in design. Up to an 1/8” of differential movement can be accommodated.

7) Facade Aesthetics: The final result or any post anchoring system is to avoid scars and hardware exposed on the veneer. Dur-O-Wal Repair Anchors are all concealed at joint locations in the veneer. It is not recommended to drill thru the brick face. This may destroy the rain screen permeance of the veneer and require regular maintenance to keep drilled hole water tight. Dur-O-Wal Repair Anchors are concealed with matching mortar plugs, and hidden form view.

8) Seismic Retrofit: Changing seismic code requirements have necessitated requirements to reinforce existing veneers. Using stainless steel nine gauge wire at 24 inch vertical intervals in the bed joint of an existing veneer, can solve part of the problem. This is accomplished by gringing the hardened mortar out of the joint to approximately 1 1/2 inch depth, and repointing the joint with the wire embedded. However, to fulfill code requirements, the wire reinforcement needs to be engaged to anchorage system for the connecting wythes. The Dur-O-Wal Stabilization Anchor accommodates the code by providing a patented recess that engages the nine gage wire to the tie thereby meeting code.

Selection Charts

REPAIR ANCHOR

STABILIZING VENEERS GREATER & EQUAL TO 3 INCHES THICK

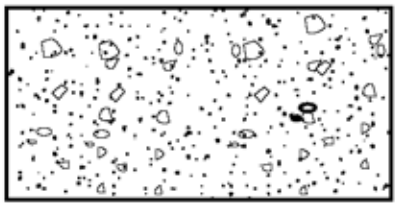
	BACKUP MATERIAL										
VENEER MATERIAL	**BRICK**	**SOFT BRICK**	**HOLLOW BLOCK**	**SOLID BLOCK**	**CONCRETE**	**WOOD STUD**	**STEEL STUD**	**STEEL**	**STONE**	**CLAY TILE**	**WOOD SHEALING**
BRICK	5000 5100 5600 5400	5600	5100 5400	5000 5100 5600 5400	5000 5100 5600 5400	5300	5300 5105	5205	5000 5100 5600 5400	5100 5400	5300
SOFT BRICK	5600 5100	5600	5100 5400	5100 5600	5100	5300 HD 5105	5300 HD	5205	5100 5600	5100	5300 HD
SOLID BRICK	5000 5100 5600	5600	5100 5400	5000 5600 5400 5100	5000 5100 5600 5400	5300	5300 5105	5205	5000 5100 5600 5400	5100 5400	5300
PRECAST	5000 5100 5600	5600	5100 5400	5000 5600 5400 5100	5000 5100 5600 5400	5300	5300 5105	5205	5000 5100 5600 5400	5100 5400	5300 5600
STONE >3" THICK	5000 5100 5600	5600	5100 5400	5000 5600 5400 5100	5000 5100 5600 5400	5300	5300 5105	5205	5000 5100 5600 5400	5100 5400	5300

PANEL ANCHOR

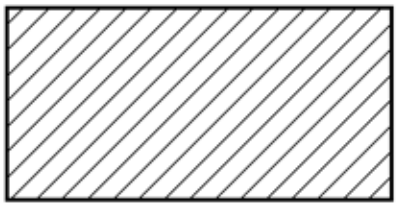
STABILIZING VENEERS LESS THAN 3 INCHES

	BACKUP MATERIAL										
VENEER MATERIAL	**BRICK**	**SOFT BRICK**	**HOLLOW BLOCK**	**SOLID BLOCK**	**CONCRETE**	**WOOD STUD**	**STEEL STUD**	**STEEL**	**STONE**	**CLAY TILE**	**WOOD SHEALING**
HOLLOW BLOCK	6000 6100	6100	6100 6000	6100 6000	6100	6153 6151	6153 6152	6153	6100	6100	6153
STONE <3" RESTRAINT ONLY	6100 6140 5956	6100 5950 6140 6380 6120 6340	6100 6100 TGL 6140 6120 6380 6340	5056 6100	6100 TGL	6153	6153 6153 TGL	6152 6140 6100 TGL	6000 6100 6100 TGL	6100 6252	6153
SUPPORT & RESTRAINT STONE <3"	6100 6140 5950	6100 5950 5956	6100	5950 5056 6100 6100TGL 6140 6380 6120 6340	6100TGL 6100 5950 6140 6120 6380 6340	6153	6153 6153TGL	6152	6000 6100 6140 6100TGL	6100 6152 6100 TGL	6153
TERRA COTA	6100	6100	6100	6100	6100 6100 6140	6153	6153	6152	6000 6100 6140	6100 6152	6153

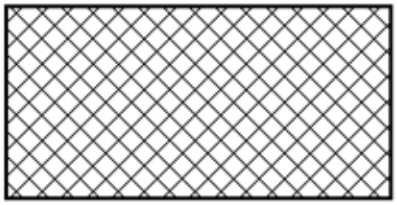
Materials



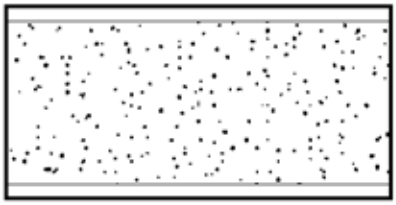
CONCRETE



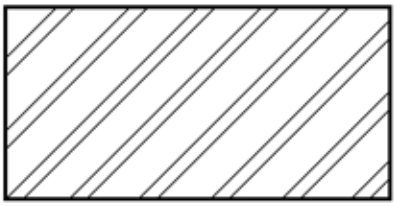
BRICK & TILE



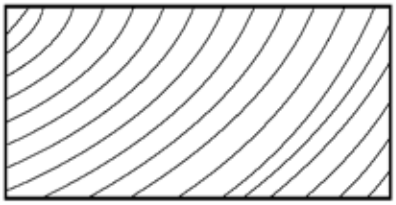
CONCRETE MASONRY UNIT



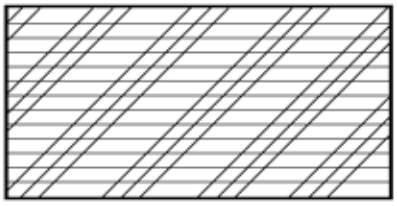
PLASTER/G.W.B.



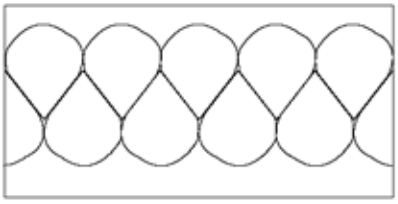
STEEL/IRON



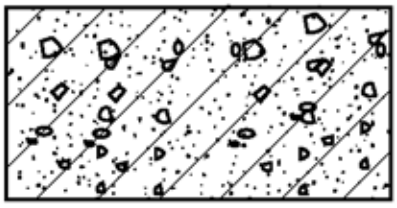
FINISH WOOD



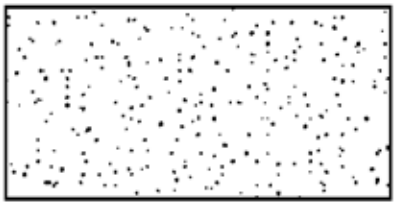
PLYWOOD (LARGE SCALE)



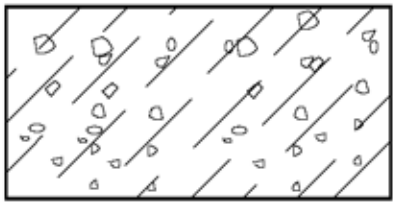
BATT INSULATION



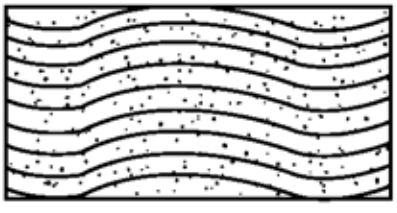
PRECAST CONCRETE



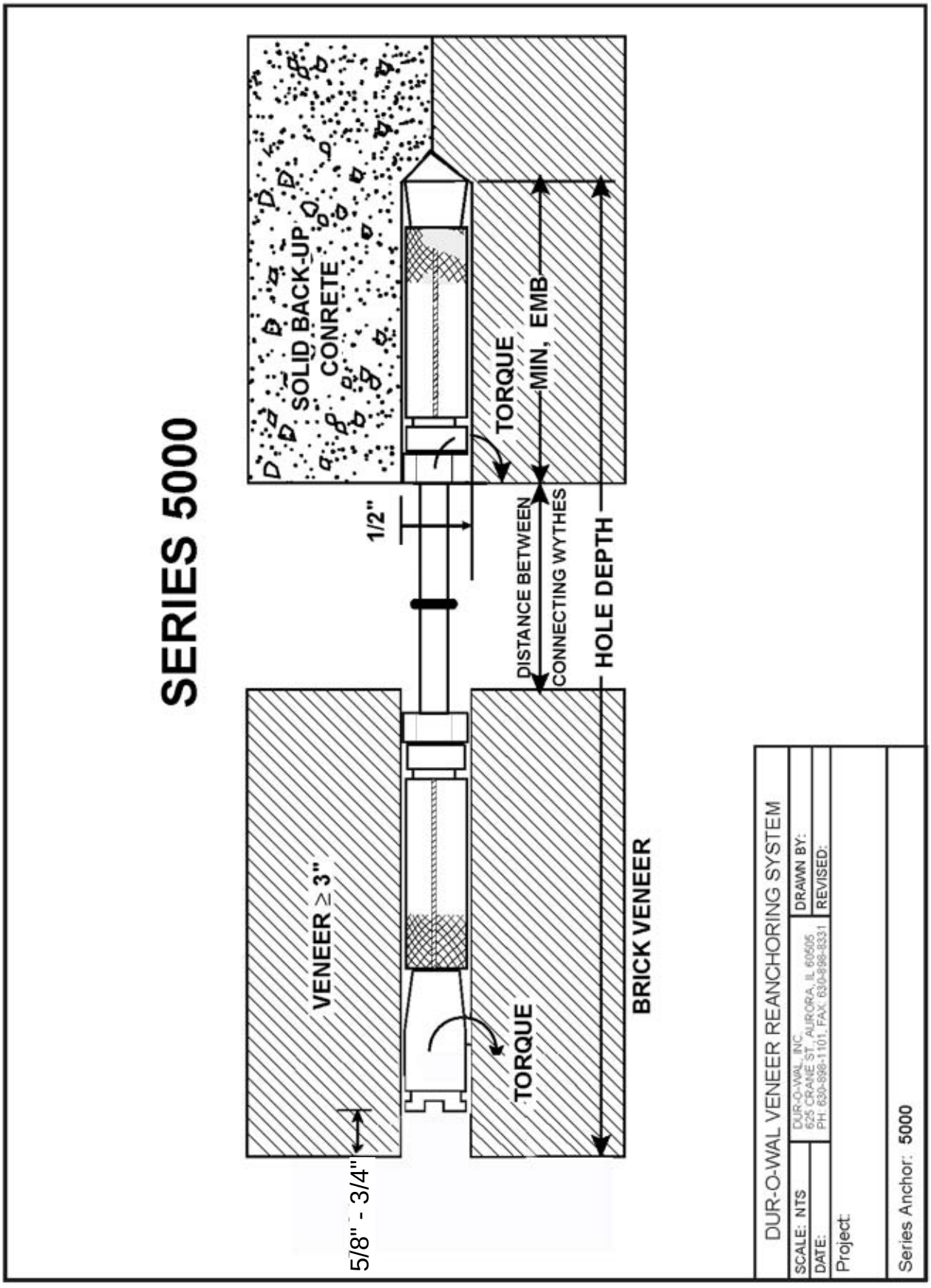
LIMESTONE



GRANITE



PARTICLE BOARD


SERIES 5000
SOLID BACK-UP CONRETE
TORQUE
MIN. EMB
1/2"
DISTANCE BETWEEN CONNECTING WYTHES
HOLE DEPTH
VENEER ≥ 3"
TORQUE
BRICK VENEER
5/8" - 3/4"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 5000

DAYTON SUPERIOR

APPLICATION

VENEER	BACK-UP
Brick	Brick
Solid Block	Solid Block
Precast	Concrete
Stone	Stone

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5005044	5 1/4"	0-1"
5005054	6 1/4"	0-1 1/2"
5005064	7 1/4"	0-2 1/2"
5005074	8 1/4"	0-3 1/2"
5005084	9 1/4"	0-4 1/2"

The 5000 series anchor provides an excellent method of reanchoring a solid facade >=3" to various solid backups. The anchor is installed by drilling standard 1/2" masonry hole through the veneer into the back-up at a 'T' joint location. Anchor placement edge distance = 6", 1 anchor per 2-4 ft ^{2} of masonry. Anchors are installed with the 5550001 setting tool, via 50-100 lb. torque. Custom lengths available upon request.

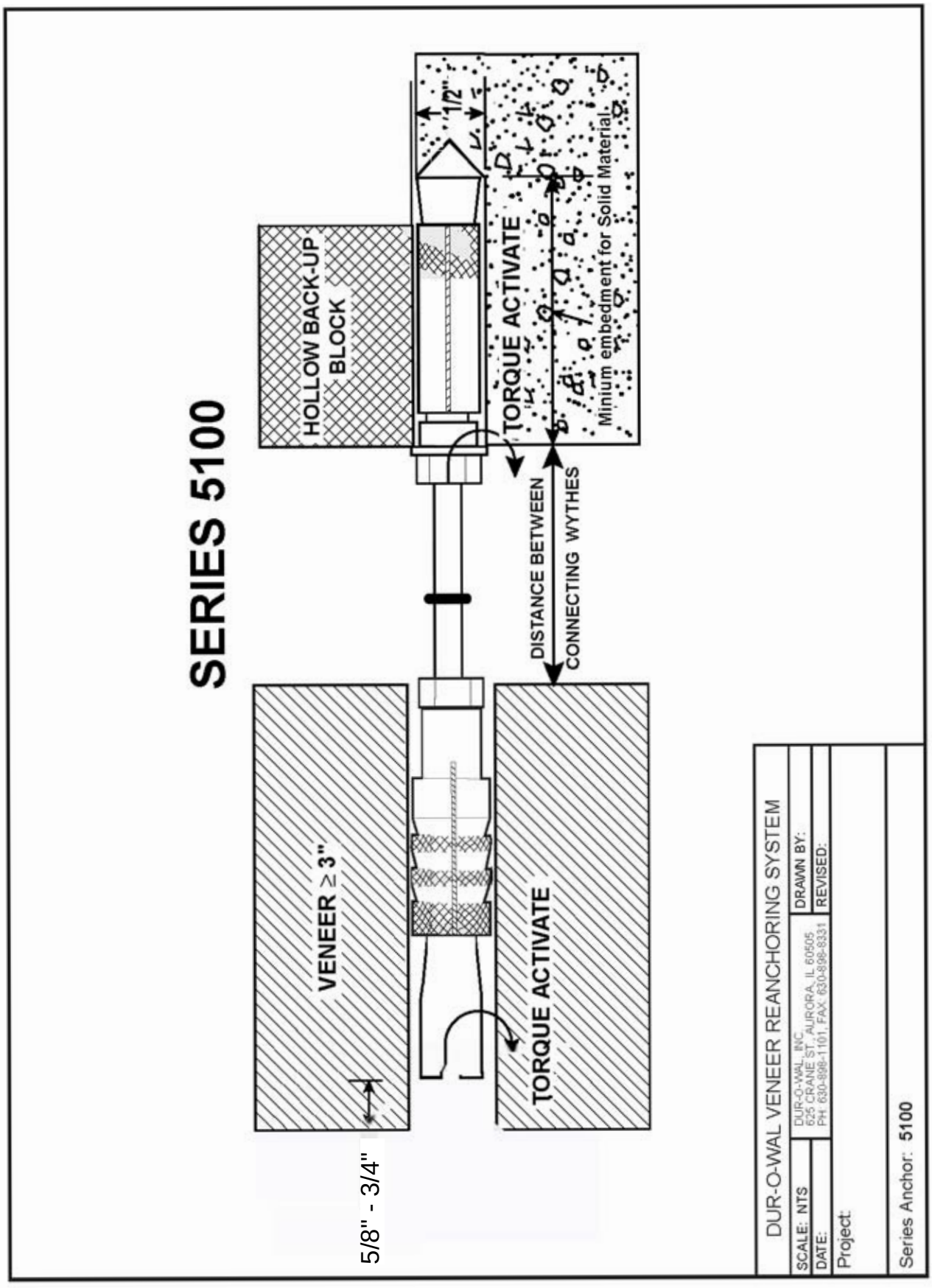
	SERIES 5000	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast/CC ④				2169	382	18
	Brick ⑤				2062	170	8
BACK-UP MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast/CC ④				2169	382	18
	Brick ⑤				2062	170	8
BUCKLING STRENGTH (CAVITY)	5 1/2"	1623	199	12.3			
	6 1/2"	1463	112	7.7			
	9 1/2"	1084	94	8.7			
	11 1/2"	724	110	15.2			

① 962 psi mortart joint
② 1450 psi mortart joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5000 - Recognized ICBO 4575

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5000 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Brass Sleeves & Cones	1/2"	1/2"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 5100
HOLLOW BACK-UP BLOCK
1/2"
TORQUE ACTIVATE
Minium embedment for Solid Material
DISTANCE BETWEEN CONNECTING WYTHES
VENEER ≥ 3"
TORQUE ACTIVATE
5/8" - 3/4"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 5100

Series Anchor: 5100

APPLICATION

VENEER	BACK-UP
Brick	Brick
Soft Brick	Hollow Block
Solid Block	Solid Block
Precast	Concrete
Stone	Stone
	Clay Tile
	Precast

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5005144	5"	3/8" - 1 3/8"
5005154	6"	3/4" - 1 3/4"
5005164	7"	1 1/2" - 2 1/2"
5005174	8"	2 1/2" - 3 1/2"
5005184	9"	3 1/2" - 4 1/2"

The 5100 series anchor provides an excellent method of reanchoring a solid facade >=3" to various solid or hollow backups. A 5/8" veneer hole and 7/16 back-up hole is required using the 50508711 dual diameter bit and a quantity 1/2" hammer drill. Anchor placement edge distance =6", and spacing distance should be 1 anchor per 2 to 4 square feet of masonry. Install at intersecting head joints. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. Custom lengths available upon request.

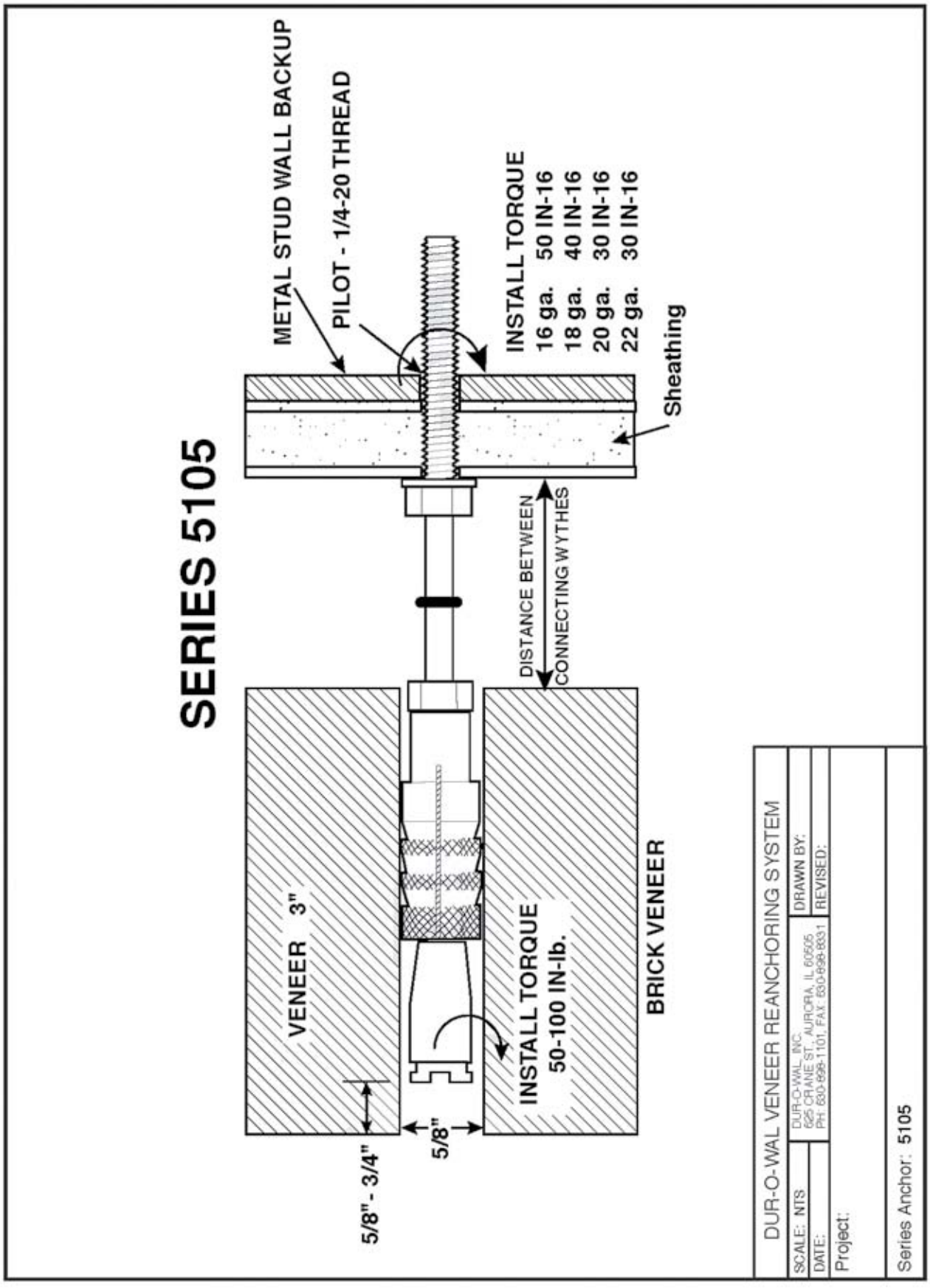
	SERIES 5100	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	414	185	45	1058	382	36
	9/16" Mortar Jt ②	930	232	24.9	1850	488	26.4
	Brick ③				1348	297	22
	Precast/CC				2169	382	18
	Brick ④				2062	170	8
BACK-UP MATERIAL	Hollow Block				1385	175	12.7
	Stone Aggregate CC				3409	226	6.6
	9/16" Mortar Jt ⑤	320	75	25	1216	505	42
	9/16" Mortar Jt ⑥	979	218	22	1321	272	20
	Brick ⑦				1348	297	22
	Precast ⑧				2169	382	18
	Brick ⑨				2062	170	8
BUCKLING STRENGTH (CAVITY)							
	5 1/2"1623	199	12.3				
	6 1/2"1463	112	7.7				
	9 1/2"1084	94	8.7				
	11 1/2"724	110	15.2				

① 962 psi mortart joint
② 1450 psi mortart joint
③ 7700 psi brick
④ 11000 psi brick
⑤ 962 psi mortar joint
⑥ 1450 psi mortar joint
⑦ 7700 psi brick
⑧ 3500 psi concrete
⑨ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5100 - Recognized ICBO #4575

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5100 Series Repair Anchor		Nut & Washer 360 Brass Screws & Cones	7/16"	5/8"		DUR-O-WAL or approved Equal

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 5105
METAL STUD WALL BACKUP
PILOT - 1/4-20 THREAD
INSTALL TORQUE
16 ga. 50 IN-16
18 ga. 40 IN-16
20 ga. 30 IN-16
22 ga. 30 IN-16
Sheathing
DISTANCE BETWEEN
CONNECTING WYTHES
VENEER 3"
INSTALL TORQUE
50-100 IN-lb.
BRICK VENEER
5/8" - 3/4"
5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
665 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 5105

Series Anchor: 5105

APPLICATION

VENEER	BACK-UP
Brick	Steel Stud
Soft Brick	
Solid Block	
Precast	
Stone >3"	

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5105144	5"	5/8" - 1 1/4"
5105154	6"	1" - 2"
5105164	7"	1 1/2" - 2 1/2"
5105174	8"	2" - 3"
5105184	9"	2 1/2" - 3 1/2"

The 5105 series anchor provides an excellent method of reanchoring a solid facade >=3" to a steel stud back-up. The anchor is installed by drilling a standard 5/8" masonry hole through the veneer and a 13/64 tap with 1/4-20 threading in the back-up. Anchor placement is restricted by stud location and a 6" edge distance. Spacing distance is 16" x 16". In masonry veneers, positioning is recommended in the bed joint. In masonry veneers, positioning is recommended in the bed joint. Anchors installed with the 5550001 setting tool, via torque. Custom lengths available upon request.

	SERIES 5105	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Mortar Jt ①	414	185	45	1058	382	36
	Mortar Jt ②	930	232	24.9	1850	488	26
	Brick ③				1348	297	22
	Precast				2169	382	18
	Brick ④				2062	170	8
BACK-UP MATERIAL	18 Ga Steel Stud				700	N/A	N/A
	≤ 20 Ga Steel Stud				400	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2"1623						
	6 1/2"1463						
	9 1/2"1084						
	11 1/2"						

① 962 psi mortart joint

② 1450 psi mortart joint

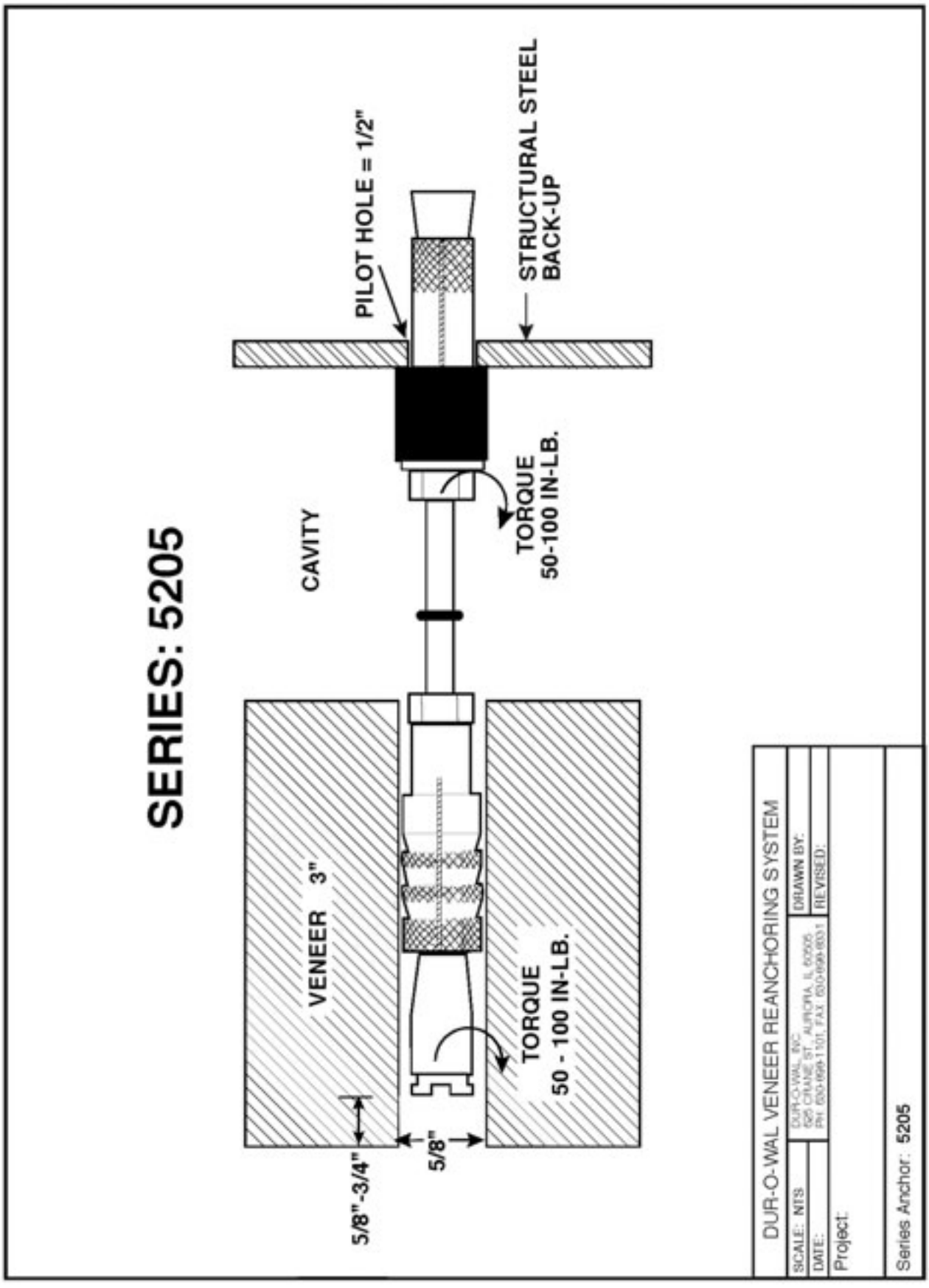
③ 7700 psi brick

④ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5105 - ICBO recognized #4575 veneer connection only

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5105 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Brass Screws & Cones	1/4-20" Tap & Die	5/8"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5205
PILOT HOLE = 1/2"
STRUCTURAL STEEL BACK-UP
CAVITY
TORQUE 50-100 IN-LB.
VENEER 3"
TORQUE 50 - 100 IN-LB.
5/8"-3/4"
5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
Project:
Series Anchor: 5205

Series Anchor: 5205

APPLICATION

VENEER	BACK-UP
Brick	Structural Steel> 1/4"
Soft Brick	
Solid Block	
Precast	
Stone >3"	

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5205144	5"	1 1/4" - 1 7/8"
5205154	6"	1 5/8" - 2 5/8"
5205164	7"	2 1/8" - 3 1/8"
5205174	8"	3 1/8" - 4 1/8"

The 5205 series anchor provides an excellent method of reanchoring a solid facade >=3" to a structural steel back-up. The anchor is installed by drilling a standard 5/8" hole through the veneer, and, a 1/2" hole in the backup. Anchor placement is restricted by steel member location, minimum edge distance = 6". Spacing distances equals one anchor for 2 to 4 square feet of masonry. In masonry veneers, positioning is recommended in the bed joint. Anchors are installed with the 5550001 setting tool, via torque 50-100 lb. Custom lengths available upon request.

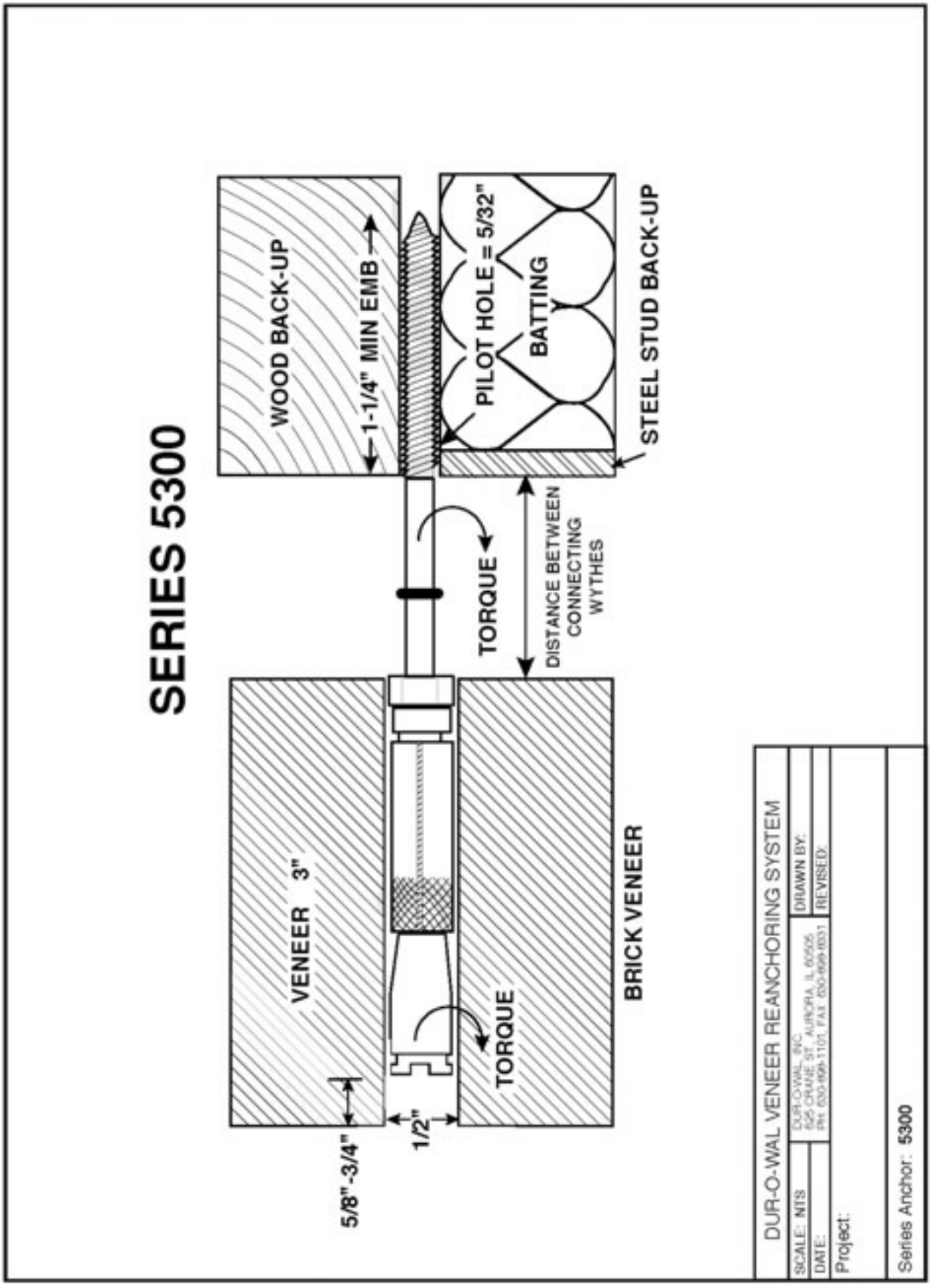
	SERIES 5205	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	414	185	45	1058	382	36
	9/16" Mortar Jt ②	930	232	24	1850	488	26
	Brick ③				1348	297	22
	Precast/CC				2169	382	18
	Brick ④				2062	170	8
BACK-UP MATERIAL	Structural Steel	Refer to Buckling Below			2700	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2"1623	199	12.3				
	6 1/2"1463	112	7.7				
	9 1/2"1084	94	8.7				
	11 1/2"724	110	15.2				

① 962 psi mortar joint
② 1450 psi mortar joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5205 - ICBO recognized #4575 veneer connection only

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5205 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Brass Screws & Cones	1/2"	5/8"		Rotary Only

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 5300
WOOD BACK-UP
1-1/4" MIN EMB
PILOT HOLE = 5/32"
BATTING
STEEL STUD BACK-UP
TORQUE
DISTANCE BETWEEN CONNECTING WYTHES
VENEER 3"
BRICK VENEER
TORQUE
5/8"-3/4"
1/2"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DRAWN BY:
DATE:
REVISED:
Project:
Series Anchor: 5300

DAYTON SUPERIOR

APPLICATION

VENEER	BACK-UP
Brick	Wood Stud
Solid Block	Steel Stud
Precast	Wood Sheathing
Stone >3"	

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5005354	6"	3/8" - 1 1/2"
5005364	7"	1 1/2" - 2 1/2"
5005374	8"	2 1/2" - 3 1/2"
5005384	9"	3 1/2" - 4 1/2"
5005394	10"	4 1/2" - 5 1/2"

The 5300 series anchor provides an excellent method of reanchoring a solid facade >=3" to a wood or steel stud backup. The anchor is installed by drilling a standard 1/2" masonry hole through the veneer. A 5/32" Pilot Hole is needed for 18, 20 and 22 gauge steel stud and 3/16" Pilot Hole in 16 gauge. Anchor is self tapping and self threading in wood stud. Anchor placement is restricted by stud location and minimum edge distance = 6". Anchor spacing distance is one anchor for two to four square feet of masonry. In masonry veneers, positioning is recommended in the bed joint. In masonry veneers, positioning is recommended in the bed joint. Anchors are installed with the 5550001 setting tool, via torque. Custom lengths available upon request.

	SERIES 5105	ULTIMATE CAPACITY					
		TENSION (lb)			COMPRESSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8
BACK-UP MATERIAL	2x4 Wood Stud				895	129	14.4
	4X4 Wood Stud				1209	187	15.1
	16 Ga Steel Stud				911	N/A	N/A
	18 Ga Steel Stud				600	N/A	N/A
	20 Ga Steel Stud				488	N/A	N/A
	21 Ga Steel Stud				308	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2"				1623	199	12.3
	6 1/2"				1463	112	7.7
	9 1/2"				1084	94	8.7
	11 1/2"				724	110	15.2

① 962 psi mortart joint

② 1450 psi mortart joint

③ 7700 psi brick

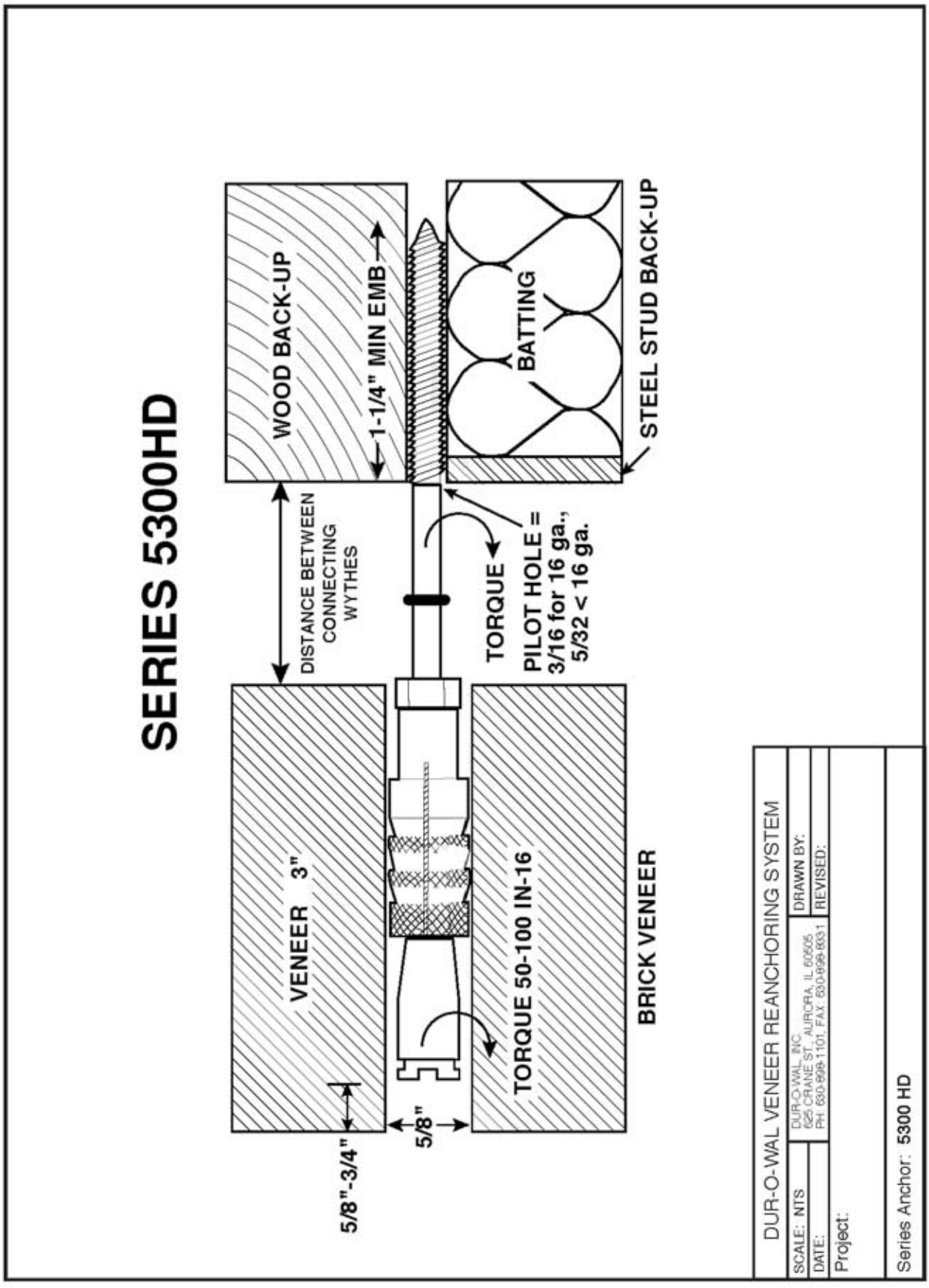
④ 3500 psi concrete

⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5300 - ICBO recognized #4575

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5300 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Sleeves & Cones	None Wood 5/32 Steel Stud	1/2"		

* Submittals for alternate should meet or exceed ultimate anchor performance.
Refer to anchor performance characteristics for performance specifications.


SERIES 5300HD
WOOD BACK-UP
1-1/4" MIN EMB
BATTING
STEEL STUD BACK-UP
DISTANCE BETWEEN CONNECTING WYTHES
TORQUE
PILOT HOLE = 3/16 for 16 ga., 5/32 < 16 ga.
VENEER 3"
TORQUE 50-100 IN-16
BRICK VENEER
5/8"-3/4"
5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101 FAX: 630-898-8831
SCALE: NTS
DATE:
DRAWN BY:
REVISED:
Project:
Series Anchor: 5300 HD

Series Anchor: 5300HD

APPLICATION

VENEER	BACK-UP
Brick	Wood Stud
Soft Brick	Steel Stud
Solid Block	Wood Sheathing
Precast	
Stone >3"	

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5005354 HD	6"	3/8" - 1 1/2"
5005364 HD	7"	1 1/2" - 2 1/2"
5005374 HD	8"	2 1/2" - 3 1/2"
5005384 HD	9"	3 1/2" - 4 1/2"
5005394 HD	10"	4 1/2" - 5 1/2"

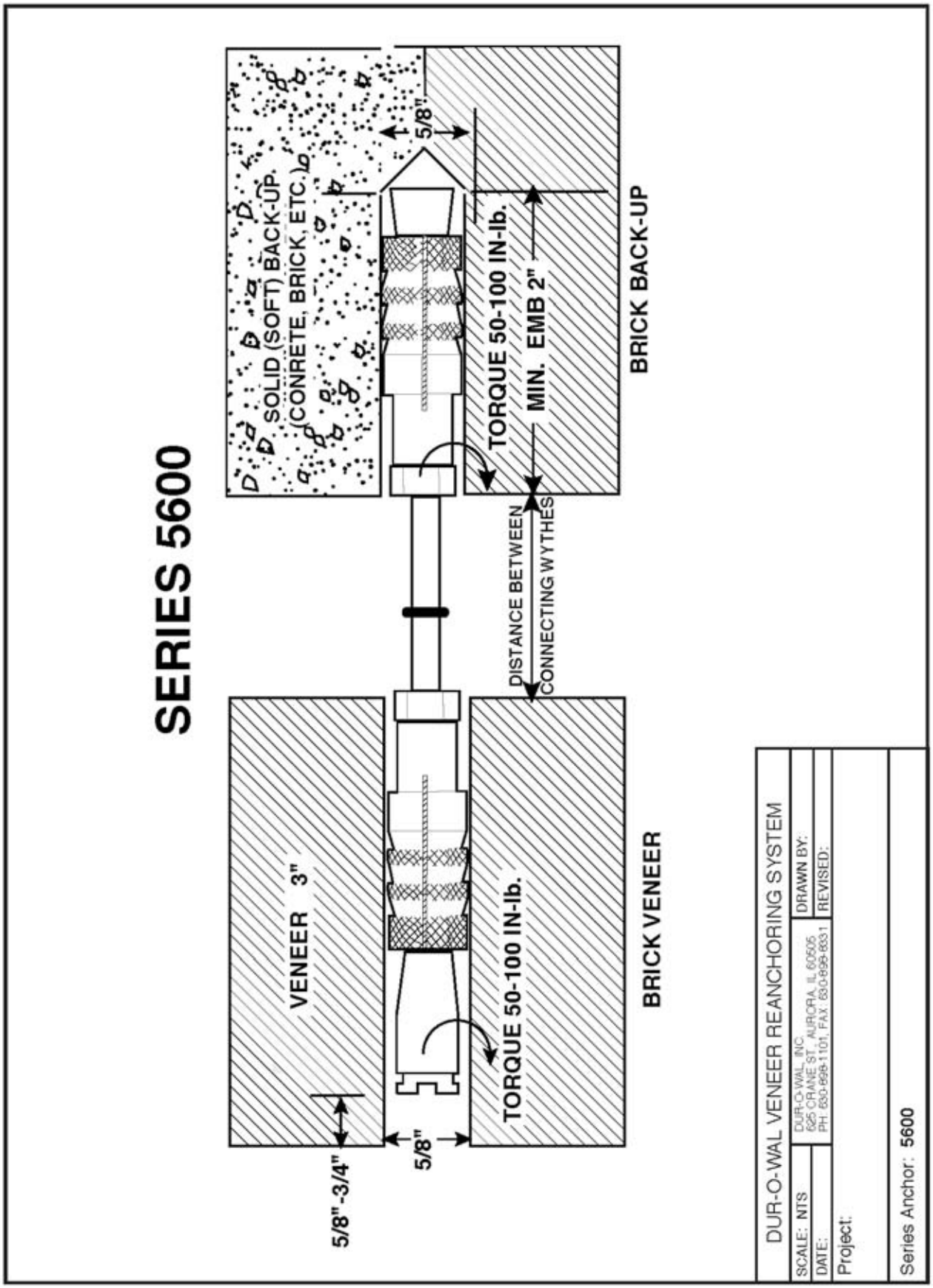
The 5300 Heavy Duty series anchor provides an excellent method of reanchoring a solid facade >=3" to a wood or steel stud back-up. The anchor is installed by drilling a standard 5/8" masonry hole through the veneer. A 5/32" Pilot Hole is needed for 18, 20 and 22 gauge steel stud and 3/16" Pilot Hole in 16 gauge. Anchor is self tapping and self threading in wood stud. Anchor placement is restricted by stud location and minimum edge equals 6". Anchor spacing distance is one anchor for two square feet of masonry. In masonry veneers, positioning is recommended in the bed joint. Anchors are installed with the 5550001 setting tool, via torque. Custom lengths available upon request.

	SERIES 5300 HD	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Mortar Joint	414	185	45	1058	382	36
	Mortar Joint	930	232	24.9	1850	488	26.4
	Brick				1348	297	22
	Precast				2169	382	18
	Brick				2062	170	8
BACK-UP MATERIAL	2x4 Wood Stud				895	129	14.4
	4X4 Wood Stud				1209	187	15.1
	16 Ga Steel Stud				911	N/A	N/A
	18 Ga Steel Stud				600	N/A	N/A
	20 Ga Steel Stud				488	N/A	N/A
	21 Ga Steel Stud				308	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2"	1623	199	12.3			
	6 1/2"	1463	112	7.7			
	9 1/2"	1084	94	8.7			
	11 1/2"	724	110	15.2			

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5300 HD - ICBO recognized #4575

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer		Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5300 HD Series Repair Anchor	DUR-O-WAL or approved Equal		None in Wood 5/32" in Steel Stud	5/8"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 5600
SOLID (SOFT) BACK-UP
(CONCRETE, BRICK, ETC.)
5/8"
TORQUE 50-100 IN-lb.
MIN. EMB 2"
BRICK BACK-UP
DISTANCE BETWEEN
CONNECTING WYTHES
VENEER 3"
TORQUE 50-100 IN-lb.
BRICK VENEER
5/8"-3/4"
5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL INC.
625 CRANE ST. AURORA, IL 60505
PH 630-898-1101, FAX 630-898-8831
DRAWN BY:
REVISED:
Project:
Series Anchor: 5600

Series Anchor: 5600

APPLICATION

VENEER	BACK-UP
Brick	Brick
Soft Brick	Soft Brick
Solid Block	Solid Block
Precast	Concrete
Stone > 3”	

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5005354	5 1/4"	0 - 1"
5005364	6 1/4"	0 - 1 1/2"
5005374	7 1/4"	0 - 2 1/2"
5005384	8 1/4"	0 - 3 1/2"
5005394	9 1/4"	0 - 4 1/2"

The 5600 series anchor provides an excellent method of reanchoring a solid facade >=3” to various solid backups. The anchor’s extra gripping power is achieved through heavy duty sleeves and is an excellent choice for softer bricks or mortars. The anchor is installed by drilling a 5/8” masonry hole through the veneer into the back-up. Anchor edge distance = 6”. Spacing distance is one anchor per 2 to 4 square feet of masonry. Install at ‘T’ joints. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. Custom lengths available upon request.

	SERIES 5600	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Mortar Jt ①	414	185	45	1058	382	36
	Mortar Jt ②	930	232	24.9	1850	488	26
	Brick ③				1348	297	22
	Precast/CC				2169	382	18
	Brick ④				2062	170	8
BACK-UP MATERIAL	Mortar Jt ①	414	185	45	1058	382	36
	Mortar Jt ②	930	232	24.9	1850	488	26
	Brick ③				1348	297	22
	Precast/CC				2169	382	18
	Brick ④				2062	170	8
BUCKLING STRENGTH (CAVITY)	5 1/2”	1623	199	12.3			
	6 1/2”	1463	112	7.7			
	9 1/2”	1084	94	8.7			
	11 1/2”	724	110	15.2			

① 962 psi mortar joint

② 1450 psi mortar joint

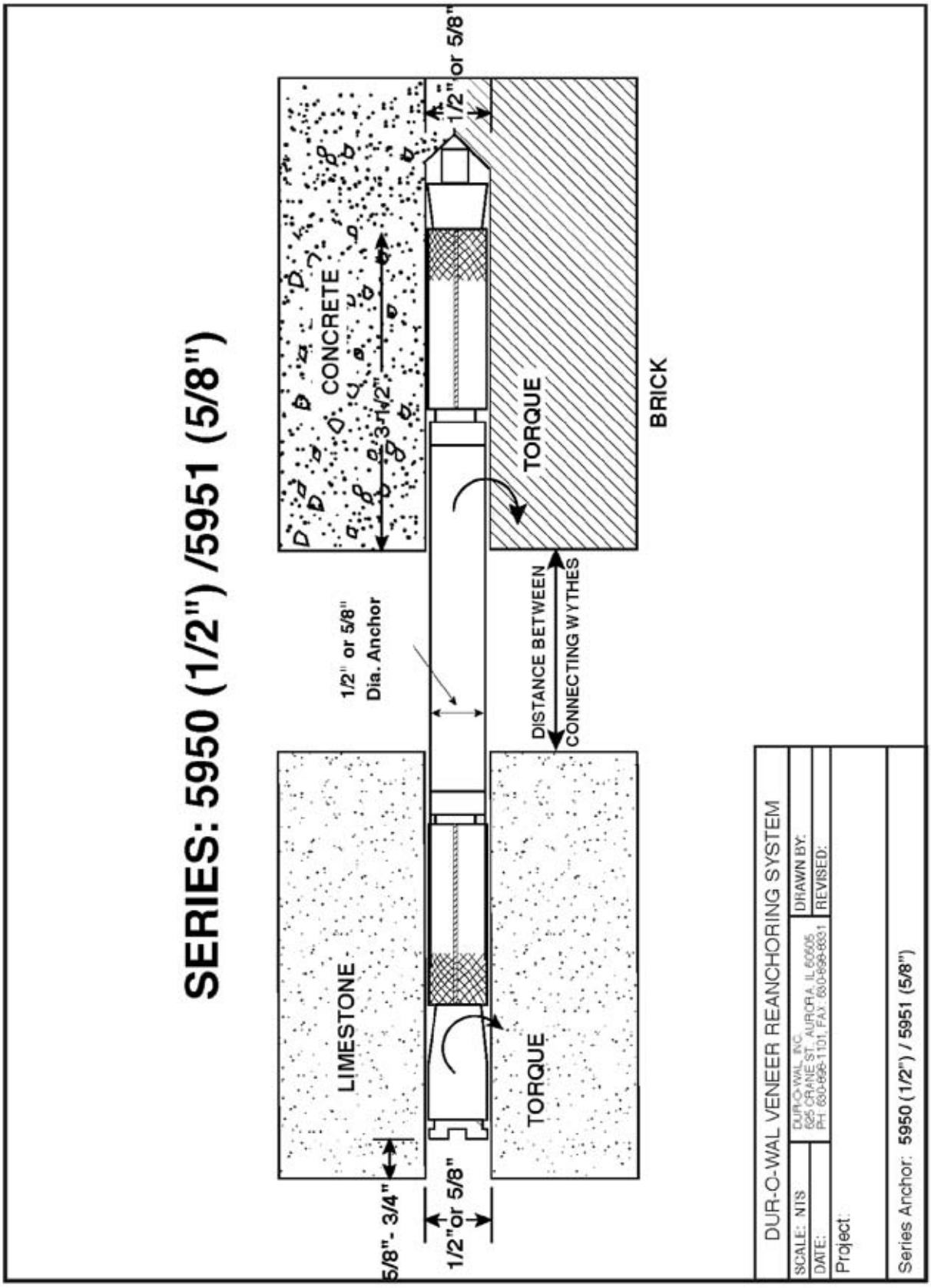
③ 7700 psi brick

④ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5600 - ICBO recognized #4575

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5600 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Brass Sleeves & Cones	5/8"	5/8"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5950 (1/2") /5951 (5/8")
CONCRETE
3-1/2"
1/2" or 5/8"
TORQUE
BRICK
1/2" or 5/8" Dia. Anchor
DISTANCE BETWEEN CONNECTING WYTHES
LIMESTONE
TORQUE
5/8"- 3/4"
1/2"or 5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: N1S
DATE:
DUR-O-WAL, INC.
825 CRANE ST. AURORA, IL 60505
PH: 630-896-1101, FAX: 630-896-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 5950 (1/2") / 5951 (5/8")

Series Anchor: 5950/5951

APPLICATION

VENEER	BACK-UP
Brick	Brick
Solid Block	Soft Brick
Precast	Concrete
Stone ≥ 4”	Stone

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
Field	Verify	

The 5950 series anchor provides an excellent method of reanchoring a solid facade >=3” to various solid backups. The anchor’s extra gripping power is achieved through heavy duty sleeves and is an excellent choice for softer bricks or mortars. The anchor is installed by drilling a 5/8” masonry hole through the veneer into the back-up. Anchor edge distance = 6”. Spacing distance is one anchor per 2 to 4 square feet of masonry. Install at ‘T’ joints. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. Custom lengths available upon request.

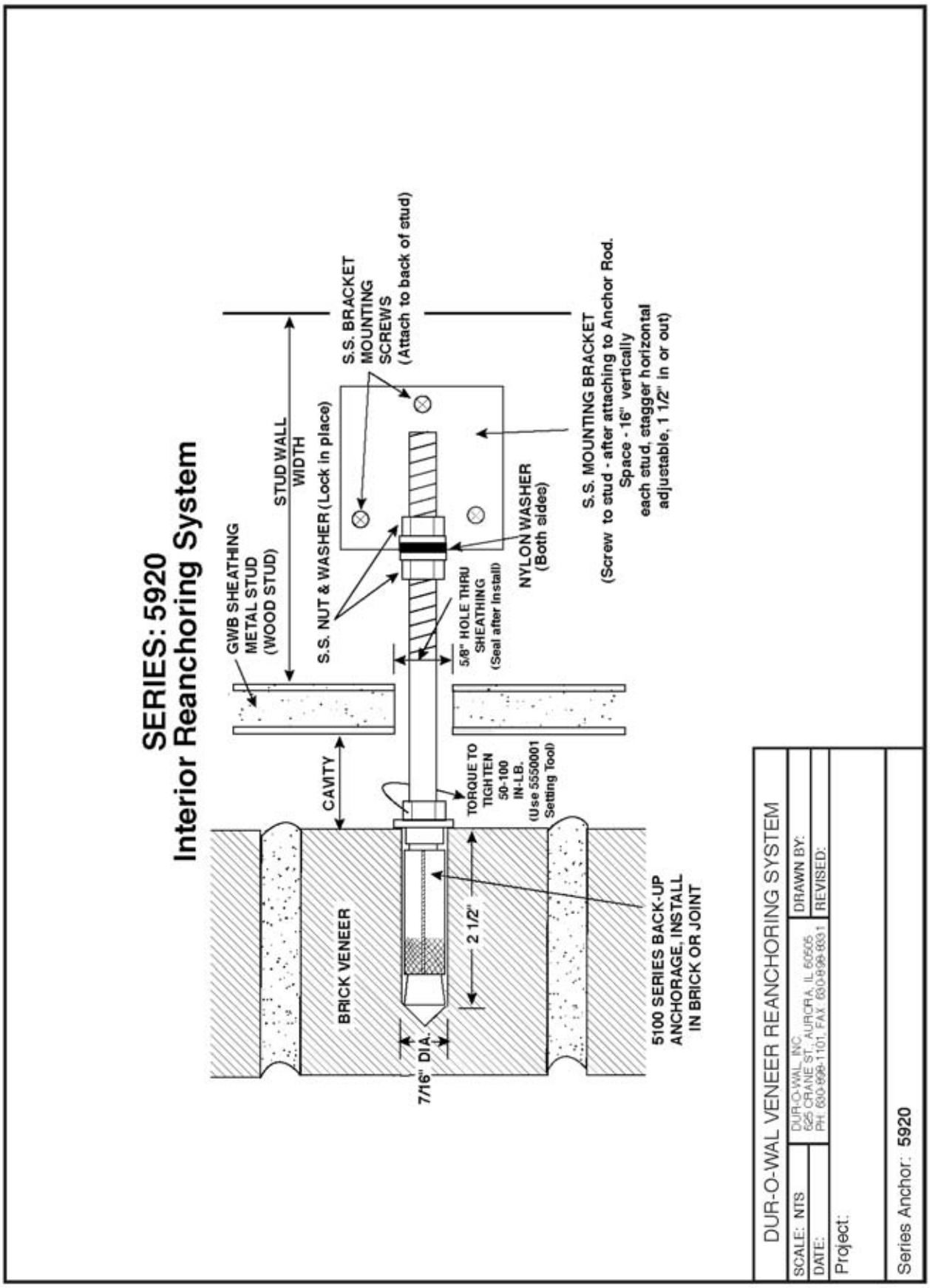
	SERIES 5950/5951	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8
BACK-UP MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8

① 962 psi mortart joint
② 1450 psi mortart joint
③ 7700 psi brick
④ 3500 psi Concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL FACADE REPAIR ANCHOR SERIES: 5950/5951

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5950/5951 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washer 360 Brass Sleeves & Cones	1/2" / 5/8"	1/2" / 5/8"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5920
Interior Reanchoring System
GWB SHEATHING
METAL STUD
(WOOD STUD)
STUD WALL
WIDTH
S.S. NUT & WASHER (Lock in place)
S.S. BRACKET
MOUNTING
SCREWS
(Attach to back of stud)
NYLON WASHER
(Both sides)
S.S. MOUNTING BRACKET
(Screw to stud - after attaching to Anchor Rod.
Space - 16" vertically
each stud, stagger horizontal
adjustable, 1 1/2" in or out)
5/8" HOLE THRU
SHEATHING
(Seal after install)
CAVITY
TORQUE TO
TIGHTEN
50-100
IN-LB.
(Use 5550001
Setting Tool)
BRICK VENEER
2 1/2"
7/16" DIA.
5100 SERIES BACK-UP
ANCHORAGE, INSTALL
IN BRICK OR JOINT
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8831
DRAWN BY:
REVISED:
Project:
Series Anchor: 5920

Series Anchor: 5920
Interior Reanchoring System

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Metal Stud
		Wood Stud

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5920441	4 1/2"	3/4"-2 3/4"
5920541	5 1/2"	1 3/4"- 3 3/4"
5920641	6 1/2"	2 3/4"- 5 3/4"
5920741	7 1/2"	3 3/4" - 5 3/4"

When access to the interior face of an existing veneer occurs (such as remodeling), reattaching the existing veneer is easily accomplished with the 5920 Interior Reanchoring Assembly. After drilling holes, connection to the veneer is accomplished with the 5550001 setting tool. The anchor shaft is tightened to the wall bracket. The wall bracket is attached to either metal or wood stud walls with three 900 Series stainless self tapping screws. Other sizes available.

	SERIES 5920	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	N/A	N/A		2060	170	8.2
	Brick ②	N/A	N/A		1350	297	22
	Mortar Jt ③	N/A	N/A		1321	227	20.6
	Mortar Jt ④	N/A	N/A		850	N/A	N/A
BUCKLING STRENGTH	5 1/2"	1623	199	12.3			
	6 1/2"	1463	112	7.7			
	9 1/2"	1084	94	8.7			
	11 1/2"	724	110	15.2			

① MW brick, 11000 psi

② MW brick, 7700 psi

③ 1450 psi mortar strength, Type N

④ 950 psi mortar strength, Type N

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5920 INTERIOR REANCHORING SYSTEM

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	All SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5920 I.R.S.	DUR-O-WAL or approved Equal	Expanded Brass	N/A	7/16"	FIELD VERIFY	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.

Selection Features: Reattaching existing veneers less than 3" thick, typically requires analysis which requires identifying the type and size of live and dead loads imposed. Generally, stone panels fall into this category. The anchor types illustrated in this section consider bilateral live load resistance, singular direction loading, support loading, and combinations of all types. The back up anchorage system may dictate the style of anchorage required.

The panel reanchoring systems illustrated are mechanically activated. In some cases, you will recognize repair anchor details and performance characteristics previously reviewed in other sections. Other design considerations are:

1) **Performance Repeatability:** The back up anchorage system, and the veneer connection method, develop performance characteristics indicative of the quality of the base material. The stone panel density and quality uniformity will influence the performance repeatability characteristics. The anchor design and material used in manufacturing are quality controlled to assure repeatable performance results.
2) **Quality Control:** Back up anchorage systems can be independently evaluated for quality installations. This can be measured by either direct tension, or torque. The panel connection is also measurable by torque. This will translate to a clamping force required to stabilize the panel.
3) **Live Loads:** The critical nature of a thin veneer connection will be controlled by the type, thickness, and quality of the stone veneer. Testing of the stone, with the proposed connector, will provide the performance data necessary, that will evaluate spacing and size requirements. Most all veneer connections provide loads greater than 1200 pounds tension (typical 1 inch diameter bearing surface). A larger bearing head, or greater thickness of stone, or very dense material (such as granite), will increase the performance. Compression loading (inward movement) resistance is a more difficult stress to resist. Although most applications are not concerned with inward load resistance, spring activated toggles provide a solution which can resist 500-800 pounds.
4) **Installation Ease:** Back up and veneer anchorage methods are easy to install. Either hammer set, or torque controlled anchors are easily activated with simple hand tools and Dur-O-Wal setting tools. However care must be taken when drilling into and thru the veneer. For most common medium density stone materials such as travertine, marble, limestone, etc., specialty carbide dry drilling systems are made by Dur-O-Wal to create the hole size and shape necessary for the anchor. Granites and special finish materials may require more elaborate diamond drilling systems. Dur-O-Wal can assist the contractor to develop the necessary tools and equipment to facilitate the application.
5) **Installed Cost:** Regardless of the size of the anchor system, the relative cost of this reanchoring system is much less than removing stone panels and resetting them. For example, all the panels are drilled and reanchored in place, specialty equipment for removal of panels is not necessary. Also, the inner structure is not exposed to the elements which will maintain security and comfort for the occupants. The anchors install quickly which results in savings.
6) **In-Plane Ductility:** The size of the anchor selected will determine ductility features. Support systems need large diameter anchor bodies in order to carry stone weight. The panel connector type provides sufficient free play to accommodate panel movement and/or expansion and contraction cycles. All veneer connectors can be sealed in a flexible sealant to minimize moisture intrusion and allow for material geometric changes.
7) **Facade Aesthetics:** The finished panel appearance is a primary concern. Some stone panels can be "Plugged" with like stone plugs. They would be cored, cut, and finished, then sealed in place over the stainless steel head of the veneer connection. Less elaborate finishes can be accomplished with matching sealants. Verification in the field will verify the alternatives.
8) **Seismic Retrofit:** No specific product falls into this category for seismic retrofit. Most panel connections are structurally evaluated for performance criterias. The same analysis would prevail for reanchoring existing panel veneers.

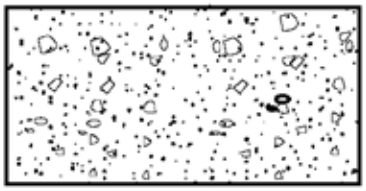
Selection Chart

Panel Anchor

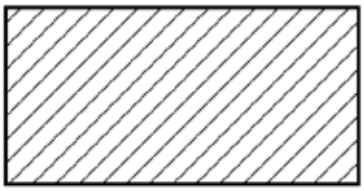
STABILIZING VENEERS LESS THAN 3 INCHES

BACKUP MATERIAL											
VENEER MATERIAL	**BRICK**	**SOFT BRICK**	**HOLLOW BLOCK**	**SOLID BLOCK**	**CONCRETE**	**WOOD STUD**	**STEEL STUD**	**STEEL**	**STONE**	**CLAY TILE**	**WOOD SHEALING**
HOLLOW BLOCK	6000 6100	6100	6100	6100 6000	6100 6000	6153	6153 6151	6153 6152	6100	6100	6153
STONE <3" RESTRAINT ONLY	6100 6140 5956	6100 5950	6100	 5056 6100 6100TGL 6140 6380 6120 6340	6100TGL 6100 6140 6120 6380 6340	6153	6153 6153 TGL	6152	6000 6100 6140 6100 TGL	6100 6252 6100TGL	6153
SUPPORT & RESTRAINT STONE <3"	6100 6140 5950 5956	6100 5950	6100	5950 5056 6100 6100TGL 6140 6380 6120 6340	6100 TGL 6100 5950 6140 6120 6380 6340	6153	6153 6153TGL	6152	6000 6100 6140 6100TGL	6100 6152 6100TGL	6153
TERRA COTA	6100	6100	6100	6100	6000 6100 6140	6153	6153	6152	6000 6100	6100 6152 6140	6153

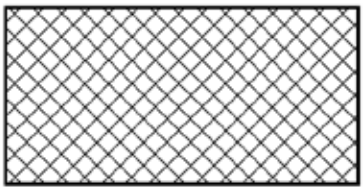
Materials



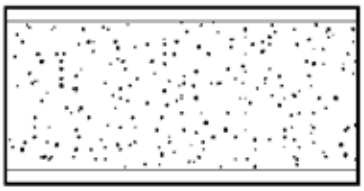
CONCRETE



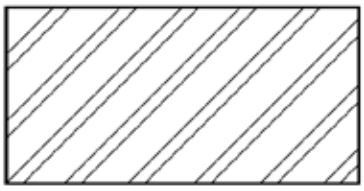
BRICK & TILE



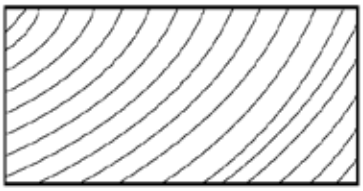
CONCRETE MASONRY UNIT



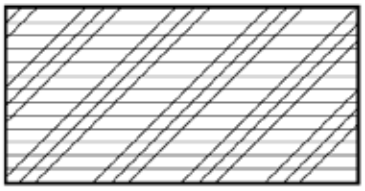
PLASTER/G.W.B.



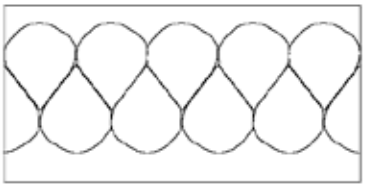
STEEL/IRON



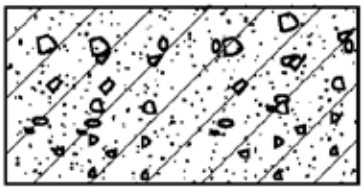
FINISH WOOD



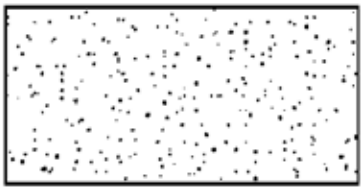
PLYWOOD (LARGE SCALE)



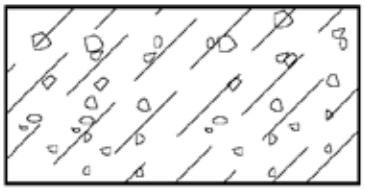
BATT INSULATION

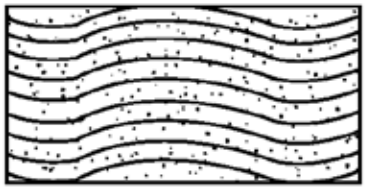


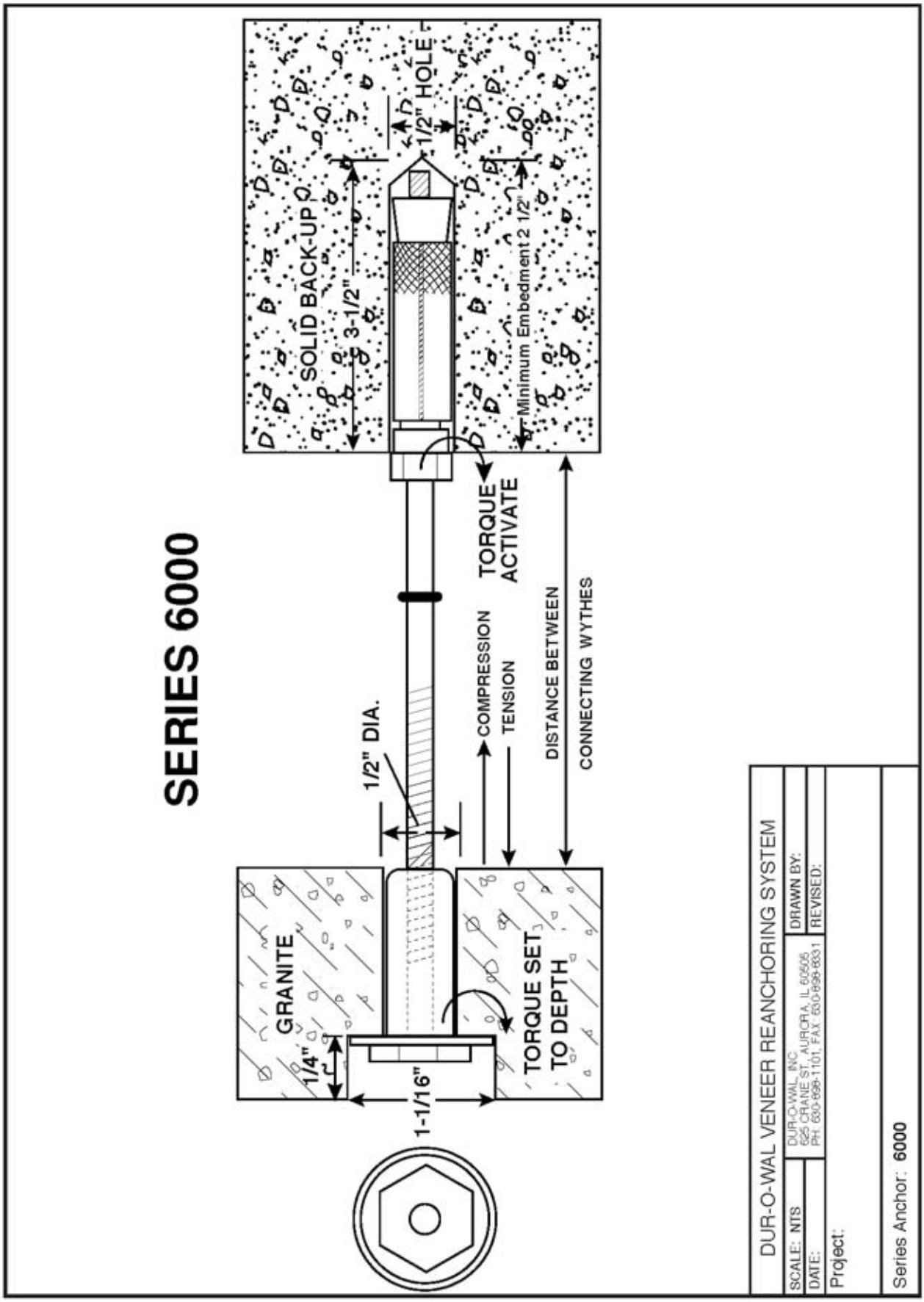
PRECAST CONCRETE



LIMESTONE






SERIES 6000
SOLID BACK-UP
3-1/2"
1/2" HOLE
Minimum Embedment 2 1/2"
TORQUE ACTIVATE
1/2" DIA.
COMPRESSION
TENSION
DISTANCE BETWEEN
CONNECTING WYTHES
GRANITE
1/4"
TORQUE SET TO DEPTH
1-1/16"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DRAWN BY:
DUR-O-WAL, INC.
625 CRANE ST, AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DATE:
REVISED:
Project:
Series Anchor: 6000

Series Anchor: 6000

APPLICATION

VENEER		BACK-UP
Stone > 3”		Brick
Terra Cotta		Solid Block
		Concrete
		Stone

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5006042	2 7/8"	1" - 2"
5006041	3 7/8"	2" - 3"

The 6000 series anchor provides an excellent method of restraining (tension loading) a solid facade <3” thick to various solid backups. The anchor is installed by drilling a standard 1/2” masonry hole through the veneer into the back-up followed by a 11⁄16” countersink hole in the veneer. Anchor placement is only restricted by edge and spacing distance. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. in the back-up. Veneer connections are tightened 1/4-1/2 turn past from solid contact. Custom lengths available upon request.

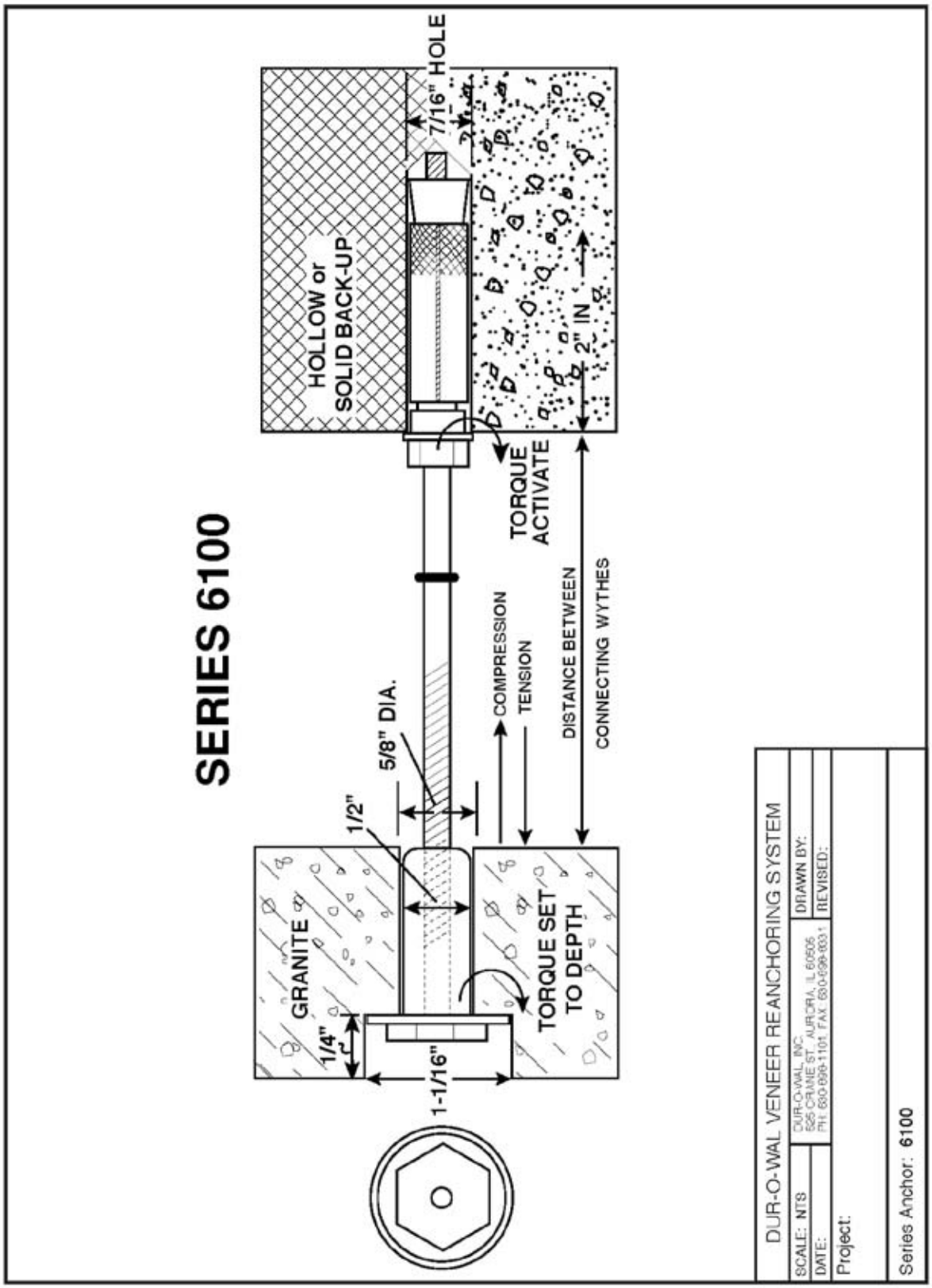
	SERIES 6000	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL							
		F I E L D V E R I F Y					
BACK-UP MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8
BUCKLING STRENGTH (CAVITY)	5 1/2”	1623	199	12.3			
	6 1/2”	1463	112	7.7			
	9 1/2”	1084	94	8.7			
	11 1/2”	724	110	15.2			

① 962 psi mortar joint
② 1450 psi mortar joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 6000

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers <3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	6000 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Head 306 Brass Cones	1/2"	1/2" & 1 1/16"		

* Submittals for alternate should meet or exceed ultimate anchor performance.
Refer to anchor performance characteristics for performance specifications.


SERIES 6100
7/16" HOLE
HOLLOW or SOLID BACK-UP
2" IN
TORQUE ACTIVATE
COMPRESSION
TENSION
DISTANCE BETWEEN CONNECTING WYTHES
5/8" DIA.
1/2"
GRANITE
TORQUE SET TO DEPTH
1/4"
1-1/16"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
525 CRANE ST., AURORA, IL 60505
PH: 630-896-1101 FAX: 630-896-1031
DRAWN BY:
REVISED:
Project:
Series Anchor: 6100

APPLICATION

VENEER	BACK-UP
Stone > 3”	Brick
Terra Cotta	Hollow Block
	Solid Block
	Concrete
	Stone
	Clay Tile
	Precast

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5006142	2 7/8"	1" - 2"
5006141	3 7/8"	2" - 3"

The 6100 series anchor provides an excellent method of restraining (tension only) a solid facade <3” thick to various solid or hollow backups. A 5/8” veneer hole and 7/16” back-up hole can be easily achieved in one step using the 5058711 dual diameter bit, followed by a 11⁄16” countersink hole in the veneer. Anchor placement is only restricted by edge and spacing distance. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. in the back-up. Veneer connections should be tightened 1/4-1/2 turns past hand tight. Custom lengths available upon request.

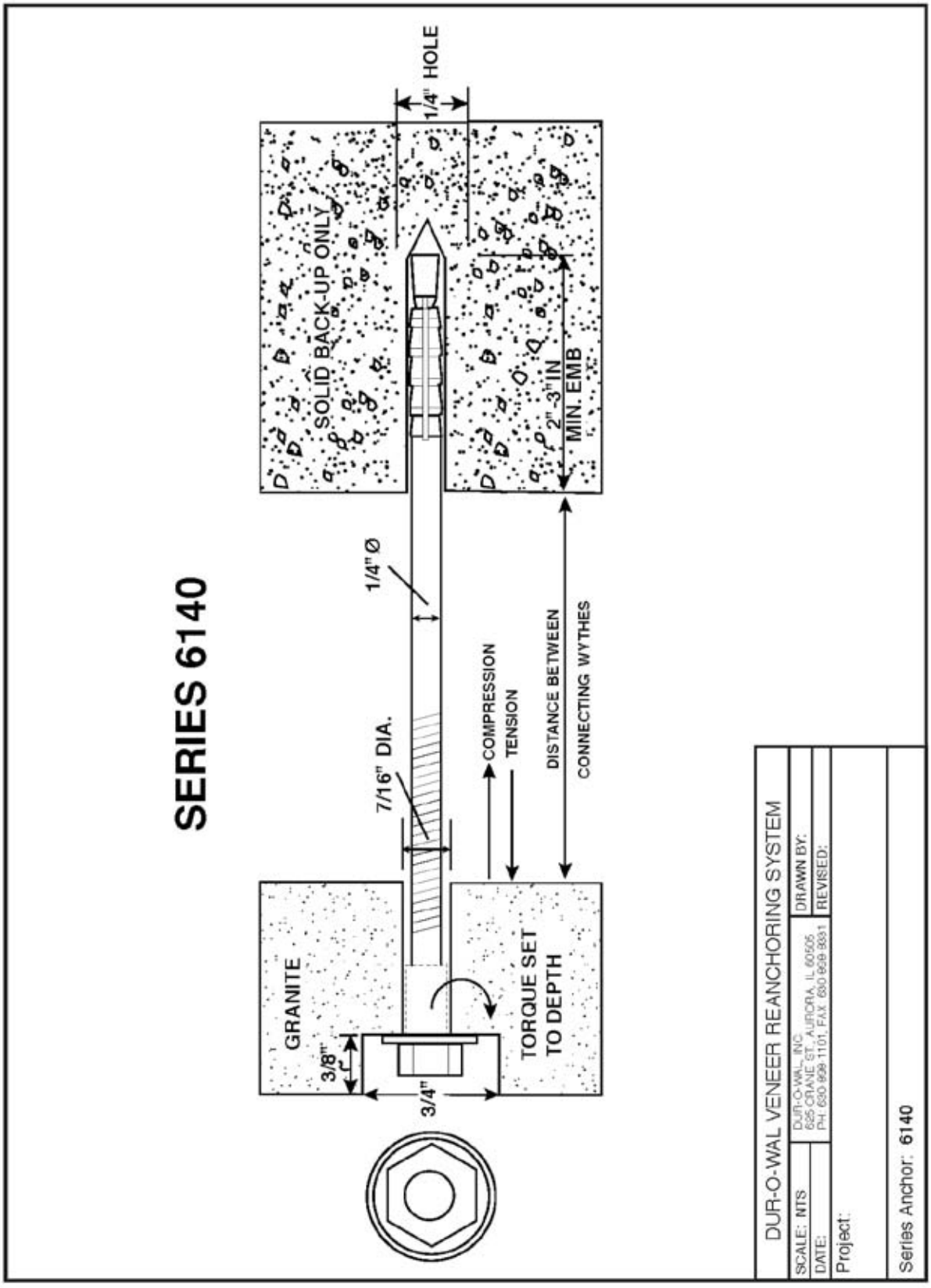
	SERIES 6100	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL							
		F I E L D V E R I F Y					
BACK-UP MATERIAL	Hollow Block				1385	175	12.7
	Concrete				3409	226	6.6
	Mortar Jt ①	300	75	25	1216	505	42
	Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8
BUCKLING STRENGTH (CAVITY)							
	5 1/2”	1623	199	12.3			
	6 1/2”	1463	112	7.7			
	9 1/2”	1084	94	8.7			
	11 1/2”	724	110	15.2			

① 962 psi mortar joint
② 1450 psi mortar joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL FACADE REPAIR ANCHOR SERIES: 6100

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	6100 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Head 306 Brass Sleeved & Cones	7/16"	1/2" & 1 1/16"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 6140
1/4" HOLE
SOLID BACK-UP ONLY
2"-3" IN MIN. EMB
1/4" Ø
7/16" DIA.
COMPRESSION
TENSION
DISTANCE BETWEEN
CONNECTING WYTHES
GRANITE
3/8"
3/4"
TORQUE SET TO DEPTH
DUR-O-WAL VENEER REANCHORING SYSTEM
DUR-O-WAL, INC.
625 CRANE CT. AURORA, IL 60505
PH 630 859 1101, FAX 630 859 3931
SCALE: NTS
DATE:
DRAWN BY:
REVISED:
Project:
Series Anchor: 6140

APPLICATION

VENEER		BACK-UP
Stone > 3”		Concrete
		Solid Block
		Precast

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5006147	3 1/8"	0" - 2"
5006146	4 1/8"	0" - 2"

The 6140 series anchor provides an excellent method of reanchoring (tension only) a solid facade <3” thick to various solid backups. The anchor is installed by drilling appropriate hole size (anchor diameter) through the veneer (7/16”) into the back-up, (1/4”) followed by appropriate countersink hole for panel tie head (3/4” dia). The anchor is activated by hammering action to expand into the back-up, and a screw on panel tie head to ensure positive connection between facade and backup. Panel connection should be tightened 1/4-1/2 turn past hand tight. Anchor available in custom lengths.

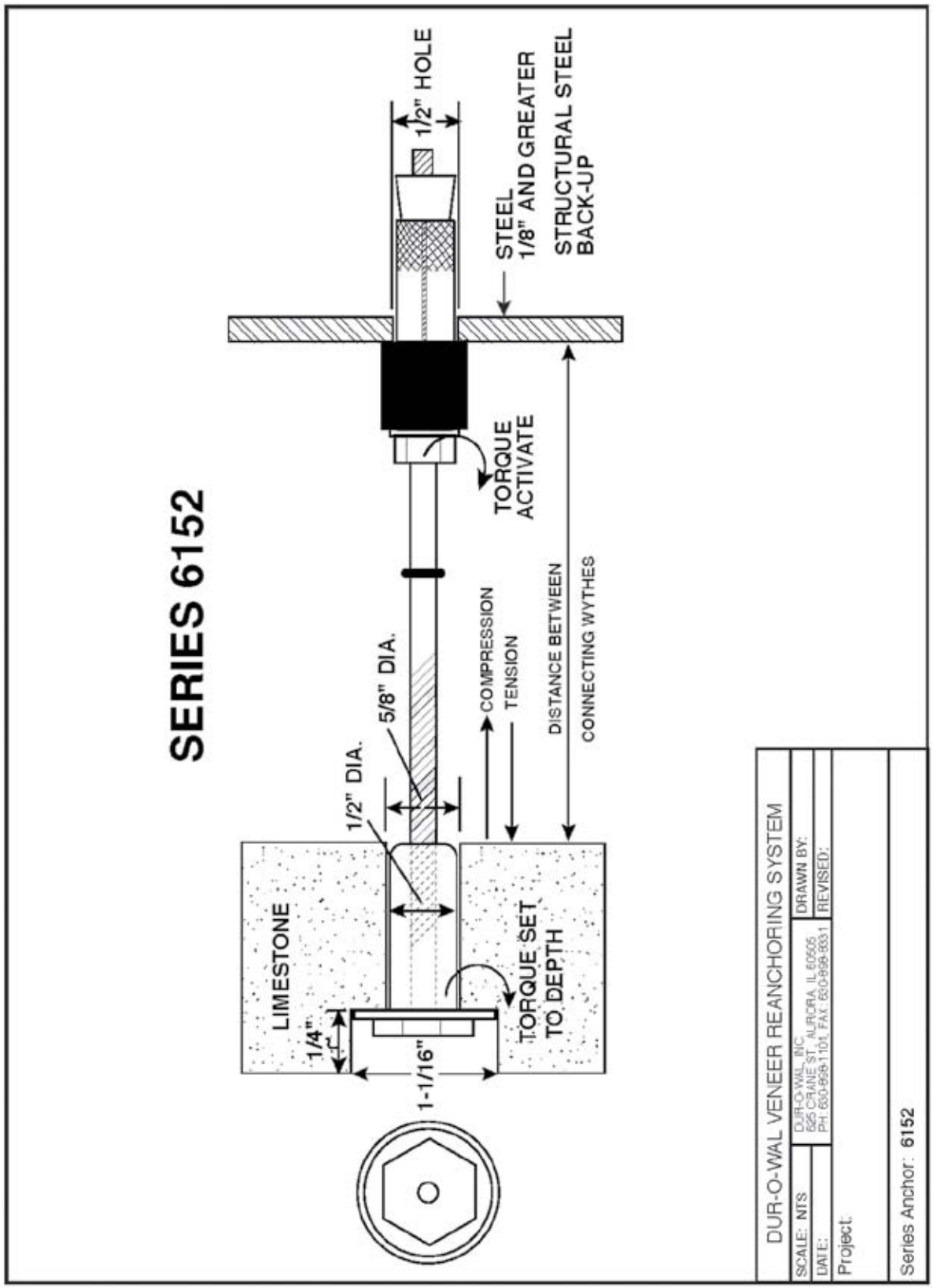
	SERIES 6140	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL							
	F I E L D V E R I F Y						
BACK-UP MATERIAL	Stone Agregate Concrete				2053	137	6.7

① 3147 psi concrete

SPECIFICATION REFERENCE FOR DUR-O-WAL FACADE REPAIR ANCHOR SERIES: 6140

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	All 304 Stainless	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	6140 Series Repair Anchor	DUR-O-WAL or approved Equal	Steel	1/4"	7/16" 3/4"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 6152
1/2" HOLE
STEEL
1/8" AND GREATER
STRUCTURAL STEEL
BACK-UP
TORQUE
ACTIVATE
DISTANCE BETWEEN
CONNECTING WYTHES
COMPRESSION
TENSION
5/8" DIA.
1/2" DIA.
LIMESTONE
1/4"
1-1/16"
TORQUE SET
TO DEPTH
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH 630-859-1101, FAX 630-859-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 6152

Series Anchor: 6152

APPLICATION

VENEER		BACK-UP
Stone > 3”		Structural Steel
Terra Cotta		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE

The 6152 series anchor provides an excellent method of restraining (tension only) a solid facade <3” thick to a structural steel backup. A 5/8” masonry veneer hole and 7/16” steel back-up hole followed by a 1 1⁄16” countersink in the veneer is required. Anchor placement is only restricted by edge and spacing distance. Anchors are installed with the 5550001 setting tool, via torque 50-100 in-lb. in the back-up. The veneer connection is tightened 1/4-1/2 turn past tight. Custom lengths available upon request.

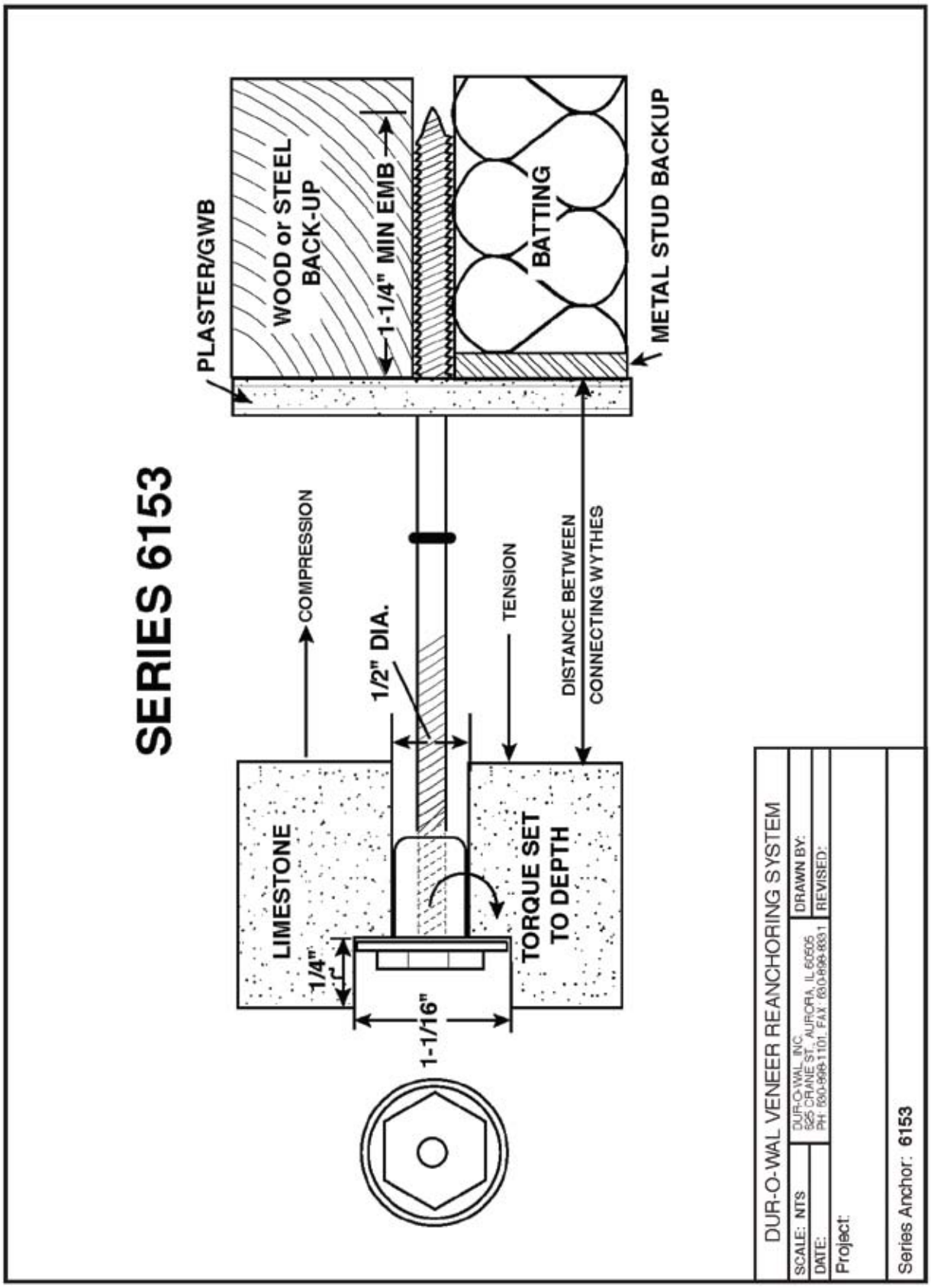
	SERIES 6152	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL							
		FIELD VERIFY					
BACK-UP MATERIAL	Structural Steel	Refer To Buckling Below			2700	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2”	1623	199	12.3			
	6 1/2”	1463	112	7.7			
	9 1/2”	1084	94	8.7			
	11 1/2”	724	110	15.2			

① 962 psi mortar joint
② 1450 psi mortar joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 6152

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers <=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	SS Shaft Nut &	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	6152 Series Repair Anchor	DUR-O-WAL or approved Equal	Head 306 Brass Sleeves Cones Engineered Plastic Spaces	1/2"	1/2" & 1 1/16"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES 6153
PLASTER/GWB
WOOD or STEEL BACK-UP
1-1/4" MIN EMB
BATTING
METAL STUD BACKUP
COMPRESSION
1/2" DIA.
TENSION
DISTANCE BETWEEN CONNECTING WYTHES
LIMESTONE
1/4"
TORQUE SET TO DEPTH
1-1/16"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL INC.
825 CRANE ST., AURORA, IL 60505
PH: 630-898-1101 FAX: 630-898-8931
DRAWN BY:
REVISED:
Project:
Series Anchor: 6153

Series Anchor: 6153

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Stone > 3”		Wood Stud
Terra Cotta		Steel Stud

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE

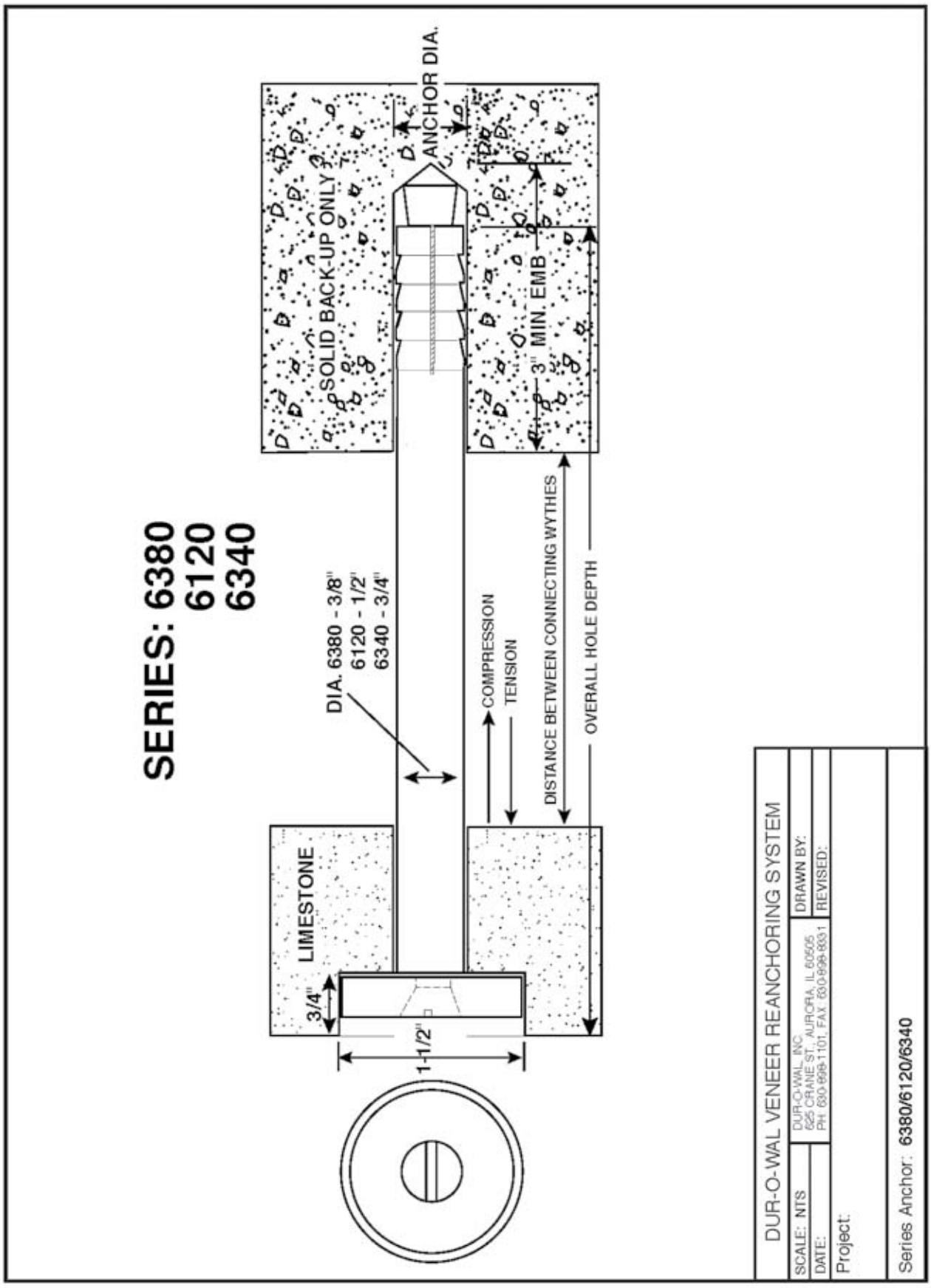
The 6153 series anchor provides an excellent method of reanchoring (tension only) a solid facade <3” thick to a steel or wood stud back-up. The anchor is installed by drilling a standard 1/2” masonry hole through the veneer followed by a 11⁄16” countersink. A 5/32” pilot hole is needed for 18, 20 and 22 gauge steel stud and 3/16” pilot hole in 16 gauge. Anchor is self tapping and self threading in wood stud. Anchor placement is only restricted by edge and spacing distance. Anchors are installed with the 5550001 setting tool, via torque 30-100 in-lbs. in the back-up. The veneer is tightened 1/4-1/2 turn past tight. Custom lengths available upon request.

	SERIES 6153	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL							
			FIELD VERIFY				
BACK-UP MATERIAL	2x4 Wood Stud				895	129	14.4
	4x4 Wood Stud				1209	187	15.1
	16 Ga Steel Stud				911	N/A	N/A
	18 Ga Steel Stud				600	N/A	N/A
	20 Ga Steel Stud				488	N/A	N/A
	21 Ga Steel Stud				308	N/A	N/A
BUCKLING STRENGTH (CAVITY)	5 1/2”	1623	199	12.3			
	6 1/2”	1463	112	7.7			
	9 1/2”	1084	94	8.7			
	11 1/2”	724	110	15.2			

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 6153

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers <=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304SS Short Nut	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	6153 Series Repair Anchor	DUR-O-WAL or approved Equal	Washer & Head 306 Brass Sleeves Cones	Wood-NA 5/32" Steel Stud	1/2" & 1 1/16"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 6380
6120
6340
ANCHOR DIA.
SOLID BACK-UP ONLY
3" MIN. EMB
DIA. 6380 - 3/8"
6120 - 1/2"
6340 - 3/4"
COMPRESSION
TENSION
DISTANCE BETWEEN CONNECTING WYTHES
OVERALL HOLE DEPTH
LIMESTONE
3/4"
1-1/2"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH 630-898-1101, FAX 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: 6380/6120/6340

APPLICATION

VENEER		BACK-UP
Stone > 3”		Concrete
		Solid Block
		Precast

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	ANCHOR DIAMETER	CAVITY RANGE
5006382	5 5/8"	3/8"	0 - 1 1/8"
5006381	6 5/8"	3/8"	0 - 2 1/8"
5006122	5 5/8"	1/2"	0 - 1 1/8"
5006121	6 5/8"	1/2"	0 - 2 1/8"
5006342	5 5/8"	3/4"	0 - 1 1/8"
5006341	6 5/8"	3/4"	0 - 2 1/8"

The 6140, 6380, 6120 and 6340 series anchors provide an excellent method of reanchoring (tension only) and supporting a solid facade <3” thick to various solid backups. The anchor is installed by drilling appropriate hole size (anchor diameter) through the veneer into the back-up, followed by appropriate countersink hole for panel tie head. The anchor then uses a hammering action to expand into the back-up and a screw on panel tie head to ensure positive connection between facade and back-up. Anchor available in custom lengths.

TEST RESULTS

Table No. 1 - Summary of Test Results
Average Ultimate Loads for Dur-O-Wal® Panel Tie Anchors Installed in Stone Aggregate Concrete

Tension Tests

Catalog Series	Anchor Diam. D (in.)	Hole Diam. BD (in.)	Edge Distance m (in.)	Average Embed. E (in.)	Number of Tests	Concrete Strength f'c (psi)	Avg. Test Load (lbs.)	Stand. Dev./ Coef. of Var. (lbs.)	(%)
5006380	3/8	3/8	24	2.798	5	3447	3244	76	2.3
5006120	1/2	1/2	12	3.177	5	3447	7157	402	5.6
5006120[1]	1/2	1/2	12	3.177	5	3447	8177	771	9.4
5006340	3/4	3/4	12	2.839	5	3447	7543	357	4.7

Shear Tests (Load Applied 1 1/8" Above Surface of Concrete)

Catalog Series	Anchor Diam. D (in.)	Hole Diam. BD (in.)	Edge Distance m (in.)	Average Embed. E (in.)	Number of Tests	Concrete Strength f'c (psi)	Avg. Load @ Deflection[2] 1/16" (lbs.)	1/8" (lbs.)	1/4" (lbs.)	Stand. Dev./ Coef. of Var. (lbs.)	(%)
5006120	1/2	1/2	4	2.730	3	3467	1416	2415	3297	115	3.5
5006340	3/4	3/4	6	2.854	3	3447	2481	3915	4913	574	10.3

Shear Tests (Load Applied 2 1/8" Above Surface of Concrete)

Catalog Series	Anchor Diam. D (in.)	Hole Diam. BD (in.)	Edge Distance m (in.)	Average Embed. E (in.)	Number of Tests	Concrete Strength f'c (psi)	Avg. Load @ Deflection[2] 1/16" (lbs.)	1/8" (lbs.)	1/4" (lbs.)	Stand. Dev./ Coef. of Var. (lbs.)	(%)
5006120	1/2	1/2	4	2.783	3	3467	607	1093	1771	114	6.4
5006340	3/4	3/4	6	2.843	3	3447	1310	2007	3438	275	8.0

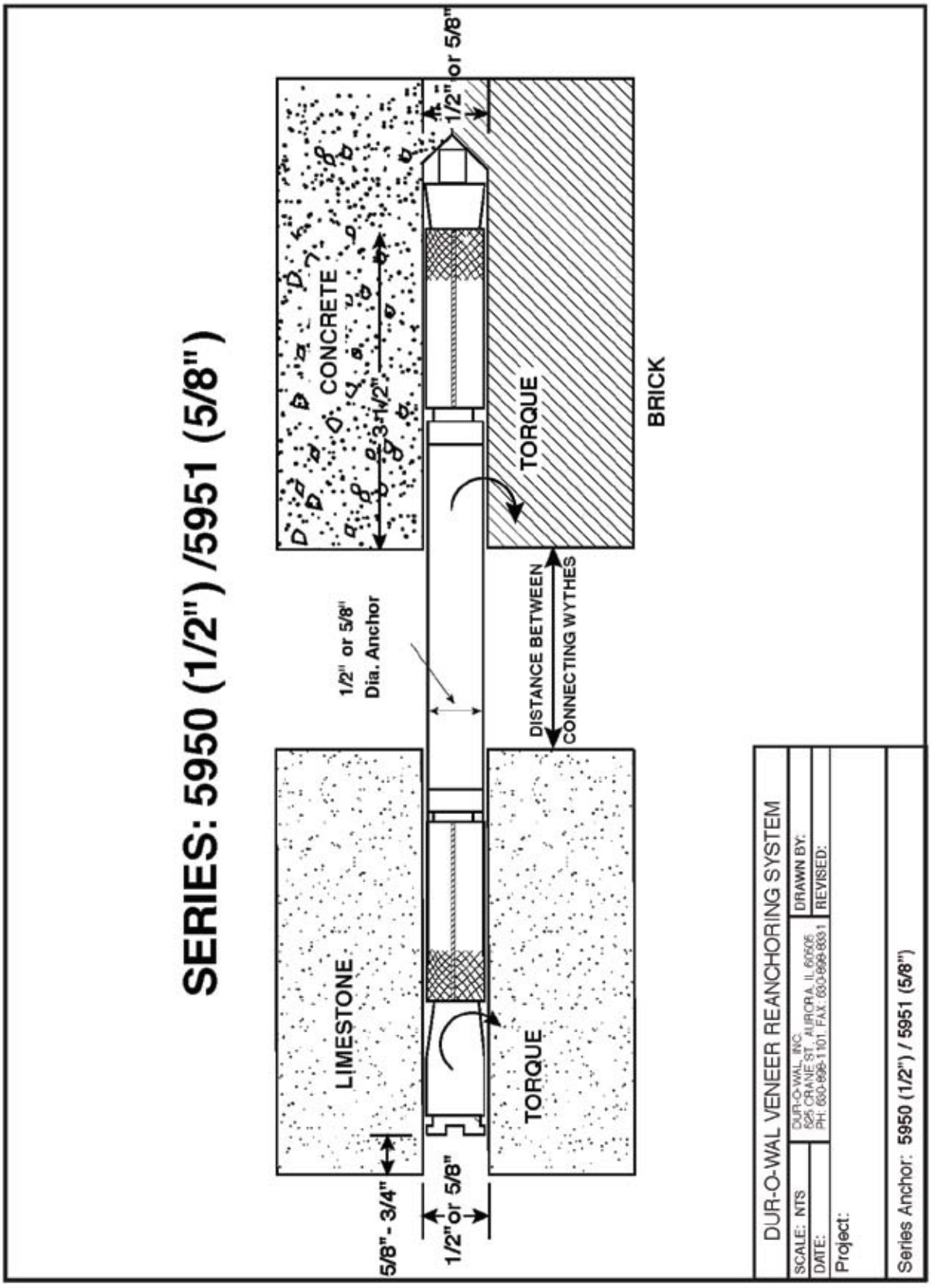
[1] Tests were continued on 5006120 specimens listed in the line above after replacing the standard 3/8”-16 threaded connectors and bearing plates with high strength rod and washers. Final loads are based on tests of anchors using high strength steel threaded connectors and washers.

[2] All tabulated deflection values are average loads interpolated from load deformation data.

SPECIFICATION REFERENCE FOR DUR-O-WAL FACADE REPAIR ANCHOR SERIES: 6380, 6120, 6340

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	All 304	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor		DUR-O-WAL or approved Equal	Stainless Steel	3/8", 1/2" or 3/4"	3/8", 1/2" or 3/4"		
								1 1/2"			

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5950 (1/2") /5951 (5/8")
CONCRETE
3-1/2"
1/2" or 5/8"
TORQUE
BRICK
1/2" or 5/8" Dia. Anchor
DISTANCE BETWEEN CONNECTING WYTHES
LIMESTONE
TORQUE
5/8" - 3/4"
1/2" or 5/8"
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
555 CRANE ST., AURORA, IL 60506
PH: 630-898-1101 FAX: 630-898-8831
DRAWN BY:
REVISED:
Project:
Series Anchor: 5950 (1/2") / 5951 (5/8")

APPLICATION

VENEER		BACK-UP
Brick		Brick
Solid Block		Solid Block
Precast		Concrete
Stone ≥ 4"		Stone

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
Field	Verify	

The 5950 series anchor provides an excellent method of reanchoring and supporting a solid facade >=3" thick to various solid backups. The anchor is installed by drilling a standard 1/2", or 5/8" hole through the veneer into the back-up. Anchor placement edge distance = 6". Spacing distance is one anchor per 2 sq. ft. Anchors are installed with the 5550001 setting tool, via torque 50-100 lb. Custom lengths available upon request.

	SERIES 5950/5951	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8
BACK-UP MATERIAL	9/16" Mortar Jt ①	300	75	25	1216	505	42
	9/16" Mortar Jt ②	979	218	22	1321	272	20
	Brick ③				1348	297	22
	Precast ④				2169	382	18
	Brick ⑤				2062	170	8

① 962 psi mortar joint
② 1450 psi mortar joint
③ 7700 psi brick
④ 3500 psi concrete
⑤ 11000 psi brick

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: 5950/5951

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers <3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304SS Rod	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5950/5951 Series Repair Anchor	DUR-O-WAL or approved Equal	Nut & Washers 306 Brass Sleeves & Cones	1/2" 5/8"	1/2" 5/8"		

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.

Dur-O-Wal, Dur-O-Flex Friction Pin Anchor

DESCRIPTION:

A suitable anchor for wall tying in applications that typically would use masonry connectors of the light to medium duty variety.

Dur-O-Flex is a non-corrosive masonry anchoring system uniquely designed to withstand axial loading, and provide flexible within-plane wythe movement. The Dur-O-Flex anchor concept can be used in either restoration or new applications. The Dur-O-Flex is attached to a structure via friction using simple installation methods, or bonded with epoxies to create the most flexible wall tie in its class. The Dur-O-Flexanchor retangular cross section has been engineered into a continuous spiral shape with broad bearing surface edges that distributes forces over a large area.

FEATURE	BENEFITS
• One step installation.	• Lower installed cost.
• Manufactured of austentic steel type 304. for most	• Provides outstanding corrosion protection all aggressive corrosion environments.
• Helical design.	• Creates a threading action during installation that ensures a friction fit for quality performance.
• Broad bearing surface edges.	• Optimized steel contact area with base material which minimizes stress—no sharp edges.
• No axial stiffening rib.	• Provides in-plane ductility which allows for nonconcurrent wythe movement of masonry.
• Flexible.	• Absorbs energy from veneer movement within-plane and lessens the chance of the anchor to “walk” out of the hole.
• Engineered drilled hole sizes.	• Provides the maximum amount of surface contact area in hard or soft anchoring materials.
• One piece anchor.	• No multiple components assembly required.
• Simplified installation equipment.	• Requires little training with easy installation methods.
• Can be field trimmed to length.	• Allows for easy adaptation to common field variations of depth.
• Anchorage performance enhancement possible without sacrificing flexibility.	• Optional epoxy bonded connections obtain great holding power in base materials which are soft or fragile. Flexibility is maintained via the Dur-O-Flex design.
• Optional resin bonded connections can be quality tested independently for the back up anchor and veneer anchor connections.	• Provides a quality assurance method no other epoxy pin connection is capable of this qualification.

When evaluating the application of a friction pin anchoring system, the following anchoring features should be evaluated:

A) **Performance Repeatability:** All dry fix or friction pin connectors are subject to base material consistency. Similar to a nails performance in various substrates, the dry fix connection relies on intimate contact with its base material. The connection forces are distributed at the circumferential contact points of its spiral shape. Performance repeatability will then be a function of base material density, hole size, friction coefficients of the base material, uniformity of base material qualities, and base material elasticity.

B) **Quality Control:** On site quality control testing is possible but limited to veneer, or outermost connections only. Tension testing of the back up, or verifying a back up connection has occurred, is only possible if non-contact veneer anchoring exists. That can be accomplished by drilling an oversize hole (1/2") thru the veneer, then switch to the appropriate back-up hole for the pin installation in the back up. Also, the veneer connection can be disengaged (cored out) to isolate the back up for testing. However, this would only indicate what was available for the subject specimen, and cannot be assumed for all pins installed.

C) **Live Loads:** As a dry fix, or friction pin connector, performance results are a function of base material quality, thickness and density. Good results in solid materials are typically achieved. Ultimate pullout capacities greater than 250 pounds are possible in most all building material. This satisfies many moderate wind load performance criteria in non-essential structures and low rise buildings.

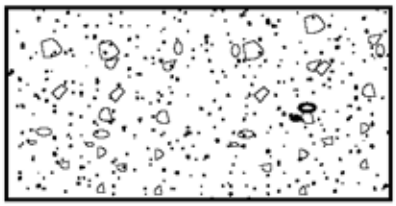
D) **Installation Ease:** By far, the friction pin anchoring system is the easiest retrofit system available. Once the pilot hole has been properly drilled, the anchor installs in seconds by using a quality rotary hammer and the S.D.S. adapted setting tool. The setting characteristics of threading and insertion is accomplished by the anchor's spiral design and the hammer driving action of the tool. The chisel pointed end, which is factory produced, provides the leading end a directional path to anchor into the substrate.

E) **Installed Cost:** The fact that the Dur-O-Flex Friction Pin installation technique is among the quickest reanchoring systems available, contributes significantly to the anchor's installed cost. Also, Dur-O-Wal's effort to develop a durable, low cost, installation tool, combined with a competitively priced anchor, makes this system a cost effective solution for pinning. Total time to install a Dur-O-Flex Friction Pin can be less than 60 seconds.

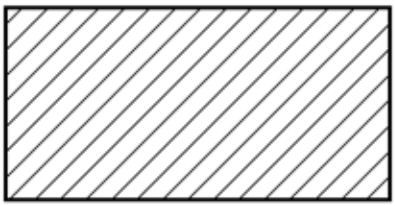
F) **In-Plant Ductility:** By virtue of the Dur-O-Flex design, in plane flexibility is greater than most standard masonry wall ties. This is especially important to consider for significant deflection caused by expansion and contraction cycles. Dur-O-Flex's spring like design is an ideal solution for anchoring insulated cavity walls with insufficient ties.

G) **Facade Aesthetics:** The friction pin anchor requires hole sizes of approximately 1/4". The anchor, once installed, is recessed in the veneer by approximately 1/4-3/8". The installer needs only to plug a small hole with mortar since the joint is a preferred location. Note that thru brick installations are very difficult to maintain in a water tight condition. However, a sealant can be used to match the color.

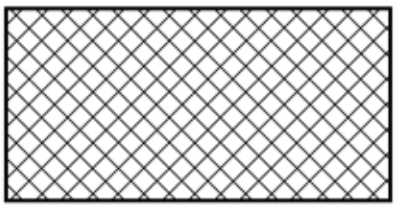
H) **Veneer Seismic Retrofit:** Currently, adaptations to the Dur-O-Flex are not available to accommodate 9 gauge wire reinforcement. However, when used in new construction, the wire can be tied to the Dur-O-Flex for engagement purposes, thus meeting code.



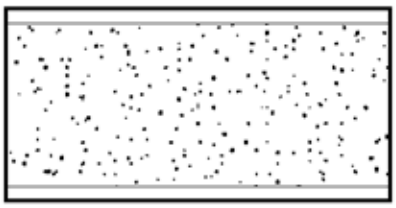
CONCRETE



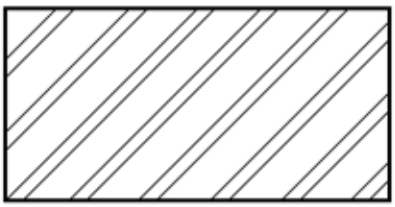
BRICK & TILE



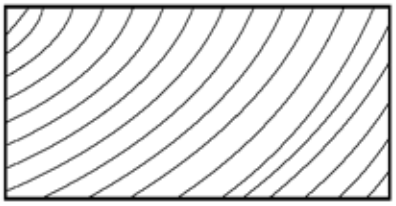
CONCRETE MASONRY UNIT



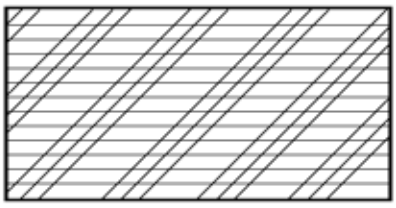
PLASTER/G.W.B.



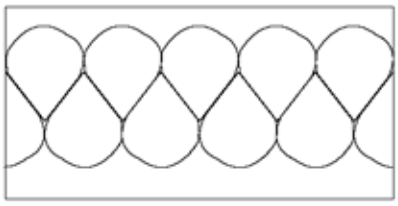
STEEL/IRON



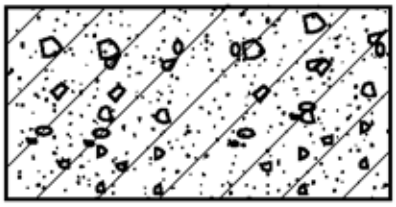
FINISH WOOD



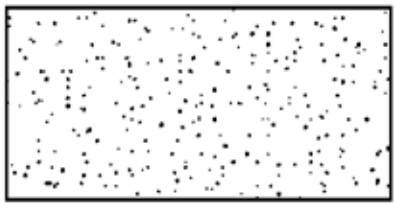
PLYWOOD (LARGE SCALE)



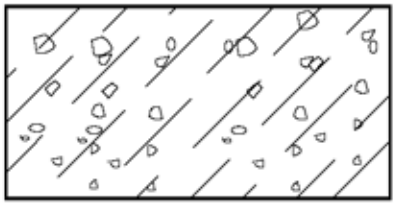
BATT INSUL



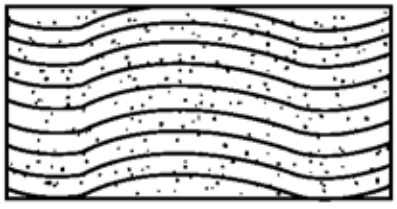
PRECAST CONCRETE



LIMESTONE

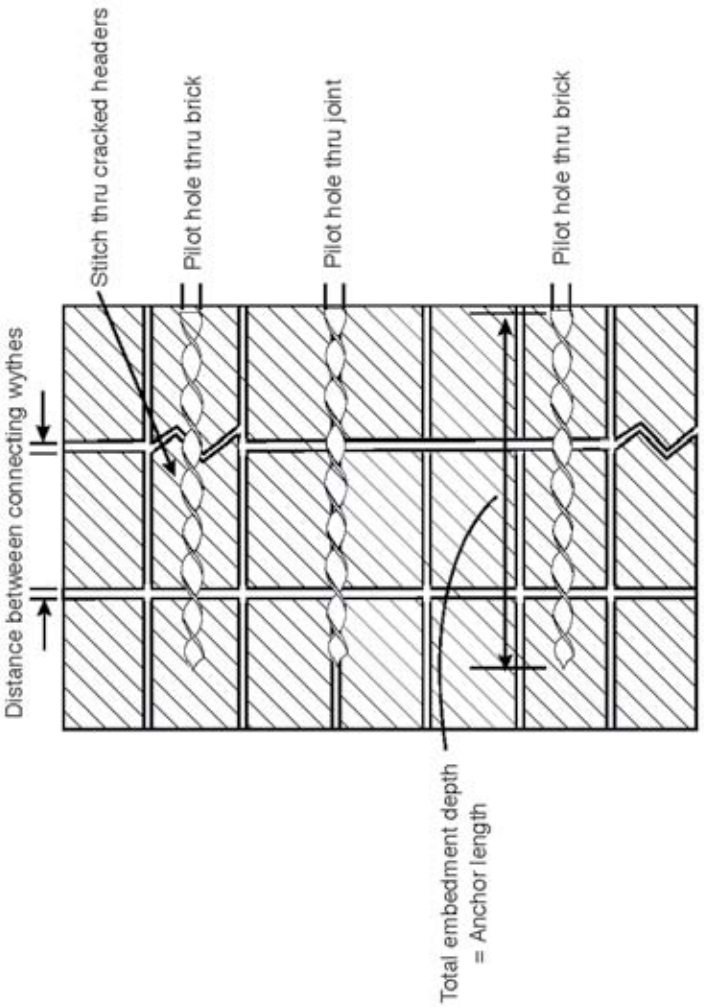


GRANITE



PARTICLE BOARD

DUR-O-FLEX FRICTION PIN



Multi brick wythes

NOTE: Pilot hole depth should be greater than anchor length by 1" min.

DUR-O-WAL VENEER REANCHORING SYSTEM

SCALE: NTS | DUR-O-WAL, INC. 625 CRANE ST., AURORA, IL 60505 PH: 630-898-1101, FAX: 630-898-8331 | DRAWN BY:

DATE: | REVISED:

Project:

Series Anchor: **DUR-O-FLEX FRICTION PIN**

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Brick
Soft Brick		Soft Brick

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	N/A
508 Flex 7	7"	N/A
508 Flex 8	8"	N/A
508 Flex 9	9"	N/A
508 Flex 10	10"	N/A

Dur-O-Flex Friction Pin can be installed thru cracked headers, mortar joints, or the brick of composite walls. The length of anchor is a function of the number or multiple wythes to be anchored and the minimum embedment required. Hole size selection to be field verified. Other lengths available. Install using a Dur-O-Flex Setting Tool and an S.D.S. Rotary Hammer.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Mortar Jt ②	484	193	40	484	193	40
BACK-UP MATERIAL	Brick ①	362	103	28	362	103	28
	Brick ②	279	97	35	279	97	35
	Mortar Jt ③	484	193	40	484	193	40
	Mortar Jt ④	316	86	27	316	86	27
BUCKLING STRENGTH	4" ⑤	534	N/A	N/A			

① 4" embedment, 2145 psi, per ASTM E477 Prism Test.

② Installed in joint, 1720 psi Type N mortar, 4" embedment

③ 2" embedment in brick.

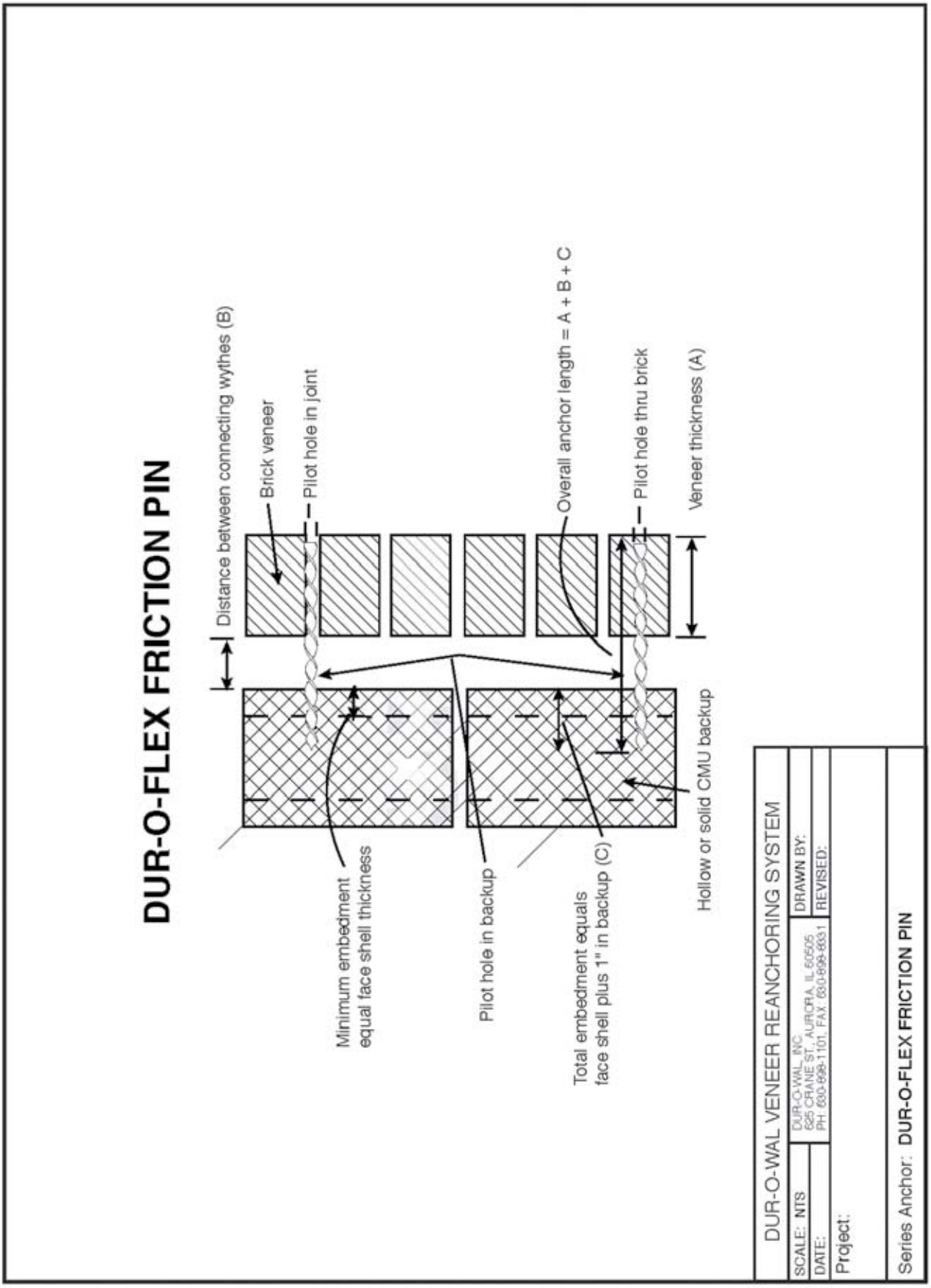
④ 2" embedment in mortar joint.

⑤ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Distance between connecting wythes (B)
Brick veneer
Pilot hole in joint
Overall anchor length = A + B + C
Pilot hole thru brick
Veneer thickness (A)
Minimum embedment
equal face shell thickness
Pilot hole in backup
Total embedment equals
face shell plus 1" in backup (C)
Hollow or solid CMU backup
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH. 630-898-1101 FAX 630-898-8831
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		CMU Hollow
Soft Brick		CMU Grouted
Concrete		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	0" - 1/2"
508 Flex 7	7"	0" - 1"
508 Flex 8	8"	1" - 2"
508 Flex 9	9"	2" - 3"
508 Flex 10	10"	3" - 4"

Dur-O-Flex Friction Pins can be used to restabilize brick, soft brick, and precast concrete veneers to hollow or solid grouted CMU. Installation thru the brick veneer can occur at the joint or thru the brick. Field verify hole sizes. Other lengths available. Install using a Dur-O-Flex Setting Tool and an S.D.S. Rotary Hammer.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Mortar Jt ②	484	193	40	484	193	40
	Concrete ③	611	227	37	611	227	37
BACK-UP MATERIAL	Hollow CMU ④	426	183	43	426	183	43
	Hollow CMU ⑤	259	72	28	259	72	28
BUCKLING STRENGTH							
	4" ⑥	534	N/A	N/A			

① 4" embedment, 2145 psi, per ASTM E477 Prism Test.

② Installed in joint, 1720 psi Type N mortar, 4" embedment

③ 2" embedment 3000 psi

④ 1-1/4" embedment in face shell, light weight CMU

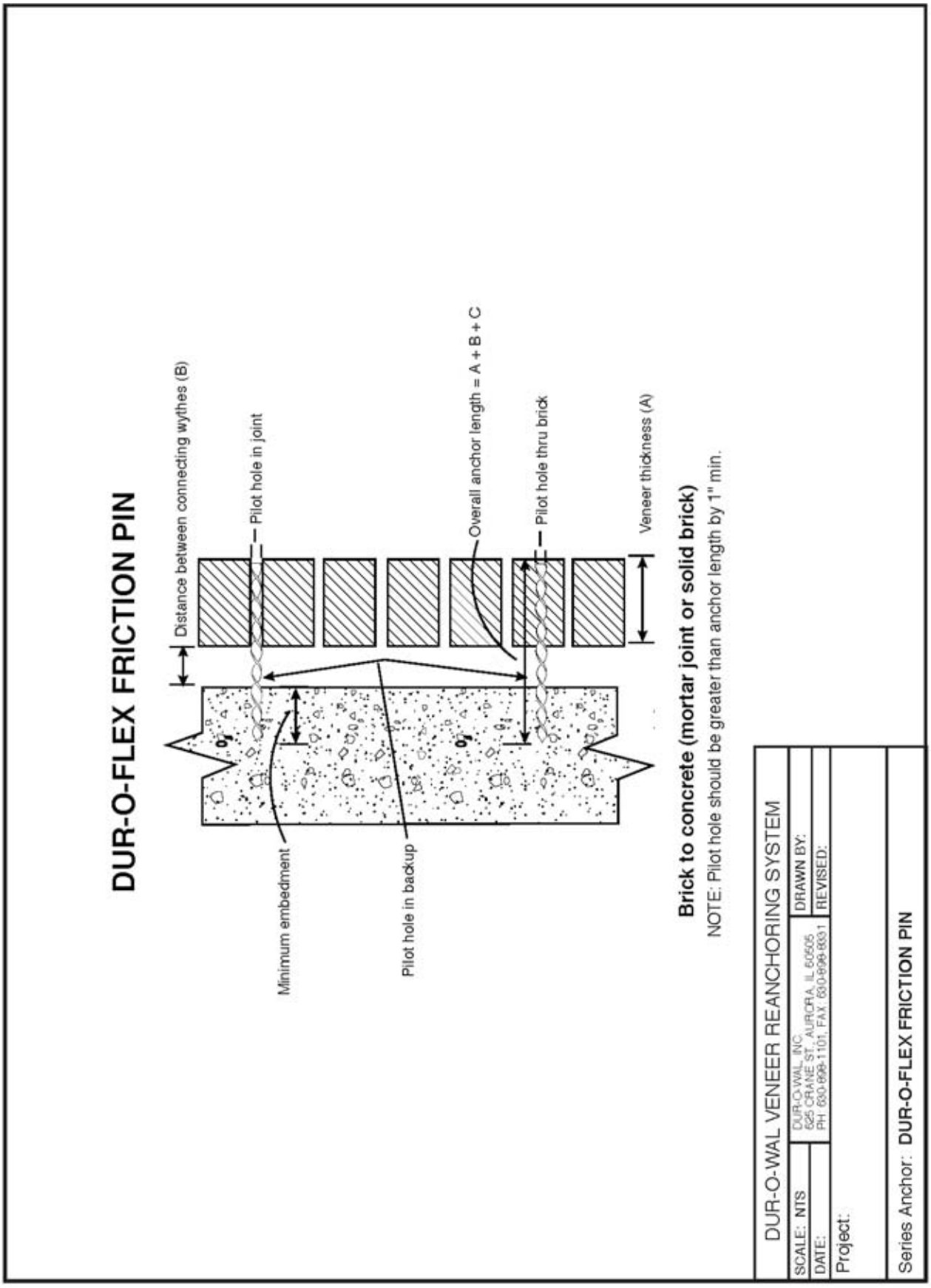
⑤ 1-1/4" embedment in face shell, normal weight CMU

⑥ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Distance between connecting wythes (B)
Pilot hole in joint
Overall anchor length = A + B + C
Pilot hole thru brick
Veneer thickness (A)
Minimum embedment
Pilot hole in backup
Brick to concrete (mortar joint or solid brick)
NOTE: Pilot hole should be greater than anchor length by 1" min.
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL INC.
625 CRANE ST., AURORA, IL 60505
PH 630-898-1101, FAX 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Concrete
Soft Brick		
Concrete		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	0" - 1/2"
508 Flex 7	7"	0" - 1"
508 Flex 8	8"	1" - 2"
508 Flex 9	9"	2" - 3"
508 Flex 10	10"	3" - 4"

Dur-O-Flex Friction Pins can be used to restabilize brick, soft brick, and precast concrete veneers to hollow or solid grouted CMU. Installation thru the brick veneer can occur at the joint or thru the brick. Field verify hole sizes. Other lengths available. Install using a Dur-O-Flex Setting Tool and an S.D.S. Rotary Hammer.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Mortar Jt ②	484	193	40	484	193	40
	Concrete ③	611	227	37	611	227	37
BACK-UP MATERIAL	Concrete ③	611	227	37	611	227	37
BUCKLING STRENGTH	4" ④	534	N/A	N/A			

① 4" embedment, 2145 psi, per ASTM E477 Prism Test.

② Installed in joint, 1720 psi Type N mortar, 4" embedment

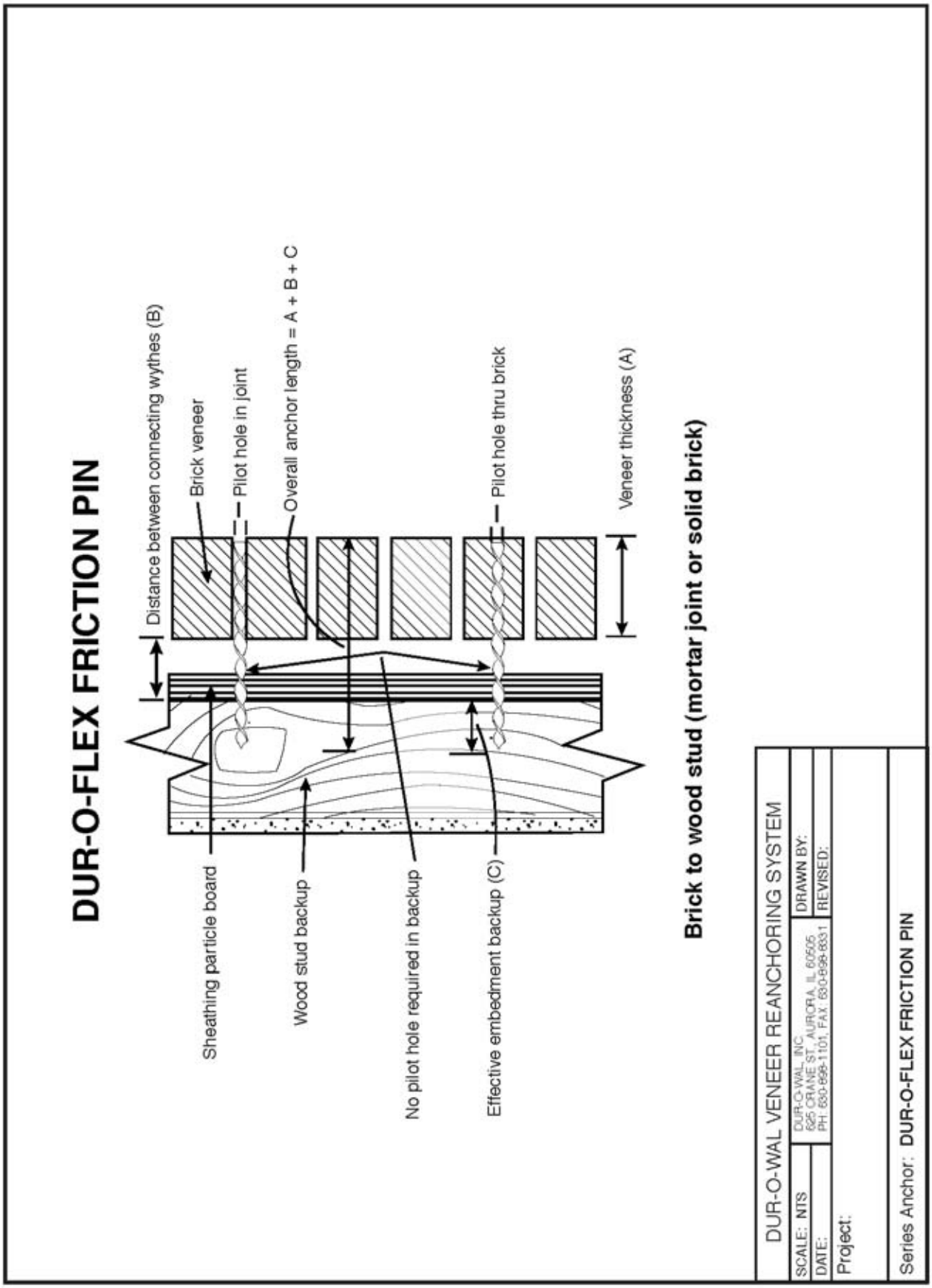
③ 2" embedment 3000 psi

④ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Distance between connecting wythes (B)
Brick veneer
Pilot hole in joint
Overall anchor length = A + B + C
Pilot hole thru brick
Veneer thickness (A)
Sheathing particle board
Wood stud backup
No pilot hole required in backup
Effective embedment backup (C)
Brick to wood stud (mortar joint or solid brick)
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Wood
Soft Brick		Wood Sheathing

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	0" - 1/2"
508 Flex 7	7"	0" - 1"
508 Flex 8	8"	1" - 2"
508 Flex 9	9"	2" - 3"
508 Flex 10	10"	3" - 4"

Dur-O-Flex can be installed either thru the brick or mortar joint. The selection of hole size is dependent on hardness of either joint or brick. Field verification of hole size required for optimum results. Other lengths available. Install using a Dur-O-Flex Setting Tool and S.D.S. Rotary Hammer.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Mortar Jt ②	484	193	40	484	193	40
BACK-UP MATERIAL	Wood @ 1-1/4" ③	611	227	37	611	227	37
	Wood @ 2"	329	68	21	329	68	21
BUCKLING STRENGTH	4" ④	534	N/A	N/A			

① 4" embedment, 2145 psi, per ASTM E477 Prism Test.

② Installed in joint, 1720 psi Type N mortar, 4" embedment

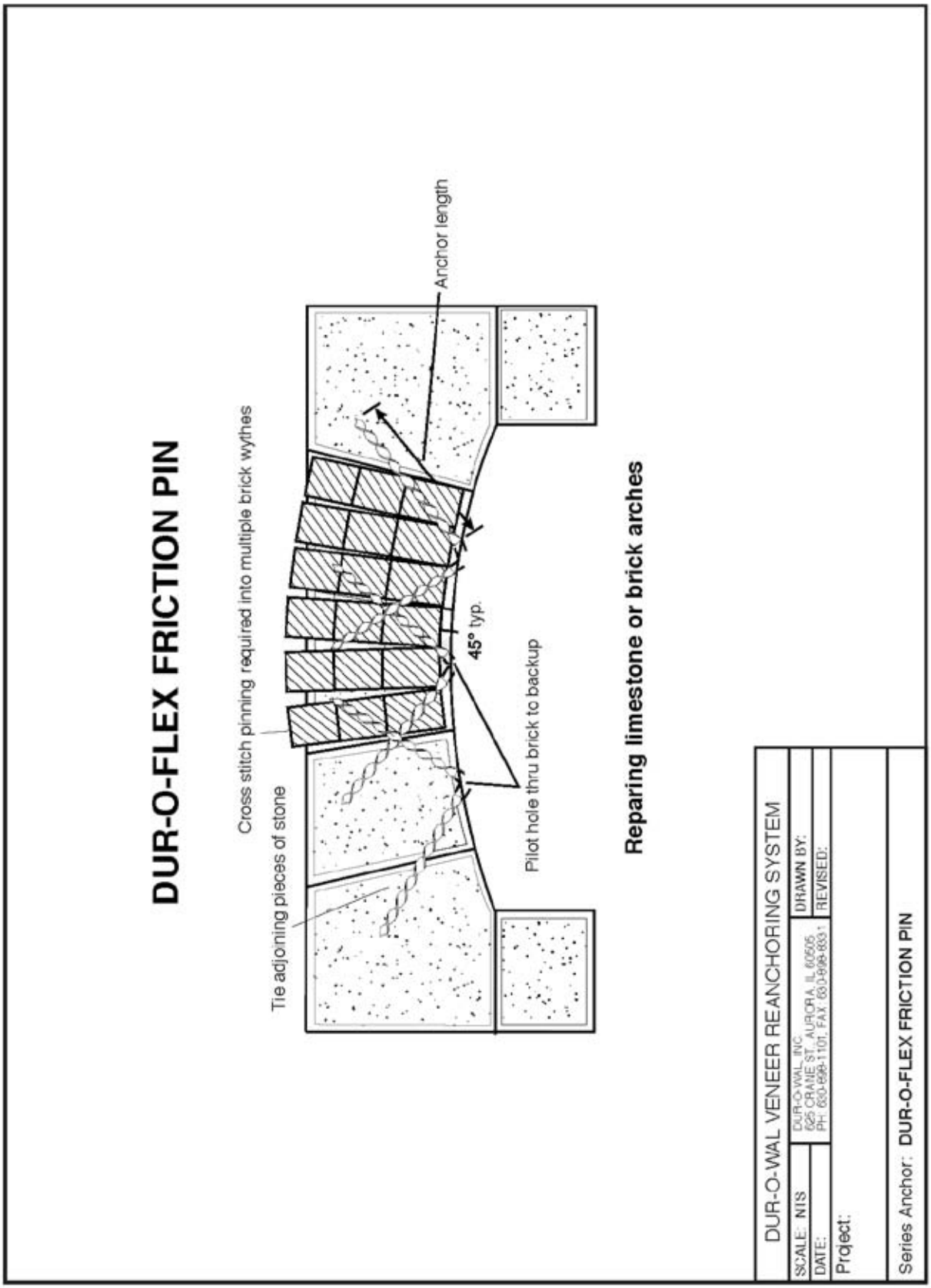
③ 2 x 4 kiln dried fir, in 2" face.

④ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Anchor length
Cross stitch pinning required into multiple brick wythes
Tie adjoining pieces of stone
45° typ.
Pilot hole thru brick to backup
Reparing limestone or brick arches
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8931
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Stone		Brick
Brick		Concrete
		Mortar
		Wood

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	N/A
508 Flex 7	7"	N/A
508 Flex 8	8"	N/A
508 Flex 9	9"	N/A
508 Flex 10	10"	N/A

The Dur-O-Flex Friction Pin can be used to reanchor existing archways that exhibit settlement. The pin should be installed in pairs in a cross stitch style for stability. Hole size should be field verified. Install using the Dur-O-Flex Setting Tool and S.D.S. Rotary Hammer. Other lengths available.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Stone	FIELD VERIFY			FIELD VERIFY		
BACK-UP MATERIAL	Brick ①	362	103	28	362	103	28
	Brick ②	279	97	35	279	97	35
	Mortar Jt. ③	316	86	27	316	86	27
	Mortart Jt. ④	484	193	40	484	193	40
	Concrete ⑤	611	227	37	611	227	37
	Wood ⑥	241	31	13	241	31	13
	Wood ⑦	329	68	21	329	68	21
BUCKLING STRENGTH							
	4" ⑧	534	N/A	N/A			

① 4" embedment, 2145 psi, per ASTM E477 Prism Test.

② 2" embedment 3000 psi

③ Installed in joint, 1720 psi Type N mortar, 4" embedment

④ In mortar joint, 4" embedment

⑤ 2" embedment 3000 psi

⑥ 2" x 4" stud lumber @ 1-1/4" embedment.

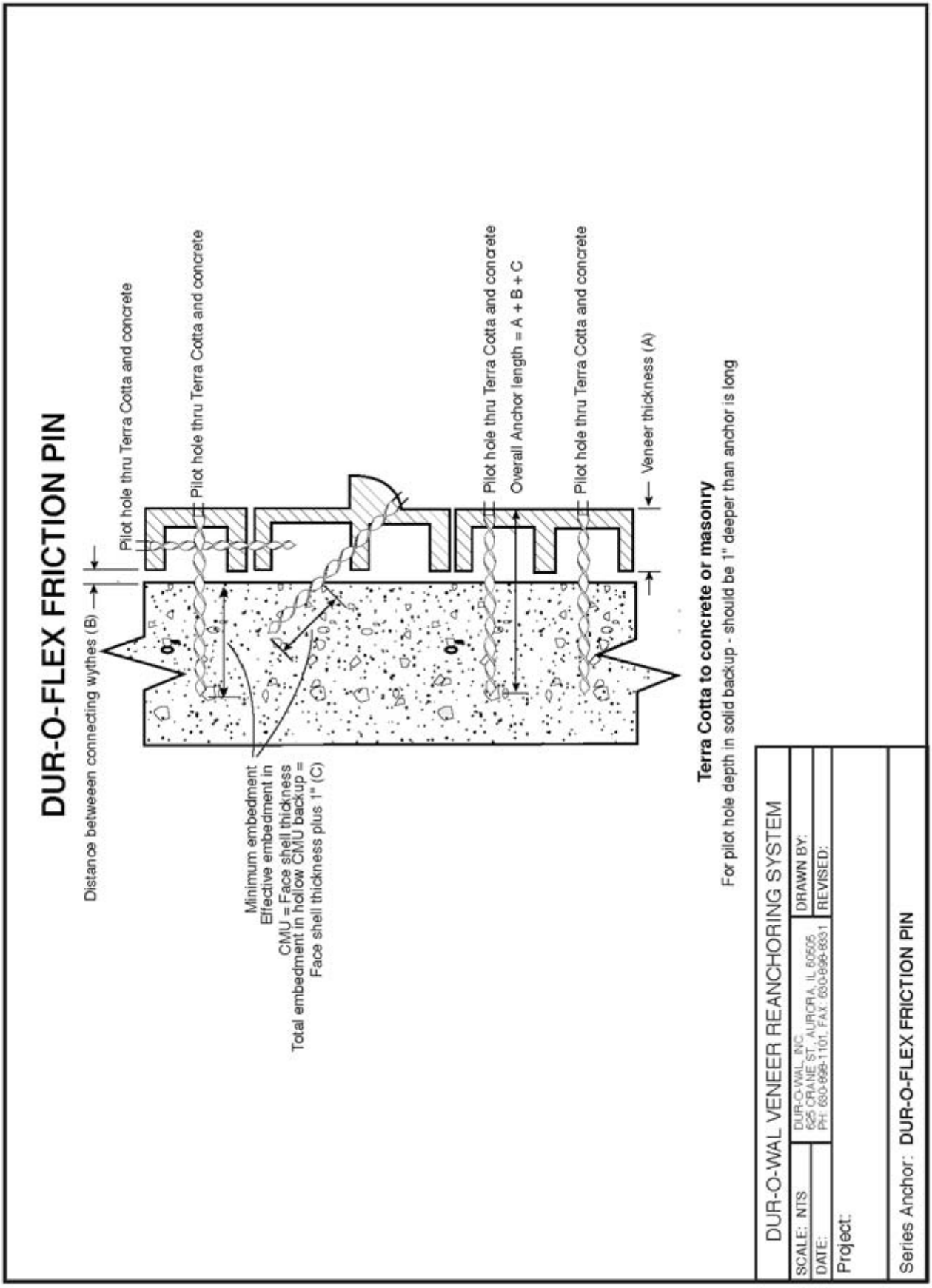
⑦ 2" x 4" stud lumber @ 2" embedment.

⑧ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Distance between connecting wythes (B)
Pilot hole thru Terra Cotta and concrete
Pilot hole thru Terra Cotta and concrete
Minimum embedment
Effective embedment in
CMU = Face shell thickness
Total embedment in hollow CMU backup =
Face shell thickness plus 1" (C)
Pilot hole thru Terra Cotta and concrete
Overall Anchor length = A + B + C
Pilot hole thru Terra Cotta and concrete
Veneer thickness (A)
Terra Cotta to concrete or masonry
For pilot hole depth in solid backup - should be 1" deeper than anchor is long
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8331
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Terra Cotta		Concrete
		Brick
		Block

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	N/A
508 Flex 7	7"	N/A
508 Flex 8	8"	N/A
508 Flex 9	9"	N/A
508 Flex 10	10"	N/A

Dur-O-Flex Friction Pins are a good method to stitch or anchor terra cotta to various backup materials. Care must be exercised when drilling so as not to shatter the terra cotta. Field verify hole sizes. Install using the Dur-O-Flex Setting Tool with S.D.S. Rotary Hammer. Other lengths available. Can be installed thru terra cotta or mortar joint.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Terra Cotta	FIELD VERIFY			FIELD VERIFY		
	Mortar Jt. ①	484	193	40	484	193	40
BACK-UP MATERIAL	Concrete ②	611	227	37	611	227	37
	Brick ③	279	97	35	279	97	35
	Brick ④	362	103	28	362	103	28
	Mortar ⑤	316	86	27	316	86	27
	Mortar ①	484	193	40	484	193	40
	Block ⑥	426	183	43	426	183	43
	Block ⑦	259	72	28	259	72	28
BUCKLING STRENGTH	4" ⑧	534	N/A	N/A			

① Installed in joint, 1720 psi Type N mortar, 4" embedment

② 2" embedment 3000 psi

③ 2" Embedment in brick, 2140 psi per ASTM E477 Prism Test.

④ 4" embedment in brick

⑤ In mortar joint 2" embedment, 1720 psi Type N mortar.

⑥ 1-1/4" embedment in face shell, light weight CMU

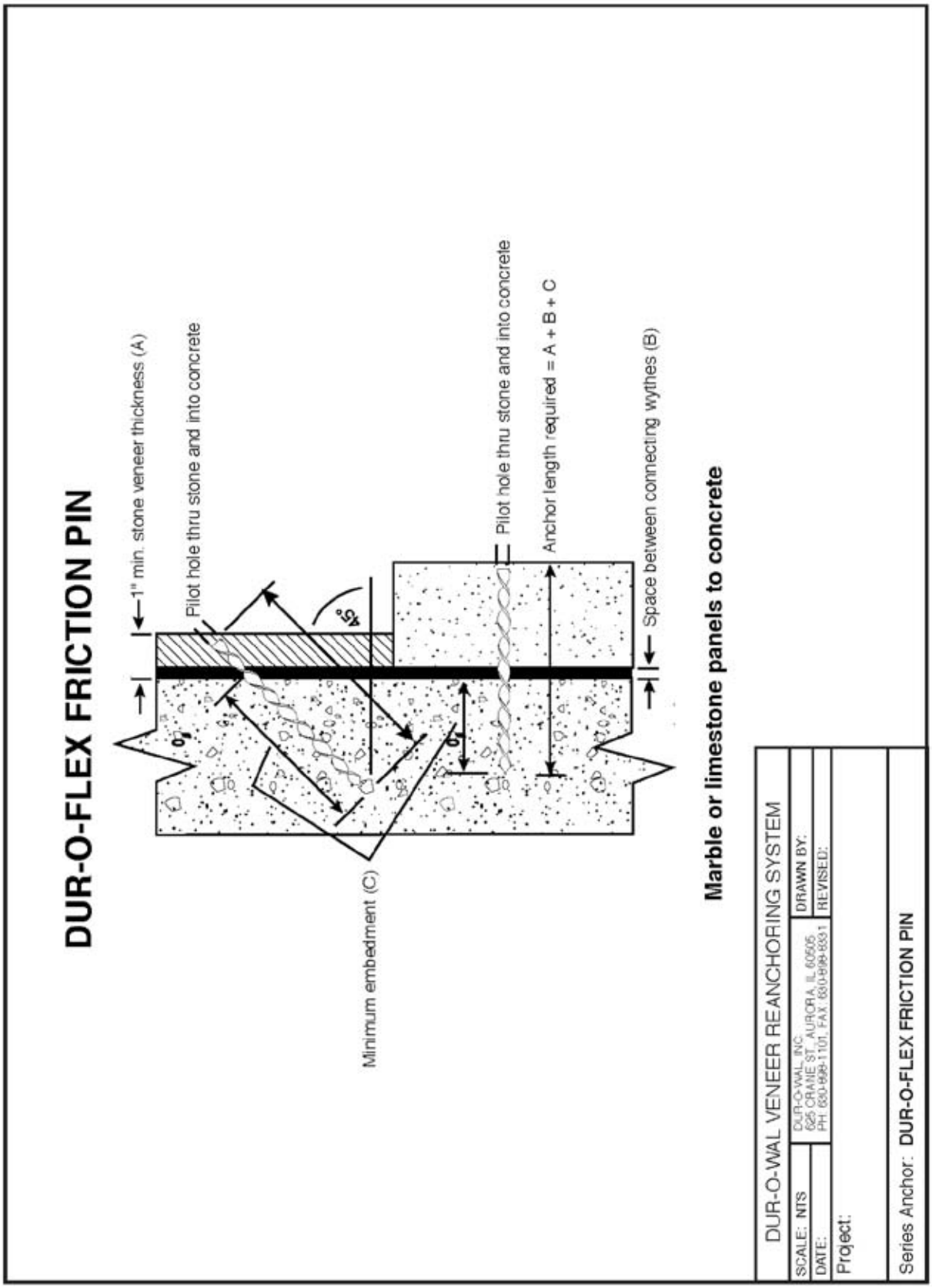
⑦ 1-1/4" embedment in face shell, light weight CMU

⑧ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
1" min. stone veneer thickness (A)
Pilot hole thru stone and into concrete
45°
Pilot hole thru stone and into concrete
Anchor length required = A + B + C
Space between connecting wythes (B)
Minimum embedment (C)
Marble or limestone panels to concrete
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL INC.
625 CRANE ST., AURORA, IL 60505
PH 630-898-1101, FAX 630-898-8831
DRAWN BY:
REVISED:
Project:
Series Anchor: DUR-O-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Marble		Concrete
Limestone		Brick
Travertine		Block
Sandstone		Wood
Precast		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	N/A
508 Flex 7	7"	N/A
508 Flex 8	8"	N/A
508 Flex 9	9"	N/A
508 Flex 10	10"	N/A

Dur-O-Flex can be used to stabilize most stone veneers. Stone density will limit the application (not recommended for granite). Field verification of performance and hole size is required due to the varying qualities of stones. Install using the Dur-O-Flex Setting Tool with S.D.S. Rotary Hammer. Other lengths available.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Concrete ①	611	227	37	611	227	37
	Marble	FIELD VERIFY			FIELD VERIFY		
	Limestone	FIELD VERIFY			FIELD VERIFY		
	Travertine	FIELD VERIFY			FIELD VERIFY		
	Sandstone	FIELD VERIFY			FIELD VERIFY		
BACK-UP MATERIAL	Concrete ①	611	227	37	611	227	37
	Brick ②	279	97	35	279	97	35
	Brick ③	362	103	28	362	103	28
	Mortar ④	316	86	27	316	86	27
	Mortar ⑤	484	193	40	484	193	40
	Block ⑥	426	183	43	426	183	43
	Block ⑦	259	72	28	259	72	28
	Wood ⑧	241	31	13	241	31	13
	Wood ⑨	329	68	21	329	68	21
BUCKLING STRENGTH	4" ⑩	534	N/A	N/A			

① 2" embedment 3000 psi

② 2" Embedment in brick, 2140 psi per ASTM E477 Prism Test.

③ 4" embedment in brick

④ Installed in mortar joint 2" embedment, 1720 psi Type N mortar.

⑤ Installed in mortar joint 4" embedment

⑥ 1-1/4" embedment in face shell, light weight CMU

⑦ 1-1/4" embedment in face shell, normal weight CMU

⑧ 2" x 4" kiln dried fir, installed in 2" face, 1-1/4" embedment.

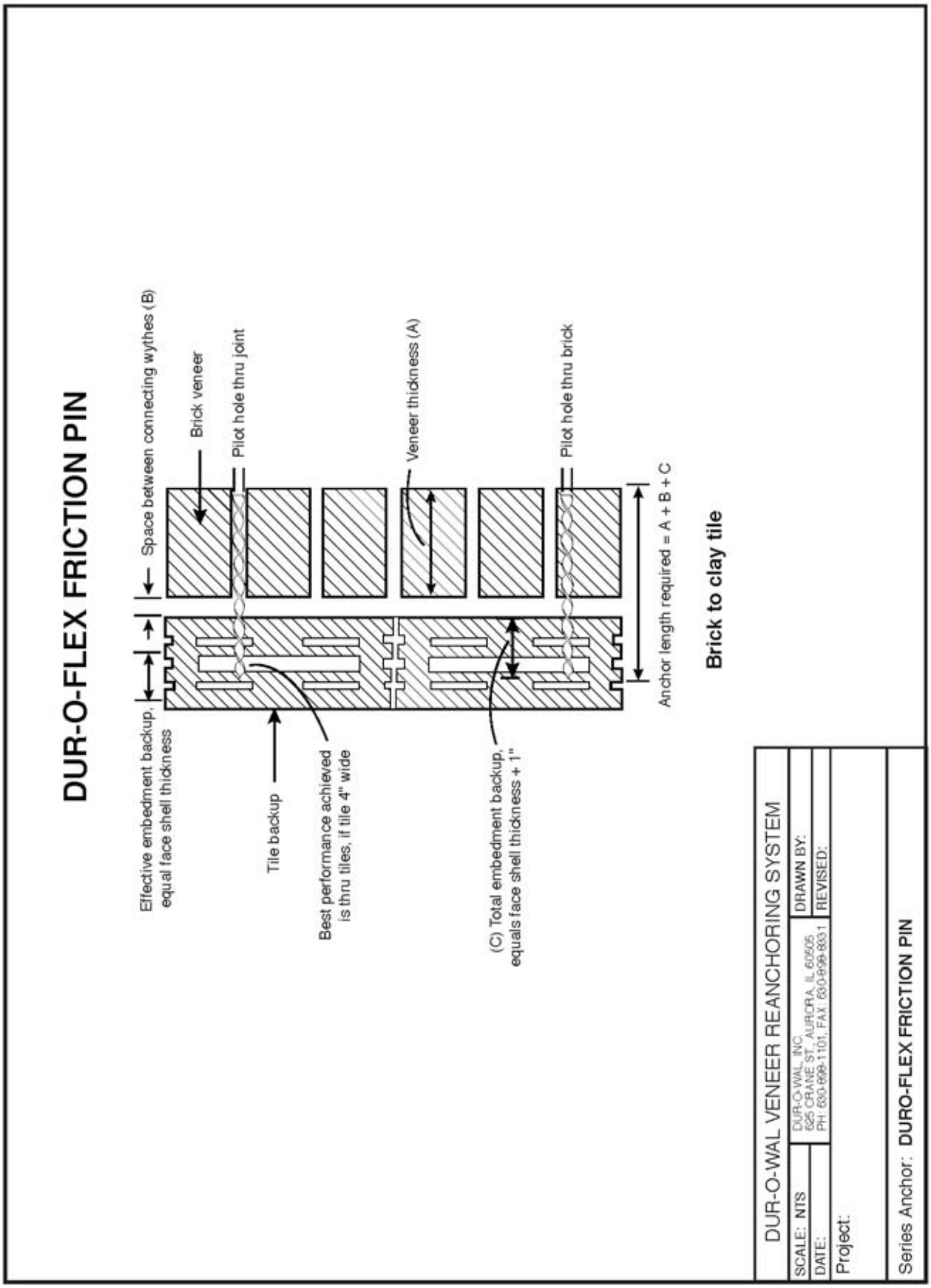
⑨ 2" x 4" kiln dried fir, installed in 2" face, 2" embedment.

⑩ Unsupported length = 4", equal to 4" cavity.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


DUR-O-FLEX FRICTION PIN
Space between connecting wythes (B)
Brick veneer
Pilot hole thru joint
Veneer thickness (A)
Pilot hole thru brick
Effective embedment backup, equal face shell thickness
Tile backup
Best performance achieved is thru tiles, if tile 4" wide
(C) Total embedment backup, equals face shell thickness + 1"
Anchor length required = A + B + C
Brick to clay tile
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8031
DRAWN BY:
REVISED:
Project:
Series Anchor: DURO-FLEX FRICTION PIN

Series Anchor:
Dur-O-Flex Friction Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Tile

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	N/A
508 Flex 7	7"	N/A
508 Flex 8	8"	N/A
508 Flex 9	9"	N/A
508 Flex 10	10"	N/A

The Dur-O-Flex Friction Pin can be used to stabilize brick veneers to a tile backup. Care must be exercised when drilling in tile, preferably rotation only, or a very light impacting hammer drill is recommended. Install Dur-O-Flex using the Dur-O-Flex Setting Tool and an S.D.S. Rotary Hammer. Verify the hole size in the field. Other lengths available. Installation thru the mortar joint or brick is possible.

		ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①	362	103	28	362	103	28
	Mortar Jt. ②	484	193	40	484	193	40
BACK-UP MATERIAL	Tile	FIELD VERIFY			FIELD VERIFY		

① 4" embedment, 2145 psi per ASTM E477 Prism Test.

② 4" embedment in mortar joint, 1720 psi Type N mortar.

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-FLEX FRICTION PIN

GENERAL				PRODUCTS				EXECUTION			
Quality AssuranceSubmittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-FLEX	DUR-O-WAL or approved Equal		Field Verify	Field Verify	Field Verify	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.

Dur-O-Pair Resin Anchor
Catalog #5083080

DAYTON SUPERIOR

Product Description

Dur-O-Pair™ is the fast, economical, easy way to anchor materials to brick, hollow block, terra-cotta, tile and concrete. It is ideal for close to the edge mounting and fastening in areas where setting stresses and vibratory loads are of concern. It can be used as an anchor to reattach existing wythes of brick and masonry.

The Dur-O-Pair resin anchoring system consists of a two-part, 100% solid epoxy-based adhesive which is automatically mixed in the proper proportions through its dispensing nozzle. Supplemental components of the system necessary to complete the job are the dispensing tool, anchor rods, wire mesh screens, nuts and washers (as required). In combination they provide an adhesive anchorage that is consistently reliable, has exceptional bonding strength and is easy and economical to use in a broad range of masonry applications. And, since they operate as a complete system. Dur-O-Pair resin anchors eliminate the guesswork associated with conventional epoxy mixing.

The system incorporates the latest technology in polymer chemistry. The unique properties of the thixotropic gel provide an exceptionally high strength bond with quick gel time characteristics. The result is an adhesive anchor that is far more resistant to hydrolization (breakdown of the bond in the presence of water), as well as less temperature sensitive, than other epoxy and polyester based anchors.

The Dur-O-Pair resin anchor has excellent surface wetting characteristics that penetrate concrete dust and moisture to generate maximum anchoring integrity even in questionable concrete or soft masonry materials. The anchoring material actually makes the area around the anchor stronger than the rest of the base material. This feature is particularly important in renovation applications.

Dur-O-Pair resin is available as a low odor formulation. This formulation is ideally suited for use in enclosed areas or areas with poor ventilation.

Properties of Components

Property	Part A	Part B
Color	White	Black
Viscosity (77°F)	Thixotropic	Thixotropic (paste-like)
Epoxy Equivalent		
Mixing Ratio	1	1 by volume
Shelf Life	1 year @ 75°F	1 year @ 75°F
Volatile Content	None	None
Filler Content	±46%	±46%

Properties of Formulation

Property	Description	
Color	Gray (when mixed)	
Water Absorption	None	
Shrinkage	No shrinkage	
Thermal Compatibility	HDT (heat distortion temperature) 63°C, 146°F	
Gel Time (77°F)	50 gram mass—20 minutes	
	Thin film—32 minutes	
Initial Set (77°F)	Thin film—34 minutes	
Initial Cure (77°F)	Thin film—1 hour	
Final Cure (77°F)	Thin film—18 hours	
Chemical Resistance	Excellent	
Bond Strength (psi)	*Dry cure*	*Moist cure*
	2,180	2,560
	Average	
Elongation at Ultimate Strength	Less than 1%	
Compressive Strength ASTMD-695	16,300 psi	
Tensile Strength ASTMD-638	5,900 psi	

Anchor/Cartridge Set (with screen)

Rod Diameter	Screen Diameter	Length of Screen	Number of anchors per Cartridge 22 oz.
3/8”	1/2”	6”	32
		8”	23
		10”	18
1/2”	5/8”	6”	20
		8’	14
		10”	11
5/8”	3/4”	6”	14
		8”	10
		10”	8

Holes/Cartridge Set (as an anchor bolt in concrete)

Bolt Diameter	Number of holes per Cartridge 22 oz.
3/8”	145
1/2”	81
5/8”	31
3/4”	18
7/8”	13
1”	9
1-1/4”	3

Dur-O-Pair Resin Anchor
General Product Description

DAYTON SUPERIOR

FEATURE	DUR-O-PAIR BENEFIT
• Achieves strength quickly	• Fast setting action saves time in application.
• Works well in concrete, soft brick, weak mortar, etc.	• Actually strengthens the surrounding material to assure a strong, stable bond.
• Good for many epoxy applications	• Meets ASTM C-881, Type I-II or IV &V, grade 3, classes A, B or C Type Material.
• Greater vibration resistance	• In vibratory load environments, Dur-O-Pair resin anchors bond with the concrete, working with it instead of against it when vibration occurs.
• Automatic mixing	• Assures precise mixture of epoxy and resin for optimum performance. Eliminates time consuming and messy pre-mixing.
• Reduces waste	• Only the exact quantity of resin compound needed is dispensed, minimizing waste. Unused portion can be set aside for future use.
• Greater application flexibility	• The operator controls the amount of anchoring material that goes into each hole regardless of size. Requires only one inventory for all hole sizes.
• Corrosion protection	• The epoxy compound seals the hole and encapsulates the embedded portion of the threaded rod, protecting it from the corrosive action of water or chemicals. Makes it ideal for use in waste water treatment facilities, food processing and other “wet” environments.
• Minimal shrinkage	• Maintains the integrity of the bond for greater strength (.003 in/in).
• Stronger anchoring	• Significantly stronger anchoring than can be achieved with conventional expansion anchors. Ideally suited for seismicrefortification of unreinforced walls.
• Close edge distance applications	• Wider range of application than conventional expansion anchors. Also allows two anchors to be mounted closer together where added strength is needed.
• Heat deflection temperature of 146°F	• Allows for greater service temperature accept ability, meets ASTM D-648.

SELECTION FEATURE ANALYSIS

The use of adhesives for pinning applications, as well as general anchoring uses, should consider features such as those listed below, when evaluating designs:

A) Performance Repeatability: Properly installed and mixed epoxies will provide consistent results. Variations of base material quality and variations in installation techniques will influence performance repeatability. The resin performance is consistent. This is a result of the quality effort used to manufacture and package the resin. With proper embedments, and quality concrete, most grade II, and, 304 stainless anchor rods will fail in tension. The most influential performance effect on epoxy anchors is drilled hole cleanliness. Residual drill dust can vary performance almost 50% from anchors properly installed in dust free holes. Epoxy anchors used in pinning applications will be influenced by wall strengths, mortar joint and brick quality.

B) Quality Control: Dur-O-Pair Resin is packaged in pre-measured containers. The applicator does not need to perform any manual mixing or measuring of components. The dual cartridge packaging system is mixed automatically and measured accurately as the epoxy is dispensed. In order to field test an epoxy pin, significant preparation is required in order to evaluate veneer, and back-up anchorage independently. Unless destruction of the veneer connection is made, evaluation of the backup connection is not possible. On site tension testing, and torque inspection is possible. The Dur-O-Wal field technicians can assist training personal.

C) Live Loads: Dur-O-Pair Resin Anchors create a strong bond with the base material. The wetting characteristics of the epoxy provide significant anchorage performance results, especially in soft brick and mortars. The resin system is stress free (unlike expansion anchors) which makes this style or anchor suitable for applications close to edges in brick walls (such as expansion joints) or floor slabs (for shelf angle connections). Vibratory loading has little influence on epoxy anchor strength and durability. With the exception of elevated temperature applications (greater than 110 degrees F), epoxy anchoring systems are the most durable, versatile, and provide the greatest holding power of post installed anchors for masonry applications.

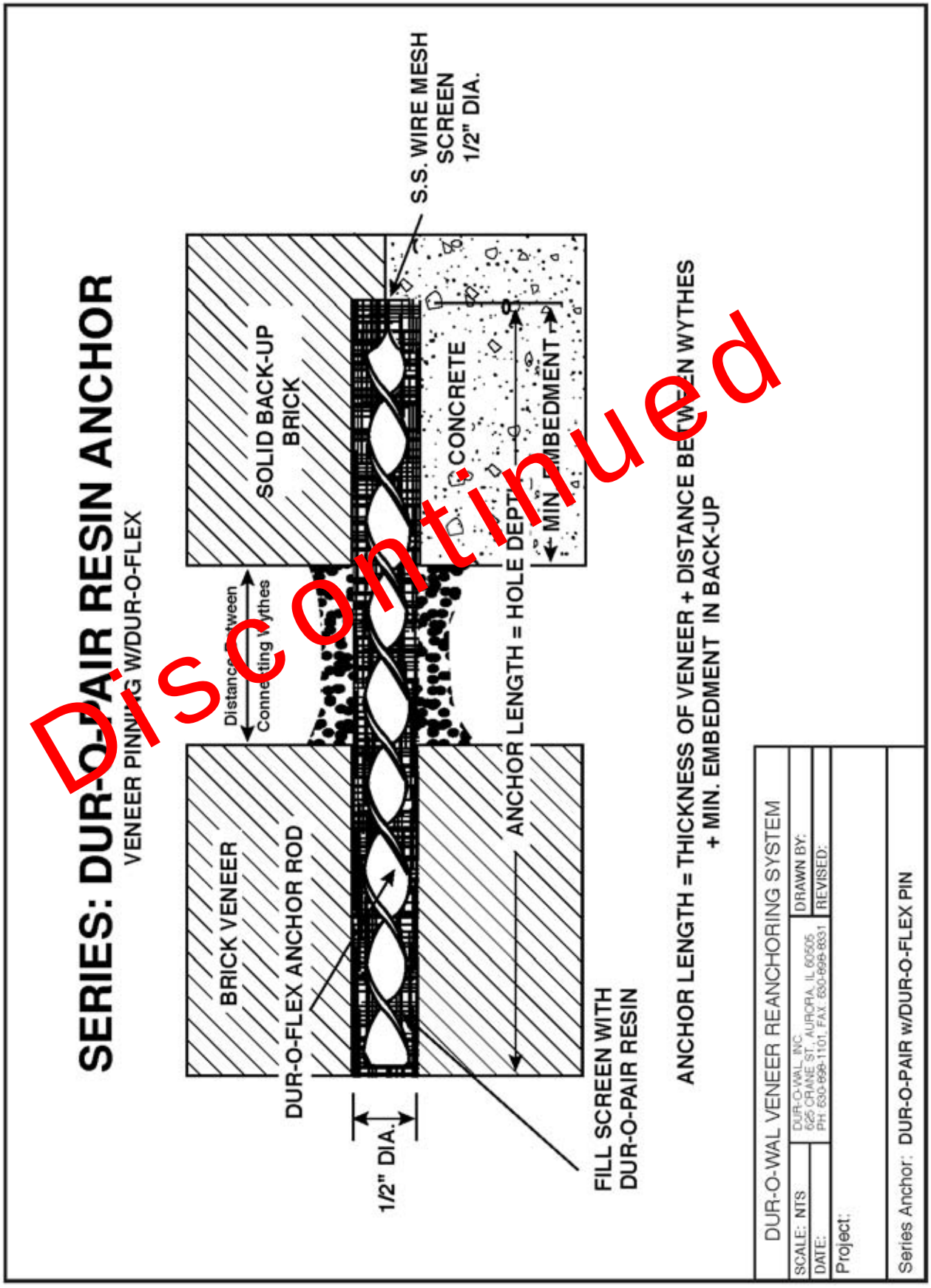
D) Installation Ease: The Dur-O-Pair Resin is packaged in cartridges that provide accurate mixing ratios when dispensed in approved dispensing equipment. Precautions need to be taken with the proper storage (80 degrees F ± 10 degrees) for efficient flow characteristics. Site personal should be trained for storage, handling, dispensing, and using epoxy anchors, in order to avoid installation difficulties.

E) Installed Cost: Compared to other pinning systems, epoxy pinning is the most costly. The care and cautions required to achieve quality performance expectations, demand the installer to be diligent in their efforts. As a result, time to install an epoxy pin is longer then other non-epoxy pinning solutions.

F) In-Plane Ductility: Epoxy pins with threaded rod are rigid connectors. Transverse loading is resisted by epoxy pins. The base material anchoring must be evaluated for resistance to flexural or shear loading in order to optimize the design. The use of Dur-O-Flex Anchor Rods in place of threaded rod, will substantially reduce in-plane stresses. Dur-O-Flex with epoxy filled screens is three times more flexible than the equivalent size epoxy pins when loading is applied via in-plane wall movement.

G) Facade Aesthetics: Most epoxy pins leave a “scar” associated with surface exposure of the hardened epoxy. Care must be exercised in order to avoid having the resin stain the brick or stone surrounding the anchorage. Proper detailing at intersecting mortar joints of masonry walls will minimize the exposure.

H) Veneer Seismic Retrofit: Dur-O-Pair Resins with properly designed anchor rods can accommodate seismic reinforcement of existing masonry veneers, preparation similar to the repair anchor is necessary. Consult with Dur-O-Wal field technicians for guidance.



Discontinued

Series Anchor:
Dur-O-Pair w/ Dur-O-Flex Pin

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Brick		Brick
Concrete		
Block		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
508 Flex 6	6"	0-1/2
508 Flex 7	7"	0-1
508 Flex 8	8"	0-1
508 Flex 9	9"	0-2
508 Flex 10	10"	0-3

The Dur-O-Flex anchor when anchored with Dur-O-Pair Resin, is an excellent veneer reanchoring system. The high strength adhesive connection to back up and veneer is connected with the Dur-O-Flex anchor. This provides significant in-plane ductility. The anchor can be installed either thru the brick or the mortar joint. A 1/2" diameter hole is required. Dur-O-Flex is inserted in a resin filled screen. The resin is displaced to create an adhesive connection, as the Dur-O-Flex is inserted.

	SERIES DUR-O-PAIR Resin Anchor	ULTIMATE CAPACITY COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Mortar Jt ①	1740	N/A	N/A	1740	N/A	N/A
BACK-UP MATERIAL	Brick ②	1219	N/A	N/A	1219	N/A	N/A
	Concrete ③	1078	N/A	N/A	1078	N/A	N/A
	Block ④	959	N/A	N/A	959	N/A	N/A

① 4" embedment thru mortar Jt. 1720 psi, type N mortar

② 3 1/2" embedment in brick, 2145 psi, per ASTM E477 Prism text

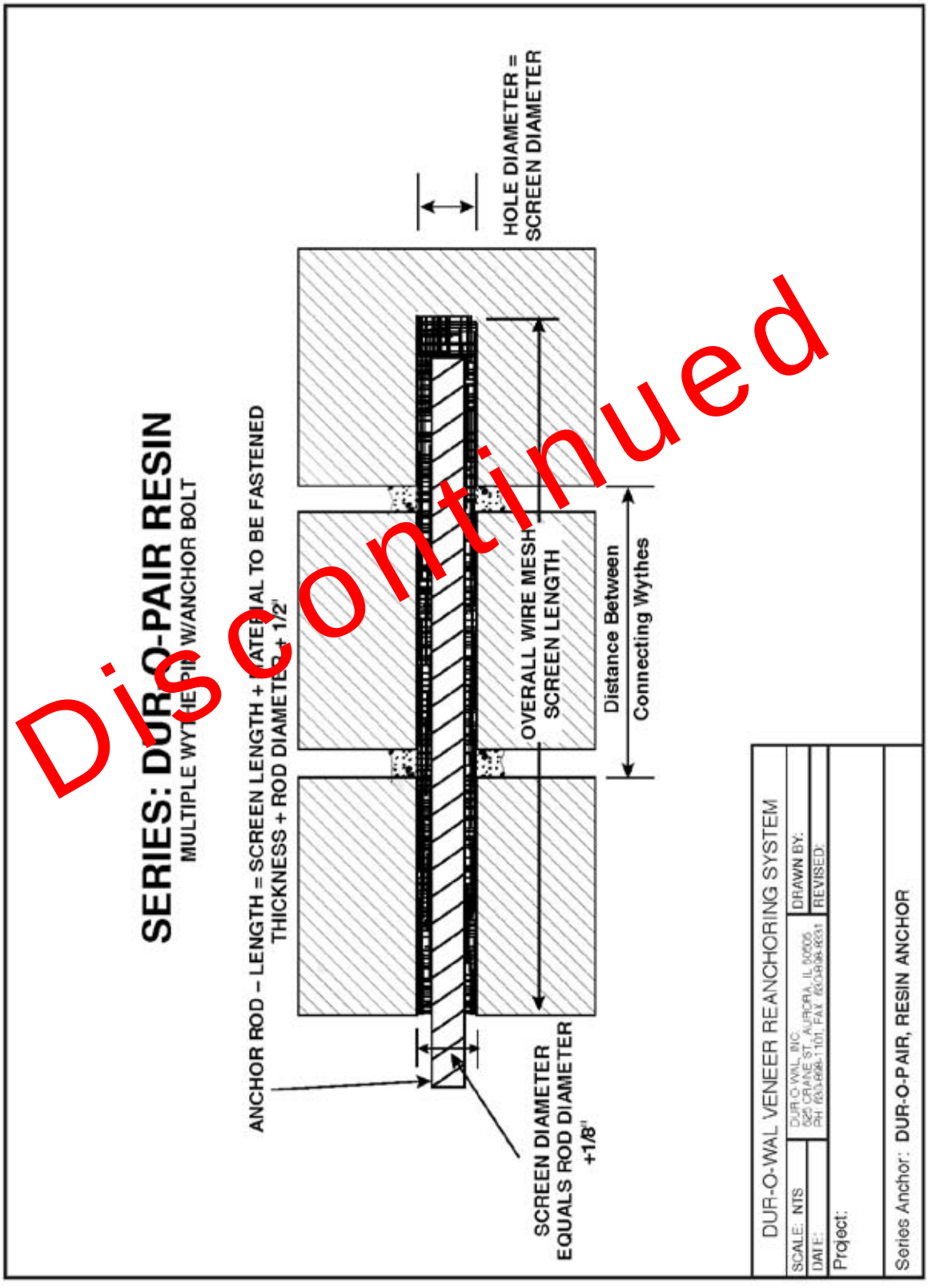
③ 3500 psi concrete @ 2 1/2 embedment

④ light weight block, thru 1 1/4" face shell, 2" overall embedment

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE REPAIR ANCHOR SERIES: DUR-O-PAIR w/DUR-O-FLEX PIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	Ty 304 SS	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-PAIR RESIN w/ DUR-O-FLEX PIN	DUR-O-WAL or approved Equal	wire mesh screen w/ SS Dur-O-Flex	1/2"	1/2"	FIELD VERIFY	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.



APPLICATION

VENEER		BACK-UP
Brick		Brick
		Block

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5083080	Field Verify	Field Verify

The Dur-O-Pair resin anchoring system utilizes stainless steel wire mesh screens and stainless steel anchor bolts and hardware. The resin bonds the rod to the masonry sub-strata. As an anchor bolt, many applications are possible, and the masonry walls become reanchored.

Discontinued

	SERIES DUR-O-PAIR Resin Anchor	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
VENEER MATERIAL	Brick ①						
	1/4" Rod	2477	546	22	2477	546	22
	3/8" Rod	3935	491	13	3935	491	13
	1/2" Rod	3000	634	21	3000	634	21
BACK-UP MATERIAL	Brick						
	1/4" Rod	2477	546	22	2477	546	22
	3/8" Rod	3935	491	13	3935	491	13
	1/2" Rod	3000	634	21	3000	634	21
BACK-UP MATERIAL	Hollow Block						
	1/4" Rod	1429	274	19	1429	274	19
	3/8" Rod	1536	371	24	1536	371	24
	1/2" Rod	1298	165	13	1298	165	13

① 4" embedment thru mortar Jt. 1720 psi, type N mortar

② 3 1.2" embedment in brick, 2145 psi, per ASTM E477 Prism text

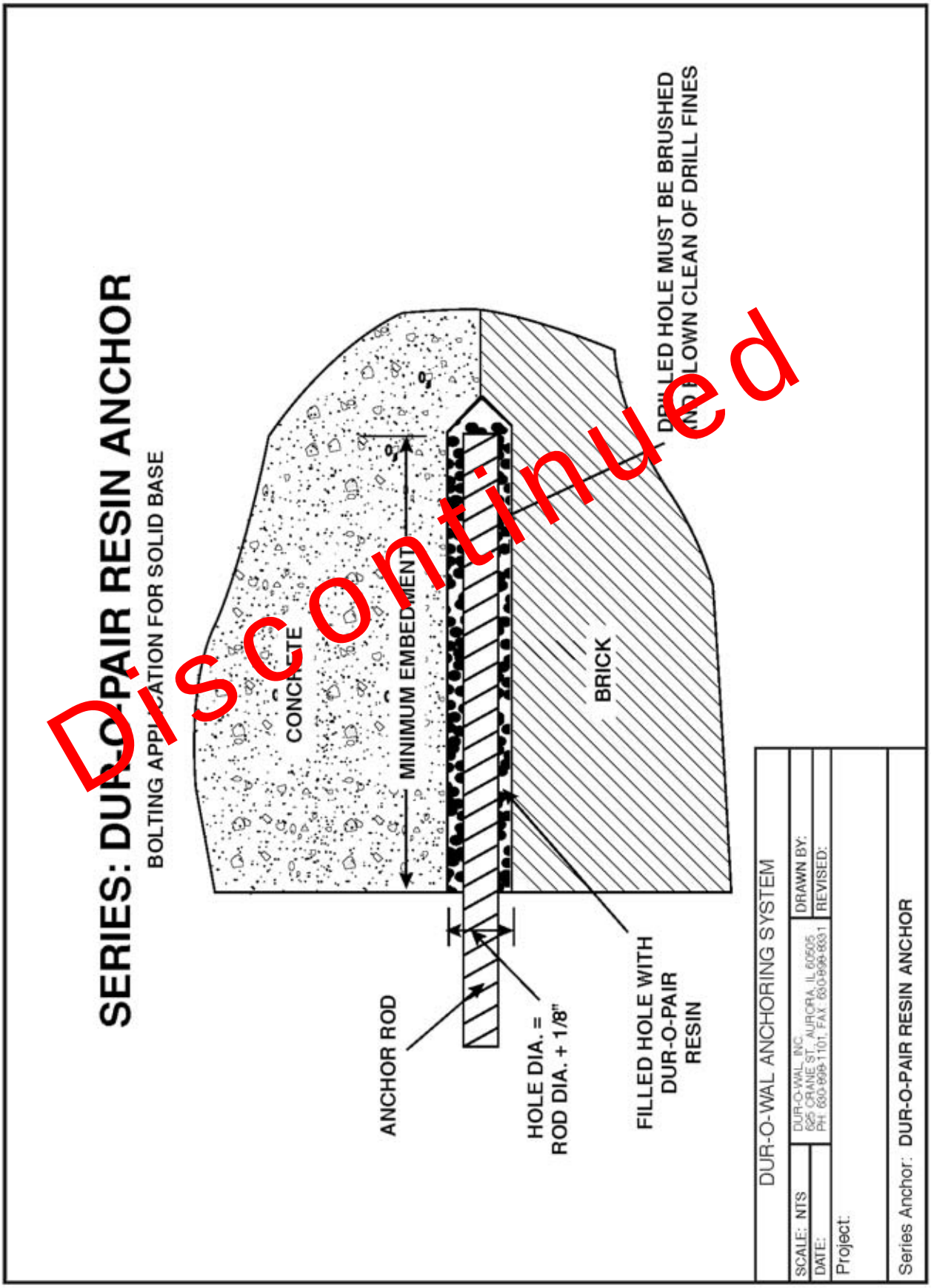
③ 3500 psi concrete @ 2 1/2 embedment

④ light weight block, thru 1 1/4" face shell, 2" overall embedment

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: DUR-O-PAIR, RESIN ANCHOR

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	SS Wire	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-PAIR RESIN Anchor	DUR-O-WAL or approved Equal	screen SS Rod w/ SS Nuts/Washers	AS DETAILED	AS DETAILED	FIELD VERIFY	FIELD VERIFY

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.



Series Anchor:
Dur-O-Pair Resin Anchor

DAYTON SUPERIOR

APPLICATION

VENEER		BACK-UP
Concrete		

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5083080	T.B.D.	N/A

The Dur-O-Pair resin system is an excellent method for anchor bolting, or rebar connecting, various applications to concrete. It is specifically advantageous for close edge distance anchoring, vibration loads, such as machinery, and is used when critical high load requirements are necessary. It is dispersed in predrilled holes, blown and brushed clean of dust, using hand held dispensing tools. Mixing is accomplished as the resin and hardener react thru the static mixer while being pumped.

				ULTIMATE CAPACITY									
				SHEER LOADS					TENSION LOADS				
				Based on Concrete Strength		Based on Steel Strength			Based on Concrete Strength		Based on Steel Strength		
Stud Diameter (in.)	Min. Embed. Depth F (in.)	Spacing (in.)	Edge Dist. (in.)	f'c = 2,000 psi	f'c = 5,000 psi	A 307 (SAE 1018)	A 193 Gr. B7 (SAE 4140)	SS 304	f'c = 2,000 psi	f'c = 5,000 psi	A 307 (SAE 1018)		
3/8	3 3/8 3 3/8	5 5	3 4 1/2	3860	3860 6620	4160 4160	9160 9160	4160 4160	9720	9200	8320	18320	6680
1/2	4 1/2 4 1/2	6 3/4 6 3/4	4 6	7180	7480 11920	7480 7480	16440 16440	7480 7480	12740	13460	14920	32840	11960
5/8	5 5/8 5 5/8	8 1/2 8 1/2	5 7 1/2	11680	12160 17640	11760 11760	25840 25840	11760 11760	19000	17900	23480	41640	18800
3/4	6 3/4 6 3/4	10 1/4 10 1/4	6 9	14720	22660 27840	17000 17000	37360 37360	17000 17000	27480	29740	33960	74720	27160
7/8	7 7/8 7 7/8	11 3/4 11 3/4	7 7/8 10 1/2	20120	31480 37380	23200 23200	51040 51040	23200 23200	27120	35780	46400	102040	37120
1	9 9	13 1/2 13 1/2	9 12	24280	39360 44700	30360 30360	66800 66800	30360 30360	41060	52480	60720	133560	48560

NOTES:

1. Safe working load must be the lesser of concrete or steel strength. Safe working loads are obtained by applying a safety factor to the average ultimate values.The steel strength values in Table No. II were obtained in accordance with Section 2702 (b) 6c and Table No. 27-A of the Uniform Building Code (1988 ed.), and Table No. 27-10-D and 27-10-P of the U.B.C. Standards (1985).
2. The tabulated values are for anchors installed at the specified spacing (s) and edge (c) distances.
3. The tabulated values are for anchors installed in concrete having the designated compressive strength at the time of installation.
4. Resin anchors experience a reduction in tensile and shear capacity with increased ambient temperatures. Please contact manufacturer for current information on temperature load factors when the anchors are installed in locations where the ambient temperatures may exceed 100°F.
5. Anchor hole sizes same as bit diameter.
6. Do not use in overhead applications.

SPECIFICATION REFERENCE FOR DUR-O-WAL ANCHOR SERIES: DUR-O-PAIR RESIN

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer		Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	DUR-O-PAIR RESIN	DUR-O-WAL or approved Equal					

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.

I General

Dur-O-Wal has coupled our new masonry construction experience, with our masonry restoration experience, to create a line of anchors specifically for brick replacement. The Dur-O-Wal Veneer Tie Assembly anchors combine a veneer tie assembly with a substrate fastener for a system that can be tailored to any project. The designer can specify the Dur-O-Wal anchor and be assured that they will be getting the best veneer tie and substrate anchor that will work together as a system. The Dur-O-Wal Brick Replacement Anchor system reduces the need to evaluate substrate fastener performance both in the design phase, and after the project is released for bid.

The Substrate Anchor: The anchor portion the Brick Replacement System consists of a 1/4" (6mm) diameter bolt with a brass expanding shell, and a brass expansion cone. This anchor will perform in any substrate from soft brick to hard concrete. This is important when considering the varying quality in existing substrates of older buildings. Be sure to specify the following performance criteria as a minimum.

The Veneer Ties: All the veneer ties by Dur-O-Wal are available in both Hot Dipped Galvanized 1.5 oz/sq ft (ASTM A153 B-2) and 304 series Stainless Steel (ASTM A167). For brick replacement, Dur-O-Wal recommends the use of 304 series Stainless Steel.

II Products

The Selection Chart: The chart allows the designer to select the best system based on the available information. Quality, or type of backup, will not be a consideration because the Dur-O-Wal anchor will work in any type substrate. The selection chart is based on cavity width, insulation, the need for adjustable systems, and if the structure needs to be designed to current seismic and/or high wind parameters.

Brick Replacement Anchor Selection Chart

Cavity Width	Insulated (Y/N)	Adjustability Required (Y/N)	Seismic/High Wind Considerations	Dur-O-Wal Product System
0" to 1/2"	No	No	No	5801 Stainless Steel
3/4" to 4"	Yes or No	Yes	No	5213 Stainless Steel
0" to 3"	No	No	Yes	5431 Stainless Steel
3/4" to 4"	Yes or No	Yes	Yes	5213S Stainless Steel

Product Descriptions of Brick Replacement Systems and Recommended Applications

DA 5801

Systems include both the veneer tie and the substrate anchor in a one piece assembly. Recommended for noninsulated cavity walls. The channel base plate is secured to the back-up and has a 11/4" (30mm) slot for slight coursing adjustability. The 3/16" (5mm) triangular tie is mortared in the veneer. The system is available in Hot Dipped and Stainless Steel finishes.

DA 5213

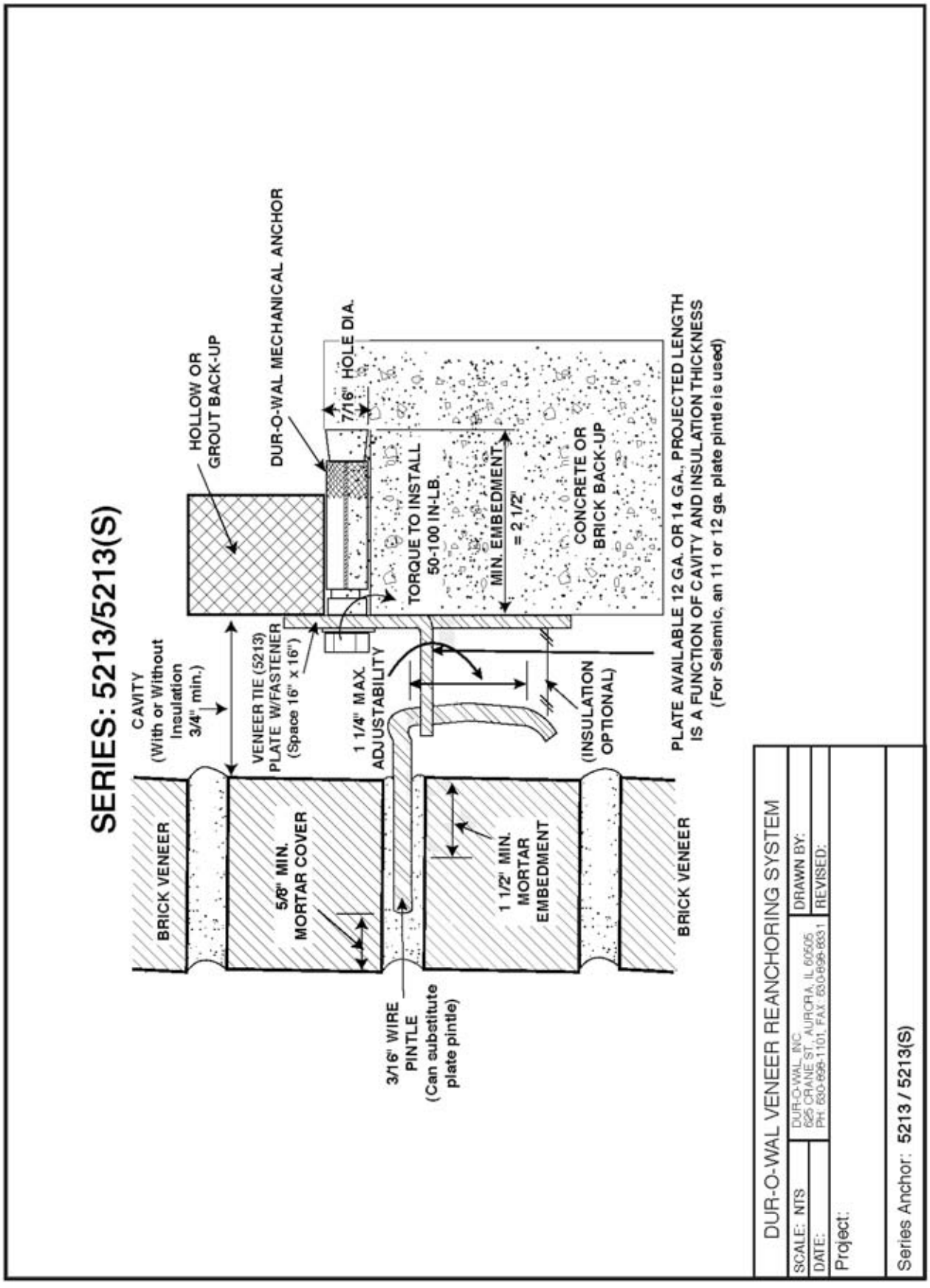
Systems includes both the veneer tie (plate and pintle) and the substrate anchor in a piece assembly. Recommended for brick cavity walls with or without insulation. The system allows of maximum allowable adjustability of 11/4", in the dual legs of the 3/16" wire pintle. The back plate, complete with stiffening gussets for minimum back up flex, projects off the back up wall to accommodate ridged insulation or larger air cavities. The system is available in Hot Dipped galvanized and Stainless Steel.

DA 5431

System includes both the veneer tie, and the substrate anchor in a one piece assembly. Recommended for reconstructing veneers with no insulation, and little air cavity. The 14 gauge (1.9mm) strap has 11/4 (30mm) slot for slight coursing adjustability. The tie is mortared into the veneer along with the new brick wythe. The system can or can not be used with pencil rod or seismic ladur. The use of these products in conjunction with the DA 5431, will meet UBC requirements or seismic zones 3 and 4. The 9 gauge pencil rod or seismic ladur must be placed in the lugs at the end of the DA 5431 as required by the UBC. The lugs resist compression and tension in the new veneer. The system is available in both Hot Dipped galvanized and Stainless Steel.

DA 5213S (Seismic)

System include veneer tie (back plate, and plate pintle) and substrate anchor in a 2 piece assembly. Recommended for reconstructing veneers that have insulation, and or a larger air cavity in areas that are prone to seismic activity and or high winds. The system is the same as the DA 5213 listed above with the exception of the plate pintle replacing the wire pintle. The plate pintle gives the system added strength and rigidity that could not be achieved with a wire pintle. The plate pintle include seismic lugs to accommodate veneer reinforcement, as well as required by the UBC Code. In addition the DA 5213S plate has side cut sheer lugs to resist lateral loads.


SERIES: 5213/5213(S)
HOLLOW OR GROUT BACK-UP
DUR-O-WAL MECHANICAL ANCHOR
7/16" HOLE DIA.
TORQUE TO INSTALL 50-100 IN-LB.
MIN. EMBEDMENT = 2 1/2"
CONCRETE OR BRICK BACK-UP
CAVITY (With or Without Insulation 3/4" min.)
VENEER TIE (5213) PLATE W/FASTENER (Space 16" x 16")
1 1/4" MAX. ADJUSTABILITY
(INSULATION OPTIONAL)
PLATE AVAILABLE 12 GA. OR 14 GA., PROJECTED LENGTH IS A FUNCTION OF CAVITY AND INSULATION THICKNESS (For Seismic, an 11 or 12 ga. plate pintle is used)
BRICK VENEER
5/8" MIN. MORTAR COVER
1 1/2" MIN. MORTAR EMBEDMENT
BRICK VENEER
3/16" WIRE PINTLE (Can substitute plate pintle)
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC. 625 CRANE ST., AURORA, IL 60505 PH: 630-898-1101, FAX: 630-896-6331
DRAWN BY:
REVISED:
Project:
Series Anchor: 5213 / 5213(S)

APPLICATION

VENEER	BACK-UP
Brick	Brick
	Concrete
	Block
	Tile

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5213330 ①	3" Tie w/0" Plate	3/4" - 1 1/4"
5213331 ①	3" Tie w/1" Plate	1 3/4" - 2 1/4"
5213332 ①	3" Tie w/1 1/4" Plate	2 1/4" - 2 3/4"
5213333 ①	3" Tie w/2" Plate	2 3/4" - 3 1/4"
5213334 ①	3" Tie w/3" Plate	3 3/4" - 4 1/4"

① Hot dip galvanized finish

The 5213 Veneer Tie Assembly is the most versatile veneer anchoring system for attachment to concrete or masonry. The single fastener provides exceptional clamping force and can be field inspected with a torque wrench. The hex head finish minimizes mortar bridging and provides easy installation. The tie assembly is available in hot dip or stainless steel. Other lengths of pintle or plate, and alternate gauge plates, are available. by substituting a plate pintle for the 3⁄16" wire pintle, the assembly becomes a high strength tie for seismic or severe wind load applications.

	SERIES 5213	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
BACK-UP MATERIAL	Brick ①	N/A	N/A	N/A	2060	170	8.2
	Brick ②	N/A	N/A	N/A	1350	297	2.2
	Concrete ③	N/A	N/A	N/A	2170	382	17.6
	Mortar Jt. ④	N/A	N/A	N/A	1321	227	20.6
	Mortar Jt. ⑤	N/A	N/A	N/A	850	N/A	N/A
	Block ⑥	N/A	N/A	N/A	1385	175	12.7
	Tile	N/A	N/A	N/A	1200	N/A	N/A
VENEER MATERIAL							
	Standard ⑦						
	0"	540	N/A	N/A	540	N/A	N/A
	3/4"	200	N/A	N/A	200	N/A	N/A
	1 1/4"	120	N/A	N/A	120	N/A	N/A
	Standard ⑧						
	0"	730	N/A	N/A	730	N/A	N/A
	3/4"	240	N/A	N/A	240	N/A	N/A
	1 1/4"	180	N/A	N/A	180	N/A	N/A
	Standard ⑨						
	0"	1256	N/A	N/A	1256	N/A	N/A
	3/4"	380	N/A	N/A	380	N/A	N/A
	1 1/4"	360	N/A	N/A	360	N/A	N/A

① MW brick, 11000 psi

② MW brick, 7700 psi

③ 3500 psi

④ 1450 psi mortar strength, Type N

⑤ 950 psi mortar strength, Type N

⑥ light weight hollow block

⑦ 3/16" wire pintle, w/ 14 gauge plate

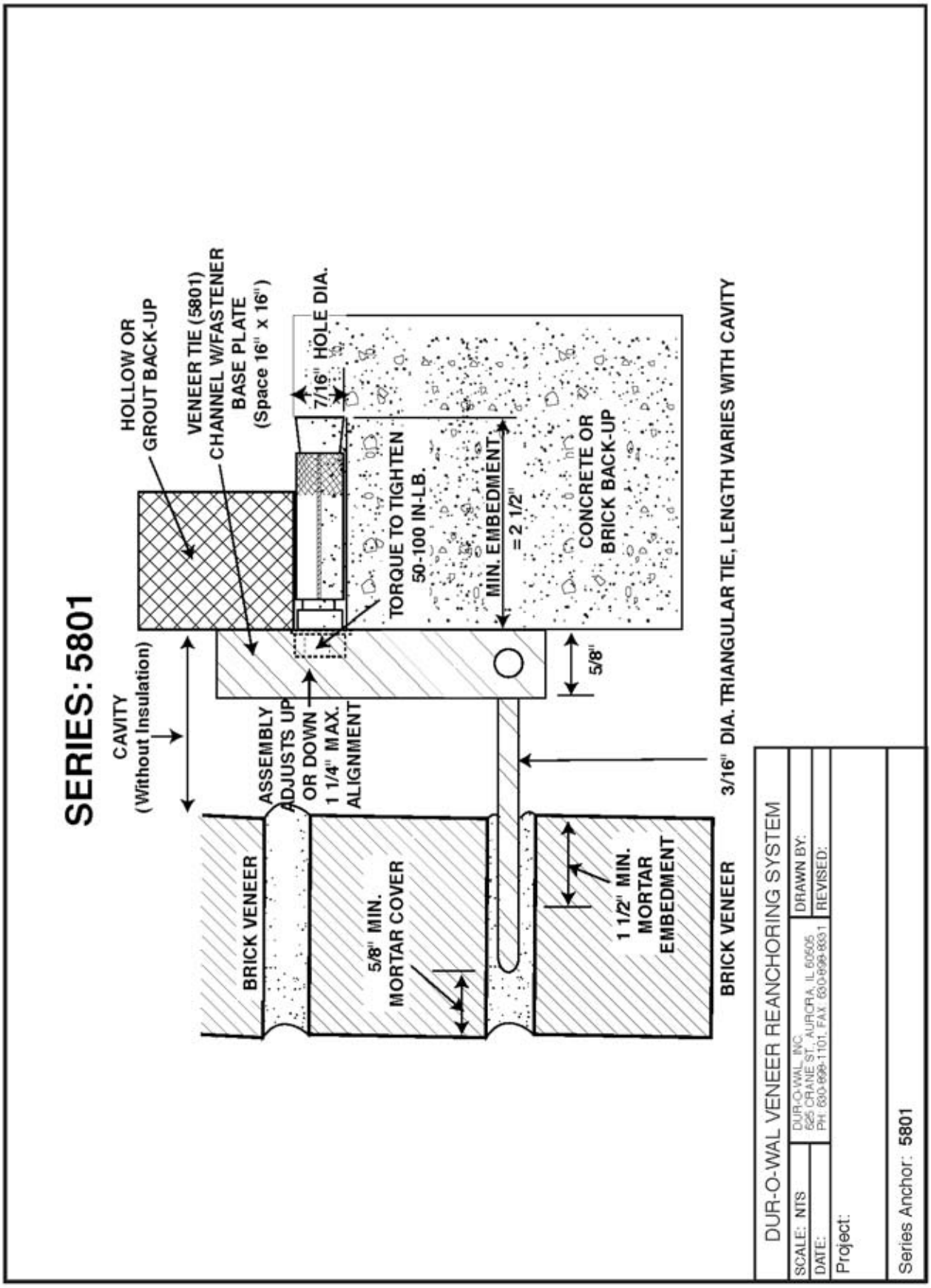
⑧ 12 gauge plate pintle, w/14 gauge plate

⑨ 11 gauge plate pintle, w/12 gauge plate

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: 5213 VENDOR TIE ASSEMBLY

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	Tie-HDG	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5213	DUR-O-WAL or approved Equal	or S.S.	7/16"	N/A	FIELD VERIFY	
							Brass Exp. Anchor				
							S.S. Bolt				

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5801
HOLLOW OR GROUT BACK-UP
VENEER TIE (5801) CHANNEL W/FASTENER BASE PLATE (Space 16" x 16")
7/16" HOLE DIA.
TORQUE TO TIGHTEN 50-100 IN-LB.
MIN. EMBEDMENT = 2 1/2"
CONCRETE OR BRICK BACK-UP
CAVITY (Without Insulation)
ASSEMBLY ADJUSTS UP OR DOWN 1 1/4" MAX. ALIGNMENT
5/8"
3/16" DIA. TRIANGULAR TIE, LENGTH VARIES WITH CAVITY
BRICK VENEER
5/8" MIN. MORTAR COVER
1 1/2" MIN. MORTAR EMBEDMENT
BRICK VENEER
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8031
DRAWN BY:
REVISED:
Project:
Series Anchor: 5801

Series Anchor: 5801

APPLICATION

VENEER		BACK-UP
Brick		Brick
		Concrete
		Block
		Tile

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5801232 ①	3" Tie	3/4" - 1 1/4"
5801242	4" Tie	3/4" - 2 1/4"
5801252	5" Tie	1 3/4" - 3 1/4"

① Hot dip galvanized finish, available in 304 stainless steel.

The 5801 Veneer Tie Anchoring System is an excellent, high strength adjustable wall tie anchoring system. It is assembled complete with the Dur-O-Wal masonry fastener to mechanically attach to any concrete or masonry back-up wall. The design allows for 11/4" maximum alignment of the mortar joint. The hex head finish on the anchor minimizes mortar clutter in the cavity and provides significant clamping force. The style fastener allows for site quality control via torque measurement.

	SERIES 5213	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
BACK-UP MATERIAL	Brick ①	N/A	N/A	N/A	2060	170	8.2
	Brick ②	N/A	N/A	N/A	1350	297	2.2
	Concrete ③	N/A	N/A	N/A	2170	382	17.6
	Mortar Jt. ④	N/A	N/A	N/A	1321	227	20.6
	Mortar Jt. ⑤	N/A	N/A	N/A	850	N/A	N/A
	Block ⑥	N/A	N/A	N/A	1385	175	12.7
	Tile	N/A	N/A	N/A	1200	N/A	N/A
VENEER							
	1/4" ⑦	N/A	N/A	N/A	600	N/A	N/A
	1" ⑦	N/A	N/A	N/A	375	N/A	N/A
	1 1/4" ⑦	N/A	N/A	N/A	200	N/A	N/A

① MW brick, 11000 psi

② MW brick, 7700 psi

③ 3500 psi

④ 1450 psi mortar strength, Type N

⑤ 950 psi mortar strength, Type N

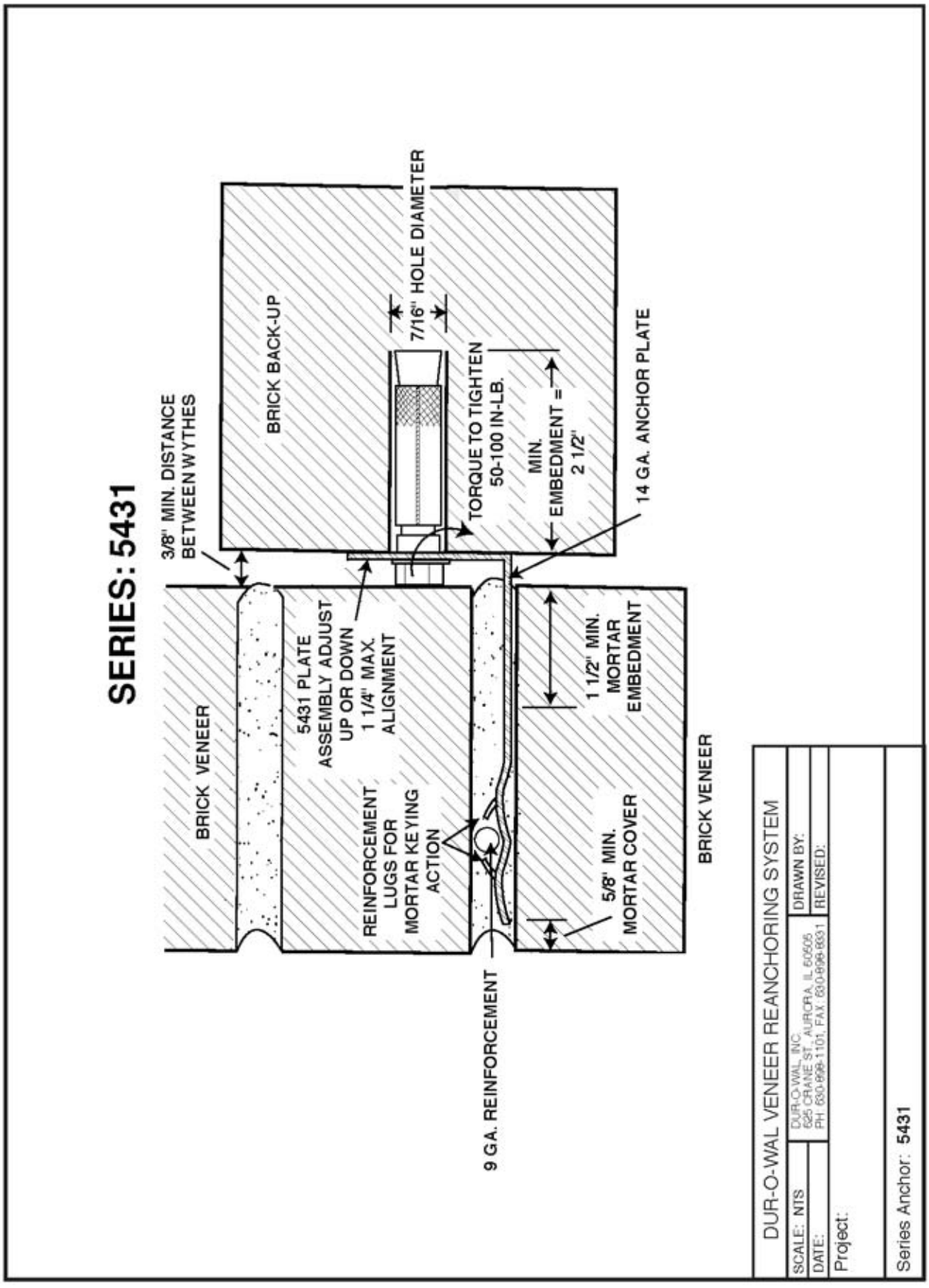
⑥ Light weight hollow block

⑦ Eccentricity of applied load to plate connection

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: 5801 VENDOR TIE ASSEMBLY

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	Tie-HDG	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5801	DUR-O-WAL or approved Equal	or S.S. Brass Exp. Anchor S.S. Bolt	7/16"	N/A	FIELD VERIFY	

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.


SERIES: 5431
3/8" MIN. DISTANCE BETWEEN WYTHES
BRICK BACK-UP
7/16" HOLE DIAMETER
TORQUE TO TIGHTEN 50-100 IN-LB.
MIN. EMBEDMENT = 2 1/2"
14 GA. ANCHOR PLATE
BRICK VENEER
5431 PLATE ASSEMBLY ADJUST UP OR DOWN 1 1/4" MAX. ALIGNMENT
REINFORCEMENT LUGS FOR MORTAR KEYING ACTION
1 1/2" MIN. MORTAR EMBEDMENT
5/8" MIN. MORTAR COVER
BRICK VENEER
9 GA. REINFORCEMENT
DUR-O-WAL VENEER REANCHORING SYSTEM
SCALE: NTS
DATE:
DRAWN BY:
REVISED:
DUR-O-WAL, INC.
625 CRANE ST., AURORA, IL 60505
PH: 630-898-1101, FAX: 630-898-8831
Project:
Series Anchor: 5431

Series Anchor: 5431

APPLICATION

VENEER		BACK-UP
Brick		Brick
		Concrete
		Block
		Tile

ANCHOR SELECTION

ITEM NUMBER	ANCHOR LENGTH	CAVITY RANGE
5431332 ①	3 1/2"	0" - 3/8"
5421432 ②	3 1/2"	0" - 3/8"

① Hot dip galvanized ② Stainless steel

The 5431 Series Veneer Tie Assembly is a strap anchor wall tie system. The 14 gauge plate is available in finishes of hot dip or stainless steel, and is provided with a fastener to attach to any masonry structure. The fastener provides a hex bolt appearance to minimize clutter in the attachment and provide a means to inspect the anchor. Other gauges, widths, lengths can be made to order.

	SERIES 5431	ULTIMATE CAPACITY					
		COMPRESSION (lb)			TENSION (lb)		
		avg.	std.dev.	c.v. %	avg.	std. dev.	c.v. %
BACK-UP MATERIAL	Brick ①	N/A	N/A	N/A	2060	170	8.2
	Brick ②	N/A	N/A	N/A	1350	297	2.2
	Concrete ③	N/A	N/A	N/A	2170	382	17.6
	Mortar Jt. ④	N/A	N/A	N/A	1321	227	20.6
	Mortar Jt. ⑤	N/A	N/A	N/A	850	N/A	N/A
	Block ⑥	N/A	N/A	N/A	1385	175	12.7
	Tile	N/A	N/A	N/A	1200	N/A	N/A
VENEER							

① MW brick, 11000 psi

② MW brick, 7700 psi

③ 3500 psi

④ 1450 psi mortar strength, Type N

⑤ 950 psi mortar strength, Type N

⑥ Light weight hollow block

SPECIFICATION REFERENCE FOR DUR-O-WAL
FACADE ANCHOR SERIES: 5431 VENDOR TIE ASSEMBLY

GENERAL				PRODUCTS				EXECUTION			
Quality Assurance Submittals * Ultimate Anchor Performance				Anchors & Fasteners for Solid Veneers >=3" to a solid back-up			Components	Hole Size		Anchor Length	Drilling Technique
Backup		Facade		Item	Product	Manufacturer	Clip-HDG	Backup	Facade		
TEN	COM	TEN	COM	Facade Stabilization Anchor	5431	DUR-O-WAL or approved Equal	or S.S.	7/16"	N/A	FIELD VERIFY	
							Brass Exp.				
							S.S. Bolt				

* Submittals for alternate should meet or exceed ultimate anchor performance. Refer to anchor performance characteristics for performance specifications.

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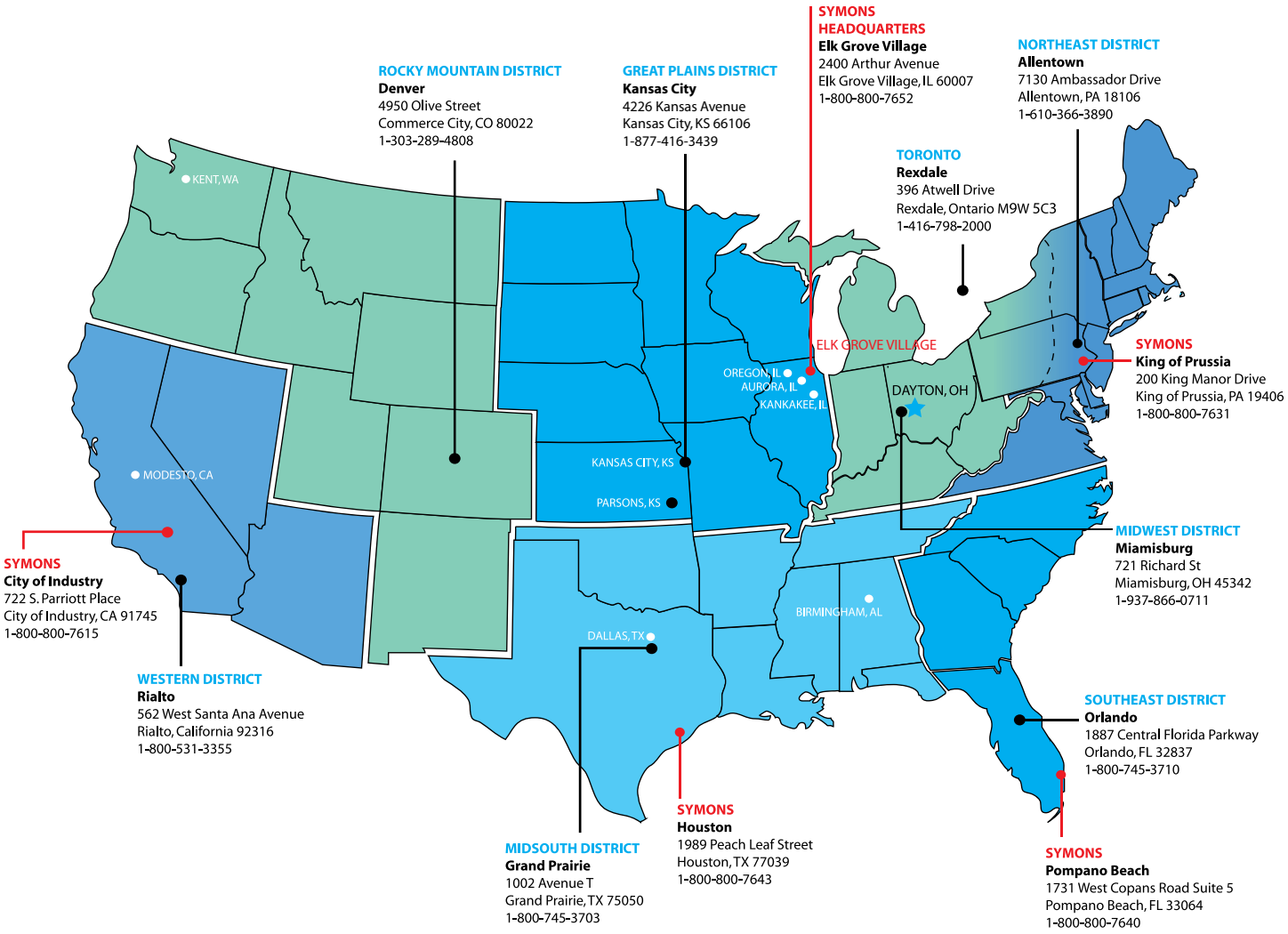

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