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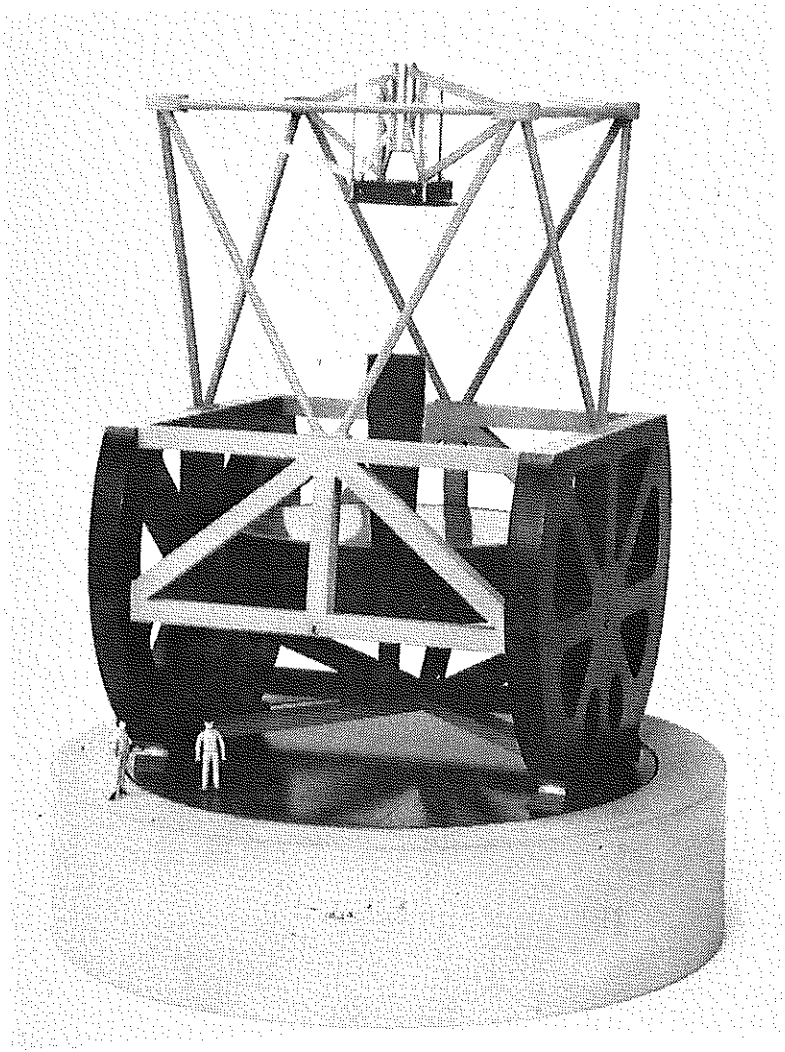

Octagonal Enclosure with Hidden Skirt

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Report No. 4 dated March 1989 summarized the preliminary design of both an octagonal and dome type enclosure for the Magellan Project 8-meter telescope. The octagonal design (shown on drawing E271036 of that report) placed the ring beam directly under each of the eight columns, or the "points" of the octagon, as seen in the plan view. This was the most direct load path and affected the simplest structure; that is, the fewest structural members.

However, doing so does require an external skirt to enclose the ring beam area, since it projects beyond the "flats" of the octagon. This was found objectionable from the aesthetic standpoint. It was then proposed that a study be made of an alternate design whereby the skirt function would be incorporated directly into the octagonal building, and thus "hidden" from view.

The hidden skirt version is then shown in Figure 1 (drawing E271041) of this report. The size of the structure is determined by the sixteen-sided stationary building below, with a 42 foot radius to the flats (reference top view). This leaves 3 feet of clearance to the 39 foot maximum radius on the telescope. With the ring beam at the points of the stationary building and the flats of the rotating enclosure, there is then approximately 1 foot of excess minimum clearance (over the required 3 feet) above the ring beam level.

In this way, the vertical walls of the octagonal enclosure extend down to just below the stationary ring beam (in the ball bearing configuration) or the top of the columns (in the case of the truck configuration). The "hidden skirt" could then be thought of as the small horizontal panel filling in between the octagon at the bottom of the rotating enclosure and the circle at the top of the stationary building (reference "section at column").

Structurally this change is accomplished by replacing the diagonal bracing in the bottom vertical walls of the rotating structure with "K" bracing, and adding the (nearly vertical) corner braces at each of the eight columns. A side benefit of this is that the ring beam span due to vertical loading is cut in half; from eight-point loading to sixteen-point loading. However, moment span due to horizontal loading is a little worse, having gone from two supports at third-span between columns to one support at mid-span.

Although no actual analysis was performed in this configuration, it is believed that both placing of members and weight estimates were done slightly conservatively.

An estimate was made of the weight change caused by this variation, and can be seen in Table 1. As shown, the net effect on the rotating building weight is small, adding only 7,300 lbs., or about 3%. However, much or all of this may be offset in the stationary building, since its radius can actually decrease from 45 feet to 42 feet.

An updated weight summary for the entire rotating building assembly in this "hidden skirt" configuration can be seen in Table 2. This includes updated estimates for bolted joints, preinsulated panels, and girts supporting the preinsulated panels.

CONCLUSIONS:

The hidden skirt feature can be accomplished with only a slight weight penalty seen by the rotating enclosure. In fact, a weight savings will occur in the stationary building which will make the net weight change negligible.

The major portion of the weight increase from the baseline (March 1989 report) is due to effects not related to the hidden skirt feature. An allowance for bolted connections was included and (more significantly) girts were added as necessary to support the preinsulated panels. (Panels which have no structural core are now being used in lieu of honeycomb panels due to their lower cost. However, these panels require much shorter bending spans due to wind and snow loading.)

In summary, it is believed that neither the weight nor the cost of the octagonal enclosure system is significantly impacted by incorporating the hidden skirt feature outlined above.

MAGELLAN PROJECT OCTAGONAL ENCLOSURE

DIFFERENTIAL WEIGHT DUE TO HIDDEN SKIRT

	ITEM	DIFFERENTIAL WEIGHT
1.)	Ring Beams (smaller diameter)	- 3,245
2.)	K-Braces (in lieu of diagonal)	+ 2,346
3.)	Knee-Braces	+ 5,520
4.)	Skirt (differential)	- 8,000
5.)	Structure (due to 1′ larger radius)	+10,700
ROTATING BUILDING INCREASE DUE TO HIDDEN SKIRT		+7,300 Lbs.

NOTE: Much of this will be offset by a weight savings in the stationary building; its radius has decreased from 45′ to 42′.

Table 1

WEIGHT SUMMARY

MAGELLAN PROJECT OCTAGONAL ENCLOSURE

ROTATING BUILDING WITH HIDDEN SKIRT - 5-26-89

The following is a summary of the total rotating weight for the Magellan Project Octagonal Enclosure with "hidden skirt". The estimate includes all rotating weight (including rotating ring beam), in the ball bearing configuration. Note that the use of trucks, in lieu of the ball bearing, would add approximately 16,000 lbs. to the total system weight (that is, the net effect on both the stationary and rotating buildings); ref March 1989 report. "*Baseline" indicates figures taken from the March report.

DESCRIPTION	WEIGHT
*Baseline Bare Structure, FEA	104,500
*Baseline Shutter Supports	7,400
*Baseline Shutter Structure (2)	30,780
Bolted Joints (assumed @ 10%)	14,270
Added Wt. due to Hidden Skirt (summary this report)	7,300
Girts for Versawall (summary this report)	32,500
Total Structural Steel	196,750
Preinsulated Panels	50,000
Miscellaneous (drives, windscreen, etc.)	15,000
TOTAL WEIGHT ROTATING BUILDING ASSEMBLY	262,000 Lbs.

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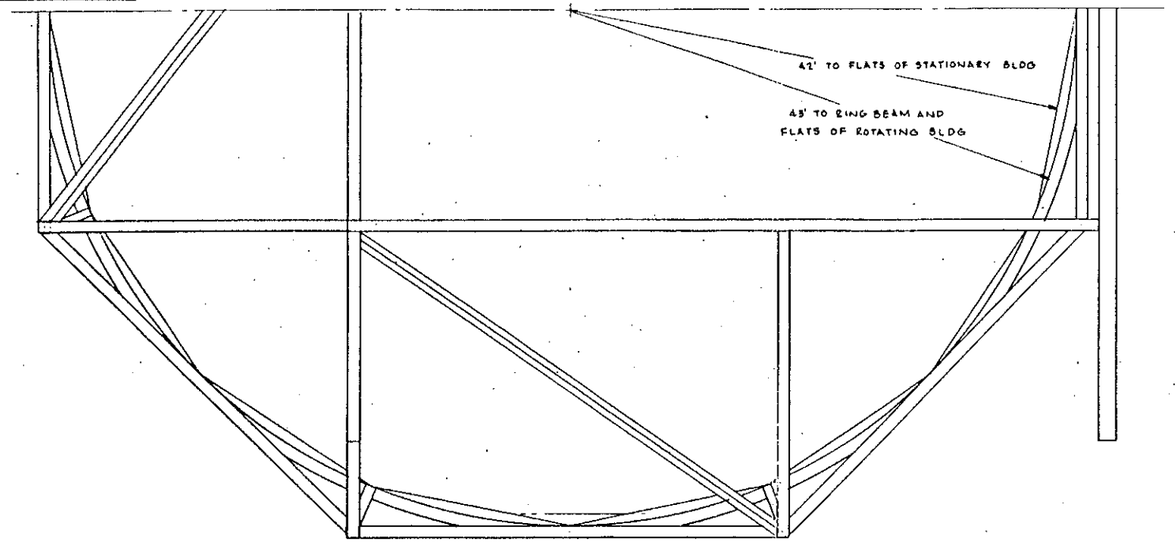
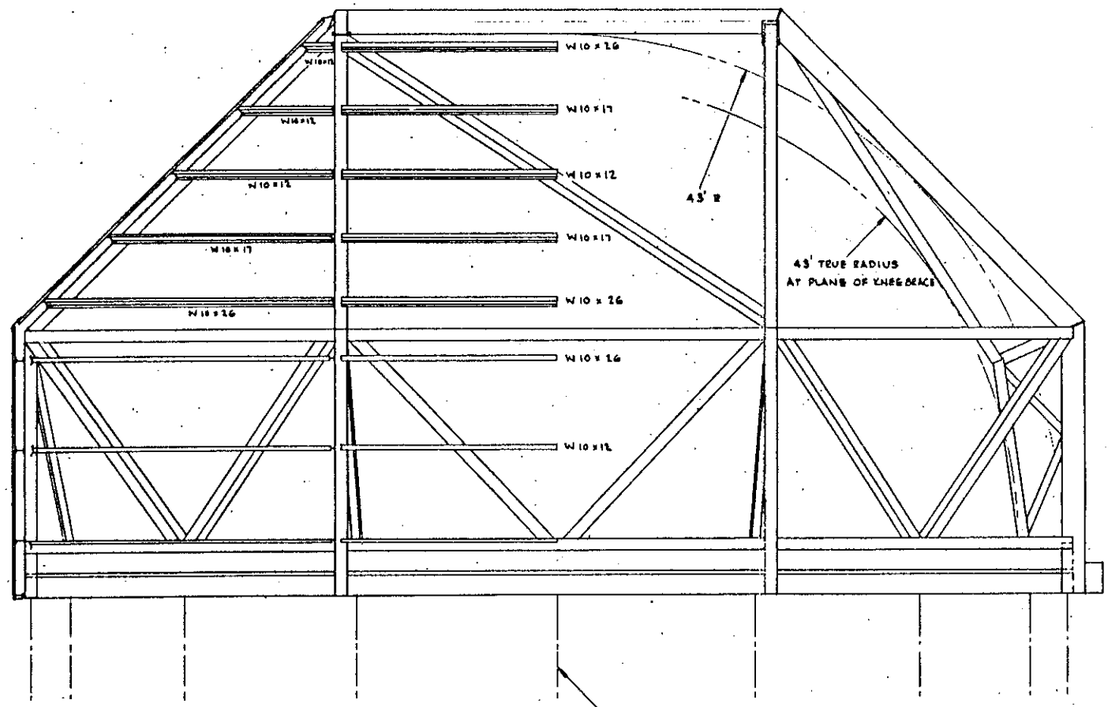
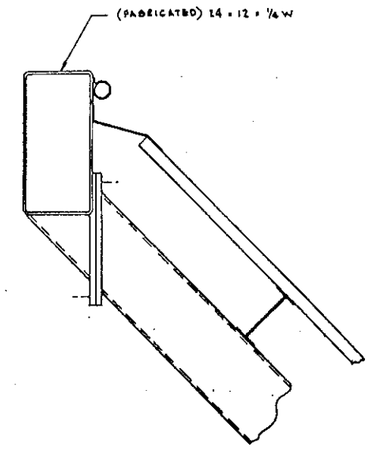
$$T = \frac{262{,}000}{2\pi\,(42 \times 12)^2\,(.2833)} = 0.58 \text{ in.}$$

Table 2

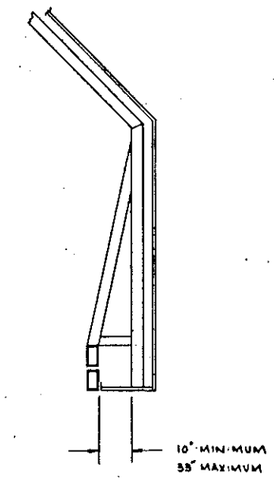
Figure 1







SECTION AT ARCH



SECTION AT COLUMN

NOTE :

1) WEIGHT CHANGE DUE TO "HIDDEN SKIRT" FEATURE IS SUMMARISED IN SEPARATE REPORT.

2) DESIGN CAN ACCEPT EITHER TRUCKS OR BALL BEARING.

LFI INDUSTRIES

MAGELLAN 6M TELESCOPE
OCTAGONAL ENCLOSURE
HIDDEN SKIRT

SMG 5-13-9
SMG 5-21-9

E 271041

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