Structural Evaluation

LTR

STRUCTURAL

EVALUATIONS

End Panel

Dimensions: Height: 90 inch; Width: 24-3/4 inch; Thickness: 1-7/8 inch
Thickness of steel: 0.053 inch

STRUCTURAL EVALUATION

The end panels of this test sample significantly contribute to the strength and stiffness of the upright system. Each base bracket is attached to the end panel by a 1/4-inch diameter bolt; in addition, each canopy bracket and the outer edge of the canopy are attached to the end panel by a sheet-metal screw. Furthermore, the canopy top is also presumably effective in reinforcing the center upright with respect to lateral deflection. Alternatively, use of floor levelers with this construction would be expected to add to lateral deflection if they raised the bottoms of the end panels above the floor.

The weak point of this construction is the joint between the bottom end of the upright and the base bracket. This joint is not a problem when end panels are used, but without an end panel or when multiple sections are joined together to form long ranges, it would be expected that this joint would distort considerably.

TEST RESULTS

Condition of Finish

Findings: The shelving satisfied the test specification.

Hazards to Books or People

Findings: None of the shelves or brackets contained burrs or sharp edges. Three shelves had gaps greater than 3/32 inches between the end of the shelf and the shelf bracket. Therefore, the shelving unit did not satisfy the test specification for gaps.

Ease of Changing Unloaded Shelves

Findings: The empty shelves were relatively easy to move.

Ease of Changing Loaded Shelves

Findings: The shelves were found to be relatively difficult to move because adjacent shelf brackets fit closely together. Thus, the shelves did not conform to the expectations of the test specification.

Lateral Deflection of the Uprights Under Shelf Loads

Results:

Load Condition	End Deflection (inches)	Center Deflection (inches)
Empty	0	0
One side loaded at 150#	58/64	43/64
Both sides loaded at 150#	5/64	5/64
Empty	2/64	3/64

Findings: The shelf unit satisfied the test specification.

End Panels
Dimensions: Length: 90 inch; Width: 24-1/2 inch; Thickness: 1-1/2 inch

Canopy
Dimensions: Length: 36 inch; Width: 24-1/2 inch; Thickness: 1-1/2 inch
Construction: Bolts to special canopy brackets.

STRUCTURAL EVALUATION

The end panels of this shelving sample significantly contribute to the strength and stiffness of the upright system. Each base bracket is attached to the end panel by a sheet-metal screw; in addition, each canopy bracket is attached to the end panel by a bolt, and each outer edge of the canopy is attached to the end panel by a sheet-metal screw.

During testing, lateral deflection of the center upright was 46.6 percent greater than that of the end upright. It might be expected, therefore, that the lateral deflection of the interior uprights would increase still further if longer runs of shelving were used, which would increase the distance from the center sections to the end uprights and panels. The amount of lateral deflection, however, was quite small. The excellent performance of this sample as compared to those of similar construction can likely be attributed to the fact that the bottom of the base bracket is secured to the bottom of the upright by means of a bolt whose longitudinal axis is parallel to that of the base bracket itself.

This sample was not equipped with levelers but was equipped with metal end panels. As a result, the end panels rested on the floor. It is not clear what effect levelers would have had on the outcome of these results.

The weak point of this construction is the joint between the bottom of the upright and the base bracket. This joint is not a problem when end panels are used, but without an end panel or when sections are joined together to form a range, it would be expected that this joint would distort considerably.

It would also be desirable if the sheet-metal screws used to attach the base brackets and the canopies to the end panels were replaced with bolts. This would allow stronger connections so that the full strengthening and stiffening effect of the end panels could be realized.

TEST RESULTS

Condition of Finish
Findings: The shelves satisfied the test specification. In general, the finish was relatively smooth with only slight orange peel.

Hazards to Books or People
Findings: There were no particularly sharp edges or burrs on the shelving or brackets. Gaps between the ends of the shelves and the shelf rackets did not exceed 3/32 inches.

STRUCTURAL EVALUATION

The end panels of this shelving system significantly contribute to the strength and stiffness of the upright system. In terms of construction, each base bracket is attached to the end panel by a sheet-metal screw; in addition, each canopy bracket is attached to the end panel by a bolt, and each outer edge of the canopy is attached to the end panel by a sheet-metal screw. In terms of performance, lateral deflection of the center upright exceeded that of the end upright by 6 percent. Deflection of interior uprights in long multi-section ranges might be expected to be somewhat greater.

The weak point of this construction is the joint between the bottom of the upright and the base bracket. This joint is not a problem when end panels are used, but without an end panel, or where sections are joined together, it would be expected that this joint would distort considerably.

Importantly, there is no provision for bolting or screwing the base brackets to the faces of the uprights either near the bottom nor top of the bracket. If the bracket were bolted to the face of the upright, it would be expected to contribute to the strength and stiffness of this connection since bending forces acting on this joint would be resisted more directly.

It would also be desirable if the half-inch long #10 sheet-metal screws used to attach the base bracket and the canopy to the end panel were replaced with bolts. This would allow stronger connections to be made so that the full strengthening and stiffening effect of the end panel could be realized.

TEST RESULTS

Condition of Finish

Findings: There were minor orange peel effects on the shelves and end panels, but these were scarcely noticeable.

Hazards to Books or People

Findings: None of the shelves had burrs or sharp edges. Gaps between the ends of the shelves and the shelf brackets were less than 3/32 inches.

Ease of Changing Unloaded Shelves

Findings: The shelves could be readily moved.

Ease of Changing Loaded Shelves

Findings: The shelves could be moved without undue difficulty.

Base Shelves

Dimensions: Length: 35-1/4 inch; Depth: 13/16 inch; Height: 11 inch;
Thickness: 0.062 inch

End Panel

Dimensions: Length: 84-1/2 inch; Width: 25-1/2 inch; Thickness: 1-1/2 inch
Thickness of steel: 0.043 inch
Description: Ends of the shelves are bent to fit into tabs in the sides of the base brackets. A 2-3/4 inch wide by 33-1/4 inch long base closure channel fits between the uprights in the same plane as the shelves.

Sway Braces

Used in one section. Consist of 1/4-inch diameter rods with hooks and turnbuckles.

STRUCTURAL EVALUATION

The bolted joint between the upright and the foot is critical in this construction. If these joints are not properly tightened, the parts may slip with respect to one another, particularly if only one side of the range is loaded. At the least, the bolts in these joints should be tightened with a torque wrench, and the proper torque should be specified in the instruction manual.

TEST RESULTS

During the testing for lateral deflection under shelf loads of the original test sample which was constructed at the test site by a representative of the manufacturer, the left upright-to-base connection slipped. This was judged to be an installation problem rather than a design problem. Another sample was constructed at the test site with Estey's Vice President/ Engineering supervising. The test results of this sample are reported here.

Condition of Finish

Findings: There were minor orange peel effects on the shelves and end panels, but these were scarcely noticeable.

Hazards to Books or People

Findings: None of the shelves had burrs or sharp edges. Gaps between the ends of the shelves and the shelf brackets were less than 3/32 inch.

Ease of Changing Unloaded Shelves

Findings: The shelves could be readily moved.

Ease of Changing Loaded Shelves

Findings: The shelves could be moved without undue difficulty.

Sway Braces

Description: One of the two sections was reinforced with X-bracing which hooks to the sides of the uprights at points near the top and bottom. The sway bracing is tightened by means of a turnbuckle.

End Panel

End panels were of solid construction.

Canopy Top

Similar to inverted shelf. Two half-tops required per section.

STRUCTURAL EVALUATION

The solid end panels of this sample significantly contribute to the strength and stiffness of the upright system. Each base bracket is attached to the end panel by four screws; each canopy bracket and the outer edge of the canopy are attached to the end panel by an additional two screws.

The plane, unbent base brackets bolted to the sides of the uprights provide substantial strength and stiffness to the construction (as opposed to those constructions in which the brackets wrap around the upright). The X-bracing should provide considerable strength and stiffness along the length of the range as long as the turnbuckles are at the correct tension and the hooks stay in place.

Lateral deflection of this shelving was very small; in addition, deflection of the center upright was slightly less than that of the end upright. This level of stiffness is to be expected since a) levelers were not used and the end panels, therefore, rested on the floor, and b) one-piece, bolted-on base brackets were used.

TEST RESULTS

Condition of Finish

Findings: Minor orange peel effects were scarcely noticeable.

Hazards to Books or People

Findings: None of the shelves or brackets had burrs or sharp edges. None of the gaps between the ends of the shelves and the brackets exceeded 3/32 inches.

Ease of Changing Unloaded Shelves

Findings: The shelves could be easily moved.

Ease of Changing Loaded Shelves

Findings: The shelves were relatively easy to move.

Sway Braces
Description: None

End Panels
Description: Formed steel construction

Canopy Top
Description: One piece formed steel construction. Connected to canopy brackets with bolts at each corner.

STRUCTURAL EVALUATION

The end panels of this sample significantly contribute to the strength and stiffness of the upright system. Each base bracket is attached to the end panel by a sheet-metal screw; each canopy bracket is attached to the end panel by a bolt through the end of the canopy.

The weak point of this construction is the joint between the bottom of the upright and the base bracket. This joint is not a problem when end panels are used, but without an end panel or where several sections are joined together, it would be expected that this joint would distort considerably.

It would also be desirable if the half-inch long #10 sheet-metal screws used to attach the base brackets to the end panels were replaced with bolts. This would allow stronger connections to be made so that the full strengthening and stiffening effect of the end panels could be realized.

TEST RESULTS

Condition of Finish
Findings: The shelving satisfied the test specification.

Hazards to Books or People
Findings: There were no burrs or sharp edges on the shelves or shelf brackets. Gaps between the ends of the shelves and the shelf brackets did not exceed 3/32 inches.

Ease of Changing Unloaded Shelves
Findings: The shelves could be readily moved.

Ease of Changing Loaded Shelves
Findings: The shelves were relatively easy to move.

Base Shelf
Dimensions: Length: 35-1/4 inch; Width: 11 inch; Thickness: 1-1/4 inch
Construction method: Individual base shelves used; kick plate used to close gap beneath shelf
Thickness of steel: 0.076 inch

Sway Braces
Description: None

End Panel
Description: Formed steel construction

Canopy Top
Description: Individual half-tops are used. The ends of the tops are bolted to canopy brackets at each end.

STRUCTURAL EVALUATION

The end panels of this sample significantly contribute to the strength and stiffness of the uprights. Each base bracket is attached to the end panel by a sheet-metal screw; each canopy bracket is attached to the end panel by a bolt through the end of the canopy.

The weak point of this construction is the joint between the upright and the base bracket. If one side of the shelving is loaded sufficiently, it will cause the top part of the corresponding base bracket to press in against the shelf-side wall of the upright with sufficient force to cause it to bend inwardly. The fact that the two base brackets and corresponding upright are tied together with a single bolt, however, significantly contributes to the strength and stiffness of this construction.

The gusset between the two central uprights should add considerable strength and stiffness with respect to lateral deflection. This gusset in the construction tested likely accounted for the good deflection characteristics of the center upright in the lateral deflection test.

Since the uprights do not extend to the floor, it is important that the leveler located beneath the bottom spreader be precisely adjusted so that it is just flush with the other levelers or with the bottom of the base brackets. Otherwise, vertical shelf loads will be transferred to the outboard levelers or to the base brackets.

TEST RESULTS

Condition of Finish
Findings: The shelving satisfied the test specification.

STRUCTURAL EVALUATION

The gussets used with this shelving add considerable strength and stiffness with respect to lateral deflection. The hook and slot connections of the spreaders do not provide sufficient rigidity to allow the unit to pass the horizontal pull end-deflection test.

TEST RESULTS

Condition of Finish

Findings: The shelving satisfied the test specification.

Hazards to Books or People

Findings: There were no burrs or sharp edges on the shelves or brackets. None of the gaps between the ends of the shelves and the shelf brackets exceeded 3/32 inches.

Ease of Changing Unloaded Shelves

Findings: The shelves were easy to move.

Ease of Changing Loaded Shelves

Findings: The shelves were easy to move.

Lateral Deflection of the Uprights Under Shelf Loads

Results:

Load Condition	End Deflection (inches)	Center Deflection (inches)
Empty	0	0
One side loaded at 150#	46/64	31/64
Both sides loaded at 150#	12/64	0
Empty	3/64	0

Findings: The unit satisfied the test specification.

Deflection of the Shelves Under Load (Shelf Sag)

Results:

	Deflection		
Shelf No.	Empty	150#	Empty
1	0	10/64	0
2	0	8/64	0
3	0	8/64	0
4	0	8/64	0
5	0	8/64	0

Findings: The shelves satisfied the test specification.

LIBRARY TECHNOLOGY REPORT
TEST RESULTS, DECEMBER 1998
EXHIBIT 1

MANUFACTURER	UNIT TYPE	LONGITUDINAL DEFLECTIONS	LATERAL DEFLECTION 1 SIDE LOADED	LATERAL DEFLECTION BOTH SIDES LOADED	SHELF SAG 5 SHELF AVERAGE
			150# /SHELF	150# /SHELF	
		ALLOW, 16/64	ALLOW, 64/64	ALLOW, 20/64	ALLOW, 12/64
LIBRARY BUREAU STEEL	WELD FRAME	12/64	32/64	0/64	7.6/64
	SWAY BRACE	8/64	28/64	0/64	7.6/64
	SWAY BRACE SEISMIC	13/64	8/64	0/64	7.6/64
BURROUGHS	WELD FRAME	14/64	48/64	20/64	5.2/64
	WELD FRAME SEISMIC	4/64	36/64	8/64	5.2/64
MJ INDUSTRIES	SYSTEM 3000	14/64	48/64	4/64	6.2/64
MONTEL	WELD FRAME	16/64	48/64	16/64	10/64
SPACESAVER	WELD FRAME	6/64	16/64	12/64	8/64
	WELD FRAME SEISMIC	5/64	8/64	0/64	8/64
TENNSCO	WELD FRAME 2" UPRIGHT	16/64	40/64	8/64	9.5/64
	WELD FRAME 2 1/2" UPRIGHT	14/64	24/64	4/64	9.5/64
	ZEE BASE	7/64	28/64	12/64	9.5/64

RATINGS BY MANUFACTURER
EXHIBIT II

MANUFACTURER		LONGITUDINAL DEFLECTION	LATERAL DEFLECTION 1 SIDE LOADED	LATERAL DEFLECTION BOTH SIDES LOADED	SHELF SAG	OVERALL RANKING
LIBRARY BUREAU STEEL		11/64	23/64	0/64	7.6/64	
	RATING	3	2	1	3	2.25
SPACESAVER		5.5/64	12/64	6/64	8/64	
	RATING	1	1	3	4	2.25
BURROUGHS		9/64	42/64	14/64	5.2/64	
	RATING	2	4	5	1	3
MJ INDUSTRIES		14/64	48/64	4/64	6.2/64	
	RATING	5	5	2	2	3.5
TENNSCO		12.3/64	31/64	8/64	9.5/64	
	RATING	4	3	4	5	4
MONTEL		16/64	48/64	16/64	10/64	
	RATING	6	5	6	6	5.75

THE RATINGS ARE DERIVED FROM AN AVERAGE OF ALL MANUFACTURER'S UNIT TYPES, SHOWN ON EXHIBIT I, FOR ALL STRUCTURAL TESTS

SEISMIC
INC.
MATERIAL HANDLING ENGINEERING
CONTRACTORS LICENSE NO. 432725

TEL: (818) 962-1162

FAX: (818) 962-1279

SEISMIC ANALYSIS
OF
CANTILEVER SHELVING UNITS
FOR

LOS ANGELES CENTRAL LIBRARY

LOS ANGELES, CA
9/13/91

PREPARED BY

SAL E. FATEEN

14160-H Live Oak Avenue • Baldwin Park • California 91706

SEIZMIC

INC.
MATERIAL HANDLING ENGINEERING
CONTRACTORS LICENSE NO. 432725

TEL: (818) 962-1162 FAX: (818) 962-1279

MR. TONY GENTILE
MEDIA STACK INC.,
111 SOUTH 15TH STREET,
MILVILLE, N.J. 08332

DECEMBER 3, 1991

SUBJECT: INSTALLATION OF BOOKSTACK ON CARPETED FLOORS

DEAR MR. GENTILE,

PER YOUR REQUEST, WE HAVE REVIEWED THE REQUIREMENTS FOR ANCHORAGE OF THE BOOKSTACKS FOR THE LOS ANGELES CENTRAL LIBRARY.

THE ANCHORS REQUIRED NEED TO RESIST A MAXIMUM UPLIFT FORCE OF 331LBS WHICH IS WELL WITHIN THE CAPACITY OF THE PROPOSED REDHEAD WEDGE ANCHOR, PROVIDED THE ANCHOR IS INSTALLED UNDER THE GUIDELINES OF THE L.A. CITY APPROVAL REPORT #RR-2748.

AS FOR THE INSTALLATION OVER A CARPET, IT WILL HAVE NEGLIGIBLE BEARING ON THE STABILITY, PROVIDED THE ANCHORS ARE TORQUED TO THE MANUFACTURERS RECOMMENDED TORQUE VALUE, IN WHICH CASE THE CARPET WILL BE COMPRESSED AND ITS EFFECT IS MINIMIZED.

IF YOU HAVE ANY QUESTIONS, PLEASE CALL.

SINCERELY,

SAL E. FATEEN, P.E.
C.E. 25969

14180-I Live Oak Avenue • Baldwin Park • California 91706

SEISMIC INC.
MATERIAL HANDLING ENGINEERING
(818) 962-1162 • FAX: (818) 962-1279

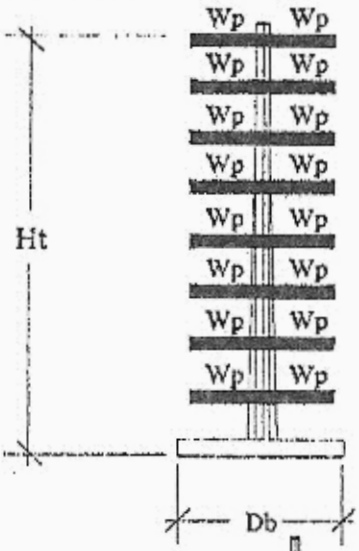
PROJECT LOS ANGELES LIBRARY
FOR LOS ANGELES
SHEET NO. 6 OF 6
CALCULATED BY C.T. DATE 1-22-1992

SEISMIC SHEAR (ITEM 31A)

V = ZICpWpN
Z = 0.4
I = 1
Cp = 0.75
Wp = 50 P.S.F.
N = 16 (# OF SHELVES)

W = 50 X AREA(SHELF)/144
= 50 x 10 x 36/144
= 125#

V = ZICpWpN x 0.4 x 1 x 0 x 16
= 0.3 x Wp x 16
= 600#

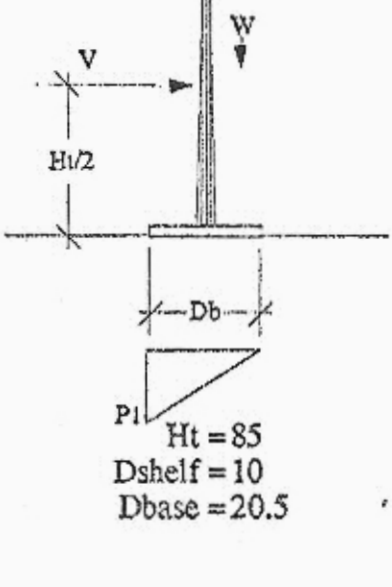


CHECK OVERTURNING SINGLE SIDE LOADED (ITEM 02)

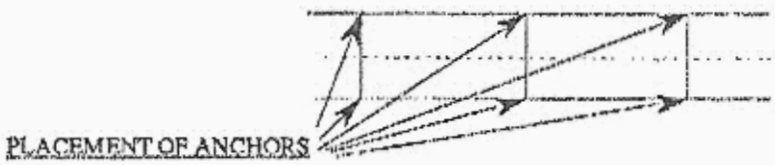
$\sum Mo = P1 \times 20.5 + W \times .5(10) - 600/2 \times Ht/2$

20.5P1 = 7,750"#
P1 = 378#

USE 3/8 x 2-1/2 x MIN. EMBED. ANCHORS.
QTY = 2 PER BASE OR 1 PER END
CAP./BOLT = 355#/BOLT approx. 378# O.K.



Ht = 85
Dshelf = 10
Dbase = 20.5


PLACEMENT OF ANCHORS

CHECK CAPACITY OF 'X' BRACINGS (1PER 2UNITS)

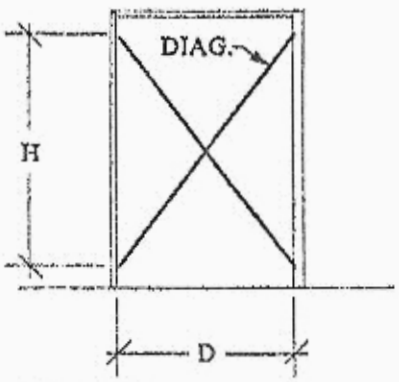
IN TRANVERSE ANALYSIS HALF THE SHEAR GOES TO THE TOP AND HALF TO THE BASE

Vdiag.=1/2V x (DIAG/D) x 2= 1,297#

TENSION CAPACITY OF THE ROD

Pall = Ft x Area x 1.33
= .105 x 20000 x 1.33
= 2,800#

THE ABOVE ANALYSIS APPLIES TO ALL UNITS WITH A BASE DEPTH OF 20.5 INCHES AND THE NUMBER OF SHELVES LESS THAN 16.



H = 69.0"
D = 36.0"
DIAG. = 77.8"

SEIZMIC
INC.
MATERIAL HANDLING ENGINEERING
(818) 962-1162 • FAX: (818) 962-1279

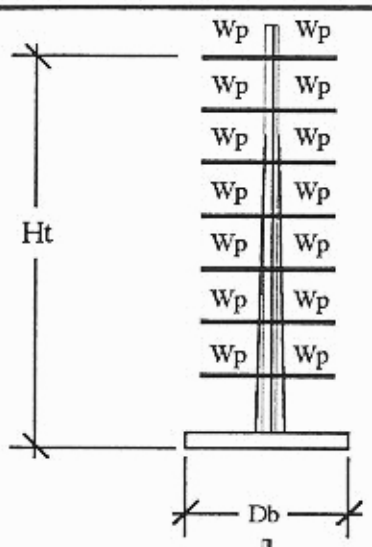
PROJECT LOS ANGELES LIBRARY
FOR LOS ANGELES
SHEET NO. 5 OF 6
CALCULATED BY C.T. DATE 9-13-1991

SEISMIC SHEAR (ITEM 31)

V = ZICpWpN
Z = 0.4
I = 1
Cp = 0.75
Wp = 50 P.S.F.
N = 14 (# OF SHELVES)

W = 50 X AREA(SHELF)/144
= 50 x 10 x 36/144
= 125#

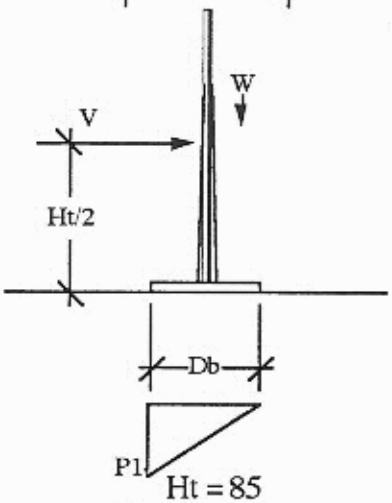
V = ZICpWpN x 0.4 x 1 x 0 x 14
= 0.3 x Wp x 14
= 525#



CHECK OVERTURNING SINGLE SIDE LOADED (ITEM 31)

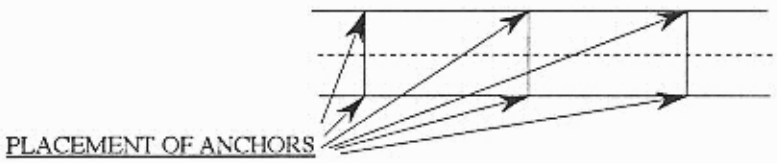
Σ Mo = P1 x 20.5 + W x .5(10) - 525/2 x Ht/2

20.5P1 = 6,781"#
P1 = 331#



Ht = 85
Dshelf = 10
Dbase = 20.5

USE 3/8 x 2-1/2 x MIN. EMBED. ANCHORS.
QTY = 2 PER BASE OR 1 PER END
CAP./BOLT =355#/BOLT


PLACEMENT OF ANCHORS

CHECK CAPACITY OF 'X' BRACINGS (1PER 2UNITS)

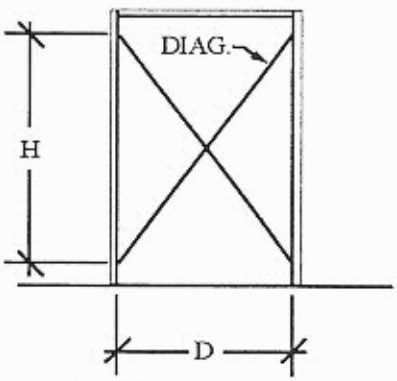
IN TRANVERSE ANALYSIS HALF THE SHEAR GOES TO THE TOP AND HALF TO THE BASE

Vdiag.=1/2V x (DIAG/D) x 2= 1,174#

TENSION CAPACITY OF THE ROD

Pall = Ft x Area x 1.33
= .105 x 20000 x 1.33
= 2,800#

THE ABOVE ANALYSIS APPLIES TO ALL UNITS WITH A BASE DEPTH OF 20.5 INCHES AND THE NUMBER OF SHELVES LESS THAN 14.



H = 72.0"
D = 36.0"
DIAG. = 80.5"

70

SEIZMIC
INC.
MATERIAL HANDLING ENGINEERING
(818) 962-1162 • FAX: (818) 962-1279

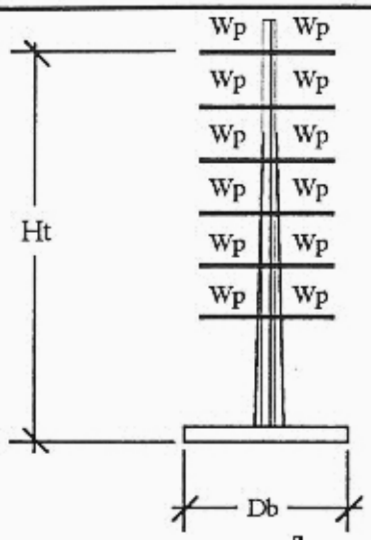
PROJECT LOS ANGELES LIBRARY
FOR LOS ANGELES
SHEET NO. 4 OF 6
CALCULATED BY C.T. DATE 9-13-1991

SEISMIC SHEAR (ITEM 04)

V = ZICpWpN
Z = 0.4
I = 1
Cp = 0.75
Wp = 50 P.S.F.
N = 12 (# OF SHELVES)

W = 50 X AREA(SHELF)/144
= 50 x 18 x 36/144
= 225#

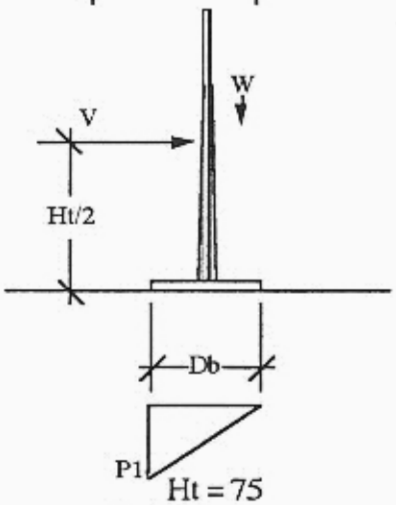
V = ZICpWpN x 0.4 x 1 x 0 x 12
= 0.3 x Wp x 12
= 810#



CHECK OVERTURNING SINGLE SIDE LOADED (ITEM 04)

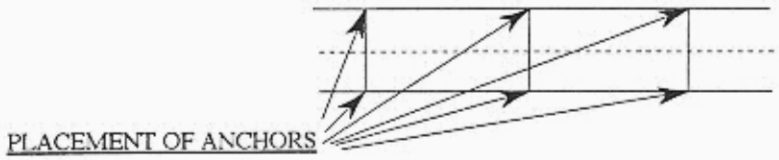
$\Sigma Mo = P1 \times 38.5 + W \times .5(18) - 810/2 \times Ht/2$

38.5P1 = 3,038"#
P1 = 79#



Ht = 75
Dshelf = 18
Dbase = 38.5

USE 3/8 x 2-1/2 x MIN. EMBED. ANCHORS.
QTY = 2 PER BASE OR 1 PER END
CAP./BOLT =355#/BOLT



CHECK CAPACITY OF 'X' BRACINGS (1PER 2UNITS)

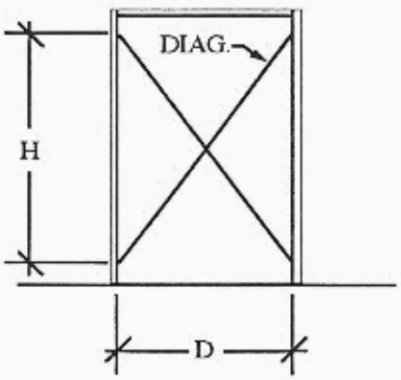
IN TRANVERSE ANALYSIS HALF THE SHEAR GOES TO THE TOP AND HALF TO THE BASE

Vdiag.=1/2V x (DIAG/D) x 2= 1,751#

TENSION CAPACITY OF THE ROD

Pall = Ft x Area x 1.33
= .105 x 20000 x 1.33
= 2,800#

THE ABOVE ANALYSIS APPLIES TO ALL UNITS WITH A BASE DEPTH OF 38.5 INCHES AND THE NUMBER OF SHELVES LESS THAN 12.



H = 69.0"
D = 36.0"
DIAG. = 77.8"

69

SEIZMIC
INC.
MATERIAL HANDLING ENGINEERING
(818) 962-1162 • FAX: (818) 962-1279

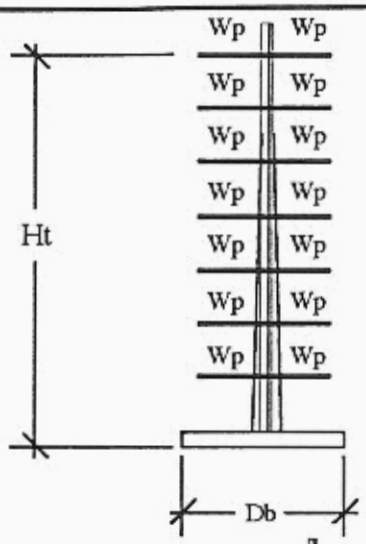
PROJECT LOS ANGELES LIBRARY
FOR LOS ANGELES
SHEET NO. 3 OF 6
CALCULATED BY C.T. DATE 9-13-1991

SEISMIC SHEAR (ITEM 02)

V = ZICpWpN
Z = 0.4
I = 1
Cp = 0.75
Wp = 50 P.S.F.
N = 14 (# OF SHELVES)

W = 50 X AREA(SHELF)/144
= 50 x 10 x 36/144
= 125#

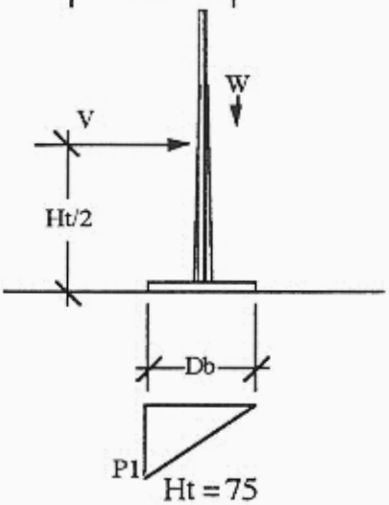
V = ZICpWpN x 0.4 x 1 x 0 x 14
= 0.3 x Wp x 14
= 525#



CHECK OVERTURNING SINGLE SIDE LOADED (ITEM 02)

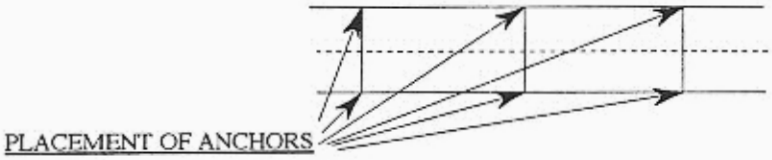
Σ Mo = P1 x 24.5 + W x .5(10) - 525/2 x Ht/2

24.5P1 = 5,469"#
P1 = 223#



Ht = 75
Dshelf = 10
Dbase = 24.5

USE 3/8 x 2-1/2 x MIN. EMBED. ANCHORS.
QTY = 2 PER BASE OR 1 PER END
CAP./BOLT =355#/BOLT



CHECK CAPACITY OF 'X' BRACINGS (1PER 2UNITS)

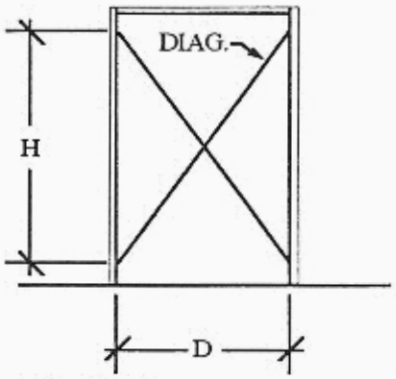
IN TRANVERSE ANALYSIS HALF THE SHEAR GOES TO THE TOP AND HALF TO THE BASE

Vdiag.=1/2V x (DIAG/D) x 2= 1,135#

TENSION CAPACITY OF THE ROD

Pall = Ft x Area x 1.33
= .105 x 20000 x 1.33
= 2,800#

THE ABOVE ANALYSIS APPLIES TO ALL UNITS WITH A BASE DEPTH OF 24.5 INCHES AND THE NUMBER OF SHELVES LESS THAN 14.



H = 69.0"
D = 36.0"
DIAG. = 77.8"

68

SEIZMIC
INC.
MATERIAL HANDLING ENGINEERING
(818) 962-1162 • FAX: (818) 962-1279

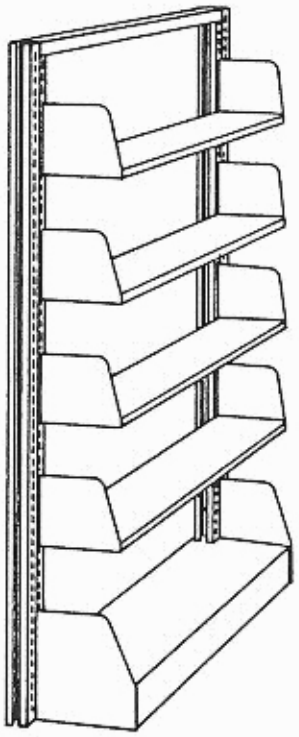
PROJECT LOS ANGLELES LIBRARY
FOR LOS ANGELES
SHEET NO. 2 OF 6
CALCULATED BY C.T. DATE 9-13-1991

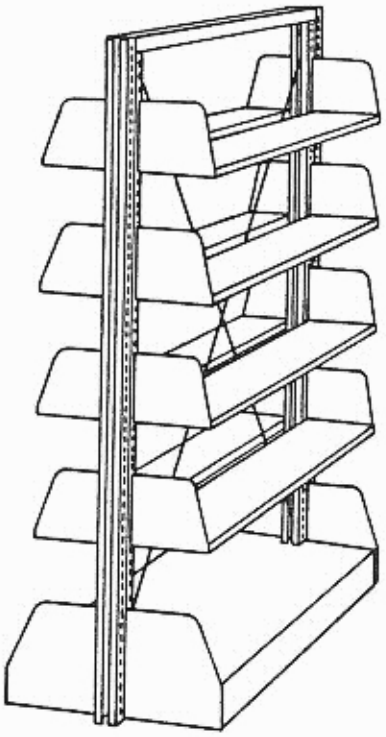
SCOPE:

VERIFY ADEQUACY OF CANTILEVER SHELVING TO CARRY THE LIBRARY BOOKS IN SEISMIC ZONE 4 PER LOS ANGELES CITY BUILDING CODE.

PARAMETERS:

- CANTILEVER TYPE SHELVING SUPPLIED BY LIBRARY BUREAU TO CARRY BOOKS (50 P.S.F.) SINGLE AND DOUBLE FACED.
- THE MAXIMIM NUMBER OF SHELVE ARE 7 PER SIDE.
- STEEL 36000 P.S.I.
- BOLTS A307 (UNLESS NOTED)
- ANCHORS 3/8"x2 1/2" MIN. EMBED. (WEDGE TYPE)





NOTE:

SINCE THE TOP SHELF OF ALL UNITS ARE BELOW 8 FEET, THE ANALYSIS WILL FOCUS ON STABILITY OF THE SYSTEM.
NOT COVERED IN THIS ANALYSIS IS THE IMPACT OF THE SHELF LOADING ON THE BUILDING, NOR THE IMPACT OF THE SINGLE UNITS ON THE STUD WALLS.

14180-I LIVE OAK AVENUE • BALDWIN PARK • CALIFORNIA 91706 • CONT'R. LIC. NO. 432725