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Point Theatre, Concert Hall and Exhibition Centre

Le Théatre Point, salle de concerts et centre d'expositions

Das Point Theater, Konzerthalle und Ausstellungszentrum

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SUMMARY

This facility located in the Docklands area of Dublin is the venue for theatrical events, concerts and conventions. Originally constructed in 1878 as a quayside railway goods warehouse, it was converted in 1988 into a multipurpose concert and exhibit venue with an auditorium capacity of up to 3'750 seated and 8'000 standing. The central auditorium covering 2'850 sqm was created by the removal of internal columns after the roof had been supported on external beams spanning 55 m between supports over proscenium arch some 34 m span.

RÉSUMÉ

Ce bâtiment dans la zone portuaire de Dublin abrite des représentations théâtrales et musicales et des congrès. Construit en 1878 pour servir d'entrepôt des chemins de fer portuaires, il fut transformé en 1988 en une maison de la culture à usage polyvalent (3'750 places assises et 8'000 places debout). D'une surface de 2'850 m2, la création de l'auditorium a impliqué la démolition des piliers intérieurs, après avoir suspendu et ancré la toiture à des poutraisons extérieures qui, avec une portée de 55 m, enjambent une scène courbe de 34 m de longueur.

ZUSAMMENFASSUNG

Dieses Gebäude im Dubliner Hafenglände ist Schauplatz für Theater- und Konzertaufführungen und Kongresse. Im Jahre 1878 ursprünglich als Warenlagerhaus für die Eisenbahn am Hafenkai errichtet, wurde es 1988 in einen Mehrzweckkulturbau umgebaut, mit 3'750 Sitzplätzen und 8'000 Stehplätzen. Das zentrale Auditorium mit 2'850 m2 Grundfläche wurde durch Entfernen der Innenstützen geschaffen, nachdem das Dach an externen Trägern verankert wurde, die mit 55 m Spannweite einen Bühnenbogen von 34 m überspannen.

1. INTRODUCTION

As originally constructed for the Great Southern and Western Railway of Ireland in 1878, the Point Depot comprised a 52m wide nine track three bay goods warehouse 112m long. The 12m high centre bay was flanked by full height mezzanine floors 8m over ground level. Transfer of goods to and from the upper levels was effected by a series of chain operated swing derricks mounted on the mezzanine columns and external walls. Prior to the conversion, the Point Depot stored permanent way materials following the rationalisation of railway freight services in the early 1970s.

2. CLIENT BRIEF

The twin aims of the brief to the design team were to provide a venue for modern entertainment activities while preserving the unique ambience of the building particularly the delicate detailing of the wrought iron roof and mezzanine steelwork (Fig.3). The major structural elements of the conversion undertaken between 1988 and 1991 were:

Phase 1: (1988)	-	removal of columns to provide a 34m wide x 55m deep central column free area thereby creating an amphitheatre type space.
	-	the provision of an over stage grid to support sound and visual equipment up to 18 tonnes in weight.
Phase 2: (1989)	-	the addition of an 80 line fly tower with flying height of 21m and load capacity of 27 tonnes.
	-	improved load capacity of up to 30 tonnes over the central auditorium for events 'in the round'.
Phase 3: (1991)	-	side and rear balconies with fixed seating capacity for 1,574 persons to reduce labour costs associated with demountable seating.

3. STRUCTURAL ASSESSMENT OF ORIGINAL BUILDING

The structural elements of the building were in good condition with no significant defects in the masonry walls, columns or roof trusses. At the time of original construction both wrought iron and cast iron were in general use (1). The materials used in the trusses and beams were identified as wrought iron following tests undertaken by University College Dublin (Yield Strength : 234N/sq.mm. : Ultimate Tensile Strength: 351N/sq.mm.).

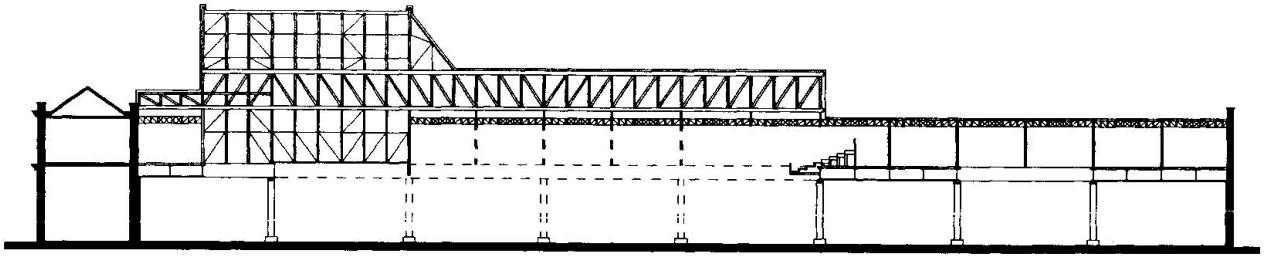
The material of the cast iron columns was confirmed by their orange skin appearance and the wall thickness measured at three points around each diameter. The load bearing capacity of 6500 kN was calculated from the lowest of the Euler, Rankine, American and Goodman formulae. The structural assessment based on research and tests was substantially confirmed by local folklore which related that during World War II some 6,000 tons of sugar had been stored on the mezzanine floors with a combined area of 3,500 sq.m. giving a superimposed live load of 17 kN/sq.m.

Fig.1: Erection of Main Roof Girders - Phase 1.

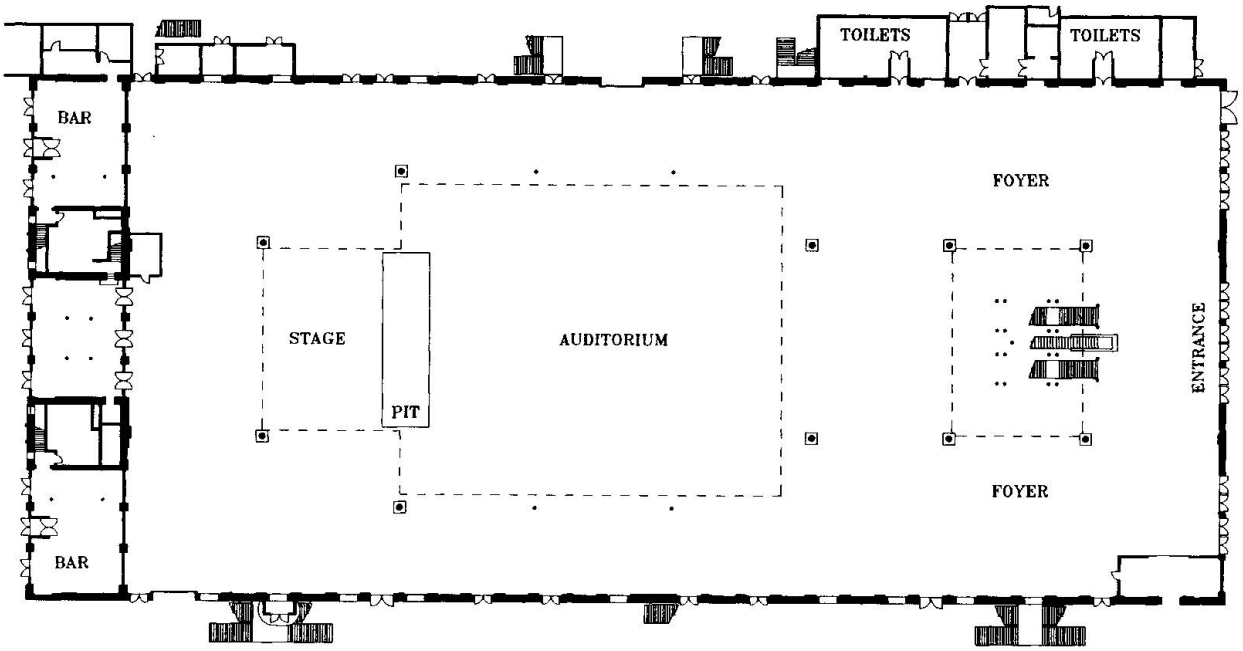
4. STRUCTURAL SCHEME FOR CONVERSION

The major element of the conversion from goods warehouse to multi-purpose arena was the opening up the centre of the building to form an amphitheatre and the linking of the two mezzanine floors in the side bays to form circulation, access and upper exhibition areas. The enlarged central well containing the seating area measures 55 metres long by 34 metres wide.

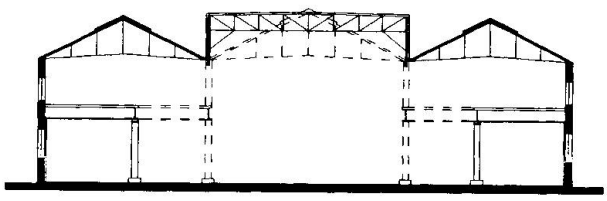
In order to retain the original roof form, the solution devised by consulting engineers Thorburn Colquhoun, provided for the replacement of support lost by the removal of interior columns by transferring the roof load to an external structure i.e. literally hanging the roof from it. The solution enabled the new complex to accommodate heavy equipment when hosting concerts or other events without the need to erect a special scaffolding as is the case in some other concert halls and venues. The external structure located in the roof valleys comprised twin lattice girders, 55m long, 3.5m deep and each weighing 38 tonnes, supporting the roof from 36mm dia, high strength hangers at 6.87m ctrs. A camber was designed into the girders both for the sake of appearance and to shed rainwater externally. Lateral stability to the girders was provided by the over stage grid and by external cranked and tapered lattice beams over the seating area.



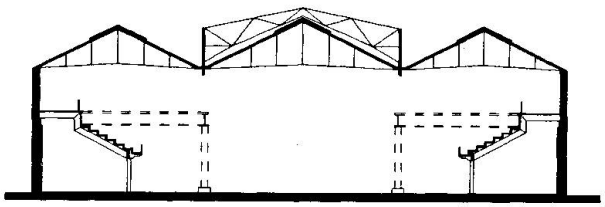
LONGITUDINAL SECTION – Phase 1 & 2



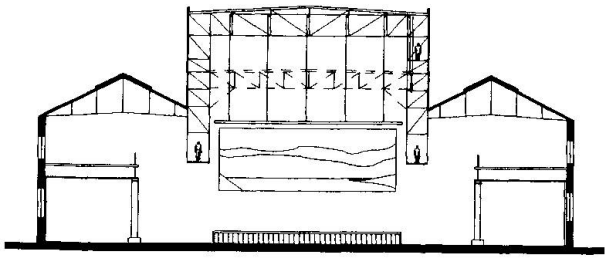
FLOOR PLAN



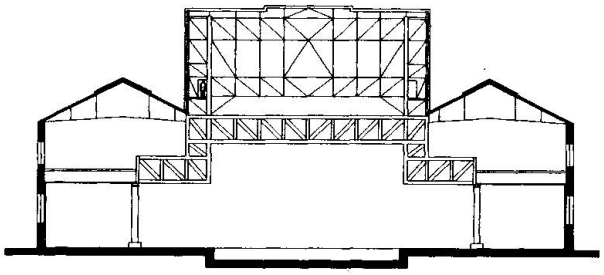
SECTION STAGE – Phase 1



SECTION PROSCENIUM – Phase 3



SECTION STAGE – Phase 2



SECTION PROSCENIUM – Phase 2

0 5 10 15 20m

Fig. 2

5. CONSTRUCTION - PHASE ONE (Summer 1988)

Because of the size of the two primary support girders, the Contractor opted to fabricate them on site. After fabrication, on site x-ray checking was carried out on all butt welds. While this work was being executed the mezzanine floor beams adjacent to the four primary support columns were propped and the columns suspended from the beams while new piled foundations were installed under the original columns and their stone bases. A noteworthy feature of the erection procedure was the contractors decision to temporarily remove the roof trusses over the auditorium to facilitate erection of the main girders (Fig.1). This decision was undoubtedly influenced by the fact that a new roof covering on new steel angle purlins was being provided to replace the original timber boarding.

Once the roof loading had been removed from the columns at mezzanine level, the wrought iron beams at the central area mezzanine level were propped and cut back by 7 metres with the remaining six cast iron columns replaced on new piled foundations incorporating the original stone bases. The original fascia beams were also replaced on the columns before removal of the temporary props.

Within the foyer area, the central well at mezzanine level was infilled with reinforced 914mm x 419mm Universal Beams to create landing areas for the stairs and escalator.

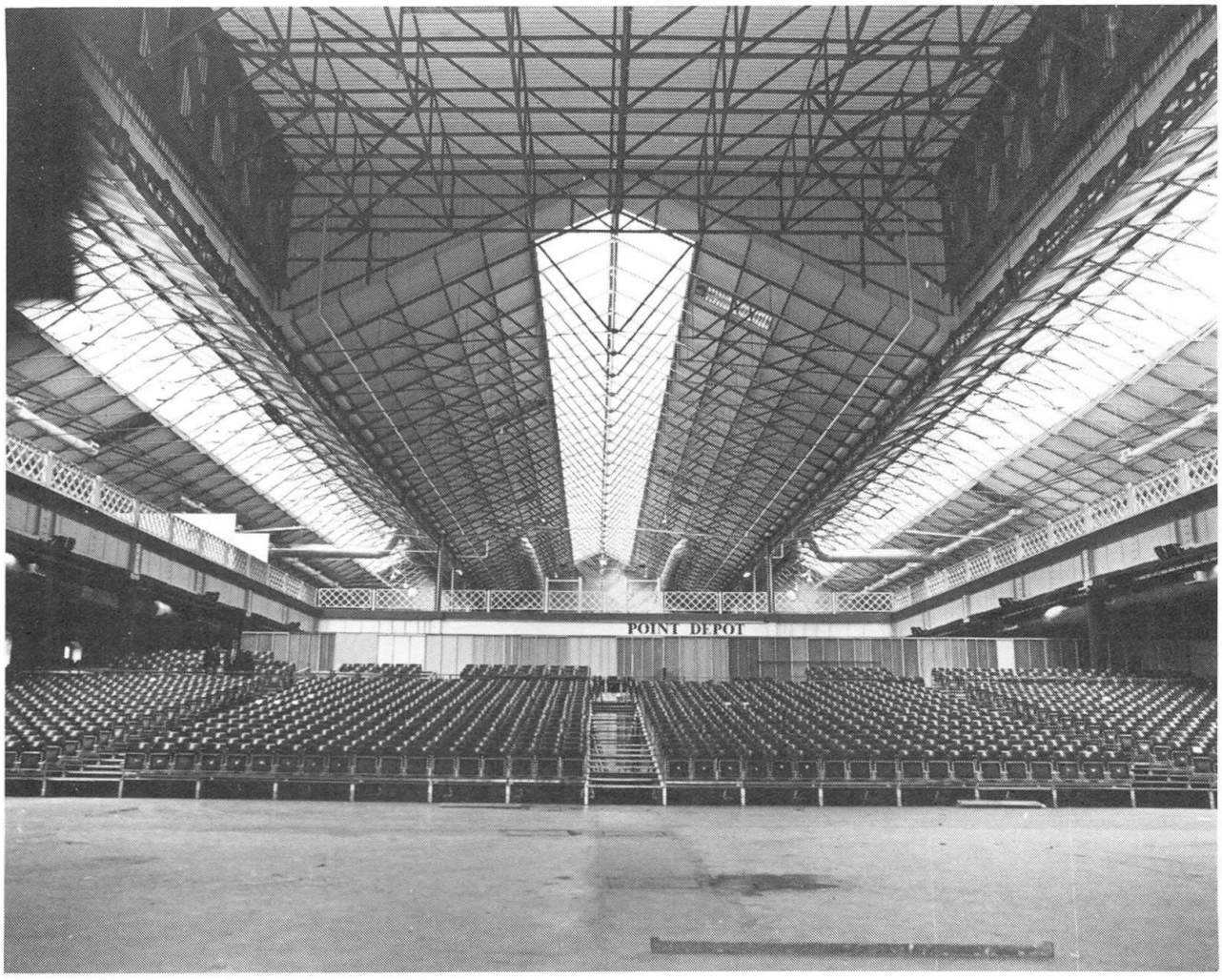


Fig.3 Auditorium from Stage - Phase 1.

6. STRUCTURAL ASPECTS - PHASE TWO.

Because of the requirement for clear floor space under the fly tower, a double purchase system, employing 27 tonnes of counterweights on one side only, to balance the flying loads of 13.5 tonnes, was required. The major structural challenge was to support the fly tower on the large valley girders installed during the previous year to create the central well area. Particular attention was paid to the stability of the valley girders following removal of the original grid, to the load carrying capacity of the valley beams and to supporting structures. The addition of the fly tower generated an increase from 2263 kN to 2595 kN on each valley beam, inclusive of drifting snow against the wall of the fly tower.

The core of the design finally evolved, after consideration of strength, stability and sight lines, involved a cranked lattice beam 2.8m deep spanning 34m between two of the relocated columns. This beam in addition to providing an intermediate support to the valley girders has the additional advantage of creating a natural break between stage and auditorium at the front of the fly tower without unduly restricting the open space aspect of the building during exhibitions.

7. CONSTRUCTION - PHASE TWO (SUMMER 1989)

Phase two was successfully completed in 1989 to an erection sequence devised by Thorburn Colquhoun. No exceptional difficulties were encountered during construction. The main supporting beam under the proscenium arch was fabricated in three sections in the workshop and assembled by site welding. Erection proved awkward due to the weight (28 tonnes) and lack of headroom for the crane jibs.

8. PHASE THREE (SUMMER 1991)

Operating experience during the first two seasons highlighted the requirement for permanent seating where possible. To facilitate installation of the two side balconies, the cut back mezzanine in the central well was removed and replaced with precast concrete terrace units on cranked 457mm deep Universal Beams supported on new 300mm dia. circular hollow section columns. The side balconies also incorporated a full length horizontal wind girder at mezzanine level. The primary supporting member in the rear balcony was a 19.6m long composite steel section comprising 254 x 254 UC on 914 x 419 UB 343 stiffened by 2 No. 36mm dia wire cables giving total depth at the centre of 2,400mm. Such a low span/depth ratio of 8:1 was required to limit vibration by foot-tapping patrons on the rear balcony.

ACKNOWLEDGEMENTS

The author wishes to thank everyone associated with the project with particular credit to Mr. Harry Crosbie for his vision and foresight.

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