

SHOWSCAN

INTAMIN

DMS Planning Manual

SHOWSCAN/INTAMIN
DYNAMIC MOTION SIMULATOR

PRELIMINARY PLANNING AND
EQUIPMENT OUTLINE SPECIFICATION

for:

DMS/27

DMS/45

DMS/90

GENERIC DESIGNS

28 - Oct - 88

Copy N^o

Showscan Film Corporation
3939 Landmark Street
Culver City, CA 90232

Intamin Corporation Inc., Est.
Im Mühleholz 14
FL 9450 Vaduz/Liechtenstein

Showscan is a Registered Service Mark of Showscan Film Corporation
© 1988 Showscan Film Corporation/Intamin Corporation Inc., Est.

DYNAMIC MOTION SIMULATOR

EXHIBIT A

DMS PLANNING MANUAL

SECTION II INTRODUCTION

The success of the DMS depends on its ability to convince viewers of the total reality of their sensory environment. The Showscan filming and presentation system was designed specifically with this in mind.

The projection frame rate, providing 60 new images to the screen per second, effectively eliminates the two major motion picture artifacts that make the viewers aware that they are "watching a movie,"... flicker and strobing. Our ability to perceive flicker is proportional to screen brightness at normal (24fps) frame rates. At 60 frames per second we pass a threshold of flicker perception where screen brightness can be raised to any practical level.

Studies have shown that our sense of realism of a viewed image increases as the level of brightness increases up to the level encountered in the actual original scene. Contrary to what one would imagine, the images seem to be sharper and colors become more saturated and vivid at higher levels of screen brightness than at lower levels. For this reason screen brightness specifications for Showscan installations are much higher than for conventional theaters. This visual realism is enhanced by an extremely high quality multi-channel stereo sound system.

Motion artifacts (strobing), are also greatly diminished at 60 frames per second so that all moving elements in a scene look real with no "picket fencing" or wagon wheels turning backwards.

The above information should serve as a caution to architectural and show planners of the critical need to adhere strictly to the design specifications contained herein to insure a truly exciting and realistic Showscan/Intamin DMS presentation.

The Showscan/Intamin Dynamic Motion Simulator provides an exciting and thrilling experience. It is our intention that all DMS installations should comprehend a total show. To that end we stand ready to assist your show designers to fully understand the capabilities of the DMS Control Systems and to help in the creation of a total experience. We also consider it vital that the show, and the system, be operated at very high quality levels. This, at a practical level, means preventative maintenance, periodic testing and alignment, clean facilities, (both for the equipment and patrons), and a well trained staff.

The Showscan Show Control System allows for a substantial number of switch closures. These may control lighting dimmers for the house lights, actuating special lighting effects, wind machines, background music in between shows, and other thematic effects that you may want to design as part of the total show. Very special or extraordinary requirements beyond the following standards should be discussed with Showscan/Intamin...we can help you achieve your

goals. (Showscan/Intamin does not supply such effects... only the switch closures to control them).

This manual covers three generic sizes of DMS installations:

- DMS/27, which is a layout comprising three rows of nine seats each, having a total capacity of 27 visitors.
- DMS/45, which is a layout comprising five rows of nine seats each, having a total capacity of 45 visitors, and...
- DMS/90, which is a layout comprising two banks of five rows of nine seats each, having a total capacity of 90 visitors.

It is possible to plan other sizes of DMS auditoriums, having fewer or more rows, but in all cases they must be planned using the basic nine-seat row unit as shown in drawing DMS/4.0. Showscan is prepared to assist in such planning and will work with your architectural consultants to arrive at suitable layouts.

In some cases it may be desirable to design two DMS auditoriums "back-to-back." Such a plan could utilize the same projection booth. The expanded booth is shown in drawing DMS/7.1.

In these standard designs and where such special designs are required, Showscan will design the projection and sound system layouts. Because the projection of Showscan film image is special and proprietary, only Showscan can provide this service.

SECTION III ARCHITECTURAL

3.1 AUDITORIUM LAYOUT

The general space requirements of each size of DMS auditorium is illustrated in drawings DMS/1.0, DMS/2.0, and DMS/3.0 in Section 6.0 of this manual. The drawings provide the basic dimensions of the space requirements and the general relationship of the major components of the system. Below is a summary table of the auditoriums, projection booths, and hydraulic pump rooms.

	W x L x H	Area
DMS/27 Auditorium	42'-10" x 38'-6" x 18"0" (13 060 x 11 735 x 5486)	1649.0 ft ² 153.2 m ²
DMS/27 Booth	22'-0" x 12'-0" x 9'-0" (6705 x 3650 x 2740)	264.0 ft ² 24.4 m ²
DMS/45 Auditorium	42'-10" x 50'-2" x 19'-6" (13 060 x 15 290 x 5945)	2148.6 ft ² 199.6 m ²
DMS/45 Booth	22'-0" x 12'-0" x 9'-0" (6705 x 3650 x 2740)	264.0 ft ² 24.4 m ²
DMS/90 Auditorium	59'-0" x 58'-0" x 24'-7" (18 000 x 17 680 x 7500)	3422.0 ft ² 317.9 m ²
DMS/90 Booth	22'-0" x 12'-0" x 9'-0" (6705 x 3650 x 2740)	264.0 ft ² 24.4 m ²
DMS/Dual Booth*	27'-10" x 15'-6" x 9'-0" (8485 x 4725 x 2740)	431.4 ft ² 40.0 m ²
DMS/Pump Room (for DMS/27 & 45)	12'-9" x 22'-2" x 9'-0" (3900 x 6750 x 2740)	282.6 ft ² 26.3 m ²
DMS/DualPump Room	12'-0" x 49'-6" x 9'-0" (3660 x 15 100 x 2745)	594.0 ft ² 55.2 m ²

**Note: The Dual Booth plan, see drawing DMS/7.1, is utilized in those designs where there are two DMS theaters "back-to-back." Other layouts may be appropriate to satisfy other existing conditions.*

It is desirable that interior architectural surfaces and finishes adjacent, or in close proximity, to the screen be almost matte black. In cases where this is impractical, existing finishes shall be judged relative to a grey scale value; i.e., one equals white, ten equals black. Ceiling, walls, and floor in the front third of the auditorium shall be a low value of 8-10. These same surfaces in the back two thirds of the auditorium may be in the range of 5-10. All other architectural details shall be non-reflective.

Please Note: In certain cases metric dimensions are derived from standard American sizes based on foot/inch practises. Where there are comparable metric standards they should be used...provided they meet local building

requirements and the specific requirements of Showscan/Intamin equipment. Some doors and openings are sized to allow movement and installation of equipment and are, consequently, minimum specifications.

It is important to note that the width and lengths of the auditoriums shown in the drawings represent minimum space requirements. They may be bigger, but they cannot be smaller. These dimensions provide the minimum space for safe and effective traffic movement; i.e., fast load, un-load cycles. Additionally, the dimensions establish the necessary space for the proper location of the projection screen relative to the audience.

The interior of each standard auditorium includes sufficient space for seat row load/un-load apparatus and aisle ways. The layouts do not, however, provide for any operational spaces, such as queue line or visitor holding areas, ramps, corridors, emergency hallways, offices, storage rooms, concession stands, ticket booths or other show features external to the auditorium, booth and pump room.

Please Note: It is the Owner's responsibility to insure that architectural planning accomodates the installation ingress and movement of all Showscan/Intamin equipment; i.e., doorways, corridors, ramps and railings, and other architectural openings. Likewise, all floors must accomodate the weight of all equipment during such movement.

The hydraulic pump room(s) shall be as shown in drawings DMS/6.0 and 6.1. The hydraulic pump room may be in a location separate from the auditorium but must be within 30' (9145) of the nearest DMS seat row unit. (An excellent location is just below the projection booth).

3.2 BOOTH LAYOUT

The Projection Booth, as shown in drawing DMS/7.0 (and DMS/7.1) shows all of the booth equipment and a reasonable plan arrangement for effective operations. There is considerable latitude in arranging the non-critical equipment and consequently a number of other arrangements may be possible. However, the projectors must be located equidistant about the theater/screen centerline, have a minimum of 39" (1000) working clear space at sides and rear, and the audio racks and control console must be adjacent to the right side (loading side) of the projector. (Note: Right hand/Left hand is with respect to facing the projection screen).

The projection booth should be 12' x 22' (3650 x 6705mm) and have a plan area of approximately 264 square feet (24.4 m²). The finish ceiling shall be an acoustical type at nine feet high (2740mm) minimum.

With the exception of the hydraulic equipment, projection screen and the audio speakers, the projection booth houses all projection, audio and related equipment. This consists of the projectors, lamp-houses, audio racks; electrical, interface and control console; storage cabinet, work bench, and rewind bench.

Projection Ports: The projection ports shall be as shown schematically in drawing DMS/8.0

Projection port glass must be OCLI,* HEA (High-efficiency, anti-reflective) coated both sides, select float glass in 3mm and 6mm thicknesses. Ref. OCLI Specification 6102009.

*Optical Coating Laboratory, Inc., Santa Rosa, California. An acceptable substitute is (in Europe) Schott No. 7234 f 4mm and 6mm; ref. DIN 67 507.

If required Showscan can provide, at extra cost, all projection and viewing port-frames and glass as pre-assembled units.

3.3 STRUCTURAL REQUIREMENTS

The following are the major structural requirements for a DMS Theater:

1. The floor of the Projection Booth must provide a stable platform for the Projector and Audio equipment...we recommend a concrete floor.
2. The stepped floor tiers, (concrete or fabricated steel), of the auditorium must accept both the dead-load of the DMS Seat Row Units and the dynamic loads of Seat Row action. Basic dynamic loading is illustrated in drawings DMS/4.1 through DMS/4.3. Additional engineering data is available from Intamin.
3. A structural I-Beam, (two in the case of DMS/90) must be permanently installed above the finish ceiling of the auditoriums. These beams are used for the installation, maintenance, and removal if needed, of the DMS Seat Row Units. These beams are schematically illustrated in drawings DMS/1.0 through DMS/3.0. The engineering design and specification of the beams, along with a removable 11000 lbs (5000 Kg) capacity manual chain hoist is provided by the Owner.
4. The floor of the hydraulic pump room must carry the dead load of the hydraulic pump unit(s).
5. The following is a summary of major DMS equipment weights:

Item	Pounds/Net	Kilograms
Projector & Lamphouse	1050 lbs	(476 Kg)
Audio Racks/2 Bay	1600 lbs	(726 Kg)
Control Console	300 lbs	(136 Kg)
Hydraulic Power Unit	5348 lbs	(2430 Kg)
Control Cabinet	755 lbs	(340 Kg)
Seat Row Unit/each	5511 lbs	(2500 Kg)

3.4 ELECTRICAL REQUIREMENTS

3.4.1 Electrical Power System

Note: These recommendations and specifications are for planning purposes only. They may not reflect the requirements of local authorities or building codes having jurisdiction over the project venue. Variations from these specifications must be submitted to Showscan Film Corporation prior to the completion of preliminary engineering designs. Construction may not commence without Showscan Film Corporation review and approval.

DMS systems can be designed to operate on voltages other than those specified below. However, such deviations from these specifications may require additional equipment and/or additional engineering resulting in higher equipment costs and additional engineering fees.

3.4.2 60 Hertz Power

(see also Drawing No. DMS/5.1)

Input Voltage for the entire system:

480 Y/277 volts, 4 wire + ground 3 phase

The neutral can either be solidly or resistively grounded.

Maximum tolerable input voltage variation:

Plus or minus 10% of nominal phase-to-phase voltage

Regulation must be maintained even during motor starting.

Maximum tolerable phase-to-phase voltage imbalance:

Plus or minus 2% of nominal phase-to-phase voltage.

Maximum tolerable frequency variation:

Plus or minus 2 hertz from 60 hertz line frequency.

Maximum allowable fault current available to DMS:

12,000 amperes RMS symmetrical.

	DMS 27	DMS 45	DMS 90
Minimum input kVA requirement	170 kVA	170 kVA	300 kVA
Description of major loads			
Number 1 Lamphouse 208Y/120 volts, 4 wire + ground, 3Ø	18 kVA	18 kVA	21 kVA
Number 2 Lamphouse 208Y/120 volts, 4 wire + ground, 3Ø	18 kVA	18 kVA	21 kVA

3.4.2.1 Sound and Control System

This load varies a great deal depending on the loudness of the audio. A reasonable number to use for total power consumption is 12 kVA. It is possible that on very loud passages this figure might be exceeded for a brief period and could reach 20 kVA.

This load should be provided for with ten separate single-phase circuits. Each circuit should have over-current protection of 20 amperes. The voltage of each circuit should be 120 volts nominal.

3.4.2.2 Hydraulic Pump(s):

Each hydraulic pump uses a 100 horsepower 3 phase induction motor. The DMS/27 and DMS/45 use one such pump. The DMS/90 uses two such pumps.

Each pump motor has its own wye-delta starter supplied by Showscan/Intamin. The motor has no mechanical load during starting. The full load current requirement of each motor is 125 amperes at 480 volts.

3.4.2 50 Hertz Power

(see also Drawing No. DMS/5.2)

Input Voltage for the entire system:

380Y/220 volts, 4 wire + ground 3 phase; or
416Y/240 volts, 4 wire + ground 3 phase
The neutral shall be solidly grounded to earth.

Maximum tolerable input voltage variation:

Plus or minus 10% of nominal phase-to-phase voltage
Regulation must be maintained even during motor starting.

Maximum tolerable phase-to-phase voltage imbalance:

Plus or minus 2% of nominal phase-to-phase voltage.

Maximum tolerable frequency variation:

Plus or minus 2 hertz from 50 hertz line frequency.

Maximum allowable fault current available to DMS:

12,000 amperes RMS symmetrical.

	DMS 27	DMS 45	DMS 90
Minimum input kVA requirement	170 kVA	170 kVA	300kVA
Description of major loads			
Number 1 Lamphouse 380Y/220 volts, 4 wire + ground, 3Ø or 416Y/240 volts 4 wire + ground 3Ø	18 kVA	18 kVA	21 kVA
Number 2 Lamphouse 80Y/220 volts 4 wire + ground 3Ø; or 416Y/240 volts 4 wire + ground 3Ø	18 kVA	18 kVA	21 kVA

3.4.3.1 Sound and Control System

This load varies a great deal depending on the loudness of the audio. A reasonable number to use for total power consumption is 12 Kva. It is possible that on very loud passages this figure might be exceeded for a brief period and could reach 20 Kva.

This load should be provided for with ten separate single-phase circuits. Each circuit should have over-current protection of 10 to 15 amperes. The voltage of each circuit should be either 220 or 240 volts nominal.

3.4.3.2 Hydraulic Pump(s)

Each hydraulic pump uses a 75 kW-mechanical 3 phase induction motor. The DMS/27 and DMS/45 use one such pump. The DMS/90 uses two such pumps.

Each pump motor has its own wye-delta starter supplied by Showscan/Intamin. The motor has no mechanical load during starting. The full load current requirement of each motor is 180 amperes at 380 volts or 150 amperes at 416 volts.

3.5 ACOUSTICAL REQUIREMENTS/ACOUSTICS AND NOISE CRITERION

Note: Acoustical specifications herein are based on ASTM E90, E413 and E336. Equivalent international specifications are ISO R140 and R717.

3.5.1 Reverberation Times

Reverberation times (RT_{60}) (ISO/RT-60) in DMS auditoriums must meet or exceed the maximum limits listed here. RT_{60} is the time it takes for the noise in each octave bandwidth to decay 60 dB when the noise source is removed. Measurement shall be made in accordance with ASTM standard C423-84A (ISO-R354) Standard Test Method for Sound Absorption...by the Reverberation Room Method. (See next page.)

Freq. (Hz)	63	125	250	500	1000	2000	4000	8000
Time (sec)	0.7	0.6	0.5	0.4	0.3	0.3	0.2	0.2

3.5.2 Background Noise

Background noise in the theatre from all sources shall not exceed NC-30 (ISO/NR-30). Ref. SMPTE recommended practice RP 141-1986 Background Acoustic Noise Levels in Theatres and Review Rooms

3.5.3 Sound Transmission

The projection booth, hydraulic equipment rooms and theatre perimeter walls and ceilings shall have a Sound Transmission Classification rating of STC-45 (ISO/Ia-45). If any theatre walls or ceilings adjoin mechanical equipment spaces, then those walls or ceilings shall have a rating of STC-60 (ISO/Ia-60). Summary as follows:

- Projection Booth and theater exterior walls: STC-45 (ISO/Ia-45).
- Mechanical equipment rooms and partitions: STC-60 (ISO/Ia-60).
- Noise Criteria Mech. Equip. (in auditorium): NC-30 (ISO/NR-30).
- HVAC Duct Velocities: 1200 FPM (365 m/min) Max.
- HVAC Grill Velocities: 200 FPM (61 m/min) Max.

Please Note: When planning the architectural layout of a DMS auditorium, it is our recommendation that, wherever possible, opposing walls or surfaces should not be parallel. Parallel walls tend to induce flutter echoes which must be acoustically avoided.

3.6 ENVIRONMENTAL REQUIREMENTS

3.6.1 Mechanical System

Lamphouse Exhaust:

600-800 CFM* (17-22 m³/min) @ 3/4" (1.9cm) H₂O, per lamphouse. Lamphouse must be exhausted directly to atmosphere. This exhaust system must not be interconnected with any other heating, ventilating or air conditioning system. Requires an 8" Ø (20cm) rigid duct and an electrical contactor for interconnection with Projector electrical system.

*Varies with size of lamphouse.

Pump Room Heat Exchanger:

The hydraulic system is interconnected to a water cooled heat exchanger, which is provided as part of the hydraulic system. Each unit requires a chilled water supply (by the Owner): Inlet temperature @ 77°F (25° C) max., temperature raise @ 50°F (10°C), pressure @ 5 bar min. to 20 bar max., water volume @ approx. 1188.8 gal/hr (4500 L/hr). Chilled water to be treated against corrosion of copper heat exchanger. This chilled water specification is valid for DMS/27, 45 and double the capacity for DMS/90.

Pump Rooms mechanical ventilation to dissipate the following heat loads:

DMS/27	8,570 BTU/hr	(2.5 kw)
DMS/45	12,000 BTU/hr	(3.5 kw)
DMS/90	24,000 BTU/hr	(7.0 kw)

The pump room temperature must not exceed 104°F (40° C) maximum.

Fire Suppression:

- Booth: Water sprinkler system.
- Theater: Water sprinkler system.
- Pump Room: Water sprinkler system.

Environmental Conditions:

Auditorium: a) Relative Humidity @ 35–40% min. range
b) Temperature: 68°–72° F (20°–22°C).

Note; these temperatures must be effected three days prior to scheduled screen installation and maintained thereafter.

Booth: a) Relative Humidity @ 40-60% minimum year round
b) Temperature: 60°–70° F (15.5°–21°C)
c) Heat Load: Varies with equipment; general range, 27,300–34,100 BTU/hr (8,000–10,000 watts)sensible.

The booth air conditioning and heating system shall maintain a positive pressure at all times and shall be operative at time of Showscan/Intamin equipment installation.

SECTION IV

SHOWSCAN/INTAMIN DMS SYSTEM

EQUIPMENT OUTLINE

4.1 PROJECTION SYSTEM

4.1.1 Film Standard

70mm 5 perf (Spherical), perforated as per ANSI PH22.119-1981, projected image area 0.870" x 1.912".

4.1.2 Sound Format

70mm/60fps, Magnetic 6 Channel.
Striped as per ANSI/SMPTE 221.1987.

The Showscan EP-70 Electronic pull-down Projector is designed specifically for DMS applications. It utilizes an electronically controlled servo-motor to advance the film instead of the mechanical geneva (maltese cross) mechanism used in conventional projectors. This permits fast forward and rewind at 120 frames per second for rapid access to selected programs. Projector head and reels are completely enclosed and a film cleaner assembly is contained within this housing to ensure film cleanliness. The projector accepts 22 inch (55cm) reels which can hold up to seventeen minutes of film program. It is automatically programmed to stop at a cue mark, rewind and ready itself for a new show. It is a low maintenance projector requiring no oiling and only periodic cleaning. It is very gentle on the film and once threaded does not require re-threading until the film is removed and replaced...fast forward and rewind is through the gate. Two projectors are provided in all systems.

4.1.3 Projector

EP-70/70mm, 60fps (± 1 fps). Single shuttered, electronic pull-down, reel-to-reel, rewind through-the-gate at 120 fps, w/magnetic reproducer penthouse (6 channel).

4.1.4 Steadiness

At trap/gate: As per SMPTE ...

a) Horizontal = 0.100% (Weave)

b) Vertical = 0.100% (Jump)

This specification exceeds SMPTE RP 105-1981.

4.1.5 Steadiness Test

Steadiness measured at projection screen surface in accordance with SMPTE RP 105-1981. Projected test image shall be SMPTE (70-PA) RP 91 (70mm).

4.1.6 Film Capacity

16.9 minutes at 60 frames per second on 22" (55cm) reels. A loaded reel weighs approximately 50 lbs. (23 kg).

4.1.7 Manuals

Projector is furnished with Operations and Service Manuals.

4.1.8 Spare Parts

A compliment of spare parts and circuit cards are provided as a normal part of the equipment package.

4.2 LAMPHOUSE

4.2.1 Standards

Service of the lamphouse is for the projection and viewing of 70mm film projected at a rate of 60fps. The Showscan system provides an image of unparalleled clarity, contrast and color saturation.

4.2.3 Lamphouse

ORC, CV4500-3 or CV7000-3, Optimax Vertical Console, SPECIAL: f/2.0 Optical system; 4.5 or 7.0 KW Xenon; w/integral power supply and rectifier.

4.2.4 Lamp

Bulb: Xenon Arc; 4,500 or 7,000 watts.

Note: Lamphouse wattage, bulb ratings, and screen brightness levels may vary with size of screen and projection system design.

4.3 LENS SYSTEM

4.3.1 Standards

All projection shall meet or exceed the minimum requirements of all ANSI & SMPTE Recommended Practices and Standards.

Prime Lens: Shall be Isco Ultra MC (multi-coated), six element, Projection Lens for 70mm curved screen application; with Isco Curved field Magnifier. 100–150mm focal lengths.

4.4 SCREEN

4.4.1 General

The projection Screen shall be curved (in plan view) to a calculated radius (only by Showscan) and suitable for each application; it shall be seamless and wrap mounted on a round tubular perimeter frame.

4.4.2 Material

Shall be Stewart Film Screen Corp. Ultramatte, one piece seamless, polyvinyl chloride acetate with anti-saddling polyurethane coat. Corners shall be mitered for wrap mounting. With .041" (0.0104m) diameter perforations (8.25% open area).

4.4.3 Gain

1.5; gain shall be determined as per SMPTE RP 94-1980.

4.4.4 Edges

2" (50mm) Woven Tape binding integral w/screen material.

4.4.5 Grommets

$\frac{3}{8}$ " (9mm) dia. #2 nickel plated brass, 6" (150mm) o.c. all edges.

4.4.6 Size

Aspect Ratio = 1 : 2.21 (Image size at chord plane).

DMS/27	10'-9" x 23'-9"	(3275 x 7240)
DMS/45	12'-0" x 26'-6"	(3655 x 8075)
DMS/90	19'-3" x 42'-8"	(5882 x 13 000)

4.5 SCREEN FRAME

4.5.1 Type

Stewart AT-3. Fabricated of 6063-T5 and 6061-T6 aluminum angles, channels, tubes and plates. It shall be bolted, welded and mechanically fastened as shown in the drawings. Finish shall be primed and painted matte black. All field assembly joints shall be matched-labeled.

4.5.2 Sheet Attachment

Wrap mounting: The sheet shall be wrapped around perimeter frame and secured with $\frac{1}{4}$ " (6mm) dia. braided cover multi-strand rubber shock cord and zinc plated S-hooks, which shall be factory installed and integral with perimeter frame members.

4.5.3 Stabilizers

Vertical stabilization shall be effected by four, custom length, adjustable telescoping aluminum tubes with welded details. The tubes shall attach to primary frame members at one end, attached to a P-1000

Unistrut channel (see drawing DMS/10.2) mounted on architectural walls at the other end.

4.6 SOUND SYSTEM

Sound for the DMS experience is recorded on magnetic stripes on the 70mm film. A magnetic playback head in the projector reads the audio signal and transmits it to the audio system where it is processed, amplified, and sent to speakers in the auditorium.

In the auditorium there are speakers for four full frequency audio channels plus speakers for one band limited channel (below 150 Hz only) used for low frequency or subwoofer effects.

There are two screen channels, left and right. Each channel consists of a cluster (sometimes a single) group of speakers located at, near, or behind the left and right portions of the screen. There are two surround channels, also left and right. Surround speakers consist of one or more (distributed) speakers for each channel mounted on the left and right walls of the auditorium. Size and number depends on the size and shape of the auditorium.

A house microphone for public address and a cassette tape player for background music between shows is provided.

The total frequency range is 20 Hz to 20 kHz. Sound Pressure Levels; the subwoofer frequency band audio levels can average 105 dBc with peaks to 125 dBc SPL.

4.7 FILM HANDLING

4.7.1 Film Thickness

Estar base = .00528" (.013mm).

Weight: Approx. 9.25 lbs/1,000 ft. (0.014 kg/m): 70mm

4.7.2 Reels

Two each aluminum, 70mm x 22" (56cm) Ø, 1/2" Ø spindle, floating hub, 8" Ø core.

4.7.3 Rewind

Motorized, variable speed, Die-cast aluminum, with alternate manual hand cranks, with interchangeable 5/16" and 1/2" dia. spindles. Supplied with tight-winds. (On Rewind Bench...see drawing DMS/16.0).

4.7.4 Splicer

For 70mm film, taped, straight cut, Neumade 70-SS.

4.8 DYNAMIC SEAT SYSTEM

The Dynamic Seat System consists of:

- The seat row units, including lap bars, (each row having a seating capacity of nine persons) including dynamic articulation members, base supports and related hydraulic actuators and control equipment.
- Hydraulic power equipment, including heat exchanger, (located in pump rooms) and related control equipment.
- System Control cabinet, located in the hydraulic pump room.
- Installation, operations and maintenance manuals.

4.9 CONTROL SYSTEMS

4.9.1 Control Console

Show control unit, steel construction, for program and show sequence control. See drawing DMS/15.0.

4.9.2 Control Cabinet

Welded steel construction, houses Dynamic Seat Row control equipment. See drawing DMS/15.1.

Show Controller:

Motion control information that defines how and when the seats are to move is recorded on one of the magnetic stripes on the 70mm film alongside the standard audio channels. Signals for the four independent axes of seat motion are recorded together as one audio signal. When the film is stored in computer memory as motion files—one for each show sequence. The signals for the four independent axes of motion are synchronized with the SMPTE time code track recorded on the film. The computer generates the signals, which are input to the control electronics for the hydraulic systems which physically move the seats.

The entire show experience is controlled from an operator's console which is located in the auditorium or alternatively from an identical console in the projection booth. Show sequences include house lights fading up/down, background music fading in/out, seats coming up to their ready position, and picture, sound and motion all playing to the audience. Show sequences are controlled by the Show Controller and Effects Sequencer. The Show Controller makes decision on certain actions based on the inputs it receives from the show equipment. The effects sequencer provides up to 16 time-assignable switch closures for custom output requirements to control show elements provided by the Owner.

4.10 MISCELLANEOUS EQUIPMENT

4.10.1 Supplied by Showscan

- Rewind Bench: Editing Table, w/Lightwell and drawer with re-winds and tight-winds. See drawing DMS/16.0.
- Bulb aligning tool.
- Protective jacket, one pair bulb handling gloves and one protective face shield, required for safe bulb changing.
- Exhaust Duct, 6 ft. (1.820m), Flexible, 8" Ø (Ø203m), PVC w/ spring steel wire. With two 8" Ø (Ø203m) stainless steel, duct clamps.
- See also Section 5.0 Responsibilities.

4.10.2 Supplied by the Owner

- Storage Cabinet: Welded steel construction, 2 door, lockable w/2 keys, 5 shelves (4 adjustable). See DMS/19.0. This cabinet is required for the storage of spare parts, bulbs, hand tools and consumable supplies.
- Work Bench: With tempered hardboard on solid wood core top, steel H frames w/stringer, lower shelf, bench riser, back and end stops, and drawer: see drawing DMS/17.0.
- Special loading "bridges"...from aisles to Seat Row Units.
- See also Section 5.0 Responsibilities.

4.11 SYSTEM TEST & INSTALLATION

4.11.1 General

Showscan will receive, assemble and interconnect the entire Showscan projection and sound system. (The DMS seat row units are tested at the Intamin factory).

4.11.2 Assemble and Test

Showscan will conduct sub-system and full system tests on all projection and sound equipment to demonstrate that the equipment assemblies meet or exceed specifications as outlined herein and/or the published specifications of the various manufacturers or suppliers of the equipment.

4.11.3 Shipping

Upon completion of the assembly and test of the equipment Showscan will pack, crate and ship all components, accessories and other system material to the Project Job Site. Showscan equipment FOB factory, USA and Intamin equipment FOB factory, Europe.

4.11.4 Insurance

Showscan/Intamin will provide and maintain all risk insurance, for full replacement cost including coverage of related labor, for all equipment specified up to the date of shipment, FOB factory USA/ Europe (per section 4.11.3 above). From that point on, risk of loss for the equipment and insurance shall be the responsibility of the Owner unless other arrangements are made.

4.11.5 Installation

In accord with mutually agreed to Project schedules, Showscan/Intamin will provide skilled personnel to advise on the installation, start-up, and adjustment of the DMS system. (The cost of such services and related expenses are the responsibility of the Owner).

[Intentionally Left Blank]

SECTION V

RESPONSIBILITIES

5.1 SHOWSCAN/INTAMIN RESPONSIBILITIES:

In summary, Showscan/Intamin provides the following services and equipment:

- DMS Design and Engineering data, and review of Owner's architectural and engineering plans.
- Projection system consisting of projectors, lamphouses, lenses, screen, control consoles, control cabinet, and rewind table with rewinds and tightwinds.
- Sound system consisting of audio racks w/all sound reproducing and amplification equipment, speakers, and all projection/sound interface control equipment.
- Show control software and related equipment with switch closures.
- Dynamic Seat Rows.
- Dynamic Seat Row hydraulic equipment and related control equipment.
- Operation and Maintenance Manuals.
- Observation of installation. (Extra cost).

5.2 OWNER'S RESPONSIBILITIES

The Owner shall be responsible for, including but not limited to, the following:

- All architectural design and engineering of the facility.
- All construction of the facility including structural, electrical, and mechanical systems; i.e., heating, ventilating, plumbing, chilled water, air conditioning systems, interior and emergency lighting, furnishings and finishes, and all acoustical treatments.
- All permits, licenses, and tests required for the construction, installation and operation of the DMS system.
- All labor, tools and equipment, for the installation of the Showscan/Intamin equipment.
- All interior design and planning of ancilliary functions and spaces including queue line and audience holding areas, offices, and other Owner show functions.
- The construction, supply and installation of all electrical conduits and conductors for all Showscan/Intamin systems and equipment

including audio speaker wiring, projection wiring, booth wiring and all connections to Showscan/Intamin equipment, all hydraulic piping and related hydraulic electrical control system wiring.

- The structural beams, chain hoist, and all rigging equipment and materials necessary for the installation of the DMS Seat Rows.

IMPORTANT NOTE:

All construction, rigging, and installation provided, and services performed by the Owner shall be in accordance with Showscan/Intamin specifications wherever they apply. Where Showscan/Intamin specifications and requirements are at variance with local requirements, it shall be the responsibility of the Owner to so inform, in writing, Showscan/Intamin of such variances and shall provide accurate details of related requirements. Notification of such variance shall be effected during the design development phase and prior to the production of Showscan/Intamin equipment and systems.

CONTENTS

SECTION	Page
1.0 ———ABOUT THIS MANUAL	1-1
2.0 ———INTRODUCTION	2-1
3.0 ———ARCHITECTURAL	3-1
3.1 Auditorium Layout	3-1
3.2 Booth Layout	3-2
3.3 Structural Items	3-3
3.4 Electrical Requirements	3-4
3.5 Acoustical Requirements	3-6
3.7 Environmental & Mechanical Requirements	3-7
4.0 ———SHOWSCAN/INTAMIN DMS SYSTEM	4-1
4.1 Projection System	4-1
4.2 Lamphouse	4-2
4.3 Lens System	4-2
4.4 Screen	4-3
4.5 Screen Frame	4-3
4.6 Sound System	4-4
4.7 Film Handling	4-4
4.8 Dynamic Seat System	4-5
4.9 Control System	4-5
4.10 Miscellaneous Equipment	4-6
4.11 System Test & Intallation	4-6
5.0 ———RESPONSIBILITIES	5-1
5.1 Showscan/Intamin Responsibilities... ..	5-1
5.2 Owner's Responsibilities	5-1
6.0 ———DRAWINGS, w/Index	6-1

© 1988 Showscan Film Corporation

This manual and the systems described here are copyrighted with all rights reserved. The design information contained herein is proprietary and confidential and may not be copied, in whole or in part, without the written permission of Showscan Film Corporation and Intamin Corporation Inc., Est.

SECTION I

ABOUT THIS MANUAL

This Showscan/Intamin DMS Planning Manual has been prepared to assist you in the evaluation of basic requirements and in providing general data necessary for conceptual planning and the preliminary architectural design of facilities for the installation of the Dynamic Motion Simulators. If planning goes beyond Preliminary Design, Showscan and Intamin can provide additional detailed drawings and specifications to further assist in design development.

This manual assumes your general interest and that you have experienced a demonstration at an existing DMS installation and that you are generally familiar with the basic design concepts of the Showscan/Intamin Dynamic Motion Simulator.

- Section 2.0 describes the three general sizes of DMS which are based on seating capacities.
- Section 3.0 discusses the minimum architectural requirements of each DMS size, booth and equipment layouts, structural requirements, electrical power, and acoustical considerations.
- Section 4.0 reviews the general details of the projection and sound systems, film handling, tests, and installation procedures.
- Section 5.0 reviews the responsibilities of the Owner and Showscan/Intamin and provides a summary overview of services and equipment provided by each.
- Section 6.0 provides the drawings that delineate the basic plan characteristics, provide structural data, and illustrate all equipment. The drawings are in standard foot/inch scales with metric equivalents in millimeters. Metric scale drawings are available on special request.

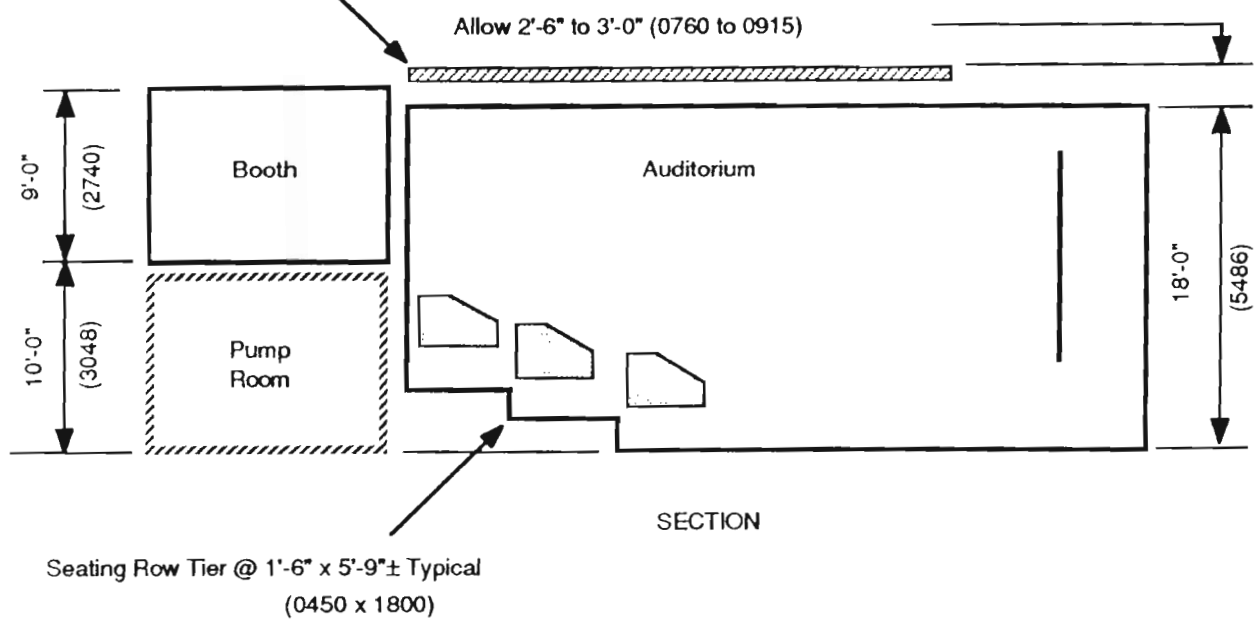
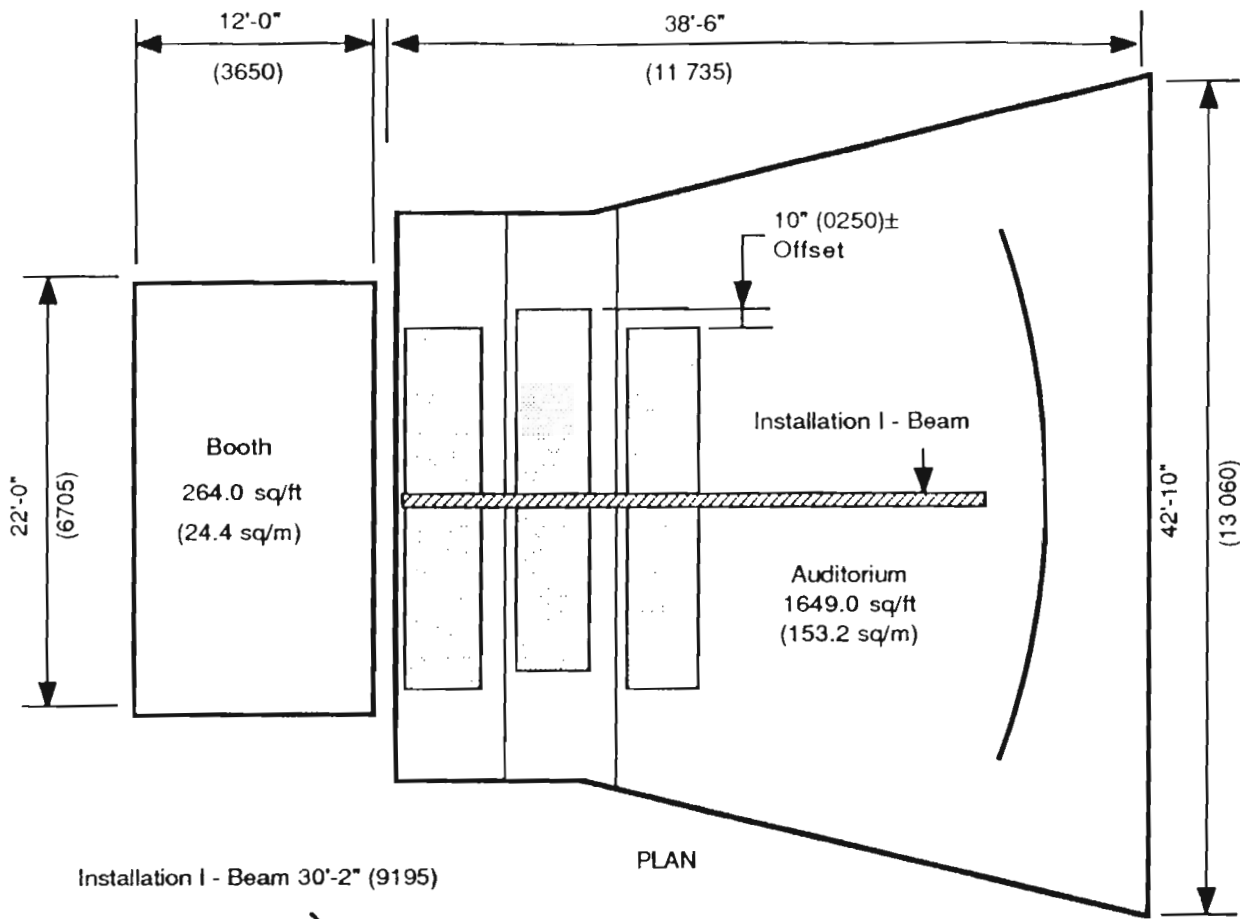
Note: This document is not a contract and Showscan/Intamin reserves the right to change these specification and/or drawings without prior notice.

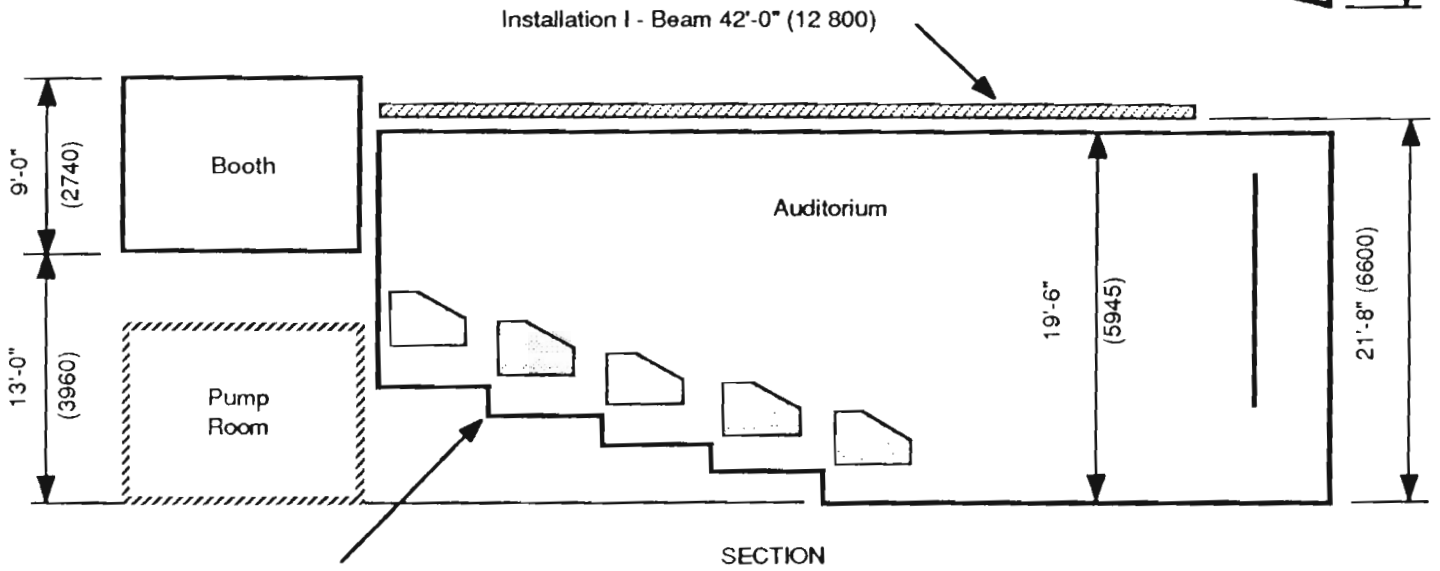
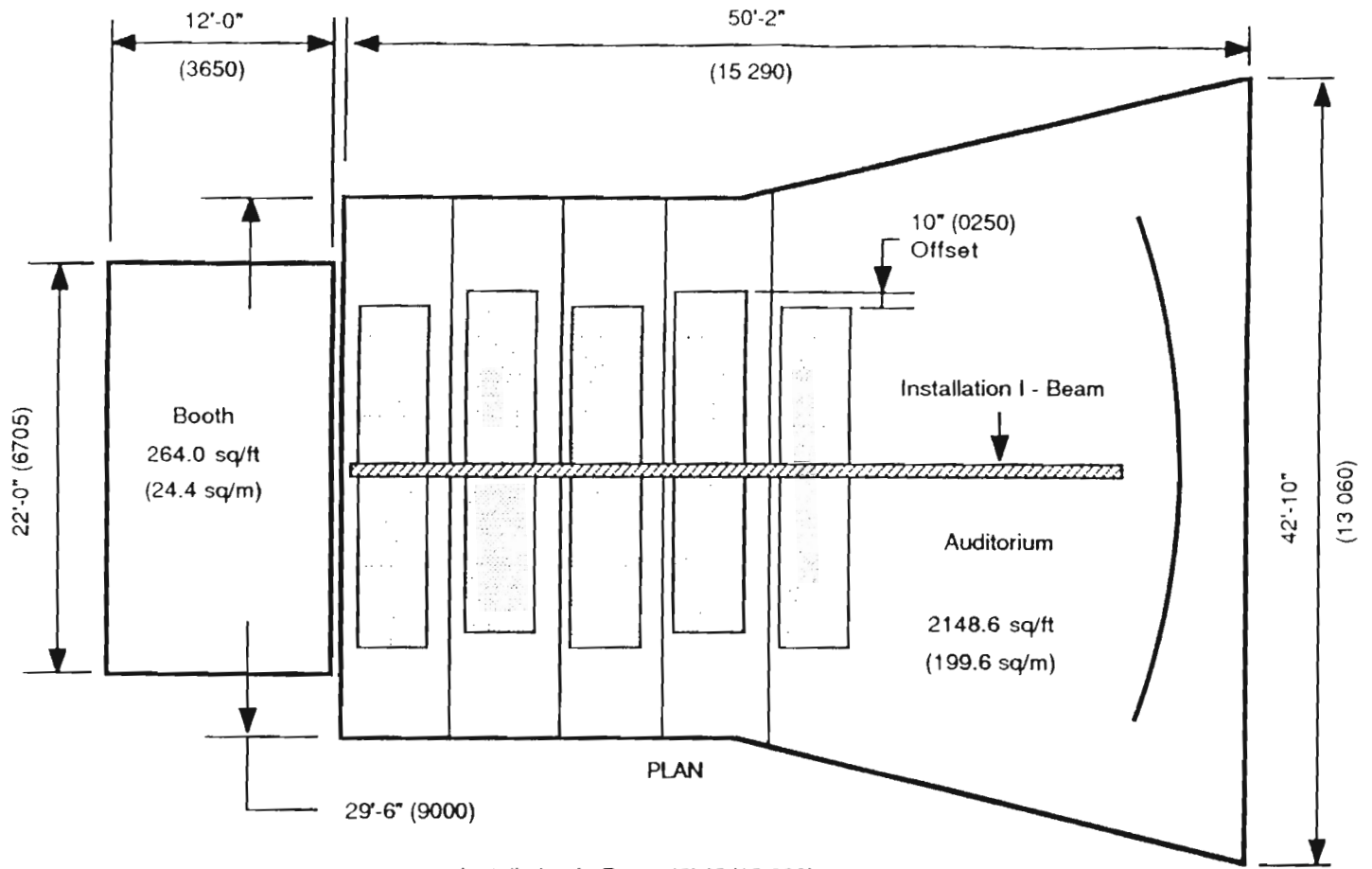
[Intentionally Left Blank]

SECTION VI DRAWING INDEX

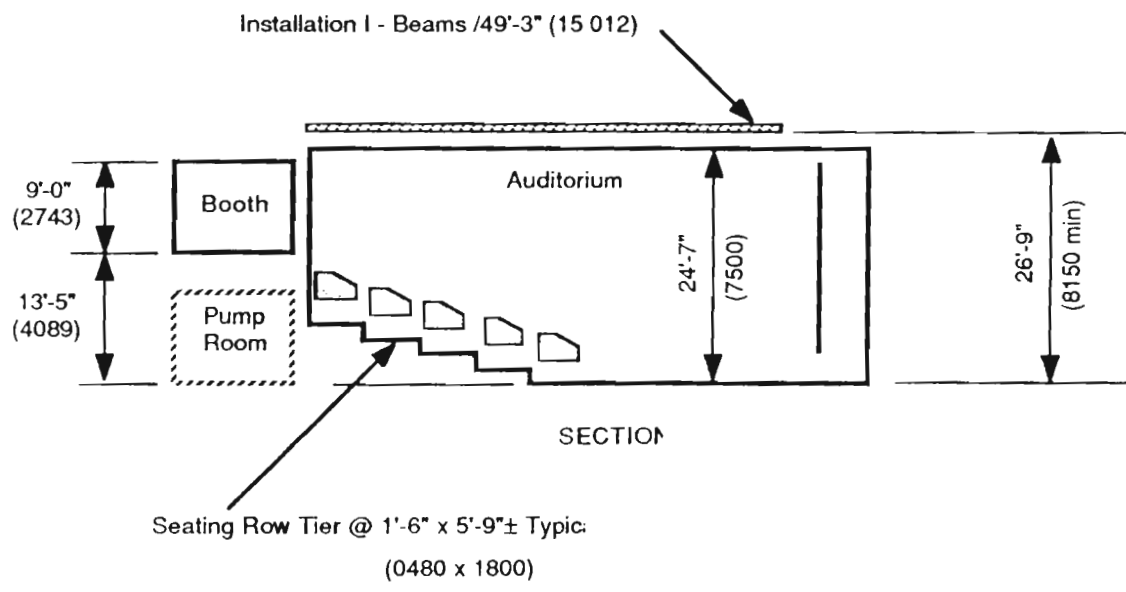
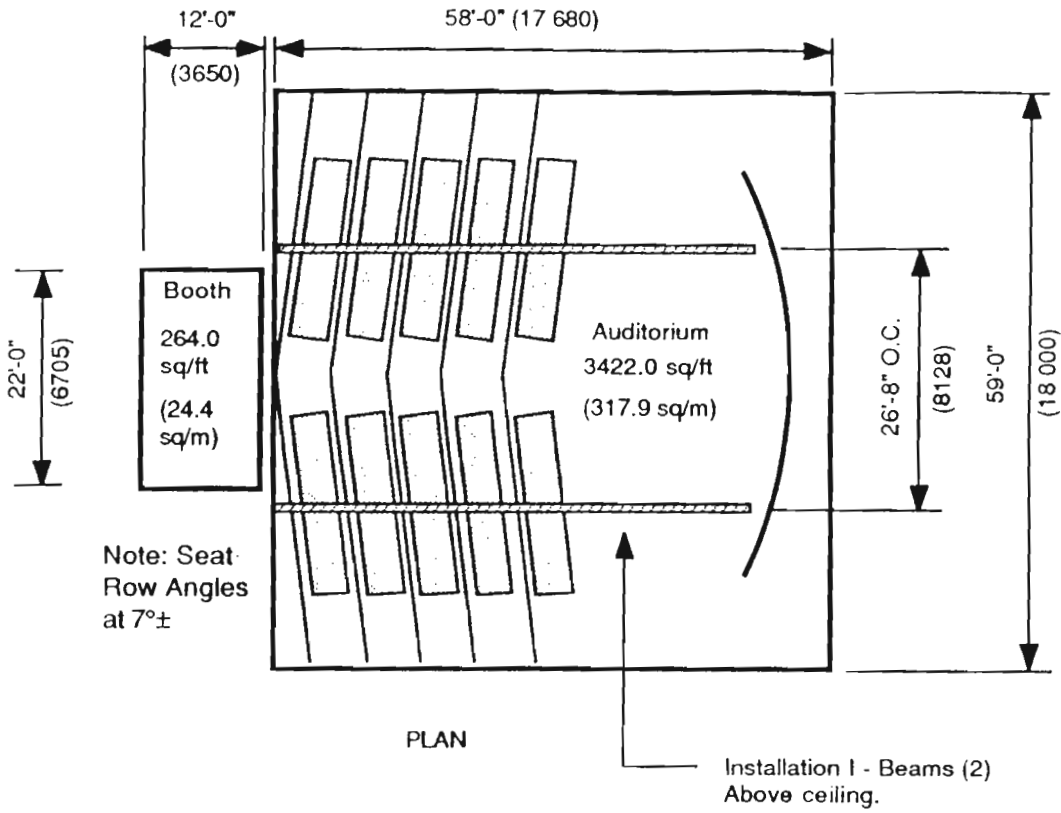
Dwg. Title	Dwg. No.	Date*	Scale
DMS/27 Plan & Schematic Sections	DMS/1.0	6 Apr 88	1"=10'
DMS/45 Plan & Schematic Sections	DMS/2.0	6 Apr 88	1"=10'
DMS/90 Plan & Schematic Sections	DMS/3.0	6 Apr 88	1"=20'
Dynamic Seat Row Schematic	DMS/4.0	7 Apr 88	1/4"
Unused Number	DMS/4.1	14 June 88	deleted
DMS/Foundation Forces	DMS/4.2	12 Apr 88	None
DMS/Foundation Forces	DMS/4.3	12 Apr 88	None
DMS/Beam Load Schematic	DMS/4.4	14 June 88	None
DMS/Beam Load Schematic	DMS/4.5	14 June 88	None
Installation Schematic	DMS/5.0	12 Apr 88	None
Electrical Block Diagram/60 Hz	DMS/5.1	12 Apr 88	None
Electrical Block Diagram/50 Hz	DMS/5.2	12 Apr 88	None
DMS Pump Room Plan	DMS/6.0	12 Apr 88	1/4"
DMS Dual Pump Room Plan	DMS/6.1	12 Apr 88	1/8"
DMS Hydraulic Power Unit	DMS/6.2	12 Apr 88	1/2"
DMS/Typical Booth Plan	DMS/7.0	12 Apr 88	1/4"
DMS/Booth Plan/Dual Theaters	DMS/7.1	13 Apr 88	1/4"
Projection Port Schematic	DMS/8.0	13 Apr 88	None
DMS/Screen Plan Schematic	DMS/9.0	13 Apr 88	1/8"
DMS/Screen Section	DMS/10.0	13 Apr 88	1/2"
Screen Frame/Detail One	DMS/10.1	13 Apr 88	1/2 Size
Screen Frame/Detail Two	DMS/10.2	13 Apr 88	1/2 Size
Screen Frame/Detail Three	DMS/10.3	13 Apr 88	1/2 Size
Screen Frame/Detail Four	DMS/10.4	13 Apr 88	1/2 Size
Screen Frame/Detail Five	DMS/10.5	13 Apr 88	1/2 Size
Screen Frame/Detail Six	DMS/10.6	13 Apr 88	1/2 Size
EP-70/Projector Elevation	DMS/11.0	14 Apr 88	3/4"
EP-70/Projector Plan	DMS/12.0	14 Apr 88	3/4"
EP-70/Projector Installation	DMS/13.0	14 Apr 88	3/4"
Audio Racks/2 Bay	DMS/14.0	14 Apr 88	1/2"
DMS Control Console	DMS/15.0	14 Apr 88	1/2"
Control Cabinet/Hydraulic	DMS/15.1	14 Apr 88	1/2"
Film Rewind Table	DMS/16.0	14 Apr 88	3/4"
Projection Booth Work Bench	DMS/17.0	14 Apr 88	3/4"
Projection Booth Storage Cabinet	DMS/19.0	14 Apr 88	3/4"
Screen Elevation/Sizes	DMS/20.0	14 Apr 88	None
Screen Layout DMS/27	DMS/21.27	14 Apr 88	None
Screen Layout DMS/45	DMS/21.45	14 Apr 88	None
Screen Layout DMS/90	DMS/21.90	14 Apr 88	None
Film Format Data	DMS/22.0	14 Apr 88	2:1
Screen Illumination Data	DMS/23.0	14 Apr 88	None
Sound Test Data	DMS/23.1	28 Dec 87	None
Booth Equipment	DMS/24.0	14 Apr 88	1/4"

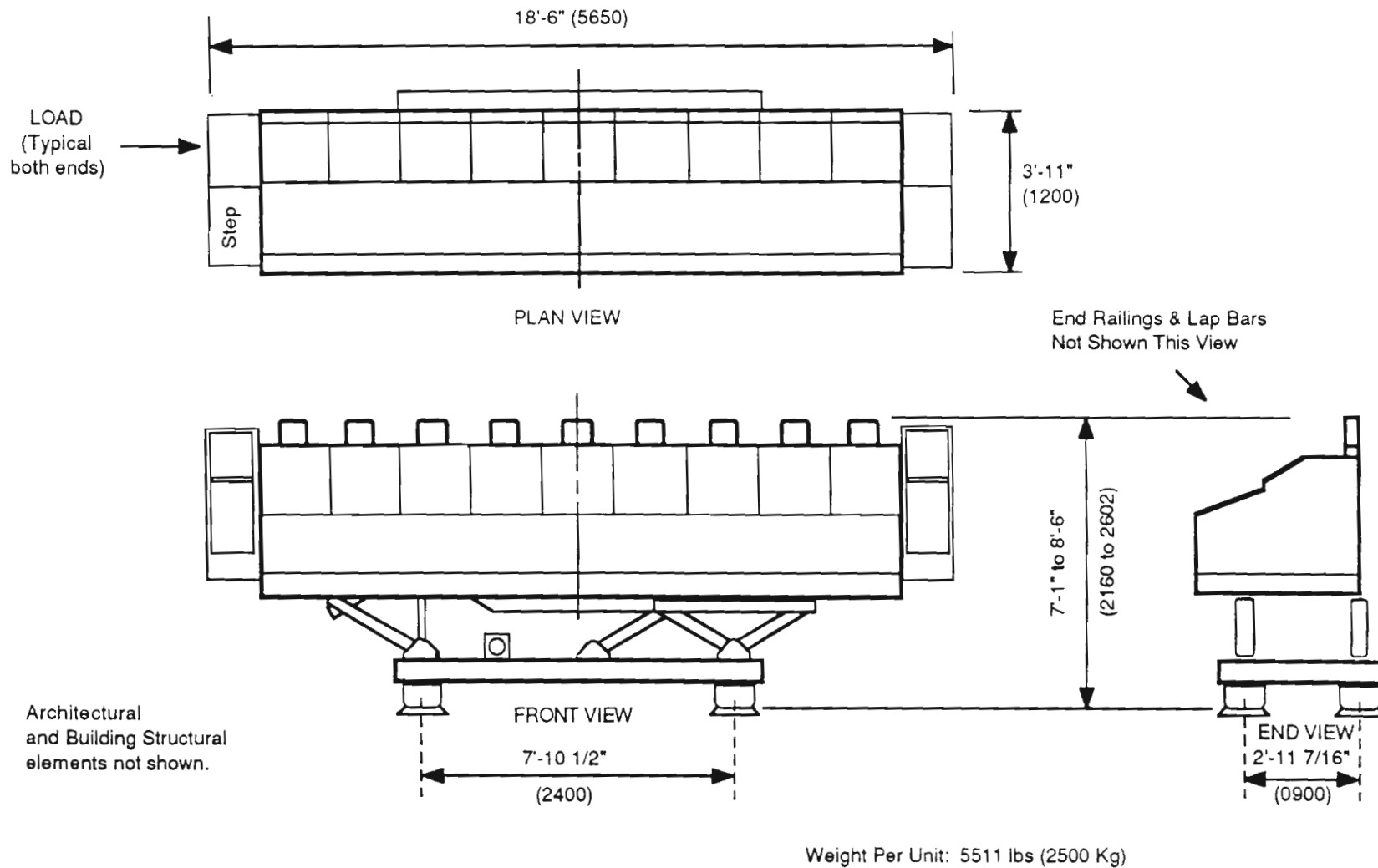
*See latest revision. Metric scale drawings are available on special request.

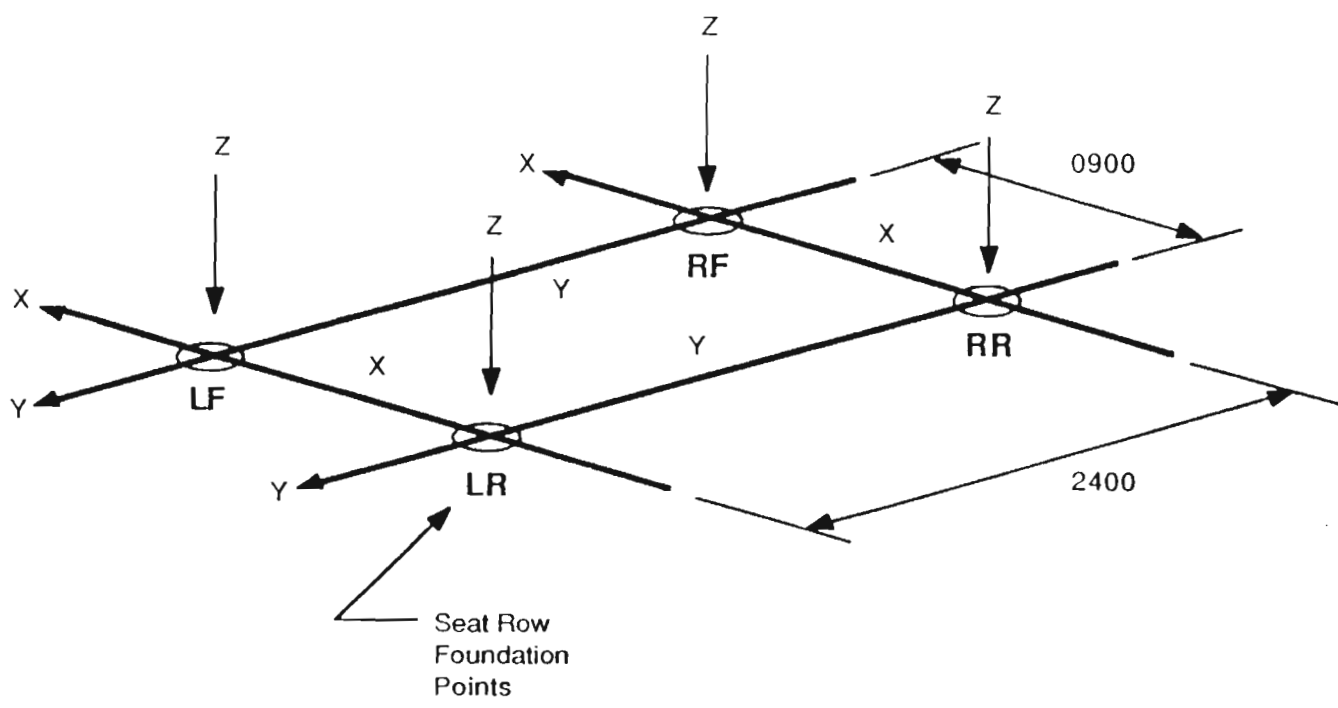




Seating Row Tier @ 1'-6" x 5'-9" ± Typical
 (0450 x 1800)

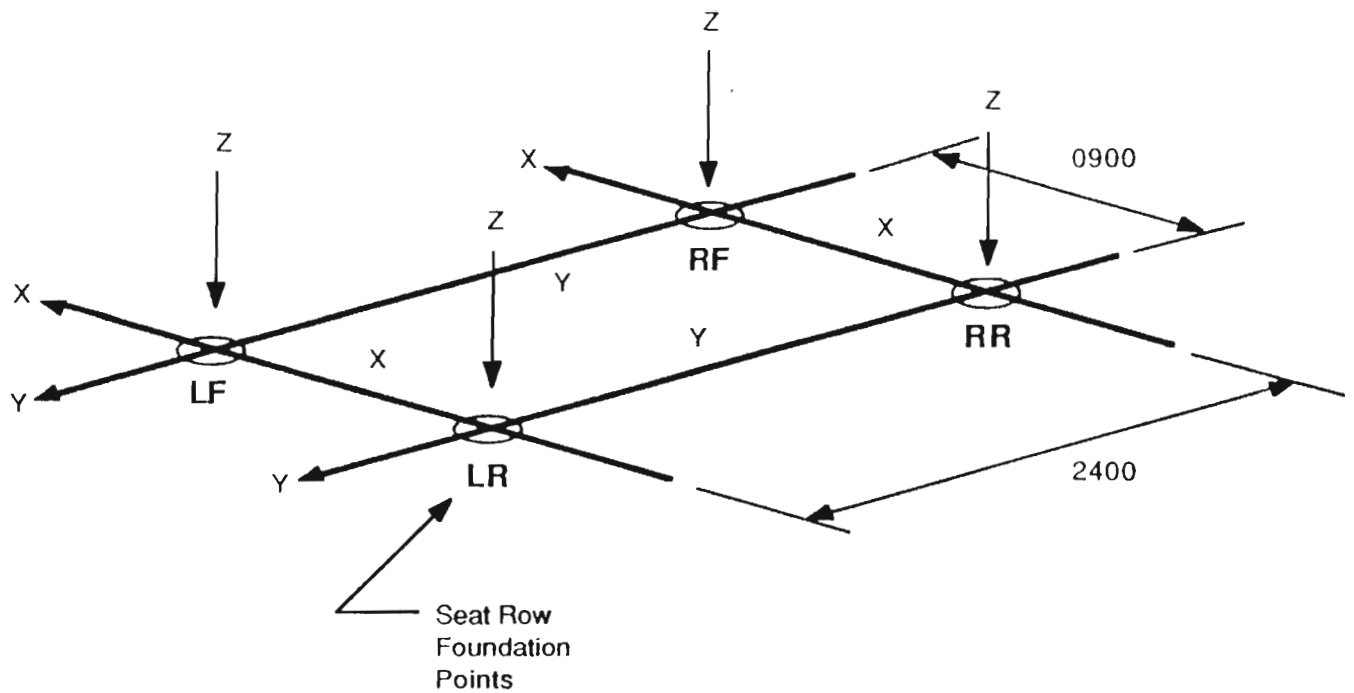






	LF			RF			LR			RR		
	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y
Max Load	+23	3	7	+23	3	7	+31	3	7	+31	3	7
Min Load	-16	-3	-7	-16	-3	-7	-20	3	-7	-20	3	-7

All Forces in KN at Seating Row Tier V, excluding dynamic factor
 Suggested Dynamic Factor : 1.5 Safety Coefficient 1 : 3
 (For further details ref. Intamin Drawing No. Di - 23/7000 - 7005)

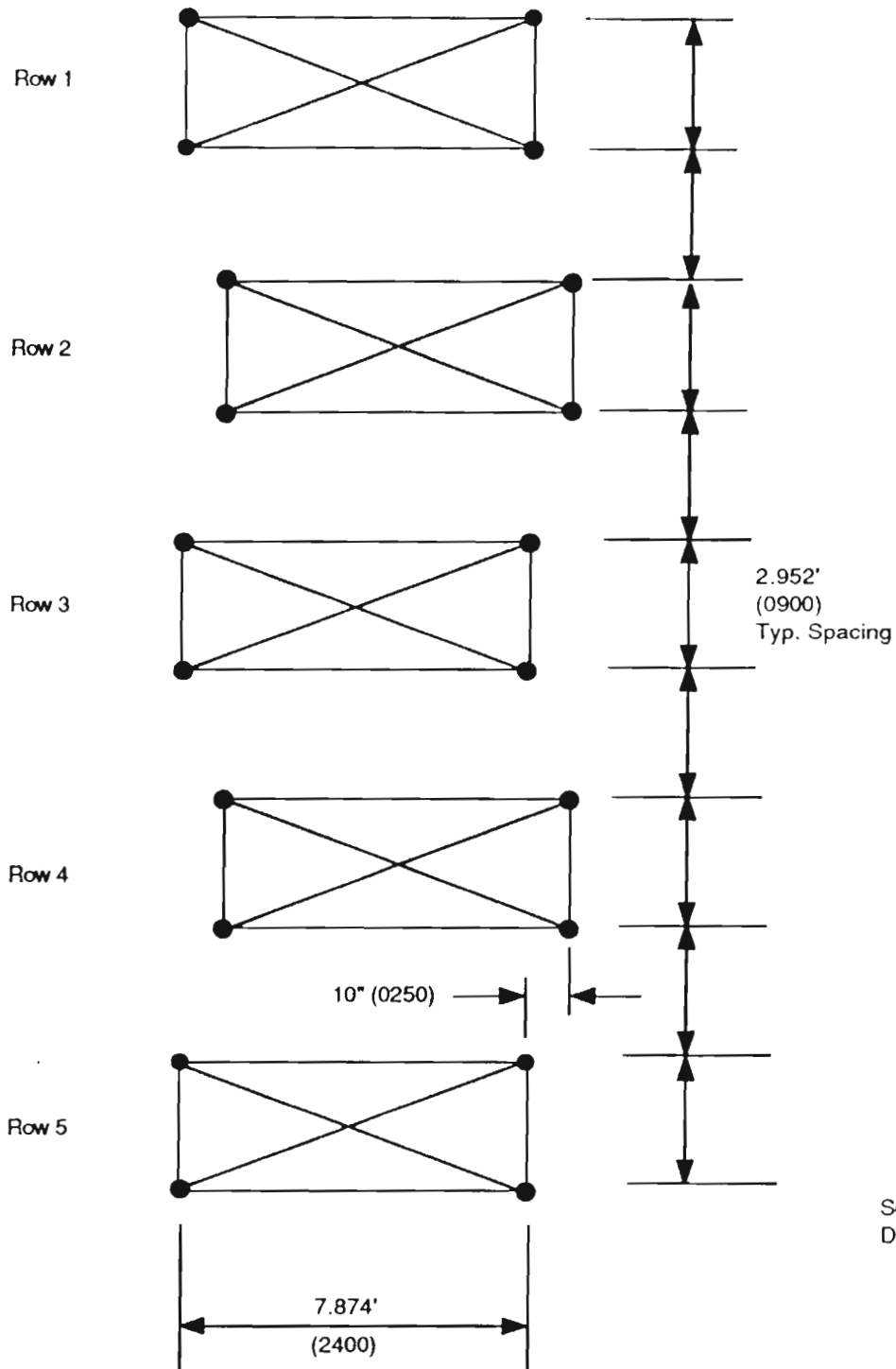


	LF			RF			LR			RR		
	Z	X	Y	Z	X	Y	Z	X	Y	Z	X	Y
Max Load	+23	3	7	+23	3	7	+31	3	7	+31	3	7
Min Load	-16	-3	-7	-16	-3	-7	-20	3	-7	-20	3	-7

All Forces in KN at Seating Row Tier V, excluding dynamic factor

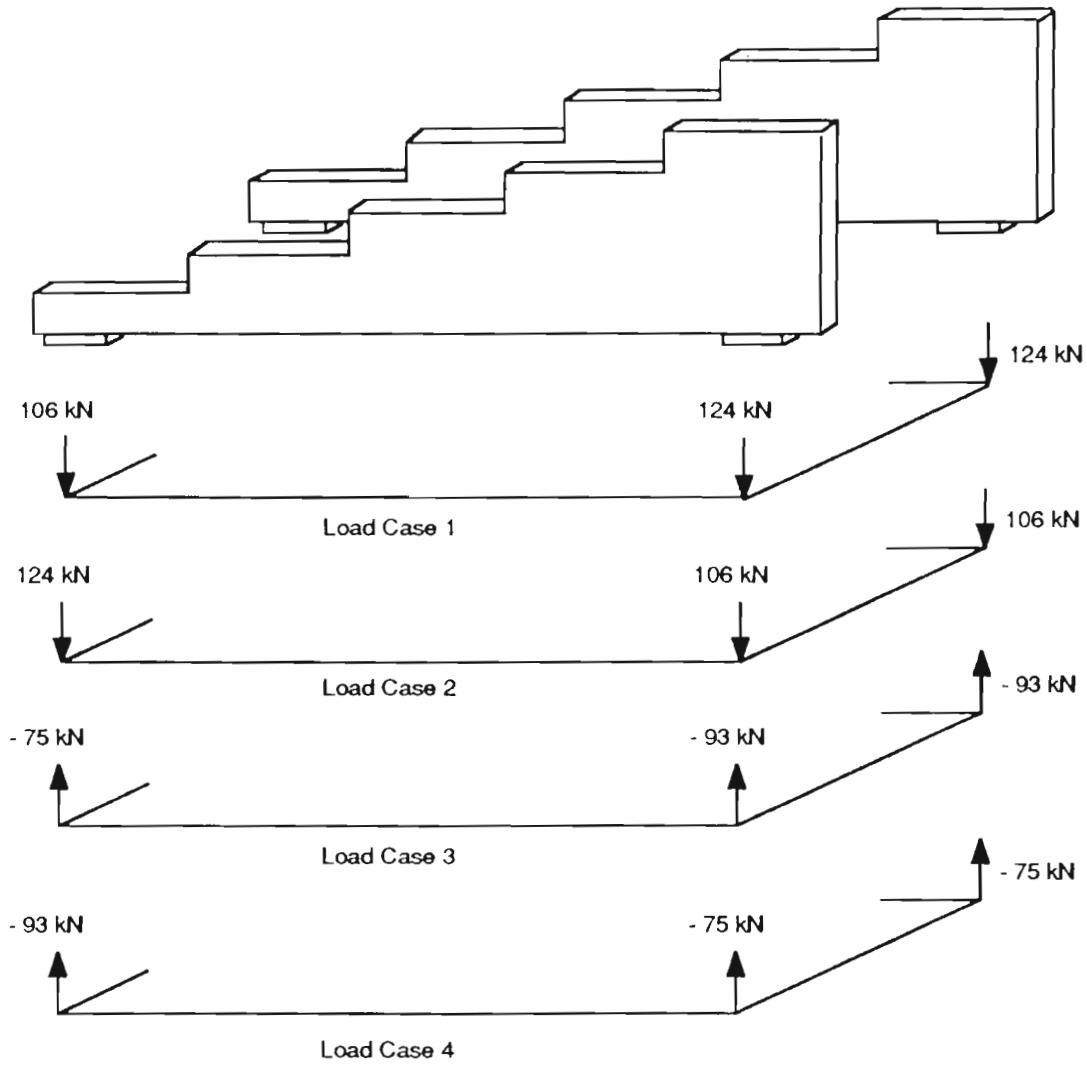
Suggested Dynamic Factor : 1.5 Safety Coefficient 1 : 3

(For further details ref. Intamin Drawing No. Di - 23/7000 - 7005)



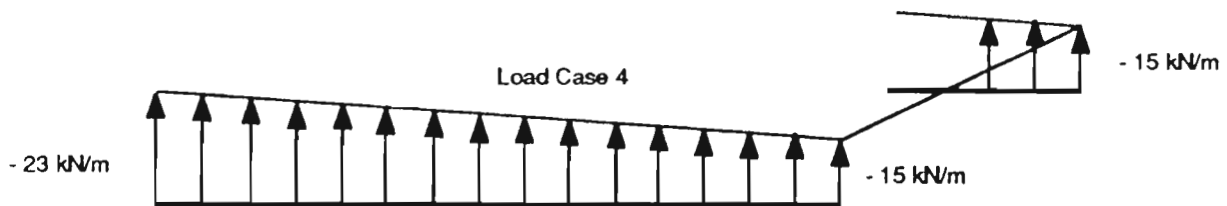
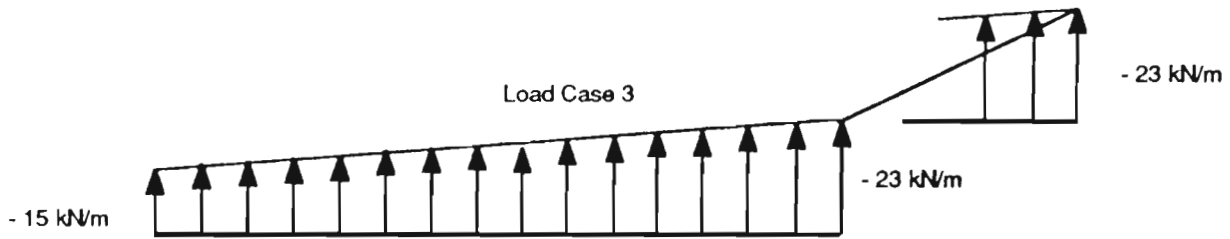
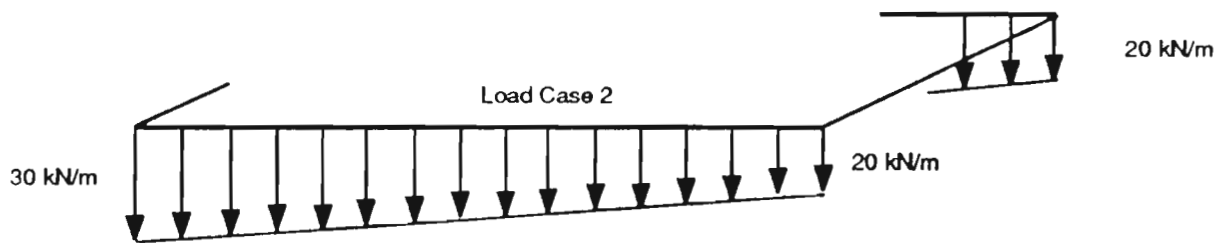
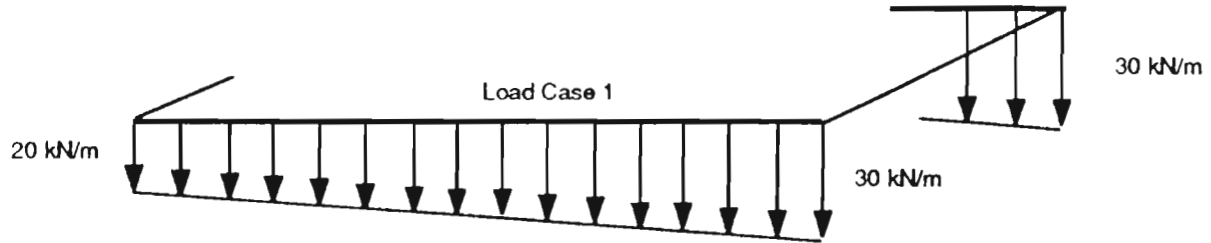
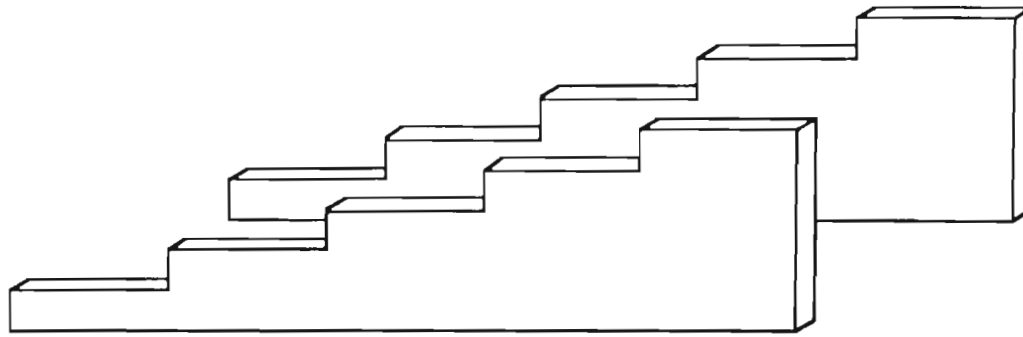
FORCES ACTING ON FLOORS/Location of Foundation Points. DMS/45 shown, others similar.

CONTINUOUS BEAMS/Concentrated Load at 4 Locations
 (five seat row units mounted on continuous beams)

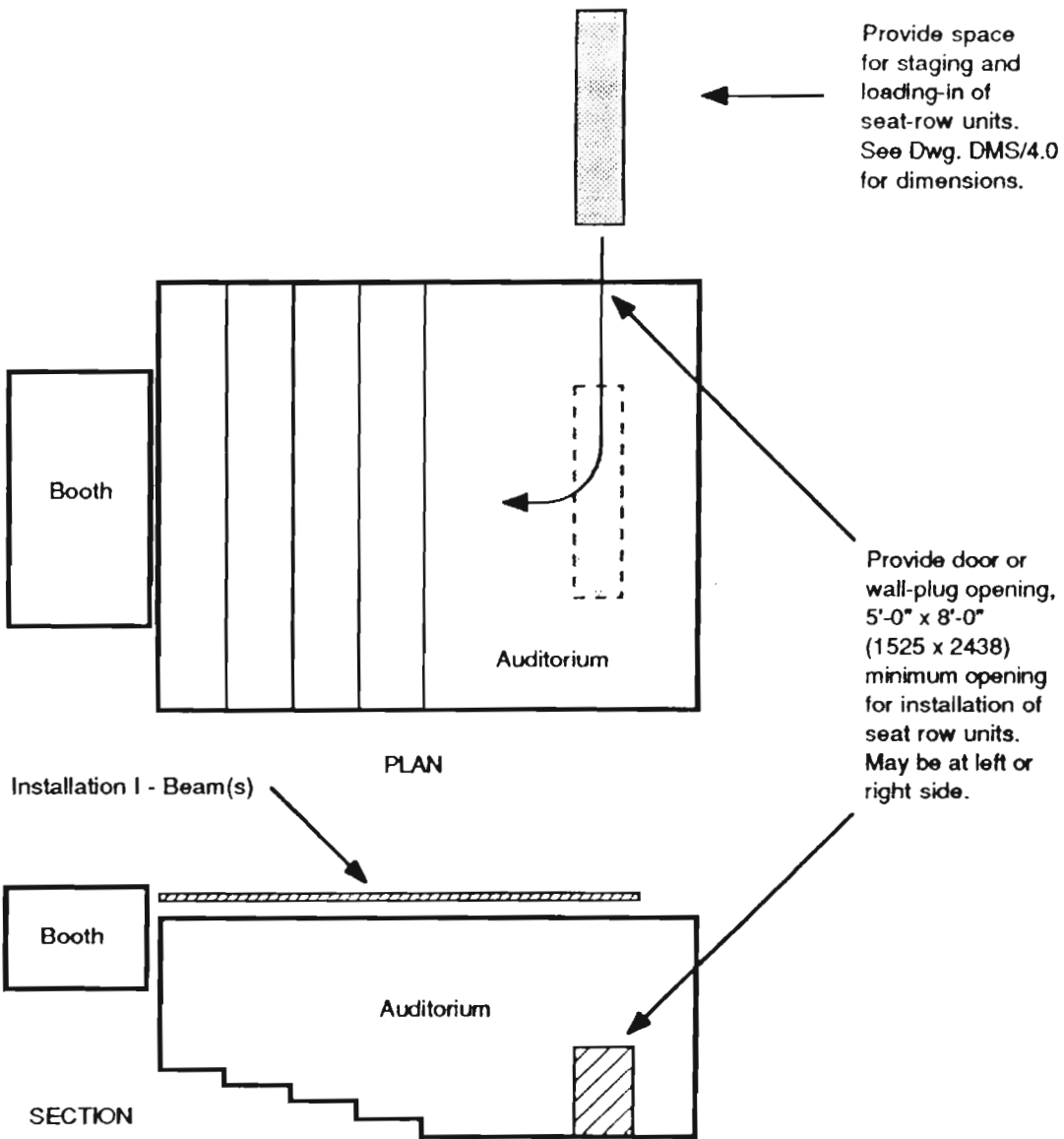


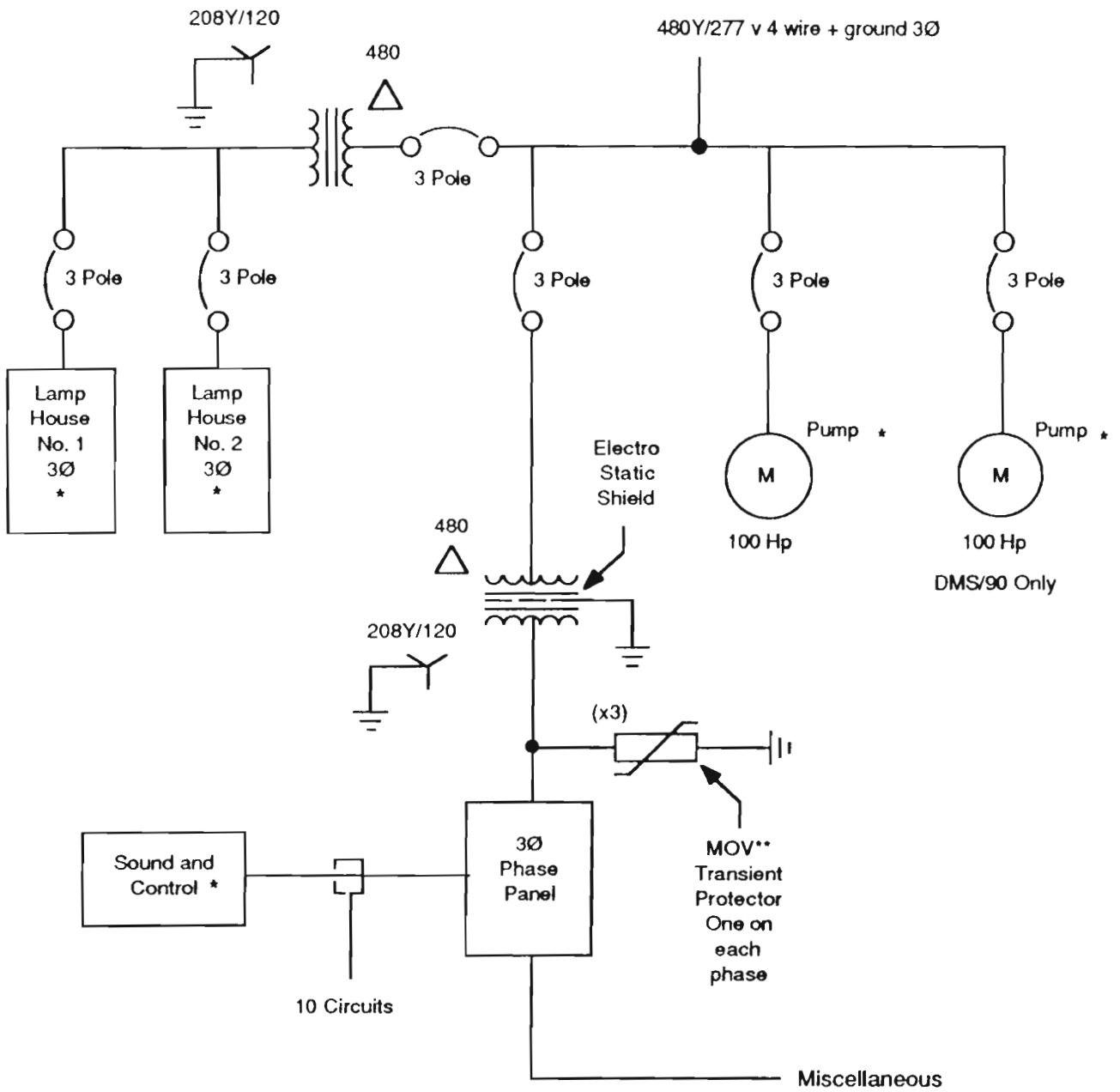
All Loads excluding the weight of the continuous beams.

CONTINUOUS BEAMS/Distributed load on floor.
 (five seat row units mounted on continuous beams)



All Loads excluding the weight of the continuous beams. Same load acting on each continuous beam.



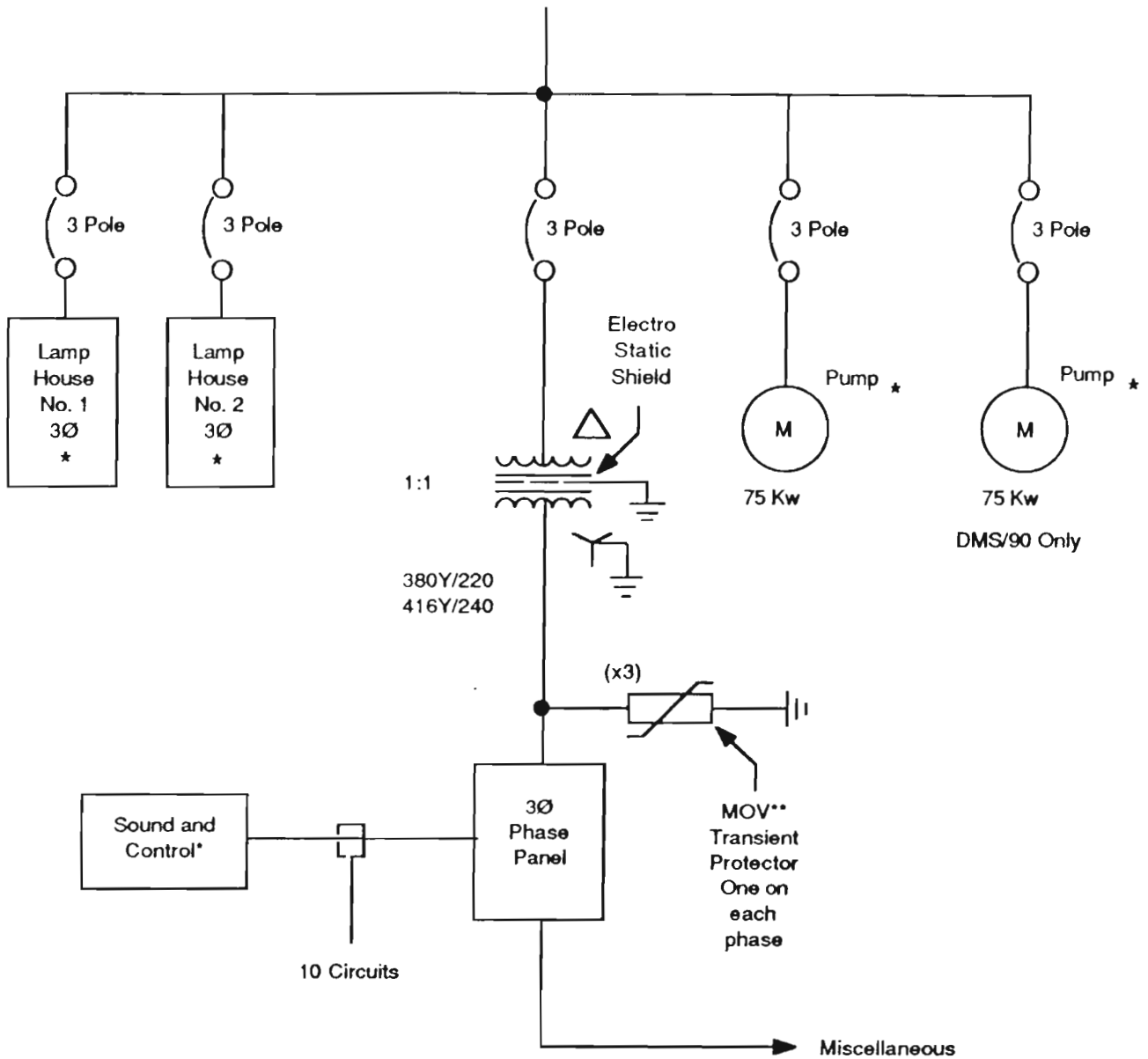


NOTE: Booth and Auditorium lighting and other show electrical NOT INCLUDED.

* Supplied by Showscan/Intamin
 ** Metal Oxide Varistor

60 Hertz Power

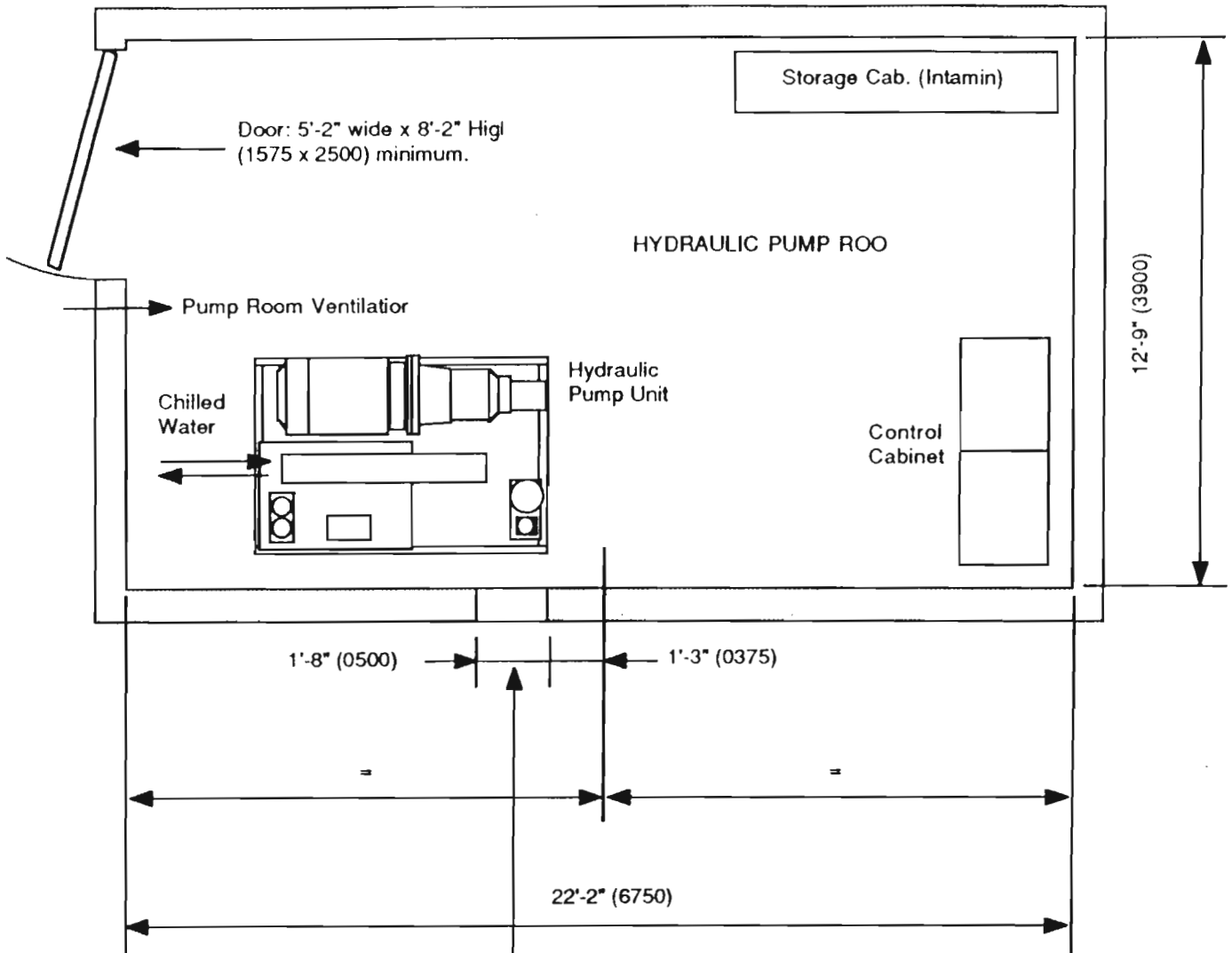
380Y/220 v 4 wire + ground 3Ø or...
 416Y/240 v 4 wire + ground 3Ø



NOTE: Booth and Auditorium lighting and other show electrical NOT INCLUDED.

* Supplied by Showscan/Intamin
 ** Metal Oxide Varistor

50 Hertz Power



Ceiling Ht. = 9'-0" (2745)

Area = 282.6 sq/ft (26.3 sq/m)

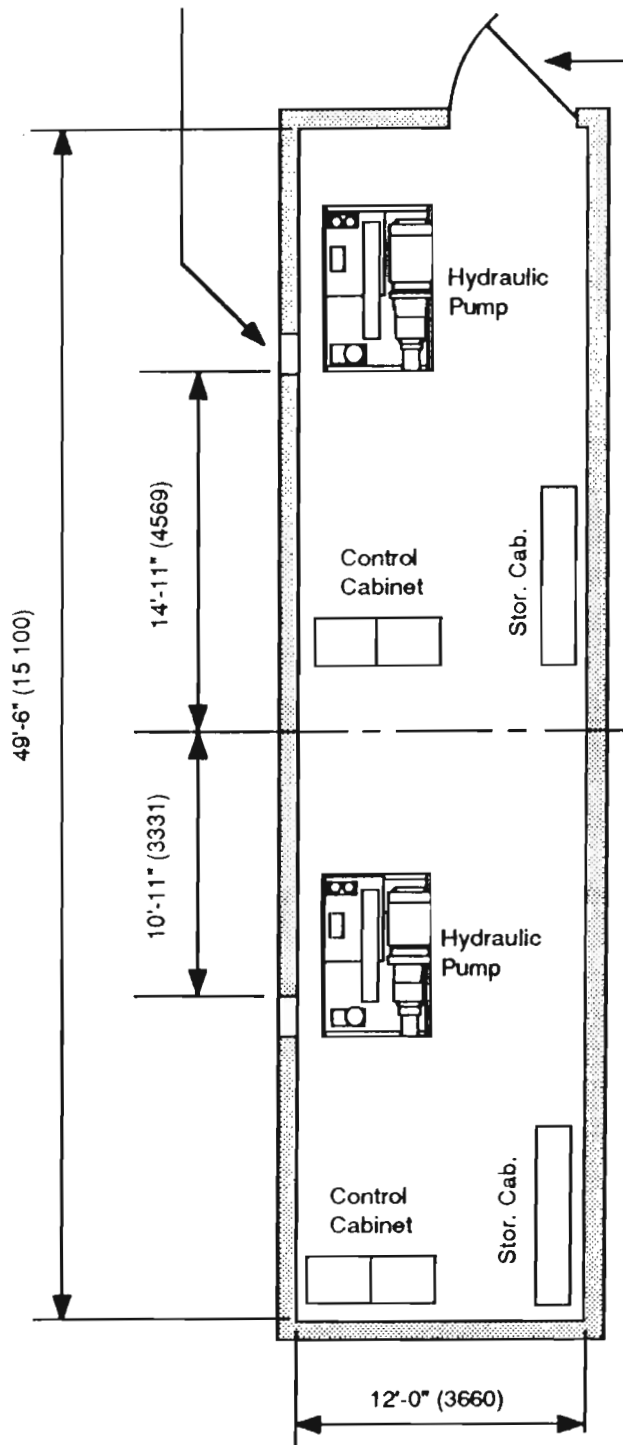
Pump Unit Wt. = 4400 lbs (2000 Kg)

Hydraulic Oil = 948 lbs (430 Kg/500 liter)

Total = 5348 lbs (2430 Kg)

1'-8" x 1'-8" (0500 x 0500)
opening: bottom edge 6'-6"
(1970) above 0.0 floor level.

1'-8" x 1'-8" (0500 x 0500) opening: bottom edge 6'-6" (1970) above 0.0 floor level. Typical 2 places.



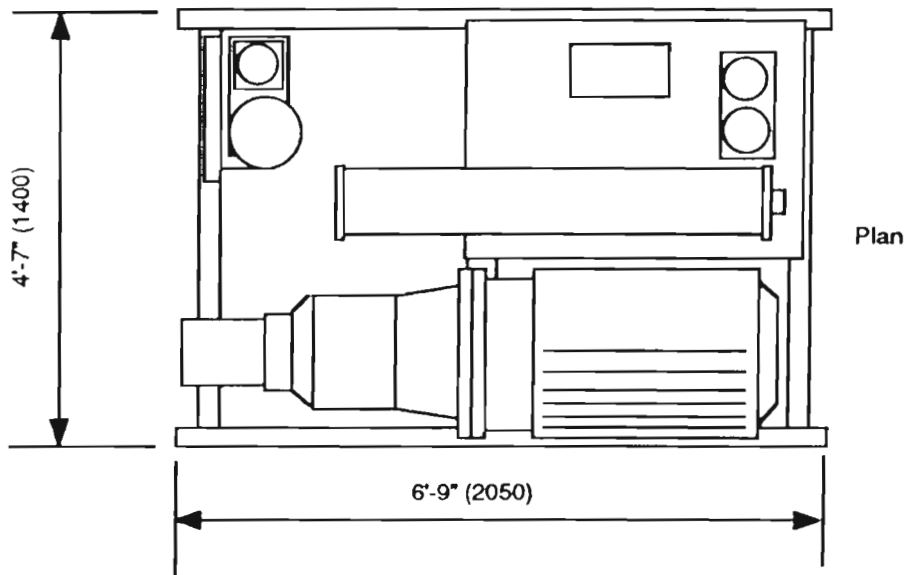
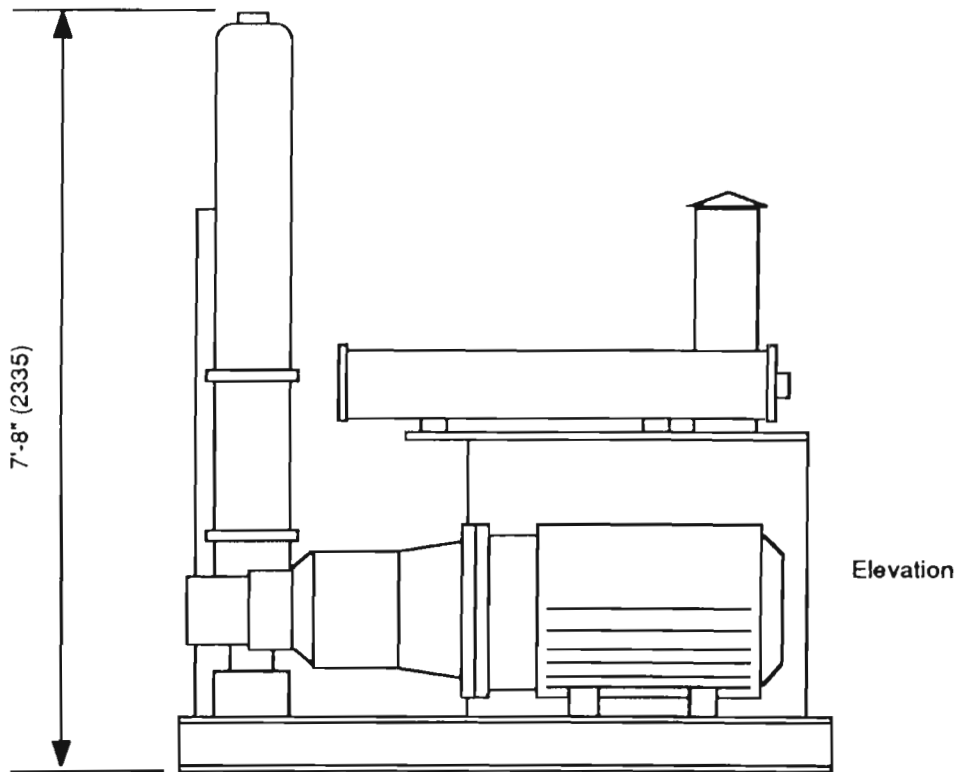
Door: 5'-2" wide x 8'-2" high (1575 x 2500) min.
Door may be located on any wall.

Note:
Dual Pump Room is required for DMS/90 or Back-To-Back DMS/45 or DMS/27 Theaters.

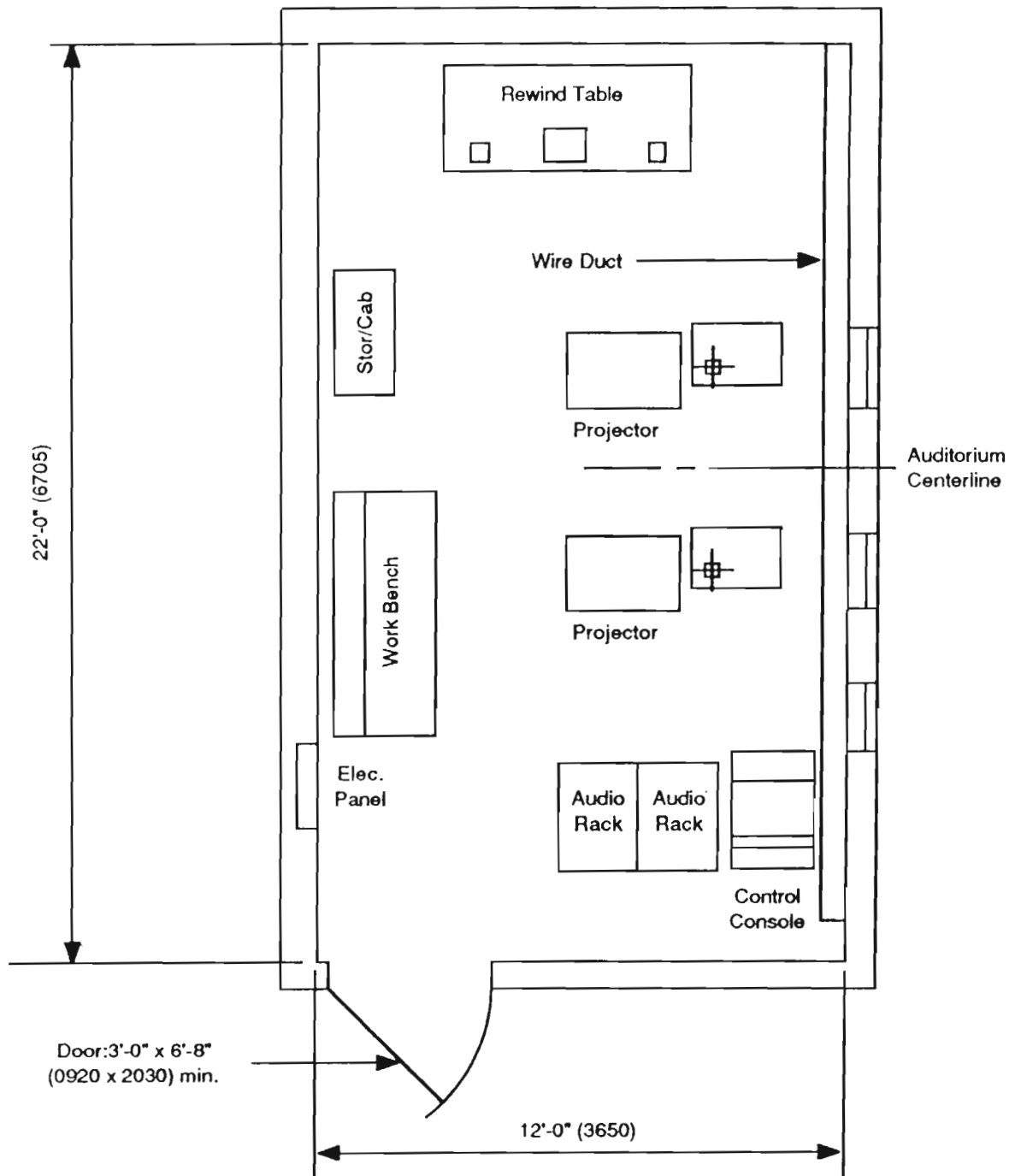
Alternately, DMS/90 Theaters may be serviced by two separate Pump Rooms, see Dwg. DMS/6.0

Area: 594 sq/ft (55.2 sq/m)

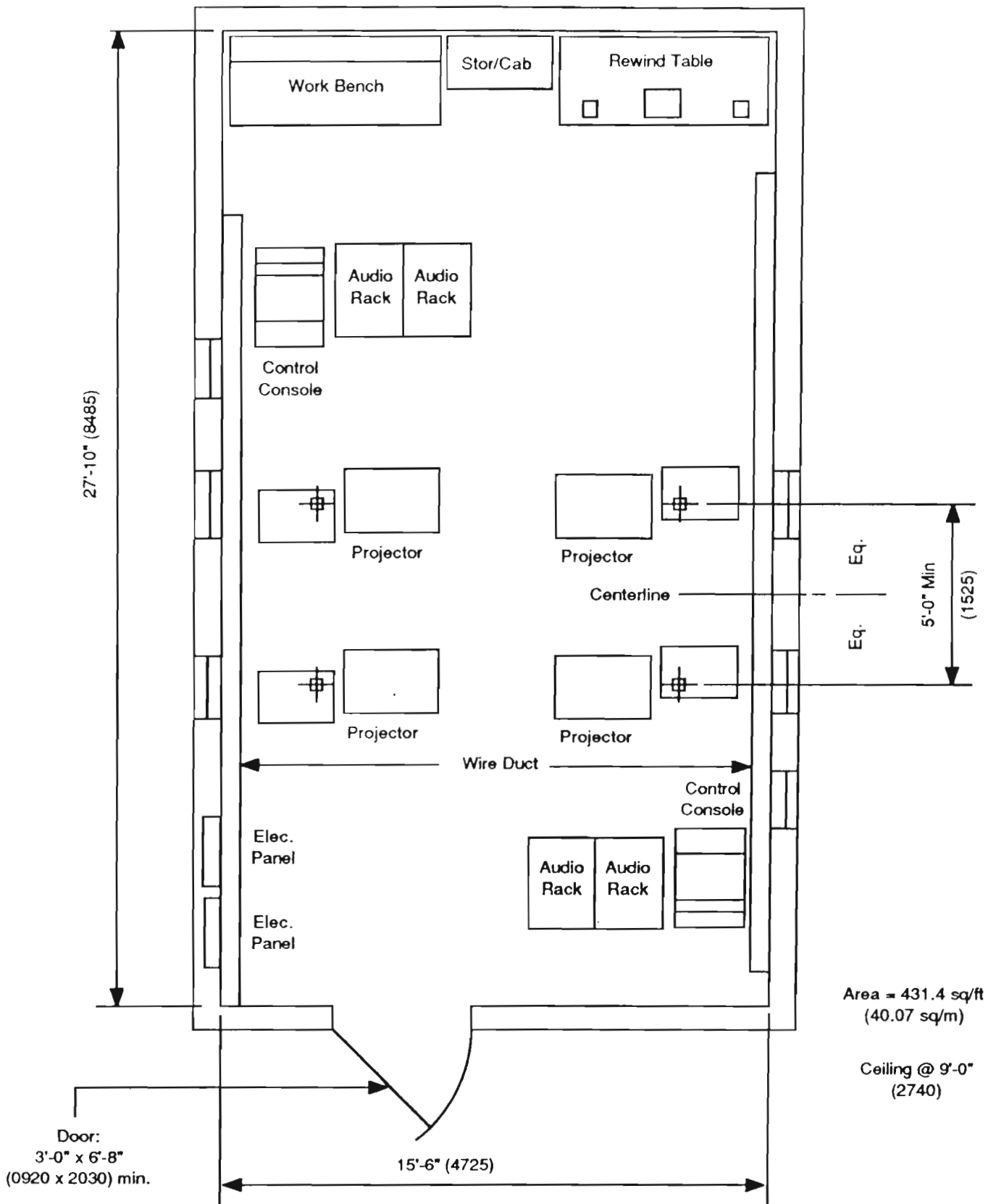
Ceiling Ht. = 9'-0" (2745)

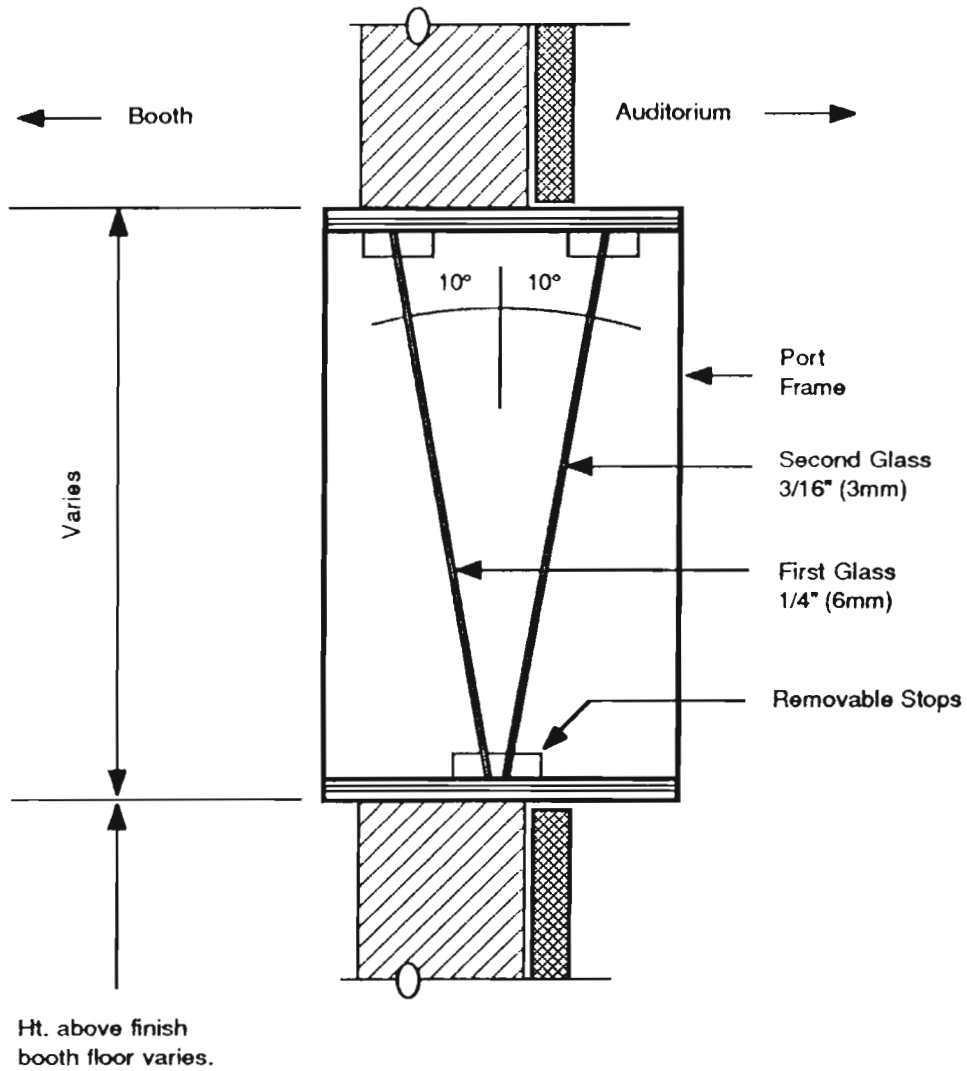


Pump Unit Wt.	=	4400 lbs (2000 Kg)
Hydraulic Oil	=	948 lbs (430 Kg/500 liters)
<hr/>		
Total	=	5348 lbs (2430 Kg)

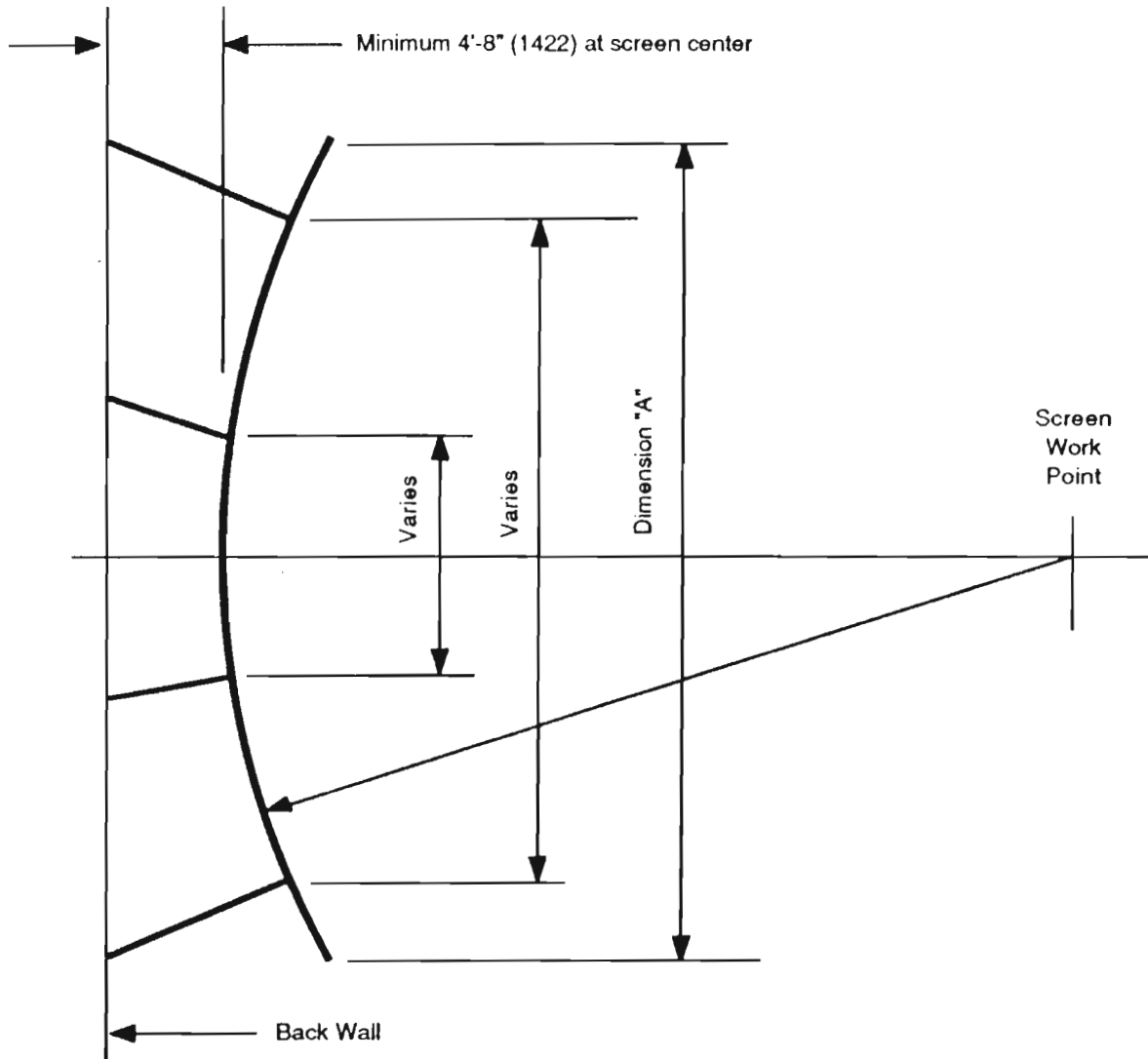


Ceiling @ 9'-0" (2740)±
 Area = 264.0 sq/ft (24.4 sq/m)





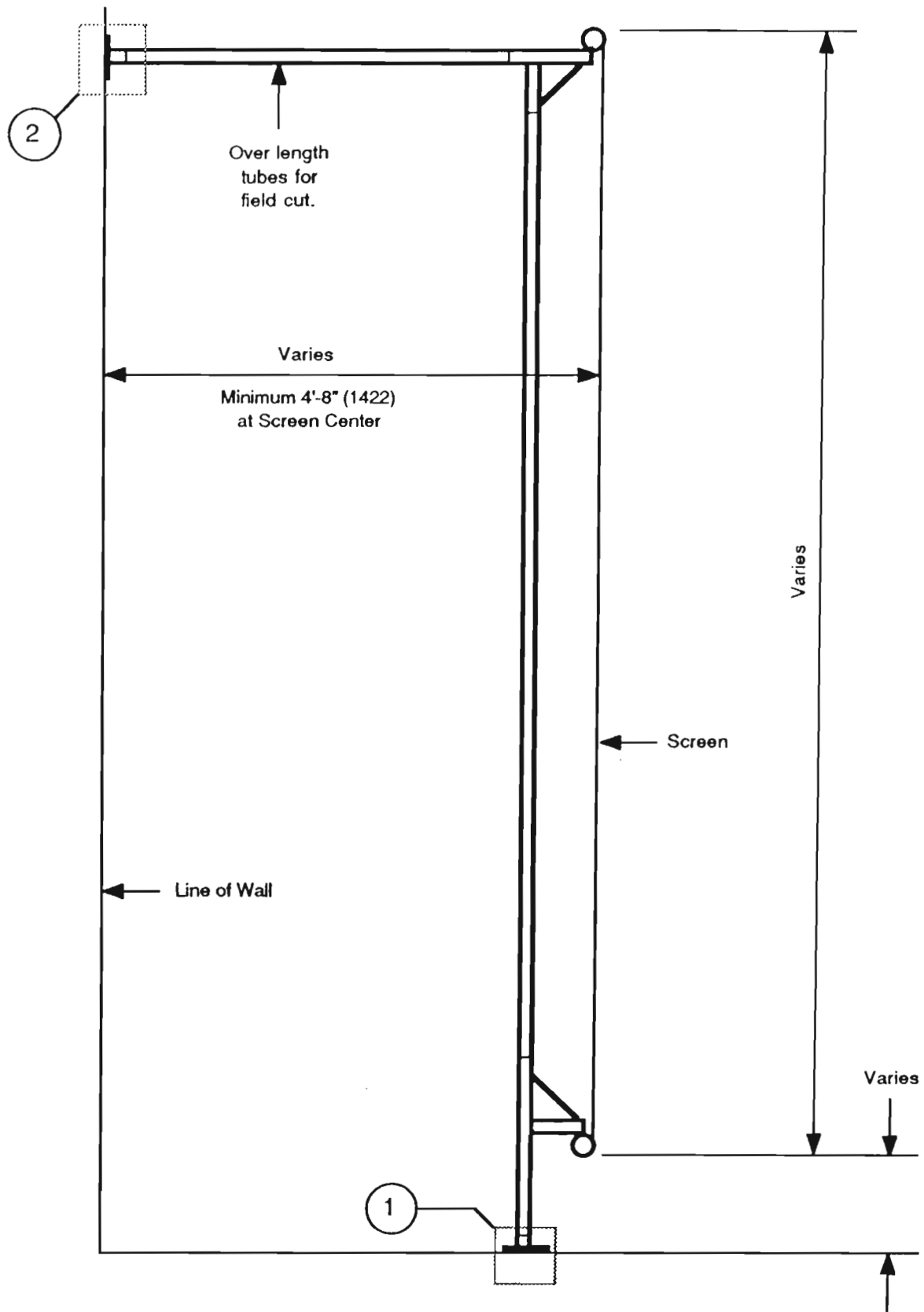
Vertical Section at Centerline



	Dimension "A"
DMS/27	23'-9" (7240)
DMS/45	26'-6" (8075)
DMS/90	42'-8" (13 000)

See also Dwg. DMS/21.0
for other layout data.

See Dwgs. DMS/10.0 thru
10.6 for frame details.



Showsan/Intamin

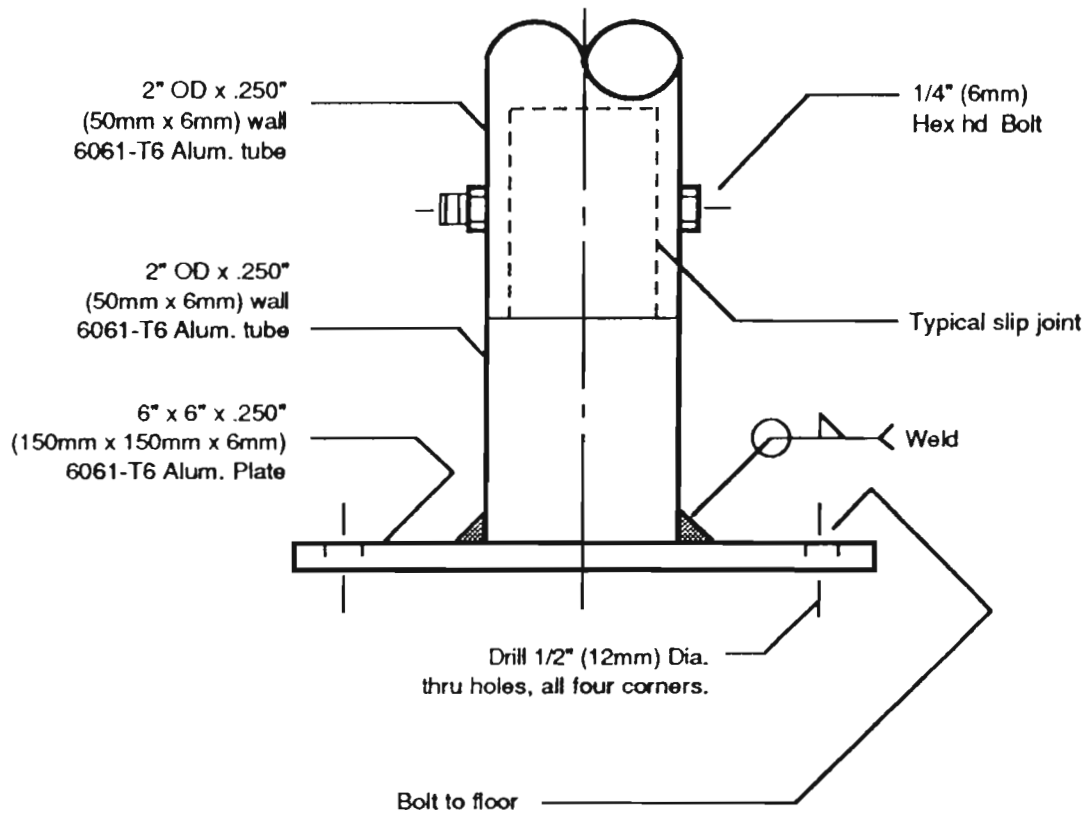
DMS/Screen Section

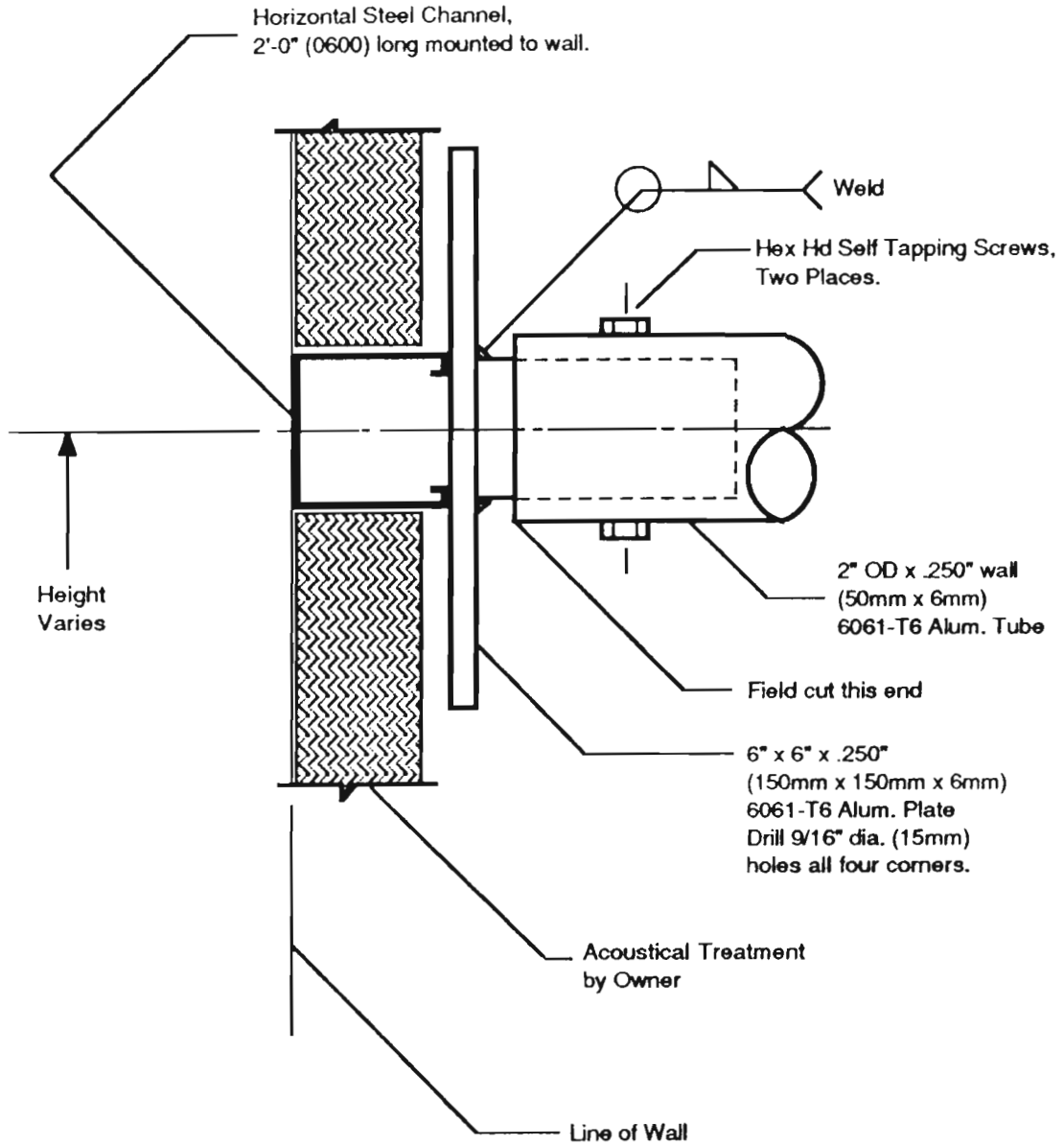
13 April 88

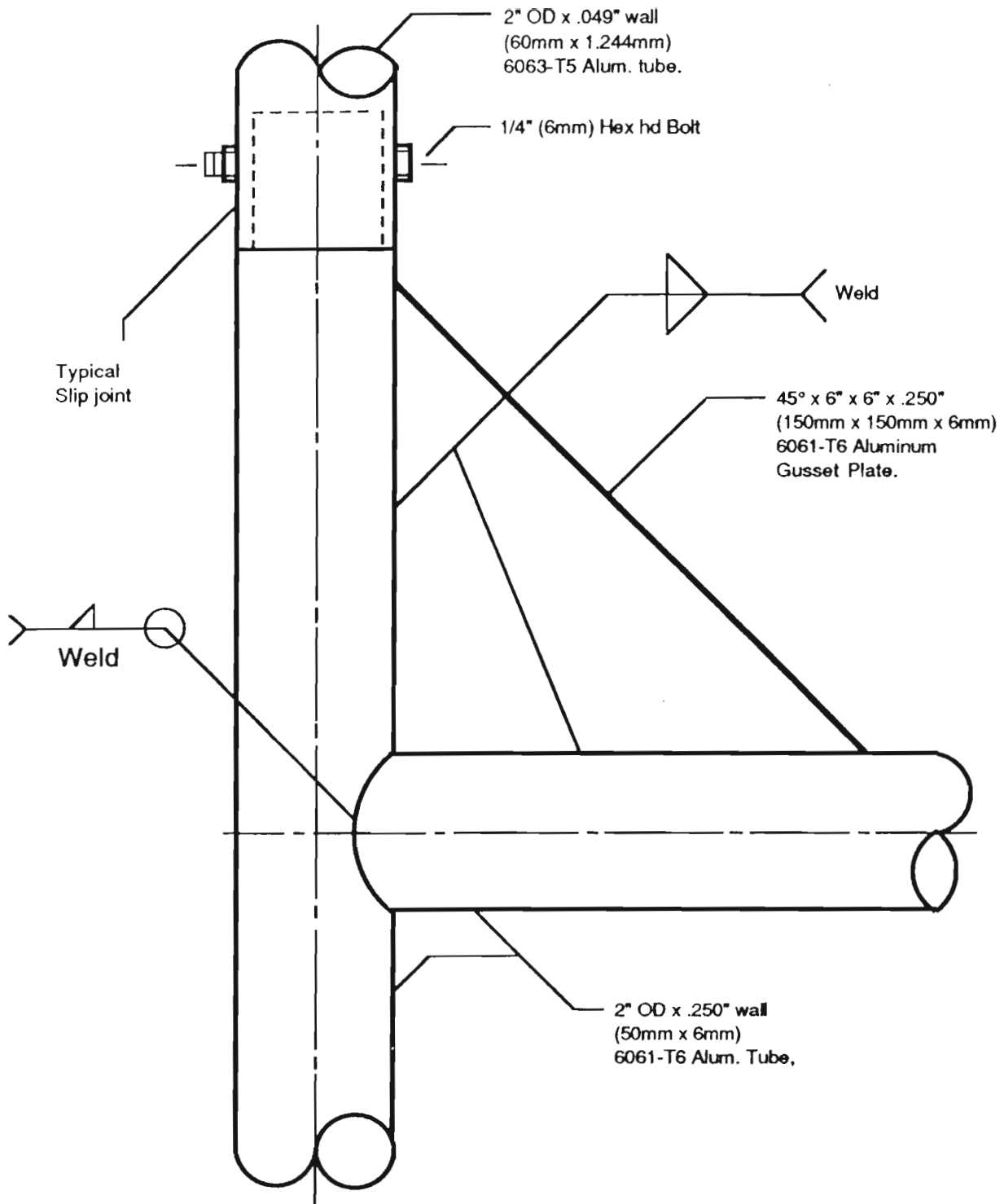
DMS Standards

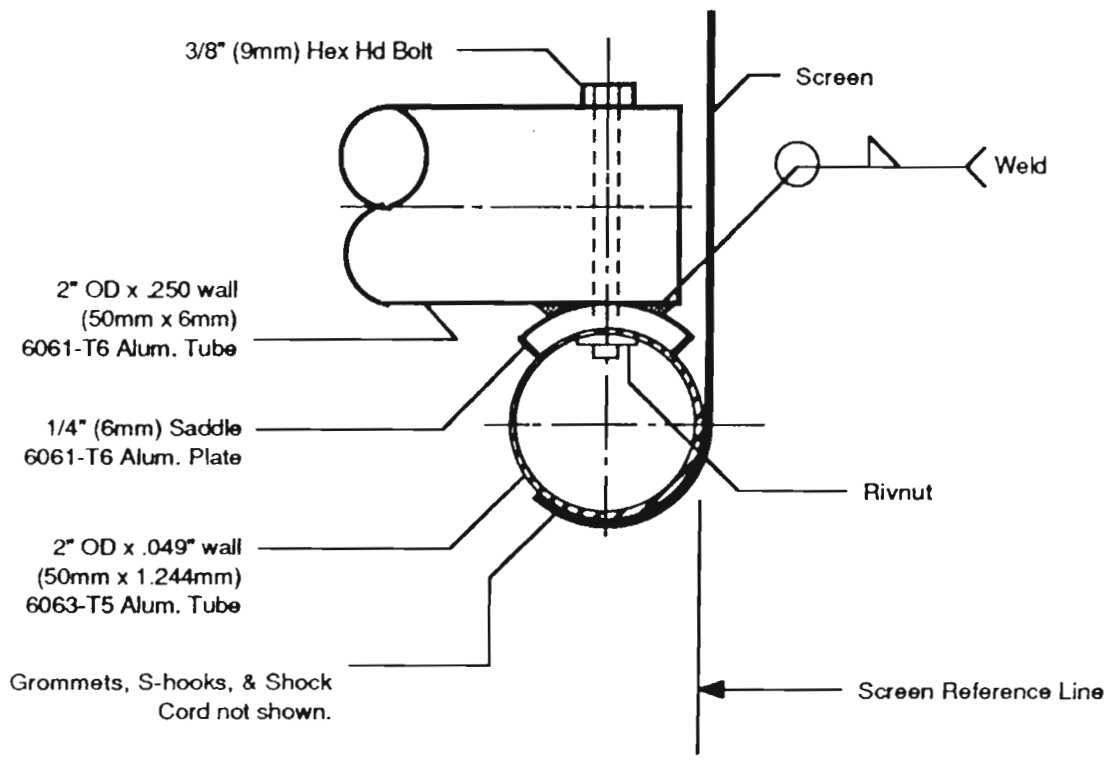
Scale: 1/2" = 1'-0"

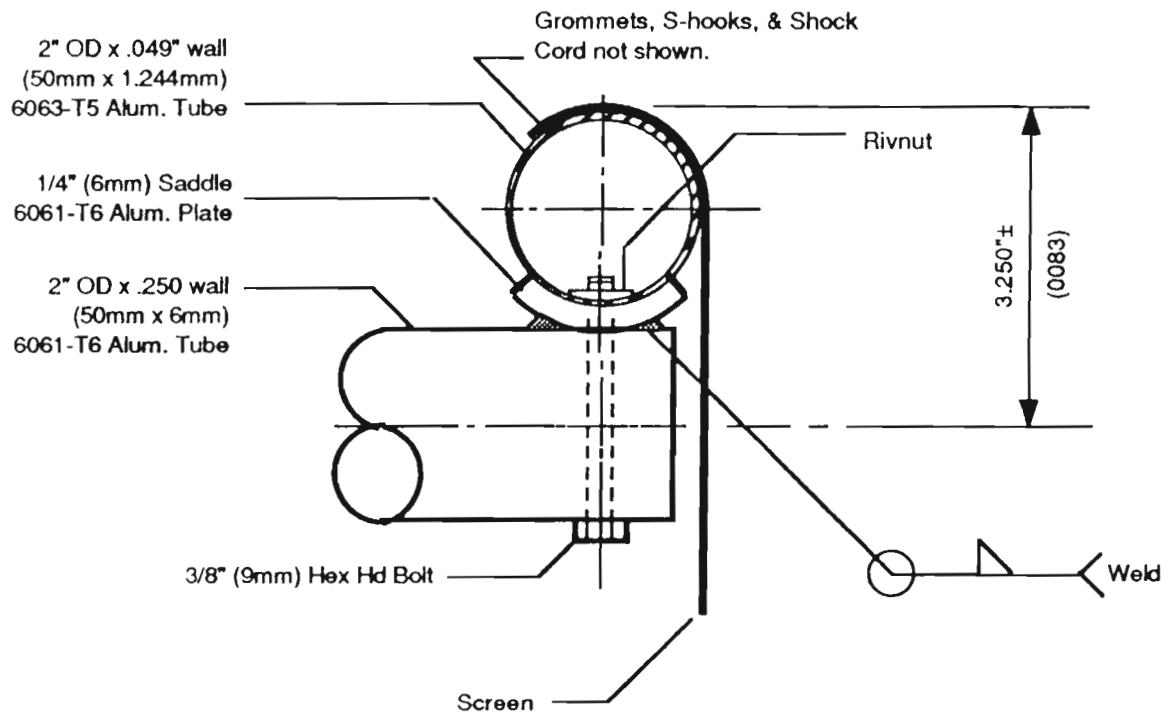
Dwg N^o DMS/10.0

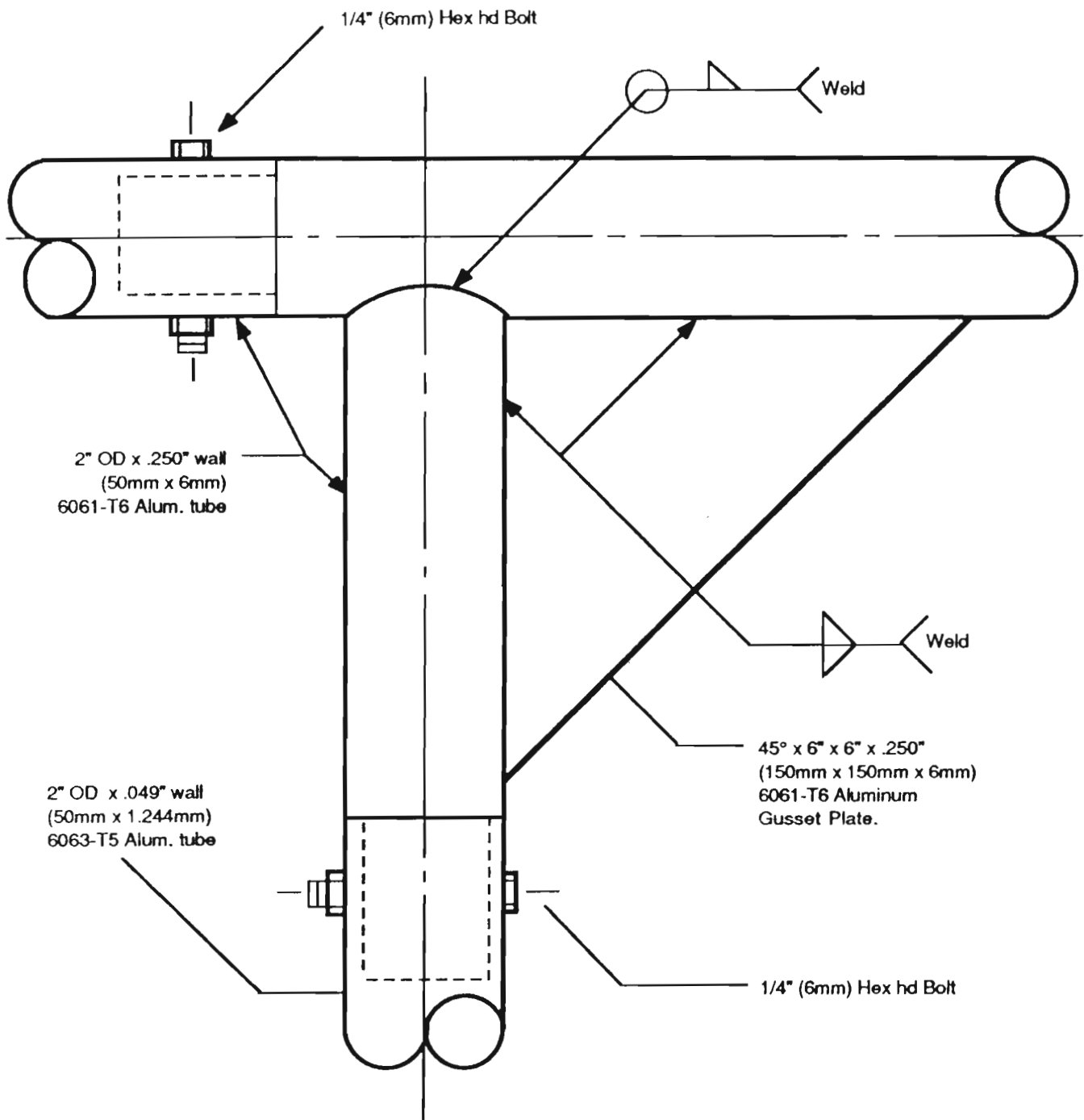


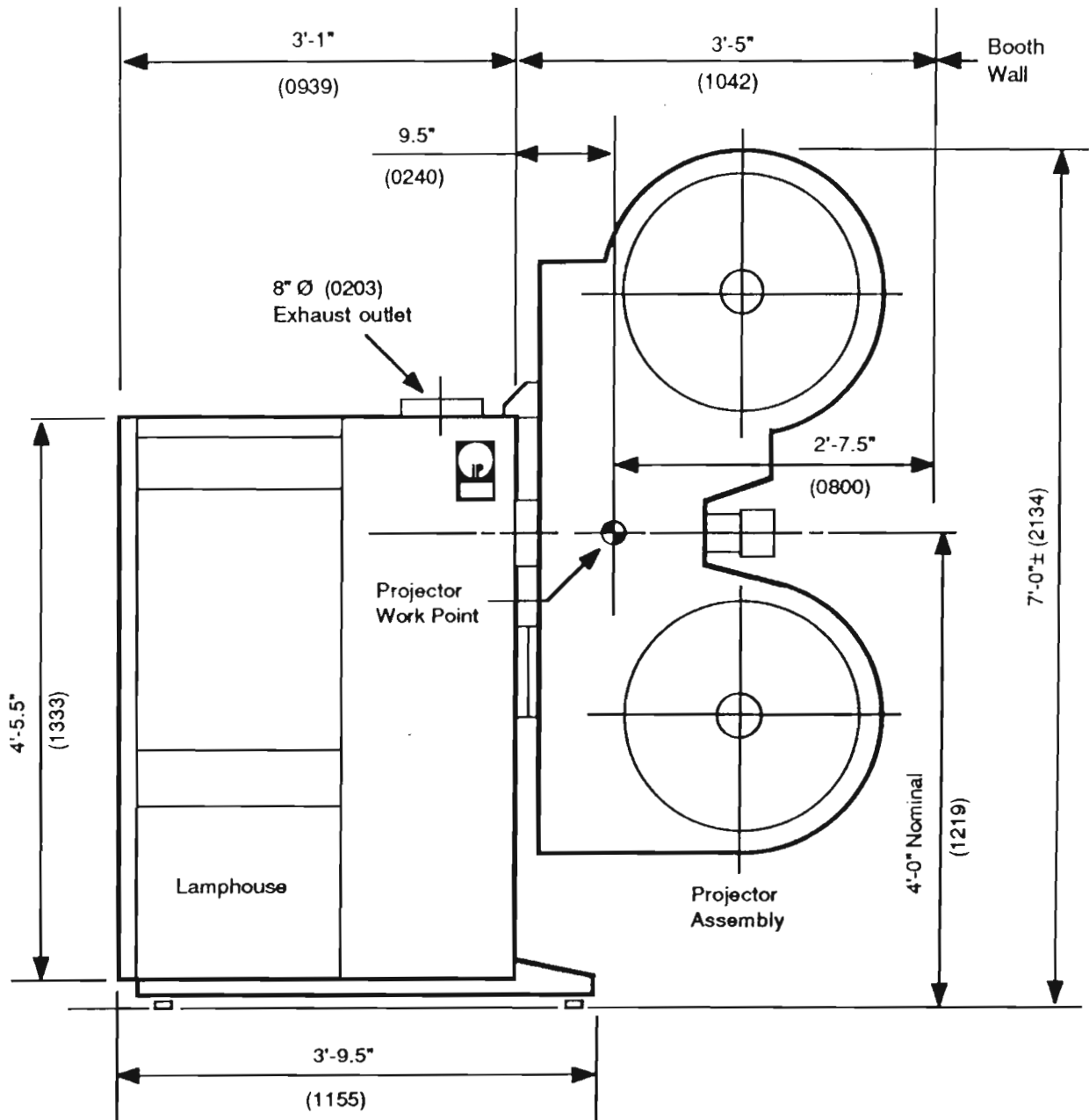




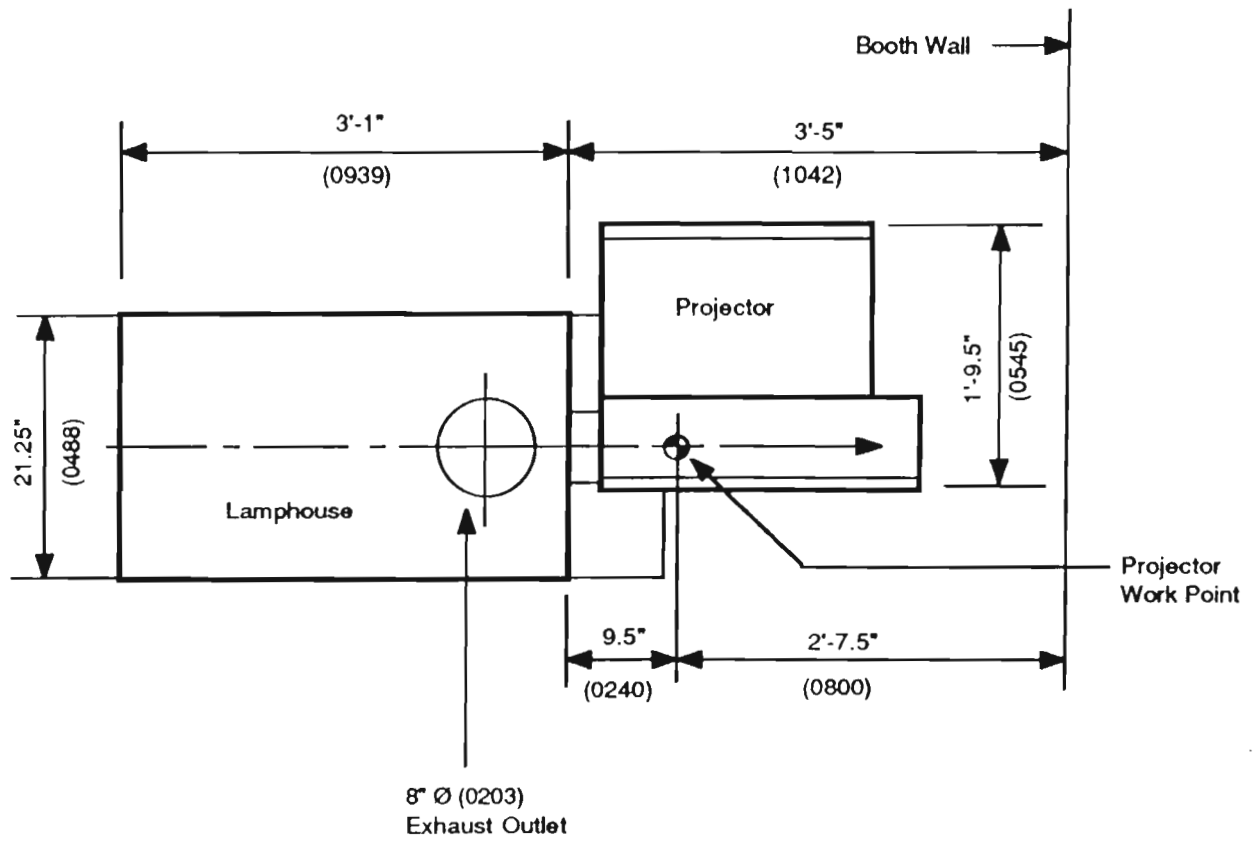


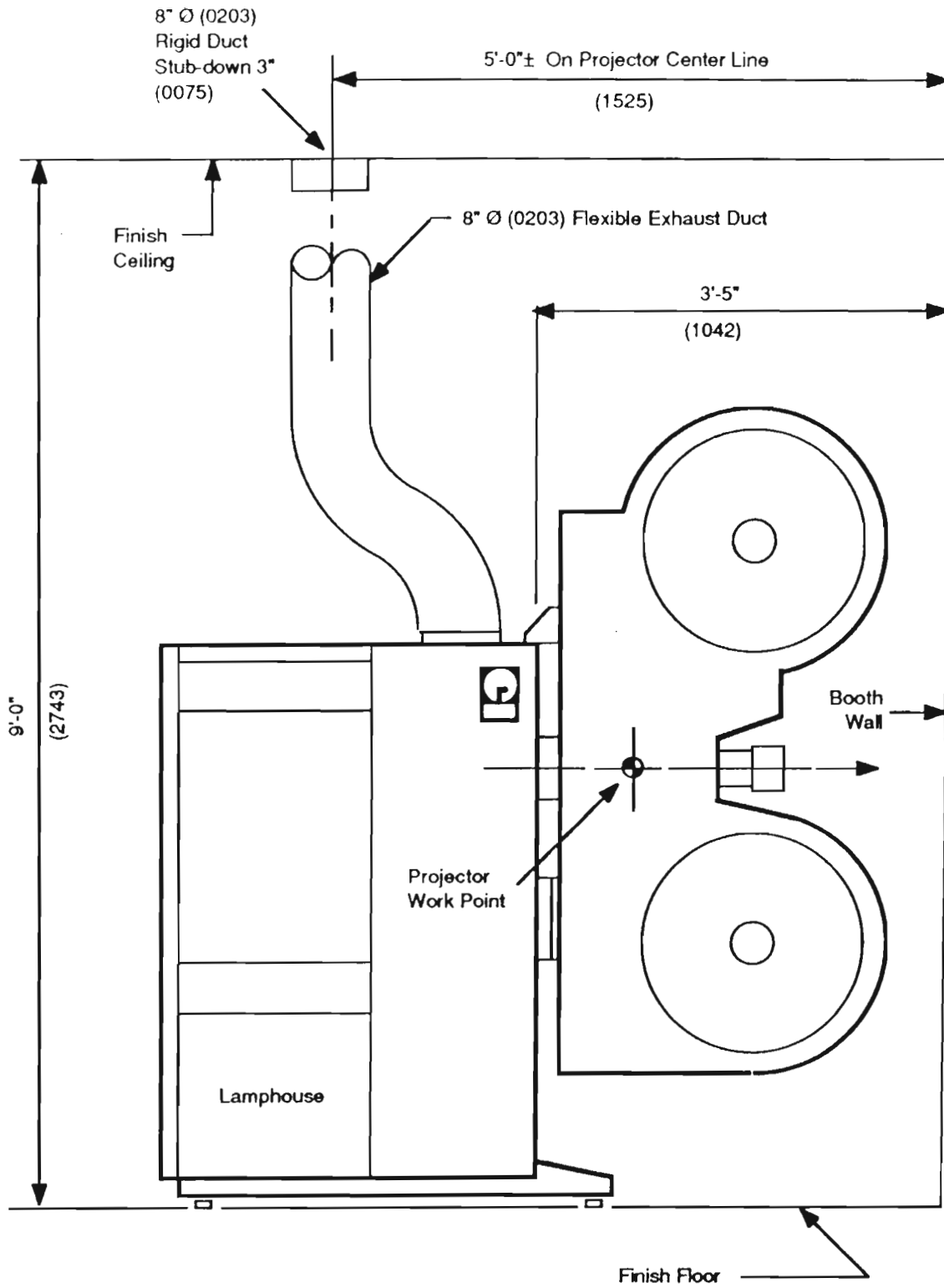


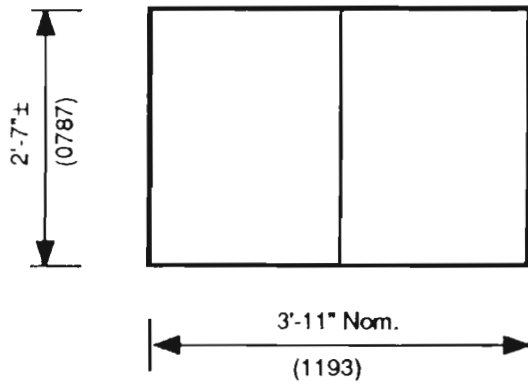




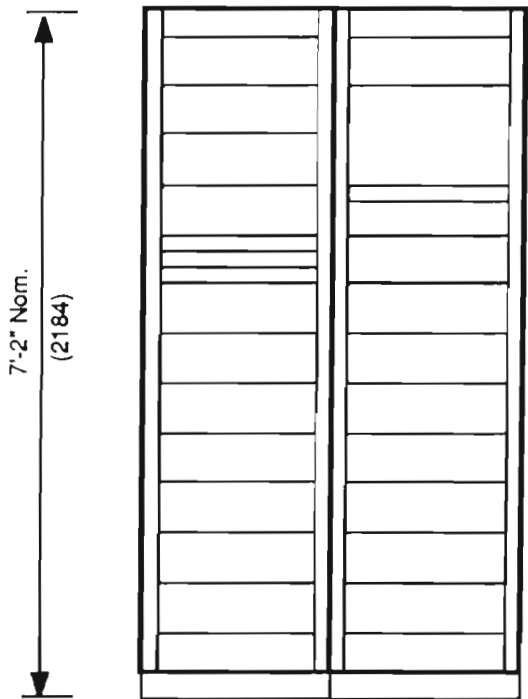
Projector	=	400 lbs
Lamphouse	=	650 lbs
<hr/>		
Total Wt	=	1050 lbs (476 Kg)







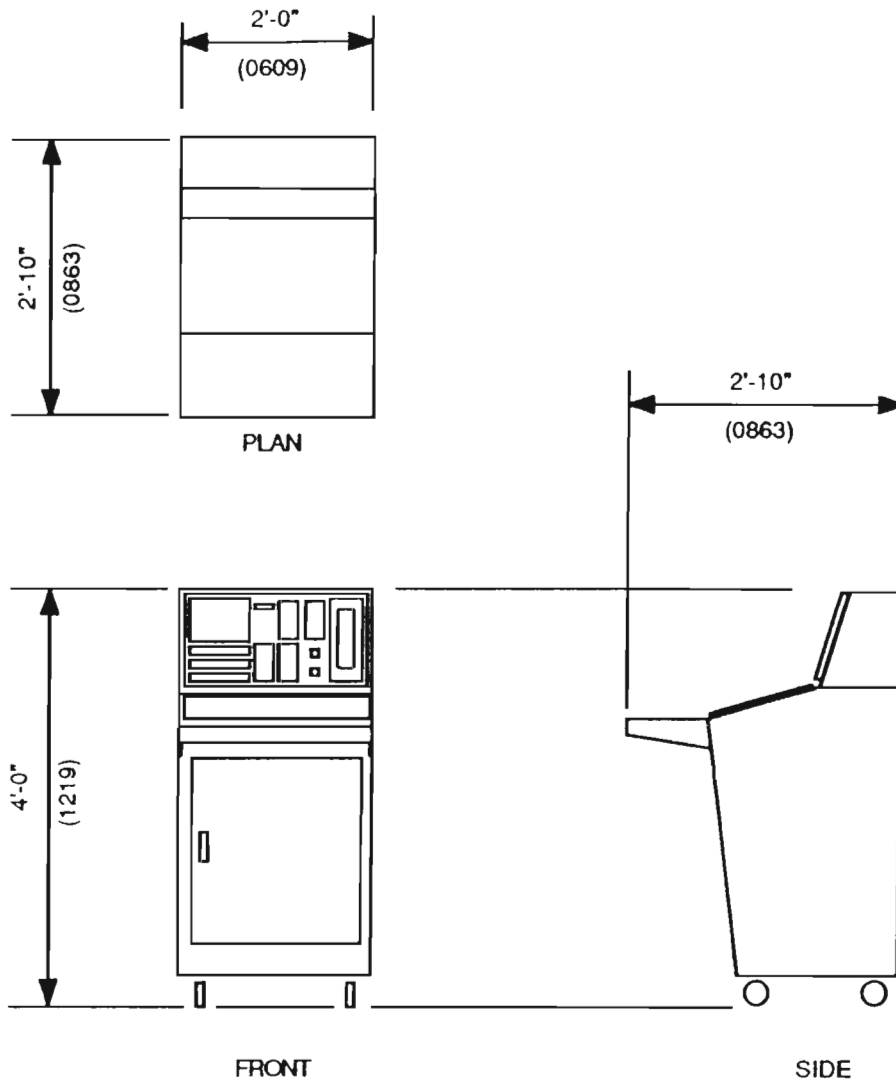
PLAN



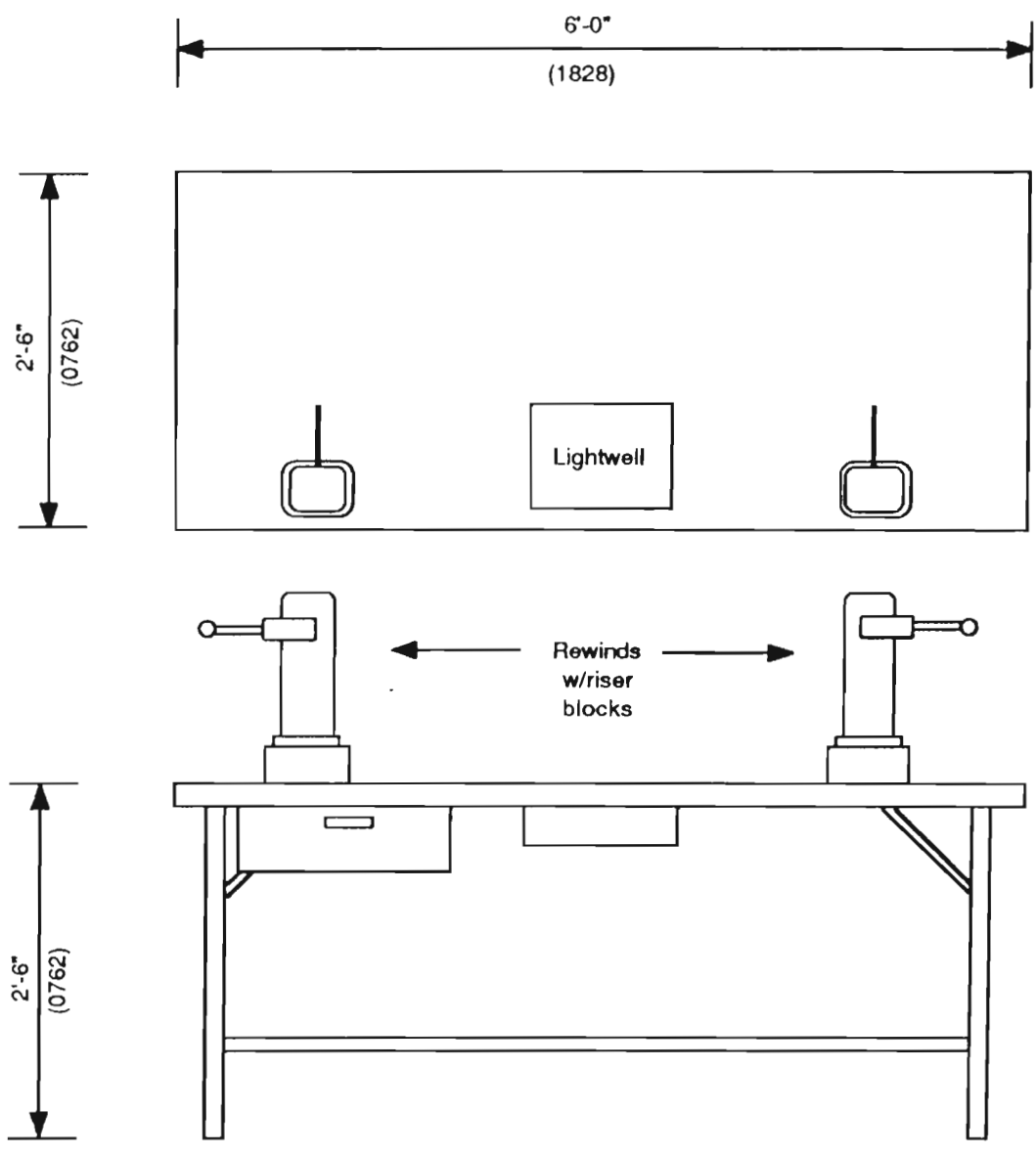
ELEVATION

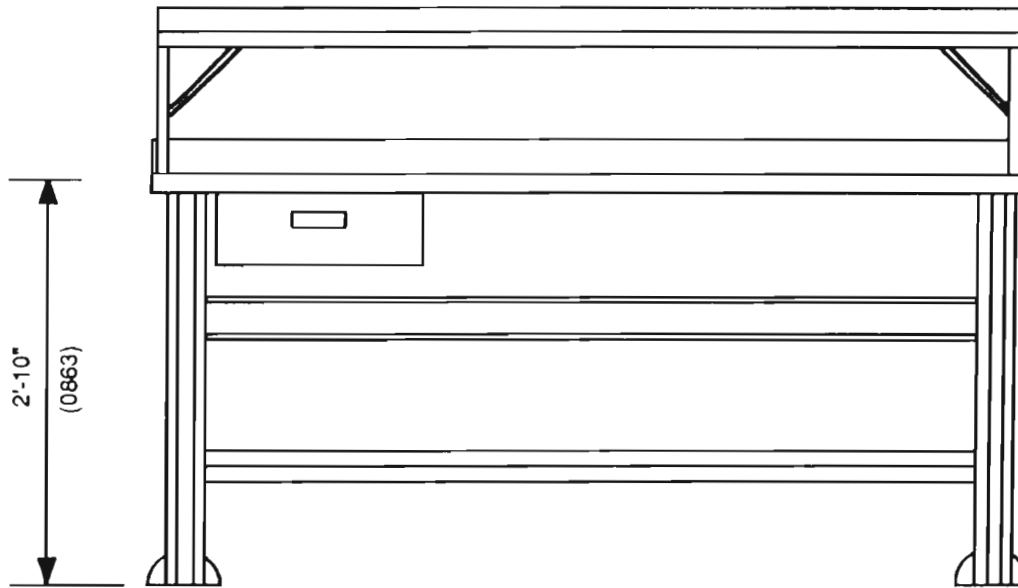
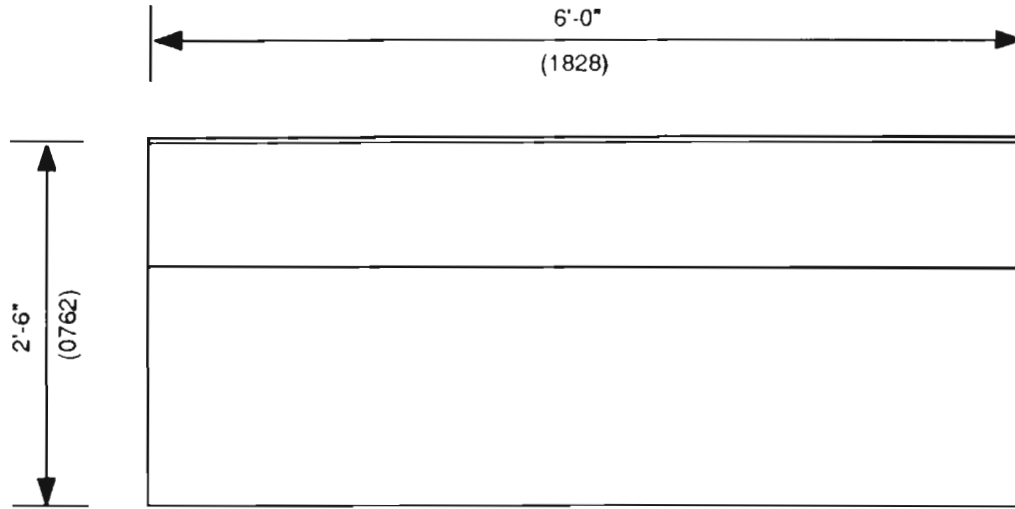
NOTE: Panel Layout
is schematic only.

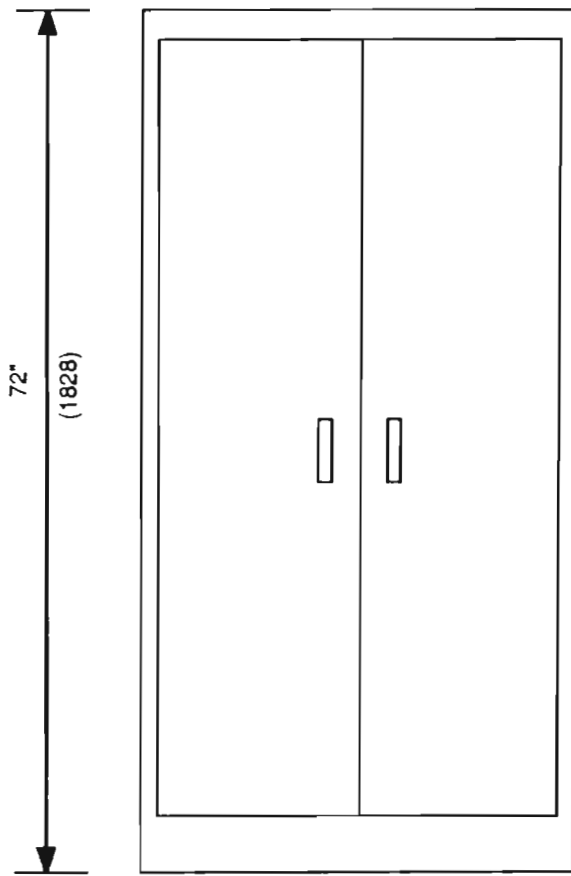
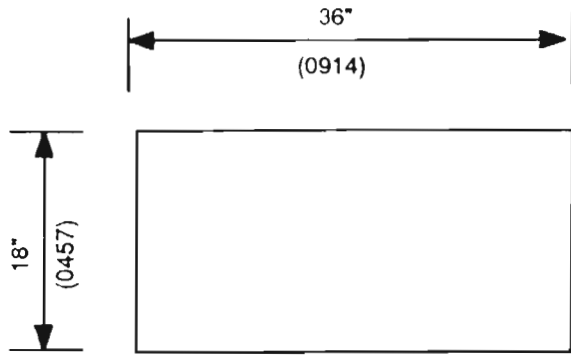
2 Bay Audio Rack: Wt. = 1600 lbs. (726 Kg)



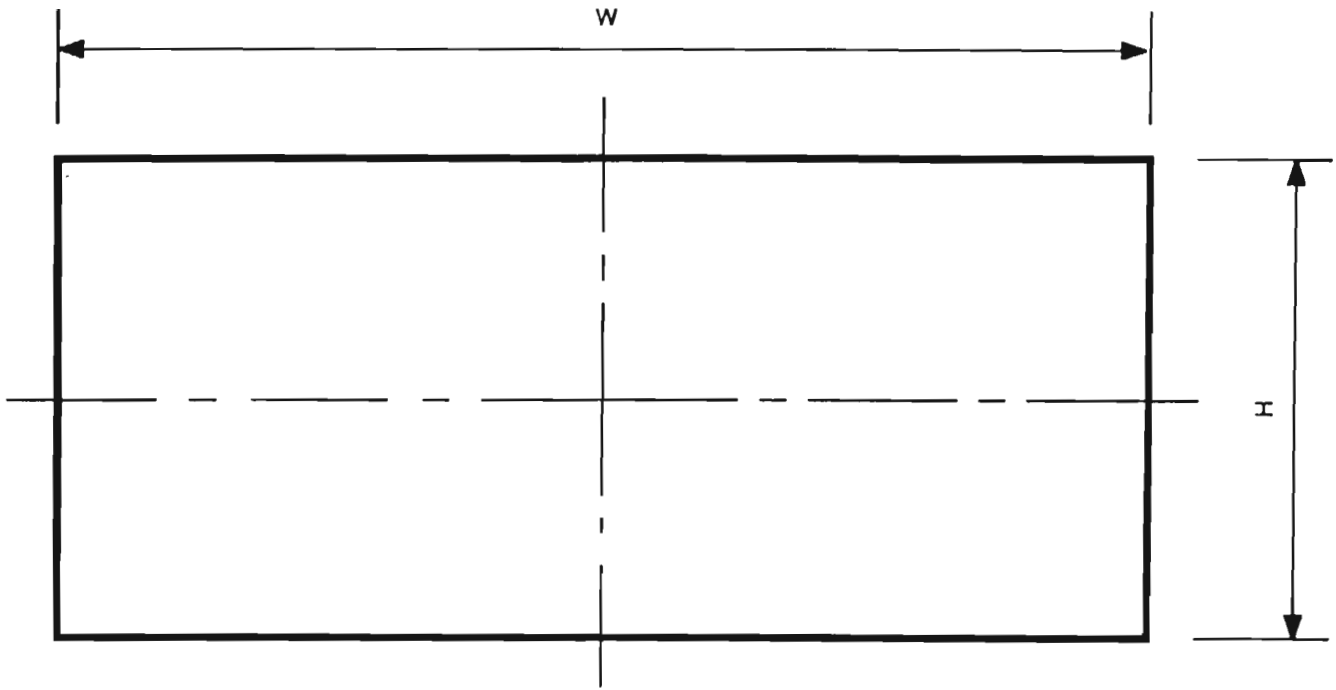
Total Wt. 300 lbs (136 Kg)





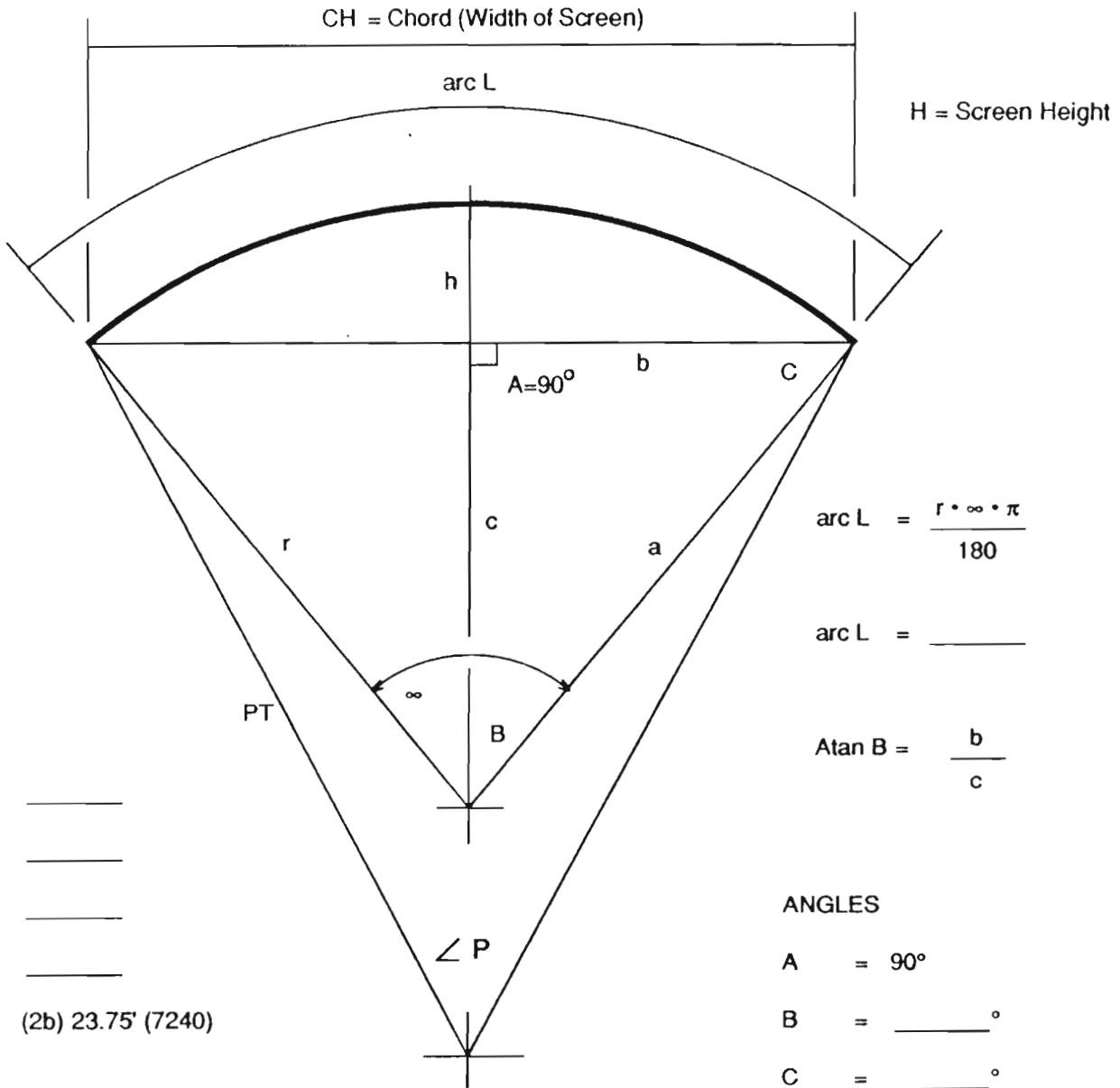


Painted steel cabinet
w/adj. shelves



Screen Sizes (at chord plane)

	Feet/Inch	Millimeters
DMS/27	10'-9" x 23'-9"	3275 x 7240
DMS/45	12'-0" x 26'-6"	3655 x 8075
DMS/90	19'-3" x 42'-8"	5882 x 13 000



- a = _____
- b = _____
- c = _____
- h = _____
- CH = (2b) 23.75' (7240)
- r = _____
- PT = 37.25' (11 354) (Projection Throw)
- H = 10.75' (3275)
- arc = _____

Screen Area = _____ ft² or m² (actual)

NOTE: All dimensions ± (00.00 dec. ft.) or (millimeters)

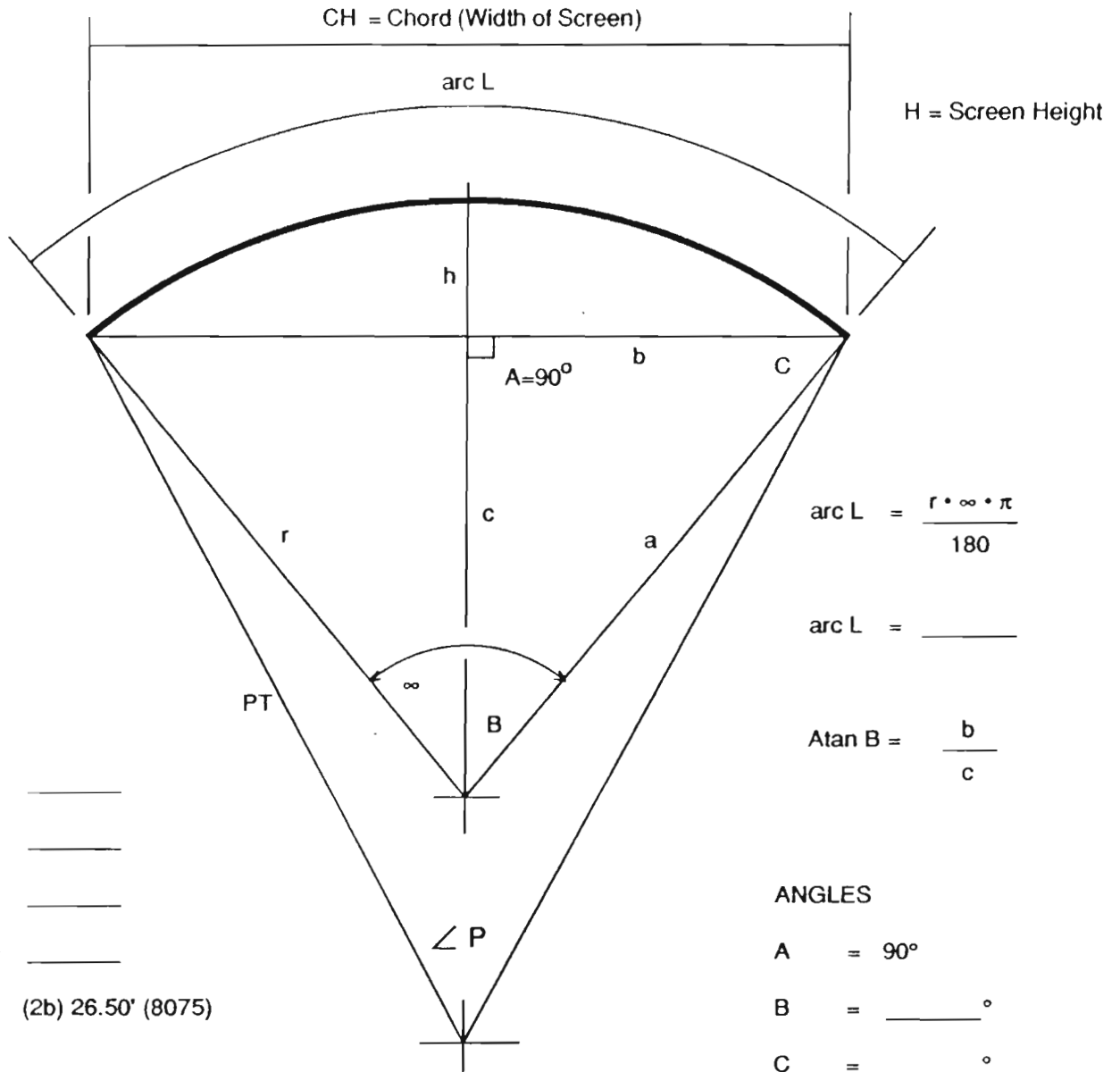
$$\text{arc } L = \frac{r \cdot \infty \cdot \pi}{180}$$

$$\text{arc } L = \underline{\hspace{2cm}}$$

$$\text{Atan } B = \frac{b}{c}$$

- ANGLES
- A = 90°
 - B = _____°
 - C = _____°
 - ∞ = _____°
 - ∠ P = _____°
 - LENS = _____ mm

MAGNIFIER = CURVED FIELD



a = _____

b = _____

c = _____

h = _____

CH = (2b) 26.50' (8075)

r = _____

PT = 49.00' (14 935) (Projection Throw)

H = 12.00' (3655)

arc = _____

Screen Area = _____ ft² or m² (actual)

NOTE: All dimensions ± (00.00 dec. ft.) or (millimeters)

$$\text{arc L} = \frac{r \cdot \infty \cdot \pi}{180}$$

$$\text{arc L} = \underline{\hspace{2cm}}$$

$$\text{Atan B} = \frac{b}{c}$$

ANGLES

A = 90°

B = _____°

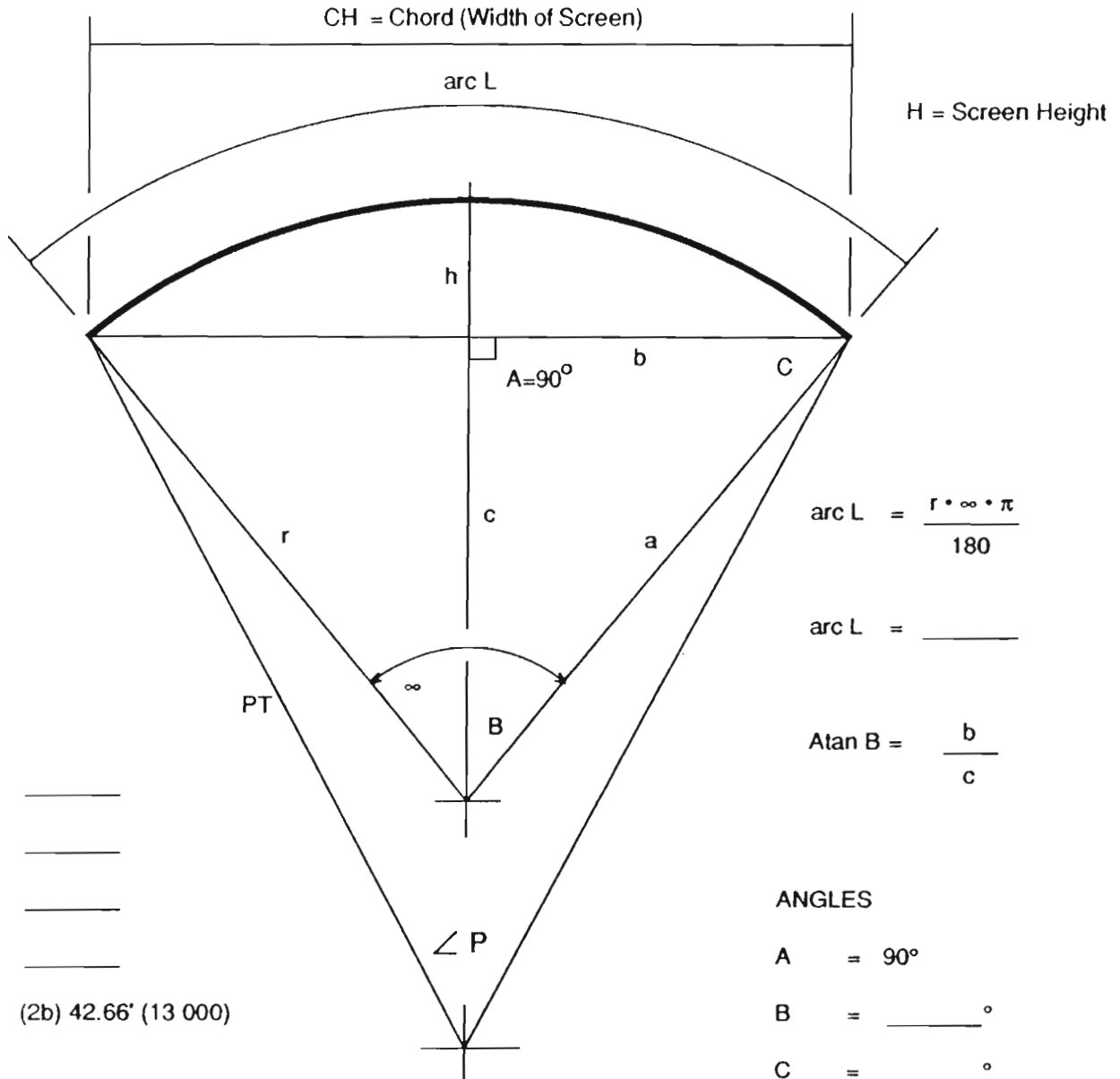
C = _____°

∞ = _____°

∠ P = _____°

LENS = _____mm

MAGNIFIER = CURVED FIELD



a = _____

b = _____

c = _____

h = _____

CH = (2b) 42.66' (13 000)

r = _____

PT = 56.83' (17 320) (Projection Throw)

H = 19.25' (5882)

arc = _____

Screen Area = _____ ft² or m² (actual)

NOTE: All dimensions ± (00.00 dec. ft.) or (millimeters)

$$\text{arc } L = \frac{r \cdot \infty \cdot \pi}{180}$$

$$\text{arc } L = \underline{\hspace{2cm}}$$

$$\text{Atan } B = \frac{b}{c}$$

ANGLES

A = 90°

B = _____°

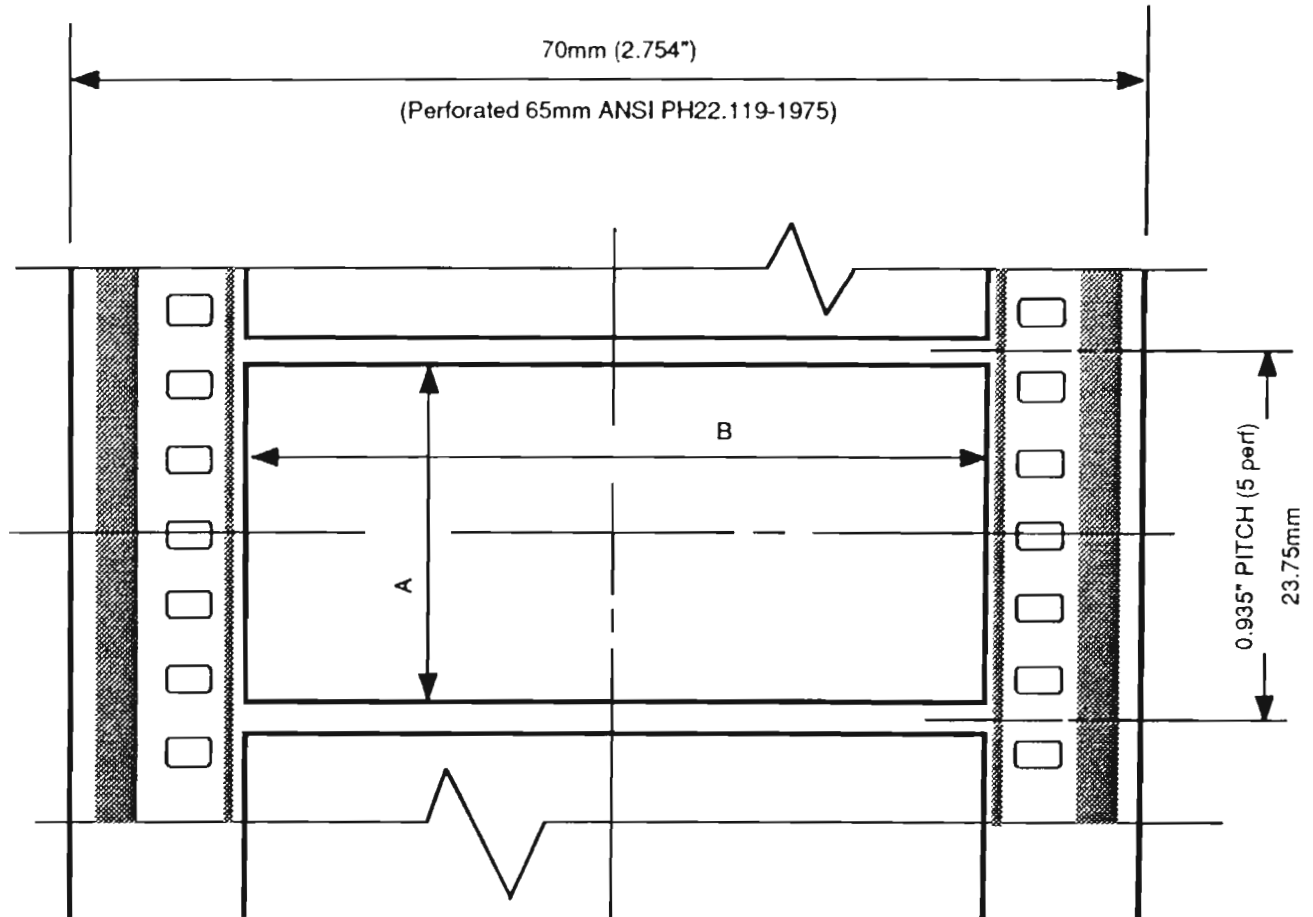
C = _____°

∞ = _____°

∠ P = _____°

LENS = _____ mm

MAGNIFIER = CURVED FIELD



PROJECTABLE IMAGE AREA, AS SHOWN

A = 0.870" (22.10mm)

B = 1.912" (48.56mm)

Ref. ANSI/ PH22.152 - 1983

CAMERA APERTURE IMAGE AREA

A = 0.906" (23.01mm)

B = 2.066" (52.48mm)

Ref. ANSI/SMPTE 215-1984

ASPECT RATIO = 1 : 2.21

RATE = 60 Frames/second

SPEED = 281.25 Ft/min (85.7 m/min)

FILM TIME AND WEIGHT: (Reel included)

22" Ø Reel: Maximum 16.9 minute show: Wt. = 50 lbs (23 Kg)

Reference: film weight is 9.25 pounds/1000 feet (13.76 Kg/Km)

POSITION	FRONT ROW / LEFT	

POSITION	FRONT ROW / CENTER	

POSITION	FRONT ROW / RIGHT	

POSITION	MIDDLE ROW / LEFT	

POSITION	MIDDLE ROW / CENTER	

POSITION	MIDDLE ROW / RIGHT	

POSITION	BACK ROW / LEFT	

POSITION	BACK ROW / CENTER	

POSITION	BACK ROW / RIGHT	

AFTER INSTALLATION:

Enter Meter Readings as Foot/Lamberts or Candelas per sq/m:
 (Foot/Lamberts x 3.4263 = Candelas per sq/m)
 (Candelas per sq/m ÷ 3.4263 = Foot/Lamberts)

THEATER: _____

LAMP METER: _____ volts _____ amps

SCREEN MAT: _____

DATE: _____ TIME _____

SCREEN GAIN: _____ SCREEN AREA: _____

BULB HOURS: _____ WATTS: _____

SCREEN SIZE: _____ HT x _____ WD

LENS: _____ mm Type _____

FILM FORMAT: _____

LIGHT METER: _____

PROJECTOR DOWN ANGLE: _____ THROW _____

READINGS TAKEN BY _____

Showsan/Intamin

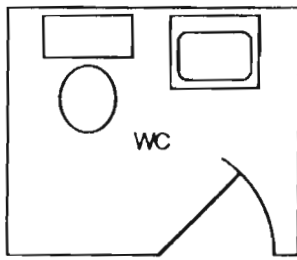
Sound Test Data

28 Dec 87

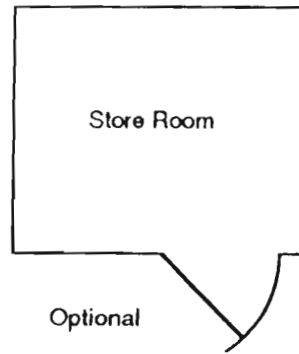
DMS Standards

Scale: None

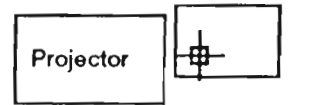
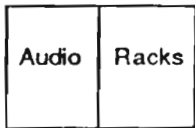
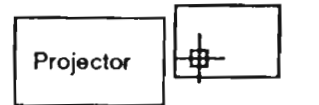
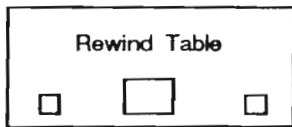
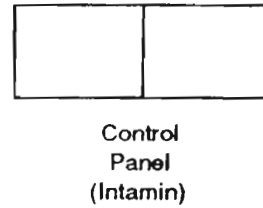
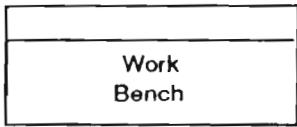
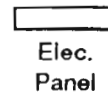
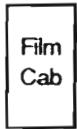
Drawing N^o DMS/23.1



Optional



Optional



Control Console

Control Console