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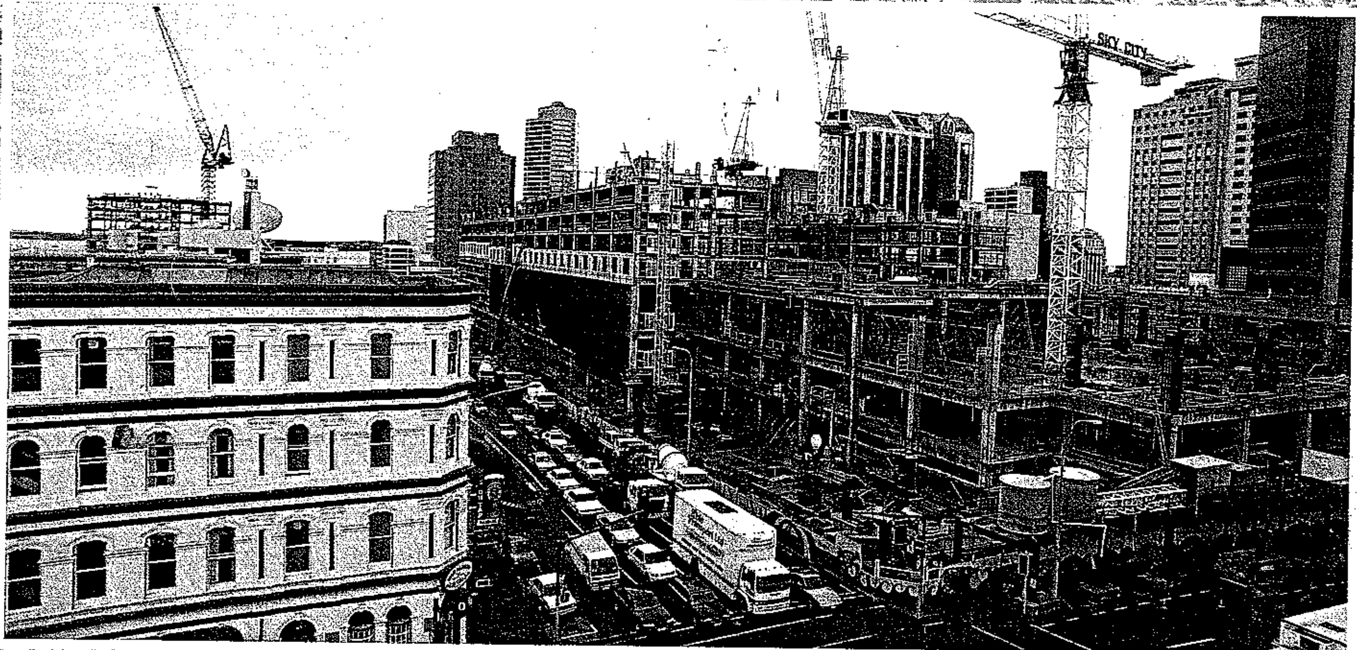
THE CONCRETE FUTURE



INTERNATIONAL CONFERENCE '95

CONFERENCE TECHNICAL PAPERS (TR17)

AUCKLAND, NEW ZEALAND
August 30 to September 1
1995

NEW ZEALAND CONCRETE SOCIETY

CONFERENCE '95 - THE CONCRETE FUTURE

Technical Conference and AGM

The Sheraton Hotel, Auckland

30 August - 1 September 1995

CONFERENCE PROGRAMME AND TABLE OF CONTENTS

FRIDAY, 1 SEPTEMBER

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CONSTRUCTION OF THE SKY TOWER

Warren Hollings[1]

BRIEF OVERVIEW OF SKY TOWER PERMANENT WORKS STRUCTURE (Refer Attached Drawg ADT 1821)

The Sky Tower is designed as a tourist, broadcasting and communications facility and expected to attract over 1,000,000 visitors each year.

The 'Pod' of the Tower contains 4 No observation levels (including 1 outdoor observation deck), 8 communications levels, 3 fire refuge levels and is served by 4 high speed lifts. The 'Pod' itself is a 20 storey building that is to be constructed at a height that is well above Auckland's present highest building.

The Tower is 328m above street level and is higher than Paris' Eiffel Tower (320m) and Sydney's Centrepoint (304m), in fact if you took Auckland's two highest building (Coopers & Lybrands Tower and the ASB Building) and put one on top of the other you are still well short of the height of the Tower.

To climb the stairs from street level to top of pod (not to top of Tower) would mean tackling over 1100 steps.

The structure contains approx 15,000m^3 of concrete, 1400 tonnes of reinforcing and 750 tonnes of structural steel.

CONSTRUCTION METHODOLOGY FOR SKY TOWER

The construction of Sky Tower can be divided into five separate structural zones:

1 Foundation
2 Shaft
3 Legs
4 Pod
5 Mast /Cone

Foundation:

The foundation system consists of a 24.5mϕ x 2.5m deep mass concrete raft (containing approximately 1200m^3 concrete and 180 tonne of reinforcing).

The raft bears on 16 no. 2.0mϕ grooved piles, 14m long which are all interconnected by a 1.0m wide x 1.5m deep ring beam, just below the raft.

The raft was poured over a 10 hour period and during the following weeks heat of hydration levels reached 75°C.

Shaft:

Constructed using a self-climbing proprietary jump form system. Concrete is pumped into the jump form from ground level. Reinforcing is lifted by tower crane to the formwork deck and either placed against the opened forms or lifted in as cages. Personnel are transported by a hoist positioned in the stairwell or via a jumplift installed temporarily within the Lift 4 well. Emergency egress will be achieved via the precast stairs which follow the production of the core wall proper.

Legs:

Are divided into two sub-parts:

a) Lower legs and pilasters
b) Collar beam

Both sub-parts above are accessed by a scaffolding which follows up the shaft around the legs as work progresses.

a) Lower legs and pilasters:

The legs will be built using precast spun concrete permanent formwork with insitu infill concrete.

[1] *Project Manager, (Fletcher Construction)*

b) Collar:

The collar will be built using precast (segment) permanent perimeter formwork with insitu infill concrete. The collar is then Post-Tensioned onto the shaft. The legs are then jacked onto the collar to reduce gravity loadings in the shaft.

Pod:

The pod is divided into three subparts:

a) Lower pod (or crayfish tail)
b) Middle pod (or large floors)
c) Upper pod

a) Lower Pod:

A specially designed "Sky Platform" will be developed to provide a safe working platform for the construction of these floors. It is positioned on the main core wall at approximately RL 159.00m (or just below the beginning of the Pre-Cast Fins). The Sky Platform will be used as a working platform off which the fins will be constructed. The remainder of the Lower Pod will be constructed using traditional methods incorporating safety screens working upwards from the top of the pre-cast fins.

b) Middle Pod:

These floors will be constructed in segments (on the ground) and lifted by the Tower Crane into position. The concrete slabs will then be poured insitu.

Edge activities will be undertaken from a specially designed "Edge Unit" which is either rolled around the perimeter of the floor on a preset rail or crane lifted into position. Window activities, including glazing, are also undertaken exclusively behind the protection of the Edge Unit.

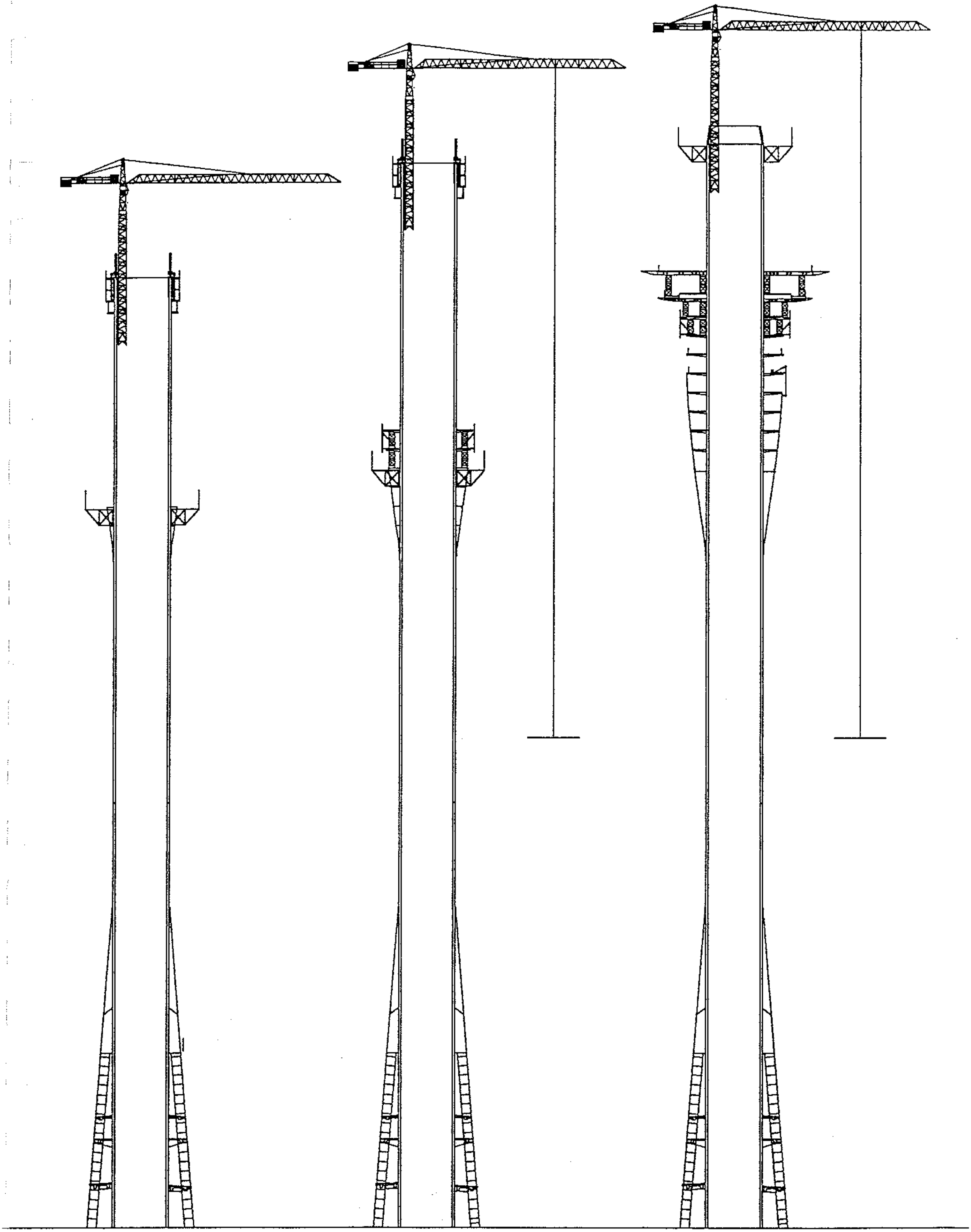
c) Upper Pod:

The upper pod is then constructed off the mid pod floors using traditional methods incorporating safety screens.

Following the completion of the "Lower Pod", the "Sky Platform" is repositioned below the space Deck floor at the top of the core wall (the jump form at this stage is finished). This will encapsulate the cone area and allow the commencement of the cone construction and mast base.

Mast:

The tower crane, located in liftshaft 3 will be used to lift the first three sections of the mast into place (4.0m, 3.0m and 2.0mϕ sections). The option available is to either jack the remaining two sections into place (0.750m, 0.40mϕ) or helicopter the remaining two sections into place. The Tower Crane will be dismantled by either Chicago Boom attached to the Mast or by Helicopter.



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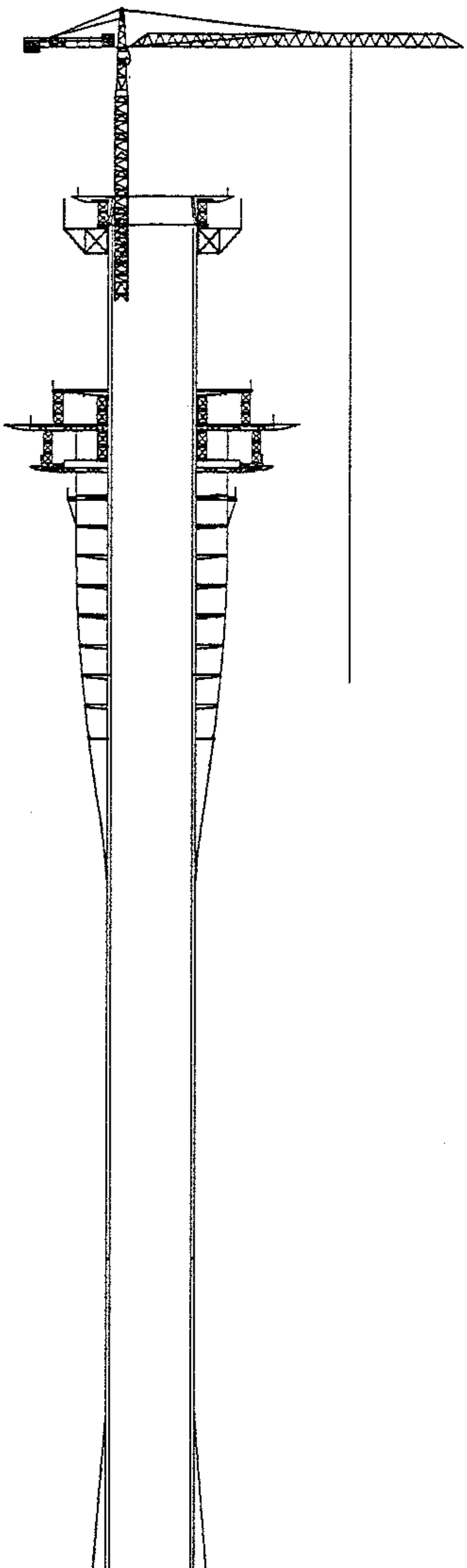

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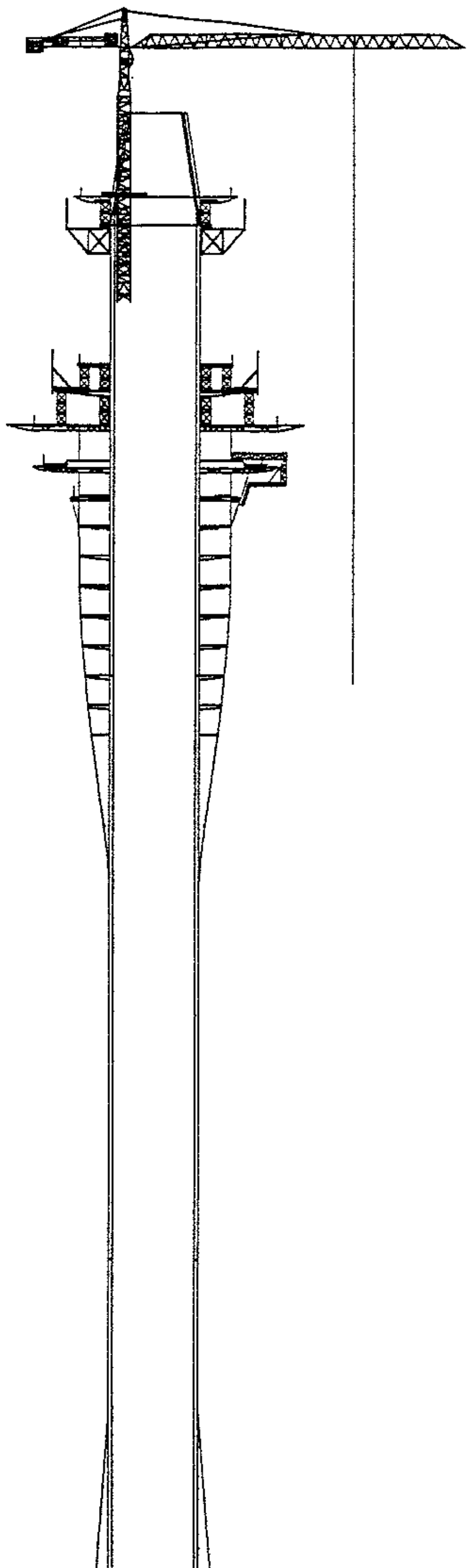

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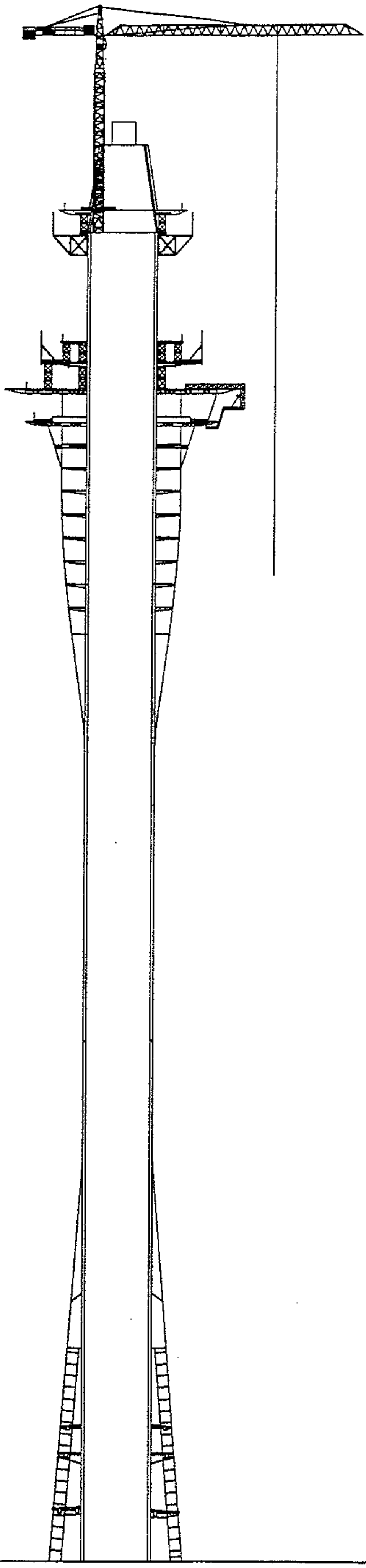

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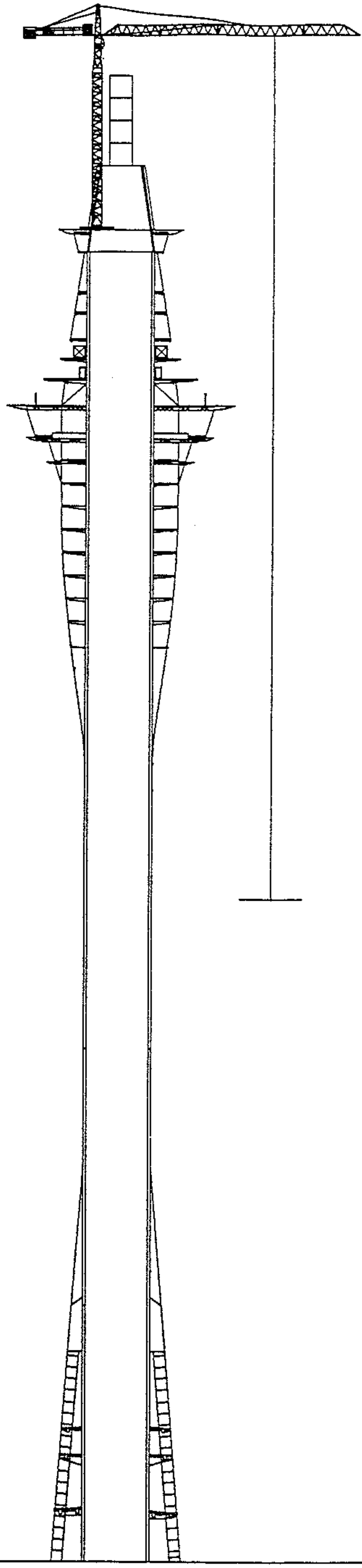

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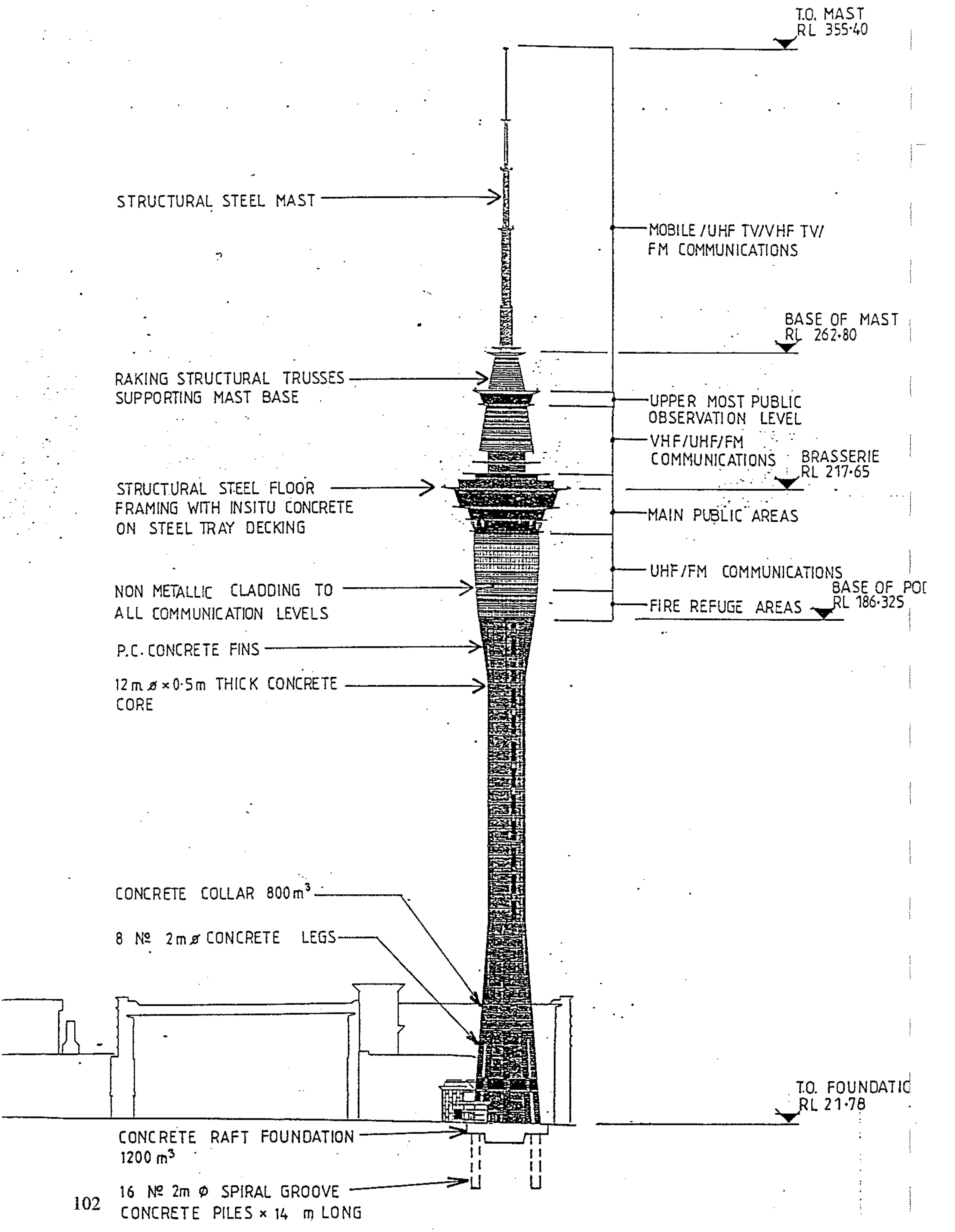
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