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COMMONWEALTH OF AUSTRALIA

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DEPARTMENT OF NATIONAL DEVELOPMENT  
BUREAU OF MINERAL RESOURCES  
GEOLOGY AND GEOPHYSICS

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RECORDS

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1949/77

PRELIMINARY REPORT ON ACCIDENT DURING ERECTION OF SEISMOLOGICAL  
OBSERVATORY AT MACQUARIE ISLAND

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by

G.F. Schaeffler

PRELIMINARY REPORT ON ACCIDENT DURING ERECTION  
OF SEISMOLOGICAL OBSERVATORY AT MACQUARIE  
ISLAND.

Report No. 1949/77

Geophysical Report No. 1949/4

INTRODUCTION.

A field party from the Bureau of Mineral Resources, Geology and Geophysics left Melbourne on 19th March, 1949, together with a relief party from the Australian National Antarctic Research Expedition, on H.M. LST. LABUAN.

The Bureau's party consisted of Mr. G. F. Schaefer, (Party Leader), Mr. A.I. Bunbury and Mr. L.H. Nicholls. \*

The object of the party's visit to Macquarie Island was -

- (1) the establishment of a Seismological Observatory,
- (2) the determination of the secular variation of magnetic declination, and
- (3) the location of magnetically suitable areas for a proposed Magnetic Observatory.

Reports on these activities are in the course of preparation and will be submitted in due course. The present preliminary report is concerned exclusively with an accident which occurred during the construction of the Seismological Observatory and which caused injuries to A/B Billan, R.A.N.

PURCHASE OF BUILDING

It is apparent that a suitable building is required for housing the seismometers and auxiliary equipment which the Bureau of Mineral Resources intends to have operating at Macquarie Island. Preliminary enquiries disclosed that no existing structure on the Island was adequate for this purpose. In order to minimise undesirable vibration effects the construction of a reinforced concrete building was ultimately recommended, and it was also stated that a prefabricated structure would be desirable in view of the limited time available for erection.

Since under present arrangements ANARE is concerned with the provision of housing the writer contacted the Expedition's engineer (Mr. J. Russell) and informed him of the essential requirements for the proposed structure. Mr. Russell then undertook to make inquiries in this direction, and finally advised that Monocrete Pty. Ltd. of Villawood, NSW. could supply a building of required size. It was understood that the structure would be designed by the Company to serve its specified purpose and would consist of reinforced concrete slabs ("Monocrete units") which could be assembled at the site with ease.

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\* On loan to ANARE from Zinc Corporation Ltd. at the request of the Bureau of Mineral Resources.

In spite of numerous requests from Mr. Russell and the writer to the Company, no further information regarding the design, drawings, or specifications was obtained before the departure of the LST, except a rough dimensioned sketch which Mr. Russell was able to reproduce from memory.

It is understood that the Monocrete slabs were despatched to Melbourne by road transport and reached the LST only a few hours before sailing time. The writer was later informed that one of the two roof slabs had broken into two clean halves along the direction of reinforcement during transport and/or loading. Inspection of these two halves, both on the LST and later on the Island, revealed that no other cracks or weaknesses were present.

The Company's drawing was handed to the writer on the second day at sea, together with some brief notes regarding miscellaneous material supplied. No information or specifications concerning the assembly of the Monocrete units were provided.

Examination of the plans and inspection of the slabs revealed that they were of extremely inconvenient size and weight for handling with the limited equipment available on the Island. It was apparent that the erection of the building would only be possible if considerable help in men and equipment would be given to the Bureau's party. Fortunately, this was made possible due to the understanding and co-operation shown by Lt.-Cd. Dixon, R.A.N. and Mr. T. Heath, of ANARE.

#### CHOICE OF SITE

In view of the unexpected difficulties mentioned above considerable thought was given to the choice of a suitable site for the Seismological Observatory. Upon the completing of landing operations a number of likely sites were inspected and tested. However, taking all factors into consideration, only one site was found suitable, and it was decided to establish the Observatory on the southern slope of Wireless Hill at an elevation of approximately 50 feet above sea level.

A cutting was then made into the side of the hill at the chosen site until a level surface of adequate floor area was obtained. After laying a reinforced concrete floor and constructing two solid reinforced concrete instrument piers the site was ready for erection of the Monocrete Hut.

While excavation work and concreting was in progress a Naval working party under the charge of Mr. A. Hayter, RAN, had been arranging the transport of the Monocrete slabs from the LST. to the site. In spite of great difficulties all slabs were brought to the site without further breakage. The back walls were leaned against the back of the cutting and suitably supported by 4" x 4" oregon pine timber and ropes; the front walls and side walls were stacked horizontally at floor level at the sides of the cuttings, and the roof slabs were deposited and secured at a point approximately 20 feet above floor level.

On Friday, 9th April, 1949, tests showed that the concrete supporting the floor beams had set sufficiently to permit erection of the building. A framework was constructed from 4" x 4" oregon pine timber for the temporary support of the Monocrete units until they could be secured by means of the tie rods provided. The erection of the walls (consisting of 9 units) proceeded smoothly and was completed during the early part of the afternoon.

The Naval working party then commenced to lower the three roof sections into position. Each slab in turn was lifted by means of ropes and moved along timber guide rails to the required position. Since the flying fox and the ropes and tackles provided took most of the load the slabs could be guided into the right direction by hand

with comparative ease. The position is illustrated on the accompanying sketch for the critical time when the two smaller (2'6" x 8'8" and 2'2" x 8'8") sections had been satisfactorily placed in their respective positions.

While the third and last roof slab was being manoeuvred into position, as shown, it was supported by two 4" x 4" oregon pine beams by the tackle suspended from the flying fox, and by the inside roof slab already in position. A third 4" x 4" beam was being pushed under the slab to give it additional support and it was found necessary for three men of the Naval working party to stand on the slab temporarily for this purpose. The slab failed at this stage by breaking across the reinforcement. Failure was sudden and without previous warning as indicated by bending or the formation of cracks. Beams A and B then collapsed due to the failure of the slab, and the sudden impact then caused the failure of beam C and made the tackle slide away from the men holding it.

Mr. A. Hayter, RAN, and another man went down either above or alongside the large slab, and suffered no injury. The third man, A/B Dillan, RAN, however, was wedged between the slab, the front wall of the hut, and the concrete pier which fortunately had prevented the slab from falling further than it did.

As soon as the accident happened an alarm was given and equipment for releasing A/B Dillan, as well as first aid equipment, was available at the site within a matter of minutes. A/B Dillan was then released by lifting the fallen slab with the tackle and two hydraulic jacks applied at the lower edge. Since the ship's doctor was fortunately present at the site at the time of the accident he was able to render immediate first aid, and, later on, to supervise A/B Dillan's transport to the LST. Information received indicated that A/B Dillan sustained a simple fracture of his right leg, approximately 3" - 4" above the knee joint.

In view of the accident it was decided to leave the Island, thus abandoning the completion of the roof of the Seismological Observatory, in order to assure that proper hospital treatment would be available to A/B Dillan at the earliest opportunity.

Mr. J. Russell undertook to ascertain the safety of the structure. If found to be safe, the ANARE party would carry out minor repairs concerning the finish of the walls, floors and and piers as well as the removal by breaking up of the fallen slab and the construction of a temporary roof, during their year at the Island.

### CONCLUSIONS

The writer and the other members of the party inspected the fallen slab after the accident. Although the fracture was not easily accessible (and could therefore not be photographed) the inspection revealed that the 4" thick concrete slab with approximately 30% voids, weighing about 23 cwt., was reinforced in the 8'8" direction by wires set at about 3" centres. These wires appeared to be about 3/32" in diameter; more accurate values could undoubtedly be obtained from the Company if required.

Since the design carried out and submitted by Monocrete Pty. Ltd. included a flat roof, and since the Company was informed of the proposed location of the building at Macquarie Island, it is difficult to understand that the type of reinforcement used could have been designed adequately for the considerable wind and snow loads to be expected, quite apart from allowing for additional heavy stresses due to difficulties of transport and erection with limited equipment.

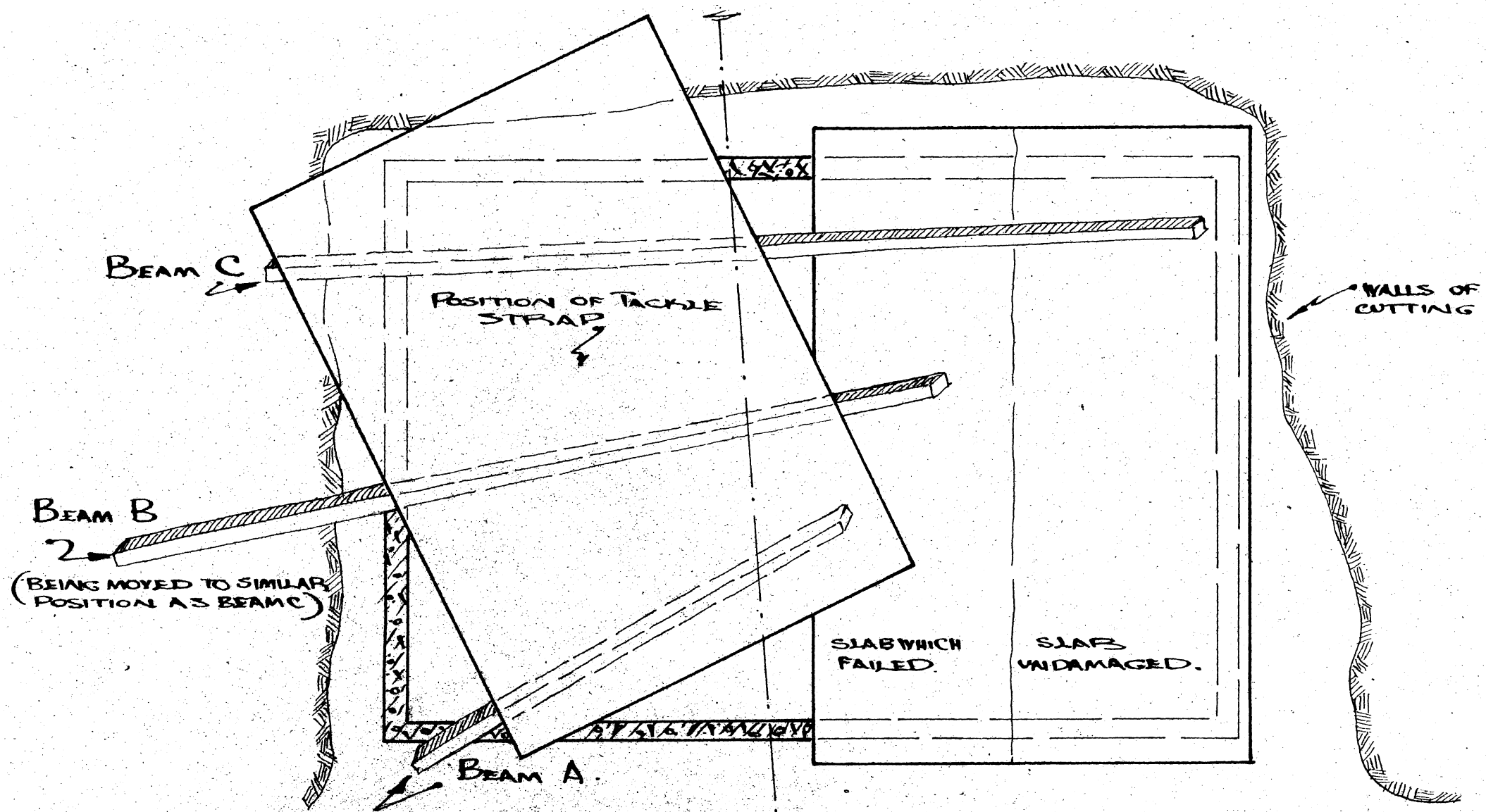
In view of these facts it is recommended that no attempt be made to recover and use the Monocrete roof slabs, but that the design be put in hand of an entirely different and adequate roof which should be erected during the next visit to the Island.

*G.F. Schaefer*

(G.F. SCHAEFLER, B.A., B.Eng.Sc.)  
Geophysicist.

Enclosures:

- (1) Diagram 1. Illustrating method of handling roof slabs at time of accident.
- (2) Diagram 2. Blueprint of Monocrete Hut.
- (3) Copy of letter from Monocrete Pty. Ltd.  
(Items (2) and (3) constitute all the information supplied by Monocrete Pty. Ltd. to the writer via ANARE.)



. DIAGRAM 1.  
. ACCIDENT REPORT, MACQUARIE

(COPY)

MONOCRETE PTY. LTD.

VILLAWOOD. N.S.W.

14th March, 1949.

Mr. Law,  
ANARE,  
ALBERT PARK.

Dear Sir,

We wish to advise that the Monocrete material required for your proposed seismograph hut has been despatched per road to Melbourne this day.

We enclose plans showing the position of wall units and foundation beams.

The miscellaneous material sent to you is explained as follows:-

Tie Rods: These rods fit over the dowel of the posts and along the top of the wall units.

Turnbuckles: The tie rods are inserted in one end of the turn-buckle and the post protrudes into the other end. The tie rod is then tightened by means of a 3/8" nut.

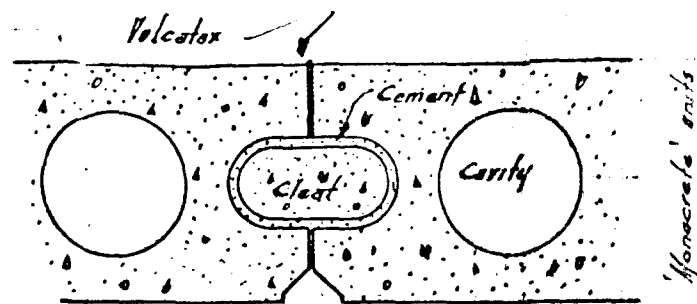
1" Gal. Pipe. The 1' lengths of pipe are fitted over the tie rod and are seated into the groove of the wall unit over all wall joints.

Vulcatex: The vulcatex is attached to the edge of the Monocrete units so that when the units are squeezed together the vulcatex completely fills the exterior butt joints.

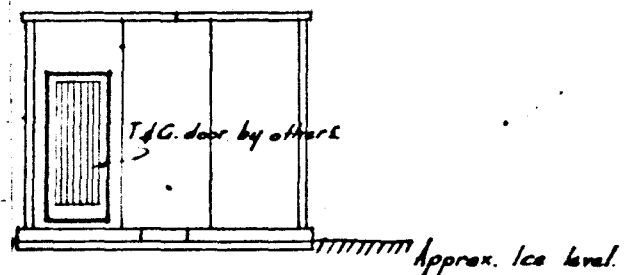
Yours faithfully,

MONOCRETE PTY. LIMITED

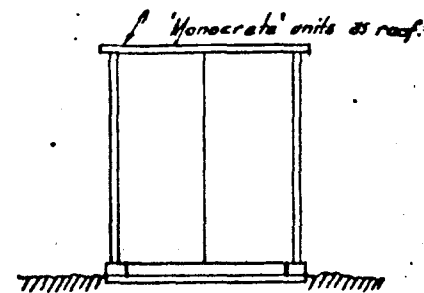
P. Quance,  
Building Division.



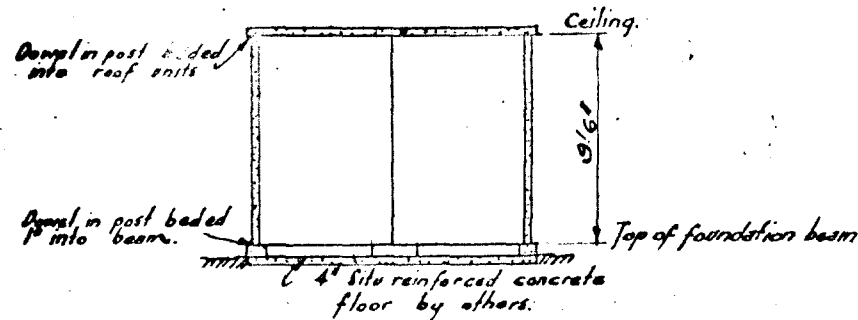
DETAIL OF ROOF JOIN



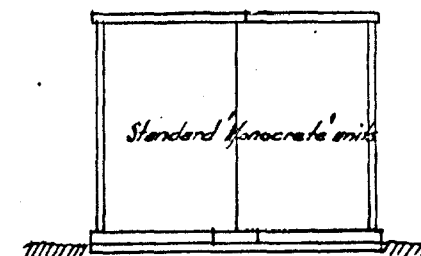
FRONT



SIDE

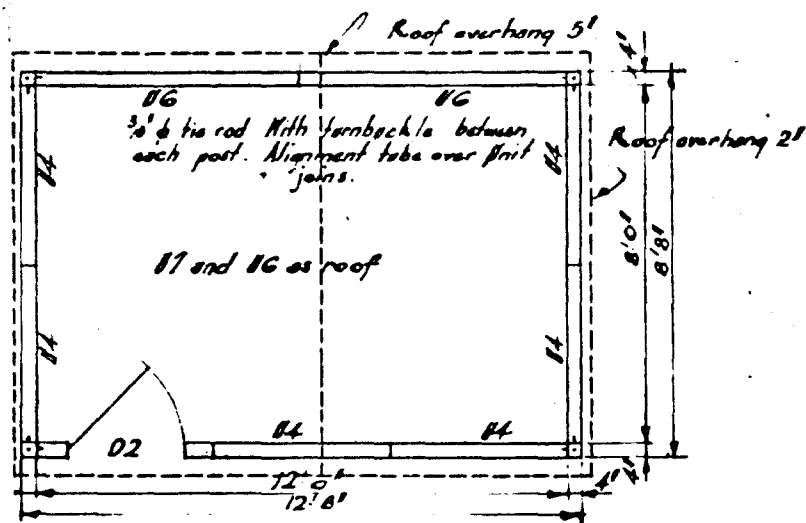


SECTION

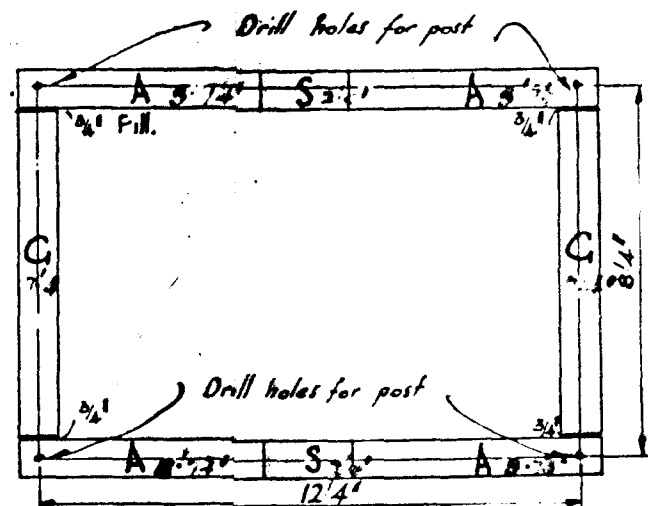


REAR

Scale :  $\frac{1}{8}" = 1'0"$

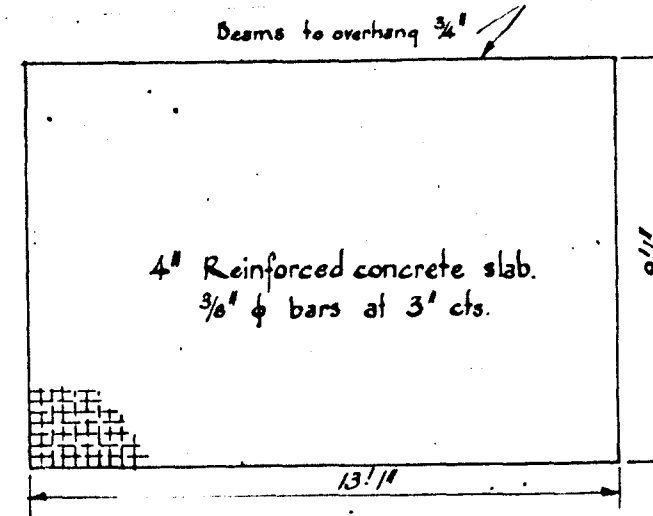


PLAN



FOUNDATION BEAMS.

Scale :  $\frac{1}{4}" = 1'0"$



FLOOR.

PROPOSED 'MONOCRETE' SISOMOGRAPH HUT FOR  
AUSTRALIAN NATIONAL ANTARCTIC RESEARCH  
EXPEDITION.

SCALES:  
 $\frac{1}{4}" = 1'0"$   
 $\frac{1}{8}" = 1'0"$   
 $\frac{3}{16}" = 1'0"$

MONOCRETE  
PTY. LTD.

DATE:  
11-3-1949

MONIER SQUARE, VILLAWOOD.  
DRAWN BY: A.W.O.

DRAWING NO.  
M126.  
SHEET NO.  
1 of 1