

S I P O R E X
B l o c k sAerated Concrete
Products

Optimum Structure for Hot Regions

- Thermally Insulant Blocks
- Thermally Insulant Roof Tiles
- Hordi Blocks
- Steel Reinforced Precast Units



1. INTRODUCTION

Siporex is lightweight Autoclaved Aerated Concrete (AAC) manufactured from the same components as conventional concrete: cement, sand and water in addition to aluminum powder and other additives.

The product is available as blocks with different dimensions and precast reinforced units, i.e., wall panels, lintels and floor/roof slabs forming a complete building system.

A villa of one or two storeys can easily be constructed using Siporex blocks, floor and roof slabs, and lintels without the need of reinforced concrete main frame.

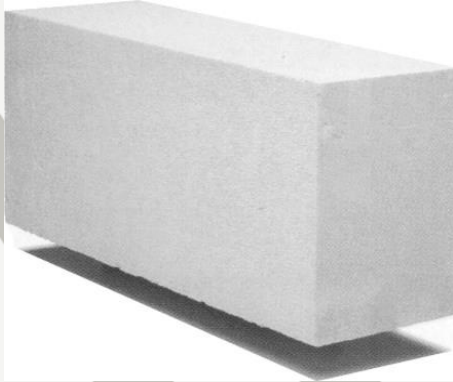
Industrial production of this versatile building material was started in 1929 and it has been produced and used for building construction ever since.

First in Europe and now world-wide. Here in the Kingdom of Saudi Arabia, Lightweight Construction Company. Ltd. (LCC-Siporex) was established in 1976 and has been producing Siporex AAC material at our plant in the Second Industrial Estate, AlKharj Road. With our continued expansion of additional manufacturing plant to sustain the growing demand, our current total production capacity has intensified to about 350,000 cubic meters of Siporex AAC products per year.



Siporex Manufacturing Plant and Head Office in Riyadh, Saudi Arabia

2. CODES & STANDARDS



Various international codes and standards had been developed to provide engineers and designers with provisions for the analysis and design of AAC factory-produced blocks and reinforced panels based on various research studies and experiences on its use. These include guidelines or recommended practice addressing the materials, manufacture and structural design of AAC including design considerations such as erection and construction details incorporating the use of AAC products in conventional construction. Some of these Codes & Standards are listed below:

CODE OR STANDARD	DESIGNATION NO.	DESCRIPTION
ACI	ACI 523.2R	Guide for Low Density Precast Concrete Floor, Roof and Wall Units
ASTM	C1555-03A	Standard Practice for Autoclaved Aerated Concrete Masonry
ASTM	C1386-98	Standard Specification for Precast Autoclaved Aerated Concrete Wall Construction Units
DEUTCH NORM	DIN 4165	Autoclaved Aerated Concrete Blocks
BRITISH STANDARD	BS 8110 – Part 2, Section Six	Autoclaved Aerated Concrete
BRITISH STANDARD	BS EN 771-4:2001	Autoclaved Aerated Concrete Masonry Units
BRITISH STANDARD	BS EN 678:1994	Determination of the Dry Density of Autoclaved Aerated Concrete
BRITISH STANDARD	BS EN 679 :1994	Determination of the compressive Strength of Autoclaved Aerated Concrete
BRITISH STANDARD	BS EN 680: 1994	Determination of the Drying Shrinkage of Autoclaved Aerated Concrete
BRITISH STANDARD	BS EN 772-10:1999	Method of test for Masonry Units
BRITISH STANDARD	BS EN 1353:1997	Determination of Moisture Content of Autoclaved Aerated Concrete
SASO	SASO 1579	Precast Autoclaved Aerated Concrete
SWEDISH BUILDING CODE		Autoclaved Aerated Concrete Products
COUNCIL OF AMERICAN BUILDING OFFICIALS		Design Procedure for Siporex Roof, Floor, Wall Panels, Masonry Blocks and Lintels of Autoclaved Lightweight Cellular Concrete(Report # NER-297)
RILEM		Autoclaved Aerated Concrete

3. MANUFACTURING

Siporex is produced by a highly complex and advanced manufacturing process in our factory under the careful control of chemists and engineers. Siporex is made either as steel reinforced panels using moulds 6 meters long, 1.5 meters wide and 600 mm deep or as non-reinforced blocks using moulds 6 meters long, 1.5 (or 1.2) meters wide and 600 mm deep.



The basic raw materials are sand, water, aluminum powder and cement. The sand is ground to required fineness in a ball mill before mixing with other raw materials with water to form slurry to which a trace of aluminum powder is added as expanding agent.



Regulated amount of aluminum powder gives accurate control of density of the final product. Moulds are only partly filled with slurry which then expands in a controlled reaction to fill the moulds.



When the mass is sufficiently hard, the moulds are stripped and the cake is wire-cut to close tolerances into blocks using high precision cutting technology.

These are then steam cured under high pressure in autoclaves for up to 15 hours.



This completes the chemical process, resulting in a unique crystal structure of calcium silicate hydrate and ensuring a stable and inert product giving AAC outstanding qualities not found in other products.



After cooling to ambient temperature, the batches are demoulded, and stacked for further handling and storage.

The block stacks are strapped, marked and stored on wooden pallets. Each pallet can be stored with up to 3 bundles of blocks (180 cm high).



At the storage area, the floor should be level to avoid tilting of stacks.



The manufacturing of Aerated Lightweight Concrete as blocks by LCC Siporex implements and maintains a Quality Management System which fulfills the requirements of [ISO 9001:2015](#).

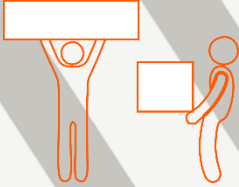
For final products, compressive test, shrinkage and dry densities are carried out on a daily basis.



The finished goods inspection program ensures the products quality. The material is now ready for loading and delivery

4. PROPERTIES & BENEFITS OF USING SIPOREX

The manufacturing process as well as the basic ingredients used provide Siporex its unique properties and benefits not found in other traditional building materials and will radically change the construction practices in this industry.

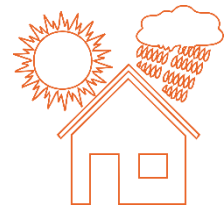


Lightweight

Siporex products are supplied with nominal dry density of 550 kg/m³ and weigh less than a quarter compared to conventional concrete. Other densities such as 450 or 600 kg/m³ can also be produced upon request. Due to the lightweight property of Siporex, foundation loads are greatly reduced resulting to big savings in the overall cost. Its light weight also means significant advantage in transportation cost.

Energy Efficient

Siporex ensure comfortable room temperature without the need for additional insulation. Its thermal insulation and heat retention offer a good protection against rapid cooling or heating up too much. This means lower power consumption in environmental management system. With a thermal conductivity ("k" value) of 0.144 W/m°C, it is the only structural materials classified by SCECO as insulating material.

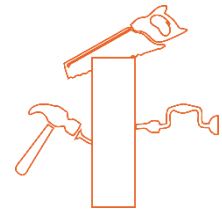


Strength

In relation to its dry density, Siporex can withstand relatively high compressive stress, which in the aspect of application is very sufficient to take building loads. Siporex achieves its full strength during autoclaving process. Minimum compressive strength is about 35 kg/cm² for nominal dry density of 550 kg/m³.

Workability

Siporex products can be sawn, cut, slot, drilled, chased and nailed with ordinary woodworking tools which makes them easier to install than other building materials. This also simplifies the installation of electro-mechanical services and other utilities, which means more cost savings.



Resistance to Fire

Siporex has remarkable fire resistance properties and is non-combustible. Heat migration takes place at a slow rate due to its low thermal conductivity, giving Siporex excellent fire resistance. A 15 cm thick panel will resist fire for seven life-saving hours. Siporex is ideal for firewall application and as protection for structural steel construction.

Acoustic Insulation

Siporex meets the appropriate standards for sound insulation in house building, which means quieter and more comfortable interior. In industrial construction, Siporex minimizes industrial noise pollution. The sound absorption of untreated Siporex surface is better than that of dense concrete. A 20 cm thick Siporex wall with 3mm surface finish will have STC rating of about 48 dB.

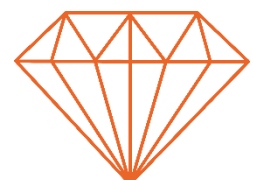


Non-toxic

Siporex itself is ecologically harmless, since it neither contains gases nor fibers, it is neither dangerous to ground-water nor does it releases any radioactive radiation. No pollutants or toxic by-products are produced in the manufacturing process or even when subjected to fire.

Durability

Siporex products do not contain any organic matter subject to deterioration and will not degrade even under severe weather conditions. Structures built several decades ago are still in active use today.



5. PRODUCT DATA

5.1 Product Application & Characteristic Data

Siporex solid blocks are used as load-bearing and non load-bearing walls and as thermally insulating roof tiles in addition to being used as Hordi blocks or infills for ribbed slabs. The production process guarantees the accurate dimensions with slim tolerance of $\pm 3\text{mm}$ for thickness & width and $\pm 5\text{mm}$ for length. This allows for a straight and plumb walls resulting in less on-site trimmings and reduces the quantity of mortar and finishing materials required.

5.2 Masonry Blocks Dimensions

For the past decades, LCC Siporex had been supplying AAC blocks with a standard face size of 25 cm high x 60 cm long only in various thicknesses. However, due to the increasing demand and growing popularity of the use of AAC blocks, LCC Siporex have started the production of new dimensions of blocks in line with the continued expansion of additional manufacturing plant to sustain the market requirements. Siporex blocks are now produced at the following standard sizes:

Standard face size: **25 cm high x 60 cm long:**

Standard face size: **20 cm high x 60 cm long:**

Thickness: **10, 15, 20, 25 and 30 cm**

Thickness: **10, 15, 20, 30 and 40 cm**

5.3 Hordi Blocks

Hordi blocks or infill blocks for ribbed slabs can be produced in various dimensions to form lightweight infill between in-situ reinforced concrete ribs designed to span in one or both directions. Due to their excellent bondage to in-situ concrete, Siporex Hordi blocks are easily arranged to form permanent part of the slab, providing excellent thermal insulation as well as fire resistance material. Hordi blocks are produced with density of 450 kg/m³ according to the following dimensions:

Length : 60 cm

Width : 37/38 cm or 40 cm

Thickness : 20, 25, 30, 35 cm



Hordi blocks application

Other sizes may be produced upon request only. Hordi blocks are not available in stock and are manufactured against order only.

5.4 Thermal Insulating Tiles

Roof insulation of existing conventional roof can still be improved with the use of Siporex thermal insulating tiles available at the following dimensions:

60 x 60 x 7.5 cm

60 x 25 x 7.5 cm

60 x 25 x 5 cm

Other dimensions can be produced upon request.



5.5 Box Type Lintels (LB)

Box type lintels are designed with special steel reinforcement arrangement produced with depth equal to the height of Siporex blocks for ease of construction. This eliminates shuttering and cast-in-situ works as well as avoids thermal bridges caused by the use of traditional concrete lintels.

5. PRODUCT DATA

5.6 Maximum Clear Span of Box Type Lintels with Various Design Loads (Height = 25 cm)



Design Load	Thickness of Box Type Lintel (cm)			
	10	15	20	25
500 kg/m	200 cm	350 cm	360 cm	360 cm
1000 kg/m	150 cm	250 cm	260 cm	265 cm
1500 kg/m	75 cm	200 cm	210 cm	210 cm

5.7 Packing Data for Siporex Blocks

Siporex blocks are delivered ready for use and packed in easily transportable wooden pallets. The pallets should be unloaded at the site by construction-site cranes, forklifts or other suitable hoisting equipments. For ease in unloading of materials, it is suggested to order Siporex blocks in whole bundle or pallet volume to avoid handling loose quantities. Following table is an easy reference in making order of some standard sizes of Siporex blocks in bundles or pallets.



Block Dimensions	No. of Blocks per m ³	No. of Blocks per m ²	No. of Blocks per Bundle	No. of Bundle per Pallet	m ³ per Bundle	m ³ per Pallet
10 x 25 x 60 cm	66.66	6.67	75	2	1.125	2.25
15 x 25 x 60 cm	44.44	6.67	50	3	1.125	3.375
20 x 25 x 60 cm	33.33	6.67	35	3	1.05	3.15
25 x 25 x 60 cm	26.66	6.67	30	3	1.125	3.375
30 x 25 x 60 cm	22.22	6.67	25	3	1.125	3.375
10 x 20 x 60 cm	83.33	8.33	72	3	0.864	2.592
15 x 20 x 60 cm	55.55	8.33	48	3	0.864	2.592
20 x 20 x 60 cm	41.67	8.33	36	3	0.864	2.592
30 x 20 x 60 cm	27.78	8.33	24	3	0.864	2.592
40 x 20 x 60 cm	20.83	8.33	18	3	0.864	2.592
SIPOREX ROOF TILES:						
5 x 25 x 60 cm	133.33	6.67	150	2	1.125	2.25
7.5 x 25 x 60 cm	88.89	6.67	100	2	1.125	2.25
7.5 x 60 x 60 cm	37.04	2.78	40	3	1.08	3.24
SIPOREX HORDI BLOCKS:						
20 x 37/38 x 60 cm	22.22	4.44	21	3	0.945	2.835
20 x 40 x 60 cm	20.83	4.17	18	3	0.864	2.592
25 x 37/38 x 60 cm	17.78	4.44	18	3	1.013	3.038
30 x 37/38 x 60 cm	14.81	4.44	15	3	1.013	3.038
30 x 40 x 60 cm	13.89	4.17	12	3	0.864	2.592
35 x 37/38 x 60 cm	12.70	4.44	12	3	0.945	2.835

6. INSTALLATION / FINISHES

6.1 Block Laying

The first course should be laid on cement-mortar bed of thickness about 1 to 3 cm depending on the evenness of the base and should maintain a correct level for fast installation progress in the following courses. It is recommended to spray the mortar face of the block before installation to keep damp at erection time especially during the hot seasons. After installation, spray with water twice a day for 3 consecutive days for curing of the mortar.



Three types of Mortars can be applied on the succeeding courses:

6.1.1 Siporex Glue (for thin joints):

Pre-mixed mortar – only water is to be added. Thickness of glue should not exceed 3 mm in horizontal and vertical joints in order to achieve the ideal consumption rate of 50 to 60 kg. of glue per cubic meter of blocks.

6.1.2 Ordinary Mortar with Gesol

1:6 Cement : Sand respectively in addition to water (with 10% of Gesol). The erection can be carried out normally as for conventional blocks. (Gesol is a liquid material used as bonding agent and retardant for the mortar especially during hot weather. Gesol is available at Siporex factory in 25 kg plastic containers).

6.1.3 Ordinary Mortar with Lime:

1:1:10 Cement : Lime : Sand

6.2 Plastering of Siporex Block Wall

Before plastering, dirt and loose particles should be removed from walls. Spray walls with water and follow one of the two methods mentioned below:

6.2.1 Traditional Plastering:

Similar to plastering of conventional block walls with the following mix:

- Splattering (3mm): Use 1 cement : 3 sand mixed with solution of water and Gesol (20% of the volume). Spray with water twice a day.
- Ordinary Plastering Mortar: (1 – 1.5 cm thick, apply 24 hours after the splattering)
 Use 1 cement : 6 sand mixed with solution of water and Gesol (10% of volume).



6.2.2 Plastering with Pre-mixed Mortar

Water is added to the pre-mixed plaster supplied in bags of 25 and 50 kgs. Surfaces should be thoroughly cleaned and wetted without any splattering. Apply plaster directly with a thickness ranging between 0.5 to 1 cm.

In both above methods, walls should be watered twice a day after plastering for three consecutive days.

6. INSTALLATION / FINISHES

6.3 Bolts and Fixings

Special types of fixings can be used with Siporex structures such as galvanized cut nails, bolt fastenings and wall plugs. The type of anchoring method to be used depends on the holding capacity required. These types of fixings are used in installation of doors and windows, as well as wall accessories with weights not exceeding the allowable loads of the type of fixing used. Ordinary wire nails should not be used since their anchoring ability to Siporex is low.

Through-bolts should be used in case of heavy fixtures such as water heater and hanging lavatories. Some of the types of fixings and anchors suitable for use with Siporex AAC materials are as follows:

Galvanized Cut Nails

Galvanized Cut Nails comes in different lengths and are available at our Siporex Factory. Cut nails are hammered directly into Siporex walls and do not need to be pre-drilled. They can be used to fasten light to moderate weight items to Siporex.



Hilti HGN Anchors

HGN Gas Concrete Anchors, manufactured by Hilti Company is a Cadmium-free Polyamide anchor especially suitable for AAC concrete base. Available in various sizes, it provides high pressure per unit of area.

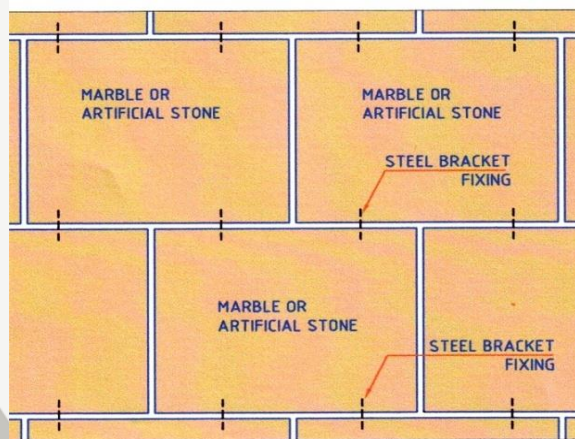


Fischer Anchors

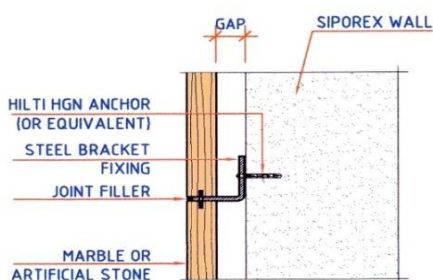
Also available with plastic plugs suitable for light to medium weight fixings in aerated concrete. It has fins providing grip as well as resistance to rotation. This type is also available in various sizes to suit the particular needs.



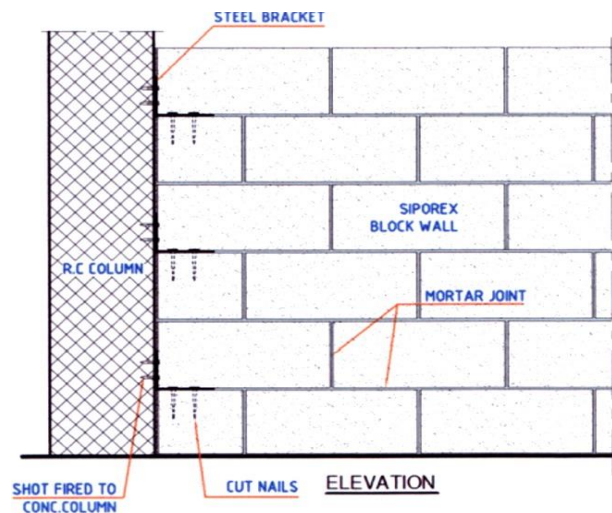
6.4 Cladding with Marble or Artificial Stone



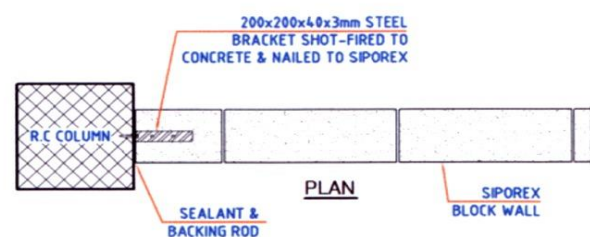
ELEVATION



6.5 Connection with dissimilar material



ELEVATION



PLAN

7. LIST OF SOME PROJECTS

No.	Client / Contractor	Name of Project	Location	Year
1.	Saudi Petrochemical Co.	136 Housing Units	Jubail	1987
2.	A.K. Group	Aziziyah Housing 208 Villas	AlKhobar	1992
3.	ABV Rock Group	SSSP Residential Cmpd 320 Units	Diff. Sites	1992
4.	Kimma Construction	Yanpet Housing Project 200 Villas	Yanbu	1993
5.	ABV Rock Group	ABV Compound	Jeddah	1993
6.	A. K. Group	Tabuk Gardens Village – 60 villas	Tabuk	1994
7.	Sata Engineering	Blocks	Taiwan	1994
8.	Saudi Real Estate Co.	D.Q. Housing Project	Riyadh	1994
9.	M.S. AlSuwaidi Cont. Est.	Yanpet Housing Proj. Ph. II 300 Villas	Yanbu	1994
10.	AMERAB-ECO- Tawam	89 Villas & B. Walls	AbuDhabi	1995
11.	AlMobti for Trad. & Cont.	273 Villas Compound	Djibouti	1996
12.	A.K. Group	R.S.L.F. Housing	Tabuk	1996
13.	International Center Co.	YCC – 40 Villas	Yanbu	1997
14.	C C C (ARAMCO)	Residential & Industrial Compound	Shaybah	1997
15.	Gen. Presidency for Girls Educ.	16 Colleges Buildings	Diff. sites	1997
16.	Developed Building Co.	Landmark Shopping Mall Proj.	Qatar	1999
17.	Developed Bldg. Co.	Al Ittihad & Al Rayyan Stadiums	Qatar	2001
18.	Saudi Wiemer & Tracte	Al Rashid Village 2	Alkhobar	2001
19.	Saudi Binladin Group	King Abdullah Multi-storey Hotel	Madinah	2001
20.	Abdullatif AlIssa Group	Al Issa Compound	Riyadh	2003
21.	Al Marasem Contg.	Residential Compound	Shouaiba	2003
22.	Al Mashrab Co.	Abha University	Abha	2004
23.	Al Ali Engineering	250 Villas	Qatar	2004
24.	Al Ali Engineering	Villaggio	Qatar	2004
25.	King Abdullah Foundation	2,500 villas – Dev. Housing Project	Diff.sites	2004-2006
26.	EMECO	Al Amar Gold Mine – Housing	Quayyiah	2004
27.	Al Ma'awdah Const.	25 Villas	Bahrain	2006
28.	Saudi Binladin Group	Al Haram Shopping Center	Madinah	2007
29.	Al Ali Engineering	The Pearl Qatar	Qatar	2007
30.	Makkah Co.	Supply of Blocks	Kuwait/Iraq	2007
31.	Al Mabda	Rezayat Housing Compound	Jubail	2007
32.	Sinoma	Hofuf Cement Factory	Hofuf	2007
33.	Al-Marasem Co.	Charity Housing	Diff. sites	2007
34.	Al-Othman Agri. Prod.	Housing Compound	Hofuf	2008
35.	Danash Co.	Al Jouf Cement Factory – Housing	Turaif	2008
36.	S.M.A. Proj. & Devt. Co.	Khartoum College of Med. Science	Sudan	2008
37.	Al-Rashid Co.	Al-Rashid Mall Extension	Al-Khobar	2008
38.	AlFonar Co.	Many substations	Diff. Locations	2008
39.	Saudi Binladin Group	“KAUST” Central Services	Thuwal	2008
40.	Azmeel Contg.	700 villas for Royal Commission Housing	Jubail	2009
41.	Al Mabani Gen. Cont.	Power Plant Project (PP10)	Riyadh	2009
42.	Al-Refae Co.	SWCC Housing Project	Diff. sites	2009
43.	King Saud University	460 Villa Extensions	Riyadh	2010
44.	Nesma Co.	Olaya Towers	Riyadh	2011
45.	Drake & Scull	Jawhara Tower	Jeddah	2011
46.	D.C.C.	Burj Rafal	Riyadh	2012
47.	Azmeel Corporation	Royal Commission 400 villas	Jubail	2012
48.	Azmeel Corporation	GOSI Housing Project	Jubail	2012
49.	Huta Marine	King Abdullah Economic City	Rabigh	2012
50.	Al-Arrab / CCC	Substation	Ras Al-Khair	2012
51.	REDCO	Qatar Airways Housing	Qatar	2012
52.	Rezaik Al-Gedrawi	King Abdullah Housing Project	Najran	2012
53.	Al Marasem	King Abdullah Housing Project	Wadi Hayat	2012

7. LIST OF SOME PROJECTS

No.	Client / Contractor	Name of Project	Location	Year
54.	Al-Hokair Co.	Hotel	Jizan	2012
55.	Gulf Elite Co.	Shaybah RIC Expansion Project	Shaybah	2013
56.	Huta Marine	Housing Compound	Rabigh	2013
57.	Go Green International	Schools & Malls	Qatar	2013
58.	Saudi Archirodon	RSF Houses	Jeddah	2013
59.	MARCO & GS	Imam University Buildings	Riyadh	2013
60.	Different Contractors	Girls Technical Colleges	Diff. locations	2013
61.	Ansaq Co.	Al Hajj Ministry – 5 buildings	Mina	2013
62.	Military Hospital	Labour Housing	Riyadh	2013
63.	Enteria Arabia	Special Forces Security Buildings	Riyadh	2014
64.	Ewaan Real Estate	Al-Fareeda Housing	Jeddah	2014
65.	Saudi Gap	Staff Accommodation	Jubail	2014
66.	Rowwad Al-Maseel	Housing Compound	Riyadh	2014
67.	Al-Fanar	SWCC Yanbu-3 S/S & Power Plant	Yanbu	2014
68.	Ewaan Real Estate	Limas Housing Project	Jubail	2015
69.	Monsha'at Al Mostaqbal	MODA Project	Rania/Hareeq	2015
70.	Go Green International	Indoor Arena	Qatar	2015
71.	Go Green International	LuLu Hypermarket	Qatar	2015
72.	National Aquaculture Co.	Farm 205 & 206 Accommodations	Al Leith	2015
73.	Go Green International	Staff and Labor Accommodations	Qatar	2015
74.	Saudi Archirodon	Al Salama Compound	Jeddah	2015
75.	MOBCO	Ready-Built Factory Buildings	Riyadh	2016
76.	Al-Kifah for Contracting	Defense Force Project, Phase 1	Jubail	2016
77.	Retail Real Estate Co.	Majma'ah Mall	Majma'ah	2016
78.	Maher Hassan Al Magamsi	Tamr Factory	Jeddah	2016
79.	Unicorp	PP-12, Warehouse	Durma	2016
80.	Al-Hussan Const.	School Extension	Jubail	2016
81.	Sinohydro Corp.	Shaybah Residential Building	Shaybah	2016
82.	Go Green International	Doha Oasis	Qatar	2016
83.	Ishada Contracting	Sugar Refinery	Jeddah	2016
84.	Distinguished Brothers	Karan Hotel	Waad Al Shammal	2017
85.	Azmeel Contracting Co.	Aramco – South Dhahran Home Ownership Prog.	Dhahran	2017
86.	MODON	Ready-Built Factories	32 diff. Places	2017
87.	Al Raidah Co.	Sendex Warehouses	Riyadh/Jeddah	2017
88.	Fast Contracting	Jeddah Airport	Jeddah	2017
89.	Al Rajhi Saudi Group	Labour Accommodations	Jeddah	2017
90.	Waleed Abu-Shawish	Arabian Oud Warehouse	Riyadh	2018
91.	Engineering Union Est.	Charity Housing	Umluj/Jizan	2018
92.	Prime Technical	Masif – RBF	Jeddah	2018
93.	Al Bawani Contg. Co.	Sharma Complex	Sharma	2018
94.	Tareg Al-Jaafari Contg.	Worker's Camp	Dammam	2018
95.	MODON	1200 Ready-Built Factories	32 diff. Places	2019
96.	Ministry of Housing	192 Villas	Ah-Ahsa	2019
97.	Ministry of Housing	959 Villas	Dammam	2019



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