MIAMI-DADE COUNTY, FLORIDA
METRO-DADE FLAGLER BUILDING

BUILDING CODE COMPLIANCE OFFICE
METRO-DADE FLAGLER BUILDING
140 WEST FLAGLER STREET, SUITE 1603
MIAMI, FLORIDA 33130-1563
(305) 375-2901 FAX (305) 375-2908

CONTRACTOR LICENSING SECTION
(305) 375-2527 FAX (305) 375-2558

CONTRACTOR ENFORCEMENT SECTION
(305) 375-2966 FAX (305) 375-2908

PRODUCT CONTROL DIVISION
(305) 375-2902 FAX (305) 372-6339

PRODUCT CONTROL NOTICE OF ACCEPTANCE

Folding Shutter Corporation
7089 Hemstreet Place
West Palm Bch FL 33413

Your application for Product Approval of:
"Titan" H.D. Extruded Aluminum Roll-Up Shutter
under Chapter 8 of the Code of Miami-Dade County governing the use of Alternate Materials and Types of Construction, and completely described herein, has been recommended for acceptance by the Miami-Dade County Building Code Compliance Office (BCCO) under the conditions specified herein.

This approval shall not be valid after the expiration date stated below. BCCO reserves the right to secure this product or material at anytime from a jobsite or manufacturer's plant for quality control testing.
If this product or material fails to perform in the approved manner, BCCO may revoke, modify, or suspend the use of such product or material immediately. BCCO reserves the right to revoke this approval, if it is determined BCCO that this product or material fails to meet the requirements of the South Florida Building Code.

The expense of such testing will be incurred by the manufacturer.

Acceptance No.: 99-0811.01 **(Revises No.: 98-0724.11)**

Expires: 01/14/2003

Raul Rodriguez
Chief Product Control Division

THIS IS THE COVERSHEET, SEE ADDITIONAL PAGES FOR SPECIFIC AND GENERAL CONDITIONS

BUILDING CODE & PRODUCT REVIEW COMMITTEE

This application for Product Approval has been reviewed by the BCCO and approved by the Building Code and Product Review Committee to be used in Dade County, Florida under the conditions set forth above.

Francisco J. Quintana, R.A.
Director
Miami-Dade County
Building Code Compliance Office

Approved: 01/14/2000

Internet mail address: postmaster@buildingcodeonline.com **Homepage: http://www.buildingcodeonline.**

Folding Shutter Corporation.

ACCEPTANCE No. : 99-0811.01

APPROVED : JAN 1 4 2000

EXPIRES : JAN 1 4 2003

NOTICE OF ACCEPTANCE: STANDARD CONDITIONS

1 Renewal of this Acceptance (approval) shall be considered after a renewal application has been filed and the original submitted documents, including test-supporting data, engineering documents, are no older than eight (8) years.

2. Any and all approved products shall be permanently labeled with the manufacturer's name, city, state, and the following statement: "Miami-Dade County Product Control Approval", or as specifically stated in the specific conditions of this Acceptance.

3. Renewals of Acceptance will not be considered if:
   a. There has been a change in the South Florida Building Code affecting the evaluation of this product and the product is not in compliance with the code changes.
   b. The product is no longer the same product (identical) as the one originally approved.
   c. If the Acceptance holder has not complied with all the requirements of this acceptance, including the correct installation of the product.
   d. The engineer who originally prepared, signed and sealed the required documentation initially submitted, is no longer practicing the engineering profession.

4. Any revision or change in the materials, use, and/or manufacture of the product or process shall automatically be cause for termination of this Acceptance, unless prior written approval has been requested (through the filing of a revision application with appropriate fee) and granted by this office.

5. Any of the following shall also be grounds for removal of this Acceptance:
   a. Unsatisfactory performance of this product or process.
   b. Misuse of this Acceptance as an endorsement of any product, for sales, advertising or any other purposes.

6. The Notice of Acceptance number preceded by the words Miami-Dade County, Florida, and followed by the expiration date may be displayed in advertising literature. If any portion of the Notice of Acceptance is displayed, then it shall be done in its entirety.

7. A copy of this Acceptance as well as approved drawings and other documents, where it applies, shall be provided to the user by the manufacturer or its distributors and shall be available for inspection at the job site at all time. The engineer need not reseal the copies.

8. Failure to comply with any section of this Acceptance shall be cause for termination and removal of Acceptance.

9. This Notice of Acceptance consists of pages 1, 2 and this last page 3.

END OF THIS ACCEPTANCE

Candido F. Font, P.E., Sr. Product Control Examiner
Product Control Division

Folding Shutter Corporation.

ACCEPTANCE No. : 99-0811.01

APPROVED : JAN 1 4 2000

EXPIRES : JAN 1 4 2003

NOTICE OF ACCEPTANCE: SPECIFIC CONDITIONS

1. SCOPE

This approves an aluminum slat roll-up shutter, as described in Section 2 of this Notice of Acceptance, designed to comply with the South Florida Building Code, 1994 Edition for Miami-Dade County (SFBC). For the locations where the pressure requirements, as determined by SFBC Chapter 23, do not exceed the Design Pressure Rating values indicated in the approved drawings.

2. PRODUCT DESCRIPTION

The **Extruded Aluminum Roll-Up Shutter** and its components shall be constructed in strict compliance with the following documents: Drawing No. 99-10, titled "Roll-Up Shutter Details" prepared by Al-Farooq Corporation, dated 03/15/99, with no revision sheets 1 through 17 of 17. They bear the Miami-Dade County Product Control Approval stamp with the Notice of Acceptance number and approval date by the Miami-Dade County Product Control Division. These documents shall hereinafter be referred to as the approved drawings.

3. LIMITATIONS

3.1 Minimum slat engagement shall be 1.25".

3.2 Minimum separation from interior of slat to glass being protected shall be as shown on sheet 17 of 17.

3.3 The operating mechanism, not part of this approval shall be certified by a recognized testing agency.

3.4 All permanent set components, included but not limited to embedded anchor bolts, threaded cones, metal shields, etc., must be protected against corrosion, contamination and damage at all time.

4. INSTALLATION

The Aluminum Slat Roll-Up Shutter and its components shall be installed in strict compliance with the approved drawings.

5. LABELING

Each shutter shall bear a permanent label with the manufacturer's name or logo, city, state and following statement: "Miami-Dade County Product Control Approved".

6. BUILDING PERMIT REQUIREMENTS

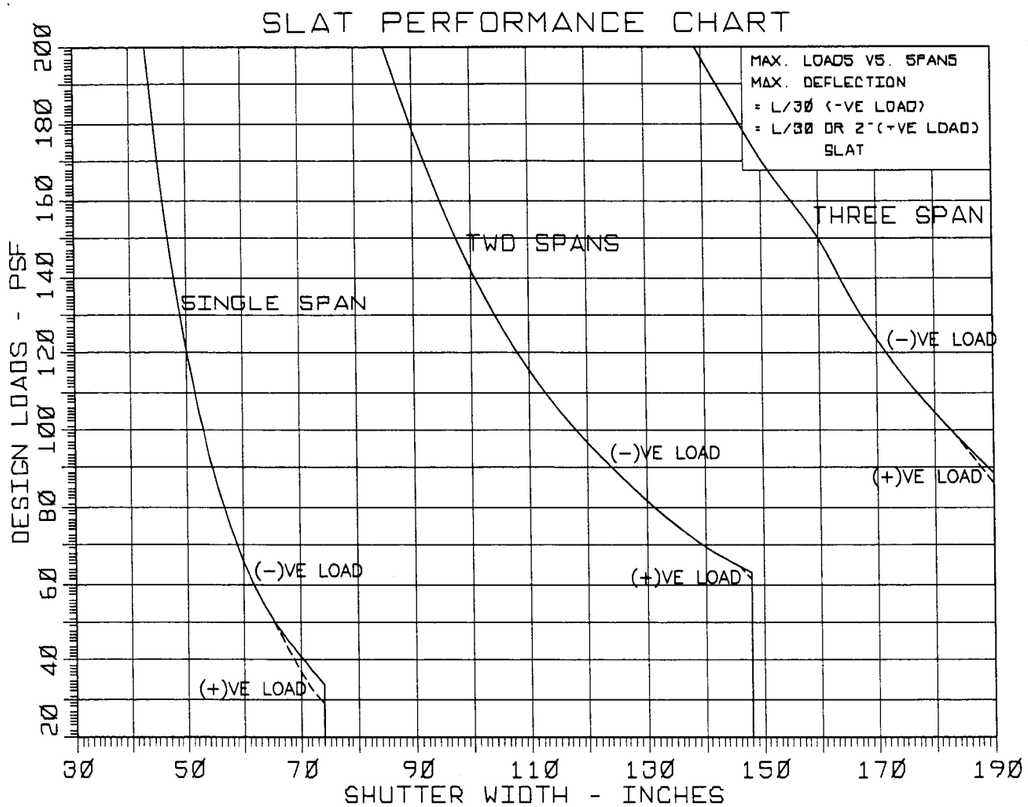
6.1 Application for building permit shall be accompanied by copies of the following:

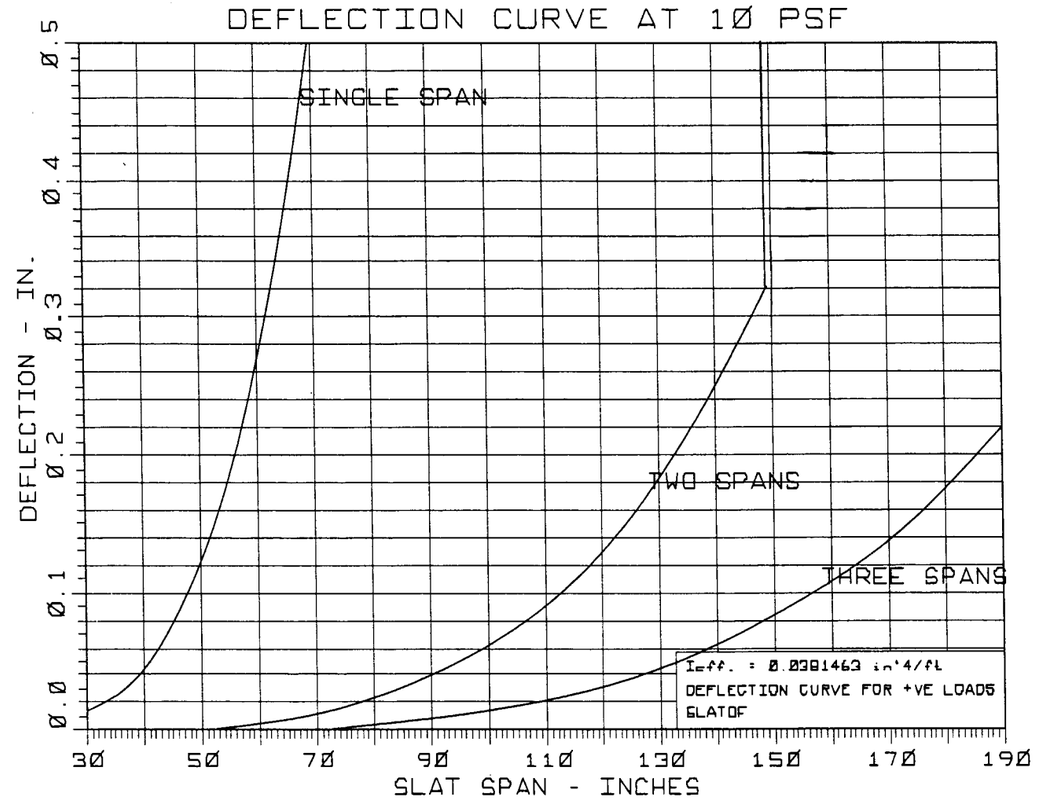
6.1.1 This Notice of Acceptance.

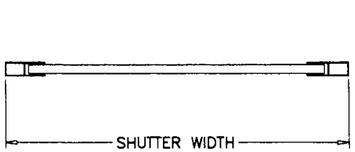
6.1.2 Duplicate copies of the approved drawings, as identified in Section 2 of this Notice of Acceptance, clearly marked to show the components selected for the proposed installation.

6.1.3 Any other documents required by the Building Official or the South Florida Building Code (SFBC) in order to properly evaluate the installation of this system.

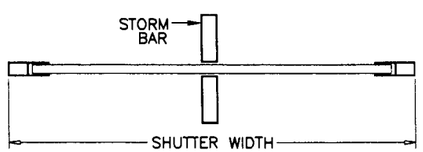
Candido F. Font, P.E., Sr. Product Control Examiner
Product Control Division



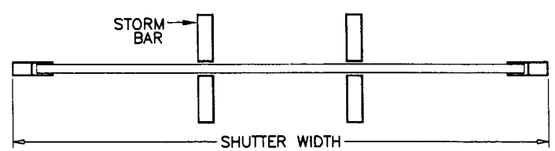




SINGLE SPANS



TWO SPANS



THREE SPANS

DESIGN LOADS SHALL BE CALCULATED AS PER REQUIREMENTS OF ASCE 7-88, BASED ON 110 MPH WIND VELOCITY.

PRODUCT MARKING

A LABEL SHALL BE AFFIXED ON UNIT AT RIGHT BOTTOM OF BOX WITH THE FOLLOWING STATEMENT:

FOLDING SHUTTER CORPORATION, WEST PALM BEACH, FL.
"DADE COUNTY PRODUCT CONTROL APPROVED"

GENERAL NOTES

1. THIS STRUCTURE IS DESIGNED AS PER THE SOUTH FLORIDA BUILDING CODE 1994 EDITION FOR DADE COUNTY. ALSO FOR WIND LOADS AS PER ASCE 7-88 USING CORRESPONDING LOADS.
2. DESIGN CRITERIA FOR ALUMINUM, MINIMUM MECHANICAL PROPERTIES, AND SAFETY FACTORS ARE IN ACCORDANCE WITH THE "ALUMINUM CONSTRUCTION MANUAL" LATEST EDITION.
3. ALUMINUM ALLOYS: ALL EXTRUSIONS SHALL BE ALLOY AS NOTED.
4. STEEL SURFACES TO BE PLACED IN CONTACT WITH ALUMINUM SHALL BE GIVEN ONE COAT OF ZINC CHROMATE PRIMER IN ACCORDANCE WITH FEDERAL SPEC. NO. TTP-645, OR BE GALVANIZED.
5. ANCHORS SHALL BE AS LISTED, SPACED AS SHOWN ON DETAILS. ANCHOR EMBEDMENT TO BASE MATERIAL SHALL BE BEYOND WALL DRESSING OR STUCCO.
6. ALL BOLTS, NUTS AND WASHERS SHALL BE STAINLESS STEEL OR ALUMINUM ALLOY 2024-T4 OR 7075-T6, OR PLATED STEEL.
7. SHUTTERS MAY BE MOTOR, TAPE PULLEY, OR GEAR DRIVEN.
8. DESIGN CRITERIA: FOR MULTIPLE SPANS THE COMBINED MAX DEFLECTION OF HEADER, STORM BARS AND SLATS $\leq$ L/30 OR 2". FOR MULLIONS MAX DEFLECTION $\leq$ L/180.
9. ANCHORING OR LOADING CONDITIONS OTHER THAN THOSE SHOWN IN THESE DETAILS ARE NOT PART OF THIS APPROVAL.

INDEX OF DRAWING

SHEET NO.	DESCRIPTION
1	NOTES, SLAT GRAPHS
2	EXTRUSION DETAILS, INSTRUCTIONS FOR USING GRAPHS
3	SINGLE SPAN DETAILS
4	MULTIPLE SPAN DETAILS
5	TRACK INSTALLATIONS AND BOX DETAIL
6	MULLION INSTALLATION DETAILS
7	HEADER/TOP SUPPORT INSTALLATION DETAILS
8	STORM BAR INSTALLATION DETAILS
9	ANCHOR GRAPHS
10	MULLION (POST) LOADING GRAPHS
11 THRU 13	HEADER (TOP SUPPORT) LOADING GRAPHS
14 THRU 16	STORM BAR LOADING GRAPHS
17	CALCULATION SHEET FOR OVERALL DEFLECTION

Engr: DR. HUMAYOUN FAROOQ
STRUCTURES
FLA. PE # 16557

DEC 07 1999

APPROVED AS COMPLYING WITH THE
SOUTH FLORIDA BUILDING CODE
DATE January 14, 2000
BY
PRODUCT CONTROL DIVISION
BUILDING CODE COMPLIANCE OFFICE
ACCEPTANCE NO. 99-0811.01

AL-FAROOQ CORPORATION
ENGINEERS, PLANNERS & PRODUCT DESIGN
1235 SW 87 AVE
MIAMI, FLORIDA 33174
TEL. (305) 264-8100 FAX. (305) 262-6978
ROLLUP\99-10FSC

ROLL UP SHUTTER DETAILS

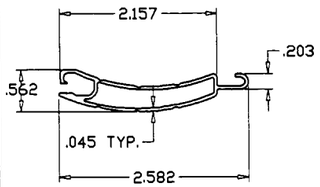
FOLDING SHUTTER CORP.
7089 HEMSTREET PLACE
WEST PALM BEACH, FL 33413
TEL.(561) 683-4811 FAX.(561) 640-8204

revisions:

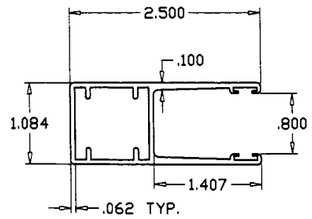
no	date	by	description
A	10.04.99		GRAPHS LIMITS REV.
B	11.17.99		GRAPH LIMITS REDUCED TO 200

date: 03-15-99
scale: 1/2" = 1"
dr. by: HAMID
chk. by:

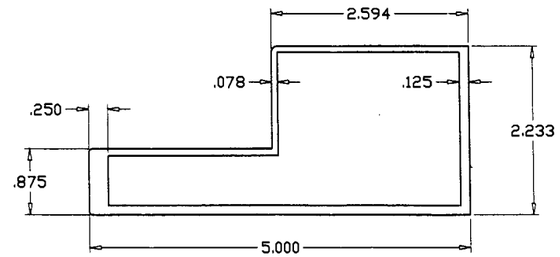
drawing no.
99-10



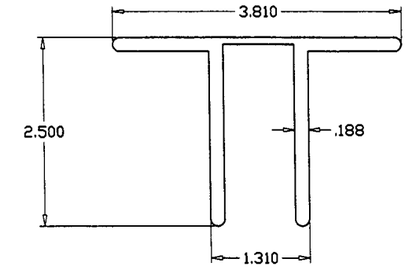
EXTRUDED ALUMINUM SLAT
6063–T6



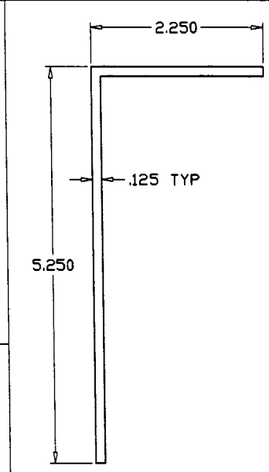
TRACK
6063–T6



CUSTOM HEADER
6061–T6 OR 6005–T5

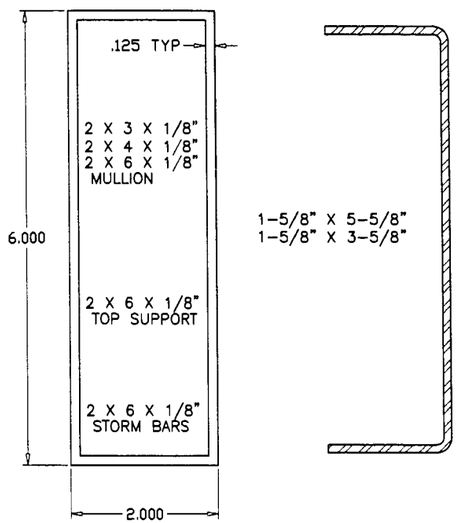


'T' CLIP
6005–T5 OR 6061–T6



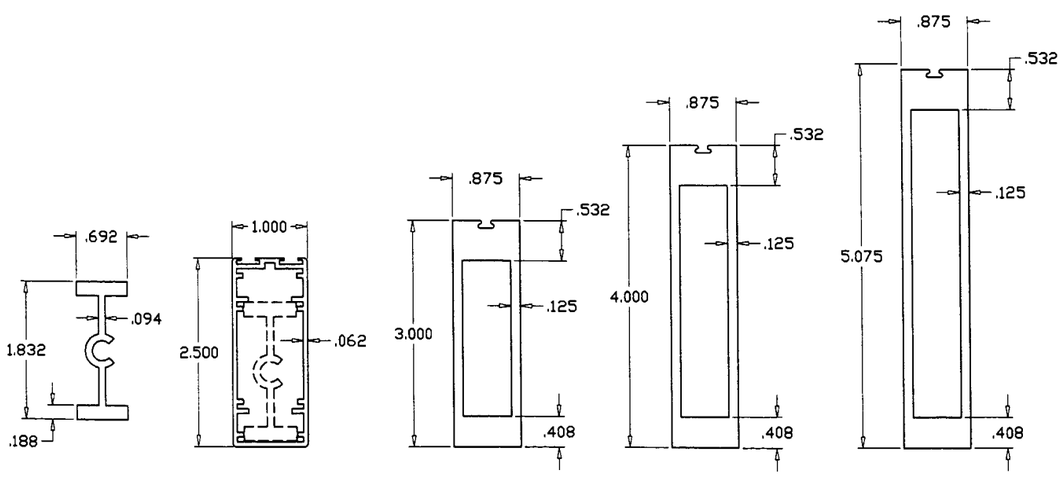
1 X 2 X 1/8"
1–1/2 X 2 X 1/8"
2 X 2 X 1/8"
2 X 3 X 1/8"
2 X 4 X 1/8"
2–1/4 X 5–1/4 X 1/8"

ALUMINUM ANGLES
6063–T6



ALUM TUBES
6063–T6

STIFFENER FOR
STORM BAR/TOP SUPPORT/MULLION
12 GA. GALV. STEEL CHANNEL



INSERT | 2–1/2" X 1" | 3" X .875" | 4" X .875" | 5" X .875"

STORM BARS
6063–T6

Guide to use charts and graphs

1. Calculate Design Wind Load requirements using ASCE 7–88 based on building height, exposure category, roof slope and tributary area.
2. From slat performance chart, select span condition as 1, 2 or 3 to determine the number of storm bars required to meet the design loads calculated above.
3. Based on slat, span and number of storm bars determine the deflection of the slat for 10 psf and determine the actual deflection for the Design Loads by proportion. Enter this deflection in step 2 of sheet 17.
4. From the shutter height and width dimensions determine the storm bar spacing and height.
5. Determine the deflection of the storm bar at 10 psf from the deflection chart and obtain storm bar deflection by proportion to the design loads. Enter this deflection in step 4 of sheet 17.
6. Determine the deflection of the header at 10 psf from the deflection chart and obtain header deflection by proportion to the design loads. Enter this deflection in step 6 of sheet 17.
7. Complete form on sheet 17 and check the deflection requirements. If deflection exceeds the allowable deflection increase the size of storm bar and/or header to bring the overall deflection under the allowable limits.
8. Repeat the procedure items 2 to 7 for both positive and negative loads for any given shutters.

Engr: DR. HUMAYOUN FAROOQ
STRUCTURES
FLA. PE # 16557

DEC 07 1999

APPROVED AS COMPLYING WITH THE
SOUTH FLORIDA BUILDING CODE
DATE January 14, 2000
BY
PRODUCT CONTROL DIVISION
BUILDING CODE COMPLIANCE OFFICE
ACCEPTANCE NO. 99-0811.01

AL-FAROOQ CORPORATION
ENGINEERS, PLANNERS & PRODUCT DESIGN
1235 SW 87 AVE
MIAMI, FLORIDA 33174
TEL. (305) 264-8100 FAX. (305) 262-6978

ROLLUP\99-10FSC

ROLL UP SHUTTER DETAILS

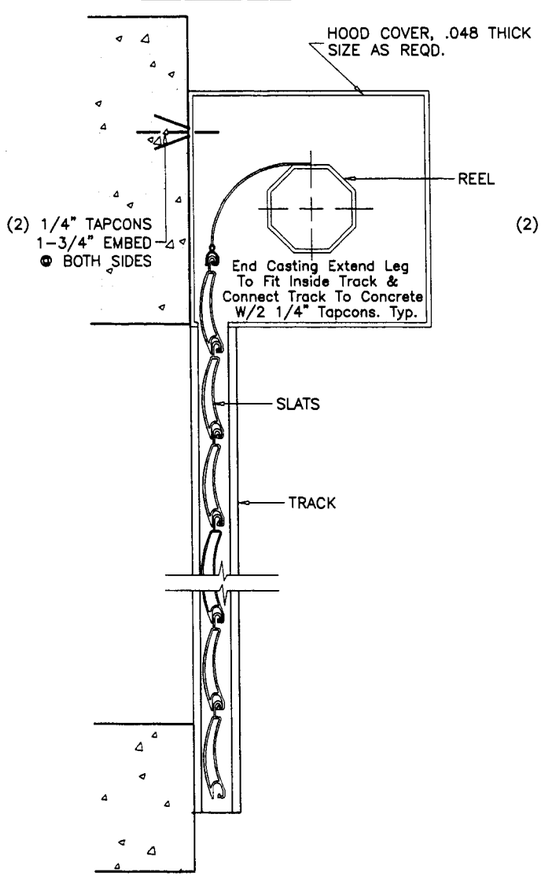
FOLDING SHUTTER CORP.
7089 HEMSTREET PLACE
WEST PALM BEACH, FL 33413
TEL.(561) 683-4811 FAX.(561) 640-8204

revisions:			
no	date	by	description

date: 03-15-99
scale: 1/2" = 1"
dr. by: HAMID
chk. by:

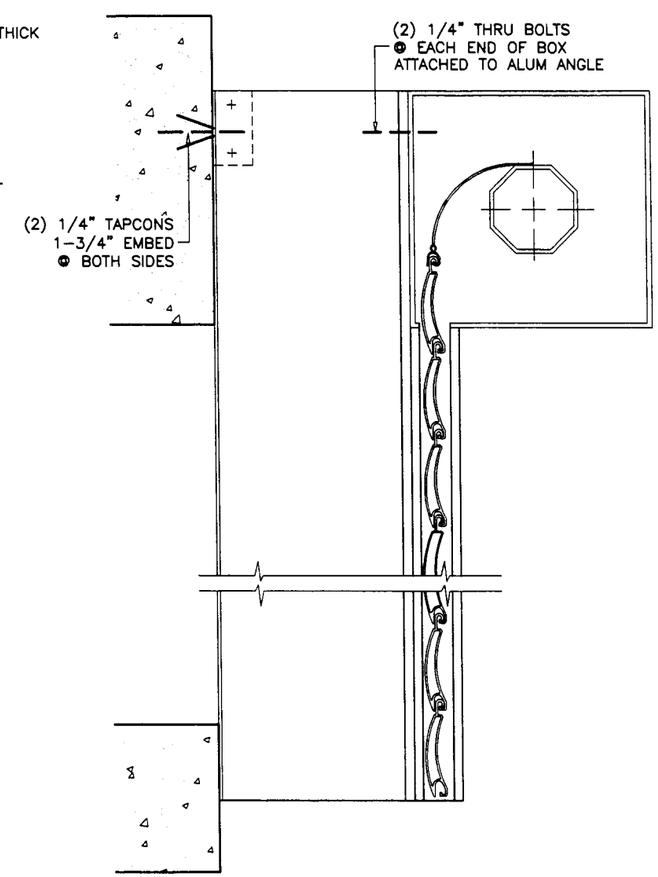
drawing no.
99–10

WALL MOUNTS



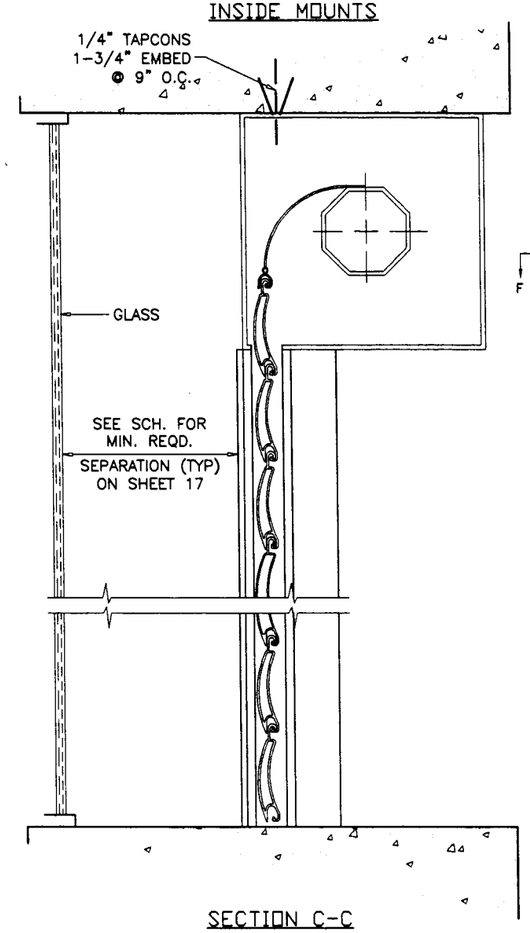
SECTION A-A

BUILT-OUT CONDITION

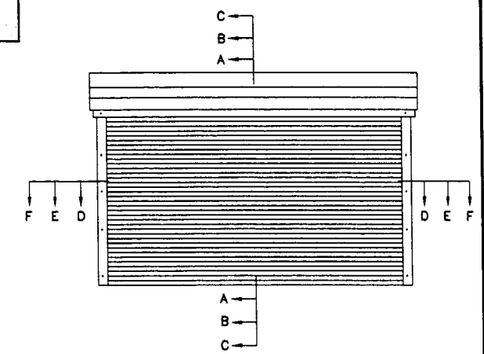


SECTION B-B

INSIDE MOUNTS



SECTION C-C



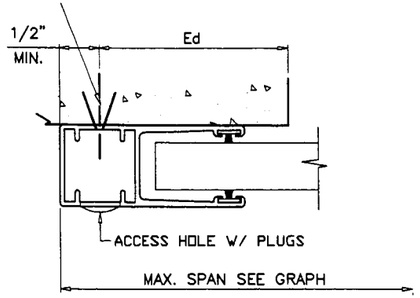
TYPICAL ELEVATION
SINGLE SPAN

ANCHORS: EMBEDMENT & EDGE DISTANCES SHOWN ARE BEYOND THE WALL & FLOOR COVERING (STUCCO, TILES, ETC.)

TYPICAL SLAT ENGAGEMENT INSIDE TRACK = 1-1/4" MIN.

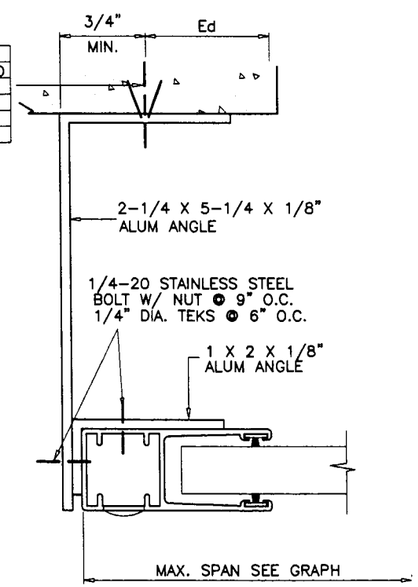
Ed = TYPICAL EDGE DISTANCE
CONC. & BLOCK = 12d (12 ANCHOR DIAMETERS)
WOOD = 5d
FOR LESSER EDGE DISTANCES SEE SHEET 9 OF 17.

ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	3	1	–
D	3	2	–
E1	–	–	2
E2	–	–	3



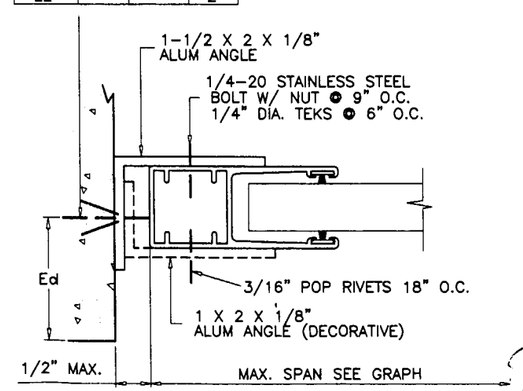
SECTION D-D

ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	4	2	–
D	4	2	–
E1	–	–	3
E2	–	–	3



SECTION E-E

ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	2	1	–
D	2	1	–
E1	–	–	2
E2	–	–	2



SECTION F-F

APPROVED AS COMPLYING WITH THE SOUTH FLORIDA BUILDING CODE
DATE January 14, 2000
BY
PRODUCT CONTROL DIVISION
BUILDING CODE COMPLIANCE OFFICE
ACCEPTANCE NO. 99-0811.01

Engr: DR. HUMAYOUN FAROOQ
STRUCTURES
FLA. PE # 16557

DEC 07 1999

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ROLLUP\99-10FSC

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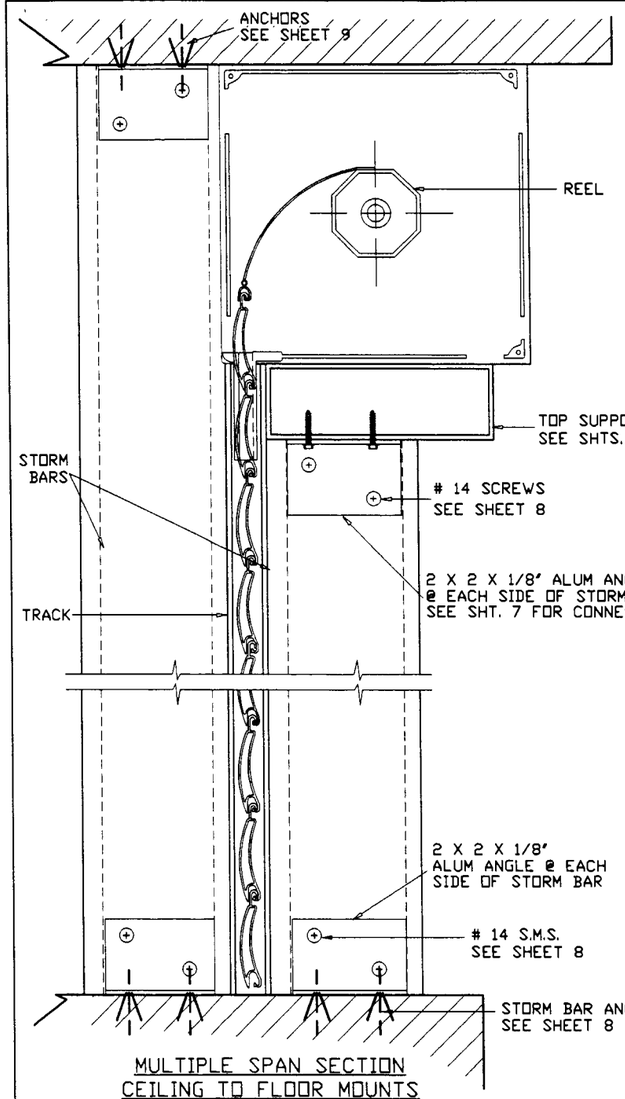
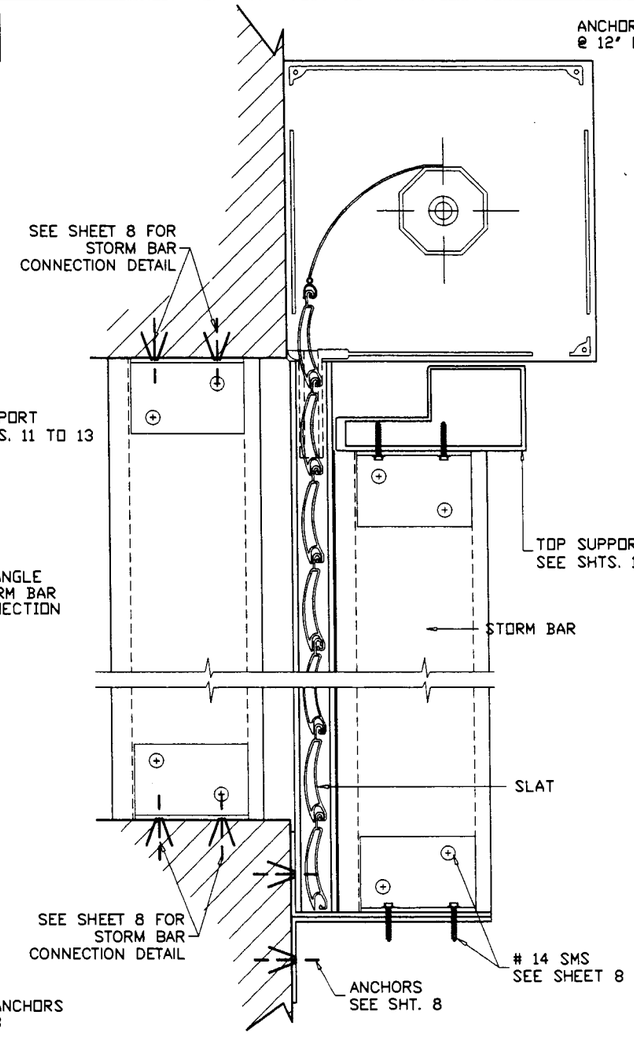
revisions:			
no	date	by	description

date: 03-15-99
scale: 1/2" = 1"
dr. by: HAMID
chk. by:

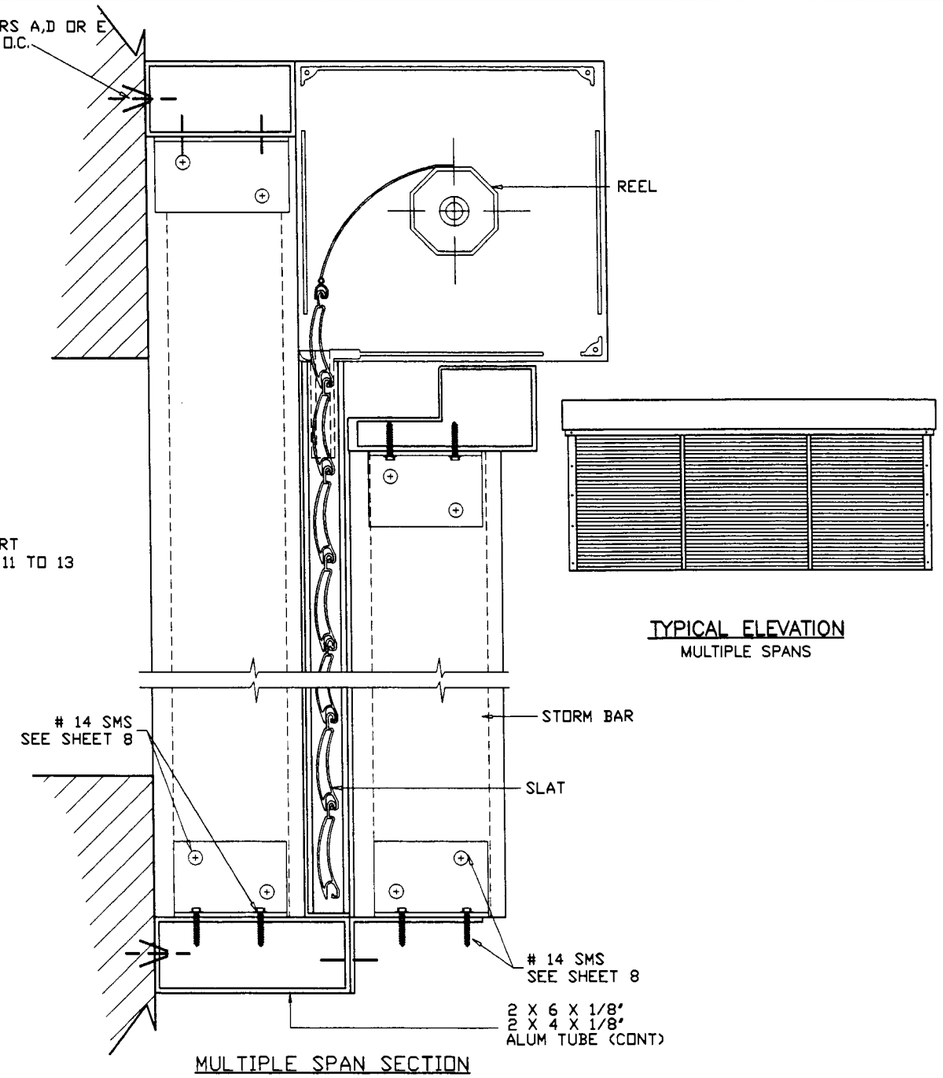
drawing no.
99-10



MULTIPLE SPAN SECTION
CEILING TO FLOOR MOUNTS

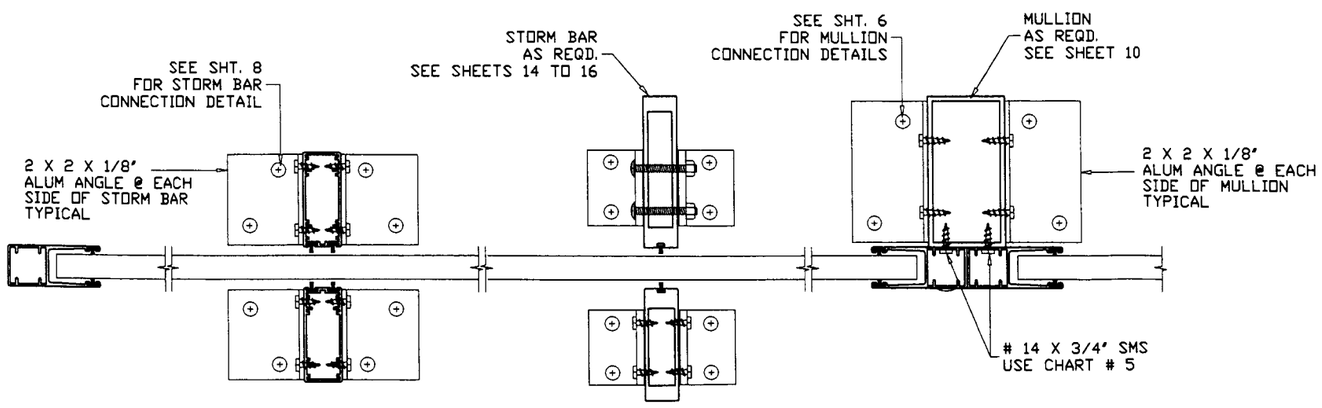


MULTIPLE SPAN SECTION
WALL MOUNTS



MULTIPLE SPAN SECTION
BUILT-OUT

TYPICAL ELEVATION
MULTIPLE SPANS



MULTIPLE SPAN PLAN
HEADER NOT SHOWN

Engr: DR. HUMAYOUN FAROOQ
STRUCTURES
FLA. PE # 16557

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ROLLUP\99-10FSC

ROLL UP SHUTTER DETAILS

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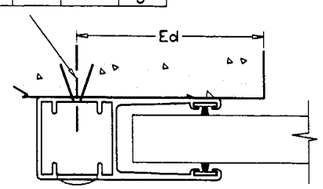
TEL.(561) 683-4811 FAX.(561) 640-8204

revisions:		
no	date	by	description

date: 03-15-99
scale: 1/4" = 1'
dr. by: HAMID
chk. by:

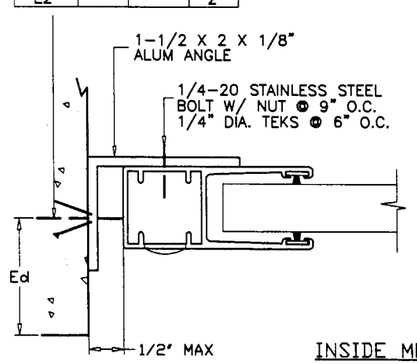
drawing no.
99-10

ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	3	1	–
D	3	2	–
E1	–	–	2
E2	–	–	3

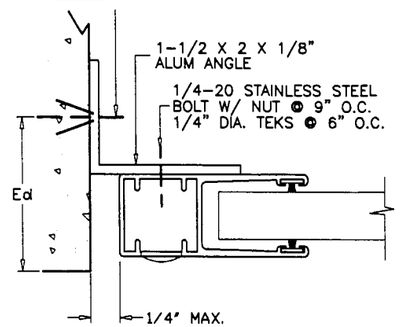


WALL MOUNTS

ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	2	1	–
D	2	1	–
E1	–	–	2
E2	–	–	2

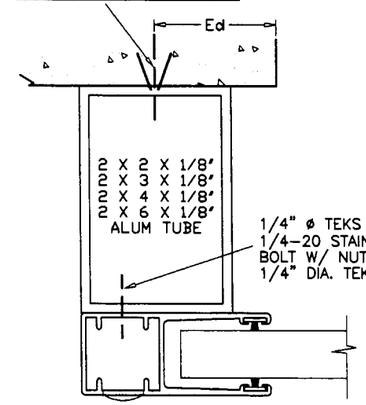


ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	2	1	–
D	3	1	–
E1	–	–	2
E2	–	–	2

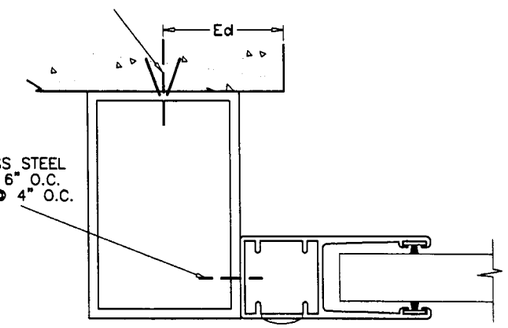


INSIDE MOUNTS

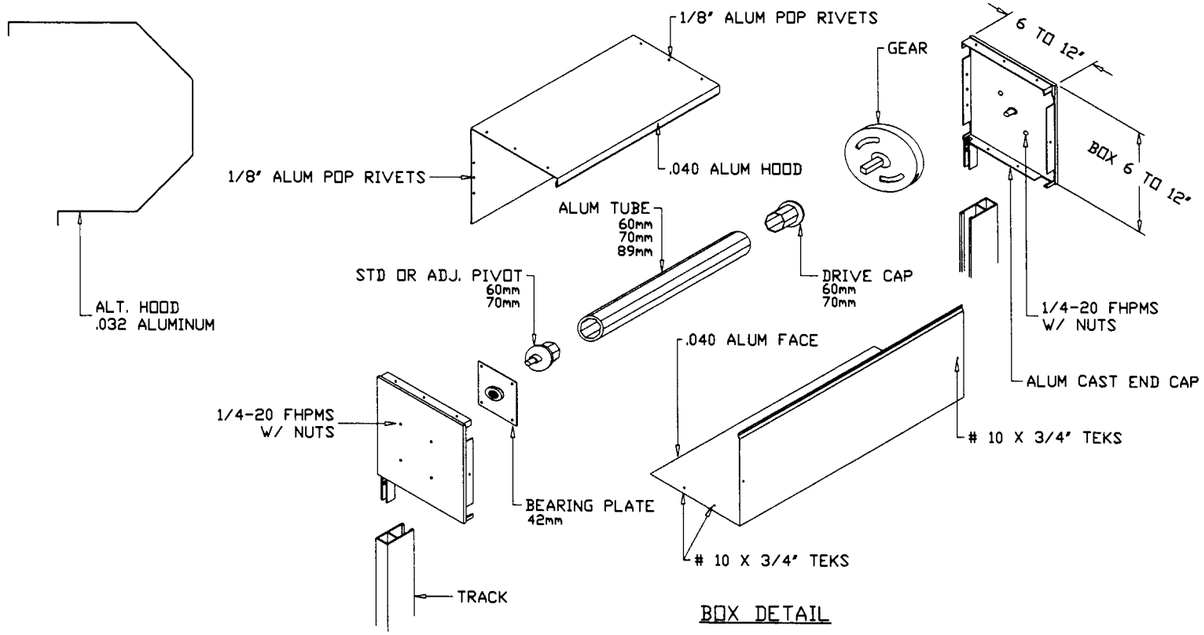
ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	5	2	–
D	5	3	–
E1	–	–	4
E2	–	–	4



ANCHOR TYPE	CHART TO USE		
	CONC.	BLOCK	WOOD
A	3	1	–
D	4	2	–
E1	–	–	2
E2	–	–	3



BUILT-OUT INSTALLATIONS



BOX DETAIL

FOR CHARTS REFERED ON DETAILS
SEE SHEET 9 OF 17

Ed = TYPICAL EDGE DISTANCE
CONC. & BLOCK = 12d (12 ANCHOR DIAMETERS)
WOOD = 5d
FOR LESSER EDGE DISTANCES SEE SHEET 9 OF 17.

Engr: DR. HUMAYOUN FAROOQ
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FLA. PE # 16557

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no	date	by	description

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dr. by: HAMID
chk. by:

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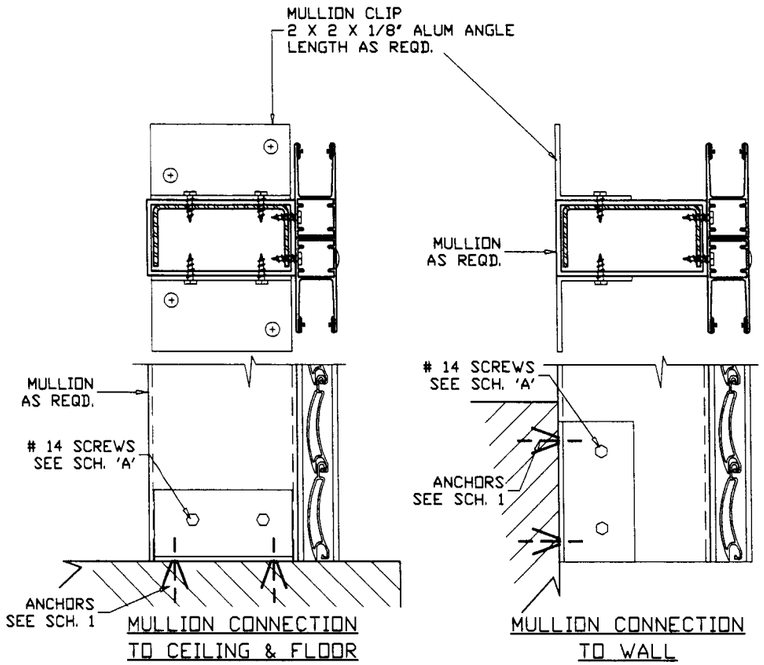
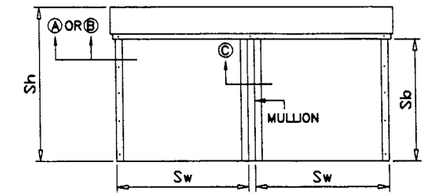
99-10





TOTAL LOAD ON CENTER MULLION

P = Sh X Sw X Pd = Lbs

TOTAL LOAD ON END MULLION

P = Sh X Sw/2 X Pd = Lbs

TOTAL LOAD ON HEADER

P = Sh/2 X Sw/2 X Pd = Lbs

LOAD AT ANCHOR

AT TOP = Pt = $\frac{P * Sb}{Sh}$ = Lbs

AT BOTTOM = Pb = P − Pt = Lbs

IF Pt OR Pb > ANCHOR CAPACITY OF FASTENER SHOWN
ANCHORAGE SYSTEM SHALL BE DESIGNED ON JOB TO JOB BASIS.

SCHEDULE 1

MULLION CONNECTION TO CEILING AND FLOOR			
ANCHOR PER SIDE	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY–lbs
1	A	CONC.	1164
	A	BLOCK	706
	D	CONC.	1176
	D	BLOCK	892
	E1	WOOD	402
	E2	WOOD	284
2	A	CONC.	2328
	A	BLOCK	1412
	D	CONC.	2348
	D	BLOCK	1784
	E1	WOOD	804
	E2	WOOD	568
3	A	CONC.	3492
	A	BLOCK	2118
	D	CONC.	3522
	D	BLOCK	2676
	E1	WOOD	1206
	E2	WOOD	852
4	A	CONC.	4656
	A	BLOCK	2824
	D	CONC.	4696
	D	BLOCK	3568
	E1	WOOD	1608
	E2	WOOD	1136

SCHEDULE 2

MULLION CONNECTION TO WALL				
CLIP ANGLE LENGTH–IN.	ANCHOR PER SIDE	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY–lbs
6	4	A	CONC.	586
		A	BLOCK	410
		D	CONC.	586
		D	BLOCK	586
		E1&E2	WOOD	586
9	6	A	CONC.	879
		A	BLOCK	615
		D	CONC.	879
		D	BLOCK	879
		E1&E2	WOOD	879
12	8	A	CONC.	1172
		A	BLOCK	820
		D	CONC.	1172
		D	BLOCK	1172
		E1&E2	WOOD	1172
15	10	A	CONC.	1465
		A	BLOCK	1025
		D	CONC.	1465
		D	BLOCK	1465
		E1&E2	WOOD	1465

SCHEDULE A

MULLION ANGLE CONNECTION			
CLIP ANGLE LENGTH–IN.	# OF SCREWS EACH LEG	SPACING BETWEEN SCREWS –IN.	CONNECTION CAPACITY–lbs
2"	2	1.5	1640
	3	.75	1968
3"	2	2	1874
	3	2	2315
	4	.75	2981
4"	2	3	2186
	3	1.5	2811
	4	1	3450
	5	.75	4099
5"	2	4	2385
	3	2	3148
	4	1.25	3813
	5	1	4685

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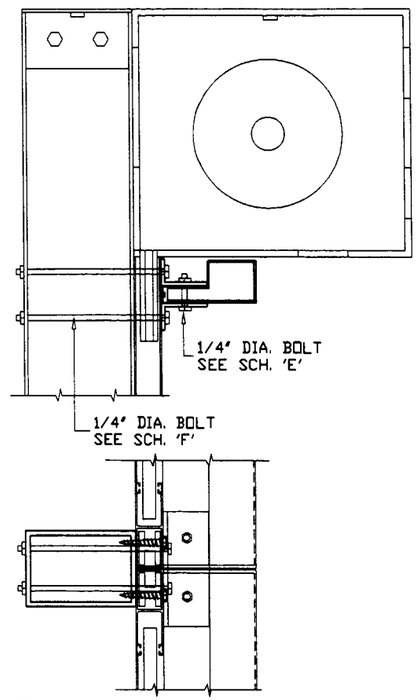
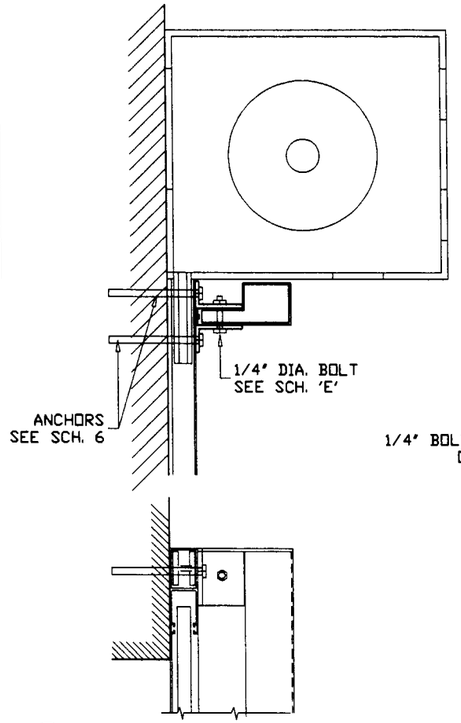
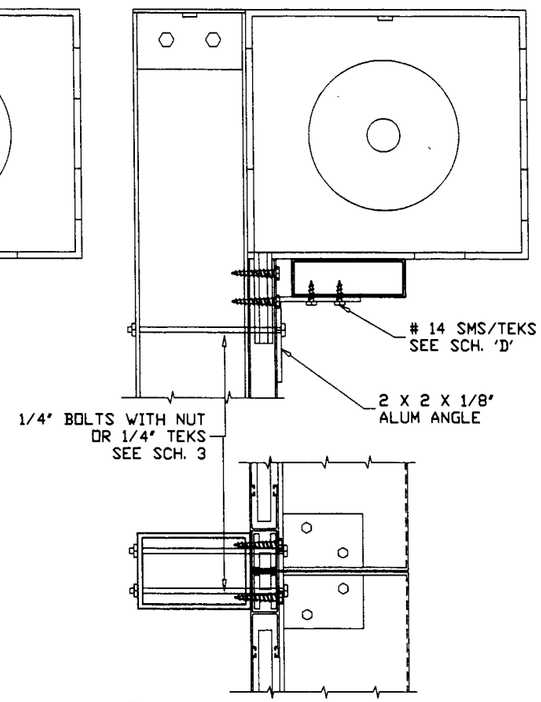


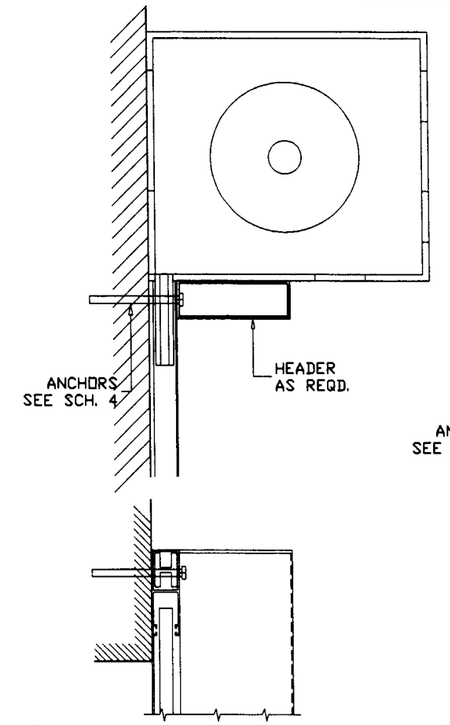
(E) HEADER CONNECTION TO MULLION
PLAN



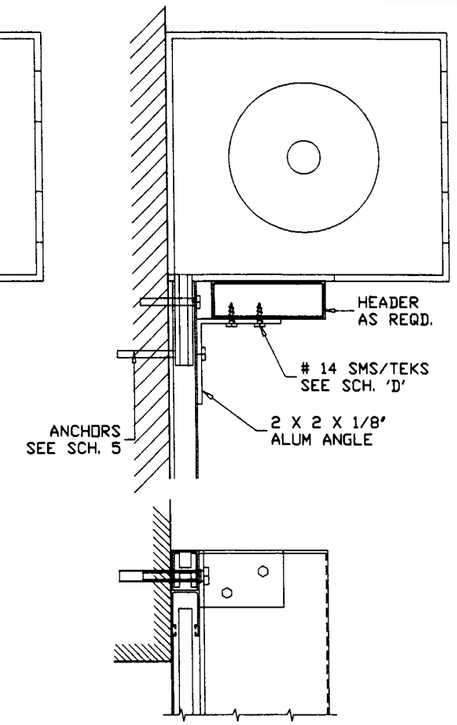
(D) HEADER CONNECTION TO WALL
PLAN



(C) HEADER CONNECTION TO MULLION
PLAN



(B) HEADER CONNECTION TO WALL
WITHOUT END ANGLE
PLAN



(A) HEADER CONNECTION TO WALL
WITH END ANGLE
PLAN

SCHEDULE F

HEADER CONNECTION	
NO. OF BOLTS	CONNECTION CAPACITY–lbs
2	1995
4	3990
6	5985
8	7980

SCHEDULE 6

HEADER CONNECTION TO WALL			
# OF ANCHORS PER CONNECTION	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY–lbs
2	A	CONC.	1122
	A	BLOCK	410
	D	CONC.	1402
	D	BLOCK	586
	E1	WOOD	832
	E2	WOOD	1040
4	A	CONC.	2244
	A	BLOCK	820
	D	CONC.	2804
	D	BLOCK	1172
	E1	WOOD	1664
	E2	WOOD	2080
6	A	CONC.	3366
	A	BLOCK	1230
	D	CONC.	4206
	D	BLOCK	1758
	E1	WOOD	2496
	E2	WOOD	3120

SCHEDULE 3

ANGLE CONNECTION TO MULLION		
NO. OF BOLTS/TEKS	ANGLE LENGTH IN.	CONNECTION CAPACITY–lbs
2	4	260
3	6	391
4	9	586
6	12	781

SCHEDULE D

HEADER CONNECTION	
# OF SCREWS EACH LEG	CONNECTION CAPACITY–lbs
1	1642
2	3284
3	4926
4	6568

SCHEDULE 4

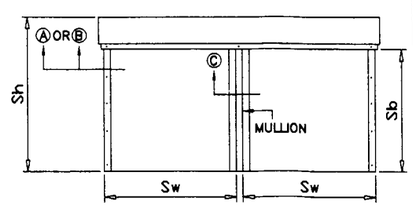
HEADER CONNECTION TO WALL			
# OF ANCHORS PER CONNECTION	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY–lbs
1	A	CONC.	561
	A	BLOCK	205
	D	CONC.	701
	D	BLOCK	293
	E1	WOOD	415
	E2	WOOD	519
2	A	CONC.	1122
	A	BLOCK	410
	D	CONC.	1402
	D	BLOCK	586
	E1	WOOD	830
	E2	WOOD	1038
4	A	CONC.	2244
	A	BLOCK	820
	D	CONC.	2804
	D	BLOCK	1172
	E1	WOOD	1660
	E2	WOOD	2076

SCHEDULE 5

HEADER CONNECTION TO WALL				
CLIP ANGLE LENGTH–IN.	# OF ANCHORS PER CONNECTION	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY–lbs
4	2	A	CONC.	260
		A	BLOCK	256
		D	CONC.	260
		D	BLOCK	260
		E1&E2	WOOD	260
6	3	A	CONC.	391
		A	BLOCK	384
		D	CONC.	391
		D	BLOCK	391
		E1&E2	WOOD	391
9	4	A	CONC.	586
		A	BLOCK	513
		D	CONC.	586
		D	BLOCK	586
		E1&E2	WOOD	586
12	5	A	CONC.	781
		A	BLOCK	641
		D	CONC.	781
		D	BLOCK	781
		E1&E2	WOOD	781

SCHEDULE E

HEADER CONNECTION	
NO. OF BOLTS	CONNECTION CAPACITY–lbs
1	622
2	1244
3	1866
4	2488
5	3110
6	3732



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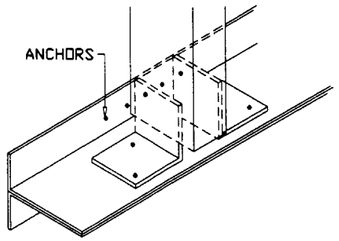
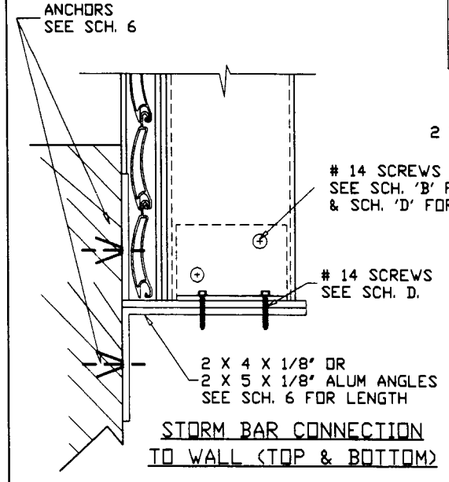


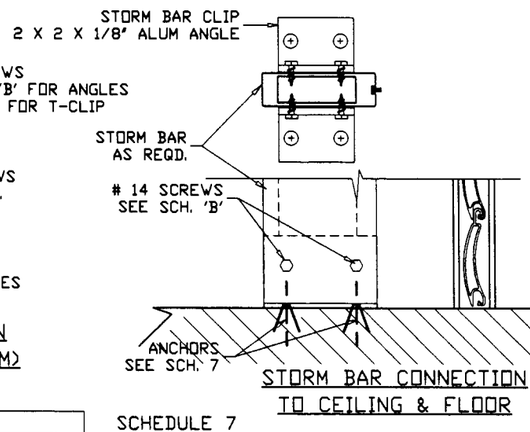
SCHEDULE B

STORM BAR BRACKET CONNECTION			
CLIP ANGLE LENGTH-IN.	# OF SCREWS EACH LEG	SPACING BETWEEN SCREWS -IN.	CONNECTION CAPACITY-lbs
2"	2	1.5	1640
	3	.75	1968
3"	2	2	1874
	3	2	2315
	4	.75	2981
4"	2	3	2186
	3	1.5	2811
	4	1	3450
	5	.75	4099
5"	2	4	2385
	3	2	3148
	4	1.25	3813
	5	1	4685
* 2"	2	1.5	1031
	3	.75	1237

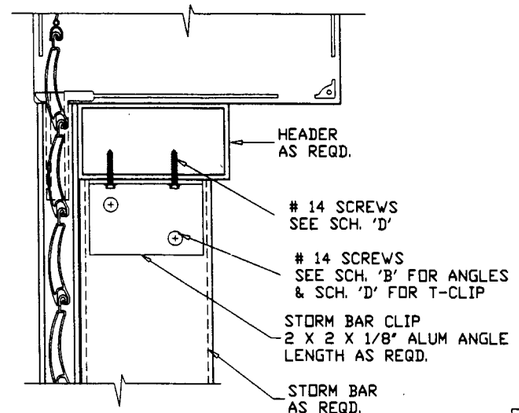
* FOR 2" & 2-1/2" STORM BARS WITH 1/16" WALL THICKNESS



STORM BAR CONNECTION TO WALL (TOP & BOTTOM)

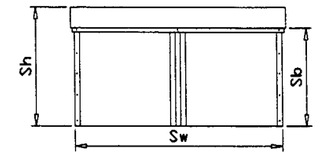


STORM BAR CONNECTION TO CEILING & FLOOR



STORM BAR CONNECTION TO HEADER

ALL DIMENSIONS SHOWN Sh, Sw, Sb ETC. ARE IN FEET.



FACTOR = 1.25 FOR 2 SPANS
= 1.10 FOR 3 SPANS
Sb = STORM BAR HEIGHT

LOAD ON STORM BAR ANCHOR = $P = \frac{Sw * Sb \times Pd \times FACTOR}{2 * (\# \text{ OF SPANS})}$

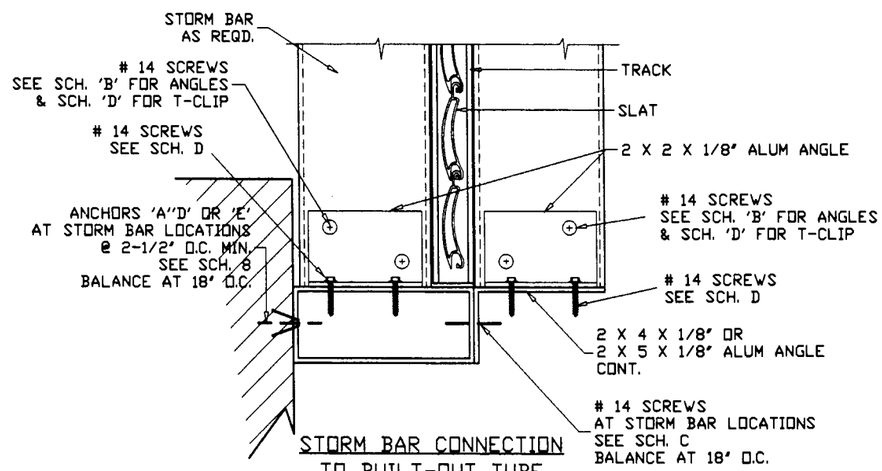
IF P > CAPACITY OF FASTENERS SHOWN, ANCHORAGE SYSTEM SHALL BE DESIGNED ON JOB TO JOB BASIS.

SCHEDULE D

STORM BAR CONNECTION	
# OF SCREWS EACH LEG	CONNECTION CAPACITY-lbs
1	1642
2	3284
3	4926
4	6568

SCHEDULE C

ANGLE CONNECTION TO TUBE AT STORM BAR LOCATION	
# OF SCREWS	CONNECTION CAPACITY-lbs
2	353
3	530
4	586



STORM BAR CONNECTION TO BUILT-OUT TUBE

SCHEDULE 6

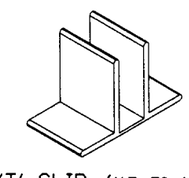
STORM BAR CONNECTION TO WALL				
ALUM ANGLE LENGTH IN.	# OF ANCHORS PER CONNECTION	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY-lbs
9"	4	A	CONC.	780
		A	BLOCK	780
		D	CONC.	780
		D	BLOCK	780
		E1 & E2	WOOD	780
12"	4	A	CONC.	1040
		A	BLOCK	820
		D	CONC.	1040
		D	BLOCK	1040
		E1 & E2	WOOD	1040
15"	6	A	CONC.	1300
		A	BLOCK	1230
		D	CONC.	1300
		D	BLOCK	1300
		E1 & E2	WOOD	1300
18"	6	A	CONC.	1560
		A	BLOCK	1230
		D	CONC.	1560
		D	BLOCK	1560
		E1 & E2	WOOD	1560
24"	8	A	CONC.	2080
		A	BLOCK	1640
		D	CONC.	2080
		D	BLOCK	2080
		E1 & E2	WOOD	2080

SCHEDULE 7

STORM BAR CONNECTION TO CEILING AND FLOOR				
ALUM ANGLE LENGTH IN.	# OF ANCHORS PER CONNECTION	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY-lbs
2"	2	A	CONC.	1162
		A	BLOCK	704
		D	CONC.	1172
		D	BLOCK	890
		E1	WOOD	400
		E2	WOOD	284
3-1/2"	4	A	CONC.	2324
		A	BLOCK	1408
		D	CONC.	2344
		D	BLOCK	1780
		E1	WOOD	800
		E2	WOOD	568
6-1/2"	6	A	CONC.	3486
		A	BLOCK	2112
		D	CONC.	3516
		D	BLOCK	2670
		E1	WOOD	1200
		E2	WOOD	852
9"	8	A	CONC.	4648
		A	BLOCK	2816
		D	CONC.	4688
		D	BLOCK	3560
		E1	WOOD	1600
		E2	WOOD	1136

SCHEDULE 8

TUBE CONNECTION TO WALL @ STORM BAR LOCATION			
NO. OF ANCHORS	ANCHOR TYPE	BASE MATERIAL	CONNECTION CAPACITY-lbs
2	A	CONC.	561
	A	BLOCK	205
	D	CONC.	586
	D	BLOCK	293
	E1	WOOD	415
	E2	WOOD	519
3	A	CONC.	586
	A	BLOCK	308
	D	CONC.	586
	D	BLOCK	440
	E1	WOOD	586
	E2	WOOD	586
4	A	CONC.	586
	A	BLOCK	410
	D	CONC.	586
	D	BLOCK	586
	E1	WOOD	586
	E2	WOOD	586



'T' CLIP (ALT. TO ANGLES)
CLIP LENGTH AND NO. OF FASTENERS SAME AS SHOWN IN SCHEDULES.

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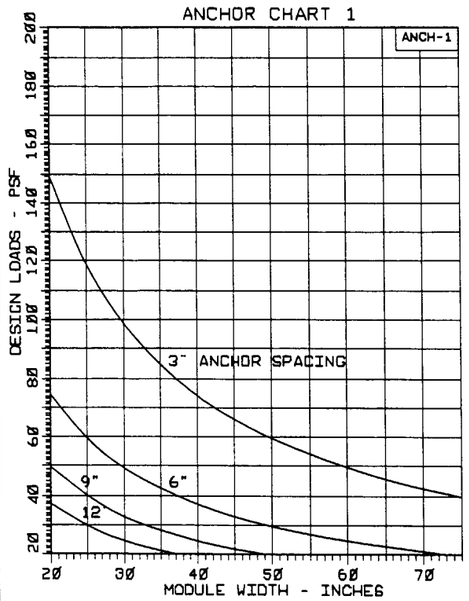
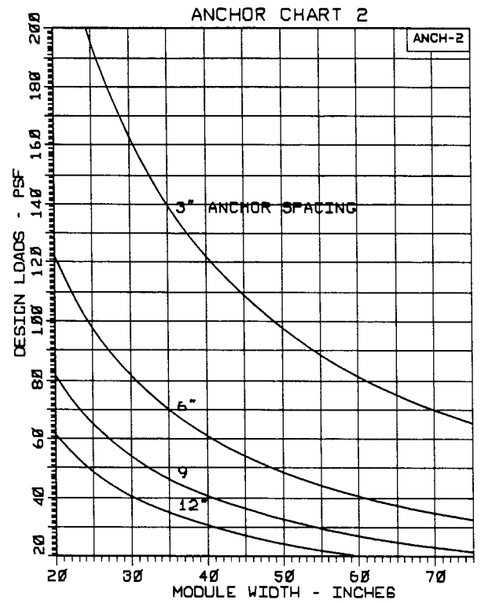
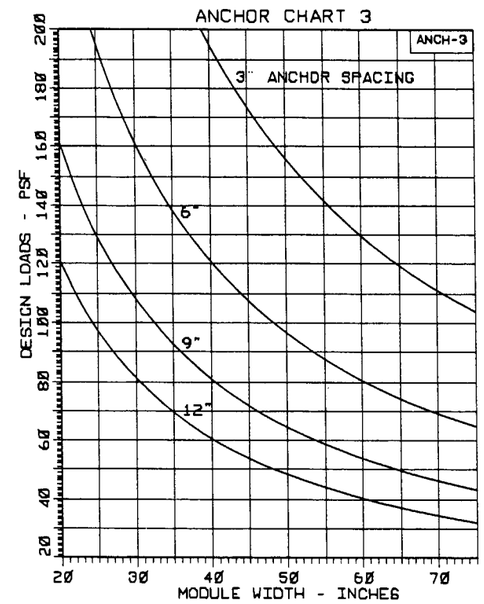
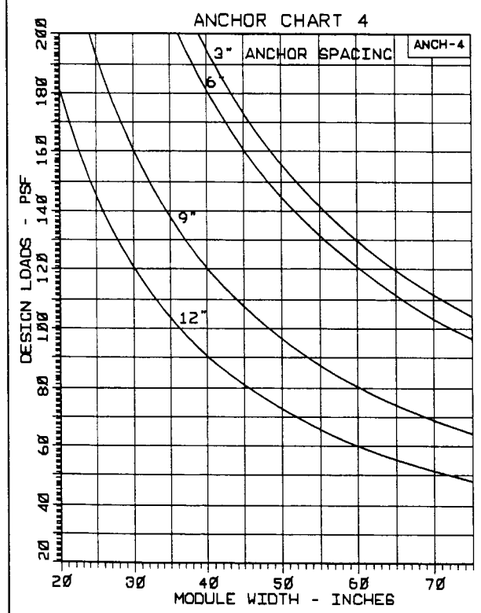
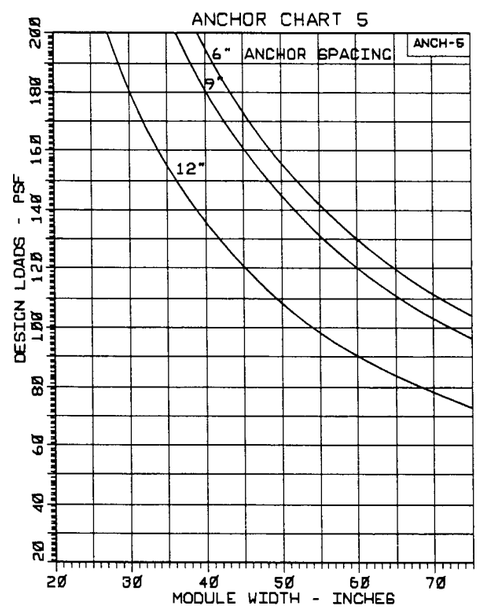




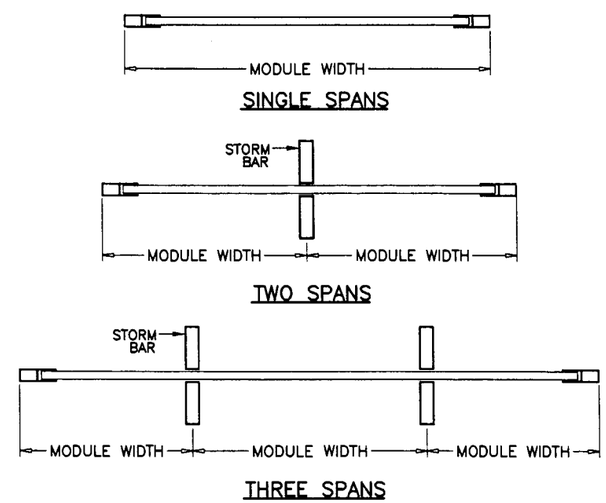






USE CHARTS 1 THRU 5 TO VERIFY ANCHOR REQUIREMENTS AND STRESS LIMITATIONS OF LOAD/SPAN COMBINATIONS.

$$\text{MODULE WIDTH} = \frac{\text{SHUTTER WIDTH}}{\text{\# OF SPANS}}$$



FASTENER SPACING IN MASONRY					
CHARTS ARE BASED ON TYPICAL EDGE DISTANCE = 12d. FOR LESSER EDGE DISTANCE DECREASE SPACING BY MULTIPLYING WITH THE FACTOR BELOW					
EDGE DIST.	12d=3"	10d=2-1/2"	8d=2"	6d=1-1/2"	5d=1-1/4"
FACTOR	1.00	0.86	0.71	0.57	0.50
EXAMPLE: FOR 3" EDGE DIST. SPACING = 12" O.C. (FROM CHART) FOR 2" EDGE DIST. SPACING = 12 X .71 = 8.5 O.C.					

TYPICAL EDGE DISTANCE IN WOOD = 1-1/4"
NO REDUCTION FACTOR IS REQUIRED

TYPICAL ANCHORS

ANCHOR (A) = 1/4" TAPCON (ITW BUILDEX)
1-3/4" EMBEDMENT TO CONC. (3000 PSI MIN.)
1-1/4" EMBEDMENT TO BLOCK

ANCHOR (D) = 1/4" RAWL CALK-IN.
7/8" MIN. EMBED INTO CONC. (3000 PSI) OR BLOCK

ANCHOR (E1) = #14 S.M.S. INTO WOOD. (SYP MIN. S.G.= 0.55)
1-1/2" MIN. PENETRATION.

ANCHOR (E2) = 1/4" LAG SCREWS INTO WOOD. (SYP MIN. S.G.= 0.55)
1-1/2" MIN. PENETRATION.

NOTE: ANCHORS, USE FULL EMBEDMENT IN CONCRETE BEYOND THE COVERING (STUCCO, TILES, ETC.)

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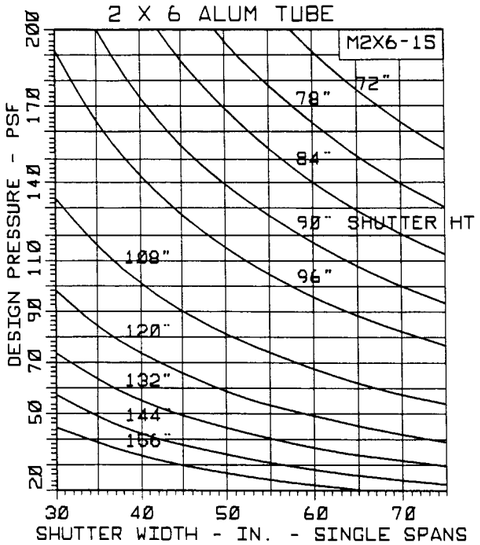
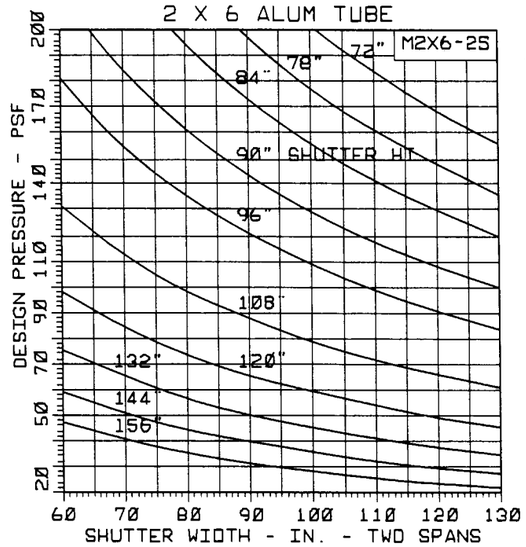
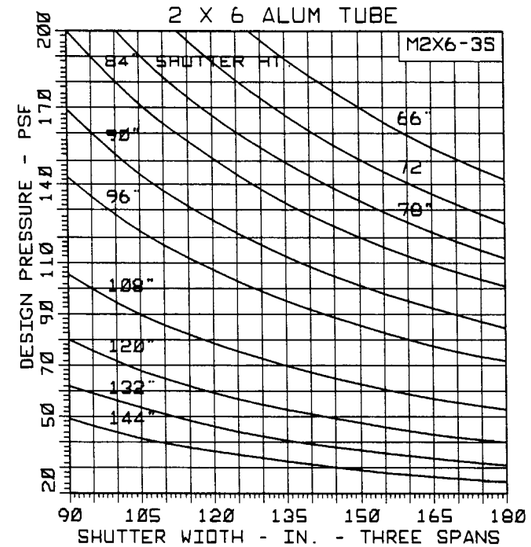
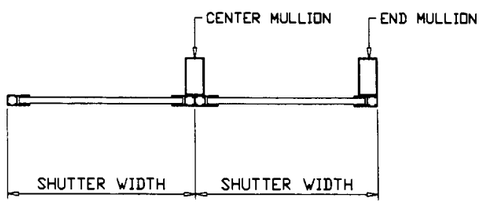
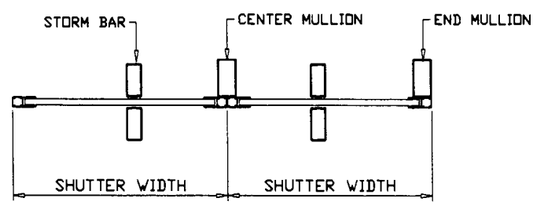








SINGLE SPANS



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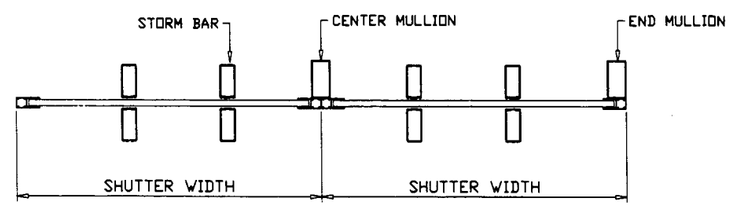

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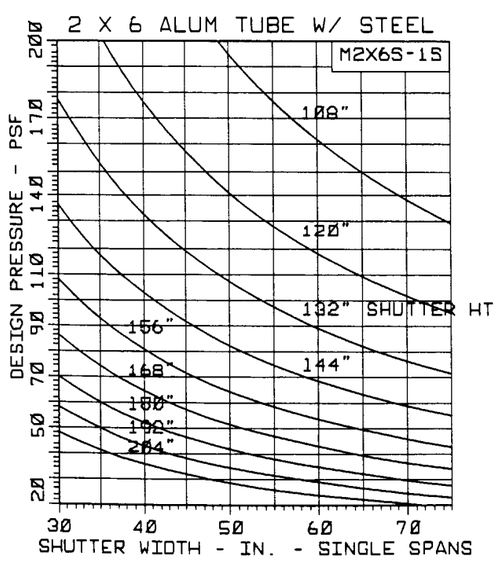

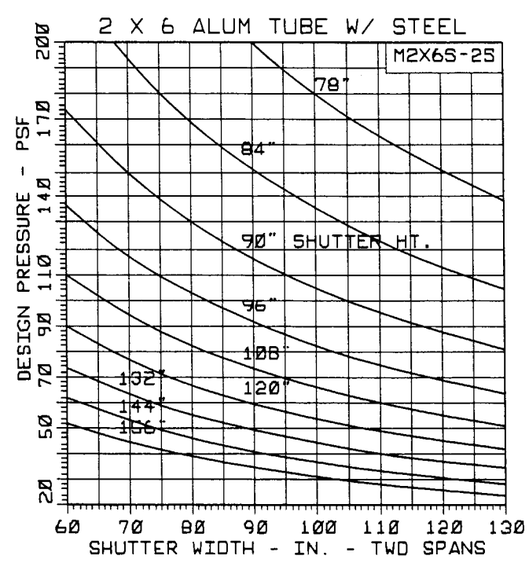

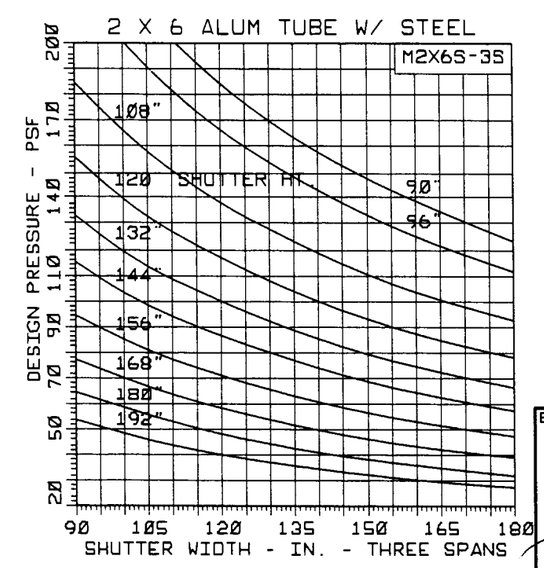

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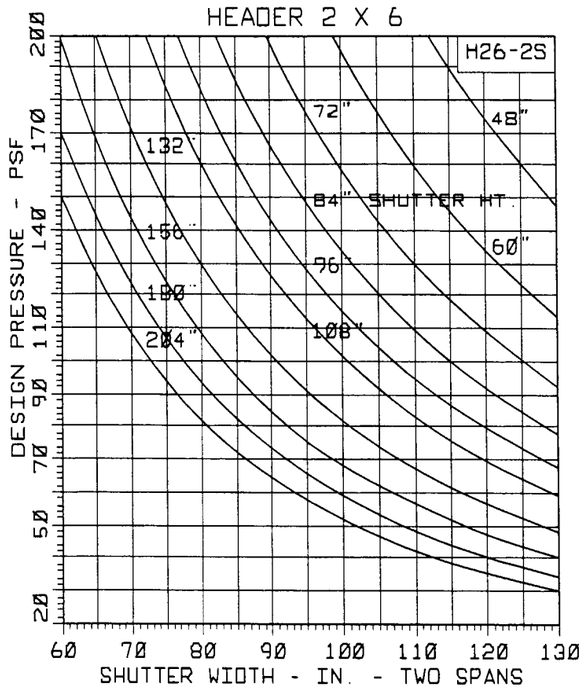

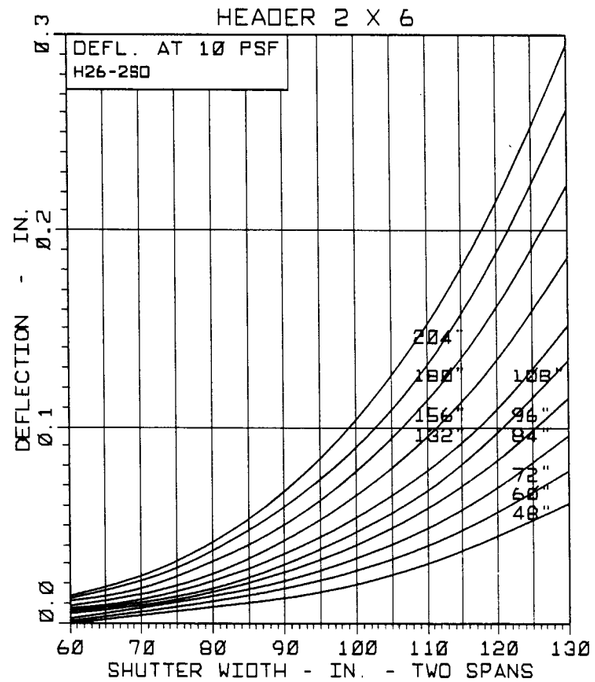

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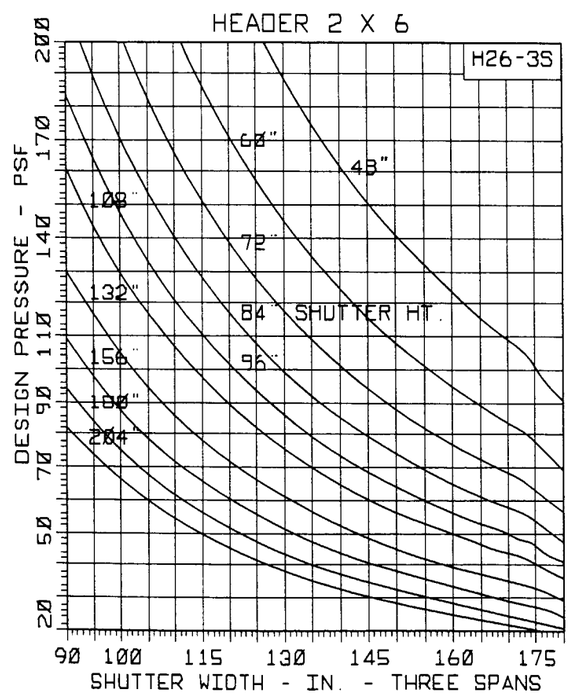
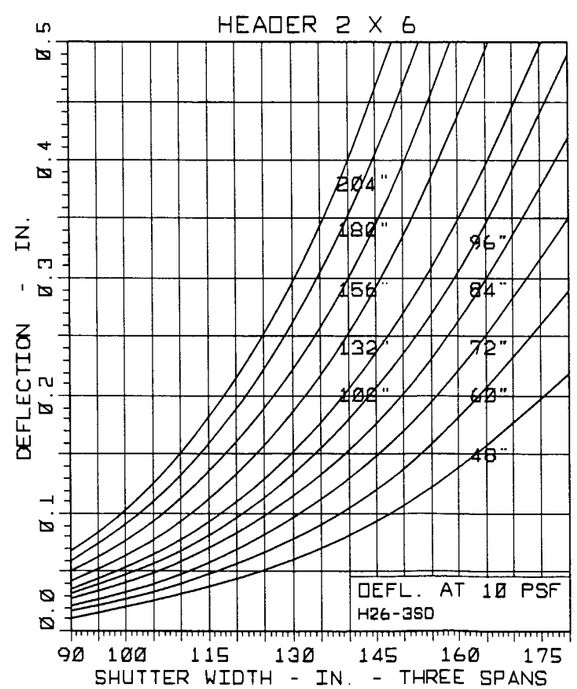
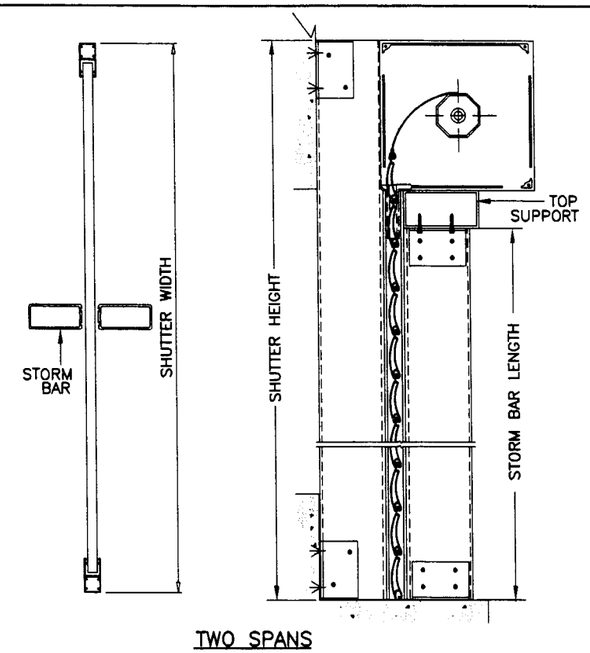
SEE SKETCH FOR REFERENCE







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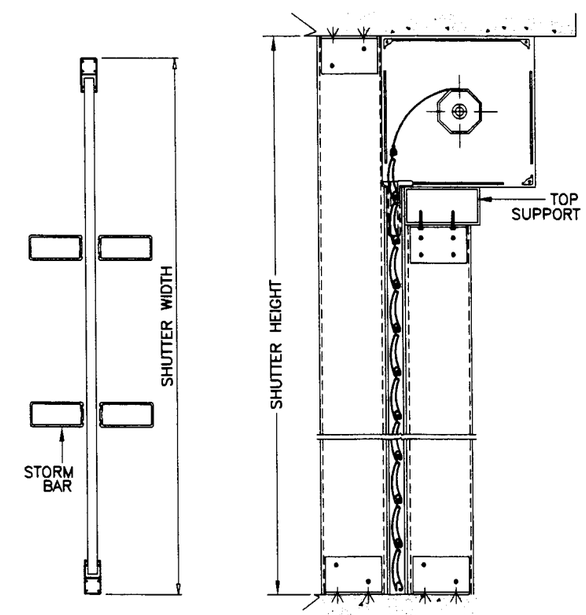

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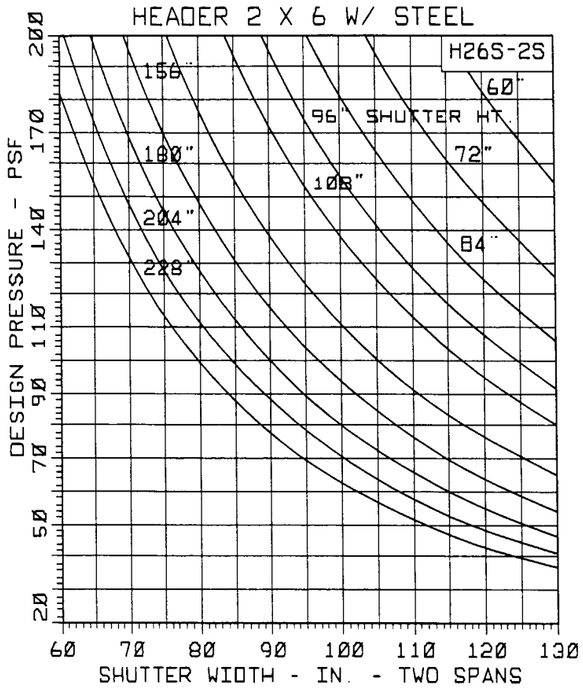

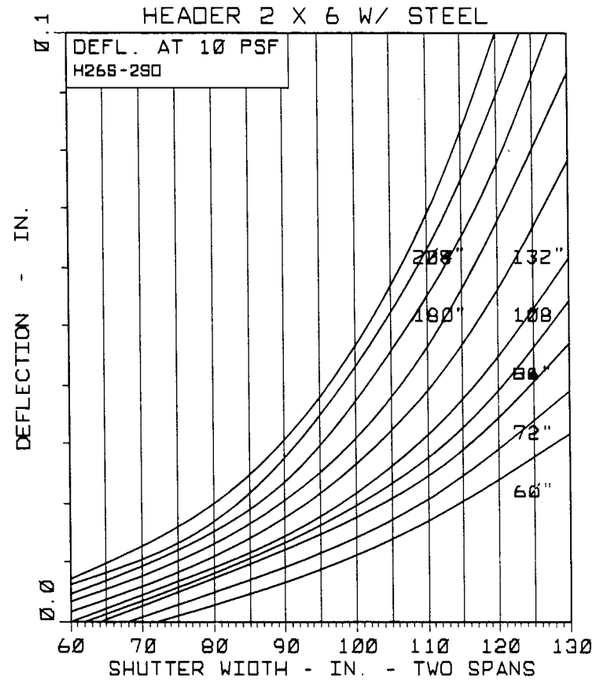

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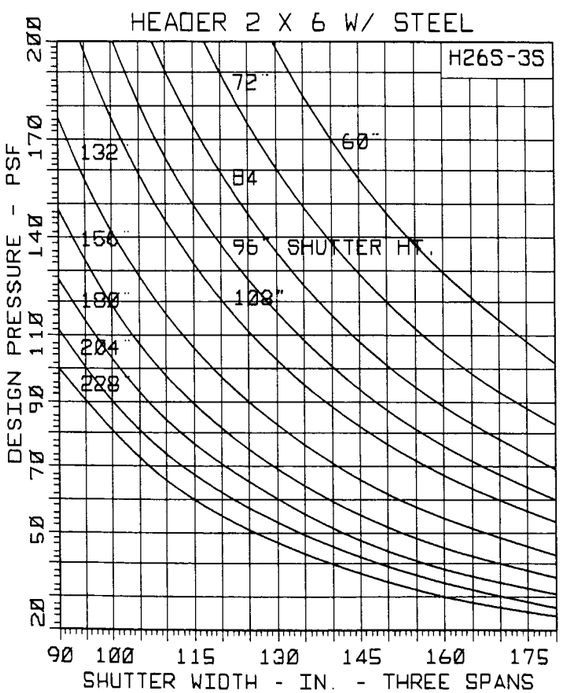

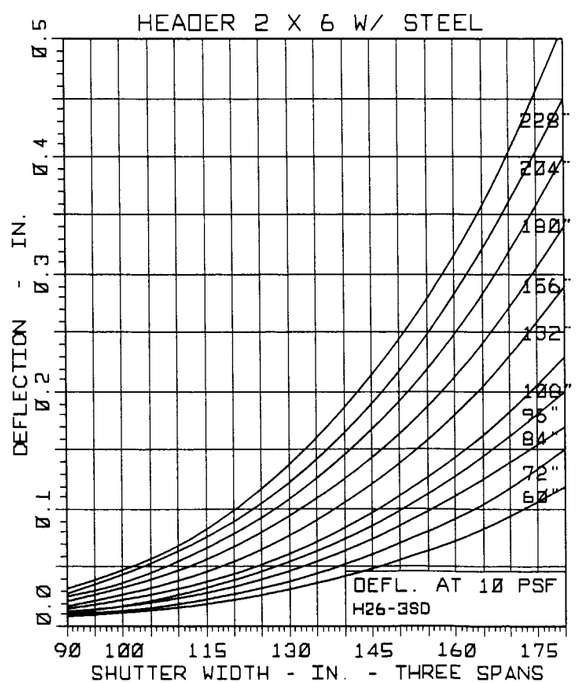

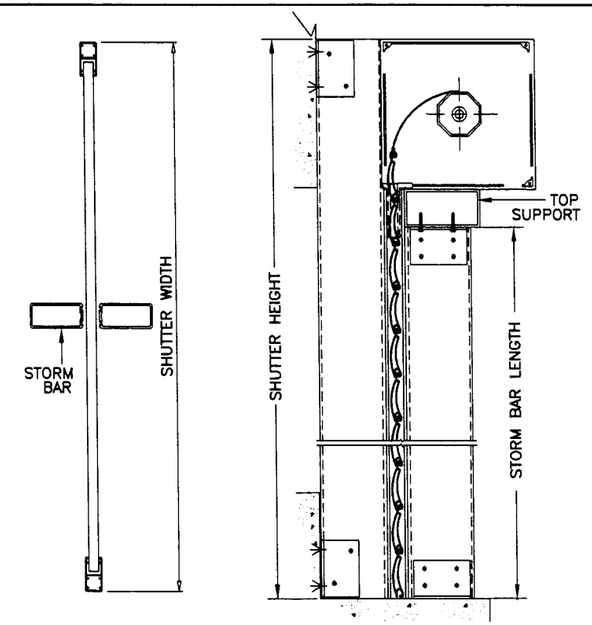

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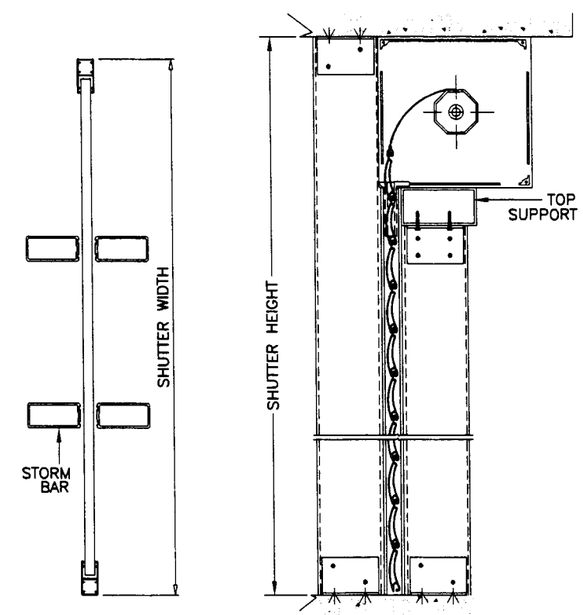

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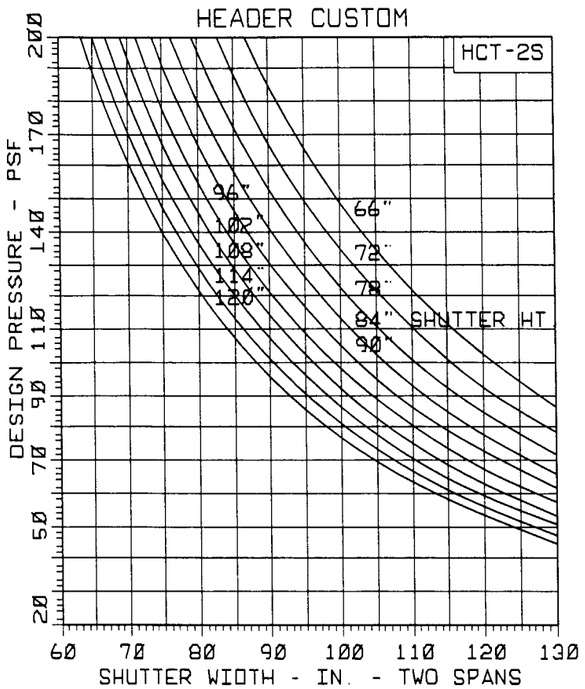

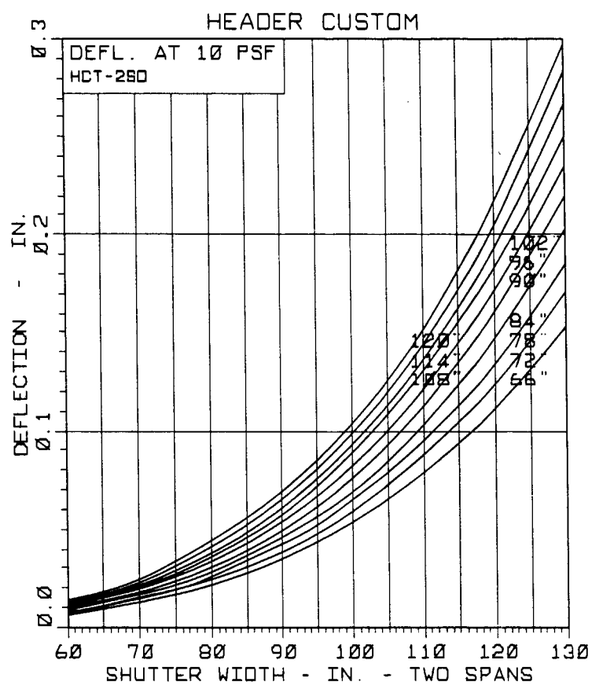

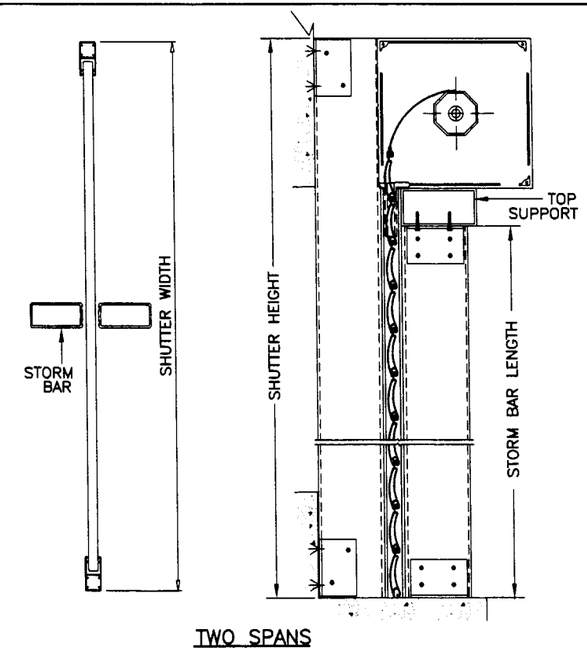

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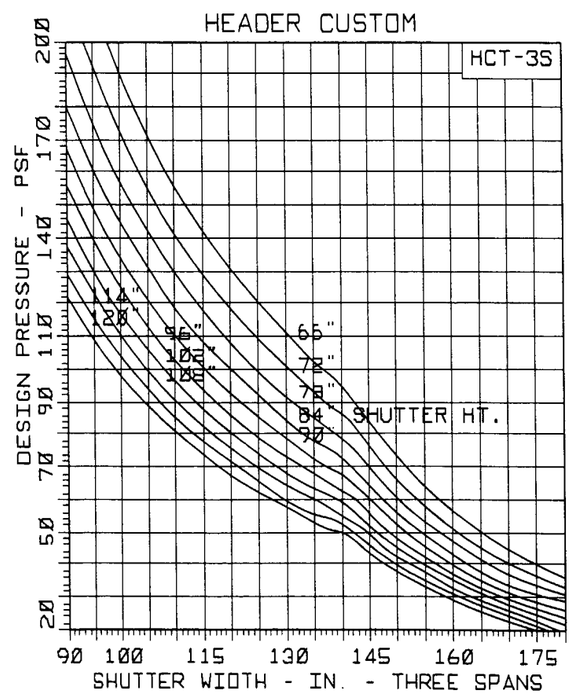

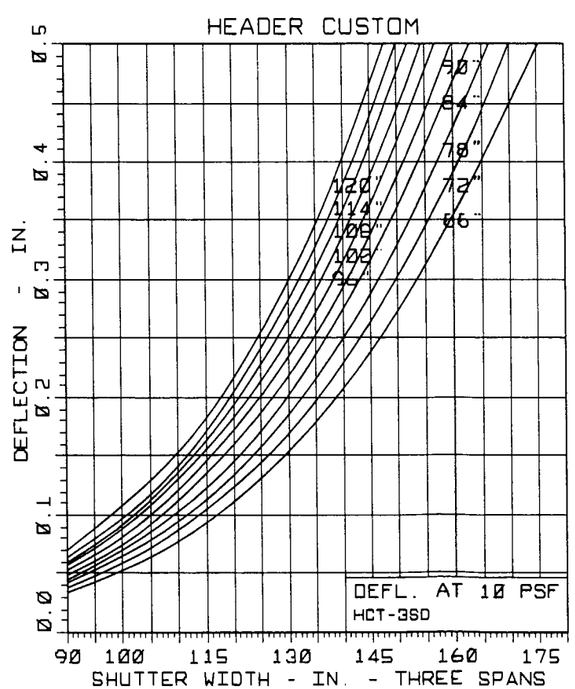

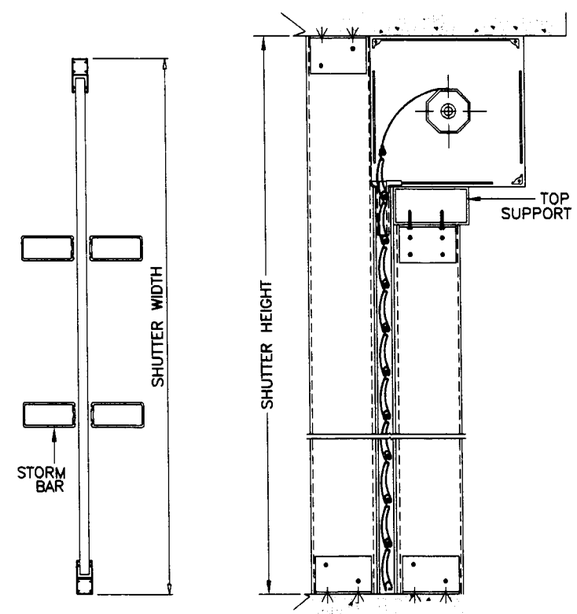

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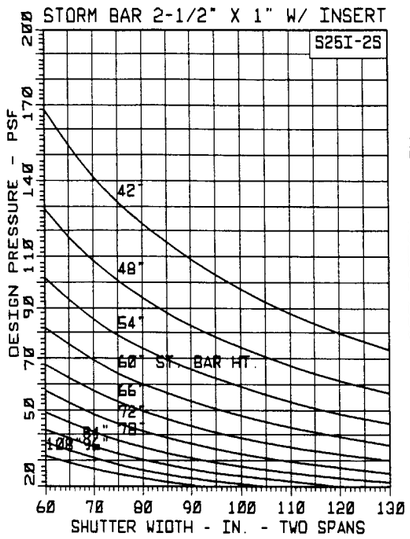
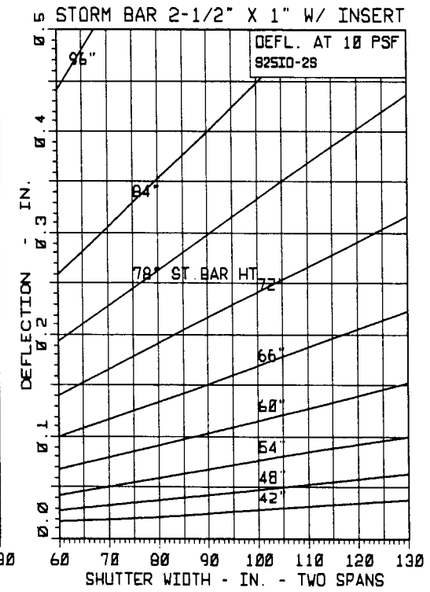
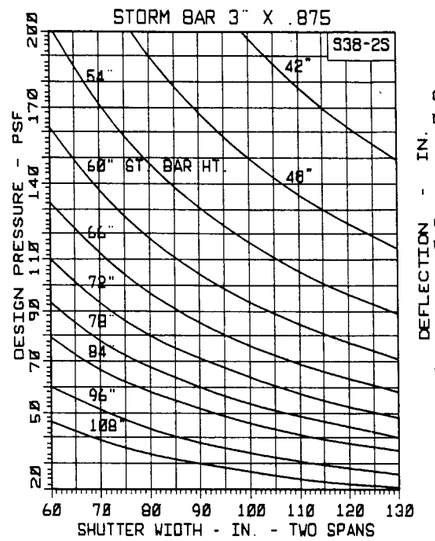
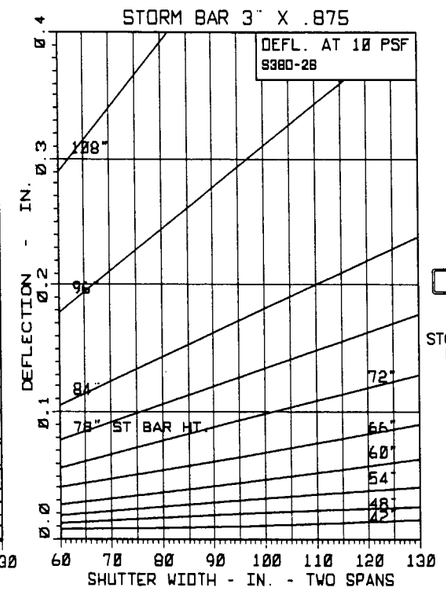
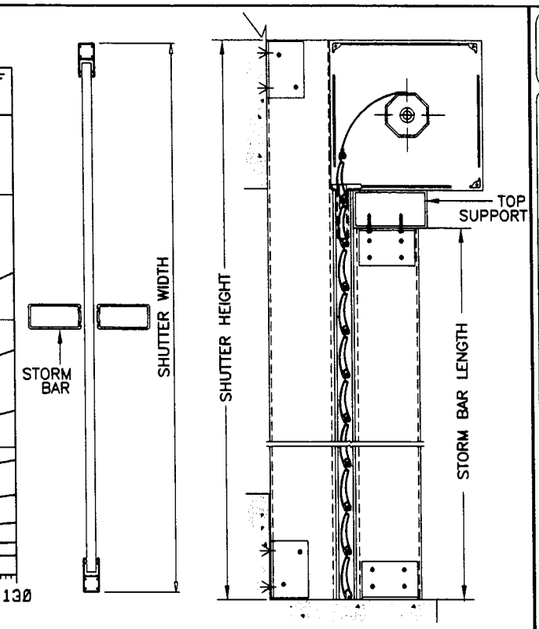




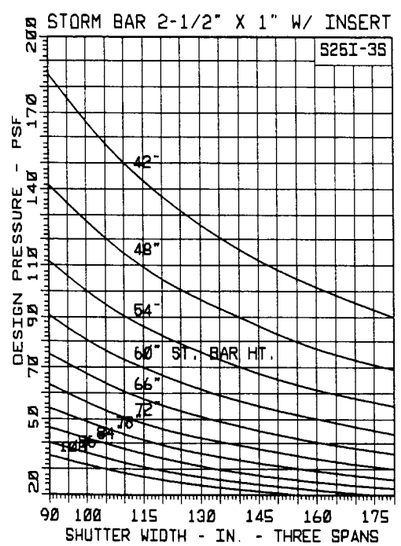


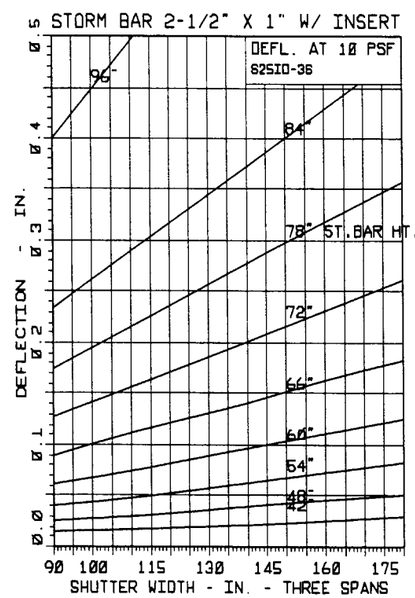


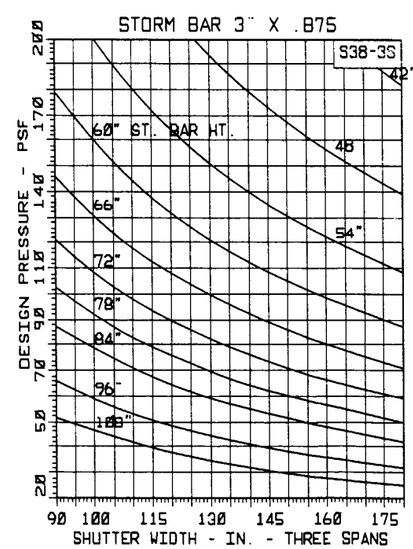


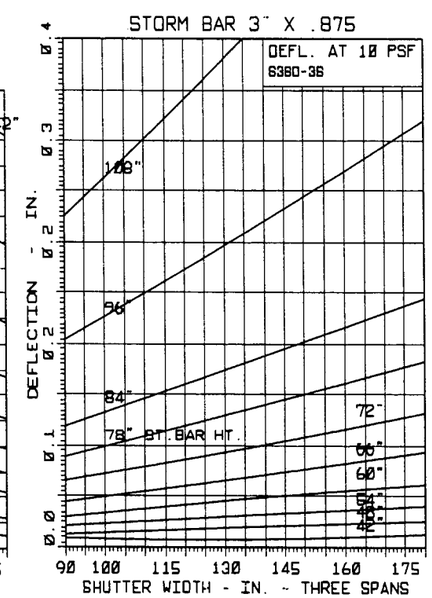
TWO SPANS

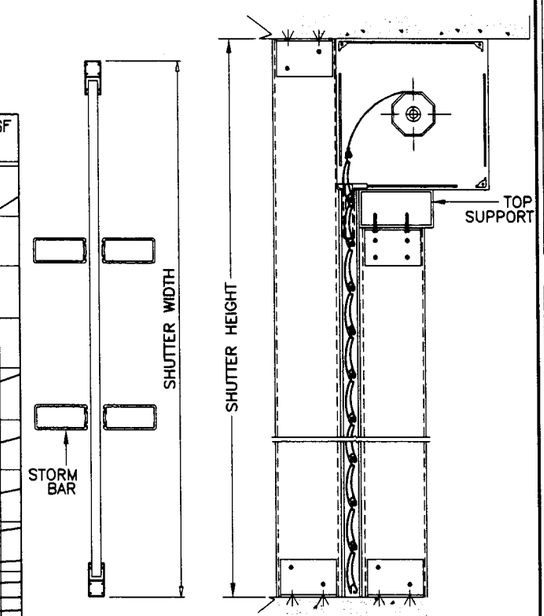
SEE SKETCH FOR REFERENCE
THE CURVES ON THESE GRAPHS SHOW STORM BAR LENGTHS











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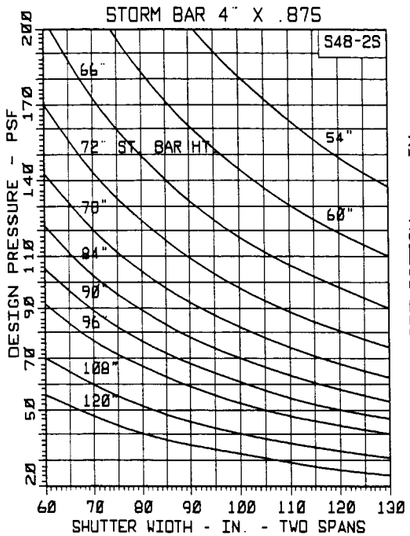

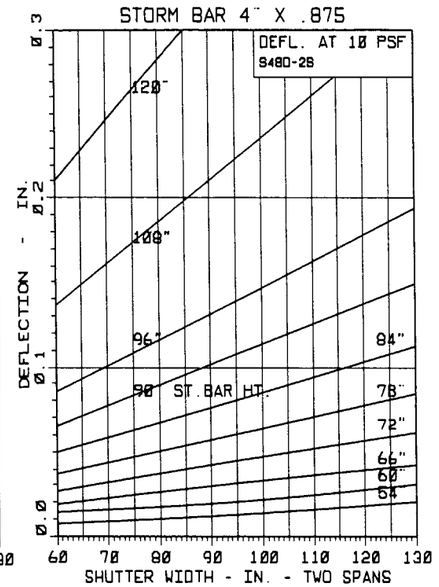

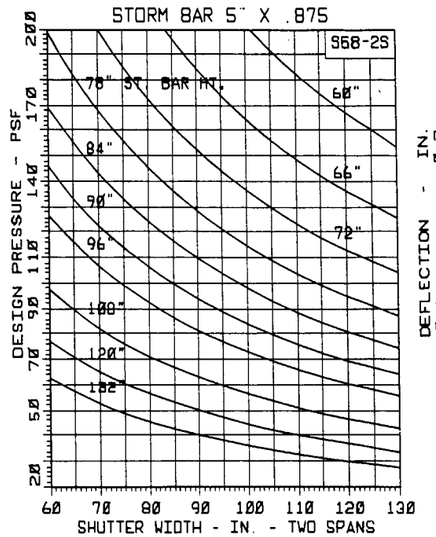

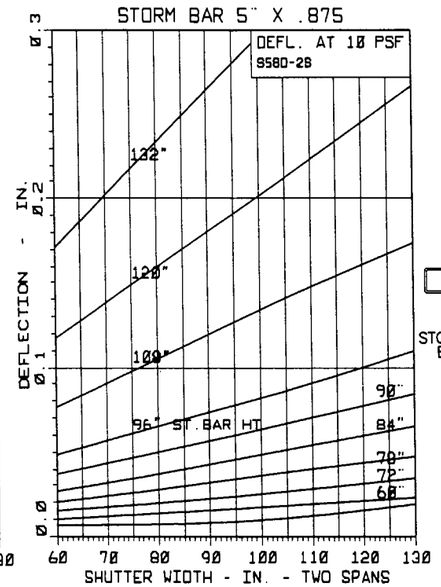

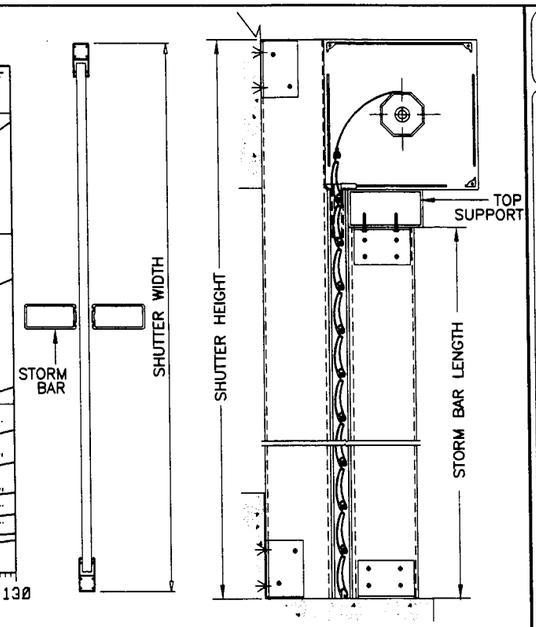

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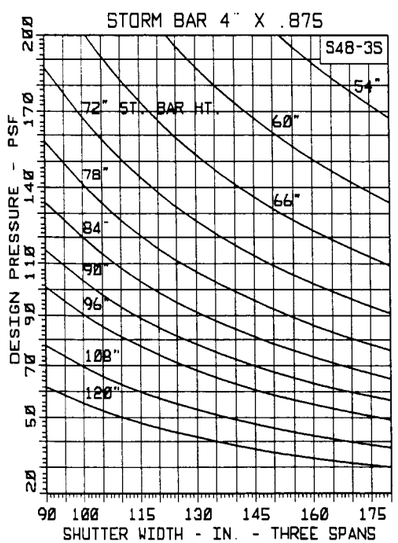

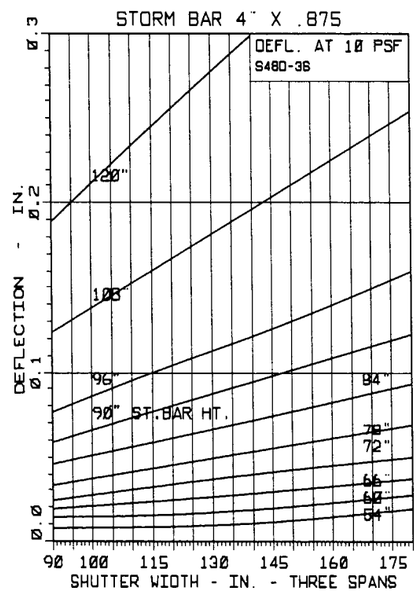

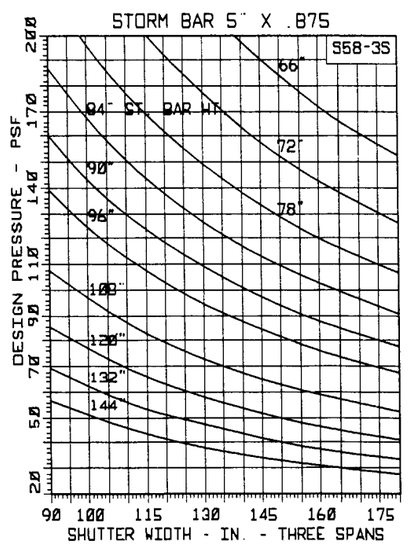

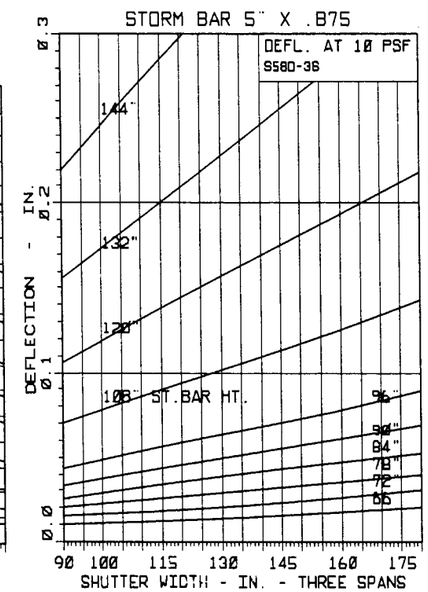

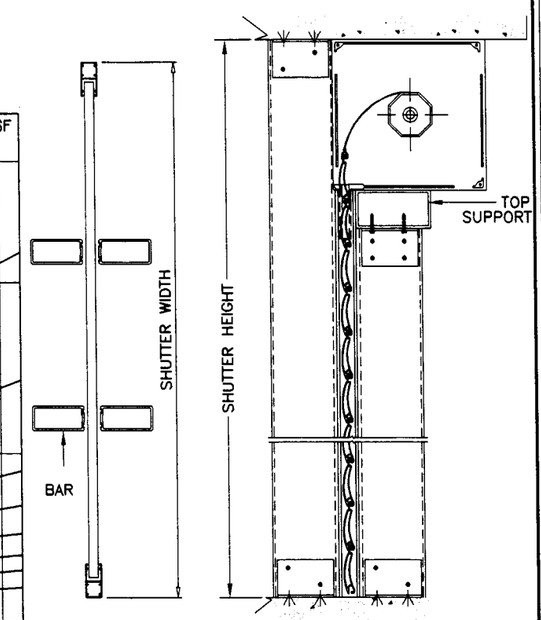

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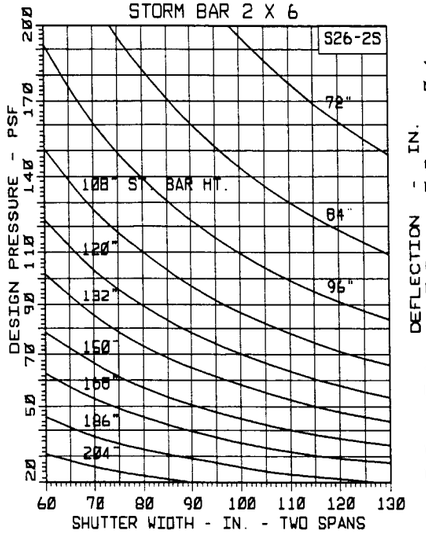

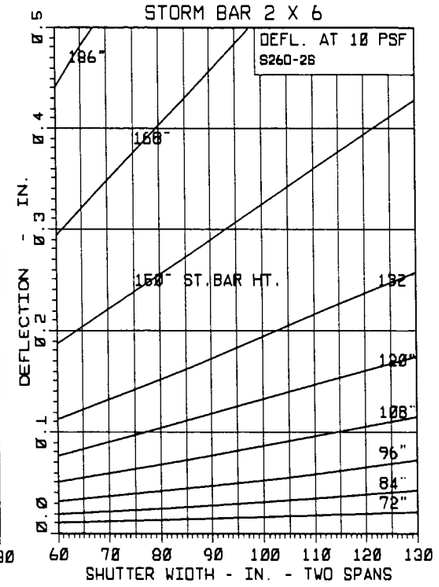

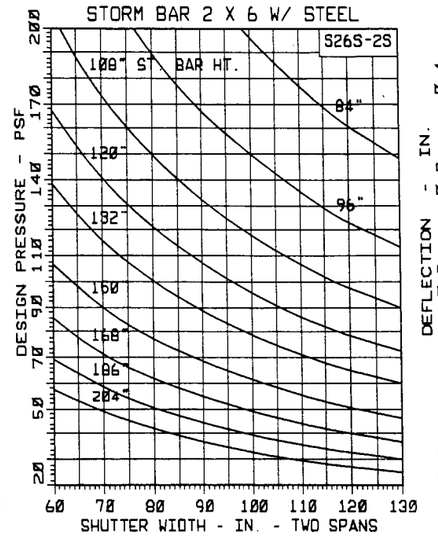

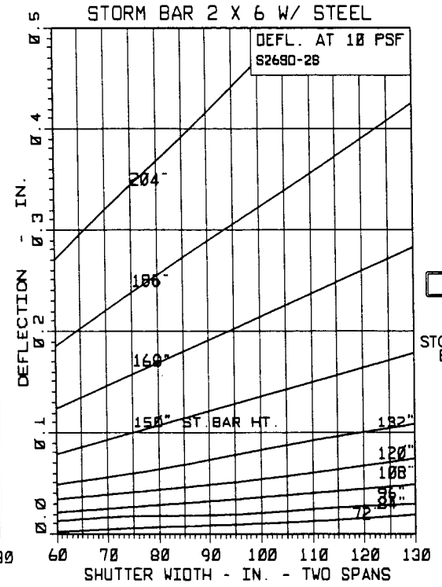

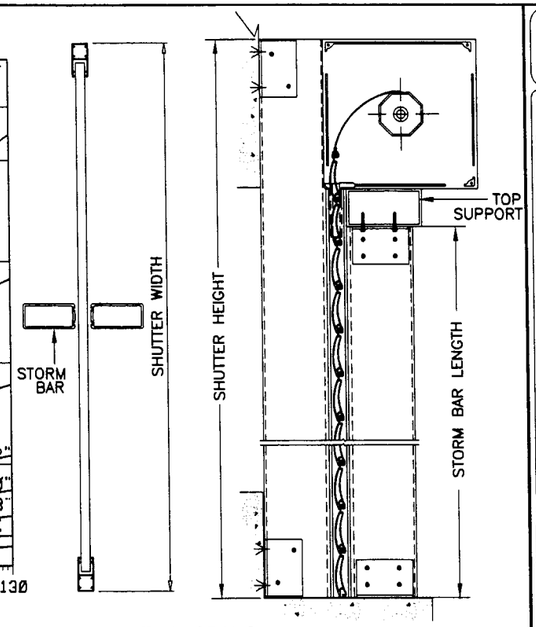

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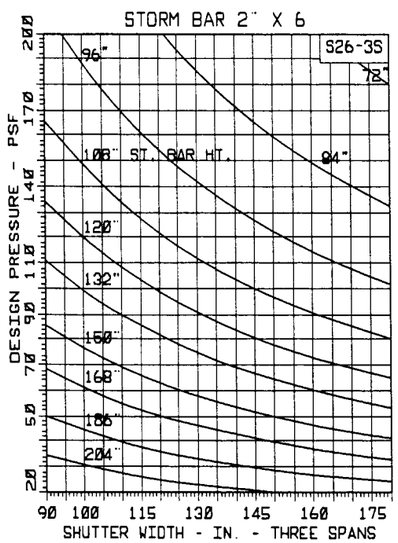

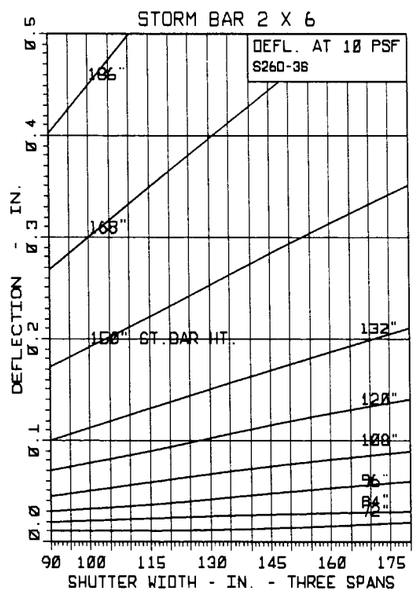

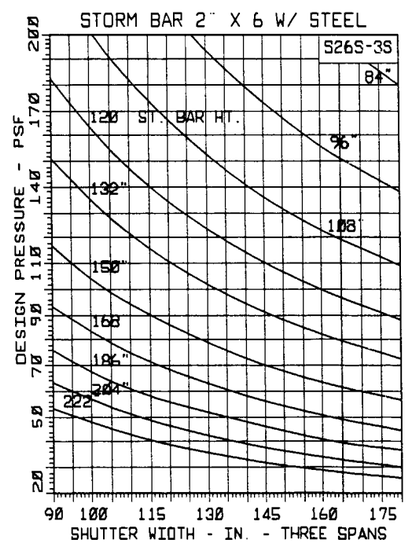

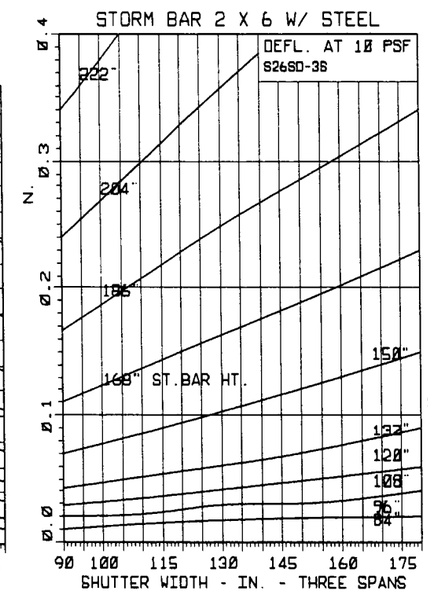

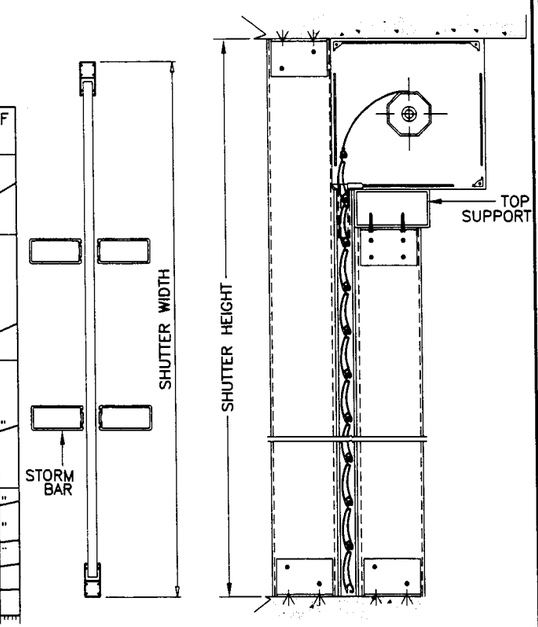

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ROLL SHUTTER OVERALL DEFLECTION CALCULATION SHEET

POSITIVE LOAD

ASCE 7-88: DESIGN LOAD = Pd = PSF
MULTIPLIER FACTOR = K = Pd/10 =

SHUTTER WIDTH = Sw = 1N.			
NO. OF STORM BARS USED = N =			
SPAN CONDITION = N+1 =			
SHUTTER HEIGHT = Sh = IN.			
BOX HEIGHT = BOXh = IN.			
STORM BAR HEIGHT = BL = SH-BOXh = IN.			
TRACK WIDTH = Tw = IN.			
	STEP		
SLAT	1	SLAT SPAN = Ls = (Sw - 2 * Tw)/(N + 1) FROM GRAPHS CHECK SLAT SPAN FOR DESIGN LOAD AND SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE	
	2	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE SLAT SPAN = R1 DEFLECTION OF SLAT = D1 = K * R1	→
STORM BAR	3	FROM GRAPHS SELECT STORM BAR FOR ABOVE SHUTTER WIDTH, SHUTTER HEIGHT, DESIGN LOAD & SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE TRY STORM BAR SIZE :	
	4	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE STORM BAR = R2 DEFLECTION OF STORM BAR = Db = K * R2 EFFECT ON SLATS = D2 = Db/2	→
HEADER (IF THERE IS NO HEADER SKIP STEPS 5 & 6.)	5	FROM GRAPHS SELECT HEADER SIZE FOR ABOVE SHUTTER WIDTH, SHUTTER HEIGHT, DESIGN LOAD & SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE. TRY HEADER SIZE:	
	6	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE HEADER = R3 DEFLECTION OF HEADER = Dh = K * R3 EFFECT ON SLATS = D3 = Dh/4	→
	7	TOTAL DEFLECTION = D = D1+D2+D3 IN.	→
		Ls/30	→

NEGATIVE LOAD

ASCE 7-88: DESIGN LOAD = Pd = PSF
MULTIPLIER FACTOR = K = Pd/10 =

SHUTTER WIDTH = Sw = 1N.			
NO. OF STORM BARS USED = N =			
SPAN CONDITION = N+1 =			
SHUTTER HEIGHT = Sh = IN.			
BOX HEIGHT = BOXh = IN.			
STORM BAR HEIGHT = BL = SH-BOXh = IN.			
TRACK WIDTH = Tw = IN.			
	STEP		
SLAT	1	SLAT SPAN = Ls = (Sw - 2 * Tw)/(N + 1) FROM GRAPHS CHECK SLAT SPAN FOR DESIGN LOAD AND SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE	
	2	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE SLAT SPAN = R1 DEFLECTION OF SLAT = D1 = K * R1	→
STORM BAR	3	FROM GRAPHS SELECT STORM BAR FOR ABOVE SHUTTER WIDTH, SHUTTER HEIGHT, DESIGN LOAD & SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE TRY STORM BAR SIZE :	
	4	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE STORM BAR = R2 DEFLECTION OF STORM BAR = Db = K * R2 EFFECT ON SLATS = D2 = Db/2	→
HEADER	5	FROM GRAPHS SELECT HEADER SIZE FOR ABOVE SHUTTER WIDTH, SHUTTER HEIGHT, DESIGN LOAD & SPAN CONDITION TO MEET DEFLECTION < L/30 OR 2". AND STRESSES LESS THAN ALLOWABLE. TRY HEADER SIZE:	
	6	FROM DEFLECTION GRAPH FOR 10 PSF READING FOR ABOVE HEADER = R3 DEFLECTION OF HEADER = Dh = K * R3 EFFECT ON SLATS = D3 = Dh/4	→
	7	TOTAL DEFLECTION = D = D1+D2+D3 IN.	→
		Ls/30	→

NOTES:

1. IF FOR NEGATIVE LOAD D > Ls/30
   OR IF FOR POSITIVE LOAD D > Ls/30 OR 2".
   REPEAT ABOVE CALCULATIONS WITH LARGER STORM BARS AND OR LARGER HEADER.
2. DIFFERENT SIZE STORM BARS/HEADERS MAY BE USED FOR POSITIVE AND NEGATIVE LOADS.
3. USE ADDITIONAL CALCULATION SHEETS FOR DIFFERENT SHUTTERS ON THE SAME JOB.

MINIMUM SEPARATION REQD. FROM GLASS

FOR INSTALLATIONS ABOVE 30 FT. OF GRADE DUE TO WIND LOAD	FOR INSTALLATIONS UPTO 30 FT. OF GRADE DUE TO LARGE MISSILE IMPACT	
	MAX. SPAN UPTO	SEPARATION
OVERALL DEFLECTION + 1"	50"	2-1/4"
	58"	3"
	74"	3-1/4"

NOTE: NO PART OF SHUTTER SHALL BE UNDER 30' ABOVE GRADE TO WAIVE LARGE MISSILE IMPACT REQUIREMENT.

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