Form # P 04

DISPLAY THIS CARD ON PRINCIPAL FRONTAGE OF WORK

CITY OF PORTLAND

B[illegible]CTION

PERMI[illegible]

Please Read Application And Notes, If Any, Attached

Permit Number: 040161

This is to certify that Bartlett Island Llc /Mechanic[illegible]Services[illegible]

has permission to Retail/ Coffee Shop Install T[illegible]e Natura[illegible]as hea[illegible]n Roof [illegible]uilding

AT 43 Washington Ave [illegible] 013 I020001

provided that the person or persons, [illegible]m or [illegible]tion [illegible]epting this permit shall comply with all of the provisions of the Statutes of [illegible]ine and of th[illegible]ances of the City of Portland regulating the construction, maintenance and u[illegible] of buildings and s[illegible]tures, and of the application on file in this department.

Apply to Public Works for street line and grade if nature of work requires such information.	N[illegible]ification [illegible] inspe[illegible]n must g[illegible]n and w[illegible]n permi[illegible]n procu[illegible] b[illegible]re this [illegible]ding or [illegible]t there[illegible] la[illegible]ed or [illegible]osed-in. [illegible] H[illegible]R NOTICE IS REQUIRED.	A certificate of occupancy must be procured by owner before this building or part thereof is occupied.

OTHER REQUIRED APPROVALS

Fire Dept. [illegible signature]

Health Dept. ______

Appeal Board ______

Other ______

Department Name

[signature] 3/9/04

Director - Building & Inspection Services

PENALTY FOR REMOVING THIS CARD

City of Portland, Maine - Building or Use Permit Application

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

Permit No:	04-0161
Issue Date:	PERMIT ISSUED MAR 1 0 2004 CITY OF PORTLAND
CBL:	013 I020001

Location of Construction: 43 Washington Ave	**Owner Name:** Bartlett Island Llc	**Owner Address:** 67 India St
Phone:		
Business Name:	**Contractor Name:** Mechanical Services, Inc	**Contractor Address:** 400 Presumpscot St Portland
Phone: 2077741531		
Lessee/Buyer's Name	**Phone:**	**Permit Type:** HVAC
Zone: B4		
Past Use: Retail/ Coffee Shop	**Proposed Use:** Retail/ Coffee Shop Install Trane Natural Gas heater on Roof of building	**Permit Fee:** $129.00
Cost of Work: $11,825.00	**CEO District:** 1	

Proposed Project Description:
Retail/ Coffee Shop Install Trane Natural Gas heater on Roof of building

FIRE DEPT: ☑ Approved ☐ Denied
Signature:

INSPECTION:
Use Group: B Type: 5B
3/10/04
Signature:

PEDESTRIAN ACTIVITIES DISTRICT (P.A.D.)
Action: ☐ Approved ☐ Approved w/Conditions ☐ Denied
Signature: Date:

Permit Taken By: ldobson	**Date Applied For:** 02/26/2004

1. This permit application does not preclude the Applicant(s) from meeting applicable State and Federal Rules.
2. Building permits do not include plumbing, septic or electrical work.
3. Building permits are void if work is not started within six (6) months of the date of issuance. False information may invalidate a building permit and stop all work..

Zoning Approval

Special Zone or Reviews	Zoning Appeal	Historic Preservation
☐ Shoreland	☐ Variance	☑ Not in District or Landmark
☐ Wetland	☐ Miscellaneous	☐ Does Not Require Review
☐ Flood Zone	☐ Conditional Use	☐ Requires Review
☐ Subdivision	☐ Interpretation	☐ Approved
☐ Site Plan	☐ Approved	☐ Approved w/Conditions
Maj ☐ Minor ☐ MM ☐	☐ Denied	☐ Denied
Date: OK 3/5/04	Date:	Date:

CERTIFICATION

I hereby certify that I am the owner of record of the named property, or that the proposed work is authorized by the owner of record and that I have been authorized by the owner to make this application as his authorized agent and I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in the application is issued, I certify that the code official's authorized representative shall have the authority to enter all areas covered by such permit at any reasonable hour to enforce the provision of the code(s) applicable to such permit.

SIGNATURE OF APPLICANT	ADDRESS	DATE	PHONE
RESPONSIBLE PERSON IN CHARGE OF WORK, TITLE		DATE	PHONE

City of Portland, Maine - Building or Use Permit

389 Congress Street, 04101 Tel: (207) 874-8703, Fax: (207) 874-8716

Permit No:	Date Applied For:	CBL:
04-0161	02/26/2004	013 I020001

Location of Construction:	Owner Name:	Owner Address:	Phone:
43 Washington Ave	Bartlett Island Llc	67 India St	
Business Name:	**Contractor Name:**	**Contractor Address:**	**Phone**
	Mechanical Services, Inc	400 Presumpscot St Portland	(207) 774-1531
Lessee/Buyer's Name	**Phone:**	**Permit Type:**	
		HVAC	

Proposed Use:	Proposed Project Description:
Retail/ Coffee Shop Install Trane Natural Gas heater on Roof of building	Retail/ Coffee Shop Install Trane Natural Gas heater on Roof of building

Dept: Zoning **Status:** Approved **Reviewer:** Marge Schmuckal **Approval Date:** 03/05/2004
Note: **Ok to Issue:** ☑

Dept: Building **Status:** Approved with Conditions **Reviewer:** Mike Nugent **Approval Date:** 03/09/2004
Note: **Ok to Issue:** ☑

1) Not penetrating the apartment separation according to Bryce Leblanc/Installer.

Dept: Fire **Status:** Approved **Reviewer:** Lt. MacDougal **Approval Date:** 03/08/2004
Note: **Ok to Issue:** ☑

FILL IN AND SIGN WITH INK

DEPT. OF BUILDING INSPECTION CITY OF PORTLAND, ME FEB 2004 RECEIVED

APPLICATION FOR PERMIT HEATING OR POWER EQUIPMENT

To the INSPECTOR OF BUILDINGS, PORTLAND, ME.

The undersigned hereby applies for a permit to install the following heating, cooking or power equipment in accordance with the Laws of Maine, the Building Code of the City of Portland, and the following specifications:

Location 41-43 Washington Ave Use of Building Coffee Retail / Manufacturing Date 2/24/04

Name and address of owner of appliance Ian Spear / Coffee By Design

O13 I 20   147 India Street Portland, ME 04101

Installer's name and address Mechanical Services, Inc   Boyce LeBlanc

400 Presumpscot St. Portland, ME 04103 Telephone 774-1531

Location of appliance:

- ☐ Basement
- ☐ Floor
- ☐ Attic
- ☒ Roof

Type of Fuel:

☒ Gas ☐ Oil ☐ Solid

Appliance Name: Trane

U.L. Approved ☒ Yes ☐ No

Will appliance be installed in accordance with the manufacture's installation instructions? ☒ Yes ☐ No

IF NO Explain: ____________

The Type of License of Installer:

- ☐ Master Plumber # ____________
- ☐ Solid Fuel # ____________
- ☐ Oil # ____________
- ☒ Gas # PNT 2312
- ☐ Other ____________

Type of Chimney:

☐ Masonry Lined

Factory built ____________

☐ Metal

Factory Built U.L. Listing # ____________

☐ Direct Vent

Type ____________ UL# ____________

Type of Fuel Tank

☐ Oil   natural Gas

☐ Gas

Size of Tank ____________

Number of Tanks ____________

Distance from Tank to Center of Flame NA **feet.**

Cost of work   11,825.00

Permit cost   125.00

Approved

Fire: [signature]

Ele.: ____________

Bldg.: ____________

Approved with Conditions

☐ See attached letter or requirement

Signature of Installer [signature]

White - Inspection   Yellow - File   Pink - Applicant's   Gold - Assessor's Copy

Spaulding Engineering and Construction Services, Inc.

24 Common Street ~ Waterville, Maine 04901
Phone (207) 861-9923 ~ Fax (207) 861-9923

February 23, 2004

Mr. Brice Leblanic - Project Engineer
Mechanical Services, Inc.
400 Presumpscot Street
Portland, Maine 04103-5292

RE: Structural Evaluation of the "Coffee By Design" existing roof system for Support of a New 1018-Pound HVAC Unit

Dear John,

We have reviewed all existing condition roof information and performed load calculations regarding placement of a new 1018-pound HVAC unit at the location of "Coffee by Design", 43 Washington Ave., Portland, Maine. This new HVAC unit is to be installed by Mechanical Services. The roof is structurally adequate to support the required snow load and equipment load provided the unit and its support are installed per the attached sheet 1. The existing roof system is constructed of steel decking, wood surface, rigid insulation and rubber membrane. The existing roof system sets on 12-inch deep steel joist spaced 5' on-center and having a span 16'-3".

Mechanical Systems will need to provide (2) 4" x 4" x 7' long P.T. sleepers spanning over two of the existing joists. These sleepers shall run perpendicular to the existing joists. The sleepers shall be positioned such that they are over two panel points per each specific existing joist.

If you should have any questions or comments regarding the "Coffee By Design" Structural Evaluation, please contact me at (207) 861-9923 (office) or (207) 471-7763 (pager).

Sincerely,

Daniel E. Spaulding P.E.

STATE OF MAINE
DANIEL E. SPAULDING
No. 6097
REGISTERED PROFESSIONAL ENGINEER

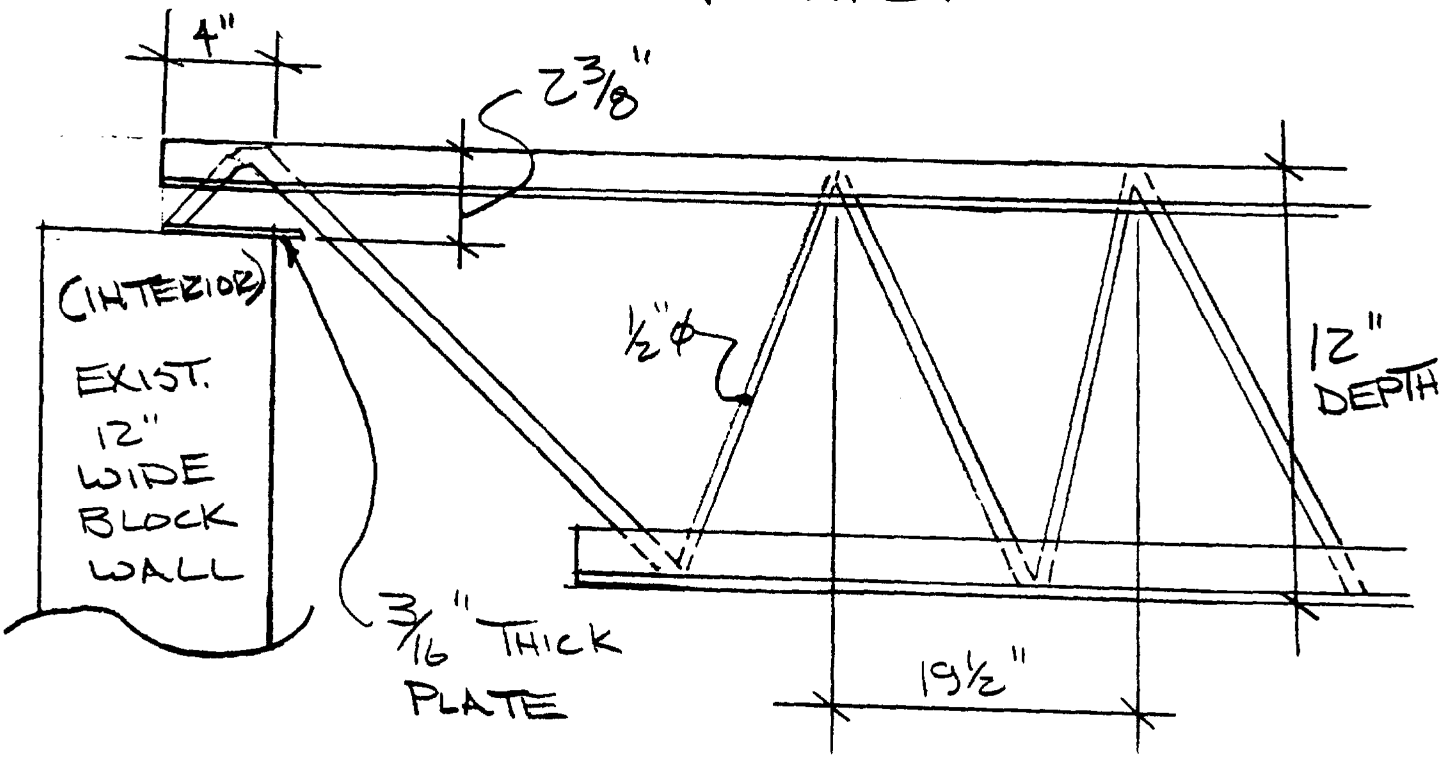
c: Project File

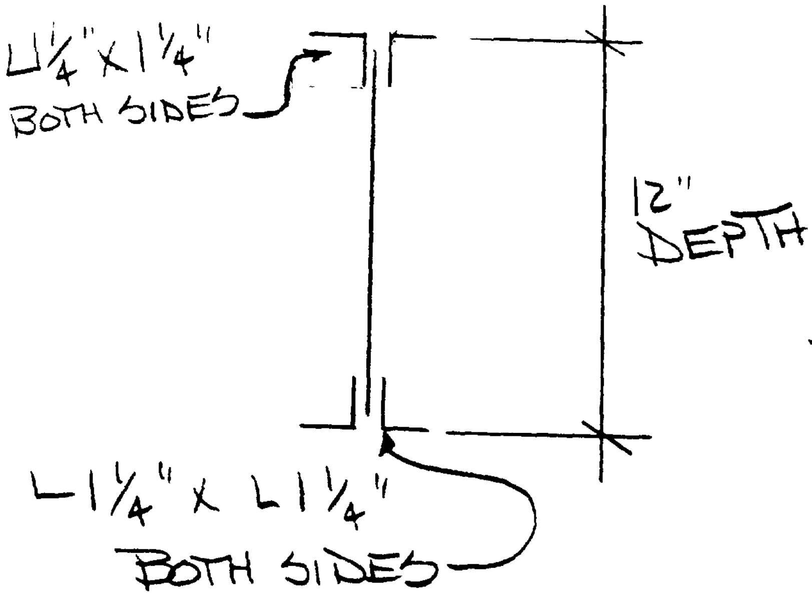
attached: structural calculation packet/sheet 1

013I 90

STRUCTURAL ANALYSIS:

EXIST. ROOF JOIST INFO:





- EXIST. JOISTS ARE SPACED @ 5'-1" O.C.

- ONE ROW OF L1 1/4" x 1 1/4" ANGLE @ TOP & BOTTOM CHORDS CONNECTS ALL OF THE JOISTS. (5' FROM INTERIOR BLOCK WALL)

013 I 20

STRUCTURAL ANALYSIS:

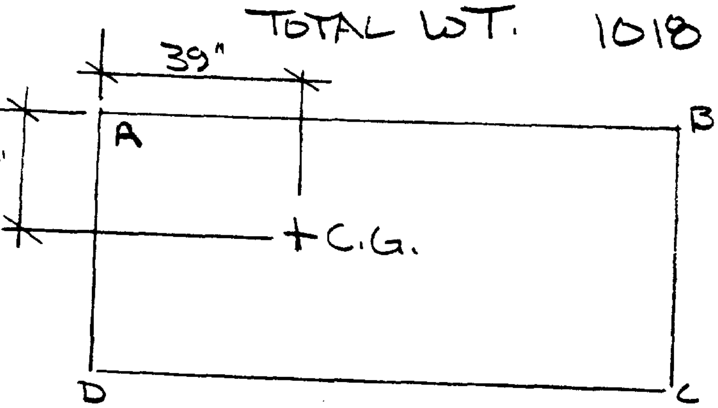
LOCATION: COFFEE BY DESIGN
41 - 43 WASHINGTON AVE
PORTLAND, ME

NEW HVAC UNIT ON EXIST. ROOF:

UNIT SPECIFICATIONS:

TRANE MANUFACTURE - 6 TON UNIT
MODEL # YHC072A

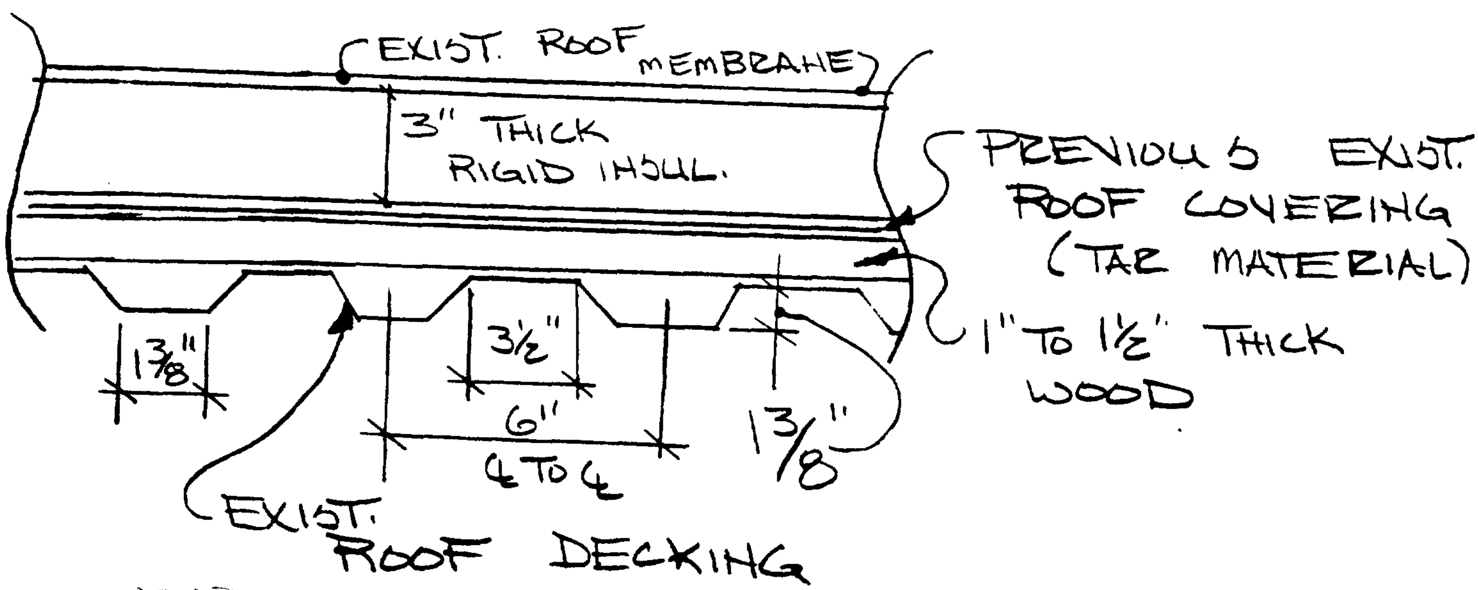
NET WT.	772 LBS	
ADD ON WT.	246 LBS	
TOTAL WT.	1018 LBS	



CENTER OF GRAVITY IS BASE ONLY ON UNIT NET WT.

CORNER POINT LOADS: A = 249 LBS B = 198 LBS
C = 141 LBS D = 184 LBS

EXIST. ROOF CROSS-SECTION:



813 I 20

2/17/04
MSL
SPAULDING
ENGINEERING

STRUCTURAL ANALYSIS:

WT. OF EXIST. ROOF:

MEMBRANE = 5 PSF (ASSUMING 5 PLY)

RIGID INSULATION = 1 PCF x 0.5' = 0.5 PSF

WOOD = 25 PCF (ASSUMING WHITE PINE)

$$(25\text{ PCF})\left(\frac{1.5''}{12''}\right)(1\text{ FT}) = 3.125\text{ PSF}$$

STEEL DECKING = 1.8 PSF (ASSUMING HIGH SIDE)

TOTAL EXIST. ROOF WT.

= 5 PSF + 0.5 PSF + 3.125 PSF + 1.8 PSF

= 10.425 PSF

USE 10.5 PSF

4" concrete block, stone or gravel		34
4" concrete block, lightweight		22
4" concrete brick, stone or gravel		46
4" concrete brick, lightweight		33
6" concrete block, stone or gravel		50
6" concrete block, lightweight		31
8" concrete block, stone or gravel		55
8" concrete block, lightweight		35
12" concrete block, stone or gravel		85
12" concrete block, lightweight		55
CONCRETE		**PCF**
Plain	Cinder	108
	Expanded slag aggregate	100
	Expanded clay	90
	Slag	132
	Stone and cast stone	144
Reinforced	Cinder	111
	Slag	138
	Stone	150
INISH MATERIALS		**PSF**
coustical tile unsupported per 1/2"		0.8
uilding board, 1/2"		0.8
ment finish, 1"		12
berboard, 1/2"		0.75
ypsum wallboard, 1/2"		2
rble and setting bed		25-30
ster, 1/2"		4.5
ster on wood lath		8
ster suspended with lath		10
wood, 1/2"		1.5
glazed wall 3/8"		3
ceramic mosaic, 1/4"		2.5
rry tile, 1/2"		5.8
rry tile, 3/4"		8.6
azzo 1", 2" in stone concrete		25
yl tile, 1/8"		1.33
dwood flooring, 25/32"		4
d block flooring, 3" on mastic		15
OR AND ROOF (CONCRETE)		**PSF**
core, 6" precast lightweight concrete		30
core, 6" precast stone concrete		40
cinder concrete, 2"		15
gypsum, 2"		12
rete, reinforced, 1"	Stone	12.5
	Slag	11.5
	Lightweight	6-10
rete, plain, 1"	Stone	12
	Slag	11
	Lightweight	3-9
S AND LIQUIDS		**PCF**
oiled anthracite		47-58
oiled bituminous		40-54
		57.2
ne		75
		8
fresh		62.4
sea		64
		PSF
d plate, 1/4"		3.28
d plate, 1/2"		6.56
strength, 1/8"		26 oz
B, 1/32"		45 oz
B, 1/4"		52 oz

1/4 wire glass	3.5
Glass block	18
INSULATION AND WATERPROOFING	**PSF**
Batt, blankets per 1" thickness	0.1-0.4
Corkboard per 1" thickness	0.58
Foamed board insulation per 1" thickness	2.6 oz
Five-ply membrane	5
Rigid insulation	0.75
LIGHTWEIGHT CONCRETE	**PSF**
Concrete, aerocrete	50-80
Concrete, cinder fill	60
Concrete, expanded clay	85-100
Concrete, expanded shale-sand	105-120
Concrete, perlite	35-50
Concrete, pumice	60-90
METALS	**PCF**
Aluminum, cast	165
Brass, cast, rolled	534
Bronze, commercial	552
Bronze, statuary	509
Copper, cast or rolled	556
Gold, cast, solid	1205
Gold coin in bags	509
Iron, cast gray, pig	450
Iron, wrought	480
Lead	710
Nickel	565
Silver, cast, solid	656
Silver coin in bags	590
Tin	459
Stainless steel, rolled	492-510
Steel, rolled, cold drawn	490
Zinc, rolled, cast or sheet	449
MORTAR AND PLASTER	**PCF**
Mortar, masonry	116
Plaster, gypsum, sand	104-120
PARTITIONS	**PSF**
2 x 4 wood stud, GWB, two sides	8
4" metal stud, GWB, two sides	6
4" concrete block, lightweight, GWB	26
6" concrete block, lightweight, GWB	35
2" solid plaster	20
4" solid plaster	32
ROOFING MATERIALS	**PSF**
Built up	6.5
Concrete roof tile	9.5
Copper	1.5-2.5
Corrugated iron	2
Deck, steel without roofing or insulation	2.2-3.6
Fiberglass panels (2 1/2" corrugated)	5-8 oz
Galvanized iron	1.2-1.7
Lead, 1/8"	6-8
Plastic sandwich panel, 2 1/2" thick	2.6
Shingles, asphalt	1.7-2.8
Shingles, wood	2-3
Slate, 3/16" to 1/4"	7-9.5
Slate, 3/8" to 1/2"	14-18
Stainless steel	2.5
Tile, cement flat	13
Tile, cement ribbed	16
Tile, clay shingle type	8-16
Tile, clay flat with setting bed	15-20

Wood sheathing per inch	3
SOIL, SAND, AND GRAVEL	**PCF**
Ashes or cinder	40-50
Clay, damp and plastic	110
Clay, dry	63
Clay and gravel, dry	100
Earth, dry and loose	76
Earth, dry and packed	95
Earth, moist and loose	78
Earth, moist and packed	96
Earth, mud, packed	115
Sand or gravel, dry and loose	90-105
Sand or gravel, dry and packed	100-120
Sand or gravel, dry and wet	118-120
Silt, moist, loose	78
Silt, moist, packed	96
STONE (ASHLAR)	**PCF**
Granite, limestone, crystalline	165
Limestone, oolitic	135
Marble	173
Sandstone, bluestone	144
Slate	172
STONE VENEER	**PSF**
2" granite, 1/2" parging	30
4" granite, 1/2" parging	59
6" limestone facing, 1/2" parging	55
4" sandstone or bluestone, 1/2" parging	49
1" marble	13
1" slate	14
STRUCTURAL CLAY TILE	**PSF**
4" hollow	23
6" hollow	38
8" hollow	45
STRUCTURAL FACING TILE	**PSF**
2" facing tile	14
4" facing tile	24
6" facing tile	34
8" facing tile	44
SUSPENDED CEILINGS	**PSF**
Mineral fiber tile 3/4", 12" x 12"	1.2-1.57
Mineral fiberboard 5/8", 24" x 24"	1.4
Acoustic plaster on gypsum lath base	10-11
WOOD	**PCF**
Ash, commercial white	40.5
Birch, red oak, sweet and yellow	44
Cedar, northern white	22.2
Cedar, western red	24.2
Cypress, southern	33.5
Douglas fir (coast region)	32.7
Fir, commercial white; Idaho white pine	27
Hemlock	28-29
Maple, hard (black and sugar)	44.5
Oak, white and red	47.3
Pine, northern white sugar	25
Pine, southern yellow	37.3
Pine, ponderosa, spruce: eastern and sitka	28.6
Poplar, yellow	29.4
Redwood	26
Walnut, black	38

SHEET 4 OF 53

NOTE

To establish uniform practice among designers, it is desirable to present a list of materials generally used in building construction, together with their proper weights. Many building codes prescribe the minimum weights of only a few building materials. It should be noted that there is a difference of more than 25% in some cases.

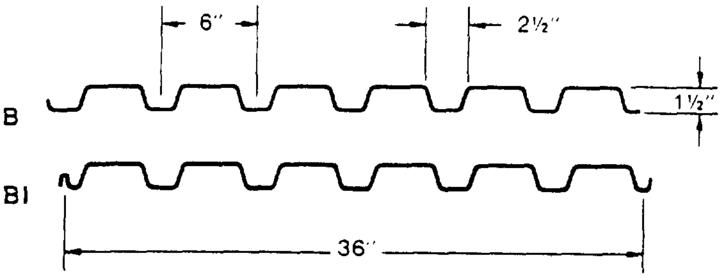
013I20

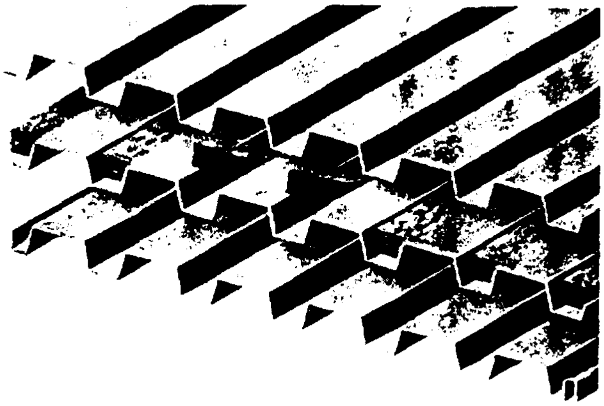
VULCRAFT

SHEET 5 OF 53

1.5 B, BI, BA, BIA

Maximum Sheet Length 42'-0
Extra Charge for Lengths Under 6'-0
Factory Mutual Approved (No. OC847.AM and OG1A4.AM)**
ICBO Approved (No. 3415)





SECTION PROPERTIES F. = 33 ksi (80 ksi for 24 gage)

Type No.	Design Thick	Weight (Lbs/Ft²) Ptd.	Weight (Lbs/Ft²) Galv.	I (In⁴/Ft)	Sp (In³/Ft)	Sn (In³/Ft)
1.5B24	0.0239	1.36	1.46	0.121	0.120	0.131
1.5B22	0.0295	1.68	1.78	0.169	0.186	0.192
1.5B21	0.0329	1.87	1.97	0.192	0.213	0.221
1.5B20	0.0358	2.04	2.14	0.212	0.234	0.247
1.5B19	0.0418	2.39	2.49	0.253	0.277	0.289
1.5B18	0.0474	2.72	2.82	0.292	0.318	0.327
1.5B16	0.0598	3.44	3.54	0.373	0.408	0.411

ACOUSTICAL DATA

Type	Absorption Coefficients 125	250	500	1000	2000	4000	Noise Reduction Coefficient*
1.5BA, BIA	.51	.95	1.06	.98	.62	.27	.90 w/insulation*
	.40	.86	1.05	.96	.55	.19	.85 w/o insulation

Source: Riverbank Acoustical Laboratories (test A78-15)
*Test had small flutes full of fiberglass insulation.
All tests were performed with 2" rigid insulation.

Type B (wide rib) deck provides excellent structural load carrying capacity per pound of steel utilized, and its nestable design eliminates the need for die-set ends.

1" or more rigid insulation is required for Type B deck.

Acoustical deck (Type BA, BIA) is particularly suitable in structures such as auditoriums, schools, and theatres where sound control is desirable. Acoustic perforations are located in the vertical webs where the load carrying properties are negligibly affected (less than 5%).

Inert, non-organic glass fiber sound absorbing batts are placed in the rib openings to absorb up to 90% of the sound striking the deck.

Batts are field installed and may require separation.

VERTICAL LOADS TYPE 1.5B

No. of Spans	Gage	Max. Span SDI Const. Load 26.6KSI	Δ = ℓ/240	5-0	5-6	6-0	6-6	7-0	7-6	8-0	8-6	9-0	9-6	10-0	10-6	11-0	11-6	12-0
				Allowable Total (Dead + Live) Uniform Load (Lbs./Sq. Ft.) — Span (ft.-in.)														
1	24	9-6	4-8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	22	8-3	5-7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	21	9-5	6-0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	20	10-4	6-5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	19	12-3	7-1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	18	14-1	7-8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	16	18-1	8-8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	24	11-9	5-10	126	104	87	74	64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	22	10-1	6-11	102	85	71	61	52	46	40	35	32	28	26	23	21	19	18
	21	11-7	7-4	118	97	82	70	60	52	46	41	36	33	29	27	24	22	20
	20	12-9	7-9	132	109	91	78	67	59	51	46	41	36	33	30	27	25	23
	19	15-1	8-5	154	127	107	91	79	69	60	53	48	43	39	35	32	29	27
	18	17-4	9-1	174	144	121	103	89	78	68	60	54	48	44	40	36	33	30
	16	22-2	10-3	219	181	152	130	112	97	86	76	68	61	55	50	45	41	38
3	24	11-9	5-10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	22	10-1	6-11	128	106	89	76	65	57	50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	21	11-7	7-4	147	122	102	87	75	65	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	20	12-9	7-9	165	136	114	97	84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	19	15-1	8-5	193	159	134	114	98	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	18	17-4	9-1	218	180	151	129	111	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	16	22-2	10-3	274	226	190	162	140	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

NOTES: 1. Load tables are calculated using sectional properties based on the steel design thicknesses shown in the Steel Deck Institute (SDI) Design Manual.
2. Loads shown in the shaded areas are governed by live load deflection not in excess of 1/240 of the span. A dead load of 10 PSF has been included.
3. Fy=60 KSI for 24 gage. Fy=33 KSI for all other gages.
**Acoustical Deck is not covered under Factory Mutual.

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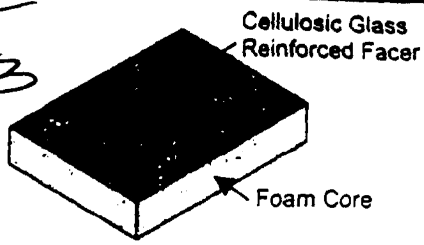
Firestone Building Products

ISO 95+ GL
Flat and Tapered



Description:
Firestone ISO 95+ GL flat and tapered roof insulation consists of a closed-cell polyisocyanurate foam core laminated to a black glass reinforced mat facer. Flat and tapered ISO 95+ GL provide outstanding thermal performance on commercial roofing applications, while providing positive roof top drainage to eliminate ponding water when tapered ISO 95+ GL is used.

All Firestone polyisocyanurate insulations use EPA accepted blowing agents and qualify under the Federal Procurement Regulation of Recycled Material. Flat and tapered ISO 95+ GL with IsoGard Foam Technology incorporates a HCFC-free blowing agent that does not contribute to the depletion of the ozone (ODP-free).

Advantages:
1. Outstanding thermal performance.
2. Meets FM 4450 and UL 1256 for direct-to-steel-deck applications.
3. Compatible with ballasted, fully adhered and mechanically attached single-ply, modified bitumen and built-up roofing systems.
4. Available in flat boards 4' x 4' (1.22 m x 1.22 m) and 4' x 8' (1.22 m x 2.44 m) in thickness ranging from 1.0" (25.4 mm) to 4.0" (101.6 mm).
5. Available in tapered boards 4' x 4' (1.22 m x 1.22 m) and 4' x 8' (1.22 m X 2.44 m) with slopes ranging from 1/16" per foot (.5%) to ½" per foot (4%).

Specification Compliance:
ASTM C1289, Type II, Class 1
UL Classified
FM Class 1 Approved
Manufactured in an ISO 9002 Registered Facility

Method of Application:
Insulation shall be neatly fitted to all roof penetrations, projections and nailers. No more insulation shall be installed than can be covered with membrane and completed before the end of each day's work or before the onset of inclement weather.

ISO 95+ GL flat and tapered may be installed using:
Fasteners and plates.
Hot asphalt.
Firestone approved insulation adhesives.

For ballasted systems, the top layer of Firestone insulation may not be mechanically attached.

Storage and Precautions:
1. Keep insulation dry at all times.
2. Elevate insulation above the deck or ground.
3. Cover insulation with waterproof tarps.
4. Flammable. Keep away from fire and ignition sources.
5. Do not install over wet, damp or uneven substrates.

ISO 95+ GL Flute Span Over Metal Decks				
Thickness	1.0"-1.1"	1.2"	1.3"-3.9"	4.0"
Span	2.625"	3.875"	4.375"	4.5"

PRODUCT DATA

Thickness* inches	LTTR** ft²h°F/Btu in	Thickness* inches	LTTR** ft²h°F/Btu in
1.0	6.0	2.5	15.3
1.1	6.6	2.6	15.9
1.2	7.2	2.7	16.6
1.3	7.8	2.8	17.2
1.4	8.4	2.9	17.9
1.5	9.0	3.0	18.5
1.6	9.6	3.1	19.1
1.7	10.3	3.2	19.8
1.8	10.9	3.3	20.4
1.9	11.5	3.4	21.1
2.0	12.1	3.5	21.7
2.1	12.8	3.6	22.4
2.2	13.4	3.7	23.0
2.3	14.0	3.8	23.7
2.4	14.7	3.9	24.3
		4.0	25.0

* 1" (inch) equals 25.4 mm (millimeters)
** Long Term Thermal Resistance (LTTR) values provide a 15-year time-weighted average in accordance with CAN/ULC S770.

POLYISO PHYSICAL PROPERTIES

Physical Property	ASTM Test	English Values	Metric Values
Compressive* Strength	D 1621	20 psi	138 kPa
Density	D 1622	2 pcf	32 kg/m³
Dimensional Stability	D 2126	<2%	<2%
Moisture Vapor Transmission	E 96	<1 Perm	<57.5 ng/(Pa•s•m²)
Water Absorption	C 209	<1% by volume	<1% by volume
Service Temperature		-100° to 250°F	-73° to 121°C

* 25 psi (172 kPa) available upon request

Firestone Building Products Company
525 Congressional Blvd. Carmel, Indiana 46032
Sales: (800) 428-4442 • Technical (800) 428-4511
Internet Address: http://www.firestonebpco.com

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TECHNICAL INFORMATION SHEET

PACKAGING:

Thickness	Widths	Lengths	Weight/ft²(m²)
.045" (1.1mm)	7.5 ft* (2.3 m*)	50 ft (15.2 m)	.29 lb (.13 kg)
	9 ft** (2.7 m**)	100 ft (30.5 m)	
	10 ft (3 m)	200 ft (61 m)	
	20 ft (6.1m)		
	25 ft (7.6 m)		
	40 ft (12.2 m)		
	50 ft (15.2 m)		
.060" (1.5 mm)	7.5 ft* (2.3 m*)	50 ft (15.2 m)	.40 lb (.18 kg)
	9 ft** (2.7 m**)	100 ft (30.5 m)	
	10 ft (3 m)		
	20 ft (6.1 m)		

*Packaged 2 panels per roll.
**Available in 100' (30.5 m) rolls only.

STORAGE:

1. Store away from sources of punctures, and physical damage.
2. Assure that structural decking will support the loads incurred by material when stored on rooftop. The deck load limitations should be specified by the project designer.
3. Store away from ignition sources as membrane will burn when exposed to open flame.

This sheet is meant only to highlight Firestone's products and specifica- :ions. Information is subject to change without notice.

=irestone takes responsibility for furnishing quality materials which meet =irestone's published product specifications. As neither Firestone itself ıor its representatives practice architecture, Firestone offers no opinion ɔn, and expressly disclaims any responsibility for the soundness of any ;tructure on which its products may be applied. If questions arise as to he soundness of a structure or its ability to support a planned installation ıroperty, the Owner should obtain opinions of competent structural ɪngineers before proceeding. Firestone accepts no liability for any tructural failure or resultant damages, and no Firestone Representative ; authorized to vary this disclaimer.

Firestone
BUILDING PRODUCTS COMPANY

RUBBERGARD NON-REINFORCED EPDM MEMBRANE (BLACK)

SHEET 7 OF 53

Factory Mutual System

Approved

"Subject to the conditions of Approval as a Roof Cover when installed as described in the current edition of the FMRC Approval Guide."

R9516
CLASSIFIED UL

Membrane for Roofing Systems Classified By Underwriters Laboratories Inc. As To An External Fire Exposure Only. See UL Directory Of Products Certified For Canada and UL Roofing Materials and System Directory.
61P2

C CLASSIFIED UL

FIRESTONE BUILDING PRODUCTS COMPANY
525 Congressional Blvd., Carmel, Indiana 46032
Sales: 1-800-428-4442 • Technical: 1-800-428-4511
Internet-Address: http://www.firestonebpco.com

CONT. STRUCTURAL ANALYSIS:

CALCULATING SNOW LOAD:
- EXIST. FLAT ROOF (SLOPE < 5°)

$P_f = 0.7 (C_e)(C_t)(I)(P_g)$

$C_e = 1.1$ (FROM TABLE 7.2 - EXPOSURE FACTOR)
- EXPOSURE A - LARGE CITIES
- PARTIALLY EXPOSED

$C_t = 1.0$ (FROM TABLE 7-3 - THERMAL FACTOR) (ALL STRUCTURES EXCEPT...)

$I = 1.0$ (FROM TABLE 7.4 - IMPORTANCE FACTOR & TABLE 1-1 - CLASSIFICATION)

$P_g = 50$ psf (FROM GROUND SNOW LOAD MAP FIG. 7-1)

$P_f = 0.7(1.1)(1.0)(1.0)(50\text{psf})$
$= 38.5$ psf

USE 38.5 PSF

ALL INFO TAKEN FROM ASCE STANDARD "MIN. DESIGN LOADS FOR BLDG.S & OTHER STRUCTURES" (6/6/96 APPROVED)

p_d = maximum intensity of drift surcharge load, in pounds per square foot (kilonewtons per square meter);
p_f = snow load on flat roofs ("flat" = roof slope ≤ 5°), in pounds per square foot (kilonewtons per square meter);
p_g = ground snow load as determined from Fig. 7-1 and Table 7-1; or a site-specific analysis, in pounds per square foot (kilonewtons per square meter);
p_s = sloped-roof snow load, in pounds per square foot (kilonewtons per square meter);
s = separation distance between buildings, in feet (meters);
w = width of snow drift, in feet (meters);
γ = snow density in pounds per cubic foot (kilograms per cubic meter) as determined from Eq. (7-3);

*7.2 Ground Snow Loads, p_g

Ground snow loads, p_g, to be used in the determination of design snow loads for roofs shall be as set forth in Fig. 7-1 for the contiguous United States and Table 7-1 for Alaska. Site specific case studies shall be made to determine ground snow loads in areas designated CS in Fig. 7-1. Ground snow loads for sites at elevations above the limits indicated in Fig. 7-1 and for all sites within the CS areas shall be approved by the authority having jurisdiction. Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2% annual probability of being exceeded (50-year mean recurrence interval).

Snow loads are zero for Hawaii, except in mountainous regions as determined by the authority having jurisdiction.

*7.3 Flat-Roof Snow Loads, p_f

The snow load, p_f, on a roof with a slope equal to or less than 5° (1 in./ft = 4.76°) shall be calculated in pounds per square foot (kilonewtons per square meter) using the following formula:

$$p_f = 0.7\, C_e C_t I p_g \qquad \text{(Eq. 7-1)}$$

*7.3.1 **Exposure Factor, C_e.** The value for C_e shall be determined from Table 7-2.

*7.3.2 **Thermal Factor, C_t.** The value for C_t shall be determined from Table 7-3.

*7.3.3 **Importance Factor, I.** The value for I shall be determined from Table 7-4.

*7.3.4 **Minimum Allowable Values of p_f for Low-Slope Roofs.** Minimum allowable values of p_f shall apply to monoslope, hip, and gable roofs with slopes less than 15° and curved roofs where the vertical angle from the eaves to the crown is less than 10°. For locations where the ground snow load, p_g, is 20 lb/sq ft (0.96 kN/m²) or less, the flat-roof snow load, p_f, shall be not less than the ground snow load multiplied by the importance factor [i.e., where $p_g \le$ 20 lb/sq ft (0.96 kN/m²), $p_f \ge p_g I$ lb/sq ft (kN/m²)]. In locations where the ground snow load, p_g, exceeds 20 lb/sq ft (0.96 kN/m²), the flat-roof snow load, p_f, shall be not less than 20 lb/sq ft (0.96 kN/m²) multiplied by the importance factor [i.e., where $p_g >$ 20 lb/sq ft (0.96 kN/m²), $p_f \ge 20\, I$ lb/sq ft (0.96 I kN/m²)].

The live load reductions in 4.8 shall not be applied to snow loads.

*7.4 Sloped-Roof Snow Loads, p_s

Snow loads acting on a sloping surface shall be assumed to act on the horizontal projection of that surface. The sloped-roof snow load, p_s, shall be obtained by multiplying the flat-roof snow load, p_f, by the roof slope factor, C_s:

$$p_s = C_s p_f \qquad \text{(Eq. 7-2)}$$

Values of C_s for warm roofs, cold roofs, curved roofs, and multiple roofs are determined from 7.4.1-7.4.4. The thermal factor, C_t, from Table 7-3 determines if a roof is "cold" or "warm." "Slippery surface" values shall be used only where the roof's surface is unobstructed and sufficient space is available below the eaves to accept all the sliding snow. A roof shall be considered unobstructed if no objects exist on it that prevent snow on it from sliding. Slippery surfaces shall include metal, slate, glass, and bituminous, rubber and plastic membranes with a smooth surface. Membranes with an imbedded aggregate or mineral granule surface shall not be considered smooth. Asphalt shingles, wood shingles, and shakes shall not be considered slippery.

7.4.1 **Warm-Roof Slope Factor, C_s.** For warm roofs (C_t = 1.0 as determined from Table 7-3) with an unobstructed slippery surface that will allow snow to slide off the eaves, the roof slope factor C_s shall be determined using the dashed line in Fig. 7-2a, provided that for nonventilated roofs, their thermal resistance (R-value) equals or exceeds 30 °F·h·sq ft/Btu (5.3 $K \cdot m^2/W$) and for ventilated roofs, their R-value equals or exceeds 20 °F·h·sq ft/Btu (3.5 $K \cdot m^2/W$). Exterior air shall

TABLE 6-4
Internal Pressure Coefficients for Buildings, GC_{pi}

Condition	GC_{pi}
Open buildings	0.00
Partially enclosed buildings	+0.80 −0.30
Buildings satisfying the following conditions: (1) sited in hurricane-prone regions having a basic wind speed greater than or equal to 110 mph (49 m/s) or in Hawaii, and (2) having glazed openings in the lower 60 ft (18 m) which are not designed to resist wind-borne debris or are not specifically protected from wind-borne debris impact	+0.80 −0.30
All buildings except those listed above	+0.18 −0.18

NOTES:
1. Plus and minus signs signify pressures acting toward and away from the internal surfaces.
2. Values of GC_{pi} shall be used with q_z or q_h as specified in Table 6-1.
3. Two cases shall be considered to determine the critical load requirements for the appropriate condition: a positive value of GC_{pi} applied to all internal surfaces, and a negative value of GC_{pi} applied to all internal surfaces.
4. For buildings with mean roof height $h \leq 60$ ft (18 m) and sited within Exposure B, calculated internal pressures shall be multiplied by 0.85.
5. Hurricane-prone regions include areas vulnerable to hurricanes, such as the U.S. Atlantic and Gulf Coasts, Hawaii, Puerto Rico, Guam, Virgin Islands, and American Samoa.
6. If a building by definition complies with both the "Open" and "Partially Enclosed" definitions, it shall be treated as an "Open" building.

constructed features. The exposure in which a specific building or other structure is sited shall be assessed as being one of the following categories:

1. **Exposure A.** Large city centers with at least 50% of the buildings having a height in excess of 70 ft (21.3 m). Use of this exposure category shall be limited to those areas for which terrain representative of Exposure A prevails in the upwind direction for a distance of at least 0.5 mi (0.8 km) or 10 times the height of the building or other structure, whichever is greater. Possible channeling effects or increased velocity pressures due to the building or structure being located in the wake of adjacent buildings shall be taken into account.
2. **Exposure B.** Urban and suburban areas, wooded areas, or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger. Use of this exposure category shall be limited to those areas for which terrain representative of Exposure B prevails in the upwind direction for a distance of at least 1,500 ft (460 m) or 10 times the height of the building or other structure, whichever is greater.
3. **Exposure C.** Open terrain with scattered obstructions having heights generally less than 30 ft (9.1 m). This category includes flat open country and grasslands.
4. **Exposure D.** Flat, unobstructed areas exposed to wind flowing over open water for a distance of at least 1 mi (1.61 km). This exposure shall apply only to those buildings and other structures exposed to the wind coming from over the water. Exposure D extends inland from the shoreline a distance of

TABLE 6-5
External Pressure Coefficients for Arched Roofs, C_p

Condition	Rise-to-span ratio, r	C_p Windward quarter	C_p Center half	C_p Leeward quarter
Roof on elevated structure	$0 < r < 0.2$	−0.9	$-0.7 - r$	−0.5
	$0.2 \leq r < 0.3$*	$1.5r - 0.3$	$-0.7 - r$	−0.5
	$0.3 \leq r \leq 0.6$	$2.75r - 0.7$	$-0.7 - r$	−0.5
Roof springing from ground level	$0 < r \leq 0.6$	$1.4r$	$-0.7 - r$	−0.5

*When the rise-to-span ratio is $0.2 \leq r \leq 0.3$, alternate coefficients given by $6r - 2.1$ shall also be used for the windward quarter.

NOTES:
1. Values listed are for the determination of average loads on main windforce resisting systems.
2. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
3. For wind directed parallel to the axis of the arch, use pressure coefficients from Fig. 6-3 with wind directed parallel to ridge.
4. For components and cladding: (1) At roof perimeter, use the external pressure coefficients in Fig. 6-5B with θ based on spring-line slope and q_h based on Exposure C; and (2) for remaining roof areas, use external pressure coefficients of this table multiplied by 0.87 and q_h based on Exposure C.

TABLE 7-1
Ground Snow Loads, p_g, for Alaskan Locations

Location	p_g lb/sq ft	p_g (kN/m²)	Location	p_g lb/sq ft	p_g (kN/m²)	Location	p_g lb/sq ft	p_g (kN/m²)
Adak	30	(1.4)	Galena	60	(2.9)	Petersburg	150	(7.2)
Anchorage	50	(2.4)	Gulkana	70	(3.4)	St Paul Islands	40	(1.9)
Angoon	70	(3.4)	Homer	40	(1.9)	Seward	50	(2.4)
Barrow	25	(1.2)	Juneau	60	(2.9)	Shemya	25	(1.2)
Barter Island	35	(1.7)	Kenai	70	(3.4)	Sitka	50	(2.4)
Bethel	40	(1.9)	Kodiak	30	(1.4)	Talkeetna	120	(5.8)
Big Delta	50	(2.4)	Kotzebue	60	(2.9)	Unalakleet	50	(2.4)
Cold Bay	25	(1.2)	McGrath	70	(3.4)	Valdez	160	(7.7)
Cordova	100	(4.8)	Nenana	80	(3.8)	Whittier	300	(14.4)
Fairbanks	60	(2.9)	Nome	70	(3.4)	Wrangell	60	(2.9)
Fort Yukon	60	(2.9)	Palmer	50	(2.4)	Yakutat	150	(7.2)

COFFEE BY DESIGN

TABLE 7-2
Exposure Factor, C_e

Terrain Category	Exposure of roof* Fully Exposed	Partially Exposed	Sheltered
✱ A (see Section 6.5.3)	N/A	✱ 1.1	1.3
B (see Section 6.5.3)	0.9	1.0	1.2
C (see Section 6.5.3)	0.9	1.0	1.1
D (see Section 6.5.3)	0.8	0.9	1.0
Above the treeline in windswept mountainous areas.	0.7	0.8	N/A
In Alaska, in areas where trees do not exist within a 2-mile (3 km) radius of the site.	0.7	0.8	N/A

The terrain category and roof exposure condition chosen shall be representative of the anticipated conditions during the life of the structure.

*Definitions

Partially Exposed: All roofs except as indicated below.

Fully Exposed: Roofs exposed on all sides with no shelter** afforded by terrain, higher structures or trees. Roofs that contain several large pieces of mechanical equipment or other obstructions are not in this category.

Sheltered: Roofs located tight in among conifers that qualify as obstructions.

**Obstructions within a distance of 10 h_o provide "shelter," where h_o is the height of the obstruction above the roof level. If the only obstructions are a few deciduous trees that are leafless in winter, the "fully exposed" category shall be used except for terrain category "A." Note that these are heights above the roof. Heights used to establish the Terrain Category in Section 6.5.3 are heights above the ground.

TABLE 7-3
Thermal Factor, C_t

Thermal Condition*	C_t
✱ All structures except as indicated below	1.0 ✱
Structures kept just above freezing and others with cold, ventilated roofs having a thermal resistance (*R*-value) greater than 25 °F·h·sq ft/Btu (4.4 $K \cdot m^2/W$)	1.1
Unheated structures	1.2

*These conditions shall be representative of the anticipated conditions during winters for the life of the structure.

01/31/20

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strength and the manner and consequences of failure (also called strength reduction factor).

Strength design: a method of proportioning structural members such that the computed forces produced in the members by the factored loads do not exceed the member design strength (also called load and resistance factor design).

Temporary facilities: buildings or other structures that are to be in service for a limited time and have a limited exposure period for environmental loadings.

1.3 Basic Requirements

***1.3.1 Strength.** Buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the factored loads in load combinations defined in this document without exceeding the appropriate strength limit states for the materials of construction. Alternatively, buildings and other structures, and all parts thereof, shall be designed and constructed to support safely the nominal loads in load combinations defined in this document without exceeding the appropriate specified allowable stresses for the materials of construction.

***1.3.2 Serviceability.** Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections, lateral drift, vibration, or any other deformations that adversely affect the intended use and performance of buildings and other structures.

***1.3.3 Self-Straining Forces.** Provision shall be made for anticipated self-straining forces arising from differential settlements of foundations and from restrained dimensional changes due to temperature, moisture, shrinkage, creep, and similar effects.

1.3.4 Analysis. Load effects on individual structural members shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility, and both short- and long-term material properties. Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis the added eccentricities expected to occur during their service life.

*1.4 General Structural Integrity

Buildings and other structures shall be designed to sustain local damage with the structural system as a whole remaining stable and not being damaged to an extent disproportionate to the original local damage. This shall be achieved through an arrangement of the structural elements that provides stability to the entire structural system by transferring loads from any locally damaged region to adjacent regions capable of resisting those loads without collapse. This shall be accomplished by providing sufficient continuity, redundancy, or energy-dissipating capacity (ductility), or a combination thereof, in the members of the structure.

*1.5 Classification of Buildings and Other Structures

Buildings and other structures shall be classified, based on the nature of occupancy, according to Table 1-1 for the purposes of applying wind,

TABLE 1-1
Classification of Buildings and Other Structures for Wind, Snow, and Earthquake Loads

Nature of Occupancy	Category
Buildings and other structures that represent a low hazard to human life in the event of failure including, but not limited to: • Agricultural facilities • Certain temporary facilities • Minor storage facilities	I
All buildings and other structures except those listed in Categories I, III, and IV	II
Buildings and other structures that represent a substantial hazard to human life in the event of failure including, but not limited to: • Buildings and other structures where more than 300 people congregate in one area • Buildings and other structures with elementary school, secondary school, or day-care facilities with capacity greater than 250 • Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities • Health-care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities • Jails and detention facilities • Power generating stations and other public utility facilities not included in Category IV • Buildings and other structures containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released	III
Buildings and other structures designated as essential facilities including, but not limited to: • Hospitals and other health-care facilities having surgery or emergency treatment facilities • Fire, rescue and police stations and emergency vehicle garages • Designated earthquake, hurricane, or other emergency shelters • Communications centers and other facilities required for emergency response • Power generating stations and other public utility facilities required in an emergency • Buildings and other structures having critical national defense functions	IV

COFFEE HOUSE WAREHOUSE

COFFEE BY DESIGN"

TABLE 7-4
Importance Factor, I (Snow Loads)

Category*	I
I	0.8
II	1.0
III	1.1
IV	1.2

*See Section 1.5 and Table 1-1.

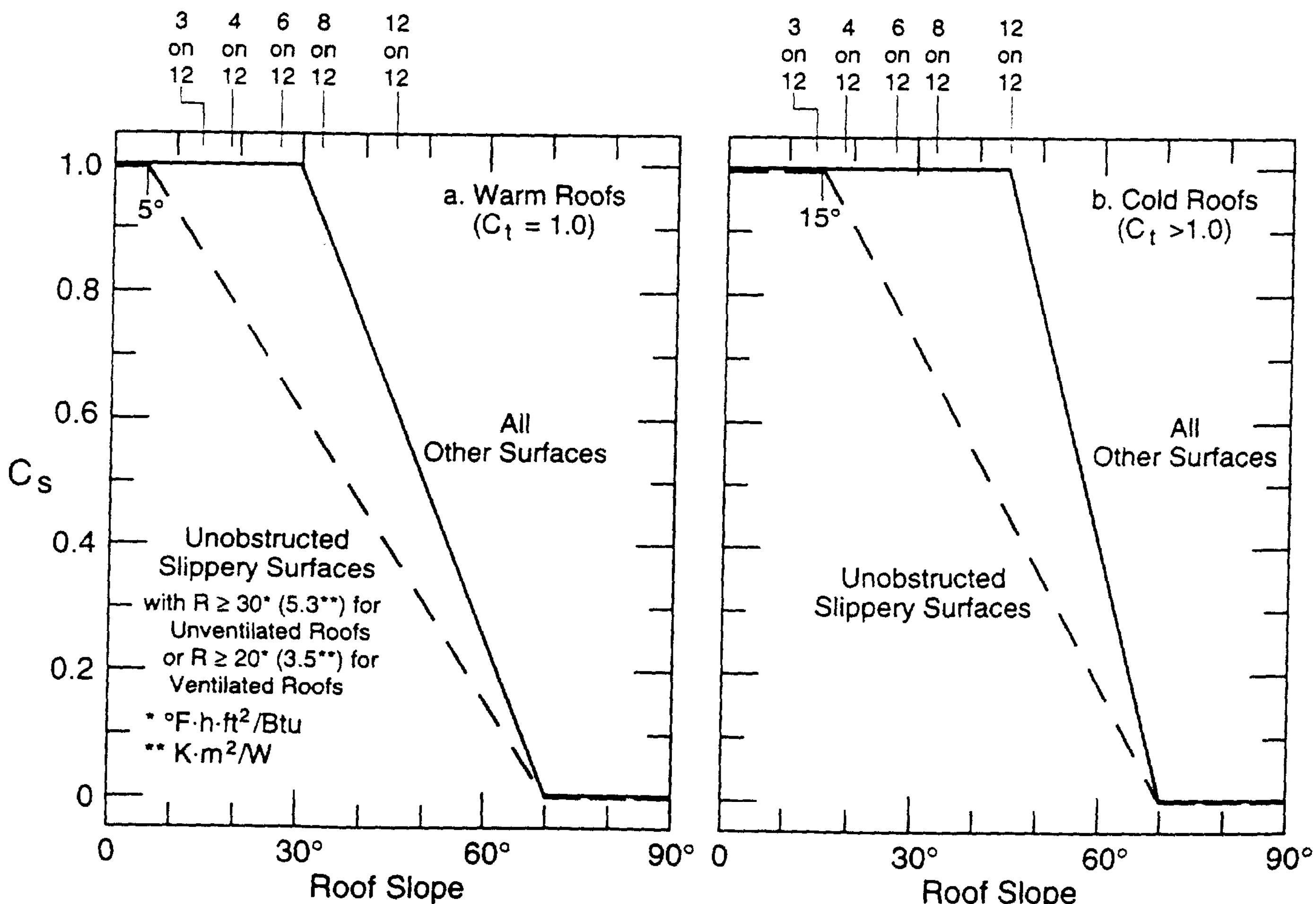
be able to circulate freely under a ventilated roof from its eaves to its ridge. For warm roofs that do not meet the aforementioned conditions, the solid line in Fig. 7-2a shall be used to determine the roof slope factor C_s.

7.4.2 Cold Roof Slope Factor, C_s. For cold roofs ($C_t > 1.0$ as determined from Table 7-3) with an unobstructed slippery surface that will allow snow to slide off the eaves, the roof slope factor C_s shall be determined using the dashed line in Fig. 7-2b. For all other cold roofs the solid line in Fig. 7-2b shall be used to determine the roof slope factor C_s.

***7.4.3 Roof Slope Factor for Curved Roofs.** Portions of curved roofs having a slope exceeding 70° shall be considered free of snow load, (i.e., $C_s = 0$). Balanced loads shall be determined from the balanced load diagrams in Fig. 7-3 with C_s determined from the appropriate curve in Fig. 7-2.

***7.4.4 Roof Slope Factor for Multiple Folded Plate, Sawtooth, and Barrel Vault Roofs.** Multiple folded plate, sawtooth, or barrel vault roofs shall have a $C_s = 1.0$, with no reduction in snow load because of slope (i.e., $p_s = p_f$).

***7.4.5 Ice Dams and Icicles Along Eaves.** Two types of warm roofs that drain water over their eaves shall be capable of sustaining a uniformly distributed load of $2\,p_f$ on all overhanging portions there:



Interpolation shall not be used to determine C_s.

FIG. 7-2. Graphs for Determining Roof Slope Factor C_s for Warm and Cold Roofs.

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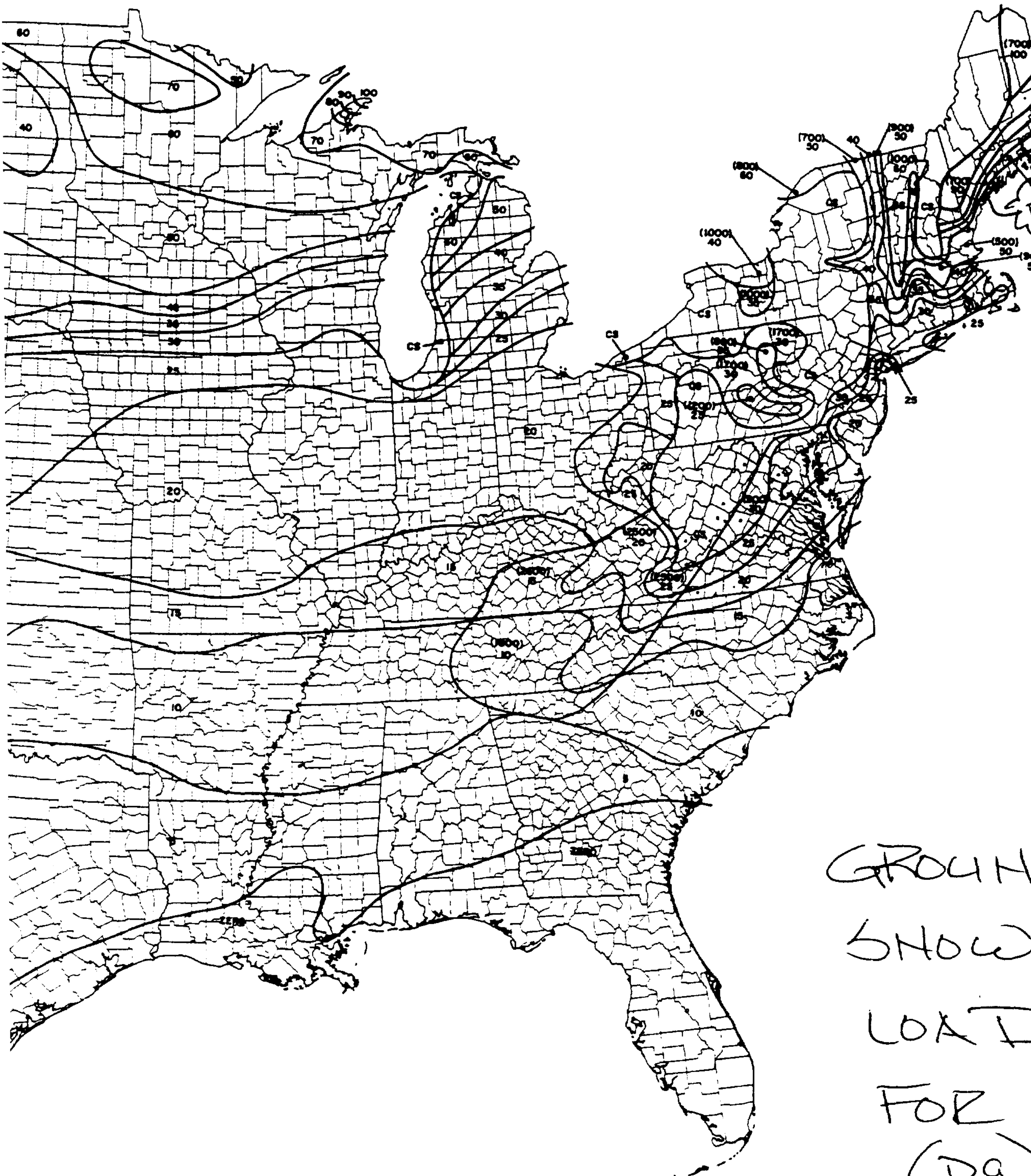


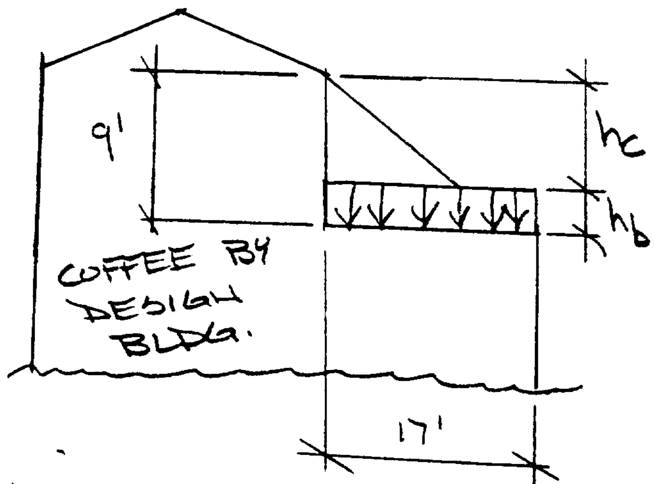
PORTLAND

PS = 50

GROUND SNOW LOAD FOR U.S. (PG)

CONT. STRUCTURAL ANALYSIS:
COFFEE BY DESIGN
CALCULATING DRIFT SNOW LOAD (P_d):

$P_f = 38.5$



h_c = CLEAR HT.

$h_b = P_f / \gamma$

$\gamma = 0.13(P_g) + 14$ (EQU. 7.3)

$\gamma = 0.13(50) + 14$

$\gamma = 20.5$ Pcf

$h_b = \frac{38.5}{20.5}$

$h_b = 1.87'$

$\frac{h_c}{h_b} < 0.2$ (DRIFT LOAD DOESN'T APPLY)

$h_c = 9' - 1.87'$

$h_c = 7.13$

$\frac{h_c}{h_b} = \frac{7.13}{1.87} = 3.81 > 0.2$ (NEED TO PROCEED W/ DRIFT CAL.)

DETERMINE (h_d - DRIFT HEIGHT):

$h_d = 0.43 \sqrt[3]{l_u} \sqrt[4]{P_g + 10} - 1.5$

- $l_u = 29' - 6"$
- $P_g = 50$ PSF

$h_d = 0.43(\sqrt[3]{29.5})(\sqrt[4]{50+10}) - 1.5$

$h_d = (.43)(3.09)(2.783) - 1.5$

$h_d = 2.198$ ft (LEEWARD DRIFT ONLY APPLIES)

* $2.198' < 7.13'$

$w = 4(h_d)$

$P_d = h_d(\gamma) = 2.198'(20.5 Pcf)$

$w = 8.792'$

$P_d = 45.06$ PCF

the building is sited in Exposure B for all wind directions, the appropriate multipliers as noted in Figs. 6-5 through 6-7, and in Table 6-4 shall be used.

6.5.3.3.2 Buildings with height h greater than 60 ft (18 m) and other structures. Components and cladding for buildings with a mean roof height in excess of 60 ft (18 m) and for other structures shall be designed on the basis of the most critical exposure category representative of the site as defined in 6.5.3.1, except that Exposure B shall be used for buildings and other structures sited in terrain representative of Exposure A, and Exposure C for certain roofs indicated in Fig. 6-8.

***6.5.4 Shielding.** Where the provisions of 6.4.2 are used there shall be no reductions in velocity pressures due to apparent direct shielding afforded by buildings and other structures or terrain features.

***6.5.5 Wind Speed-up over Hills and Escarpments.** The provisions of this section shall apply to isolated hills or escarpments located in Exposure B, C, or D where the upwind terrain is free of such topographic features for a distance equal to 50H or 1 mile, whichever is smaller, as measured from the point at which H is determined. Wind speed-up over isolated hills and escarpments that constitute abrupt changes in the general topography shall be considered for buildings and other structures sited on the upper half of hills and ridges or near the edges of escarpments, illustrated in Fig. 6-2, by using factor K_{zt}:

$$K_{zt} = (1 + K_1K_2K_3)^2 \quad \text{(Eq. 6-2)}$$

where K_1, K_2 and K_3 are given in Fig. 6-2. The effect of wind speed-up shall not be required to be considered when $H/L_h < 0.2$, or when $H < 15$ ft (4.5 m) for Exposure D, or < 30 ft (9 m) for Exposure C, or < 60 ft (18 m) for all other exposures.

*6.6 Gust Effect Factors

6.6.1 Values of Gust Effect Factors. For main wind-force resisting systems of buildings and other structures, and for components and cladding of open buildings and other structures, the value of the gust effect factor G shall be 0.8 for exposure A and B, and 0.85 for exposure C and D.

***6.6.2 Flexible Buildings and Other Structures.** Gust effect factors G_f for main wind-force resisting systems of flexible buildings and other structures shall be calculated by a rational analysis that incorporates the dynamic properties of the main wind-force resisting system.

6.6.3 Limitations. Where combined gust effect factors and pressure coefficients (GC_p, GC_{pi} and GC_{pf}) are given in the figures and tables, gust effect factors shall not be determined separately.

*6.7 Pressure and Force Coefficients

6.7.1 General. Pressure and force coefficients are given in Figs. 6-3 through 6-8 and Tables 6-4 through 6-10. The values of the coefficients for buildings in Figs. 6-4 through 6-8 and Table 6-4 include the gust effect factors; in these cases the pressure coefficient values and gust effect factors shall not be separated.

6.7.2 Roof Overhangs

6.7.2.1 Main wind-force resisting system. Roof overhangs shall be designed for a positive pressure on the bottom surface of windward roof overhangs corresponding to $C_p = 0.8$ in combination with the pressures indicated in Figs. 6-3 and 6-4.

6.7.2.2 Components and cladding. For all buildings, roof overhangs shall be designed for pressures determined from pressure coefficients given in Fig. 6-5B.

*6.8 Full and Partial Loading

The main wind-force resisting system of buildings with mean roof height greater than 60 ft (18 m) shall be designed for the torsional moments resulting from design wind pressures in Table 6-1 acting in the combinations indicated in Fig. 6-9.

*7. Snow Loads

7.1 Symbols and Notation

C_e = exposure factor as determined from Table 7-2;
C_s = slope factor as determined from Fig. 7-2;
C_t = thermal factor as determined from Table 7-3;
h_b = height of balanced snow load determined by dividing p_f or p_s by γ, in feet (meters);
h_c = clear height from top of balanced snow load to (1) closest point on adjacent upper roof; (2) top of parapet; or (3) top of a projection on the roof, in feet (meters);
h_d = height of snow drift, in feet (meters);
h_o = height of obstruction above the surface of the roof, in feet (meters);
I = importance factor as determined from Table 7-4;
l_u = length of the roof upwind of the drift, in feet (meters);

FIG. 7-7. Drifts Formed at Windward and Leeward Steps

zero there. The maximum intensity of the drift surcharge load, p_d, equals $h_d\gamma$ (in SI: $h_d\gamma/102$) where snow density, γ, is defined in Eq. (7-3):

$\gamma = 0.13p_g + 14$ but not more than 30 lb/cu ft (Eq. 7-3)
(in SI: $\gamma = 43.5p_g + 224$ but not more than 48 kg/m^3)

This density shall also be used to determine h_b by dividing p_f (or p_s) by γ (in SI: also multiply by 102 to get the depth in meters).

7.7.3 Adjacent Structures and Terrain Features. The requirements in 7.7.1 and 7.7.2 shall also be used to determine drift loads caused by a higher structure or terrain feature within 20 ft (6.1 m) of a roof. The separation distance, s, between the roof and adjacent structure or terrain feature shall reduce applied drift loads on the lower roof by the factor $(20 - s)/20$ where s is in feet [$(6.1 - s)/6.1$ where s is in meters].

*7.8 Roof Projections

The method in 7.7.2 shall be used to calculate drift loads on all sides of roof projections and at parapet walls. The height of such drifts shall be taken as half the drift height from Fig. 7-8 (i.e., 0.5 h_d) with l_u equal to the length of the roof upwind of the projection or parapet wall. If the side of a roof projection is less than 15 ft (4.6 m) long, a drift load is not required to be applied to that side.

*7.9 Sliding Snow

The extra load caused by snow sliding off a sloped roof onto a lower roof shall be determined assuming that all the snow that accumulates on the upper roof under the balanced loading condition slides onto the lower roof. The solid lines in Fig. 7-2 shall be used to determine the total extra load available from the upper roof, regardless of the surface of the upper roof.

The sliding snow load shall not be reduced unless a portion of the snow on the upper roof is blocked from sliding onto the lower roof by snow already on the lower roof or is expected to slide clear of the lower roof.

Sliding loads shall be superimposed on the balanced snow load.

*7.10 Rain-on-Snow Surcharge Load

For locations where p_g is 20 lb/sq ft (0.96 kN/m^2) or less but not zero, all roofs with a slope less than 1/2 in./ft (2.38°), shall have a 5 lb/sq ft (0.24 kN/m^2) rain-on-snow surcharge load applied to establish the design snow load. Where the minimum flat roof design snow load from 7.3.4 ex-

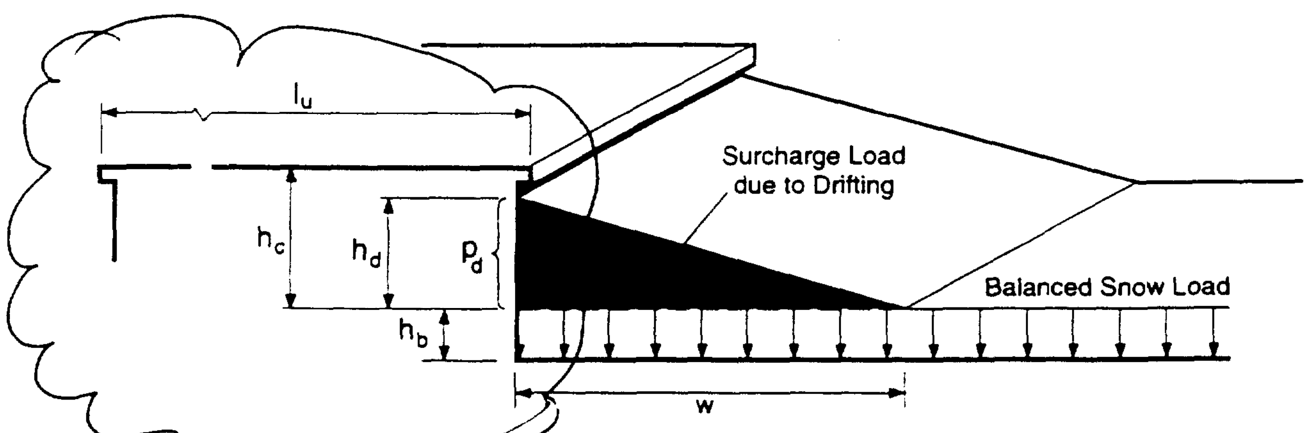
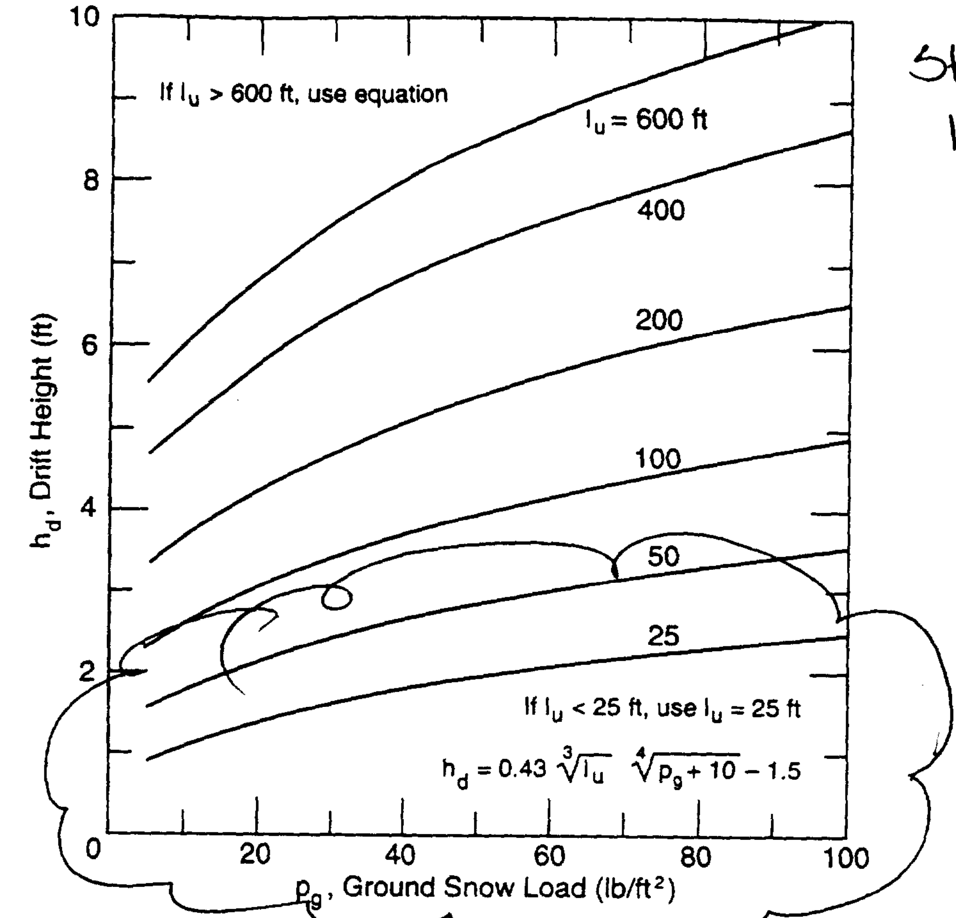


FIG. 7-8. Configuration of Snow Drifts on Lower Roofs

SHEET 18 OF 53



To convert lb/ft² to kN/m², multiply by 0.0479.
To convert feet to meters, multiply by 0.3048.

FIG. 7-9. Graph and Equation for Determining Drift Height h_d

ceeds p_f as determined by Eq. (7-1), the rain-on-snow surcharge load shall be reduced by the difference between these two values, with a maximum reduction of 5 lb/sq ft (0.24 kN/m²).

*7.11 Ponding Instability

Roofs shall be designed to preclude ponding instability. For roofs with a slope less than 1/4 in./ft (1.19°), roof deflections caused by full snow loads shall be investigated when determining the likelihood of ponding instability from rain-on-snow or from snow meltwater (see Section 8.4).

*7.12 Existing Roofs

Existing roofs shall be evaluated for increased snow loads caused by additions, alterations, and new structures located nearby (see footnote to Table 7-2 and Section 7.7.3) and strengthened as necessary.

*8. Rain Loads

*8.1 Symbols and Notations

R = rain load on the undeflected roof, in pounds per square foot (kilonewtons per square meter). When the phrase "undeflected roof" is used, deflections from loads (including dead loads) shall not be considered when determining the amount of rain on the roof.

d_s = depth of water on the undeflected roof up to the inlet of the secondary drainage system when the primary drainage system is blocked (i.e., the static head), in inches (millimeters).

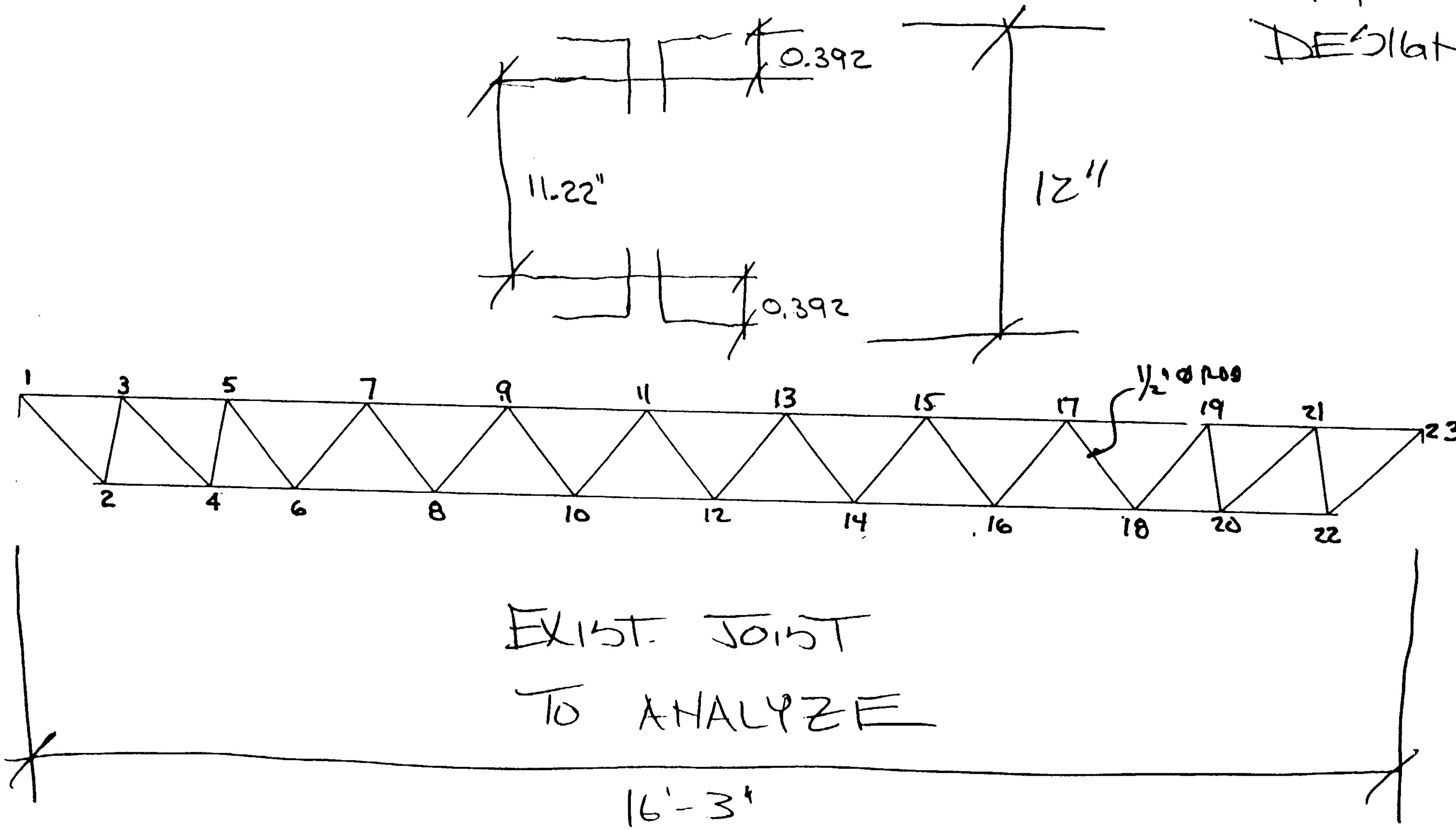
d_h = additional depth of water on the undeflected roof above the inlet of the secondary drainage system at its design flow (i.e., the hydraulic head), in inches (millimeters).

NODE	X	Y	Span on Node (ft.)	Ceiling Dead Load (LB)	Roof Dead Load (LB)	Snow Load (LB)	Snow Full Drift Load (LB)	New HVAC Load (LB)	Drfit Load Reduction due to HVAC (LB)
1	0	11.22	0.61 feet	40	34	119			
2	12.6875	0							
3	14.625	11.22	1.22 feet	40	67	238	236		-118
4	27.3125	0							
5	29.25	11.22	1.42 feet	40	78	278	224		-112
6	39	0							
7	48.75	11.22	1.63 feet	40	90	318	194		-97
8	58.5	0							
9	68.25	11.22	1.63 feet	40	90	318	125	250	-63
10	78	0							
11	87.75	11.22	1.63 feet	40	90	318	59		-30
12	97.5	0							
13	107.25	11.22	1.63 feet	40	90	318	10	250	-5
14	117	0							
15	126.75	11.22	1.63 feet	40	90	318	0		
16	136.5	0							
17	146.25	11.22	1.63 feet	40	90	318	0		
18	156	0							
19	165.75	11.22	1.42 feet	40	78	278	0		
20	167.688	0							
21	180.375	11.22	1.22 feet	40	67	238	0		
22	182.313	0							
23	195	11.22	0.61 feet	40	34	119	0		

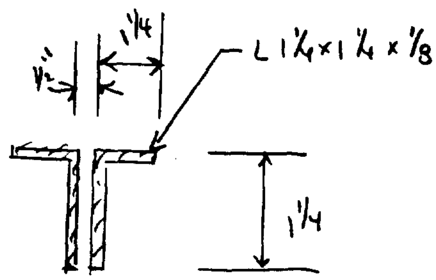
Ceiling Dead Load: 5 psf * 5' trib width = 25 pounds per lineal foot
Roof Dead Load: 11 psf * 5' trib width = 55 pounds per lineal foot
Roof Snow Load: 39 psf * 5' trib width = 195 pounds per lineal foot
Roof Full Drift Load: 45 psf * 5' trib width = 225 pounds per lineal foot @ face of wall to 0 pounds per lineal foot a 8.7 feet
HVAC Load: 1000 pounds spans over 2 joists and must be supported on joist panel points 1000 lb/4 = 250 lb per panel point

2/20/04
COFFEE BY DESIGN

L 1¼ X 1¼ X ⅛



FACE OF BLOCK
TO
FACE OF BLOCK



$A = 2[1.25(.125) + 1.125(.125)] = 0.594 \text{ in}^2$

$0.594 \text{ in}^2 \, \bar{y} = (2)1.25(.125)(1.125) + 2(1.125)(.125)(0.5625)$

$0.594 \bar{y} = 0.352 + 0.158 \qquad \bar{y} = 0.858 \text{ in}$

$I_o = \Sigma I_o + Ad^2$

$I_o = 2\left(\frac{1.25(.125)^3}{12} + 0.156(0.267)^2\right) + 2\left(\frac{.125(1.125)^3}{12} + 0.141(0.3)^2\right)$

$= 0.023 + 0.055 = 0.078 \text{ in}^4$

$S_{x_T} = \frac{0.078 \text{ in}^4}{0.392 \text{ in}} = 0.199$

$S_{x_B} = \frac{0.078 \text{ in}^4}{0.858} = 0.091$

$r_x = \sqrt{I_x / A} = \sqrt{\frac{.078 \text{ in}^4}{.594 \text{ in}^2}} = 0.131 \text{ in}$

$\hat{x} = 1.25''$

$$I_o = 2\left(\frac{1.25(.125)^3}{12} + 1.25(.125)(0.313)^2\right) + 2\left(\frac{.125(1.125)^3}{12} + 1.125(.125)(0.94)^2\right)$$

$$= 0.03 + 0.278 = 0.309 \text{ in}^4$$

$$r_y = \sqrt{I_y/A} = \sqrt{\frac{0.309}{0.594}} = 0.72 \text{ in}$$

$$S_y = I/c = \frac{.309 \text{ in}^4}{1.5 \text{ in}} = 0.206 \text{ in}^3$$

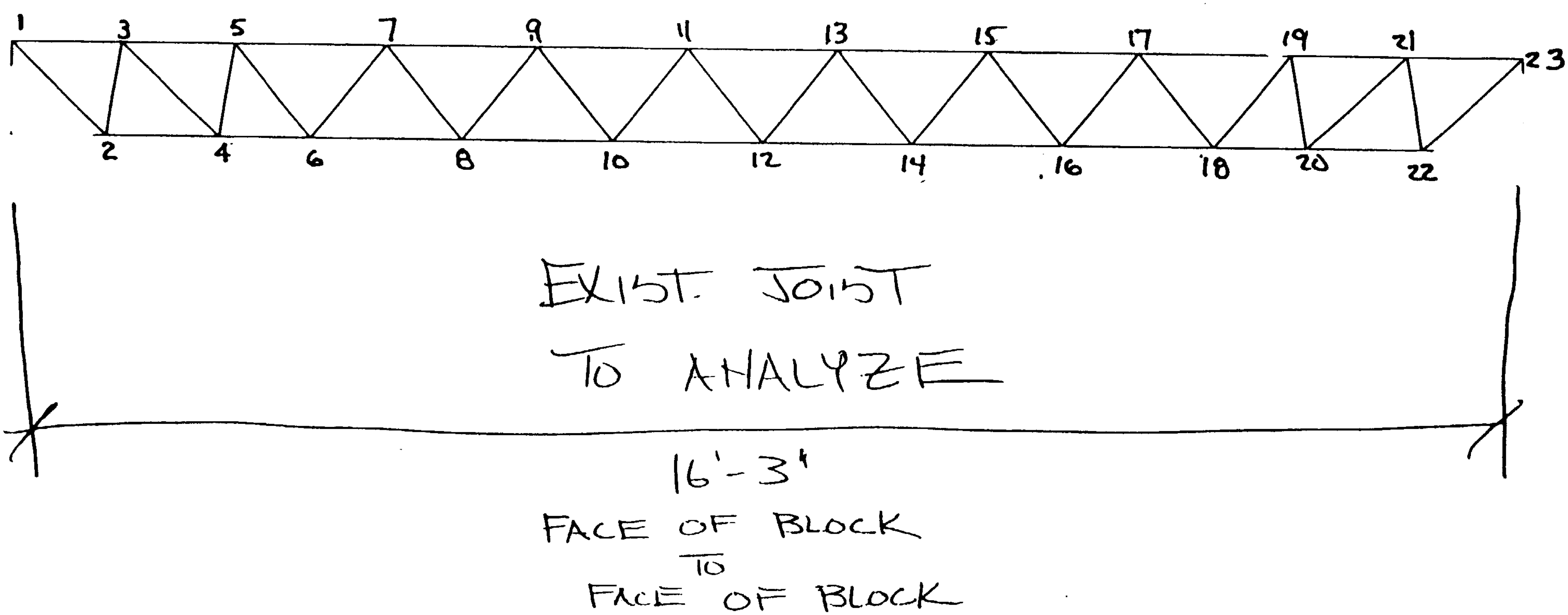
½" ⌀ ROD: $A = \pi(.25)^2 = 0.196 \text{ in}^2$

$r = d/4 = .5/4 = 0.125 \text{ in}$

CEILING DEAD LOAD

USE 5psf x 5' trib = 25 PLF

USE 25PLF x 1.62' = 40# PANEL NODES 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22



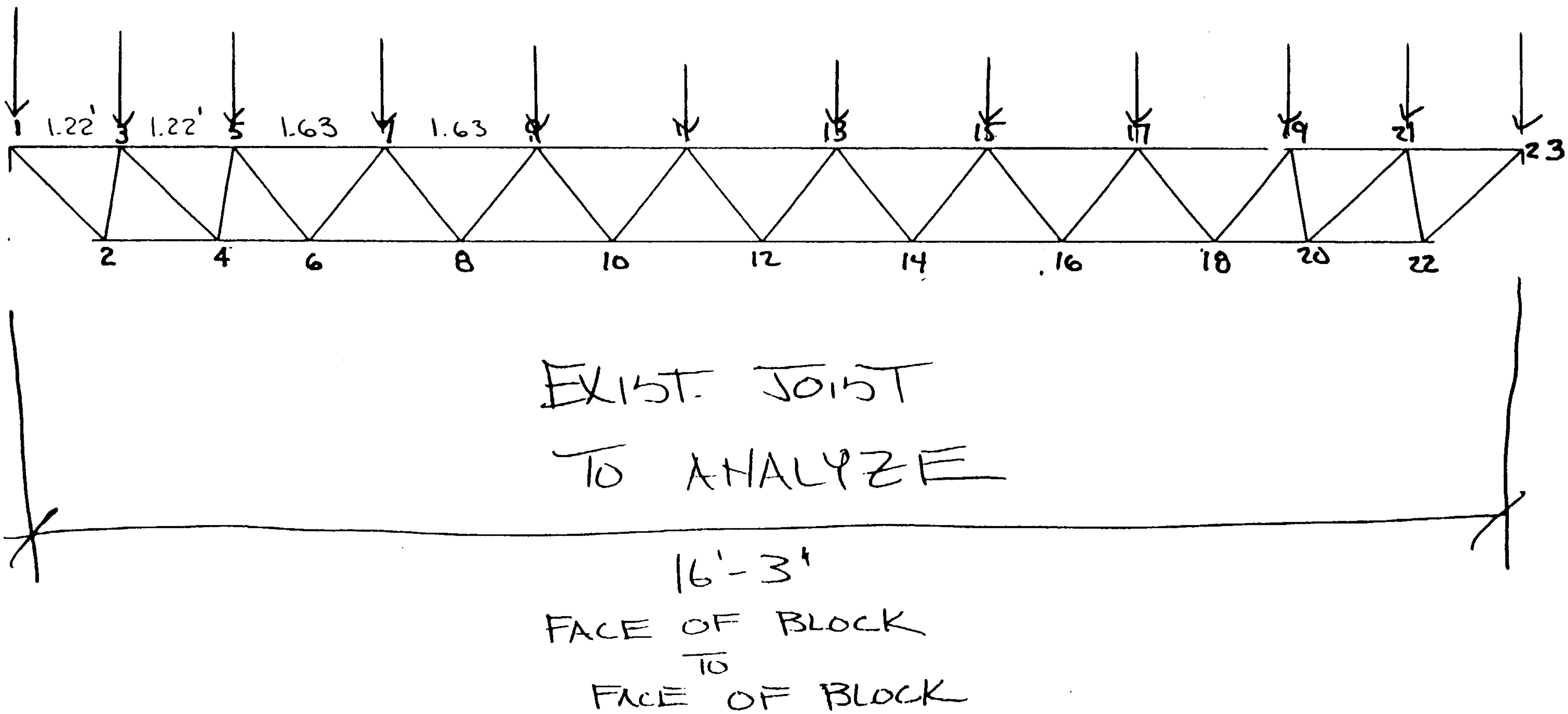
ROOF DEAD LOAD   11psf x 5' = 55 pLF

NODE 1 & 23   0.61' (55) = 34

3 & 21 $\frac{1.22' + 1.22'}{2}$ (55) = 67

5 & 19 $\frac{1.22 + 1.63}{2}$ (55) = 78

7, 9, 11, 13, 15, 17   1.63(55) = 90



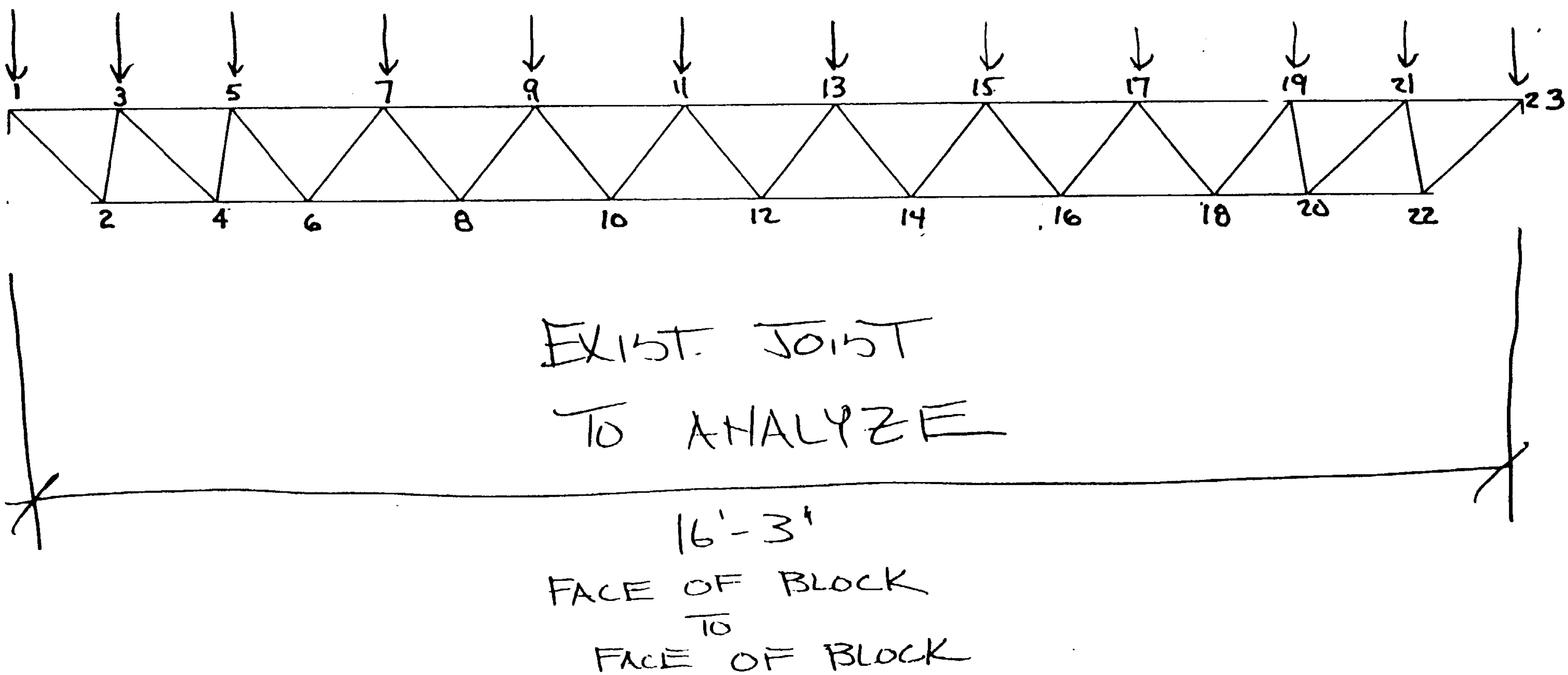
<u>ROOF SNOW LOAD</u> 39 psf x 5' TRIB = 195 #/LF

NODE 1, & 23 — $0.61'(195) = 119$

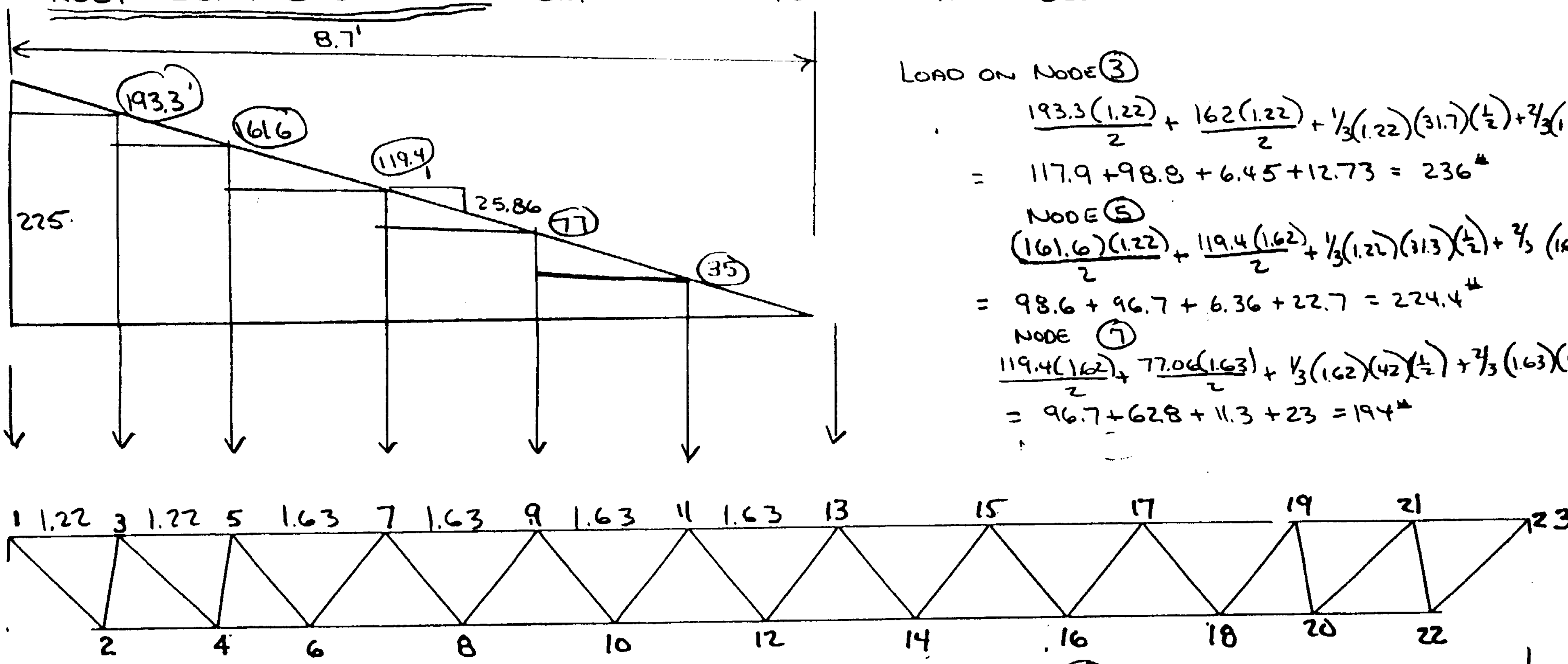
3 & 21 — $\frac{1.22+1.22}{2}(195) = 238$

5 & 19 — $\frac{1.22+1.63}{2}(195) = 278$

7, 9, 11, 13, 15, 17 — $1.63(195) = 318$



ROOF DRIFT SNOW LOAD: DRIFT LOAD = 45 PSF × 5' TRIB = 225#



LOAD ON NODE (3)

$\frac{193.3(1.22)}{2} + \frac{162(1.22)}{2} + \frac{1}{3}(1.22)(31.7)(\frac{1}{2}) + \frac{2}{3}(1.22)(31.\ldots$

$= 117.9 + 98.8 + 6.45 + 12.73 = 236^{\#}$

NODE (5)

$\frac{(161.6)(1.22)}{2} + \frac{119.4(1.62)}{2} + \frac{1}{3}(1.22)(31.3)(\frac{1}{2}) + \frac{2}{3}(1.62)(42\ldots$

$= 98.6 + 96.7 + 6.36 + 22.7 = 224.4^{\#}$

NODE (7)

$\frac{119.4(1.62)}{2} + \frac{77.06(1.63)}{2} + \frac{1}{3}(1.62)(42)(\frac{1}{2}) + \frac{2}{3}(1.63)(42)(\frac{1}{2}\ldots$

$= 96.7 + 62.8 + 11.3 + 23 = 194^{\#}$

NODE (9)

$\frac{77.06(1.63)}{2} + \frac{35(1.62)}{2} + \frac{1}{3}(1.63)(42)(\frac{1}{2}) + \frac{2}{3}(1.62)(42)(\ldots$

$= 62.8 + 28.4 + 11.3 + 22.7 = 125.2^{\#}$

EXIST. JOIST TO ANALYZE

16'-3"
FACE OF BLOCK
TO
FACE OF BLOCK

NODE (11)

$\frac{35(1.62)}{2} + \frac{2}{3}(35)(1.63)(\frac{1}{2}) + \frac{1}{3}(1.62)(42)(\frac{1}{2})$

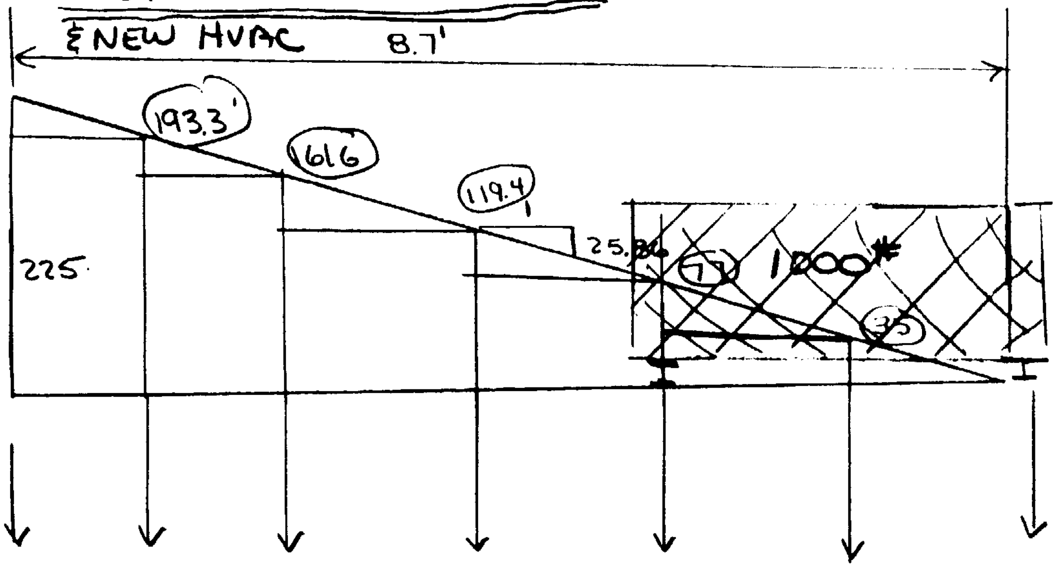
$= 28.4 + 19 + 11.3 = 59^{\#}$

NODE (13)

$\frac{1}{3}(35)(1.63)(\frac{1}{2}) = 9.5^{\#}$

Roof Drift Snow Load & New HVAC:

Drift Load = 45 PSF × 5' TRIB = 225#



Load on Node (3)

$$\frac{193.3(1.22)}{2} + \frac{162(1.22)}{2} + \tfrac{1}{3}(1.22)(31.7)(\tfrac{1}{2}) + \tfrac{2}{3}(1.22)(31.3)(\ldots$$

$$= 117.9 + 98.8 + 6.45 + 12.73 = 236^{\#}/2 = 118^{\#}$$

Node (5)

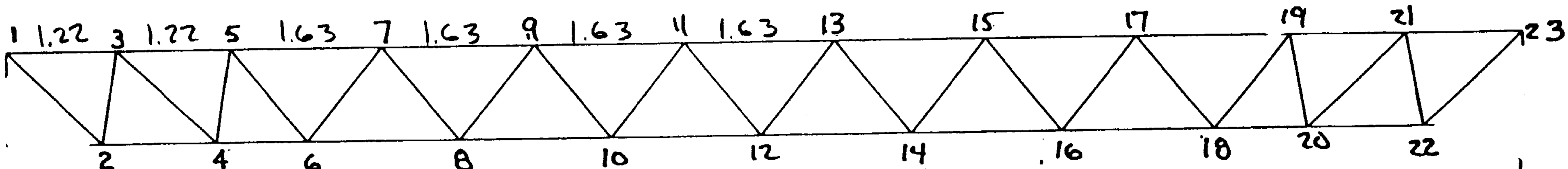
$$\frac{(161.6)(1.22)}{2} + \frac{119.4(1.62)}{2} + \tfrac{1}{3}(1.22)(31.3)(\tfrac{1}{2}) + \tfrac{2}{3}(1.62)(42)(\ldots$$

$$= 98.6 + 96.7 + 6.36 + 22.7 = \frac{224.4^{\#}}{2} = 112^{\#}$$

Node (7)

$$\frac{119.4(1.62)}{2} + \frac{77.06(1.63)}{2} + \tfrac{1}{3}(1.62)(42)(\tfrac{1}{2}) + \tfrac{2}{3}(1.63)(42)(\tfrac{1}{2})$$

$$= 96.7 + 62.8 + 11.3 + 23 = \frac{194^{\#}}{2} = 97^{\#}$$



NOTE: AIR HANDLER WILL PREVENT DRIFT IN ITS AREA SUPPORTED BY 2 JOISTS WILL REDUCE ½ DRIFT LOAD ON JOIST

EXIST. JOIST TO ANALYZE

Node (9)

$$\frac{77.06(1.63)}{2} + \frac{35(1.62)}{2} + \tfrac{1}{3}(1.63)(42)(\tfrac{1}{2}) + \tfrac{2}{3}(1.62)(42)(\tfrac{1}{2})$$

$$= 62.8 + 28.4 + 11.3 + 22.7 = \frac{125.2^{\#}}{2} = 63^{\#}$$

HVAC LOAD
NODE 9 & 11

$$1000^{\#}/4 = 250^{\#}$$

16'-3"
FACE OF BLOCK TO FACE OF BLOCK

Node (11)

$$\frac{35(1.62)}{2} + \tfrac{2}{3}(35)(1.63)(\tfrac{1}{2}) + \tfrac{1}{3}(1.62)(42)(\tfrac{1}{2})$$

$$= 28.4 + 19 + 11.3 = 59^{\#}/2 = 30^{\#}$$

Node (13)

$$\tfrac{1}{3}(35)(1.63)(\tfrac{1}{2}) = 9.5^{\#}/2 = 5^{\#}$$

Mechanical Services Coffee House

VisualAnalysis 4.00 Report

Company: Spaulding Engineering **Engineer: Dan Spaulding** **Billing: Mechanical Services Portland**

File: C:\My Documents\2004mechservice\coffeetrusswHVAC.vap

Material Properties

Material	Strength *psi*	Elasticity *psi*	Poisson	Density *lb/in^3*	Therm. Coeff. *in/in/deg-F*
Steel	-NA-	29000000.0	0.3000	0.2836	0.0000

Member Extreme Results

Member	Fx(1c) *lb*
M1	5438.97(1)
"	5438.97(1)
M2	2384.53(1)
"	2384.53(1)
M3	455.790(1)
"	455.790(1)
M4	-2107.5(1)
"	-2107.5(1)
M5	-3522.6(1)
"	-3522.6(1)
M6	-3847.6(1)
"	**-3847.6(1)**
M7	-3130.6(1)
"	-3130.6(1)
M8	-1393.7(1)
"	-1393.7(1)
M9	1136.09(1)
"	1136.09(1)
M10	2976.17(1)
"	2976.17(1)
M11	5774.60(1)
"	5774.60(1)
M12	3586.09(1)
"	3586.09(1)
M13	6559.40(1)
"	6559.40(1)
M14	9602.94(1)
"	9602.94(1)
M15	11685.5(1)
"	11685.5(1)

EXISTING JOIST

CEILING DEAD LOAD
ROOF DEAD LOAD
ROOF SNOW LOAD
NEW HVAC LOAD
PARTIAL DRIFT BECAUSE HVAC UNIT PREVENTS DRIFT OVER 1/2 JOIST TRIB WIDTH.

STRESSES ARE O.K.

JOIST IS O.K.

Member	Fx(lc) lb
M16	**12433.0(1)**
"	12433.0(1)
M17	12335.1(1)
"	12335.1(1)
M18	10992.6(1)
"	10992.6(1)
M19	8857.23(1)
"	8857.23(1)
M20	5929.49(1)
"	5929.49(1)
M21	3192.70(1)
"	3192.70(1)
M22	4159.82(1)
"	4160.45(1)
M23	-2754.0(1)
"	-2753.4(1)
M24	3451.35(1)
"	3451.97(1)
M25	-2277.8(1)
"	-2277.2(1)
M26	2348.18(1)
"	2348.81(1)
M27	-2291.2(1)
"	-2290.6(1)
M28	1616.14(1)
"	1616.76(1)
M29	-1558.3(1)
"	-1557.7(1)
M30	598.394(1)
"	599.018(1)
M31	-540.57(1)
"	-539.95(1)
M32	-45.764(1)
"	-45.140(1)
M33	103.809(1)
"	104.432(1)
M34	-992.44(1)
"	-991.81(1)
M35	1054.77(1)
"	1055.39(1)
M36	-1595.5(1)
"	-1594.8(1)
M37	1660.51(1)
"	1661.13(1)
M38	-2198.5(1)
"	-2197.9(1)
M39	2265.38(1)

Member	Fx (lc) Lb
"	2266.01(1)
M40	-2095.8(1)
"	-2095.2(1)
M41	3185.06(1)
"	3185.69(1)
M42	-2452.4(1)
"	-2451.8(1)
M43	3712.45(1)
"	3713.07(1)

Member Internal Stresses

Member	Load Case	Offset in	fa Ksi
M1	DL&CL&SL&HVAC&Drift	0.0000	9.1565
"	"	1.6256	9.1565
"	"	3.2511	9.1565
"	"	4.8767	9.1565
"	"	6.5022	9.1565
"	"	8.1278	9.1565
"	"	9.7533	9.1565
"	"	11.3789	9.1565
"	"	13.0044	9.1565
"	"	14.6300	9.1565
M2	"	0.0000	4.0144
"	"	1.6244	4.0144
"	"	3.2489	4.0144
"	"	4.8733	4.0144
"	"	6.4978	4.0144
"	"	8.1222	4.0144
"	"	9.7467	4.0144
"	"	11.3711	4.0144
"	"	12.9956	4.0144
"	"	14.6200	4.0144
M3	"	0.0000	0.7673
"	"	2.1667	0.7673
"	"	4.3333	0.7673
"	"	6.5000	0.7673
"	"	8.6667	0.7673
"	"	10.8333	0.7673
"	"	13.0000	0.7673
"	"	15.1667	0.7673
"	"	17.3333	0.7673
"	"	19.5000	0.7673

Member	Load Case	Offset in	fa Ksi
M4	"	0.0000	-3.5481
"	"	2.1667	-3.5481
"	"	4.3333	-3.5481
"	"	6.5000	-3.5481
"	"	8.6667	-3.5481
"	"	10.8333	-3.5481
"	"	13.0000	-3.5481
"	"	15.1667	-3.5481
"	"	17.3333	-3.5481
"	"	19.5000	-3.5481
M5	"	0.0000	-5.9304
"	"	2.1667	-5.9304
"	"	4.3333	-5.9304
"	"	6.5000	-5.9304
"	"	8.6667	-5.9304
"	"	10.8333	-5.9304
"	"	13.0000	-5.9304
"	"	15.1667	-5.9304
"	"	17.3333	-5.9304
"	"	19.5000	-5.9304
M6	"	0.0000	-6.4775
"	"	2.1722	-6.4775
"	"	4.3444	-6.4775
"	"	6.5167	-6.4775
"	"	8.6889	-6.4775
"	"	10.8611	-6.4775
"	"	13.0333	-6.4775
"	"	15.2056	-6.4775
"	"	17.3778	-6.4775
"	"	19.5500	-6.4775
M7	"	0.0000	-5.2705
"	"	2.1667	-5.2705
"	"	4.3333	-5.2705
"	"	6.5000	-5.2705
"	"	8.6667	-5.2705
"	"	10.8333	-5.2705
"	"	13.0000	-5.2705
"	"	15.1667	-5.2705
"	"	17.3333	-5.2705
"	"	19.5000	-5.2705
M8	"	0.0000	-2.3464
"	"	2.1667	-2.3464
"	"	4.3333	-2.3464
"	"	6.5000	-2.3464
"	"	8.6667	-2.3464
"	"	10.8333	-2.3464
"	"	13.0000	-2.3464

Member	Load Case	Offset in	fa Ksi
"	"	15.1667	-2.3464
"	"	17.3333	-2.3464
"	"	19.5000	-2.3464
M9	"	0.0000	1.9126
"	"	2.1667	1.9126
"	"	4.3333	1.9126
"	"	6.5000	1.9126
"	"	8.6667	1.9126
"	"	10.8333	1.9126
"	"	13.0000	1.9126
"	"	15.1667	1.9126
"	"	17.3333	1.9126
"	"	19.5000	1.9126
M10	"	0.0000	5.0104
"	"	1.6222	5.0104
"	"	3.2444	5.0104
"	"	4.8667	5.0104
"	"	6.4889	5.0104
"	"	8.1111	5.0104
"	"	9.7333	5.0104
"	"	11.3556	5.0104
"	"	12.9778	5.0104
"	"	14.6000	5.0104
M11	"	0.0000	9.7216
"	"	1.6222	9.7216
"	"	3.2444	9.7216
"	"	4.8667	9.7216
"	"	6.4889	9.7216
"	"	8.1111	9.7216
"	"	9.7333	9.7216
"	"	11.3556	9.7216
"	"	12.9778	9.7216
"	"	14.6000	9.7216
M12	"	0.0000	6.0372
"	"	1.6244	6.0372
"	"	3.2489	6.0372
"	"	4.8733	6.0372
"	"	6.4978	6.0372
"	"	8.1222	6.0372
"	"	9.7467	6.0372
"	"	11.3711	6.0372
"	"	12.9956	6.0372
"	"	14.6200	6.0372
M13	"	0.0000	11.0428
"	"	1.2989	11.0428
"	"	2.5978	11.0428
"	"	3.8967	11.0428

Member	Load Case	Offset in	fa Ksi
"	"	5.1956	11.0428
"	"	6.4944	11.0428
"	"	7.7933	11.0428
"	"	9.0922	11.0428
"	"	10.3911	11.0428
"	"	11.6900	11.0428
M14	"	0.0000	16.1666
"	"	2.1667	16.1666
"	"	4.3333	16.1666
"	"	6.5000	16.1666
"	"	8.6667	16.1666
"	"	10.8333	16.1666
"	"	13.0000	16.1666
"	"	15.1667	16.1666
"	"	17.3333	16.1666
"	"	19.5000	16.1666
M15	"	0.0000	19.6727
"	"	2.1667	19.6727
"	"	4.3333	19.6727
"	"	6.5000	19.6727
"	"	8.6667	19.6727
"	"	10.8333	19.6727
"	"	13.0000	19.6727
"	"	15.1667	19.6727
"	"	17.3333	19.6727
"	"	19.5000	19.6727
M16	"	0.0000	20.9311
"	"	2.1667	20.9311
"	"	4.3333	20.9311
"	"	6.5000	20.9311
"	"	8.6667	20.9311
"	"	10.8333	20.9311
"	"	13.0000	20.9311
"	"	15.1667	20.9311
"	"	17.3333	20.9311
"	"	19.5000	20.9311
M17	"	0.0000	20.7663
"	"	2.1667	20.7663
"	"	4.3333	20.7663
"	"	6.5000	20.7663
"	"	8.6667	20.7663
"	"	10.8333	20.7663
"	"	13.0000	20.7663
"	"	15.1667	20.7663
"	"	17.3333	20.7663
"	"	19.5000	20.7663
M18	"	0.0000	18.5062

Member	Load Case	Offset in	fa Ksi
"	"	2.1667	18.5062
"	"	4.3333	18.5062
"	"	6.5000	18.5062
"	"	8.6667	18.5062
"	"	10.8333	18.5062
"	"	13.0000	18.5062
"	"	15.1667	18.5062
"	"	17.3333	18.5062
"	"	19.5000	18.5062
M19	"	0.0000	14.9112
"	"	2.1667	14.9112
"	"	4.3333	14.9112
"	"	6.5000	14.9112
"	"	8.6667	14.9112
"	"	10.8333	14.9112
"	"	13.0000	14.9112
"	"	15.1667	14.9112
"	"	17.3333	14.9112
"	"	19.5000	14.9112
M20	"	0.0000	9.9823
"	"	1.3000	9.9823
"	"	2.6000	9.9823
"	"	3.9000	9.9823
"	"	5.2000	9.9823
"	"	6.5000	9.9823
"	"	7.8000	9.9823
"	"	9.1000	9.9823
"	"	10.4000	9.9823
"	"	11.7000	9.9823
M21	"	0.0000	5.3749
"	"	1.6233	5.3749
"	"	3.2467	5.3749
"	"	4.8700	5.3749
"	"	6.4933	5.3749
"	"	8.1167	5.3749
"	"	9.7400	5.3749
"	"	11.3633	5.3749
"	"	12.9867	5.3749
"	"	14.6100	5.3749
M22	"	0.0000	**21.2268**
"	"	1.8821	21.2264
"	"	3.7642	21.2261
"	"	5.6463	21.2257
"	"	7.5284	21.2254
"	"	9.4105	21.2250
"	"	11.2926	21.2247
"	"	13.1747	21.2243

Member	Load Case	Offset in	fa Ksi
"	"	15.0568	21.2240
"	"	16.9388	21.2236
M23	"	0.0000	-14.051
"	"	1.2652	-14.051
"	"	2.5303	-14.050
"	"	3.7955	-14.050
"	"	5.0607	-14.049
"	"	6.3258	-14.049
"	"	7.5910	-14.049
"	"	8.8562	-14.048
"	"	10.1213	-14.048
"	"	11.3865	-14.048
M24	"	0.0000	17.6121
"	"	1.8813	17.6118
"	"	3.7625	17.6114
"	"	5.6438	17.6111
"	"	7.5250	17.6107
"	"	9.4063	17.6104
"	"	11.2876	17.6100
"	"	13.1688	17.6097
"	"	15.0501	17.6093
"	"	16.9314	17.6090
M25	"	0.0000	-11.621
"	"	1.2652	-11.621
"	"	2.5303	-11.621
"	"	3.7955	-11.620
"	"	5.0607	-11.620
"	"	6.3258	-11.619
"	"	7.5910	-11.619
"	"	8.8562	-11.619
"	"	10.1213	-11.618
"	"	11.3865	-11.618
M26	"	0.0000	11.9837
"	"	1.6516	11.9834
"	"	3.3032	11.9830
"	"	4.9548	11.9827
"	"	6.6064	11.9823
"	"	8.2580	11.9820
"	"	9.9096	11.9816
"	"	11.5612	11.9813
"	"	13.2128	11.9809
"	"	14.8644	11.9806
M27	"	0.0000	-11.690
"	"	1.6516	-11.689
"	"	3.3032	-11.689
"	"	4.9548	-11.689
"	"	6.6064	-11.688

Member	Load Case	Offset in	fa Ksi
"	"	8.2580	-11.688
"	"	9.9096	-11.687
"	"	11.5612	-11.687
"	"	13.2128	-11.687
"	"	14.8644	-11.686
M28	"	0.0000	8.2488
"	"	1.6516	8.2485
"	"	3.3032	8.2481
"	"	4.9548	8.2478
"	"	6.6064	8.2474
"	"	8.2580	8.2471
"	"	9.9096	8.2467
"	"	11.5612	8.2463
"	"	13.2128	8.2460
"	"	14.8644	8.2456
M29	"	0.0000	-7.9507
"	"	1.6516	-7.9503
"	"	3.3032	-7.9500
"	"	4.9548	-7.9496
"	"	6.6064	-7.9493
"	"	8.2580	-7.9489
"	"	9.9096	-7.9485
"	"	11.5612	-7.9482
"	"	13.2128	-7.9478
"	"	14.8644	-7.9475
M30	"	0.0000	3.0562
"	"	1.6516	3.0559
"	"	3.3032	3.0555
"	"	4.9548	3.0552
"	"	6.6064	3.0548
"	"	8.2580	3.0544
"	"	9.9096	3.0541
"	"	11.5612	3.0537
"	"	13.2128	3.0534
"	"	14.8644	3.0530
M31	"	0.0000	-2.7581
"	"	1.6516	-2.7577
"	"	3.3032	-2.7574
"	"	4.9548	-2.7570
"	"	6.6064	-2.7566
"	"	8.2580	-2.7563
"	"	9.9096	-2.7559
"	"	11.5612	-2.7556
"	"	13.2128	-2.7552
"	"	14.8644	-2.7549
M32	"	0.0000	-0.2303
"	"	1.6516	-0.2307

Member	Load Case	Offset in	fa Ksi
"	"	3.3032	-0.2310
"	"	4.9548	-0.2314
"	"	6.6064	-0.2317
"	"	8.2580	-0.2321
"	"	9.9096	-0.2324
"	"	11.5612	-0.2328
"	"	13.2128	-0.2331
"	"	14.8644	-0.2335
M33	"	0.0000	0.5296
"	"	1.6553	0.5300
"	"	3.3105	0.5303
"	"	4.9658	0.5307
"	"	6.6210	0.5311
"	"	8.2763	0.5314
"	"	9.9315	0.5318
"	"	11.5868	0.5321
"	"	13.2420	0.5325
"	"	14.8973	0.5328
M34	"	0.0000	-5.0603
"	"	1.6480	-5.0606
"	"	3.2959	-5.0610
"	"	4.9439	-5.0614
"	"	6.5919	-5.0617
"	"	8.2398	-5.0621
"	"	9.8878	-5.0624
"	"	11.5357	-5.0628
"	"	13.1837	-5.0631
"	"	14.8317	-5.0635
M35	"	0.0000	5.3815
"	"	1.6553	5.3818
"	"	3.3105	5.3822
"	"	4.9658	5.3825
"	"	6.6210	5.3829
"	"	8.2763	5.3833
"	"	9.9315	5.3836
"	"	11.5868	5.3840
"	"	13.2420	5.3843
"	"	14.8973	5.3847
M36	"	0.0000	-8.1372
"	"	1.6480	-8.1376
"	"	3.2959	-8.1379
"	"	4.9439	-8.1383
"	"	6.5919	-8.1386
"	"	8.2398	-8.1390
"	"	9.8878	-8.1393
"	"	11.5357	-8.1397
"	"	13.1837	-8.1400

Member	Load Case	Offset in	fa Ksi
"	"	14.8317	-8.1404
M37	"	0.0000	8.4720
"	"	1.6553	8.4724
"	"	3.3105	8.4727
"	"	4.9658	8.4731
"	"	6.6210	8.4734
"	"	8.2763	8.4738
"	"	9.9315	8.4741
"	"	11.5868	8.4745
"	"	13.2420	8.4748
"	"	14.8973	8.4752
M38	"	0.0000	-11.214
"	"	1.6480	-11.214
"	"	3.2959	-11.214
"	"	4.9439	-11.215
"	"	6.5919	-11.215
"	"	8.2398	-11.215
"	"	9.8878	-11.216
"	"	11.5357	-11.216
"	"	13.1837	-11.217
"	"	14.8317	-11.217
M39	"	0.0000	11.5581
"	"	1.6553	11.5585
"	"	3.3105	11.5588
"	"	4.9658	11.5592
"	"	6.6210	11.5595
"	"	8.2763	11.5599
"	"	9.9315	11.5602
"	"	11.5868	11.5606
"	"	13.2420	11.5609
"	"	14.8973	11.5613
M40	"	0.0000	-10.689
"	"	1.2644	-10.690
"	"	2.5288	-10.690
"	"	3.7932	-10.690
"	"	5.0577	-10.691
"	"	6.3221	-10.691
"	"	7.5865	-10.692
"	"	8.8509	-10.692
"	"	10.1153	-10.692
"	"	11.3797	-10.693
M41	"	0.0000	16.2503
"	"	1.8829	16.2507
"	"	3.7659	16.2511
"	"	5.6488	16.2514
"	"	7.5317	16.2518
"	"	9.4146	16.2521

Member	Load Case	Offset in	fa Ksi
"	"	11.2976	16.2525
"	"	13.1805	16.2528
"	"	15.0634	16.2532
"	"	16.9463	16.2535
M42	"	0.0000	-12.509
"	"	1.2646	-12.509
"	"	2.5292	-12.510
"	"	3.7938	-12.510
"	"	5.0584	-12.510
"	"	6.3230	-12.511
"	"	7.5876	-12.511
"	"	8.8522	-12.511
"	"	10.1168	-12.512
"	"	11.3814	-12.512
M43	"	0.0000	18.9411
"	"	1.8821	18.9414
"	"	3.7642	18.9418
"	"	5.6463	18.9421
"	"	7.5284	18.9425
"	"	9.4105	18.9429
"	"	11.2926	18.9432
"	"	13.1747	18.9436
"	"	15.0568	18.9439
"	"	16.9388	18.9443

Member Min/Max Displacements

This item is empty. Check the selection state, or report properties.

Member Min/Max Stresses

Extreme	Item	Member	Load Case	Offset in	fa Ksi
Max	fx	M22	DL&CL&SL&HVAC&Drift	0.0000	21.2268
Min	fx	M23	"	0.0000	-14.051

Nodal Displacements

Node	Load Case	DX in	DY in

Node	Load Case	DX in	DY in
N1	DL&CL&SL&HVAC&Drift	0.0000	**0.0000**
N2	"	**-0.0457**	-0.0704
N3	"	0.0046	-0.0847
N4	"	-0.0427	-0.1537
N5	"	0.0066	-0.1669
N6	"	-0.0382	-0.2140
N7	"	0.0072	-0.2614
N8	"	-0.0274	-0.2970
N9	"	0.0048	-0.3303
N10	"	-0.0141	-0.3488
N11	"	0.0008	-0.3636
N12	"	-0.0001	**-0.3642**
N13	"	-0.0036	-0.3607
N14	"	0.0139	-0.3422
N15	"	-0.0071	-0.3201
N16	"	0.0264	-0.2857
N17	"	-0.0087	-0.2493
N18	"	0.0364	-0.2027
N19	"	-0.0074	-0.1566
N20	"	0.0404	-0.1442
N21	"	-0.0049	-0.0786
N22	"	**0.0431**	-0.0655
N23	"	0.0000	0.0000

Nodal Reactions

Node	Load Case	FX lb	FY lb
N1	DL&CL&SL&HVAC&Drift	**-8555.8**	**2757.51**
N23	"	**8555.84**	**2460.76**

Mechanical Services Coffee House

VisualAnalysis 4.00 Report
Company: Spaulding Engineering   Engineer: Dan Spaulding   Billing: Mechanical Services Portland
File: C:\My Documents\2004mechservice\coffeetruss.vap

EXISTING JOIST
CEILING DEAD
ROOF DEAD
SNOW LOAD
FULL DRIFT

Material Properties

Material	Strength psi	Elasticity psi	Poisson	Density lb/in^3	Therm. Coeff. in/in/deg-F
Steel	-NA-	29000000.0	0.3000	0.2836	0.0000

Member Extreme Results

Member	Fx(lc) lb
M1	4870.29(1)
"	4870.29(1)
M2	1872.24(1)
"	1872.24(1)
M3	102.234(1)
"	102.234(1)
M4	-2079.7(1)
"	-2079.7(1)
M5	-3191.6(1)
"	-3191.6(1)
M6	-3350.7(1)
"	**-3350.7(1)**
M7	-2658.8(1)
"	-2658.8(1)
M8	-1165.3(1)
"	-1165.3(1)
M9	1121.05(1)
"	1121.05(1)
M10	2815.08(1)
"	2815.08(1)
M11	5431.12(1)
"	5431.12(1)
M12	3663.10(1)
"	3663.10(1)
M13	6559.61(1)
"	6559.61(1)
M14	9306.07(1)
"	9306.07(1)
M15	10923.0(1)
"	10923.0(1)

STRESSES ARE O.K.
JOIST IS O.K.

Member	Fx(1c) lb
M16	11529.8(1)
"	11529.8(1)
M17	11240.4(1)
"	11240.4(1)
M18	10141.3(1)
"	10141.3(1)
M19	8249.30(1)
"	8249.30(1)
M20	5564.98(1)
"	5564.98(1)
M21	3010.44(1)
"	3010.44(1)
M22	4248.99(1)
"	4249.61(1)
M23	-2813.9(1)
"	-2813.3(1)
M24	3362.41(1)
"	3363.03(1)
M25	-2218.0(1)
"	-2217.4(1)
M26	2121.72(1)
"	2122.35(1)
M27	-2064.7(1)
"	-2064.1(1)
M28	1261.17(1)
"	1261.79(1)
M29	-1203.3(1)
"	-1202.7(1)
M30	491.165(1)
"	491.789(1)
M31	-433.35(1)
"	-432.72(1)
M32	-191.41(1)
"	-190.78(1)
M33	249.779(1)
"	250.403(1)
M34	-807.29(1)
"	-806.67(1)
M35	868.806(1)
"	869.430(1)
M36	-1410.3(1)
"	-1409.7(1)
M37	1474.55(1)
"	1475.17(1)
M38	-2013.4(1)
"	-2012.8(1)
M39	2079.42(1)

Member	Fx(1c) lb
"	2080.04(1)
M40	-1953.7(1)
"	-1953.1(1)
M41	2973.52(1)
"	2974.14(1)
M42	-2310.3(1)
"	-2309.7(1)
M43	3501.00(1)
"	3501.62(1)

Member Internal Stresses

Member	Load Case	Offset in	fa Ksi
M1	DL&CL&SL&Drift	0.0000	8.1991
"	"	1.6256	8.1991
"	"	3.2511	8.1991
"	"	4.8767	8.1991
"	"	6.5022	8.1991
"	"	8.1278	8.1991
"	"	9.7533	8.1991
"	"	11.3789	8.1991
"	"	13.0044	8.1991
"	"	14.6300	8.1991
M2	"	0.0000	3.1519
"	"	1.6244	3.1519
"	"	3.2489	3.1519
"	"	4.8733	3.1519
"	"	6.4978	3.1519
"	"	8.1222	3.1519
"	"	9.7467	3.1519
"	"	11.3711	3.1519
"	"	12.9956	3.1519
"	"	14.6200	3.1519
M3	"	0.0000	0.1721
"	"	2.1667	0.1721
"	"	4.3333	0.1721
"	"	6.5000	0.1721
"	"	8.6667	0.1721
"	"	10.8333	0.1721
"	"	13.0000	0.1721
"	"	15.1667	0.1721
"	"	17.3333	0.1721
"	"	19.5000	0.1721

Member	Load Case	Offset in	fa Ksi
M4	"	0.0000	-3.5013
"	"	2.1667	-3.5013
"	"	4.3333	-3.5013
"	"	6.5000	-3.5013
"	"	8.6667	-3.5013
"	"	10.8333	-3.5013
"	"	13.0000	-3.5013
"	"	15.1667	-3.5013
"	"	17.3333	-3.5013
"	"	19.5000	-3.5013
M5	"	0.0000	-5.3732
"	"	2.1667	-5.3732
"	"	4.3333	-5.3732
"	"	6.5000	-5.3732
"	"	8.6667	-5.3732
"	"	10.8333	-5.3732
"	"	13.0000	-5.3732
"	"	15.1667	-5.3732
"	"	17.3333	-5.3732
"	"	19.5000	-5.3732
M6	"	0.0000	-5.6410
"	"	2.1722	-5.6410
"	"	4.3444	-5.6410
"	"	6.5167	-5.6410
"	"	8.6889	-5.6410
"	"	10.8611	-5.6410
"	"	13.0333	-5.6410
"	"	15.2056	-5.6410
"	"	17.3778	-5.6410
"	"	19.5500	-5.6410
M7	"	0.0000	-4.4762
"	"	2.1667	-4.4762
"	"	4.3333	-4.4762
"	"	6.5000	-4.4762
"	"	8.6667	-4.4762
"	"	10.8333	-4.4762
"	"	13.0000	-4.4762
"	"	15.1667	-4.4762
"	"	17.3333	-4.4762
"	"	19.5000	-4.4762
M8	"	0.0000	-1.9619
"	"	2.1667	-1.9619
"	"	4.3333	-1.9619
"	"	6.5000	-1.9619
"	"	8.6667	-1.9619
"	"	10.8333	-1.9619
"	"	13.0000	-1.9619

Member	Load Case	Offset in	fa Ksi
"	"	15.1667	-1.9619
"	"	17.3333	-1.9619
"	"	19.5000	-1.9619
M9	"	0.0000	1.8873
"	"	2.1667	1.8873
"	"	4.3333	1.8873
"	"	6.5000	1.8873
"	"	8.6667	1.8873
"	"	10.8333	1.8873
"	"	13.0000	1.8873
"	"	15.1667	1.8873
"	"	17.3333	1.8873
"	"	19.5000	1.8873
M10	"	0.0000	4.7392
"	"	1.6222	4.7392
"	"	3.2444	4.7392
"	"	4.8667	4.7392
"	"	6.4889	4.7392
"	"	8.1111	4.7392
"	"	9.7333	4.7392
"	"	11.3556	4.7392
"	"	12.9778	4.7392
"	"	14.6000	4.7392
M11	"	0.0000	9.1433
"	"	1.6222	9.1433
"	"	3.2444	9.1433
"	"	4.8667	9.1433
"	"	6.4889	9.1433
"	"	8.1111	9.1433
"	"	9.7333	9.1433
"	"	11.3556	9.1433
"	"	12.9778	9.1433
"	"	14.6000	9.1433
M12	"	0.0000	6.1668
"	"	1.6244	6.1668
"	"	3.2489	6.1668
"	"	4.8733	6.1668
"	"	6.4978	6.1668
"	"	8.1222	6.1668
"	"	9.7467	6.1668
"	"	11.3711	6.1668
"	"	12.9956	6.1668
"	"	14.6200	6.1668
M13	"	0.0000	11.0431
"	"	1.2989	11.0431
"	"	2.5978	11.0431
"	"	3.8967	11.0431

Member	Load Case	Offset in	fa Ksi
"	"	5.1956	11.0431
"	"	6.4944	11.0431
"	"	7.7933	11.0431
"	"	9.0922	11.0431
"	"	10.3911	11.0431
"	"	11.6900	11.0431
M14	"	0.0000	15.6668
"	"	2.1667	15.6668
"	"	4.3333	15.6668
"	"	6.5000	15.6668
"	"	8.6667	15.6668
"	"	10.8333	15.6668
"	"	13.0000	15.6668
"	"	15.1667	15.6668
"	"	17.3333	15.6668
"	"	19.5000	15.6668
M15	"	0.0000	18.3890
"	"	2.1667	18.3890
"	"	4.3333	18.3890
"	"	6.5000	18.3890
"	"	8.6667	18.3890
"	"	10.8333	18.3890
"	"	13.0000	18.3890
"	"	15.1667	18.3890
"	"	17.3333	18.3890
"	"	19.5000	18.3890
M16	"	0.0000	19.4106
"	"	2.1667	19.4106
"	"	4.3333	19.4106
"	"	6.5000	19.4106
"	"	8.6667	19.4106
"	"	10.8333	19.4106
"	"	13.0000	19.4106
"	"	15.1667	19.4106
"	"	17.3333	19.4106
"	"	19.5000	19.4106
M17	"	0.0000	18.9233
"	"	2.1667	18.9233
"	"	4.3333	18.9233
"	"	6.5000	18.9233
"	"	8.6667	18.9233
"	"	10.8333	18.9233
"	"	13.0000	18.9233
"	"	15.1667	18.9233
"	"	17.3333	18.9233
"	"	19.5000	18.9233
M18	"	0.0000	17.0729

Member	Load Case	Offset in	fa Ksi
"	"	2.1667	17.0729
"	"	4.3333	17.0729
"	"	6.5000	17.0729
"	"	8.6667	17.0729
"	"	10.8333	17.0729
"	"	13.0000	17.0729
"	"	15.1667	17.0729
"	"	17.3333	17.0729
"	"	19.5000	17.0729
M19	"	0.0000	13.8877
"	"	2.1667	13.8877
"	"	4.3333	13.8877
"	"	6.5000	13.8877
"	"	8.6667	13.8877
"	"	10.8333	13.8877
"	"	13.0000	13.8877
"	"	15.1667	13.8877
"	"	17.3333	13.8877
"	"	19.5000	13.8877
M20	"	0.0000	9.3687
"	"	1.3000	9.3687
"	"	2.6000	9.3687
"	"	3.9000	9.3687
"	"	5.2000	9.3687
"	"	6.5000	9.3687
"	"	7.8000	9.3687
"	"	9.1000	9.3687
"	"	10.4000	9.3687
"	"	11.7000	9.3687
M21	"	0.0000	5.0681
"	"	1.6233	5.0681
"	"	3.2467	5.0681
"	"	4.8700	5.0681
"	"	6.4933	5.0681
"	"	8.1167	5.0681
"	"	9.7400	5.0681
"	"	11.3633	5.0681
"	"	12.9867	5.0681
"	"	14.6100	5.0681
M22	"	0.0000	**21.6817**
"	"	1.8821	21.6814
"	"	3.7642	21.6810
"	"	5.6463	21.6807
"	"	7.5284	21.6803
"	"	9.4105	21.6800
"	"	11.2926	21.6796
"	"	13.1747	21.6792

Member	Load Case	Offset in	fa Ksi
"	"	15.0568	21.6789
"	"	16.9388	21.6785
M23	"	0.0000	-14.357
"	"	1.2652	-14.356
"	"	2.5303	-14.356
"	"	3.7955	-14.356
"	"	5.0607	-14.355
"	"	6.3258	-14.355
"	"	7.5910	-14.355
"	"	8.8562	-14.354
"	"	10.1213	-14.354
"	"	11.3865	-14.354
M24	"	0.0000	17.1584
"	"	1.8813	17.1580
"	"	3.7625	17.1577
"	"	5.6438	17.1573
"	"	7.5250	17.1569
"	"	9.4063	17.1566
"	"	11.2876	17.1562
"	"	13.1688	17.1559
"	"	15.0501	17.1555
"	"	16.9314	17.1552
M25	"	0.0000	-11.316
"	"	1.2652	-11.316
"	"	2.5303	-11.315
"	"	3.7955	-11.315
"	"	5.0607	-11.315
"	"	6.3258	-11.314
"	"	7.5910	-11.314
"	"	8.8562	-11.314
"	"	10.1213	-11.313
"	"	11.3865	-11.313
M26	"	0.0000	10.8283
"	"	1.6516	10.8280
"	"	3.3032	10.8276
"	"	4.9548	10.8273
"	"	6.6064	10.8269
"	"	8.2580	10.8266
"	"	9.9096	10.8262
"	"	11.5612	10.8258
"	"	13.2128	10.8255
"	"	14.8644	10.8251
M27	"	0.0000	-10.534
"	"	1.6516	-10.534
"	"	3.3032	-10.533
"	"	4.9548	-10.533
"	"	6.6064	-10.533

Member	Load Case	Offset in	fa Ksi
"	"	8.2580	-10.532
"	"	9.9096	-10.532
"	"	11.5612	-10.532
"	"	13.2128	-10.531
"	"	14.8644	-10.531
M28	"	0.0000	6.4378
"	"	1.6516	6.4374
"	"	3.3032	6.4370
"	"	4.9548	6.4367
"	"	6.6064	6.4363
"	"	8.2580	6.4360
"	"	9.9096	6.4356
"	"	11.5612	6.4353
"	"	13.2128	6.4349
"	"	14.8644	6.4346
M29	"	0.0000	-6.1396
"	"	1.6516	-6.1392
"	"	3.3032	-6.1389
"	"	4.9548	-6.1385
"	"	6.6064	-6.1382
"	"	8.2580	-6.1378
"	"	9.9096	-6.1375
"	"	11.5612	-6.1371
"	"	13.2128	-6.1368
"	"	14.8644	-6.1364
M30	"	0.0000	2.5091
"	"	1.6516	2.5088
"	"	3.3032	2.5084
"	"	4.9548	2.5081
"	"	6.6064	2.5077
"	"	8.2580	2.5074
"	"	9.9096	2.5070
"	"	11.5612	2.5067
"	"	13.2128	2.5063
"	"	14.8644	2.5059
M31	"	0.0000	-2.2110
"	"	1.6516	-2.2106
"	"	3.3032	-2.2103
"	"	4.9548	-2.2099
"	"	6.6064	-2.2096
"	"	8.2580	-2.2092
"	"	9.9096	-2.2089
"	"	11.5612	-2.2085
"	"	13.2128	-2.2081
"	"	14.8644	-2.2078
M32	"	0.0000	-0.9734
"	"	1.6516	-0.9738

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Member	Load Case	Offset in	fa Ksi
"	"	3.3032	-0.9741
"	"	4.9548	-0.9745
"	"	6.6064	-0.9748
"	"	8.2580	-0.9752
"	"	9.9096	-0.9755
"	"	11.5612	-0.9759
"	"	13.2128	-0.9762
"	"	14.8644	-0.9766
M33	"	0.0000	1.2744
"	"	1.6553	1.2747
"	"	3.3105	1.2751
"	"	4.9658	1.2754
"	"	6.6210	1.2758
"	"	8.2763	1.2762
"	"	9.9315	1.2765
"	"	11.5868	1.2769
"	"	13.2420	1.2772
"	"	14.8973	1.2776
M34	"	0.0000	-4.1157
"	"	1.6480	-4.1160
"	"	3.2959	-4.1164
"	"	4.9439	-4.1167
"	"	6.5919	-4.1171
"	"	8.2398	-4.1174
"	"	9.8878	-4.1178
"	"	11.5357	-4.1181
"	"	13.1837	-4.1185
"	"	14.8317	-4.1189
M35	"	0.0000	4.4327
"	"	1.6553	4.4330
"	"	3.3105	4.4334
"	"	4.9658	4.4337
"	"	6.6210	4.4341
"	"	8.2763	4.4345
"	"	9.9315	4.4348
"	"	11.5868	4.4352
"	"	13.2420	4.4355
"	"	14.8973	4.4359
M36	"	0.0000	-7.1926
"	"	1.6480	-7.1929
"	"	3.2959	-7.1933
"	"	4.9439	-7.1937
"	"	6.5919	-7.1940
"	"	8.2398	-7.1944
"	"	9.8878	-7.1947
"	"	11.5357	-7.1951
"	"	13.1837	-7.1954

Member	Load Case	Offset in	fa Ksi
"	"	14.8317	-7.1958
M37	"	0.0000	7.5232
"	"	1.6553	7.5236
"	"	3.3105	7.5239
"	"	4.9658	7.5243
"	"	6.6210	7.5246
"	"	8.2763	7.5250
"	"	9.9315	7.5253
"	"	11.5868	7.5257
"	"	13.2420	7.5260
"	"	14.8973	7.5264
M38	"	0.0000	-10.269
"	"	1.6480	-10.269
"	"	3.2959	-10.270
"	"	4.9439	-10.270
"	"	6.5919	-10.270
"	"	8.2398	-10.271
"	"	9.8878	-10.271
"	"	11.5357	-10.272
"	"	13.1837	-10.272
"	"	14.8317	-10.272
M39	"	0.0000	10.6093
"	"	1.6553	10.6097
"	"	3.3105	10.6100
"	"	4.9658	10.6104
"	"	6.6210	10.6107
"	"	8.2763	10.6111
"	"	9.9315	10.6114
"	"	11.5868	10.6118
"	"	13.2420	10.6121
"	"	14.8973	10.6125
M40	"	0.0000	-9.9651
"	"	1.2644	-9.9654
"	"	2.5288	-9.9658
"	"	3.7932	-9.9661
"	"	5.0577	-9.9665
"	"	6.3221	-9.9668
"	"	7.5865	-9.9672
"	"	8.8509	-9.9675
"	"	10.1153	-9.9679
"	"	11.3797	-9.9682
M41	"	0.0000	15.1710
"	"	1.8829	15.1714
"	"	3.7659	15.1717
"	"	5.6488	15.1721
"	"	7.5317	15.1725
"	"	9.4146	15.1728

Member	Load Case	Offset in	fa Ksi
"	"	11.2976	15.1732
"	"	13.1805	15.1735
"	"	15.0634	15.1739
"	"	16.9463	15.1742
M42	"	0.0000	-11.784
"	"	1.2646	-11.784
"	"	2.5292	-11.785
"	"	3.7938	-11.785
"	"	5.0584	-11.785
"	"	6.3230	-11.786
"	"	7.5876	-11.786
"	"	8.8522	-11.786
"	"	10.1168	-11.787
"	"	11.3814	-11.787
M43	"	0.0000	17.8623
"	"	1.8821	17.8626
"	"	3.7642	17.8630
"	"	5.6463	17.8633
"	"	7.5284	17.8637
"	"	9.4105	17.8640
"	"	11.2926	17.8644
"	"	13.1747	17.8647
"	"	15.0568	17.8651
"	"	16.9388	17.8654

Nodal Displacements

Node	Load Case	DX in	DY in
N1	DL&CL&SL&Drift	0.0000	**0.0000**
N2	"	**-0.0436**	-0.0685
N3	"	0.0041	-0.0824
N4	"	-0.0405	-0.1480
N5	"	0.0057	-0.1605
N6	"	-0.0361	-0.2042
N7	"	0.0058	-0.2478
N8	"	-0.0255	-0.2794
N9	"	0.0035	-0.3088
N10	"	-0.0132	-0.3250
N11	"	-0.0001	**-0.3378**
N12	"	-0.0001	-0.3371
N13	"	-0.0039	-0.3329
N14	"	0.0126	-0.3158
N15	"	-0.0069	-0.2957

Node	Load Case	DX in	DY in
N16	"	0.0241	-0.2640
N17	"	-0.0083	-0.2307
N18	"	0.0334	-0.1877
N19	"	-0.0070	-0.1451
N20	"	0.0372	-0.1337
N21	"	-0.0046	-0.0730
N22	"	**0.0398**	-0.0607
N23	"	0.0000	0.0000

Nodal Loads

This item is empty. Check the selection state, or report properties.