الملحقات

ملحق (1)

- جدول يوضح قيم اقل حمل حي موزع بإنتظام واقل حمل حي مركز في المبنى

TABLE 4-1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS (continued)

Occupancy or Use	Uniform psf (kN/m²)	Conc. lb (kN)
Roofs		
Ordinary flat, pitched, and curved roofs	20 (0.96)[b]	
Roofs used for promenade purposes	60 (2.87)	
Roofs used for roof gardens or assembly purposes	100 (4.79)	
Roofs used for other special purposes	[i]	[i]
Awnings and canopies		
Fabric construction supported by a lightweight rigid skeleton structure	5 (0.24) nonreducible	
All other construction	20 (0.96)	
Primary roof members, exposed to a work floor		
Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs over manufacturing, storage warehouses, and repair garages		2,000 (8.9)
All other occupancies		300 (1.33)
All roof surfaces subject to maintenance workers		300 (1.33)
Schools		
Classrooms	40 (1.92)	1,000 (4.45)
Corridors above first floor	80 (3.83)	1,000 (4.45)
First-floor corridors	100 (4.79)	1,000 (4.45)
Scuttles, skylight ribs, and accessible ceilings		200 (0.89)
Sidewalks, vehicular driveways, and yards subject to trucking	250 (11.97)[f]	8,000 (35.60)[f]
Stadiums and arenas		
Bleachers	100 (4.79)[g]	
Fixed seats (fastened to floor)	60 (2.87)[g]	
Stairs and exit ways	100 (4.79)	[i]
One- and two-family residences only	40 (1.92)	
Storage areas above ceilings	20 (0.96)	
Storage warehouses (shall be designed for heavier loads if required for anticipated storage)		
Light	125 (6.00)	
Heavy	250 (11.97)	
Stores		
Retail		
First floor	100 (4.79)	1,000 (4.45)
Upper floors	75 (3.59)	1,000 (4.45)
Wholesale, all floors	125 (6.00)	1,000 (4.45)
Vehicle barriers	See Section 4.4	
Walkways and elevated platforms (other than exit ways)	60 (2.87)	
Yards and terraces, pedestrian	100 (4.79)	

ملحق (2)

سرعة الرياح في المنطقة

القيم التالية تم الحصول عليها من الهيئة العامة للأرصاد الجوية بالخرطوم .

Khartoum

LAT:15 36 N LONG:-32 33 E ALT:-380M ABOVE M.S.L

TAYPE OF DATA:-ANNUAL HIGEST WIND SPEED (GUST) M.P.H.

Year	HST WIND SPEED M.P.H.
1987	43
1988	52
1989	44
1990	29
1991	66
1992	61
1993	36
1994	35
1995	26
1996	21
1997	18
1998	49
1999	58
2000	31
2001	54
2002	69
2003	46

2004	57
2005	40
2006	39

NOTE: - HST = HIGHEST M.P.H = MILE PER HOUR

ملحق (3)

Category of building

TABLE 1-1 OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES FOR FLOOD, WIND, SNOW, EARTHQUAKE, AND ICE LOADS

Nature of Occupancy	Occupancy Category
Buildings and other structures that represent a low hazard to human life in the event of failure, including, but not limited to: • Agricultural facilities • Certain temporary facilities • Minor storage facilities	I
All buildings and other structures except those listed in Occupancy Categories I, III, and IV	II
Buildings and other structures that represent a substantial hazard to human life in the event of failure, including, but not limited to: • Buildings and other structures where more than 300 people congregate in one area • Buildings and other structures with daycare facilities with a capacity greater than 150 • Buildings and other structures with elementary school or secondary school facilities with a capacity greater than 250 • Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities • Health care facilities with a capacity of 50 or more resident patients, but not having surgery or emergency treatment facilities • Jails and detention facilities Buildings and other structures, not included in Occupancy Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure, including, but not limited to: • Power generating stations[a] • Water treatment facilities • Sewage treatment facilities • Telecommunication centers Buildings and other structures not included in Occupancy Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released. Buildings and other structures containing toxic or explosive substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the toxic or explosive substances does not pose a threat to the public.	III
Buildings and other structures designated as essential facilities, including, but not limited to: • Hospitals and other health care facilities having surgery or emergency treatment facilities • Fire, rescue, ambulance, and police stations and emergency vehicle garages • Designated earthquake, hurricane, or other emergency shelters • Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response • Power generating stations and other public utility facilities required in an emergency • Ancillary structures (including, but not limited to, communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water, or other fire-suppression material or equipment) required for operation of Occupancy Category IV structures during an emergency • Aviation control towers, air traffic control centers, and emergency aircraft hangars • Water storage facilities and pump structures required to maintain water pressure for fire suppression • Buildings and other structures having critical national defense functions Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing highly toxic substances where the quantity of the material exceeds a threshold quantity established by the authority having jurisdiction. Buildings and other structures containing highly toxic substances shall be eligible for classification as Occupancy Category II structures if it can be demonstrated to the satisfaction of the authority having jurisdiction by a hazard assessment as described in Section 1.5.2 that a release of the highly toxic substances does not pose a threat to the public. This reduced classification shall not be permitted if the buildings or other structures also function as essential facilities.	IV

[a]Cogeneration power plants that do not supply power on the national grid shall be designated Occupancy Category II.

ملحق (4)

معادلة توضح كيفية الحصول على معامل الاستجابة للرياح

$$G = 0.925\left(\frac{1+1.7g_Q I_z Q}{1+1.7g_v I_z}\right) \qquad (26.9\text{-}6)$$

ملحق (5)

جدول يوضح قيم معامل اتجاه الرياح (k_d) حسب نوع المنشأه

Structure Type	Directionality Factor K_d*
Buildings	
Main Wind Force Resisting System	0.85
Components and Cladding	0.85
Arched Roofs	0.85
Chimneys, Tanks, and Similar Structures	
Square	0.90
Hexagonal	0.95
Round	0.95
Solid Freestanding Walls and Solid Freestanding and Attached Signs	0.85
Open Signs and Lattice Framework	0.85
Trussed Towers	
Triangular, square, rectangular	0.85
All other cross sections	0.95

*Directionality Factor K_d has been calibrated with combinations of loads specified in Chapter 2. This factor shall only be applied when used in conjunction with load combinations specified in Sections 2.3 and 2.4.

ملحق (6)

جدول يوضح قيم معامل الضغط الخارجي (c_p)

Main Wind Force Resisting System – Part I		All Heights
Figure 27.4-1 (cont.)	External Pressure Coefficients, C_p	Walls & Roofs
Enclosed, Partially Enclosed Buildings		

Wall Pressure Coefficients, C_p

Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_z
Leeward Wall	0-1	-0.5	q_h
	2	-0.3	
	≥4	-0.2	
Side Wall	All values	-0.7	q_h

Roof Pressure Coefficients, C_p, for use with q_h

Wind Direction	Windward									Leeward		
	Angle, θ (degrees)									Angle, θ (degrees)		
	h/L	10	15	20	25	30	35	45	≥60#	10	15	≥20
Normal to ridge for θ ≥ 10°	≤0.25	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.3	-0.2 0.3	0.0* 0.4	0.4	0.01 θ	-0.3	-0.5	-0.6
	0.5	-0.9 -0.18	-0.7 -0.18	-0.4 0.0*	-0.3 0.2	-0.2 0.2	-0.2 0.3	0.0* 0.4	0.01 θ	-0.5	-0.5	-0.6
	≥1.0	-1.3** -0.18	-1.0 -0.18	-0.7 -0.18	-0.5 0.0*	-0.3 0.2	-0.2 0.2	0.0* 0.3	0.01 θ	-0.7	-0.6	-0.6

Normal to ridge for θ < 10 and Parallel to ridge for all θ		Horiz distance from windward edge	C_p
	≤ 0.5	0 to h/2	-0.9, -0.18
		h/2 to h	-0.9, -0.18
		h to 2 h	-0.5, -0.18
		> 2h	-0.3, -0.18
	≥ 1.0	0 to h/2	-1.3**, -0.18
		> h/2	-0.7, -0.18

*Value is provided for interpolation purposes.

**Value can be reduced linearly with area over which it is applicable as follows

Area (sq ft)	Reduction Factor
≤ 100 (9.3 sq m)	1.0
250 (23.2 sq m)	0.9
≥ 1000 (92.9 sq m)	0.8

Notes:

1. Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
2. Linear interpolation is permitted for values of *L/B*, *h/L* and θ other than shown. Interpolation shall only be carried out between values of the same sign. Where no value of the same sign is given, assume 0.0 for interpolation purposes.
3. Where two values of C_p are listed, this indicates that the windward roof slope is subjected to either positive or negative pressures and the roof structure shall be designed for both conditions. Interpolation for intermediate ratios of h/L in this case shall only be carried out between C_p values of like sign.
4. For monoslope roofs, entire roof surface is either a windward or leeward surface.
5. For flexible buildings use appropriate G_f as determined by Section 26.9.4.
6. Refer to Figure 27.4-2 for domes and Figure 27.4-3 for arched roofs.
7. Notation:
   B: Horizontal dimension of building, in feet (meter), measured normal to wind direction.
   L: Horizontal dimension of building, in feet (meter), measured parallel to wind direction.
   h: Mean roof height in feet (meters), except that eave height shall be used for θ ≤ 10 degrees.
   z: Height above ground, in feet (meters).
   G: Gust effect factor.
   q_z,q_h: Velocity pressure, in pounds per square foot (N/m^2), evaluated at respective height.
   θ: Angle of plane of roof from horizontal, in degrees.
8. For mansard roofs, the top horizontal surface and leeward inclined surface shall be treated as leeward surfaces from the table.
9. Except for MWFRS's at the roof consisting of moment resisting frames, the total horizontal shear shall not be less than that determined by neglecting wind forces on roof surfaces.

#For roof slopes greater than 80°, use C_p = 0.8

ملحق (7)

مخطط يوضح درجة التعرض للرياح حسب ارتفاع المبنى من سطح الارض

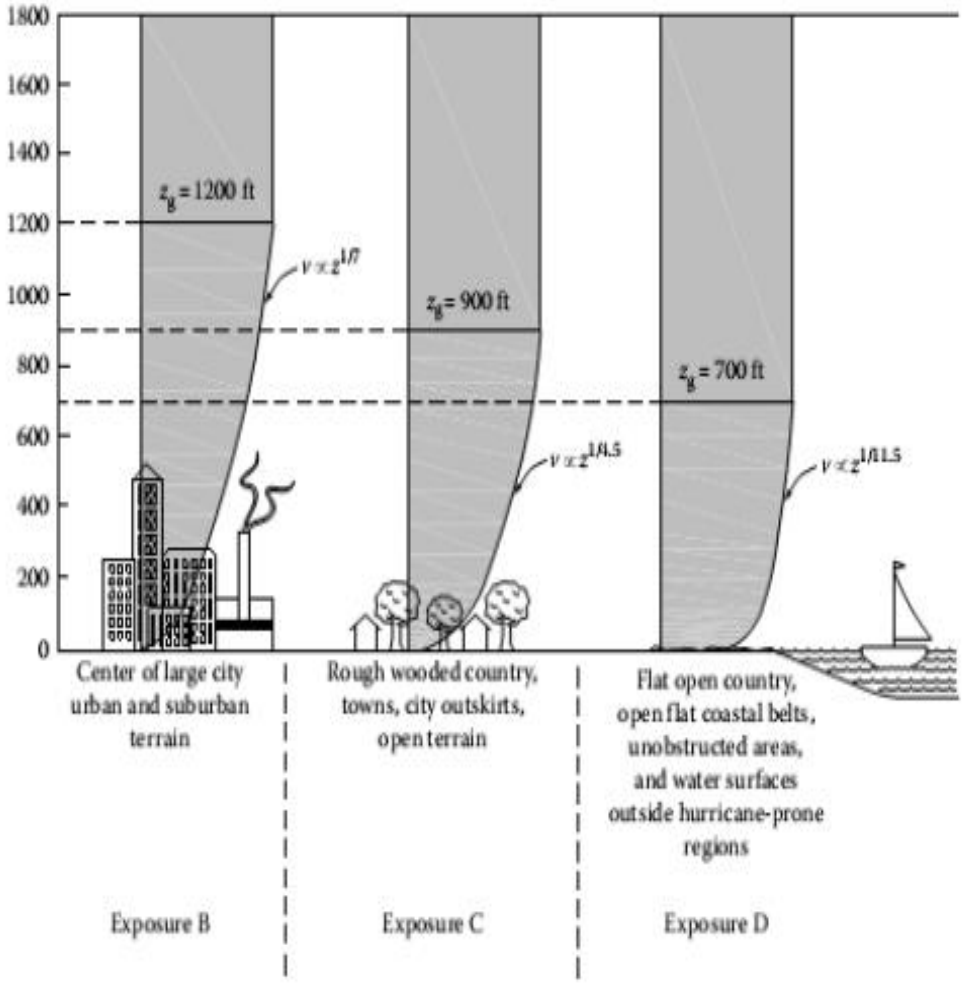


FIGURE 4.2 Wind velocity profiles as defined in the ASCE 7-05. Velocity profiles are determined by fitting curves to observed wind speeds.

ملحق (8)

Hurricane or non-hurricane prone regions

Category	Non-Hurricane Prone Regions and Hurricane Prone Regions with V = 85-100 mph and Alaska	Hurricane Prone Regions with V > 100 mph
I	0.87	0.77
II	1.00	1.00
III	1.15	1.15
IV	1.15	1.15

Note:

1. The building and structure classification categories are listed in Table 1-1.

ملحق (9)

جدول يوضح قيم معاملات ضغط السرعة حسب منطقة التعرض

Velocity Pressure Exposure Coefficients, K_h and K_z

Table 29.3-1

Height above ground level, z		Exposure		
		B	C	D
ft	(m)			
0-15	(0-4.6)	0.57	0.85	1.03
20	(6.1)	0.62	0.90	1.08
25	(7.6)	0.66	0.94	1.12
30	(9.1)	0.70	0.98	1.16
40	(12.2)	0.76	1.04	1.22
50	(15.2)	0.81	1.09	1.27
60	(18)	0.85	1.13	1.31
70	(21.3)	0.89	1.17	1.34
80	(24.4)	0.93	1.21	1.38
90	(27.4)	0.96	1.24	1.40
100	(30.5)	0.99	1.26	1.43
120	(36.6)	1.04	1.31	1.48
140	(42.7)	1.09	1.36	1.52
160	(48.8)	1.13	1.39	1.55
180	(54.9)	1.17	1.43	1.58
200	(61.0)	1.20	1.46	1.61
250	(76.2)	1.28	1.53	1.68
300	(91.4)	1.35	1.59	1.73
350	(106.7)	1.41	1.64	1.78
400	(121.9)	1.47	1.69	1.82
450	(137.2)	1.52	1.73	1.86
500	(152.4)	1.56	1.77	1.89

Notes:

1. The velocity pressure exposure coefficient K_z may be determined from the following formula:

   For $15 \text{ ft.} \le z \le z_g$ $\quad K_z = 2.01\,(z/z_g)^{2/\alpha}$

   For $z < 15$ ft. $\quad K_z = 2.01\,(15/z_g)^{2/\alpha}$

2. α and z_g are tabulated in Table 26.9.1.
3. Linear interpolation for intermediate values of height z is acceptable.
4. Exposure categories are defined in Section 26.7.

ملحق (10)

شكل يوضح كيفية الحصول على معامل الطبوغرافية

Topographic Factor, K_{zt} – Method 2

Figure 6-4 (cont'd)

Equations:

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

K_1 determined from table below

$$K_2 = \left(1 - \frac{|x|}{\mu L_h}\right)$$

$$K_3 = e^{-\gamma z / L_h}$$

Parameters for Speed-Up Over Hills and Escarpments

Hill Shape	$K_1/(H/L_h)$			γ	μ	
	Exposure				Upwind of Crest	Downwind of Crest
	B	C	D			
2-dimensional ridges (or valleys with negative H in $K_1/(H/L_h)$	1.30	1.45	1.55	3	1.5	1.5
2-dimensional escarpments	0.75	0.85	0.95	2.5	1.5	4
3-dimensional axisym. hill	0.95	1.05	1.15	4	1.5	1.5

ملحق (11)

نتائج تصميم حائط القص Pier2 للطابق (1) في البرجين

ETABS 2015 Shear Wall Design

BS 8110-97 Pier Design

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
Story1	P2	9700	-7500	8000	250	0.4

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
24855.58	30	1	413.69	413.69

Design Code Parameters

γ_c	γ_s	γ_m	IP_{MAX}	IP_{MIN}	P_{MAX}
1.5	1.15	1.25	0.04	0.004	0.8

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	7700	-25000	11700	-25000	4000	250
Top	Leg 2	7700	10000	11700	10000	4000	250
Bottom	Leg 1	7700	-25000	11700	-25000	4000	250
Bottom	Leg 2	7700	10000	11700	10000	4000	250

Flexural Design for N, M_3 and M_2

Station Location	Required Rebar Area (mm^2)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	N kN	M_3 kN-m	M_2 kN-m	Pier A_g mm^2
Top	51736	0.0259	0.0073	DStlS10	32224.566	4221.3228	-15768.176	2000000
Bottom	56417	0.0282	0.0073	DStlS10	32422.4982	4232.4832	-17387.9813	2000000

Shear Design

Station Location	ID	Rebar mm^2/m	Shear Combo	N kN	M kN-m	V kN	V_c kN	V_{Reqd} kN
Top	Leg 1	277.99	DStlS10	15991.3968	3035.6981	67.6937	1315.2534	1635.2534
Top	Leg 2	277.99	DStlS9	16233.1692	10936.4128	472.5038	2055.3436	2375.3436
Bottom	Leg 1	277.99	DStlS10	16090.3619	3238.7793	67.6937	1294.7677	1614.7677
Bottom	Leg 2	277.99	DStlS9	16332.1343	11753.9241	472.5038	1909.8315	2229.8315

الملحق(12)

نتائج تصميم حائط القص Pier2 للطابق (11) في البرجين

ETABS 2015 Shear Wall Design

BS 8110-97 Pier Design

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
Story11	P2	9700	-7500	8000	250	0.4

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
24855.59	30	1	413.69	413.69

Design Code Parameters

γ_c	γ_s	γ_m	IP_{MAX}	IP_{MIN}	P_{MAX}
1.5	1.15	1.25	0.04	0.004	0.8

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	7700	-25000	11700	-25000	4000	250
Top	Leg 2	7700	10000	11700	10000	4000	250
Bottom	Leg 1	7700	-25000	11700	-25000	4000	250
Bottom	Leg 2	7700	10000	11700	10000	4000	250

Flexural Design for N, M_3 and M_2

Station Location	Required Rebar Area (mm^2)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	N kN	M_2 kN-m	M_3 kN-m	Pier A_g mm^2
Top	8000	0.004	0.0073	DStD2	17980.005	2427.244	-1297.951	2000000
Bottom	8000	0.004	0.0073	DStD2	19121.4337	2449.0387	-1256.6485	2000000

Shear Design

Station Location	ID	Rebar mm^2/m	Shear Combo	N kN	M kN-m	V kN	V_u kN	V_{MAX} kN
Top	Leg 1	277.99	DStSS	10900.958	298.1749	35.1964	1743.3219	2063.3219
Top	Leg 2	277.99	DStSS	10564.7411	-4074.3276	177.172	1253.9253	1573.9253
Bottom	Leg 1	277.99	DStSS	10869.6231	412.764	35.1964	1750.9906	2070.9906
Bottom	Leg 2	277.99	DStSS	11063.7062	-4605.9436	177.172	1155.5903	1475.5903

ملحق (13)

نتائج تصميم حائط القص Pier2 للطابق (21) في البرجين

ETABS 2015 Shear Wall Design

BS 8110-97 Pier Design

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
Story21	P2	9700	-7500	8000	250	0.4

Material Properties

E_c (MPa)	f'_{cu} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
24855.58	30	1	413.69	413.69

Design Code Parameters

γ_m	γ_s	γ_M	P_{MAX}	P_{MIN}	P_{MAX}
1.5	1.15	1.25	0.04	0.004	0.8

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	7700	-25000	11700	-25000	4000	250
Top	Leg 2	7700	10000	11700	10000	4000	250
Bottom	Leg 1	7700	-25000	11700	-25000	4000	250
Bottom	Leg 2	7700	10000	11700	10000	4000	250

Flexural Design for N, M_2 and M_3

Station Location	Required Rebar Area (mm^2)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	N kN	M_2 kN-m	M_3 kN-m	Pier A_g mm^2
Top	8000	0.004	0.0073	DstlD2	9350.8007	1288.3785	-895.8458	2000000
Bottom	8000	0.004	0.0073	DstlD2	9492.1794	1288.0596	-857.3264	2000000

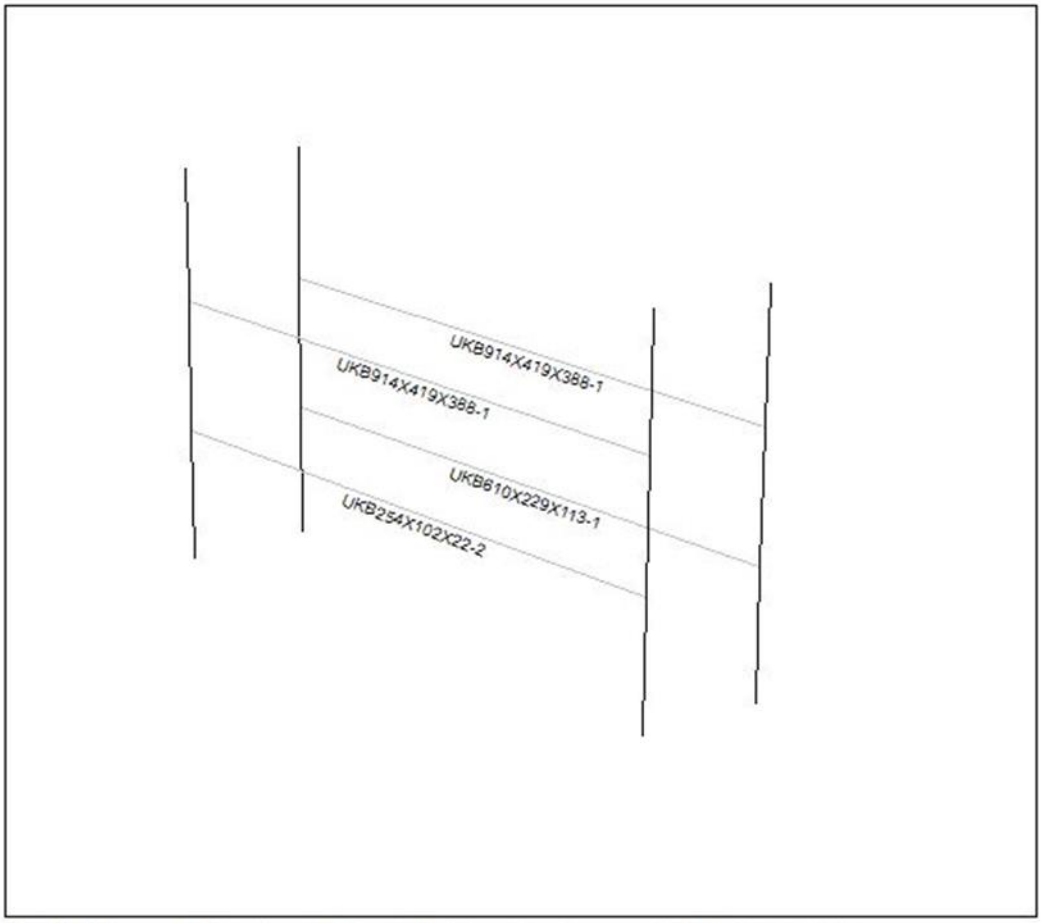
Shear Design

Station Location	ID	Rebar mm^2/m	Shear Combo	N kN	M kN-m	V kN	V_c kN	V_{max} kN
Top	Leg 1	277.99	DstlS9	5810.5184	316.3744	47.172	1278.1778	1598.1778
Top	Leg 2	277.99	DstlS9	5696.3094	884.8437	76.9298	1287.2328	1607.2328
Bottom	Leg 1	277.99	DstlS9	5709.4835	174.8583	47.172	1288.6177	1608.6177
Bottom	Leg 2	277.99	DstlS9	5795.2745	1115.8331	76.9298	1105.7369	1425.7369

ملحق(14)

نتائج تصميم الابيام الرئيسية في الفرنديل

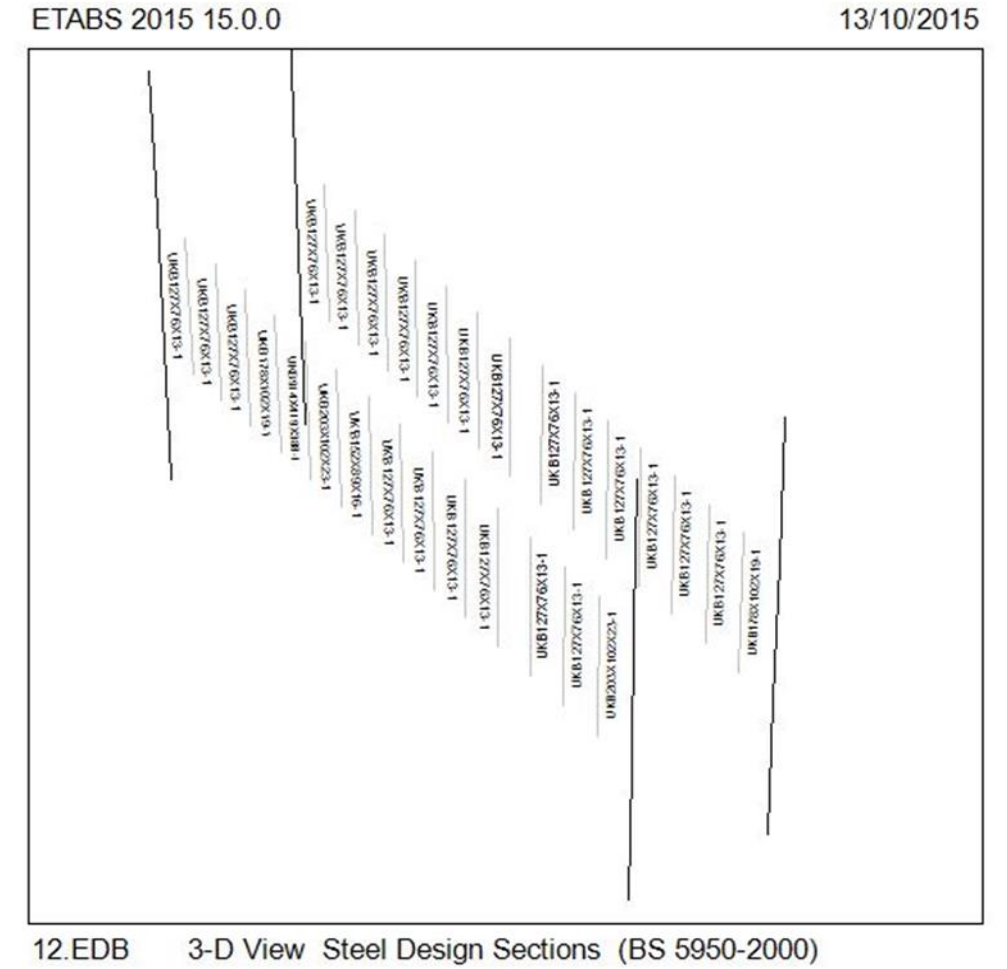
ETABS 2015 15.0.0 13/10/2015



12.EDB 3-D View Steel Design Sections (BS 5950-2000)

ملحق (15)

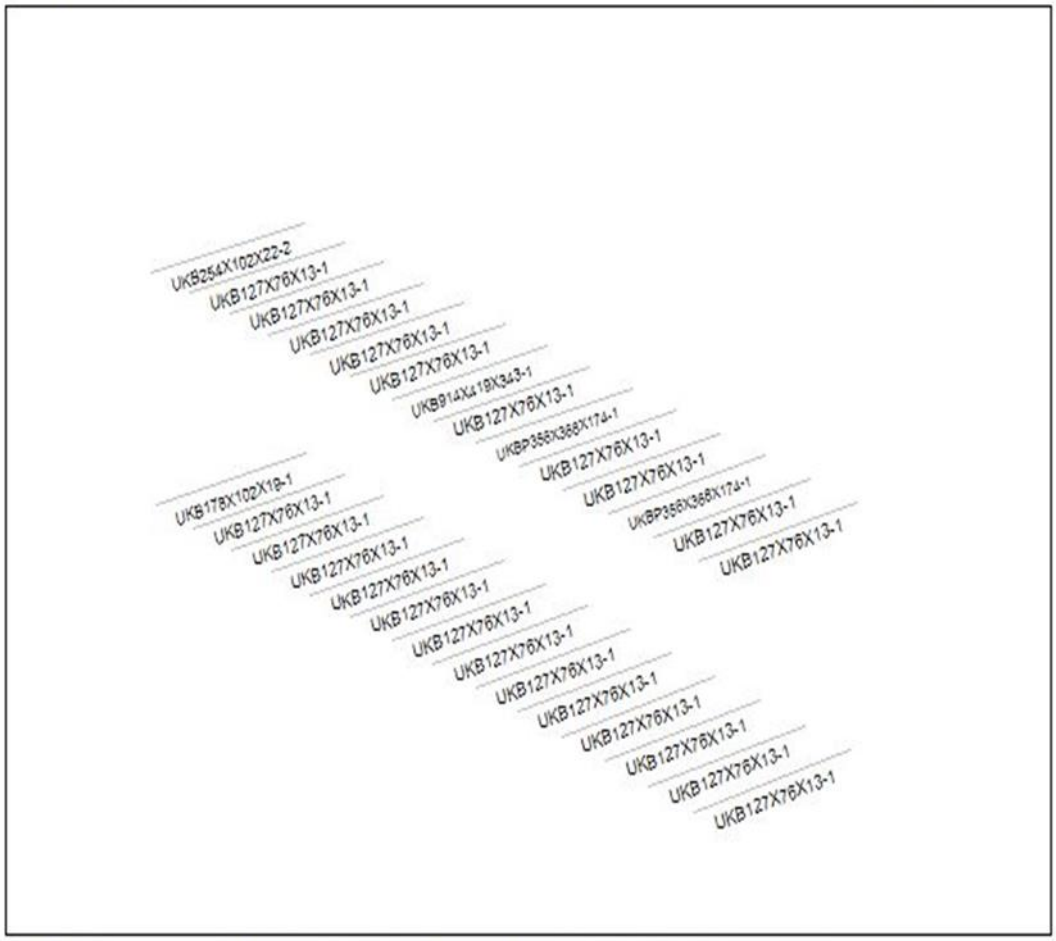
نتائج تصميم الابيام الثانوية (الرأسية) في الفرنديل



ملحق (16)

نتائج تصميم الابيام الثانوية (الأفقية) في الفرنديل

ETABS 2015 15.0.0 13/10/2015



12.EDB 3-D View Steel Design Sections (BS 5950-2000)