PERFORATIONS

Formglas

Formglas

Founded in 1961, Formglas Inc. is the worlds leading manufacturer of Glass Fibre reinforced Gypsum cast products for interior use.
With production facilities in Toronto and Kuala Lumpur of 20,000 m^2 and over 300 engineering and production personnel, Formglas has the resources to handle any size project. A network of sales agents provides service around the globe. These agents will assist, with input from the factory, in finding cost effective solutions to architect or contractors requirements.
Formglas products have been extensively tested around the world, and meet requirements for non-combustibility and low flame spread.
(For a full list of test data, see Formglas GRG brochure inside back cover, or visit our website at www.formglas.com)

PERFORATIONS:

Formglas has over the past 7 years incorporated computerized modelling and tooling into a production system that affords the possibility of creating 3D perforated shapes. A number of such projects have been completed, and this brochure illustrates some of the more interesting examples.
In designing a perforated surface, the following are some criteria to bear in mind:

- Perforations can be any shape and can be incorporated into most any size.
- Minimum perforation size is 1/4" - 6 mm dia.
- Minimum distance between edges of perforations - 1/2'' - 12mm
- Maximum panel size approximately 30 sq ft - 2.8 m^2
- Maximum size of single flat perforated panel 5'-3" X 5' 3'' - 1.6m X 1.6m
- Generally a panel needs a non-perforated border of approximately 1 1/2" 40mm for reinforcement along the edge.
- All panels have a finished surface on one side with a rough back.

Formglas

Fondata nel 1961, Formglas Inc. è il produttore leader su scala mondiale di prodotti preformati a base di gesso rinforzato con fibra dli vetro per uso per interni.
Con strutture produttive a Toronto e a Kuala Lumpur che si estendono su una superficie di 20,000 m^2 e con oltre 300 dipendenti nei reparti ingegneria e produzione, Formglas possiede le risorse per gestire progetti di qualunque portata. Una rete di agenti di vendita fornisce il proprio servizio assistenza in tutto il mondo. Questi agenti vi assisteranno, avvalendosi del contributo delle strutture produttive, nel trovare soluzioni a costa contenuti per le necessità di architetti e appaltatori.
I prodotti della Formglas sono stati ampiamente collaudati in tutto il mondo e rispondono ai requisiti di non combustibilità e di limitata attitudine alla propagazione della fiamma. (Per un elenco competo dei dati di collaudo, si veda l'opuscolo GRG all'interno della retrocopertina o si prega di visitare il nostro sito Internet all'indirizzo www.formglas.com)

Perforazioni

La Formglas, nei corso degli ultimi 7 anni, ha incorporato strumenti di modellazione ed attrezzaggio computerizzati nella sua linea di produzione, che permettono di creare forme 3D perforate. Un certo numero di questi progetti è stato completato. Quest'opuscolo ne presenta alcuni fra i più interessanti.
Nell' effettuare il design d'una superficie perforata è necessario considerare i criteri seguenti:

- Le perforazioni possono essere di qualunque forma e possono essere applicate sulla maggior parte delle forme e su forme di qualungue tipo.
- Le perforazioni minime misurano un diametro di 1/4 di pollice o 6mm.
- La distanza minima fra i bordi della perforazione è di 1/2 o 12mm.
- La grandezza massima del pannelli è di circa 30 piedi quadrati o 2,8 m^2.
- La grandezza massima di un singolo pannello piatto perforato è di 5 piedi-3 pollici X 5 piedi - 3 pollici oppure di 1, 60m X 1, 60m.
- Generalmente un pannello necessita di un bordo non perforato di circa 1 pollice e 1/2 oppure 40 mm come rinforzo lungo il bordo.
- Tutti i pannelli hanno una superficie rifinita da una parte ed un dorso non rifinito dall'altra.

Formglas Inc.は室内用グラスファイバー強化石膏製品の製造メーカーとして、1961年の創業以来今日まで常に業界をリードしてまいりました。
トロントとクアラルンプールにある総計20,000㎡の生産工場には常時300名に及ぶエンジニアと生産スタッフを配し、あらゆる規模の物件に対応可能な設備と人員を有しています。また、ネットワーク化された販売代理店は世界各地にてサービスを提供しております。これらの販売代理店は工場との情報交換により、設計者や建設業者の意向に添った最も経済的なご提案をいたします。当社の製品はこれまでに世界各国で不燃性や火災の遅延等に関する数多くの試験を通じ、その品質・性能を認められています。(試験結果のデータについてはFormglas GRGパンフレット（英語版）の裏表紙内側、もしくは本社ウエブサイトwww.formglas.comをご覧下さい。)

有孔製品

当社では7年前よりコンピューター制御による型の製造技術を導入し、有孔3次曲面体までも製造が可能な生産システムを確立いたしました。これまでに数多くご採用いただき、実績を重ねてまいりましたが、その中でも特に参考としてご覧いただきたい物件を、このパンフレットにてご紹介いたします。

有孔製品に関するデザイン上の留意点は下記の通りとなります。

・殆どの面形に対して、いかなる形状の穴でも可能です。
・穴の直径の最小サイズは6㎜。
・穴同士の間隔（縦〜縦）は12㎜以上とします。
・最大の製品サイズは約2.8㎡までとします。有孔平面パネルの最大サイズは1.6m×1.6m。
・製品端部は補強の為に約40㎜巾の無孔部分が必要です。
・製品は仕上げされた表面と仕上げされない裏面からなります。

Formglas

Die 1961 gegründete Unternehmensgruppe Formglas Inc. ist weltweit führend in der Herstellung von Produkten aus glasfaserverstärktem Gips, die speziell für den anspruchsvollen Innenausbau entwickelt wurden.
Mit insgesamt 20,000 m^2 Fertigungsstätten in Toronto/Kanada und Kuala Lumpur/Malaysia sowie über 300 qualifizierten Mitarbeitern kann Formglas selbst die schwierigste Projekte übernehmen. Außerdem steht ein weltumspannendes Netz von Verkaufsagenten bereit, um gemeinsam mit den Werkstechnikern die kostengünstigsten Lösungen für alle denkbaren Aufgaben in der Innenarchitektur und der Bauausführung zu gewährleisten. Formglas hat alle Produkte von anerkannten Instituten in der ganzen Welt auf Nichtbrennbarkeit und niedrige Rauchentwicklung testen lassen.
(Die vollständige Liste der Prüfungen sind auf der letzten Seite der GRG-Broschüre erfasst oder können auf der Web-Seite www.formglas.com eingesehen werden.)

Lochung

Im Jahr 1994 hat Formglas die Modellgestaltung computerisiert und begann mit der Fertigung auf CNC gesteuerte Werkzeugmaschinen. Durch diese Umrüstung sind auch 3-D Formen mit gelochtem Design möglich. Viele interessante Projekte sind seit dieser Zeit realisiert worden. Nur einige Beispiele der bisher ausgeführten Projekte werden in dieser Broschüre vorgestellt. Für die Fertigung von gelochten Elementen sind u.a. die nachfolgenden Kriterien besonders wichtig:

- fast jede Lochform ist möglich und kann in eine vorgegebene Fläche - flach oder gekrümmteingearbeitet werden.
- der klienste Durchmesser pro Loch beträgt 6mm.
- der Abstand zwischen den Löchern soll mindestens 12mm sein.
- die maximal herstellbare Fläche liegt bei ca. 2,8 m^2.
- die maximale Fläche für die gelochte, flache Ausführung ist 1,60 X 1,60m^2.
- an den Rändern muss ein nichtgelochter, rundun laufender Abstand bis zur notwendigen Randverstärkung von ca. 40mm verbleiben.
- alle Platten haben eine glatte, für den späteren Anstrich bereits vorbereitete Oberfläche, und eine unbearbeitete Rückseite.

Formglas

Fondé en 1961, Formglas INC. est le principal fabricant mondial de produits moulés en gypse renforcé avec de la fibre de verre. Cette technologie associée à d'autres produits où systèmes, répond aux différents besoins du second oeuvre à usage intérieur.
Avec ses deux usines situées à Toronto et Kuala Lumpur, d'une superficie totale de 20000 m^2 ainsi qu'un personnel composé de plus de 300 ingénieurs et employés de fabrication, Formglas dispose des ressources nécessaires pour la réalisation de projets de n'importe quelle envergure.
Un réseau d'agents de vente assure un service à travers le monde entier. Ces derniers en étroite collaboration avec les usines de production, participent à l'élaboration de la solution la plus rentable tout en rencontrant les exigences de ses clients.
Les produits de Formglas ont été largement testés de par le monde et répondent aux exigences d'incombustibilité et de faible propagation des flammes.(Pour de plus amples informations sur les résultats des testes effectués, veuillez vous rapporter à la couverture arrière de la brochure Formglas concernant le gypse renforcé avec de la fibre de verre, où visitez notre site Web à l'adresse suivante: www.formglas.com)

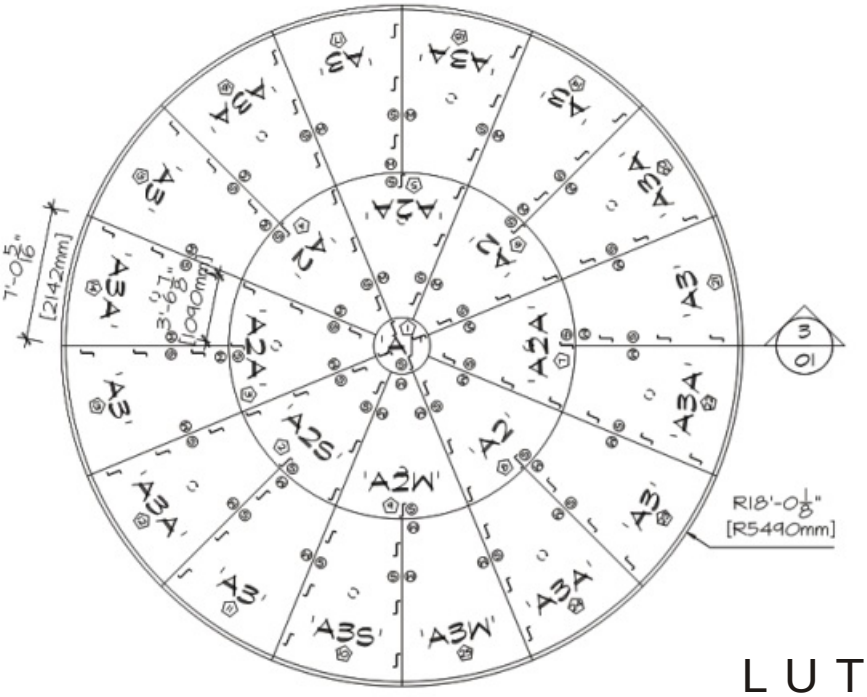
Perforations

Au cours des sept dernières années, Formglas a intégré dans son système de production de l'équipement informatisé lui permettant de réaliser la modélisation de formes perforées en 3D.
Vous trouverez dans cette brochure quelques un des exemples les plus intéressants illustrant cette technique. Cependant il ne faut pas perdre de vue les paramètres suivants lors de la création de surfaces perforées:

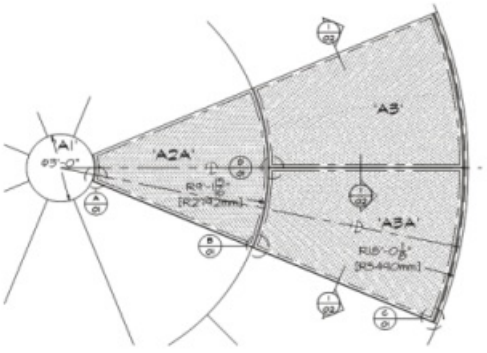
- Les perforations sont de formes très variées et peuvent s'intégre à n'importe quelle géométrie.
- La taille minimale pour une perforation est de 6mm de diamètre.
- La distance minimale à respecter entre les parois de chaque perforation est de 12mm.
- La grandeur maximale pour un panneau est d'environ 2,8 m^2.
- La grandeur maximale d'un panneau perforé plat et simple est de 1, 60m par 1, 60m.
- Il faut prévoir un espace non perforé sur le pourtour extérieur du panneau de environ 40 mm, permettant de renforcer le contour.
- La finition n'est effectuées que sur une seule des deux face.

CONFERENCE ROOM CEILING

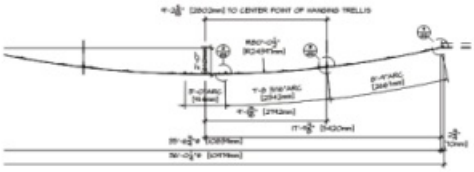
INVERTED PERFORATED DOME CEILING



REFLECTED CEILING PLAN



ENLARGED PLAN WITH PERFORATIONS PATTERN



SECTION THROUGH CEILING

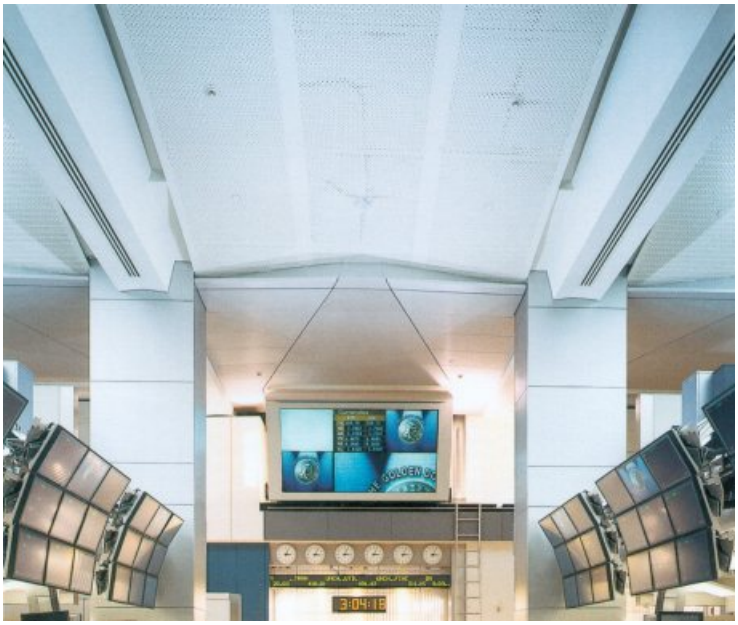
LUTHERAN CENTER

CONFERENCE ROOM BALTIMORE-MD.

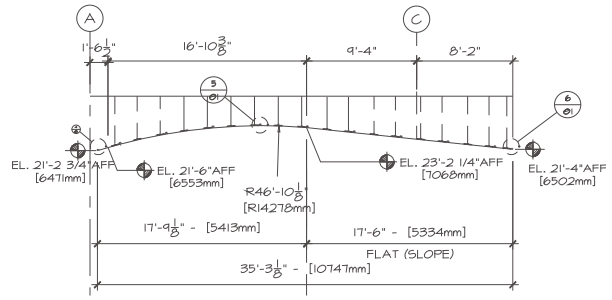
DESIGN: GWATHMEY SIEGEL & ASSOC. - N.Y.

INSTALLATION: CENTERLINE CONST. CO. - BALTIMORE MD.

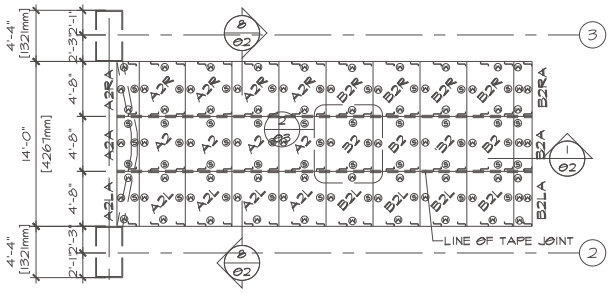
GENERAL VIEW OF TRADING FLOOR



VIEW OF TYPICAL BAY

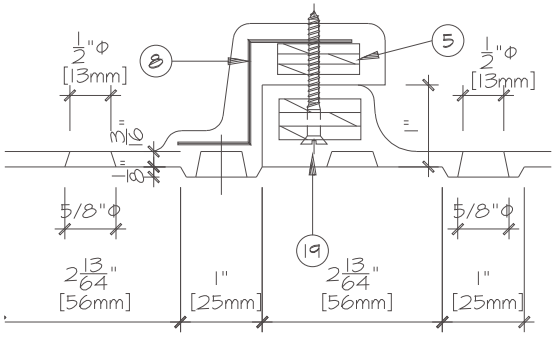


SECTION THROUGH TYPICAL BAY

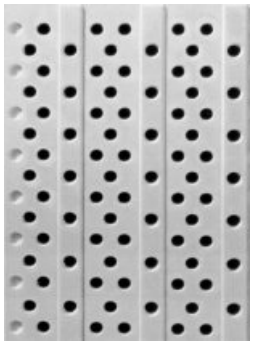


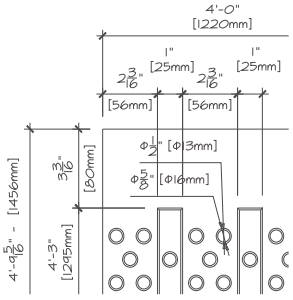
REFLECTED CEILING PLAN - TYPICAL BAY

VIEW OF CEILING FROM BALCONY



DETAIL OF JOINT BETWEEN PANELS





DETAILS OF PERFORATIONS

FEATURES:

- Curved ceiling comprising of panels approximately 4’-8” (1.4m) square.
- Square panels are both ribbed and perforated.

THE NEW YORK STOCK EXCHANGE

DESIGN:
SKIDMORE OWINGS & MERRILL - ARCHITECTS - NY
INSTALLATION: NATIONAL ACOUSTICS - NY

THE TRAINING CENTER

FEATURES:

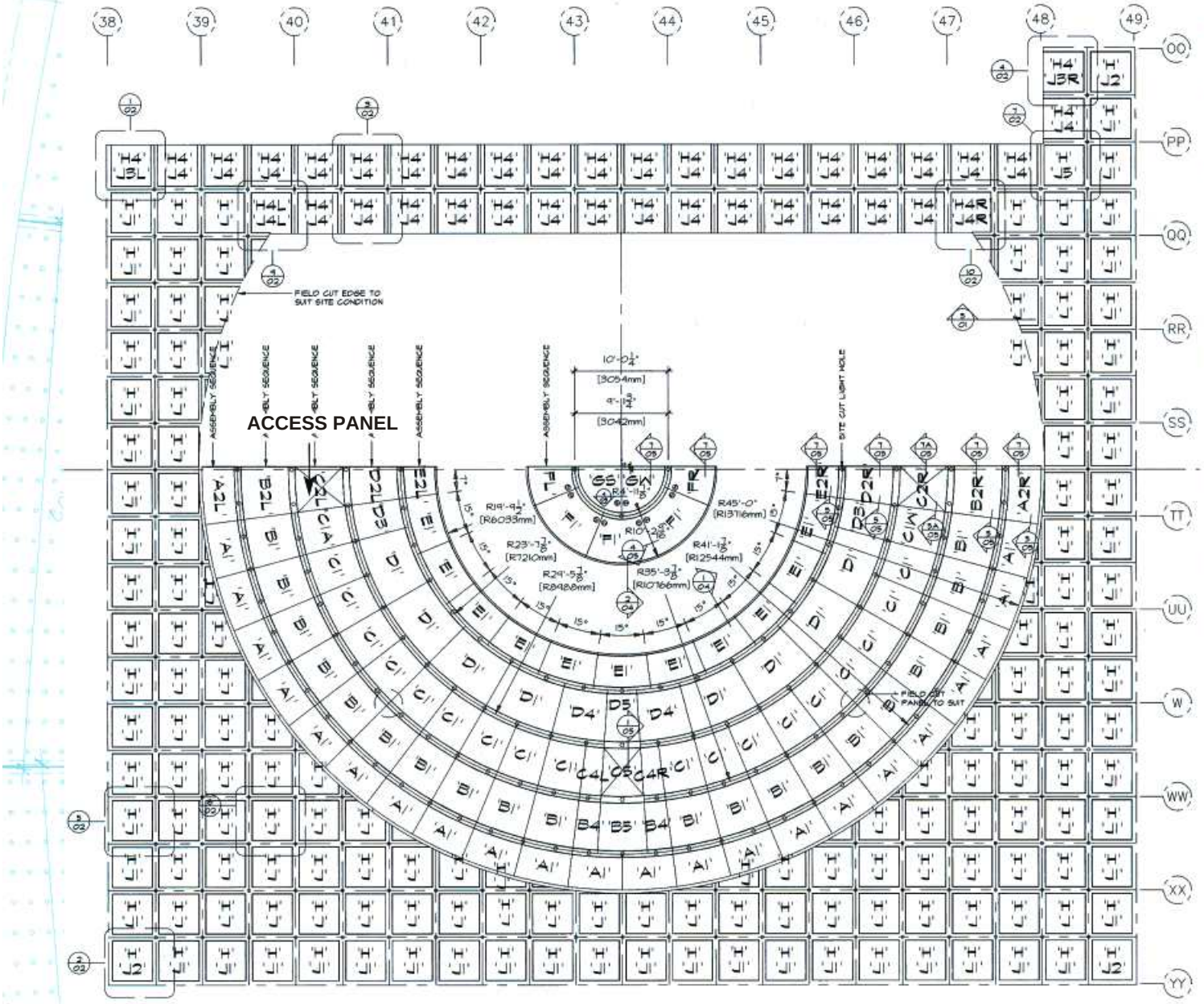
- Ceiling comprised of concentric rings of curved panels.
- Front of panels rigidised to reflect sound.
- Rear of panel perforated to absorb sound and handel air.
- Perforation pattern is radial, eminating from center of circles.
- Openings for light fixtures cast in.
- Access panels provided in curved surface in 3 locations.
- Joints all taped - standard drywall / plasterboard taping.

PEPSICO TRAINING CENTER

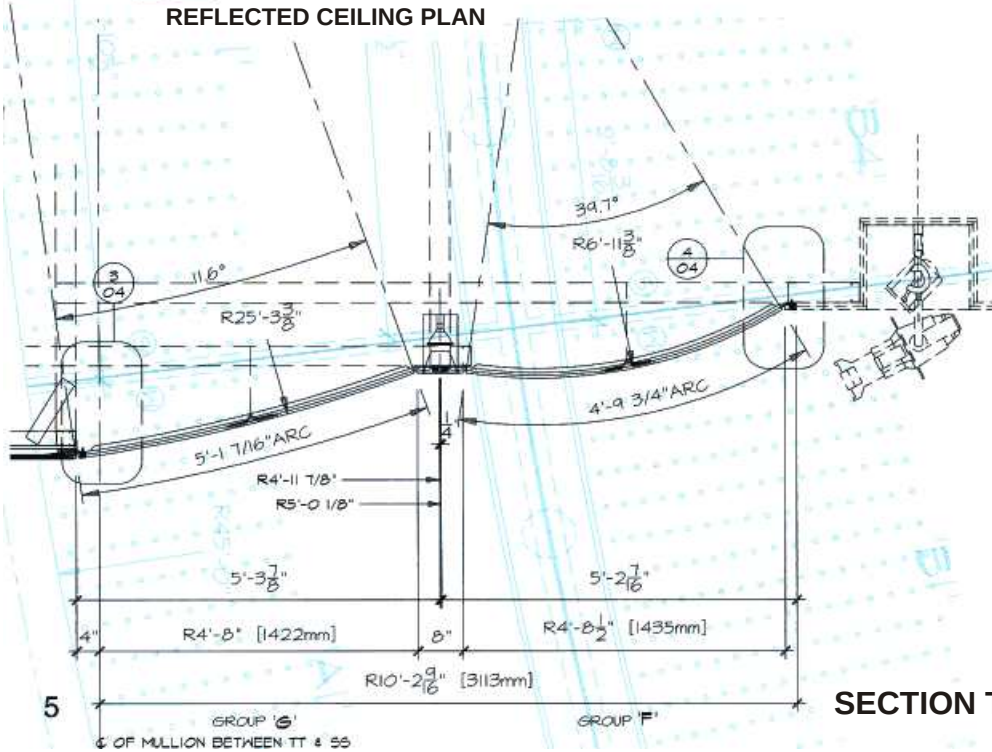
PEPSICO PURCHASE - N.Y.

DESIGN: GWATHMEY SIEGEL & ASSOCIATES. N.Y.
INSTALLATION: CORD CONTRACTING - ROSLYN HTS. - N.Y.

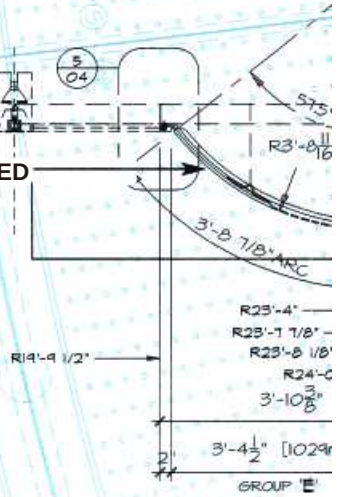
DETAIL OF CURVED CEILING



REFLECTED CEILING PLAN

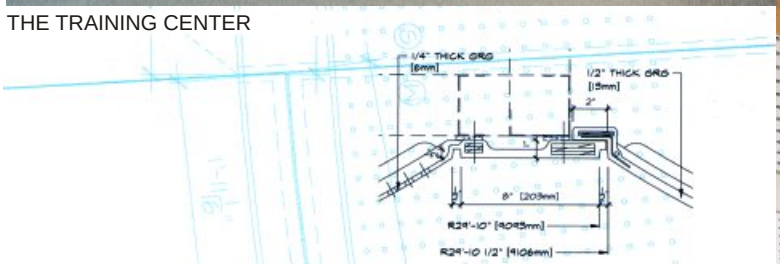


THIS FACE RIGIDISED



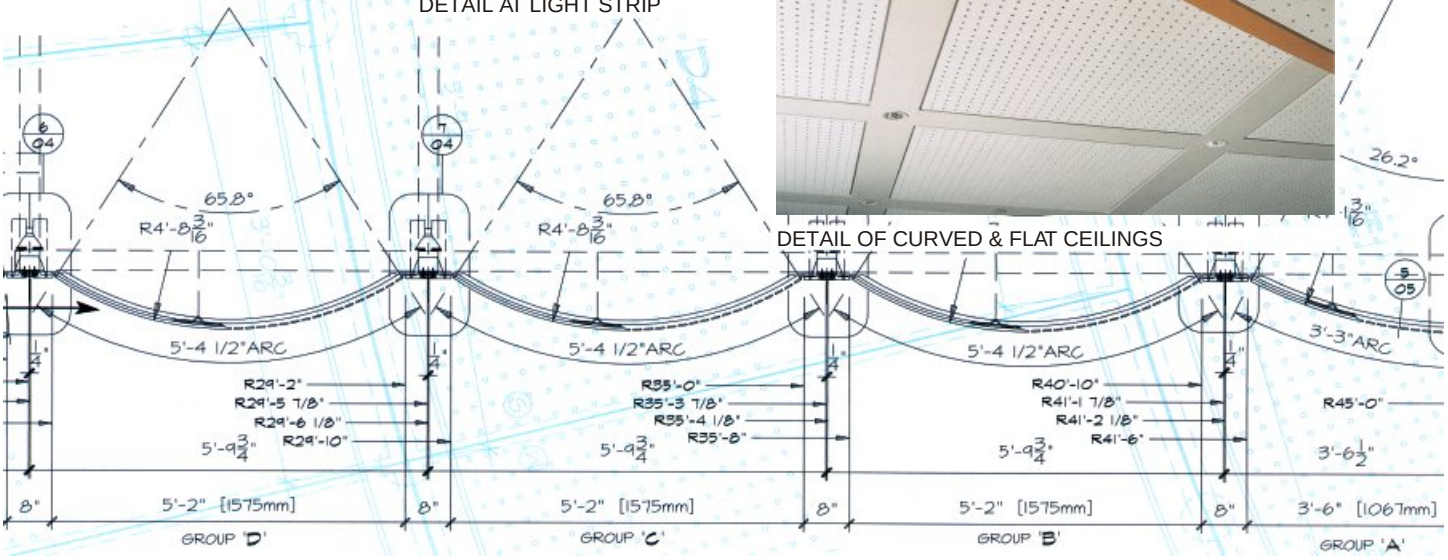
SECTION THROUGH CURVED CEILING

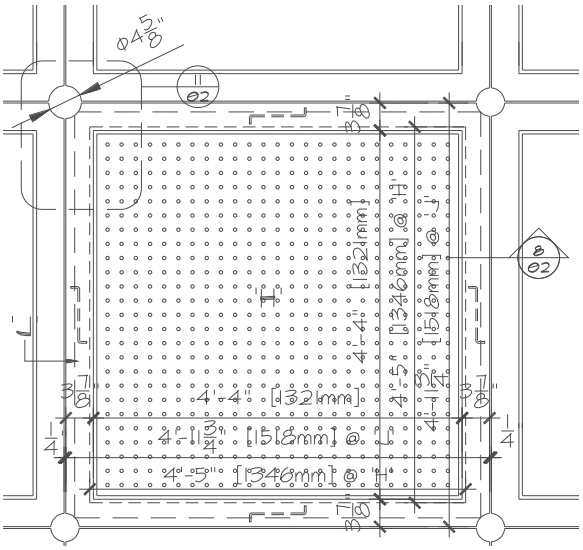
THE TRAINING CENTER



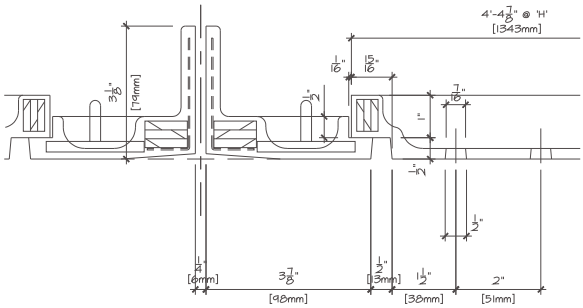
DETAIL AT LIGHT STRIP

DETAIL OF CURVED & FLAT CEILINGS

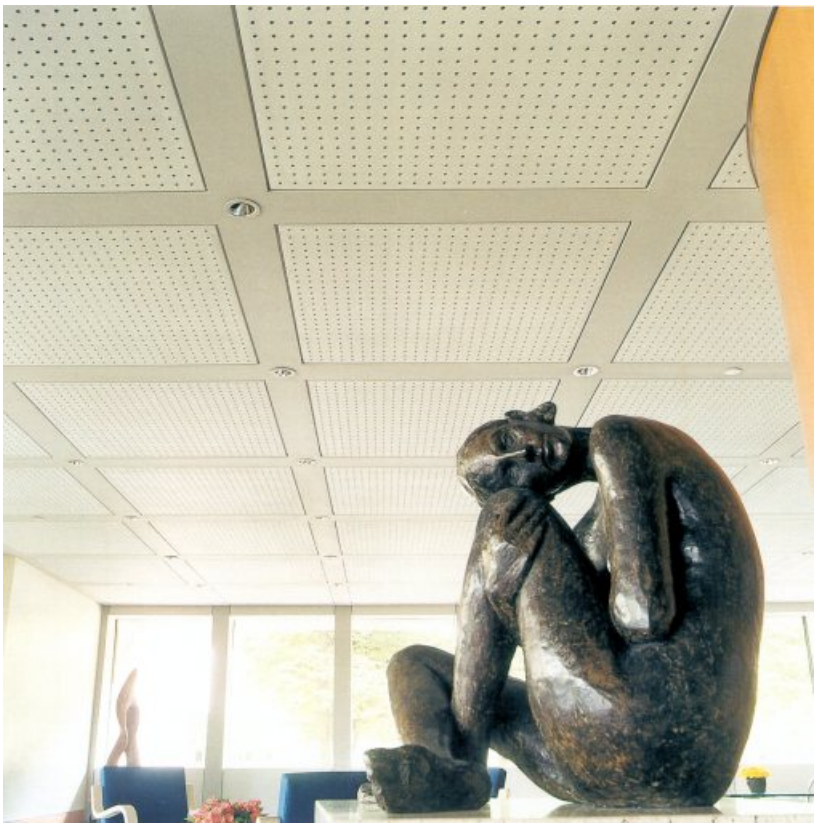




PLAN OF TYPICAL PANEL AND FRAME



DETAIL AT FRAME WITH INSET PANEL



CAFETERIA CEILING

FEATURES:

- Perforated panels are removable and 4’-5” (1.35m) square.
- Frame system replacing drywall was hung on wire.
- All lamp and sprinkler openings built into fram system.
- Prepainted panels wer dropped in after completion of frame system.

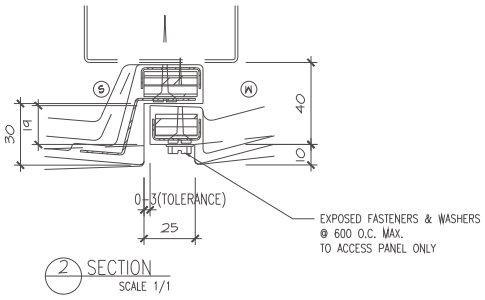
CAFETERIA CEILING

PEPSICO CAFETERIA

PEPSICO PURCHASE - N.Y.

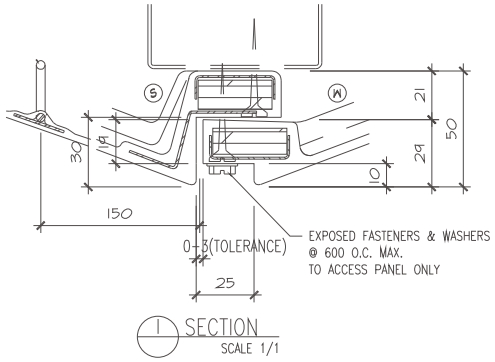
DESIGN: GWATHMEY SIEGEL & ASSOCIATES. N.Y.
INSTALLATION: CORD CONTRACTING - ROSLYN HTS. - N.Y.

LECTURE HALL CEILING



FEATURES:

- Circular lecture hall ceiling comprised of three sizes of pyramid panels.
- Pyramids have two facets perforated, and two solid.
- While facets of pyramid are angular, perforations are at 90º to the horizontal.
- Light fixture openings were cast in for custom fixtures.
- Original design was in metal - Formglas G.R.G. was more economical.
- Slab above the hall serves as a helicopter landing pad.

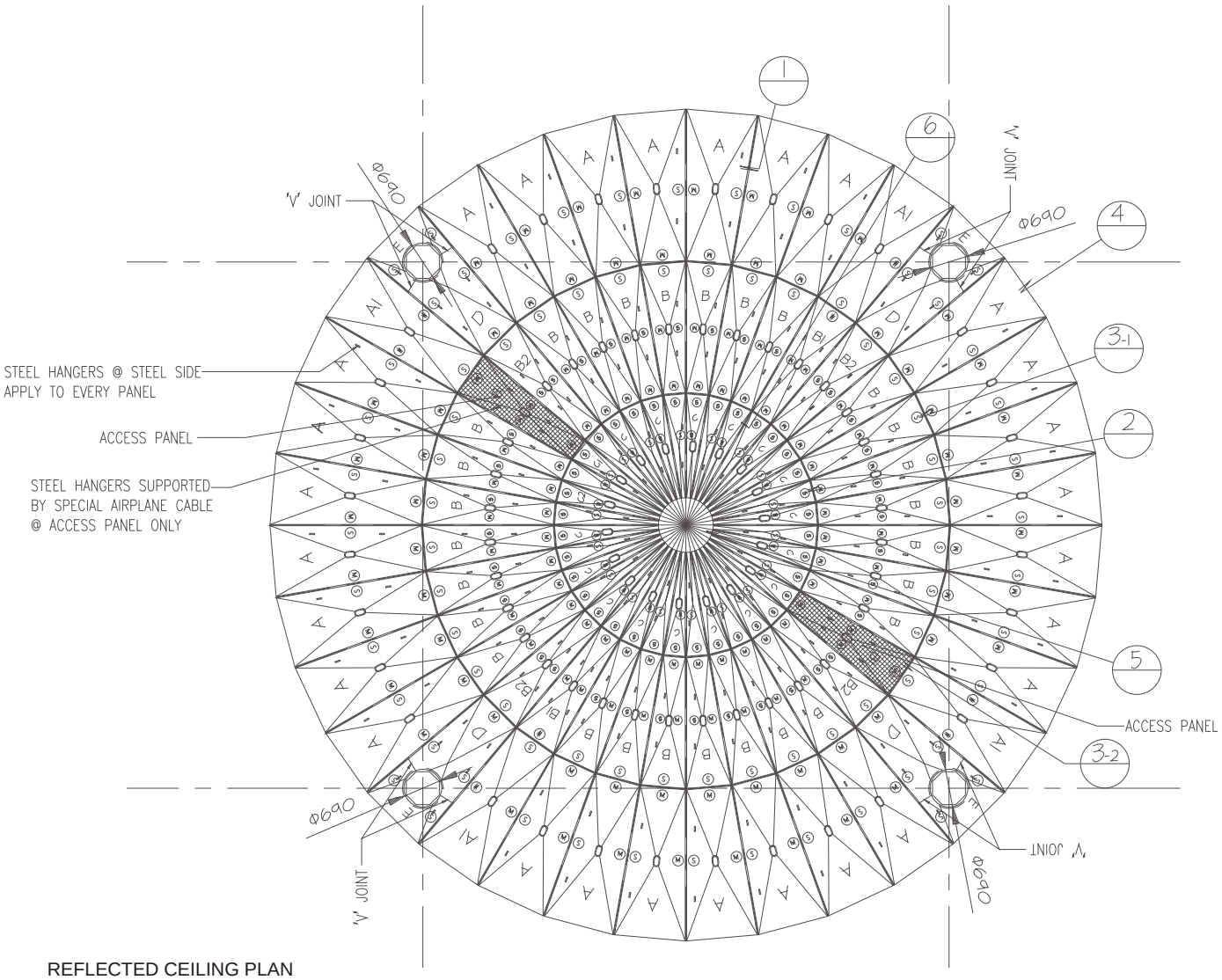


DETAILS OF JOINTS BETWEEN PANELS

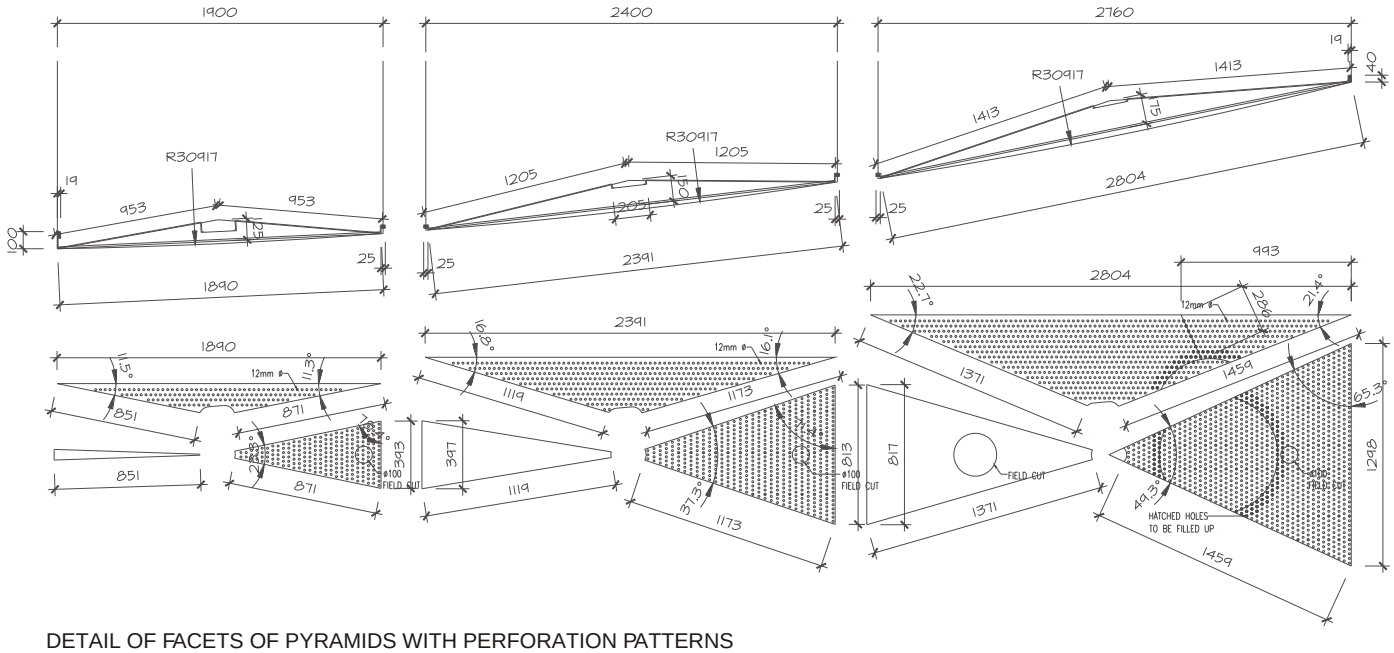
TOYO UNIVERSITY

TOYO UNIVERSITY - TOKYO

DESIGN: DAI-ICHI KOUBOU.
GENERAL CONTRACTOR: KAJIMA & TODA - JAPAN.



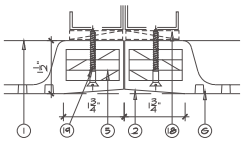
REFLECTED CEILING PLAN



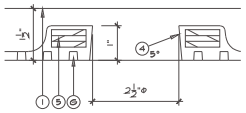
DETAIL OF FACETS OF PYRAMIDS WITH PERFORATION PATTERNS

GENERAL VIEW OF CEILING

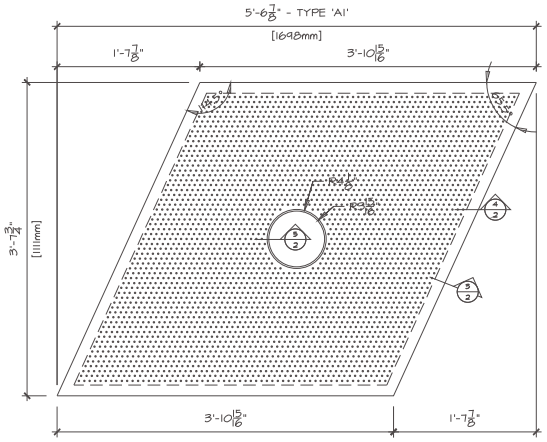
DETAIL AT CORNER WITH ACCESS PANEL



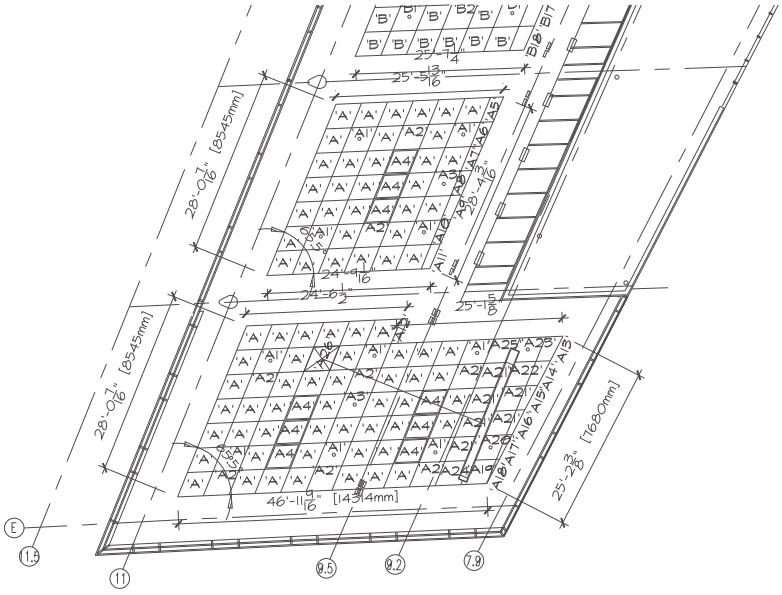
ATTACHMENT DETAIL



DETAIL AT LIGHT FIXTURE



DETAIL OF PANEL



PARTIAL REFLECTED CEILING PLAN

FEATURES:

- Ceiling is skewed grid.
- Light fixtures are independently suspended in pre-cast openings in panels.
- Some panels are removable for access.
- Panels are approx. 4'x4' (1200mm x 1200mm)

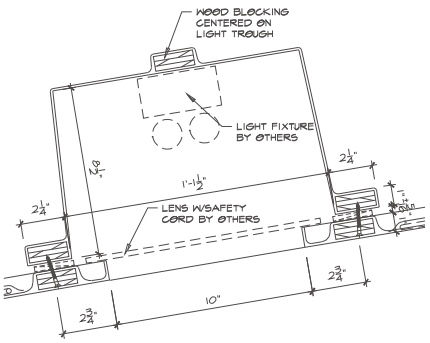
CAFETERIA

MERCK OFFICE COMPLEX

UPPER GWYNEDD TOWNSHIP - PA.

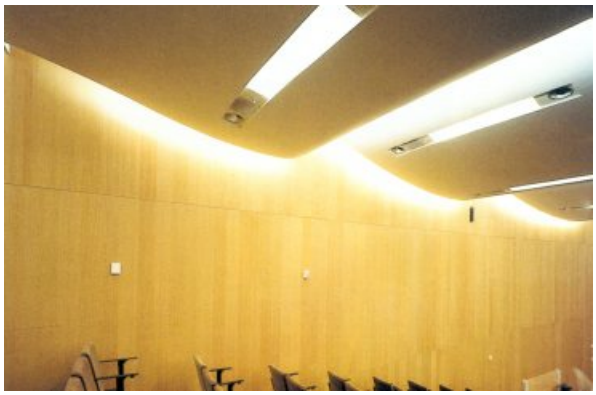
DESIGN: BALLINGER - ARCHITECTS - PA.
INSTALLATION: DUGGAN & MARCON.
CONTRACTOR: TURNER CONSTRUCTION.

GENERAL VIEW OF CEILING

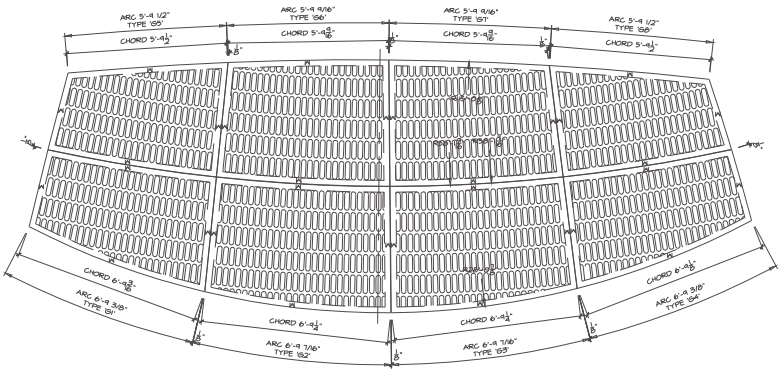


SECTION THROUGH LIGHT BOX

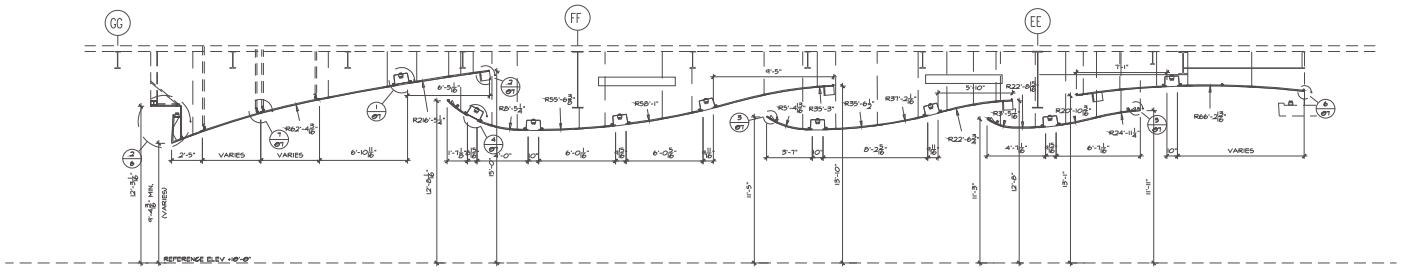
VIEW FACING STAGE



VIEW ALONG SIDE WALL



REFLECTED PLAN OF PERFORATED AREA



SECTION THROUGH CEILING

FEATURES:

- Ceiling is curved in plan and section.
- Ceiling is a combination of perforated and plain curved panels.
- Ceiling panels incorporate lighting and mechanical.

AUDITORIUM

MERCK OFFICE COMPLEX.

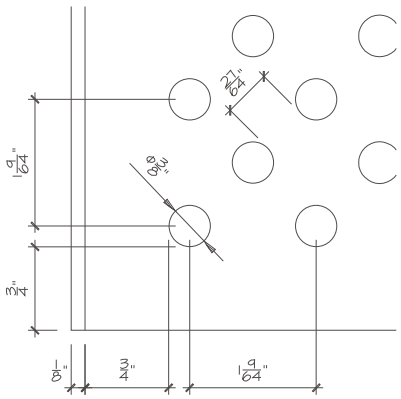
UPPER GWYNEDD TOWNSHIP-PA

DESIGN: BALLINGER - ARCHITECTS - PA.
INSTALLATION: DUGGAN & MARCON.
CONTRACTOR: TURNER CONSTRUCTION.

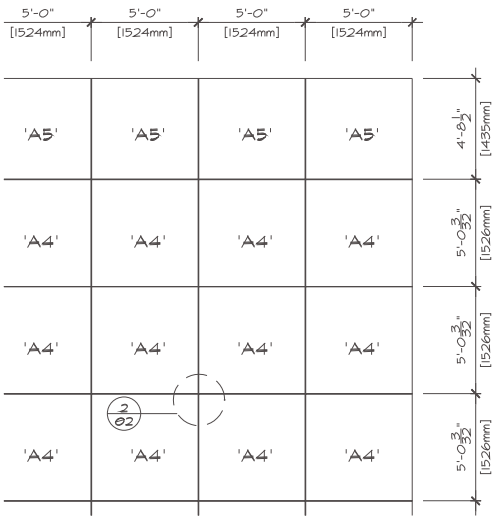
CEILING DETAIL

EXTERIOR VIEW

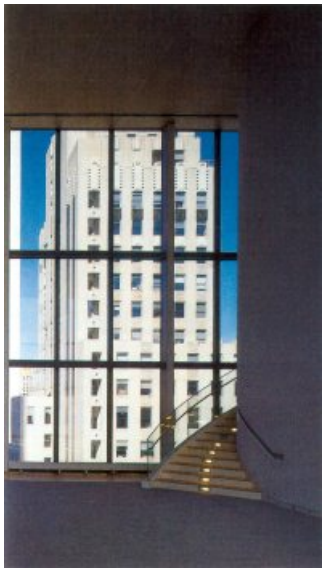
INTERIOR CORNER



DETAIL AT EDGE OF PANEL



PARTIAL REFLECTED CEILING PLAN



GENERAL VIEW OF PENTHOUSE

FEATURES:

- Panels are 5’-0” (1525mm) square.
- Panels are face fastened to light metal framing.
- Fastening is in ¾” (19mm) perimeter solid edge.

LOUIS VUTTON PENTHOUSE

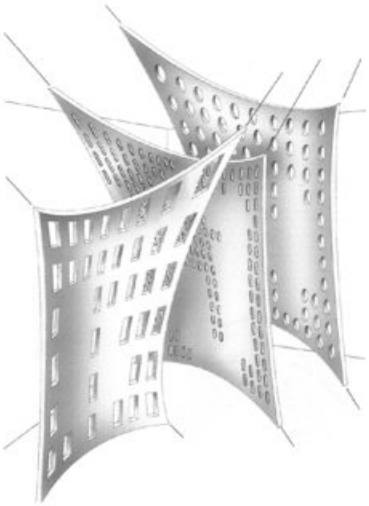
LOUIS VUITTON NEW YORK - NY

DESIGN: CHRISTIAN de PORTZAMPARC - FRANCE
THE HILLER GROUP - N.Y.
INSTALLATION: DONALDSON ACOUSTICS - BETHPAGE - N.Y.
GENERAL CONTRACTOR: TISHMAN CONSTRUCTION

IDEAS

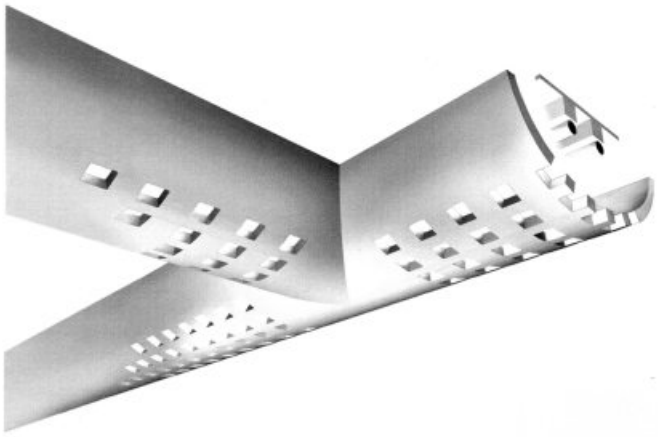
4" (100mm) wide MetalCast® 'Channels' these 'Cold Cast' Metal/G.R.G. Gypsum units are 1/3 the weigth of steel.

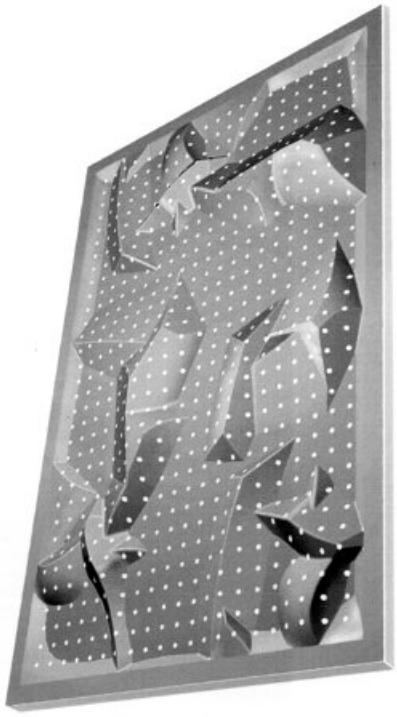
A QuarryCast® 'Concrete' Screen at 1/3 the weight of concrete.

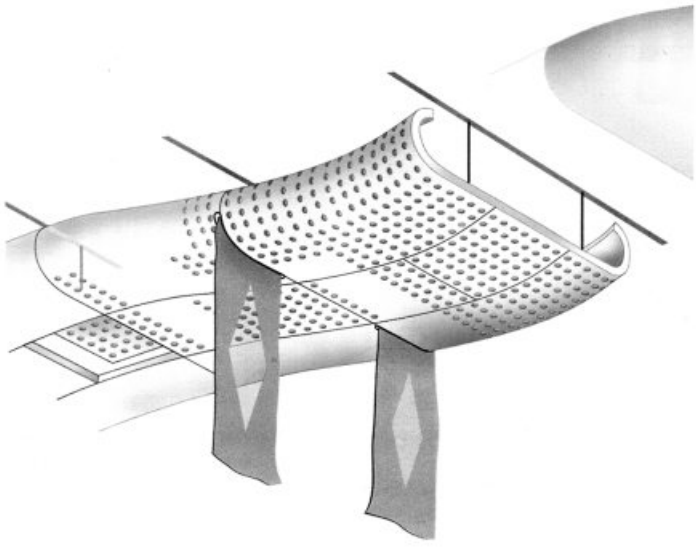


FOR DIFFERENT FORMGLAS MATERIAL TYPES SEE OUR 'INTERIOR ELEMENTS' BROCHURE.

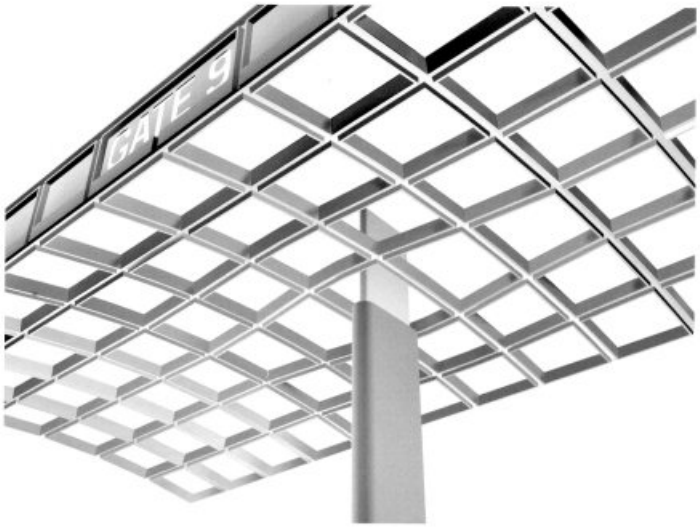
IDEAS



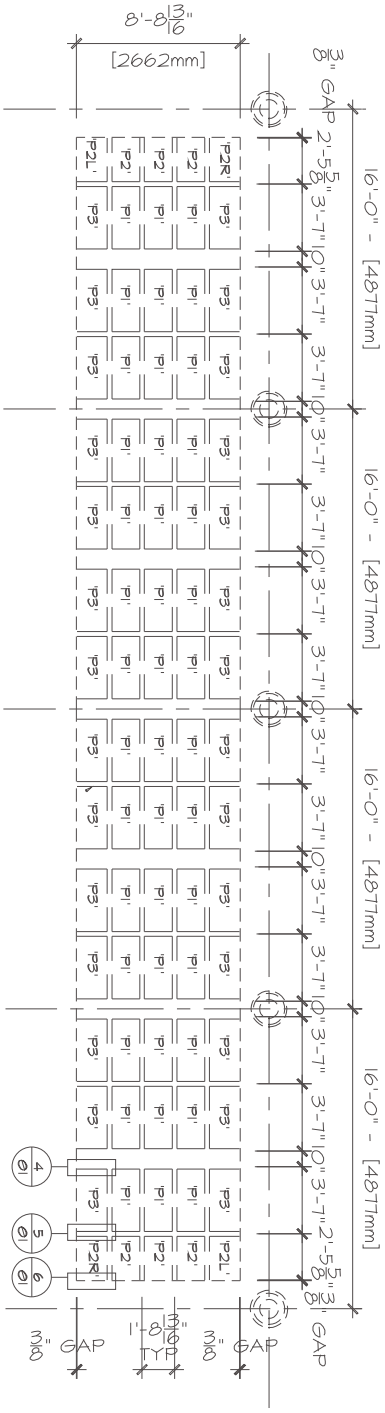




IDEAS



STORE INTERIOR WITH PERFORATED PANEL CEILING



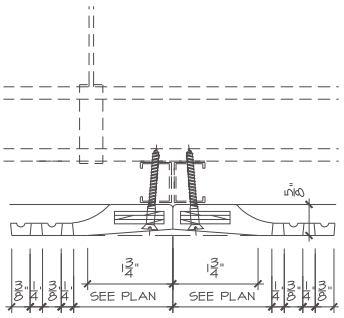
REFLECTED CEILING PLAN

- SIMPLE ARRANGEMENT OF FLOATING PANELS INTERSPERCED WITH RECESSED LIGHTING.

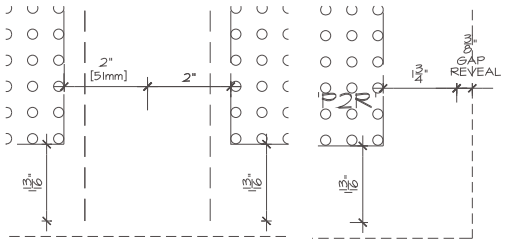
COUNTRY ROAD STORE

NEW YORK N.Y.

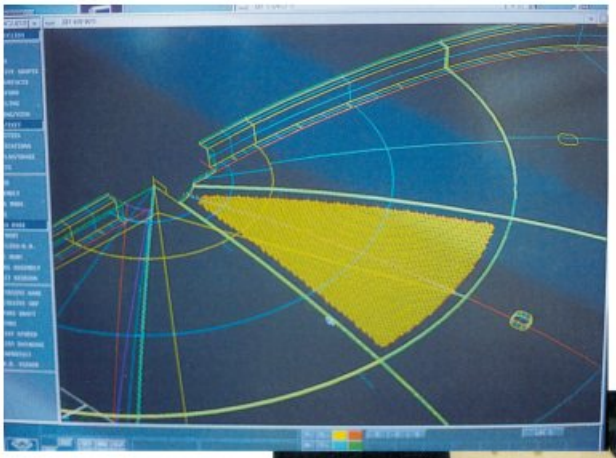
DESIGN: LALIRE MARCH ARCHITECTS - N.Y.C



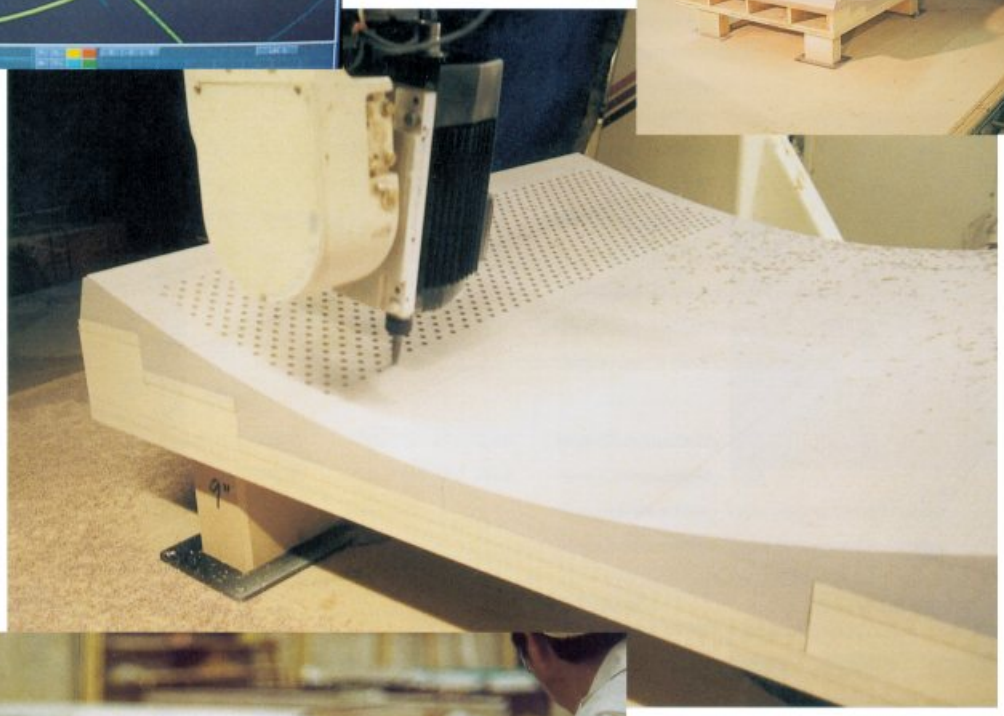
DETAIL AT JOINTS



DETAIL PLAN



1.



2.

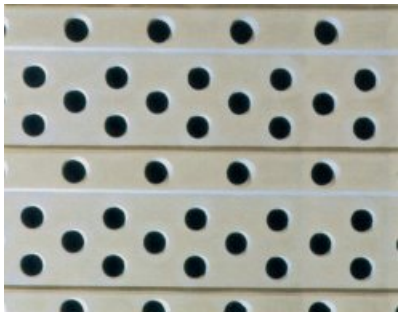
3.

4.

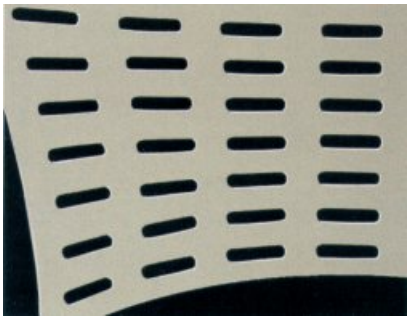
1. SHOP DRAWINGS CONVERTED TO 3D MODELS.
2. PATTERNS CUT ON CNC MACHINES.
3. PANELS ARE FABRICATED.
4. PANELS INSTALLED ON SITE.

THE PROCESS

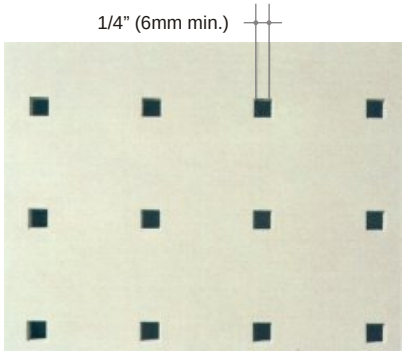
SHALLOW RIBS (SEE P. 7)



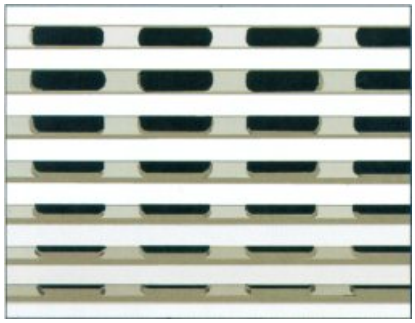
CAN SUIT ANY SHAPE



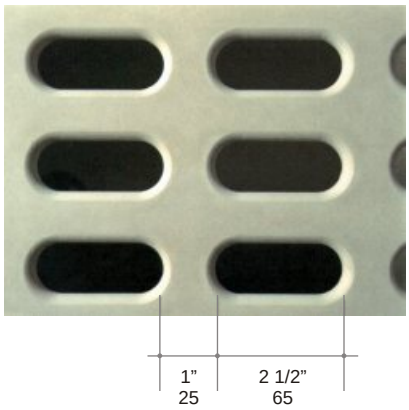
SHALLOW GROOVES



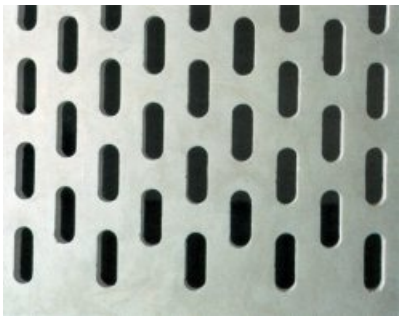
DEEP RIBS / CURVED SURFACE

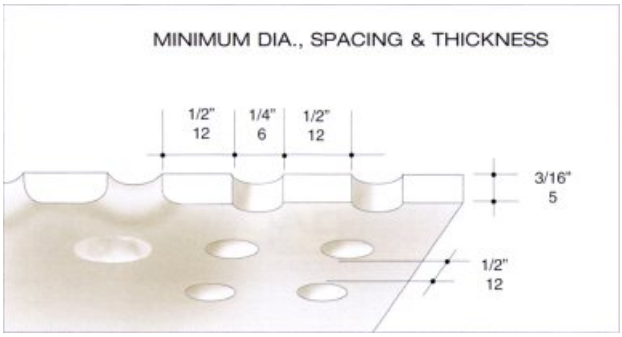


RADIUS EDGES



CURVED SURFACE





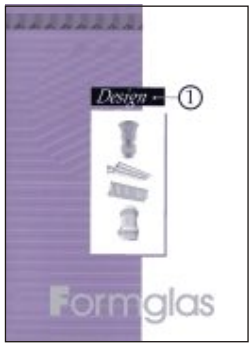
PERFORATION PATTERNS

- CUSTOM DESIGN ON ANY SHAPE.
- IN ANY FORMGLAS MATERIAL.
- CAN BE BACKED WITH ‘NON WOVEN’ FABRIC.
- MIN. PERFORATION DIAMETER - 1/4” (6mm)
- MIN. SPACE BETWEEN PERFORATIONS - 1/2” (12mm)
- MIN. PANEL THICKNESS - 3/16” (5mm)
- FLAT PANELS UP TO 5’ X 5’ (1.5m x 1.5m)
- ALL FORMGLAS PRODUCTS HAVE A ‘0’ FLAME, VERY LOW SMOKE RATINGS AND ARE APPROVED FOR UNRESTRICTED USE ACROSS THE GLOBE.

FOR DIFFERENT FORMGLAS MATERIAL TYPES SEE OUR ‘INTERIOR ELEMENTS’ BROCHURE.

Country	Testing Agency	Test Method/Standard	Certificate	Type of Test	Material
Canada	Ortech International	CAN-S114-M80			
	Ortech International	ASTM-E84-94	Flame 0 Smoke 6	Surface Burning Characteristics	MetalCast
	Intertek Testing Service	CAN/ULC S-102-M88	Flame 3 Smoke 6	Surface Burning Characteristics	QuarryCast E
	Ortech International	ASTM C501	96-T16-U4954-39	Hardness & Abrasion	All Formglas Products
France	CSTB		**MO** No RA99-076	Burning Characteristics	GRG
	CSTB		**MO** No RA99-076	Burning Characteristics	QuarryCast
	CSTB		**MO** No RA99-076	Burning Characteristics	MetalCast
Germany	MPA - NRW	DIN 4102-1(Mai 1998)	**A1** No 23000982-2	Burning Characteristics	QuarryCast
	MPA - NRW	DIN 4102-1(Mai 1998)	**A2** No 23000982-3	Burning Characteristics	MetalCast
	MPA - NRW	DIN 4102-1(Mai 1998)	**A1** No 23000982-1	Burning Characteristics	GRG
	Germanischer Lloyd		15-569-00 HH	Non Combustible - Type Approval Certificate	QuarryCast
	Germanischer Lloyd		15-568-00 HH	Non Combustible - Type Approval Certificate	GRG
Hong Kong	Facadetech	Safety test of GRC Moldings		Structural Adequacy Test (Cyclic)	Formglas EP
Japan	Ministry of Construction		1142	Certificate of Non-Combustibility	QuarryCast
	Ministry of Construction		11589	Certificate of Non-Combustibility	GRG
	Ministry of Construction		11916	Certificate of Non-Combustibility	Formglas EP
Norway	SINTEF NBL	IMO Resolution A.472(XII)	250010.10/95.280B	Non-Combustibility Test	QuarryCast
	SINTEF NBL	IMO Resolution A.472(XII)	250010.10/95.280B	Non-Combustibility Test	GRG
	Det Norske Veritas		F15392	Non Combustible - Type Approval Certificate	QuarryCast
	Det Norske Veritas		F15391	Non Combustible - Type Approval Certificate	GRG
Singapore	Singapore Fire Service	BS476 Part 4		Acceptance of Non-Combustibility	QuarryCast
	PSB - Singapore	BS476 Part 4	Ref G61417/B/HT	Non-Combustibility Test	QuarryCast
	SISIR	BS476 Part 4	Ref G 132941/B/SCA	Non-Combustibility Test	Formglas EP
Switzerland	Sicherheitsinstiut		Certificate 20000.6241	Non-Combustibility Test	QuarryCast
UK	Warrington Fire Research	BS 476 Part 6: 1989	No: 102210	Fire Test on building material	Formglas EP
	Warrington Fire Research	BS 476 Part 4: 1970	No: 57898	Fire Propagation Index	QuarryCast
	University of Stanfield	BS 6432 & BS EN 1170	Report 7/22/99	4 Point Bend Testing	Formglas EP
	Department of Transport		SUR22 (Rev 7/92)	Certificate of Acceptability	QuarryCast
	Marine Directorate				
USA	Lloyds Register	IMO Resolution A.472(XII)	MED0050301	EC Examination (Type Approval) Certificate	QuarryCast
	Lloyds Register	IMO Resolution A.472(XII)	MED0050300	EC Examination (Type Approval) Certificate	GRG
	United States Testing Company	ASTM E 72-80	176105	Strength Tests of Panels for Building Construction	Formglas EP
	United States Testing Company	PRO/MT/-LC/SCREEN	04431	Combustion Product inhalation Toxicity Screening	GRG
	Dept. of Buildings-N.Y. City		MEA 211-83-M	Approval of material for use in construction	GRG
	United States Coast Guard		46 CFR Ch1. Subpart 164.009-3c		
	United States Testing Company	ASTM E84-81a	85394	Surface Burning Characteristics of Building Materials	GRG
	United States Testing Company	ASTM E-136	185073-2	Behavior of Materials at 750°C	GRG/Formglas EP
	United States Testing Company	ASTM E-84-86	97937-2	Surface Burning Characteristics of Building Materials	Formglas EP
	Underwriters Laboratories	IMO A.799	R20583/00NK04138	Noncombustibility	GRG
	Underwriters Laboratories	IMO A.799	R20583/00NK04138	Noncombustibility	QuarryCast
	Underwriters Laboratories	IMO A.653 (16) Section 10	R20583/00NK04138	Flame Spread for Surface Finish Materials	MetalCast
	US Coast Guard	Part 1 of Annex 1 of IMO FTP	164.109/12/0	Noncombustibility	GRG
	US Coast Guard	Part 1 of Annex 1 of IMO FTP	164.109/13/0	Noncombustibility	QuarryCast

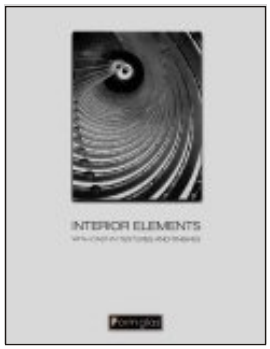
FORMGLAS LITERATURE



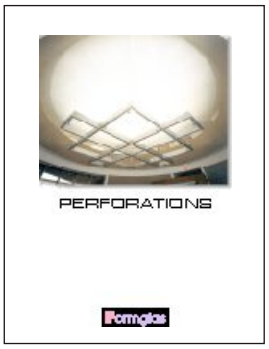
DESIGN ①

QuarryCast®

MetalCast®



Interior Elements



PERFORATIONS

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