Preliminary Platform Requirements for STAR

STAR Note #231

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December 8, 1995

ABSTRACT: The purpose of this document is to give the platform design team a set of requirements for the platforms. These platforms are used to locate racks for subsystem electronics, transformers for power distribution, pumps, etc., near the detector. Because of budgetary and physical constraints of the WAH and Assembly Building, we will need to modify these requirement.

The STAR detector contains two platforms called the north and south. Each platform has three floors. This document describes the major design requirements for these platforms. The list is not complete and represents an accumulation of thoughts and ideas that have occurred over the past two years. This note is based on several previous documents including the 5/4/95 note (revised 6/15/95) called Platform Design Requirements/Ideas by Doug Fritz. Some of the requirements are extremely firm and must be met, i.e., the platforms must be able to pass through the 27' x 27' door between the WAH and assembly building. Some other requirements are negotiable. There is a quality of life requirement which is very important as STAR personal will spend several years working on the platform. This requirement is very difficult to quantity.

These requirements are a starting point to discuss the design of the platform. There will need to be further optimized based on the physical constraints of the WAH and Assembly Hall. This document contains no cost estimates, so further modifications may need to be made to these requirements. We plan to have a meeting with the all of the people working on the platform to develop the final platform requirements.

Several changes have been made to the number of racks since STAR Note #217. The AC power distribution racks have been changed to be mounted in conventional panel boards. Workstations will be placed in various nooks of the platform. There will need to be at least two workstations on the first two south floors and one on the top floor.

1) The south platform is primarily for detector power and electronics. The north platform is for utilities and mechanical devices. Mechanical systems that contain water should be put on the north platform if possible so that water leaks will cause the least possible impact on the electronics.

2) There are 42 allocated racks on the first and second floor of the south platform. On the third floor there are four half racks. The specific floor assignments for the subsystems are negotiable.

First Floor	**Second Floor**	**Third Floor**
5 -- SVT 6 -- CTB 2 -- Slow Controls Anode Trig/TOF Control. 6 -- Trigger 4 -- Integration reserve	8 -- EMC 8 -- TPC-LV TPC-Slow Control TPC-HV TPC-Laser TPC-Field Cage HV TPC- Gated Grid Pulser TPC- Ground plane pulser 5 -- Integration Reserve	4 -- 1/2 Magnet Racks
24 Racks	**27 racks**	**4 -- 1/2 racks**

3) There should be space allocated for putting at least 6 future integration reserve racks on the north platform.

4) The rack size is -- 24” wide, 32” deep, and approximately 88” high. The usable rack space is at least 78.75”.

5) There should be 24” minimum access behind each rack -- at least 36” in front. For racks whose fronts face each other, the distance should be increased to at least 48”. The space in front of racks should be maximized.

6) Rows with more than three racks should have exits on both ends.

7) Stairs should have reasonable slopes (less than 45°). On each side the stairs should have the same slope. However, north and south stairs can have different slopes.

8) The floor of the platform should be a solid surface.

9) The cable ways must satisfy the following requirements:

> A) Cables will enter the racks from the bottom.
>
> B) Cable ways will be large enough to handle excess cable. See Tables 1 and 2 for the sizes.
>
> C) Cable paths are indicated on Figures 1-3. Table 1 defines the minimum size for the horizontal paths. The minimum sizes of the vertical cable ways between the south platform floors are shown in Table 2. These vertical cable ways run near the magnet. There will need to be one vertical 4” x 6” tray on the south end of the south platform. This tray is used to route cables to the umbilical/festoon system.
>
> D)The ease with laying cables should be at the same level of effort as installing cables in a computer floor. This can be accomplished by either installing a computer floor or using the beams of the platform to hold cable ways.
>
> E) Cable ways are situated below the floor and are located either in front or in back of racks. Access to the cable ways is through removable floor panels.
>
> F) There should be several places on each floor where cables can be routed from one rack row to another row. These paths, which are shown in Figures 1-3, are typically 4” x 6”.

10) On the first and second platforms, water and power feed the racks from the top. On the third floor, water and power feed the racks from the bottom.

11) An umbilical/festoon system will be connected to the south platform at approximately the third floor level.

12) The platforms should be able to accommodate a bridge over detector.

13) The platforms should be a comfortable and efficient place to work

14) The platforms must satisfy appropriate safety regulations. Electrical equipment should be installed according to code.

15) The total capacitance from both platforms to the concrete floor should be less than 700 pf. Grounding should follow Star Note #202. As the detector is electrically well connected to the magnet, conventional power and devices that are powered from it must be electrically isolated from the platform. Please consult STAR note #202 for more information.

16) There will be clean power on the south platform only. The amount of clean power that is needed for the detector is 335 KVA - NEC is 419 KVA. There should be provision to add a spare transformer. We only need clean power for the south platform.

17) Power, water and gas to the detector should come from the west wall and be mounted higher than 10’ above the concrete floor.

18) The total conventional power is 120 KVA -- NEC is 150 KVA. Conventional power is needed on both the north and south sides.

19) The platforms move with the magnet along the tracks. The platforms need to be able to adjust when magnet is jacked in the vertical direction. It is possible for the magnet and platform to be at slightly different elevations. During the movement of the detector and platform, the cable support system must be designed not to damage any cables.

20) The detector and platforms must fit in the Assembly Hall and the Wide Angle Hall.

21) The platform must pass through the 27’ x 27’ door. The door size should be verified now that it has been enlarged.

22) Two TPC lasers will be mounted directly to the outside south end of the magnet support cradles and should not interfere with the south platform.

23) The platform must interface with the cable support system that mounts on the face of the magnet.

24) Magnet cooling water manifolds can be located under the second level, one manifold per side. EMC electronics boxes are mounted on the back leg iron and should not be blocked by the hoses that will connect the individual coils to the manifold. The hose should be flexible.

25) There should be reasonable access around the platform to enable adequate movement of people and equipment.

26) The south platform should have places for two workstations on the first and second floors and one on the third floor.

27) The mechanical equipment described in STAR Note #217 should be placed on the platform.

28) Each rack should have a breaker. The breaker should be located near the rack so that it can be easily identified.

29) There should be one AC outlet on the front of the racks for every 2-3 racks.

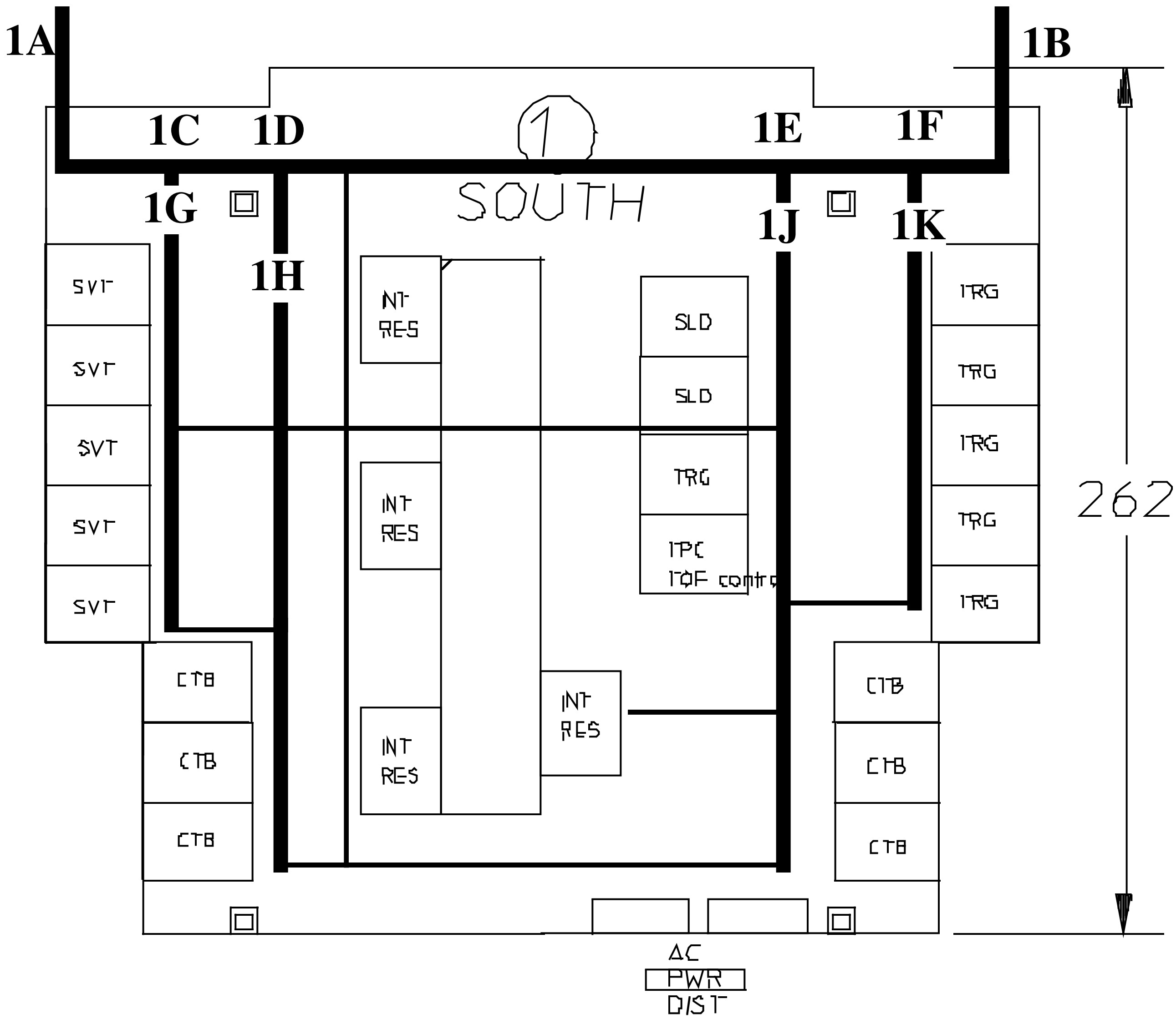

Figure 1 -- Level 1 South Platform. Thick lines represent possible cable way routing. The thin lines represent 4 “x 6” cable ways.

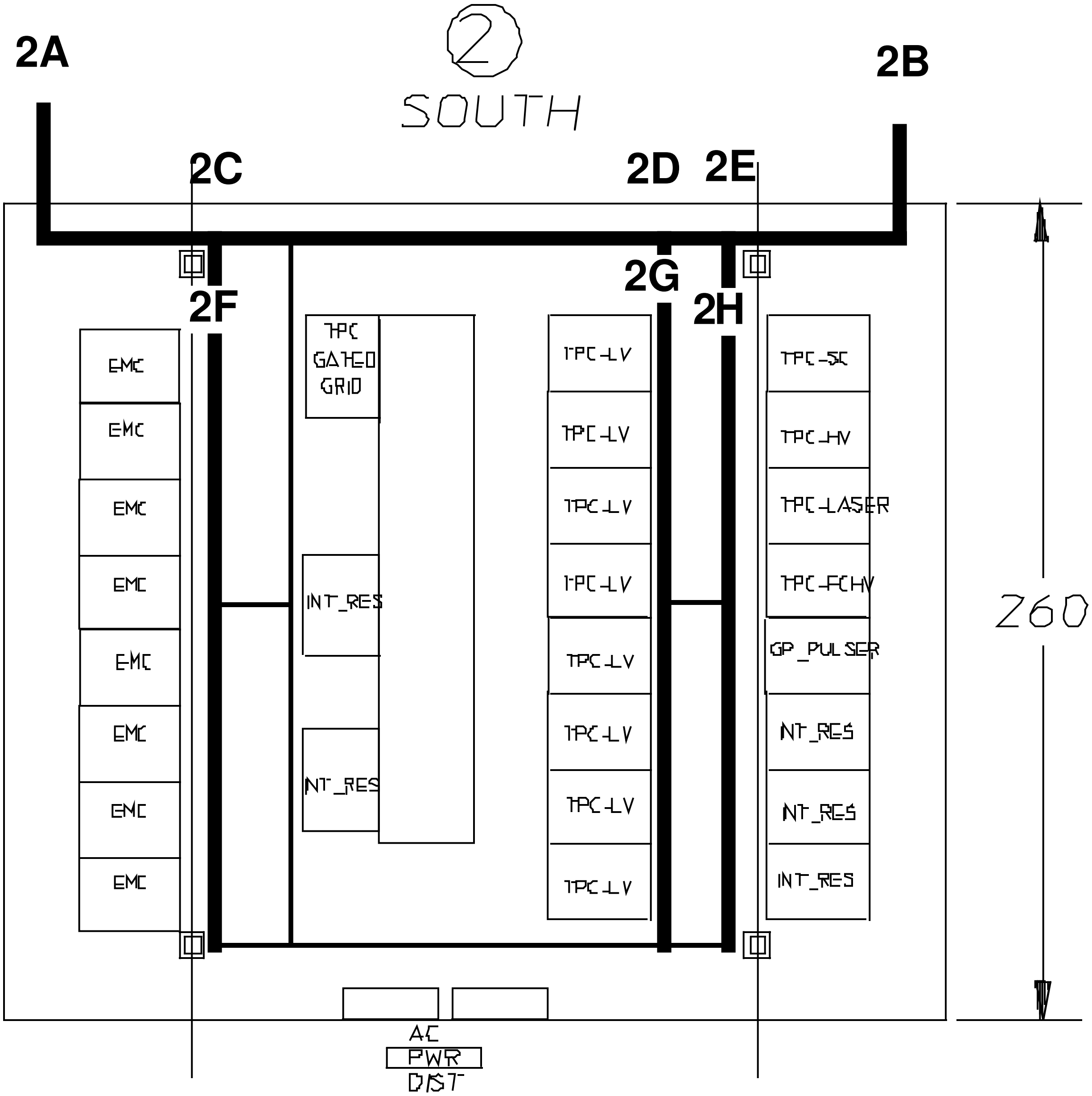

Figure 2 -- Level 2 South Platform. Thick lines represent possible cable way routing. The thin lines represent 4”x6” cable ways.

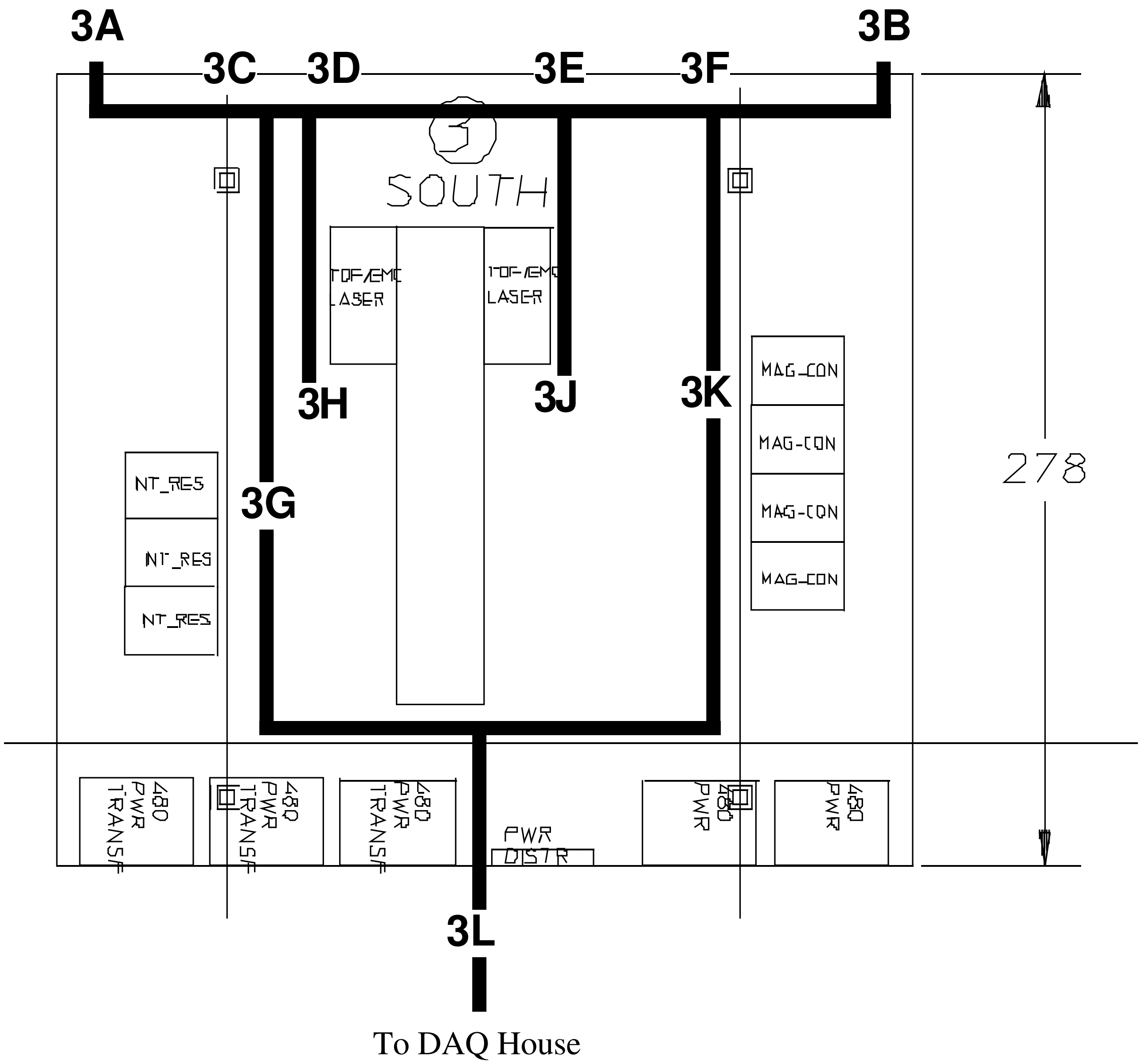

Figure 3 -- Level 3 South Platform. Thick lines represent possible cable way routing.

The following table calculates the minimum cables ways for various points along the paths of the cables. The matrix of numbers refers to the cable tray location in Figures 1-3. For instance, Floor 3 - C refers to cable tray location 3C in Figure 3.

Total cable bundle needed (100% filling factor)

	Power Cables /end	**Signal-HV /end**	**Umbil /end**	**3 - cal. laser /end**	**Total From Detec /end -Floor 1**	**Total From Detec /end - Floor -2**	**Total From Detec /end - Floor 3**	**Total From Detect /end to DAQ**	**Total From Platform to DAQ**
TPC	0.0	11.6	0.0			11.6			
FEE	18.0	1.2	3.0			19.2		3.0	6.0
CTB/TOF	36.8	36.9		3.8	73.7		3.8		
Magnet		0.8					0.8		
EMC	*23.0*	*1.0*	*3.0*	*3.8*		24.0	3.8	3.0	6.0
SVT	24.8	9.0	4.8		33.8			4.8	9.6
MWPC Trigger	**6.0**	6.0			12.0				
DAQ									1.5
Comput.									1.0
Total					**119.4**	**54.7**	**8.3**	**10.8**	**24.1**

Italic input number means guess

Cable ways sized at specified locations on the platforms

Location	**Floor 1**	**Floor 2**	**Floor 3**	**Inverse filling factor**	**Inverse filling factor**	**Inverse filling Factor**	**Floor 1 design minimum**	**Floor 2 design minimum**	**Floor 3 design minimum**
A	119.4	54.7	19.1	3	3	3	358.2	164.2	57.3
B	119.4	54.7	19.1	3	3	3	358.2	164.2	57.3
C	153.2	78.7	19.1	3	3	3	459.5	236.2	57.3
D	119.4	73.9	8.3	3	3	3	358.2	221.6	24.9
E	119.4	66.3	8.3	3	3	3	358.2	198.9	24.9
F	131.4	48.0	19.9	3	5	3	394.2	240.0	59.7
G	67.5	38.32	10.8	5	5	3	337.5	191.6	32.4
H	73.7	23.1	7.5	5	5	5	368.3	115.6	37.5
J	73.7		7.5	5		5	368.3		37.5
K	24.0		12.4	5		3	120.0		37.2
L			24.1			3			72.3
Floor sum	*238.8*	*109.4*	*38.2*	*check*					
Input sum	*238.8*	*109.4*	*38.2*	*check*					

Units are square inches

Expansion factor for cable trays feeding racks 5

Expansion factor for all other trays 3

Table 1. Determination of the size of horizontal cable ways on the platform.

To calculate the vertical cable ways we use the following model for distributing cables:

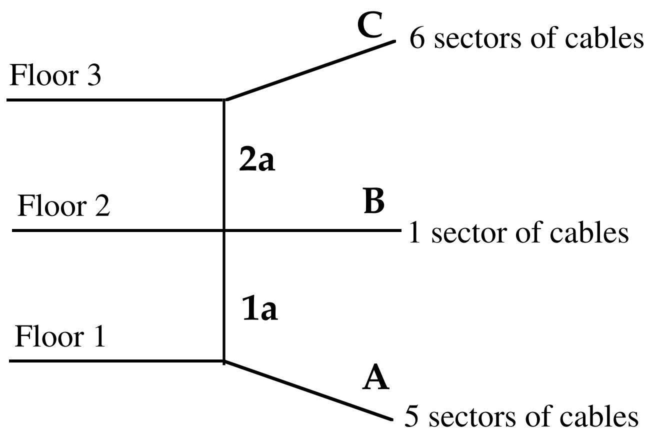

Figure 4. Model for the path of cables from one side of the detector to the platform.

Using this model we can estimate the vertical tray sizes for the platform. Table 2 calculates the sizes of the cable ways.

Vertical Cable Runs - For one end only

Size of a sector	16.5	sq. in.
Size sect. routed to 1	10.0	sq. in.
Size sect. routed to 2	5.0	sq. in.
Size sect. routed to 3	1.6	sq. in.

Cable Section	Routed sectors	Initial Bundle	Cable routed to 1	Cable routed to 2	Cable routed to 3	Cable passed 1a	Cable passed 2a
A	6	99.1	59.7	29.9	9.6	39.4	9.6
B	1	16.5	10.0	5.0	1.6	10.0	1.6
C	5	82.6	49.8	24.9	8.0	49.8	74.7
Total			**119.4**	**59.8**	**19.1**	**99.1**	**85.8**

Inverse filling factor	3.0		
Size of vertical tray from first to second		297.4	sq. in.
Size of vertical tray from second to first		257.4	sq. in.

Table 2. Calculation of vertical tray size from first to second platform and from second to third. The units are in square inches.