

PLAINTIFF'S EXHIBIT
GP-645 MM

SGP 0027306

FIREPROOF GYPSUM

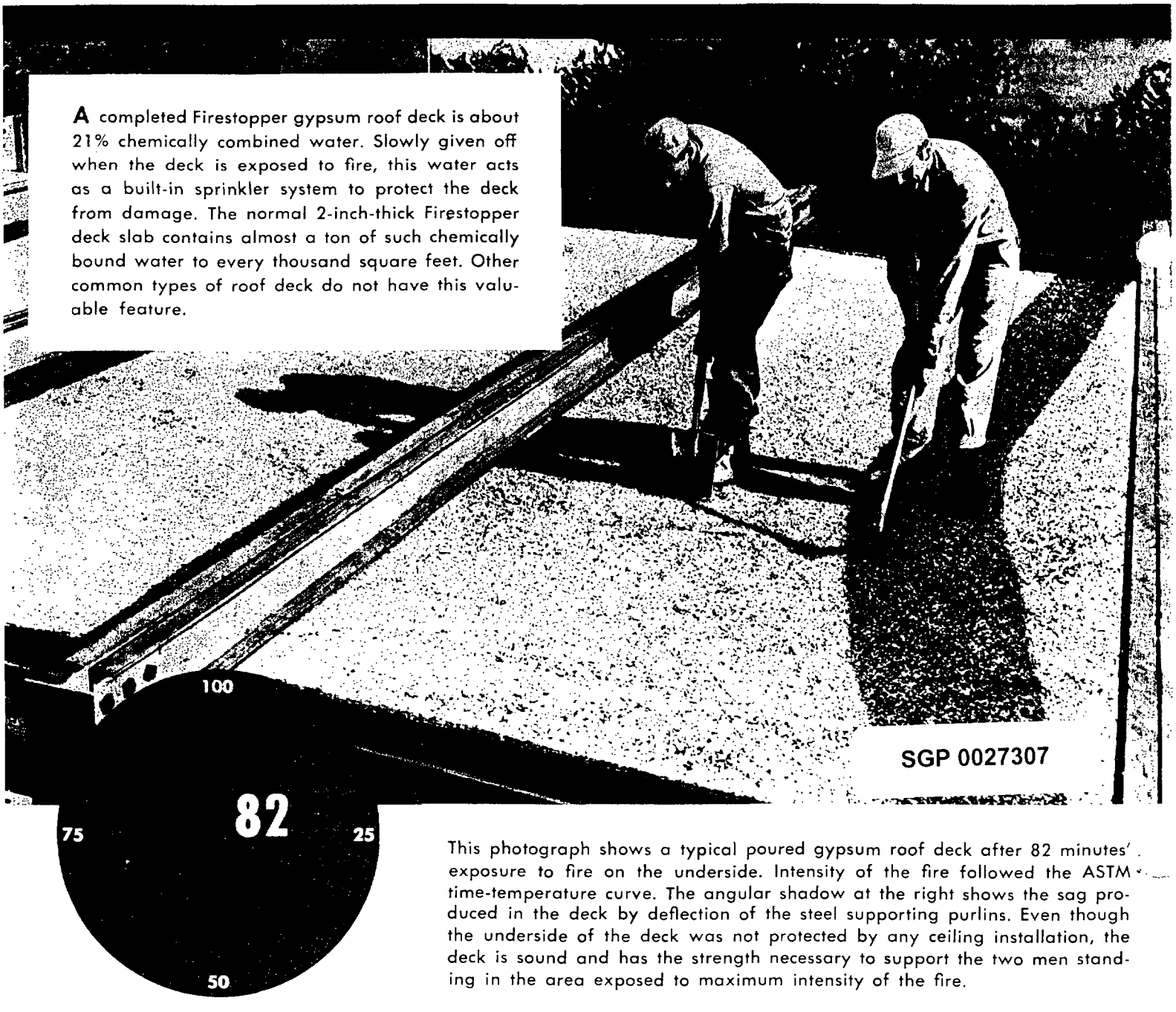
BESTWALL®

BUILDING PRODUCTS

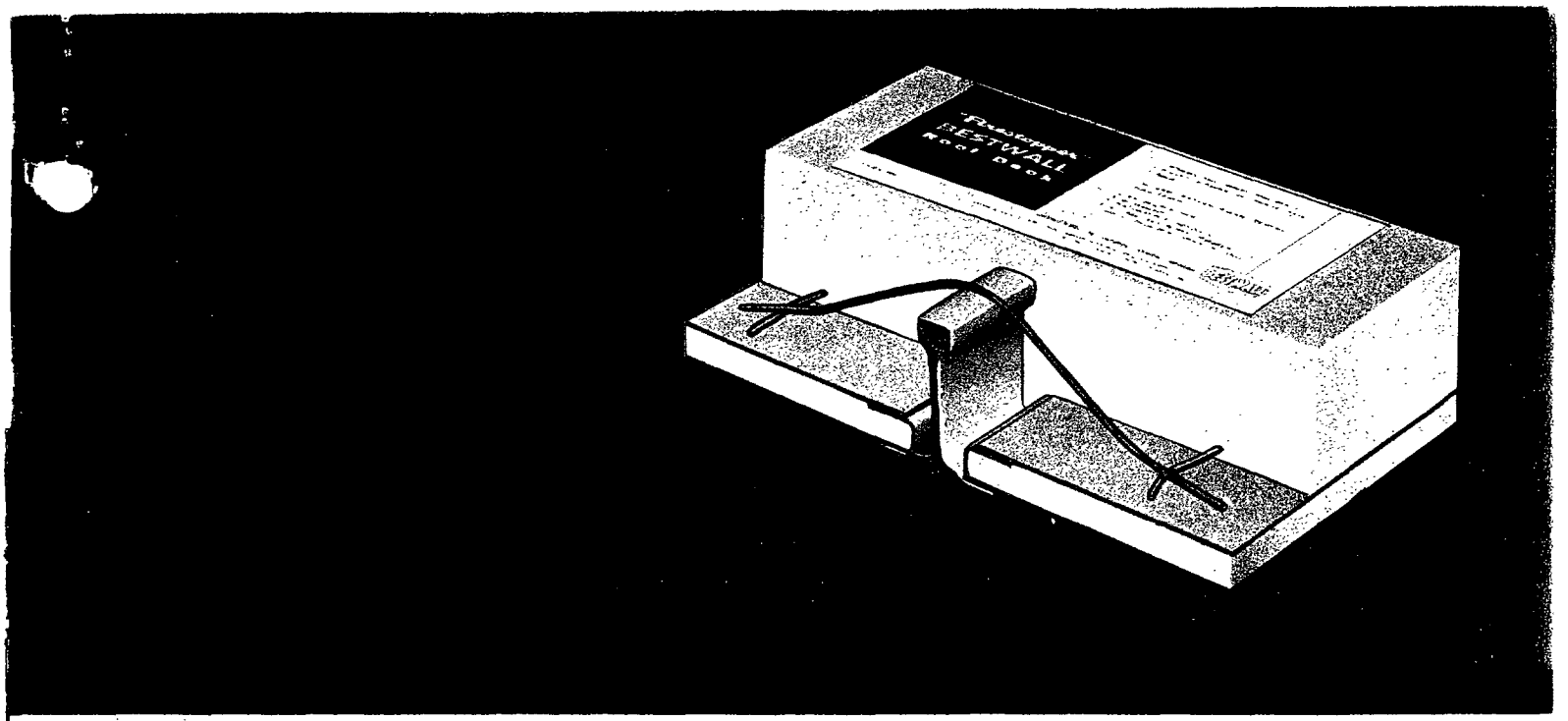
POURED-IN-PLACE GYPSUM ROOF DECK

ARCHITECTS, ENGINEERS, BUILDERS AND OWNERS—ALL PROFIT FROM THE OUTSTANDING AND VALUABLE FEATURES OF BESTWALL POURED-IN-PLACE GYPSUM ROOF DECK FOR FACTORIES, SCHOOLS, OFFICES AND SIMILAR TYPES OF BUILDING INSTALLATIONS.

A completed Firestopper gypsum roof deck is about 21% chemically combined water. Slowly given off when the deck is exposed to fire, this water acts as a built-in sprinkler system to protect the deck from damage. The normal 2-inch-thick Firestopper deck slab contains almost a ton of such chemically bound water to every thousand square feet. Other common types of roof deck do not have this valuable feature.



This photograph shows a typical poured gypsum roof deck after 82 minutes' exposure to fire on the underside. Intensity of the fire followed the ASTM time-temperature curve. The angular shadow at the right shows the sag produced in the deck by deflection of the steel supporting purlins. Even though the underside of the deck was not protected by any ceiling installation, the deck is sound and has the strength necessary to support the two men standing in the area exposed to maximum intensity of the fire.



ADVANTAGES OF BESTWALL FIRESTOPPER GYPSUM ROOF DECKS

STRENGTH—When poured at the recommended water to Metro-Mix ratio, a 2" thick reinforced slab is designed to carry a live load of 75 pounds per square foot. Tests show that a set slab, while still wet, will carry this load with a safety factor of over 4, and a dry slab will carry the load with a safety factor in excess of 8.

LIGHT WEIGHT—Reinforced gypsum concrete weighs only one-third as much as Portland cement concrete. This means less dead load with a consequent reduction in steel costs. For actual weights of various Firestopper constructions see table on next page.

LONG LIFE—Gypsum roof decks being essentially mineral in character are chemically inert, and are therefore rot proof, vermin proof, and fire proof. They will last for the life of the building, and may be altered easily and economically at any time due to the ease of cutting and replacing the slab at any point.

INCOMBUSTIBLE—Firestopper Roof Decks with Metro-Mix poured over gypsum, asbestos or Fiberglas* form boards are incombustible. When fiber insulation form board is used the rating is usually "incombustible" with an insurance deficiency penalty because of the combustible nature of the fiber insulation board.

WIDE UTILITY—Firestopper Roof Decks may be used on curved, pitched and saw tooth type roofs as well as on flat decks.

YEAR 'ROUND CONSTRUCTION—Neither hot nor cold weather will hinder the pouring of a Firestopper Roof Deck. A Firestopper Deck may be installed in the coldest weather in which men can efficiently work. While it is setting, the gypsum generates enough internal heat to prevent freezing. Adequate ventilation under the deck should be provided until the deck is thoroughly dry.

EASY TO ERECT—The short setting time of gypsum concrete (10 to 20 minutes), permits rapid installation. Slabs may be walked on as soon as set and thus may be used as working surfaces in pouring adjacent sections. Built up roofing should be applied as soon as the deck is dry on the top surface.

RESISTANCE TO SEISMIC FORCES—Firestopper Roof Decks meeting A.S.T.M. Standard Specification C317-55 Class "B", and the National Building Code, Section 914.4 Class "B", meet the requirements of the Uniform Building Code as a diaphram to resist lateral stresses resulting from earthquakes.

APPEARANCE—The smooth, trim finished undersurface of this roof deck construction requires no further decoration. If desired, the undersurface may be painted after it is thoroughly dry by following ordinary painting methods.

THERMAL INSULATION—Excellent insulation against summer heat and winter cold is provided by retarding the flow of heat. Two and one-half inches of gypsum is considered sufficient insulation for most building requirements.

ECONOMICAL—Savings in material cost and structural steel, low maintenance cost, simplicity of design, high insulation value, and the speed with which a Bestwall Firestopper Gypsum Roof Deck can be erected, make it a very economical type of construction. Easy to cut, nail and replace, changes may be made to a completed building with a minimum of expense.

*® O.C.F. Corp.

DETAILS OF EAVES

DETAILS OF PARAPET AND END WALLS

DETAILS OF CURBS

SGP 0027309

GYPSUM ROOF DECK

POURED-IN-PLACE

FIREPROOF GYPSUM BESTWALL BUILDING PRODUCTS

SUB-PURLINS TABLE OF SAFE TOTAL LOADS

Based on: Purlins spaced 2'-8⅝" O.C. fs 20,000 P.S.I., M=1 10 WL (unless otherwise indicated)

Sub-Purlins	Sect. Mod. S in.³	No. of I_4	Wt. in Lbs. per Lin. Ft.	Wt. in Lbs. per Sq. Ft. of Roof	Safe Total Load in lbs. per sq. ft. uniformly distributed																Max Eave Overhang
					3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"		
1½"x1½"x⅛" Plain T. (B)	081	086	1.33	.49	55	40															1'-4"
1½"x1½"x⅛" Plain T. (I)	.078	.082	1.33	.49	53	39															1'-4"
1.50 Flg. Chan. (B)	.110	.065	1.50	.55				34	28	Sub-Purlins spaced 2'-9½" on centers											1'-8"
3158xBulb T. (W)	.1608	.1603	1.45	.53	110	80	62														2'-0"
158 Bulb T. (I)	.165	.162	1.50	.55	112	83	63														2'-0"
1480 Bulb T. (B)	.173	.146	1.55	.57	117	86					29										2'-0"
#4-8-16 (TR. T) 1/240 (E)	.142	.176	1.05	.39	110	94	82	73	66	60	55	51	47	44	41	39					—
#4-8-16 (TR. T) 1/360 (E)	.142	.176	1.05	.39	110	94	82	73	66	60	55	51	47	44	36	30					—
2.0 Flg. Chan. (B)	.218	.166	2.00	.74					55	44	38	32	Sub-Purlins spaced 2'-10" on centers								2'-2"
3168 Bulb T. (W)	.240	.247	2.00	.73		120		74	60	50	42	35	30								2'-6"
168 Bulb T. (I)	.240	.247	2.00	.74		120	92														2'-6"
2.25 Flg. Chan. (B)	.256	.199	2.25	.83					64	52	44	38	33	28	Spaced 2'-10" O.C.						2'-6"
1680 Bulb T. (B)	.261	.251	2.00	.74			100						33	28							2'-8"
2.50 Flg. Chan. (B)	.276	.217	2.50	.92					69	56	48	41	35	31	27	Spaced 2'-10" O.C.					2'-8"
178 Bulb T. (I)	.340	.364	2.50	.92			130	103	83					37							3'-0"
8 lb ASCE Rail (W)	31	.27	2.67	.97								45	39	34	30	26					2'-10"
2.75 Flg. Chan. (B)	.311	.251	2.75	1.01					78	63	54	46	40	35	30	Spaced 2'-10" O.C.					2'-10"
3178 Bulb T. (W)	.324	.397	2.47	9			122	98	80	65		46	40	35	30						2'-10"
1780 Bulb T. (B)	.332	.348	2.40	.88			127	100						36	31						2'-10"
#1-6-16 (TR. T) 1/240 (E)	.360	.235	1.28	.47	162	139	122	108	97	88	81	75	70	65	61	57	54	46	40		—
#1-6-16 (TR. T) 1/360 (E)	.360	.235	1.28	.47	162	139	122	108	97	88	81	75	70	63	52	43	36	31	26		—
200 Bulb T. (I)	460	.503	3.00	1.10				139	113												3'-6"
3218 Bulb T (W)	.472	.561	3.01	1.10									60	50	45	40	35	31			3'-6"
214 Bulb T. (B)	.494	.671	3.20	1.18					121	100	84								33		3'-8"
218 Bulb T. (I)	.520	.598	3.00	1.10											50	44	40	35			3'-8"
2180 Bulb T. (B)	.518	.608	2.95	1.08					127						49	43	39	35			3'-8"
12 Lb. ASCE Rail (W)	.63	.66	4.00	1.45								91	79	69	60	54	48	43	39		4'-0"
2140 Bulb T. (B)	.639	.786	3.65	1.34								129				54	48	43			4'-0"
3228 Bulb T. (W)	.738	.852	3.65	1.34											72	64	56	50	45		4'-4"
16 Lb. ASCE Rail (W)	1.01	1.24	5.33	1.94										110	97	86	77	69	62		5'-2"
3258 Bulb T. (W)	1.046	1.37	4.67	1.70													80	70	65		5'-2"
20 Lb. ASCE Rail (W)	1.43	1.94	6.67	2.42	Minimum Slab Thickness (3") Three Inch Total													108	97	88	6'-2"

NOTES:

1. Loads to left of shaded block have deflections less than shaded 1/360 of Span; Loads in shaded blocks have deflections more than 1/360 of Span but less than 1/240 of Span; Loads to right of block have deflections greater than 1/240 of Span.
2. Deflections based on semi-continuous spans or $D=3WL^3/384EI$ Per A.I.S.
3. To determine total safe load for Bending Moment of ⅛ WL, use 80% of the tabulated load.
4. To determine total safe load for a maximum fiber stress of 18,000 psi, use 90% of tabulated load.
5. For suspended ceilings, use loads shown to the left of the shaded block, or 75% of loads shown in shaded block can generally be safely used.
6. For values of Acoustical slabs with 24⅝" spacing, multiply values shown by 1.325.
7. Maximum eave overhang based on a total load of 45 pounds per square foot. Bending moment M=1/2 WL. spaced as indicated
8. Manufacturers of various sub-purlins shown:
   (I) Inland Steel Company, 38 S. Dearborn St., Chicago 38, Ill.
   (B) Buffalo Steel Division—H. K. Porter Co., Inc.—Tonawanda, N. Y.
   (W) West Virginia Steel and Mfg. Co., Huntington, W. Va.
   (E) Edge Steel Products Corporation, Olatha, Kansas
9. Design loads of less than 45 pounds per sq. ft. are not recommended.

SGP 0027310

TABLE OF SLAB WEIGHTS AND THERMAL INSULATION VALUES

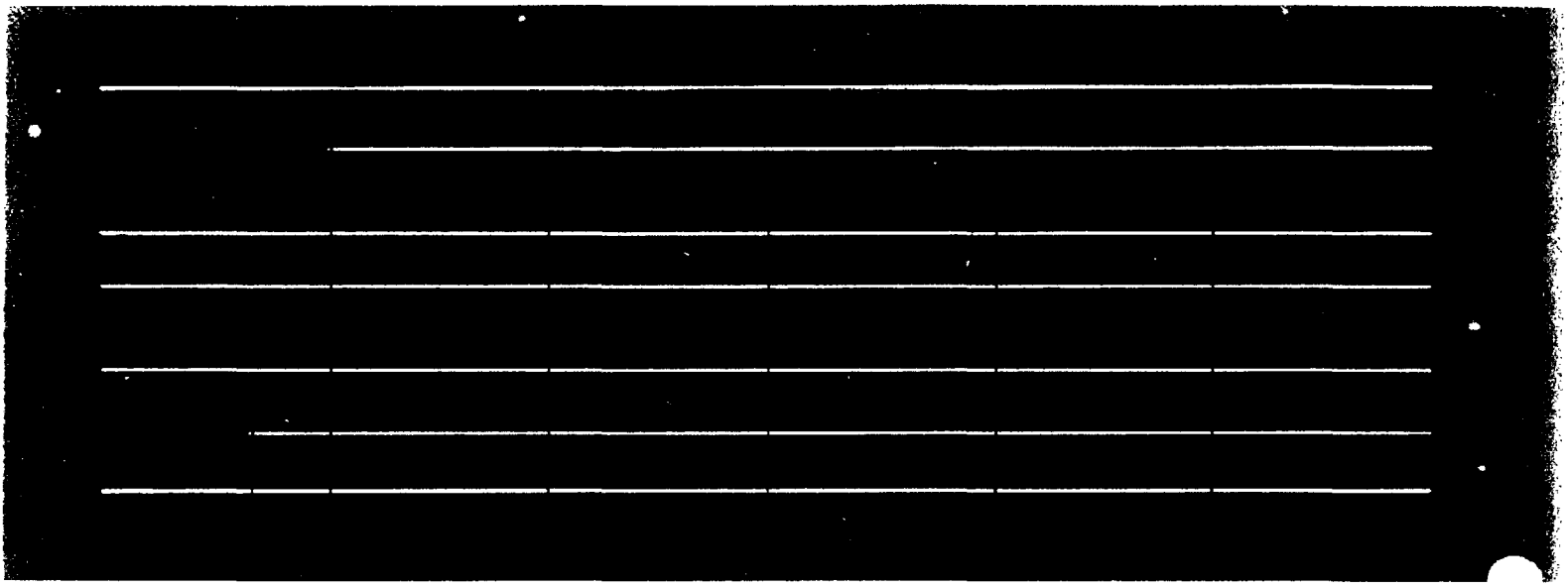
Total Slab Thickness (including Form Board)	Approx. Slab Weight per Sq. Ft	"U" Value for Complete Roof Slab including Built-Up Roof Covering Btu per square foot per hr per degree F difference in temperature: No Insulation	½" Insulation Board (K-33)	½" Fiberglas Insulation	1" Insulation Board (K-33)	1" Fiberglas Insulation
2½" Slab (2" Metro-Mix—½" Bestwall Gypsum Form Board)	10.7 Lbs	.383	242	.217	177	151
3" Slab (2½" Metro-Mix—½" Bestwall Gypsum Form Board)	12.9 Lbs.	343	226	.203	168	145
3" Slab (2" Metro-Mix—1" Fiber Insulation Form Board)	10.1 Lbs.	189	147	172	120	108
3½" Slab (2½" Metro-Mix—1" Fiber Insulation Form Board)	12.3 Lbs	.179	.141	132	116	104
2¼" Slab (2" Metro-Mix—¼" Asbestos Form Board)	11.1 Lbs.	.431	260	.231	.187	158
2¾" Slab (2½" Metro-Mix—¼" Asbestos Form Board)	13.3 Lbs	.381	242	216	177	151
3" Slab (2" Metro-Mix—1" Fiberglas Form Board)	9.62 Lbs	.160	129	121	108	097

NOTE: 1. For Total Weight of Roof Deck per square foot add Weight of Sub-Purlins per square foot of roof to the approximate Slab Weight shown to left.

2. Approximate Weight of various materials used: Metro-Mix 52 lbs. per cu ft when mixed according to specifications; ½" Bestwall Gypsum Form Board 2.05 lbs per square foot, 1" Insulation Form Board 1.45 lbs per square foot; ¼" Asbestos Board 2.44 lbs per square foot; 1" Fiberglas Form Board .96 lbs. per square foot

Gypsum

APPROXIMATE NAIL HOLDING POWER OF FIRESTOPPER SLABS



SUGGESTIONS TO ARCHITECTS

PAINTING—If it is desired to paint the underside of the poured gypsum roof deck, it may be done only after the slab is completely dry. We recommend the use of an electrical moisture meter for checking dryness Such meters should be fitted with needle type electrodes which should be driven well into the slab before a reading is made.

EXPANSION JOINTS—Where provided in the main structure, expansion joints should be provided in the roof deck. Wings should be separated from the main structure with expansion joints. Compressible filler strips should be installed at the juncture of the slab and parapet walls, skylight openings, etc. Where slab is used in building design as a diaphram to resist lateral stresses, the roof deck must tie into building frame at walls.

DRYING—Since poured gypsum roof decks are roofed-in shortly after pouring, they must dry out through the formboard on the underside. Sufficient heat and natural ventilation must be provided in open structures to carry off this moisture. In completely enclosed structures, forced ventilation must be provided and the moisture vented to the outside. This is particularly important in cold weather and in the Spring and Fall to avoid condensation.

SUSPENDED CEILINGS—Suspended ceilings must not be installed under a Firestopper Deck until the deck is dry. (See PAINTING.) The enclosed space between ceiling and deck must be vented to the outside by means of louvers, and provided with some type of forced ventilation. Ceilings are best suspended from main purlins, but may be suspended from sub-purlins if they were designed for the added weight. Ceilings should never be attached directly to the gypsum slab

EAVE ANGLES AND WOOD NAILERS—These should be provided for in the carpentry specification.

ROOFING—Roof covering should be applied as soon as possible after the gypsum slab is surface dry. This is indicated by the disappearance of visible moisture gloss on the surface of the slab. The first two plies of built-up roofing felts should be nailed to the slab with 5d or 6d square-cut nails driven through conventional tin roofing discs. Do not solid mop, nor spot mop first sheet to deck.

HIGH TEMPERATURE AND HUMIDITY—Firestopper Roof Decks are suitable for any structure where normal temperatures and humidities are encountered. In case of extremely high humidities and temperatures such as wet process plants, foundries, round houses, etc, consult your Bestwall Certain-teed Sales Corporation representative.

WIND UPLIFT RESISTANCE—High winds subject all roof decks to uplift forces which must be counteracted by secure anchorage of the deck to the supports. The total dead load of the deck can be considered as part of the resistance to uplift in design consideration. The normal requirement to be met is an uplift resistance of 35 lbs per square foot over the main deck area and 45 lbs per square foot on any overhang area. Firestopper slabs poured over bulb tees or steel rails welded to the main purlins will exceed these requirements with a safety factor of over 5. Other types of construction, where standard tees or flanged channels are used as sub-purlins, require additional anchorage of the slab.

SGP 0027311

ROOF DECK

FIREPROOF GYPSUM BESTWALL® BUILDING PRODUCTS

POURED-IN-PLACE

ARCHITECTURAL SPECIFICATIONS

SHORT FORM

A Bestwall Gypsum Company approved poured gypsum roof deck contractor shall install a poured gypsum roof deck as specified on all areas indicated, in accordance with the current published American Standard Specifications for reinforced gypsum concrete. He is to furnish all necessary materials, labor and equipment for its erection.

LONG FORM

GENERAL PROVISIONS—The roof deck contractor's work includes all materials, labor, services, equipment, hoisting and scaffolding, and performing all operations required to complete the installation of reinforced gypsum concrete in accordance with drawings and specifications. This includes the supplying and installing of the sub-purlins, the form board, the reinforcing fabrics, the Metro-Mix gypsum concrete and the gypsum roof cants, curbs and drainage fills. Approved shop drawings are required before work proceeds.

MATERIALS

1. **STEEL SUB-PURLINS**—The steel sub-purlins are to be of an approved type having the necessary structural characteristics to carry the required live and dead loads. They shall be shop painted with one coat of rust inhibitive paint.

2. **FORM BOARD**—Bestwall ½" Gypsum Roof Deck Form Board (or 1" Fiberglas Form Board or 1" Fiber Insulation Board or ¼" Asbestos Board) 32" wide and in length to correspond to purlin spacing.

3. **REINFORCING MESH**—Galvanized welded wire fabric having an effective cross sectional area of not less than 0.026 sq. in. per ft. of width, equivalent to No. 12 gauge longitudinal wires spaced not over 4 inches on centers and transverse wires shall be equivalent to No. 14 gauge and be spaced not over 8 inches on centers.

4. **GYPSUM CONCRETE**—Bestwall Metro-Mix consisting of a mill mixture of calcined gypsum and not more than 12½% by weight of wood shavings, conforming to American Standards Association requirements.

APPLICATION

1. **STEEL SUB-PURLINS** shall be welded to each primary framing member on which they bear by using fillet welds not less than ½" long placed on alternate sides of sub-purlins. Sub-purlins shall be properly spaced to receive the form boards specified.

2. **FORM BOARDS** shall be placed on flanges of sub-purlins with all end joints falling over walls, purlins, other primary framing members or joint tees. Form boards shall be cut to fit neatly, including fitting at all walls, curbs, openings, etc. as required.

3. **REINFORCING FABRIC**—Reinforcing fabric shall be placed with the longitudinal wires at right angles to the sub-purlins. Ends of the fabric shall be lapped not less than six inches. Sides of fabric shall be butted or spaced apart not more than four inches. Reinforcing fabric shall be cut to fit at all walls, curbs, openings, etc. Reinforcing fabric shall be carried into all areas where Metro-Mix is to be placed, including poured curbs.

4. **METRO-MIX GYPSUM CONCRETE** is to be mixed with clean water only, according to the directions on the bag. Pour on the form board and screed to an average thickness of not less than two inches. Pour saddles, cants and grades as indicated. Surface of the slab should be left smooth enough to receive the roof covering specified in another section. Leave roof deck free and clean for other trades.



1 Left—Laying sub-purlins and the setting of form board over sub-purlins prior to the installation of reinforcing mesh and Bestwall Metro-Mix.

2 Right—Installation of reinforcing mesh across the roof deck after form board has been installed. Mesh is laid at right angles to purlins so as to butt together at edge without overlapping.





3 Left—Splashing in Bestwall Metro-Mix by hose in order to eliminate droppings and fix deck. This step is final preparation before installation of Bestwall Metro-Mix.

4 Right—Installation of Bestwall Metro-Mix and screeding of surface. Workmen are walking on surface less than an hour after installation.



SGP 0027313

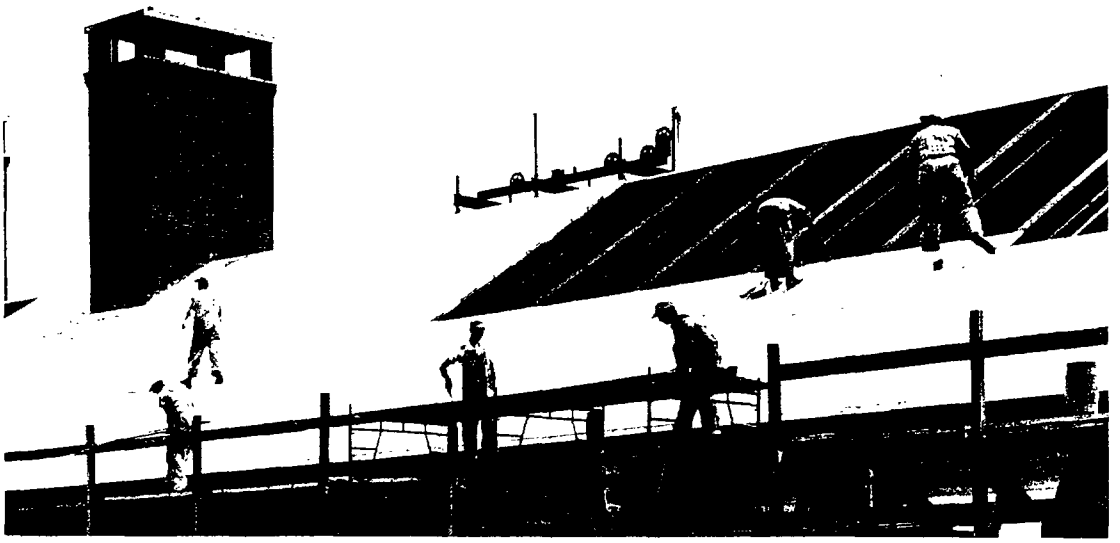
BESTWALL®

ATLANTA, GEORGIA
BUFFALO, NEW YORK
CHICAGO, ILLINOIS
CHICAGO HTS., ILLINOIS
CLEVELAND, OHIO
DALLAS, TEXAS
DES MOINES, IOWA
DETROIT, MICHIGAN
EAST ST. LOUIS, ILLINOIS
JACKSON, MISSISSIPPI
KANSAS CITY, MISSOURI
WILMINGTON, DELAWARE
RICHMOND, CALIFORNIA
MINNEAPOLIS, MINNESOTA
SALT LAKE CITY, UTAH
TACOMA, WASHINGTON

Fireproof Gypsum

ROOF DECKS





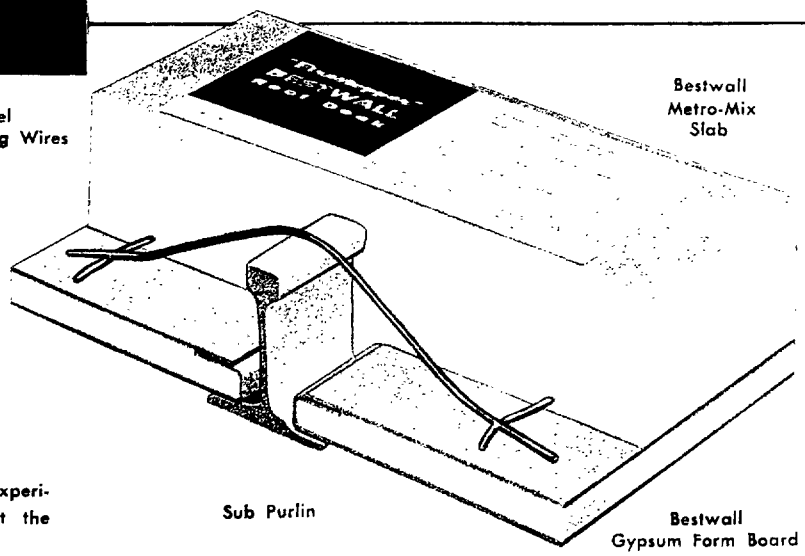
FIREPROOF GYPSUM BESTWALL BUILDING PRODUCTS

Gypsum Products

SOLD THROUGH BESTWALL — CERTAIN-TEED SALES CORPORATION

SGP 0027333

"Firestopper"



A Bestwall Poured-In-Place Gypsum Roof slab is a fireproof, light weight, durable and economical decking material. A Bestwall Firestopper Roof consists of steel sub-purlins that are welded securely to the main steel structure, a Metro-Mix slab with steel reinforcing wires, on a permanent form board. The various components form a rigid, monolithic unit which can be tailored to meet the architect's exacting requirements by varying the type of form board and the size of the sub-purlins specified. Bestwall Firestopper Roofs are installed by approved, highly-experienced gypsum roof deck contractors, located throughout the United States to assure the best in service.

STRENGTH—When poured at the recommended water to Metro-Mix ratio, a 2" thick reinforced slab is designed to carry a live load of 75 pounds per square foot. Tests show that a set slab, while still wet, will carry this load with a safety factor of over 4, and a dry slab will carry the load with a safety factor in excess of 8.

LIGHT WEIGHT—Reinforced gypsum concrete weighs only one-third as much as Portland cement concrete. This means less dead load with a consequent reduction in steel costs. For actual weights of various Firestopper constructions see table on next page.

LONG LIFE—Gypsum roof decks being essentially mineral in character are chemically inert, and are therefore rot proof, vermin proof, and fire proof. They will last for the life of the building, and may be altered easily and economically at any time due to the ease of cutting and replacing the slab at any point.

INCOMBUSTIBLE—Firestopper Roof Decks with Metro-Mix poured over gypsum, asbestos or Fiberglas* form boards are incombustible. When fiber insulation form board is used the rating is usually "incombustible" with an insurance deficiency penalty because of the combustible nature of the fiber insulation board.

WIDE UTILITY—Firestopper Roof Decks may be used on curved, pitched and saw tooth type roofs as well as on flat decks.

YEAR 'ROUND CONSTRUCTION—Neither hot nor cold weather will hinder the pouring of a Firestopper Roof Deck. A Firestopper Deck may be installed in the coldest weather in which men con efficiently work. While it is setting, the gypsum generates enough internal heat to prevent freezing. Subsequent to the pouring of gypsum concrete, adequate ventilation accompanied by heat as required, is recommended below the slabs to remove the excess moisture resulting from the slab pouring, placement of concrete floors, masonry, plastering and other similar construction work.

EASY TO ERECT—The short setting time of gypsum concrete (10 to 20 minutes), permits rapid installation. Slabs may be walked on as soon as set and thus may be used as working surfaces in pouring adjacent sections. Built up roofing should be applied as soon as the deck is dry on the top surface.

RESISTANCE TO SEISMIC FORCES—Firestopper Roof Decks meeting A.S.T.M. Standard Specification C317-55 Class "B", and the National Building Code, Section 914.4 Class "B", meet the requirements of the Uniform Building Code as a diaphram to resist lateral stresses resulting from earthquakes.

APPEARANCE—The smooth, trim finished undersurface of this roof deck construction requires no further decoration. If desired, the undersurface may be painted after it is thoroughly dry by following ordinary painting methods.

THERMAL INSULATION—Excellent insulation against summer heat and winter cold is provided by retarc ing the flow of heat. Two and one-half inches o gypsum is considered sufficient insulation for mos building requirements.

ECONOMICAL—Savings in material cost and structural steel, low maintenance cost, simplicity of design, high insulation value, and the speed with which a Bestwall Firestopper Gypsum Roof Deck can be erected, make it a very economical type of construction. Easy to cut, nail and replace, changes may be made to a completed building with a minimum of expense.

® O.C.F. Corp.

SGP 0027334

"Firestopper"

FIREPROOF GYPSUM BESTWALL BUILDING PRODUCTS

POURED-IN-PLACE GYPSUM ROOF DECKS

ARCHITECTURAL SPECIFICATIONS

SHORT FORM

A Bestwall Gypsum Company approved poured gypsum roof deck contractor shall install a poured gypsum roof deck as specified on all areas indicated, in accordance with the current published American Standard Specifications for reinforced gypsum concrete. He is to furnish all necessary materials, labor and equipment for its erection.

LONG FORM

GENERAL PROVISIONS — The roof deck contractor's work includes all materials, labor, services, equipment, hoisting and scaffolding, and performing all operations required to complete the installation of reinforced gypsum concrete in accordance with drawings and specifications. This includes the supplying and installing of the sub-purlins, the form board, the reinforcing fabrics, the Metro-Mix gypsum concrete and the gypsum roof cants, curbs and drainage fills. Approved shop drawings are required before work proceeds.

MATERIALS

1. **STEEL SUB-PURLINS** — The steel sub-purlins are to be of an approved type having the necessary structural characteristics to carry the required live and dead loads. They shall be shop painted with one coat of rust inhibitive paint.
2. **FORM BOARD** — Bestwall ½" Gypsum Roof Deck Form Board (or 1" Fiberglas Form Board or 1" Fiber Insulation Board or ¼" Asbestos Board) 32" wide and in length to correspond to purlin spacing.
3. **REINFORCING MESH** — Galvanized welded wire fabric having an effective cross sectional area of not less than 0.026 sq. in. per ft. of width, equivalent to No. 12 gauge longitudinal wires spaced not over 4 inches on centers and transverse wires shall be equivalent to No. 14 gauge and be spaced not over 8 inches on centers.
4. **GYPSUM CONCRETE** — Bestwall Metro-Mix consisting of a mill mixture of calcined gypsum and not more than 12½% by weight of wood shavings, conforming to American Standards Association requirements.

APPLICATION

1. **STEEL SUB-PURLINS** shall be welded to each primary framing member on which they bear by using fillet welds not less than ½" long placed on alternate sides of sub-purlins. Sub-purlins shall be properly spaced to receive the form boards specified.
2. **FORM BOARDS** shall be placed on flanges of sub-purlins with all end joints falling over walls, purlins, other primary framing members or joint tees. Cross joints of form boards with tongue and groove or similar interlocking designs do not require support. Form boards shall be cut to fit neatly, including fitting at all walls, curbs, openings, etc., as required. Where a suspended ceiling is to be hung below the slab, end joints may occur at random and be supported by use of suitable wire or sheet metal joint clips.

   NOTE: Where no sub-purlins are used change 1 and 2 as follows:

   1. Joint tees shall be placed across primary framing members, spacing them to receive exposed sides or ends of form boards. For spans up to 32⅝", the form boards shall be parallel or at right angles to the supports. Where spans exceed 32⅝", the form boards shall be placed at right angles to the supports.
   2. Bestwall Form Boards shall be placed on steel framing and joint tees being sure all edges and ends are supported. Where a suspended ceiling is to be hung below the slab, end joints may occur at random and be supported by use of suitable wire or sheet metal joint clips. Cut form board to fit neatly at walls, curbs, openings, etc., as required.
3. **REINFORCING FABRIC** — Reinforcing fabric shall be placed with the longitudinal wires at right angles to the sub-purlins. Ends of the fabric shall be lapped not less than six inches. Sides of fabric shall be butted or spaced apart not more than four inches. Reinforcing fabric shall be cut to fit at all walls, curbs, openings, etc. Reinforcing fabric shall be carried into all areas where Metro-Mix is to be placed, including poured curbs.
4. **METRO-MIX GYPSUM CONCRETE** shall be mixed with clean water only, and not to exceed 8½ gallons per 80 lb. bag according to the directions on the bag. Pour on the form board and screed to an average thickness of not less than two inches. Double pouring shall not be employed. NOTE: "Double pouring" means the application of gypsum concrete over substantial areas in more than one layer to complete the full slab thickness. This is to be distinguished from the common practice of "scratching in" gypsum concrete ahead of the general four to "seal" joints, etc.

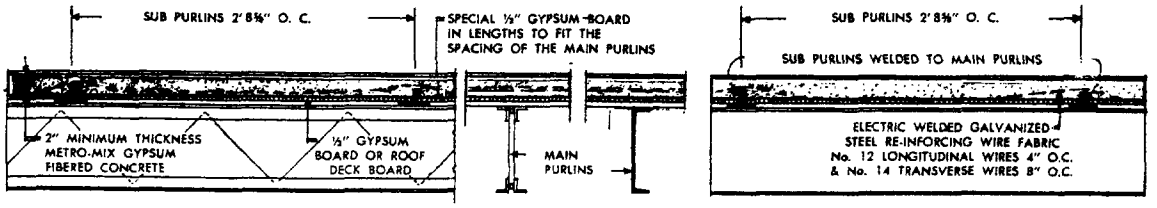
   In all cases, pouring of the gypsum concrete shall follow the installation of the form boards as promptly as possible. No more form boards shall be laid in one day than will have gypsum concrete poured over them in that day. Screeds such as metal bars or wood strips shall be placed as guides to screeding the gypsum concrete shall be spread and screeded. Surface of concrete shall be left smooth enough to receive the roof covering specified for the job. Pour all gypsum concrete cants, curbs and drainage fills specified or shown on the drawings. Drainage fills shall not exceed 8 inches in depth. Curbs around openings may be formed with form boards and have poured gypsum concrete placed to complete the curb ready for waterproof roof covering or the space between the steel framing of the curb can be filled with precast gypsum roof tile set in poured gypsum concrete mortar, ready to receive waterproof roof covering.

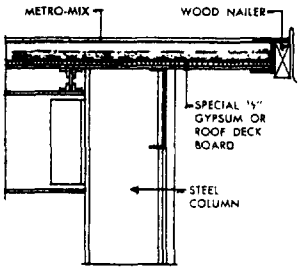
SUGGESTIONS TO ARCHITECTS

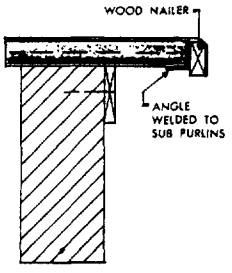
1. **PAINTING** — Paint underside of poured gypsum roof deck only after the slab is completely dry.
2. **EXPANSION JOINTS** — Where provided in the main structure, expansion joints should be provided in the roof deck.
3. **SUSPENDED CEILINGS** — Best when hung from main purlins. May be suspended from the sub-purlins if proper provisions are made for the added weight. Never attached to the gypsum slab itself.
4. **EAVE ANGLES AND WOOD NAILERS** should be provided for in the steel and carpentry specification.
5. **COLD WEATHER OPERATIONS** — Gypsum concrete shall not be poured during weather when the temperature and job exposure will allow the concrete to freeze before it takes its complete chemical set. Since the setting action of gypsum concrete generates considerable heat within the slab, it is usually safe to pour such slabs in the coldest weather during which mechanics normally work. However, at such periods, extra effort should be exerted to apply the built-up roof covering as promptly after pouring of slabs as is possible.
6. **ROOFING** — Roof covering should be applied as soon as possible after top surface of the gypsum concrete deck is reasonably dry as indicated by the disappearance of visible moisture gloss from the surface. The first two plies of the built-up roofing felts should be nailed to the slab. Nails should be 5d cut nails driven through conventional-type tin roofing discs. Holding power of each nail is approximately 17 lbs. when driven in a wet slab and 140 lbs. when slab is dry.

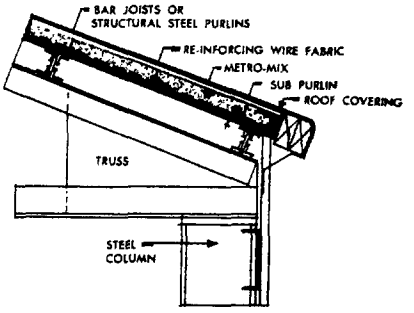
SGP 0027335

DESIGN AND INSTALLATION DETAILS

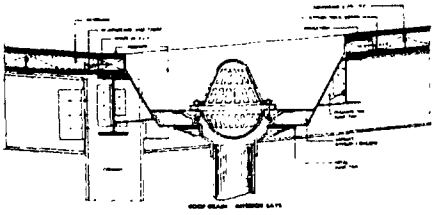




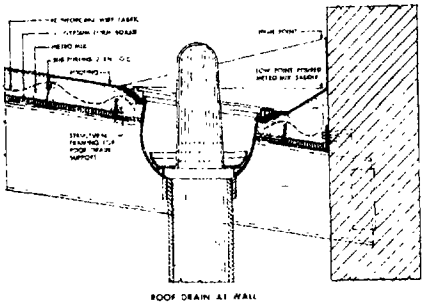


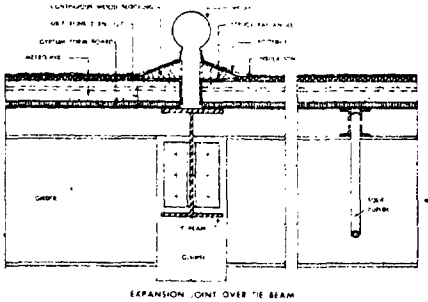


DETAIL OF EAVES

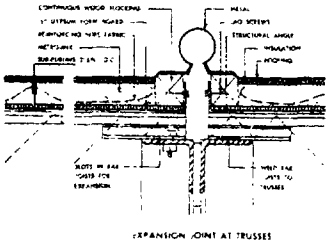


ROOF DRAIN AT WALL



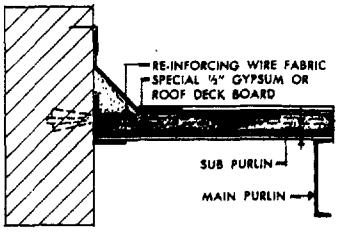


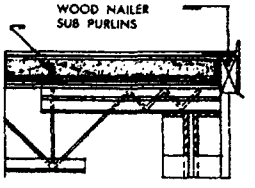
EXPANSION JOINT OVER TIE BEAM

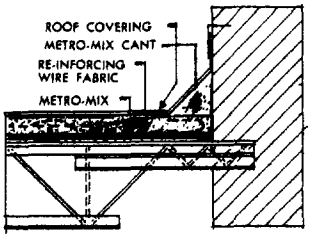


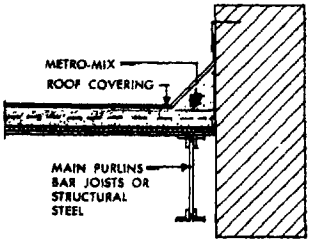
EXPANSION JOINT AT TRUSSES

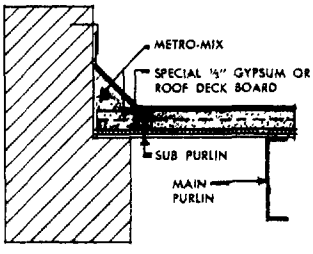
DETAIL OF PARAPET AND END WALLS

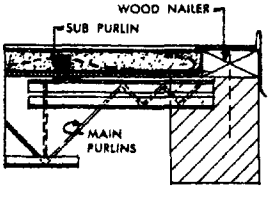




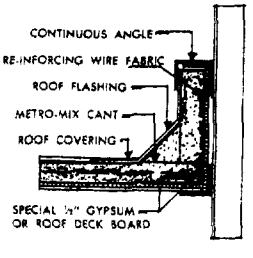


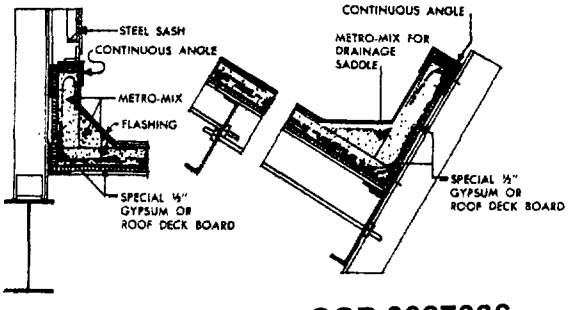






DETAIL OF CURBS





SGP 0027336

POURED-IN-PLACE GYPSUM ROOF DECKS

"Firestopper"

SUB-PURLINS TABLE OF SAFE TOTAL LOADS

Based on: Purlins spaced 2'-8⅝" O.C. fs 20,000 P.S.I., M=1/10 WL (unless otherwise indicated)

Sub-Purlins	Sect. Mod. S in.³	Mo. of I	Wt. in Lbs. per Lin. Ft.	Wt. in Lbs. per Sq. Ft. of Roof	Safe Total Load in lbs. per sq. ft. uniformly distributed															Max. Eave Overhang
					3'-0"	3'-6"	4'-0"	4'-6"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	
1½"x1½"x⅛" Plain T. (B)	.081	.086	1.33	.49	55	40														1'-4"
1½"x1½"x⅛" Plain T. (I)	.078	.082	1.33	.49	53	39														1'-4"
1.50 Flg. Chan. (B)	.110	.065	1.50	.55				34	28	Sub-Purlins spaced 2'-9½" on centers										1'-8"
3158x8ulb T. (W)	.1608	.1603	1.45	.53	110	80	62													2'-0"
158 Bulb T. (I)	.165	.162	1.50	.55	112	83	63													2'-0"
1480 Bulb T. (B)	.173	.146	1.55	.57	117	86					29									2'-0"
#4-8-16 (TR. T) 1/240 (E)	.142	.176	1.05	.39	110	94	82	73	66	60	55	51	47	44	41	39				—
#4-8-16 (TR. T) 1/360 (E)	.142	.176	1.05	.39	110	94	82	73	66	60	55	51	47	44	36	30				—
2.0 Flg. Chan. (B)	.218	.166	2.00	.74					55	44	38	32	Sub-Purlins spaced 2'-10" on centers							2'-2"
3168 Bulb T. (W)	.240	.247	2.00	.73		120		74	60	50	42	35	30							2'-6"
168 Bulb T. (I)	.240	.247	2.00	.74		120	92													2'-6"
2.25 Flg. Chan. (B)	.256	.199	2.25	.83					64	52	44	38	33	28	Spaced 2'-10" O.C.					2'-6"
1680 Bulb T. (B)	.261	.251	2.00	.74			100						33	28						2'-8"
2.50 Flg. Chan. (B)	.276	.217	2.50	.92					69	56	48	41	35	31	27	Spaced 2'-10" O.C.				2'-8"
178 Bulb T. (I)	.340	.364	2.50	.92			130	103	83					37						3'-0"
8 lb. ASCE Rail (W)	.31	.27	2.67	.97								45	39	34	30	26				2'-10"
2.75 Flg. Chan. (B)	.311	.251	2.75	1.01					78	63	54	46	40	35	30	Spaced 2'-10" O.C.				2'-10"
3178 Bulb T. (W)	.324	.397	2.47	.9			122	98	80	65		46	40	35	30					2'-10"
1780 Bulb T. (B)	.332	.348	2.40	.88			127	100						36	31					2'-10"
#1-6-16 (TR. T) 1/240 (E)	.360	.235	1.28	.47	162	139	122	108	97	88	81	75	70	65	61	57	54	46	40	—
#1-6-16 (TR. T) 1/360 (E)	.360	.235	1.28	.47	162	139	122	108	97	88	81	75	70	63	52	43	36	31	26	—
200 Bulb T. (I)	.460	.503	3.00	1.10				139	113											3'-6"
3218 Bulb T. (W)	.472	.561	3.01	1.10									60	50	45	40	35	31		3'-6"
218 Bulb T. (I)	.520	.598	3.00	1.10											50	44	40	35		3'-8"
2180 Bulb T. (B)	.518	.608	2.95	1.08					127						49	43	39	35		3'-8"
12 Lb. ASCE Rail (W)	63	.66	4.00	1.45								91	79	69	60	54	48	43	39	4'-0"
2140 Bulb T. (B)	.639	.786	3.65	1.34						129						54	48	43		4'-0"
3228 Bulb T. (W)	.738	.852	3.65	1.34											72	64	56	50	45	4'-4"
16 Lb. ASCE Rail (W)	1.01	1.24	5.33	1.94										110	97	86	77	69	62	5'-2"
3258 Bulb T. (W)	1.046	1.37	4.67	1.70													80	70	65	5'-2"
20 Lb. ASCE Rail (W)	1.43	1.94	6.67	2.42													108	97	88	6'-2"
					Minimum Slab Thickness (3") Three Inch Total															

NOTES:

1. Loads to left of shaded block have deflections less than shaded 1/360 of Span; Loads in shaded blocks have deflections more than 1/360 of Span but less than 1/240 of Span; Loads to right of block have deflections greater than 1/240 of Span.
2. Deflections based on semi-continuous spans or $D=3wL^3/384EI$ Per A.I.S.
3. To determine total safe load for Bending Moment of ⅛ WL, use 80% of the tabulated load.
4. To determine total safe load for a maximum fiber stress of 18,000 psi, use 90% of tabulated load.
5. For suspended ceilings, use loads shown to the left of the shaded block, or 75% of loads shown in shaded block can generally be safely used.
6. For values of Acoustical slabs with 24¾" spacing, multiply values shown by 1.325.
7. Maximum eave overhang based on a total load of 45 pounds per square foot. Bending moment M=⅛ WL. spaced as indicated.
8. Manufacturers of various sub-purlins shown:
   (I) Inland Steel Company, 38 S. Dearborn St., Chicago 38, Ill.
   (B) Buffalo Steel Division—H. K. Porter Co., Inc.—Tonawanda, N. Y.
   (W) West Virginia Steel and Mfg. Co., Huntington, W. Va.
   (E) Edge Steel Products Corporation, Olatha, Kansas
9. Design loads of less than 45 pounds per sq. ft. are not recommended.

TABLE OF SLAB WEIGHTS AND THERMAL INSULATION VALUES

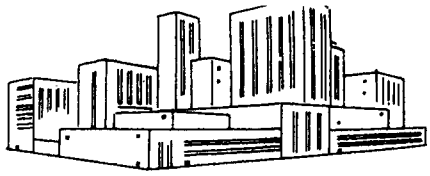
Total Slab Thickness (including Form Board)	Approx. Slab Weight per Sq. Ft.	"U" Value for Complete Roof Slab including Built-Up Roof Covering (Btu per square foot per hr. per degree F difference in temperature)				
		No Insulation	½" Insulation Board (k-33)	½" Fiberglas Insulation	1" Insulation Board (k-33)	1" Fiberglas Insulation
2½" Slab (2" Metro-Mix—½" Bestwall Gypsum Form Board)	10.7 Lbs.	.383	.242	.217	.177	.151
3" Slab (2½" Metro-Mix—½" Bestwall Gypsum Form Board)	12.9 Lbs	.343	.226	.203	.168	.145
3" Slab (2" Metro-Mix—1" Fiber Insulation Form Board)	10.1 Lbs.	.189	.147	.172	.120	.108
3½" Slab (2½" Metro-Mix—1" Fiber Insulation Form Board)	12.3 Lbs.	.179	.141	.132	.116	.104
2¼" Slab (2" Metro-Mix—¼" Asbestos Form Board)	11.1 Lbs.	.431	.260	.231	.187	.158
2¾" Slab (2½" Metro-Mix—¼" Asbestos Form Board)	13.3 Lbs	.381	.242	.216	.177	.151
3" Slab (2" Metro-Mix—1" Fiberglas Form Board)	9.62 Lbs.	.160	.129	.121	.108	.097

NOTE: 1. For Total Weight of Roof Deck per square foot add Weight of Sub-Purlins per square foot of roof to the approximate Slab Weight shown to left.

2. Approximate Weight of various materials used: Metro-Mix 52 lbs. per cu. ft. when mixed according to specifications; ½" Bestwall Gypsum Form Board 2.05 lbs. per square foot; 1" Insulation Form Board 1.45 lbs. per square foot; ¼" Asbestos Board 2.44 lbs. per square foot; 1" Fiberglas Form Board .96 lbs. per square foot.

SGP 0027337

Gypsteel Plank



a modern product for modern buildings

GYPSTEEL PLANK is a structural, precast roof deck unit. All four sides are bound with a steel framework that is tongued and grooved so that adjacent units lock to form a series of strong, rigid "I" beams. The gypsum core of each plank contains a steel wire mat.

The wide-spread acceptance of Bestwall Gypsteel Plank by architects, engineers and builders is established by the many millions of square feet of Gypsteel now in service all over the Country. Gypsteel Plank is used as a roof decking in industrial, commercial and institutional buildings.

[redacted]

1. QUALITY — Gypsteel Plank is unsurpassed in quality and uniformity because it is precast under factory quality control. This feature permits an architect to exercise the maximum control over the quality of the finished roof deck.

2. ECONOMICS —

(a) Gypsteel Plank is ready to apply when it arrives at the job; no special experience or equipment is necessary for erection. Gypsteel Plank is applied without grout and, therefore, winter time delays are avoided. It may be erected in any weather that men can work.

(b) Unlike many roof deck systems Gypsteel Plank does not require a special vapor barrier beneath roof insulation nor a sprinkler system to obtain a favorable fire insurance rating.

(c) Gypsteel Plank is light in weight and structurally well designed. This permits the selection of light framing members and allows maximum spacing. Gypsteel has the ability to follow warped surfaces, if not too extreme.

(d) Gypsteel Plank may be laid directly over wood, concrete, or steel supports of any type and of either uniform or variable spacing (not exceeding 7' on centers). End joints must be staggered, but need not come over the supports. This reduces cutting to a minimum and practically eliminates waste, for a small piece left over from the last Plank in any row may be used to start the next row.

3. VERSATILITY — Gypsteel Plank is adaptable to flat roofs, pitched roofs and curved roofs having a radius of 150 ft. or more. So that Gypsteel Plank may be attached to any steel structural supporting member in use, there are special clips available. The type, including manufacturer and size, of the structural supports to be used should be given at the time the order for Plank is placed so that proper clips may be furnished.

4. STABILITY AND DURABILITY — Gypsteel Plank represents an extremely durable and stable product. It is not effected by changes in temperature or atmospheric conditions. It will not rot, decay or deteriorate, it is vermin proof, termite proof, and is as permanent as any structure. In addition, the product will not lose its dimensional stability, appearance, or permanent structural strength due to leaks which may occur in the roofing material, providing repairs to the roofing membrane are made within a reasonable length of time.

5. APPEARANCE AND MAINTENANCE — The roof deck presents a smooth, attractive, light-reflective ceiling area which requires no maintenance. It may be painted if desired.

6. THERMAL VALUE — The insulation value afforded by Gypsteel Plank is sufficiently high to meet the requirements of most industrial and commercial buildings including factory areas, warehouses, and loading sheds. By comparison, the "U" value, including a built-up roof covering, of Gypsteel Plank is .52; steel decks — .94; 2" concrete plank — .58; and 6" poured concrete — .65.

7. FIREPROOF — Gypsteel Plank is non-combustible. Because of the unusual properties of gypsum when subjected to heat, Gypsteel Plank affords greater fire protection to a building and its contents than any comparable system. Wood will burn when exposed to heat of 300° F., steel will begin to soften at 900° F., 1" of gypsum will contain a fire of 1700° F. for one hour. This phenomenon allows gypsum to act as a fire insulator for areas to be protected. In case of fire, Gypsteel Plank will protect a building from fuel contribution from roofing materials as long as the structural support remains intact.

SGP 0027338

TECHNICAL DATA

THICKNESS	WIDTH	LENGTH	WEIGHT PER SQ. FT.
2"	15"	10'	12#

INSULATION COEFFICIENTS

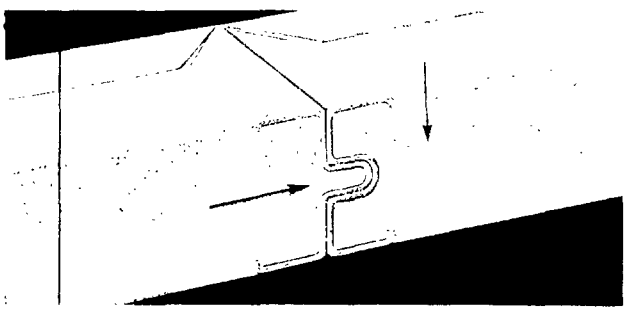
U-Factor (Air to Air) including roofing covering, ½" Gypsum Backer Board and ¾" Acoustical Tile on bar joist or suspended ceiling.			U-Factor (Air to Air) including a built-up roof covering. Thermal conductivity — Btu per sq. ft. per hour per degree F. difference in temperature.		
No Insulation	½" Insulation	1" Insulation	No Insulation	½" Insulation	1" Insulation
.16	.13	.12	.52	.28	.19

UNIFORM LOAD CARRYING CAPACITY CHART

SPAN	CARRYING CAPACITY	SAFETY FACTOR
4'	230 lbs. per sq. ft.	4
5'	146 lbs. per sq. ft.	4
6'	105 lbs. per sq. ft.	4
7'	75 lbs. per sq. ft.	4

NAIL HOLDING CHART

DESCRIPTION OF NAIL	HOLDING POWER OF DRY GYPSUM — DIRECT PULL ON NAIL Penetration ¼ less than nail's length.
1½" square cut nail	175.1 pounds
1¾" galvanized roofing nail	69.4 pounds



Carefully designed tongue provides for easy meshing, yet tight fitting joint, transmitting load from one plank to the adjacent one without causing separation of the plank.

UPLIFT RESISTANCE:

Standard clips have a holding power of 229 lbs. each. Based on an average of 2½ clips per plank, this means a resistance to uplift of 46 lbs. per square foot which with the 12# deadload of the deck is more than ample to meet building code requirements.

CANTILEVERING:

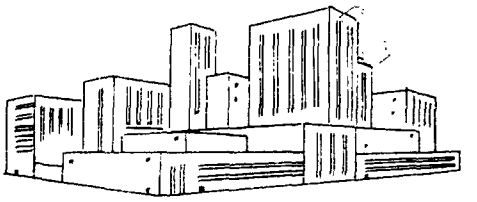
Gypsum Plank may be cantilevered in the lengthwise direction up to 30 inches providing each plank is attached to the exterior wall, that every other row of plank is started with a full plank and alternate rows are started with not less than a 4 ft. section.
Gypsum Plank may be cantilevered up to 6 inches in a crosswise direction.

FEDERAL SPECIFICATIONS:

Gypsteel Plank meets Federal Specification SS-S-439, Type I, including the limitation on the deflection of 1/120 of the span with a 75# per sq. ft. live load over a clear span of 6'-8". The plank will also pass the overload test requirements of this Federal Specification.

Gypsteel Plank

a modern product for modern buildings



SPECIFICATIONS

SCOPE: Unless otherwise designated in plans, all roof areas shall be covered with BESTWALL GYPSTEEL PLANK and all cants and saddles shall be constructed as shown or specified herein.

MATERIALS: All roof deck areas shall be covered by GYPSTEEL PLANK 2" x 15" x 10' as manufactured by the BESTWALL GYPSUM COMPANY.

Clips to secure Gypsteel Plank to the structural members shall be furnished by the Plank manufacturer. (Unless otherwise determined, the clips should be ordered at the rate of 2 ½ per individual plank.) Nails, 2 per clip, shall be 4d galvanized slater nails or 1 ¼" smooth shank, galvanized roofers nails.

All cants and saddles shall be constructed of BESTWALL METRO MIX gypsum concrete as manufactured by the BESTWALL GYPSUM COMPANY.

ERECTION: Start laying Gypsteel Plank at a corner of each independent area with the long dimension at right angles to the supports, laying the tongued side toward the exterior wall. Be certain the trademark face is up.

Start with a full Plank in the first row, a half or cut Plank in the second row, a full Plank for the third row, and so on for each succeeding row. Side and end joints shell be meshed as tightly as possible to form a smooth continuous surface.

End joints must be staggered whether they come over the supports or not. To accomplish this, the Planks which are left after cutting to fill out one row may be used to start another row, since it is not necessary to have a Plank receive support from two purlins to start a row. In staggering end joints, leave a minimum of thirty inches between them. Cut Plank to fit all hips, ridges and valleys as required by plans. Fill any voids with Bestwall Metro Mix gypsum concrete to present a finished area.

Attach the Plank to the top cord of steel purlin or joist at every point of support with galvanized steel clips furnished by the manufacturer. Where possible, clips should be placed on alternate sides of steel purlins on succeeding rows.

When Plank is laid over wood roof joints, the same erection details shall be followed except that the Plank shall be nailed with two 16d spikes at every point of support. In lieu of nailing plank to joists they may be wire tied by nailing into the edge of the Plank and using 14 gauge galvanized or Monel wire tied to nail in side of joists. Special nailing or a wire tie detail may be used in applying Gypsteel Plank to concrete joists.

On all Gypsteel Plank roofs with more than 4" pitch per foot, the thrust shall be taken up at the eaves by a stop angle or other member of appropriate size and strength. If pitch is more than 5" but less than 10" to the foot, bolt Plank every 10' up the slope using ½" carriage bolts. When pitch exceeds 10" to the foot use ¾" carriage bolts in similar manner. On all sloping roofs, proper type clip for structural support made of heavy gauge metal shall be used. See details.

Cants and saddles shall be installed as indicated on plans using Bestwall Metro Mix gypsum concrete at a water ratio of 7 and 8 gallons per 80 lb. bag.

On all overhanging deck areas a wood nailer shall be attached to the edge of the Plank flush with the deck surface to provide for attaching gravel stop and roof covering.

SGP 0027340