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Introduction

Recently the use of perimeter diagonals—hence the term 'diagrid'—for structural e ciency and architectural elegance has generated renewed interest from architectural and structural designers [1]. Diagrid structures commonly utilize intersecting diagonal members instead of the conventional vertical columns as structural supporting systems [2] which give the building a recognizable aesthetic image [3]. e

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Reviewing Case Studies.

	Doha Tower	Doha, Qatar	2005-2012	John Novel	À R R U V D E 1 0 0 0 D Q G À R R U V X Q G H U ground, 231 m	1000000	R.C. crossing diagrid columns	8	48	[18]
	The Bow Tower	Canada	2007-2012	Norman Foster	59 stories, 238 m	292000	Steel grid	12		[33]
	Dorobanti Tower	Bucharest, Romania	2008-2013	Zaha Hadid	À R R U V D E 1 0 0 0 ground, 200 m	100000	Steel grid ¿ O O H G E \ concrete	irregular		[34]
	Cleveland Clinic	Abu Dhabi, UAE	Completed in 2013	HDR Architecture		473122	Steel grid	2		[9,35,36]
	Manukau Institute of Technology	Auckland New Zealand	Completed in 2013	Warren and Mahoney architects	5 stories	65000	Steel grid	4		[9]
	Technosphere	Abu Dhabi, UAE	Completed in 2013	James Law	More than 25 stories	800000	Steel grid	4		[37]
	Lotte Tower	Seoul, Korea	Completed in 2014	S.O.M	123 stories, 556 m		Steel grid	irregular	Varying angles from 60 to 79	[16,38]
	West Bay 2 I ¿ F H 7 R	Doha, Qatar Z H U	Completed in 2014	S.O.M	50 stories, 230 m		prefabricated steel and concrete “diagrid” frame	irregular	Varying angles	[39]
	Poly International Plaza	Beijing, China	Completed in 2015	S.O.M	31 stories, 161.2 m	116000	Steel grid	4		[40]
	Z15 Tower	Beijing, China	2011-2016	TFP architects	108 stories, 528 m	300000	Steel grid	irregular		[9]

Table 1: 6 K R Z V H D F K F D V H ¶ V G D W D

IBM building

It has integrated the diagrid with the glazing system resulting in oddly shaped windows (Figure 2). is would have created a far more expensive option than the balance of curtain wall clad o ce buildings of the same period, and was likely the reason for its brief use. e steel diagrid exoskeleton assists in stability and is not a classic curtain wall system [2].

PRADA boutique

is comprises a diagonal latticework frame with a façade consisting of rhombus-shaped units (Figure 3). e diagonal lattice forming the outer lattice forms the structural framework while being an integral part of the glass facade (avoiding the need for vertical or horizontal members in the vertical planes) [14-18].

Swiss Re tower

is is supported by an e cient structure consisting of a central core and a perimeter “diagrid’. Unlike conventional tall buildings in which the central core provides the necessary lateral structural stability, the Swiss Re’s core is required to act only as a load-bearing element and is free from the diagonal bracing, producing more exible oor plates [19]. Figure 4 illustrates tower’s circular plan that widens as it rises from the ground and then tapers toward its apex. e aerodynamic

wind loass ns the structure and cladcing, andeinaldes the(usg of a more)Tj 6 Tw T* e cient structure([19].)Tj /T1_0 1 Tf 10 0 0 10313.22

in silver aluminium and is o set by opaque black panels, which reduce the de nition of the individual oor levels [21].

Tornado tower

e building has a cylindrical shape (Figure 8) with a variable radius which thins out at mid height (28.8 m/19.3 m/27.8 m). Its main feature is the outer diagrid arrangement of diagonal columns and beams which give the building a unique diamond shape pattern of the cladding [22,23].

Yellow building

Early discussions and sketched ideas were followed by parametrically driven models which were able to work with the architectural and structural requirements. is design process developed a concrete exposed diagrid which wraps around the perimeter of two rectangular oorplates (Figure 9), separated by an open atrium space [24].

One Shelly Street building

Figure 10 shows the most notable exterior diagrid structure to date. e temperate climate has permitted the diagrid to exist outside of the curtain wall façade, e ectively maximizing the internal leasable area [25].

Guangzhou west tower

Proposed an e cient, cost-e ective composite structure, comprising a reinforced concrete inside-core working in conjunction with the perimeter CFT (Concrete Filled Steel Tube) diagrid frame, which provides both good sti ness and re protection to the structure (Figure 11). An optimum geometry for the diagonals and the doubly curved elevation was adopted for the e ective wind-resistant design of such a super tall building [26].

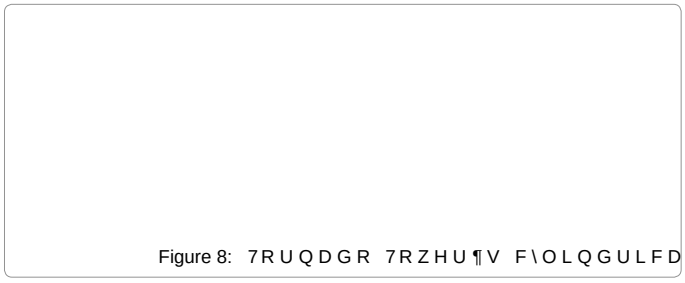

Figure 8: 7RUQDGR 7RZHU¶V F\OLQGULFDO VKDSH

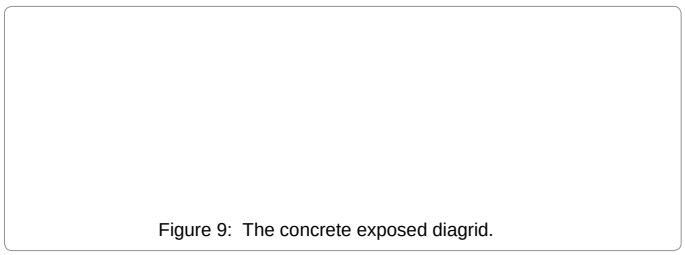

Figure 9: The concrete exposed diagrid.

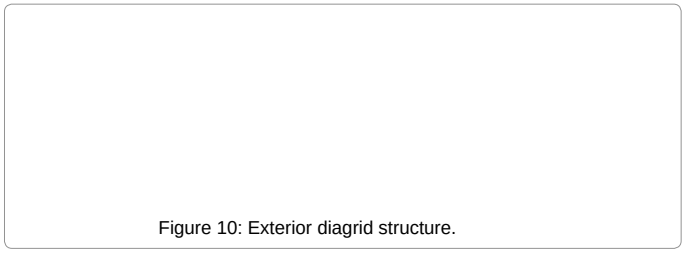

Figure 10: Exterior diagrid structure.

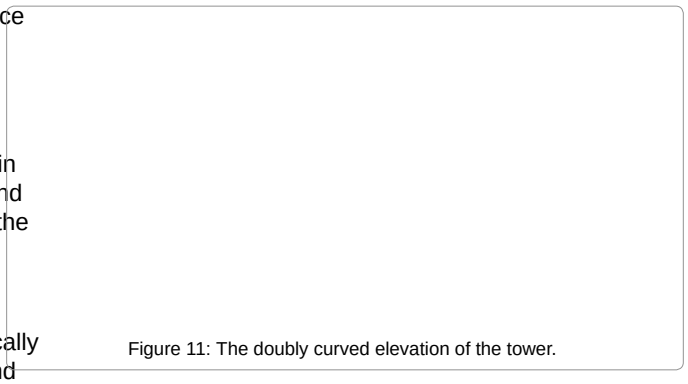

Figure 11: The doubly curved elevation of the tower.

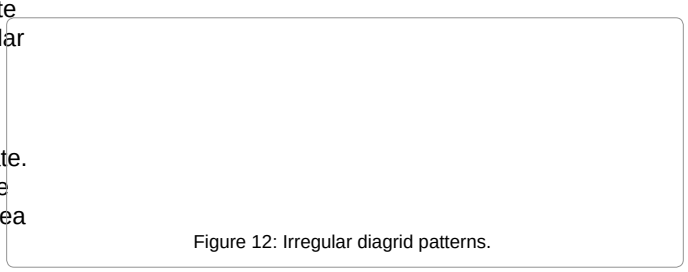

Figure 12: Irregular diagrid patterns.

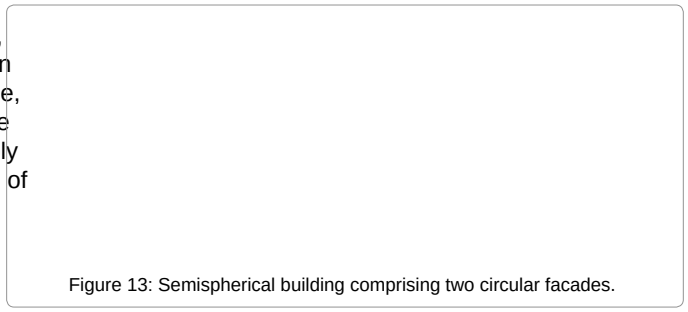

Figure 13: Semispherical building comprising two circular facades.

O-14 tower

Employs reinforced concrete diagrid as primary lateral load-resisting system. Due to the properties of concrete, the structural diagrid patterns which are directly expressed as building facade aesthetics ar more uid and irregular (Figure 12), and di erent from the pristine features of steel diagrids [16]. is e ciency and modulation enables the shell to create a wide range of atmospheric and visual e ects in the structure without changing the basic structural form [27].

T e Al Dar headquarters

It has a distinctive and innovative design, a semispherical building comprising two circular convex shaped facades linked by a narrow band of indented glazing (Figure 13). In order to solve the challenge of the façade curvature, triangular pieces of at glass combined into diamond like shapes, came together like a puzzle working with the diagrid and the highly complex geometry of the skin [28].

Hong kong institute of design

e overall stability of the towers is ensured by a vertical steel trellis structure,“diagrid”, equipped with a conventional beam-slab oor system in reinforced concrete (Figure 14). is “diagrid” system in steel o ers excellent lateral rigidity supporting both the oating platform which spans an area of 100 m u100 m and the framework of the escalator which spans a length of 60m [29].