



Universal Construction
***Xypex* Projects in Ethiopia (2000 – 2002)**

UNIVERSAL CONSTRUCTION *Private Limited Company*

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FOREWORD

Since 1996, we have been using *Xypex* to solve a wide range of waterproofing problems and have undertaken numerous projects in Ethiopia. As a result of the increasing demand for the product, the total volume of *Xypex* works executed from 2000 to 2002 has been 130% higher than that from 1996 to 1999. This increase in work volume is testimony to our claim that *Xypex* now enjoys a sizeable share of the local waterproofing market.

We attribute the success of *Xypex* in Ethiopia to:

- (i) the fact that all *Xypex* applications are done by our own trained employees whose numbers are continually growing in response to increasing demand. This has given us close control over the product's application and enabled us to prevent eventualities due to application errors.
- (ii) the dedication and commitment of our crews to prudent application techniques, curing procedures, and follow up on the performance of *Xypex* on past projects. Our *Xypex* crews, having faced all sorts of challenging waterproofing problems, and having learnt from their past experiences, have now fully mastered the product's application, and its behaviour and performance under varying conditions of climate, application techniques, concrete quality, etc.
- (iii) the levels of support and feedback that we have enjoyed from the manufacturers in the United Kingdom and in Canada that have helped us build our confidence in both the product and the management that operates *Xypex*.

This project book, *Xypex Projects in Ethiopia (2000 – 2002)*, is our second publication, and like the first one, *PROJECTS IN ETHIOPIA (1996 – 1999)*, is intended to outline sample *Xypex* waterproofing projects undertaken from 2000 to 2002.

UNIVERSAL CONSTRUCTION Private Limited Company
(Addis Abeba, Ethiopia. - December 2002)



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WHAT IS XYPEX?

Xypex is a non-toxic, chemical treatment for the waterproofing and protection of concrete. *Xypex's* primary and most distinguishing performance feature is its unique ability to generate a non-soluble crystalline formation deep within the pores and capillary tracts of the concrete – a crystalline structure that permanently seals the concrete against the penetration of water and other liquids from any direction. *Xypex* crystalline products are dry powder compounds composed of portland cement, silica sand and many active, proprietary chemicals.

HOW DOES XYPEX WORK?

To create its crystalline waterproofing effect, *Xypex* must become an integral part of the concrete mass. It does so by taking advantage of the natural and inherent characteristics of concrete: concrete is both porous (capillary tract system) and chemical in nature. By means of diffusion, the reactive chemicals in *Xypex* use water as a migrating medium to enter and travel through the capillary tracts in the concrete. This process precipitates a chemical reaction between *Xypex*, moisture and the natural chemical by-products of cement hydration (calcium hydroxide, mineral salts, mineral oxides and unhydrated and partially hydrated cement particles). The result is crystallization and ultimately, a non-soluble crystalline structure that plugs the pores and capillary tracts of the concrete. In this condition, the pores become discontinuous and the concrete is thereby rendered impenetrable by water and other liquids from any direction.

WHAT ARE TYPICAL XYPEX APPLICATIONS?

Some of the typical applications of *Xypex* are:

- | | | |
|----------------------------|-------------------|-------------------|
| ▶ Roofs | ▶ Basements | ▶ Retaining walls |
| ▶ Water reservoirs | ▶ Terraces | ▶ Concrete pipes |
| ▶ Parking decks | ▶ Swimming pools | ▶ Septic tanks |
| ▶ Chemical units | ▶ Lift shafts | ▶ Bridges |
| ▶ Fountain structures | ▶ Garden planters | ▶ Manholes |
| ▶ Cable ducts and chambers | ▶ Dams | ▶ Concrete silos |

Partially re-printed from *Xypex Chemical Corporation Specification and Application Manual 1998*.



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**NATIONAL BANK OF ETHIOPIA,
Addis Abeba.**

The basement of this building was intended for use as an underground vault for the National Bank of Ethiopia. However, as a result of water leakage into the basement, the depth of water rose up to 8 cm, hence making the basement unsuitable for its intended use as a vault.

To stop the ingress of water into the basement, a two coat system of *Xypex* was applied to all basement walls and floors and concrete repairs were done using *Xypex Patch and Plug*. All horizontal and vertical joints were also treated with *Xypex Patch and Plug* and *Xypex Concentrate Dry Pack*.

After completion of the *Xypex* application, floor and wall finishing works were done by the Main Contractor, thereby making the basement suitable for its intended use as an underground vault.

Lift shafts at this project were also treated with *Xypex*.

A total wall and floor area of 1,050 m² was treated using 1811 kg of *Xypex Concentrate*, 1175 kg of *Xypex Modified*, and 800 kg of *Xypex Patch and Plug*.



**BROOK BUILDING,
Addis Abeba.**

1225 kg of *Xypex Concentrate*, 597 kg of *Xypex Modified*, and 179 kg of *Xypex Patch and Plug* were used to waterproof 810 m² of roofs, terraces, and basement walls at this doctors' building. On the terraces and balconies, floor tiles were placed over the *Xypex* coating.



**MEKELLE AIRPORT,
Mekelle.**

Concrete roofs of the main terminal building, control tower, air traffic control office, generator house and pump house (a total area of 1,130 m²) at this airport were treated with *Xypex Concentrate* and *Xypex Modified*.



**ETHIOPIAN INSTITUTE OF BANKING AND INSURANCE,
Addis Abeba.**

Xypex was specified for waterproofing of all concrete roofs, gutters, and reservoirs at this complex. The complex is intended for use as a training and conference centre for the Ethiopian Institute of Banking and Insurance and includes several blocks such as the Administration Building, Conference Hall, Communal Centre, VIP Guest Houses, Guests' Apartments, Service Buildings, and Guard Houses.

Over 8,800 kg of *Xypex Concentrate*, 4,800 kg of *Xypex Modified*, and 3,000 kg of *Xypex Patch and Plug* were used to treat over 5,000 m².



KIRKOS SHOPPING CENTRE,
Addis Abeba.



The *Xypex* waterproofing system was specified on this shopping centre project in order to prevent moisture in the backfill from damaging rebar and also to prevent moisture appearing on the inside faces of the walls.

Over 720 m² of the exterior sides of concrete retaining walls were treated with a two coated system of *Xypex Concentrate* and *Xypex Modified*. 960 kg of *Xypex Concentrate* and 632 kg of *Xypex Modified* were used. 380 kg of *Xypex Patch and Plug* were also used for concrete repair works.



**EMBASSY OF THE UNITED REPUBLIC OF TANZANIA,
Addis Abeba.**

The *Xypex* system was specified for all waterproofing works at this Chancery and Residence Complex for the Embassy of Tanzania in Addis Abeba. Over 1,200 kg of *Xypex* products were used to waterproof terraces, balconies, roofs, and gutters.

On the terraces and balconies, floor tiles were placed over the *Xypex* coatings.



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**METTU HOSPITAL,
Mettu.**

Waste water leaking from a septic tank was seeping through the joints of the stone masonry retaining wall and appearing on the external face of the wall. To contain this flow of waste water and the consequent environmental contamination, the soil on the internal side of the retaining wall was excavated out and the stone joints were pointed. *Xypex Concentrate* was applied to the stone joints and stone surfaces after which a coat of plaster was applied. *Xypex Modified* was then applied over the plaster.



The horizontal joint of the grade beam and the masonry wall was also treated with *Xypex Patch and Plug*. The excavated soil was then backfilled. Over 420 m² of wall area and 200 linear metres of horizontal joints were treated with *Xypex*.



After completion of the *Xypex* application, the waste water was completely contained.

The centre photograph shows the inside face of the wall on which the *Xypex* was applied while the bottom photograph shows the external face of the wall.



**MEKELLE AIR FORCE CAMP,
Mekelle.**

Xypex was specified for waterproofing a swimming pool and a water reservoir at this project. Concrete surfaces on which *Xypex* waterproofing was to be applied were slightly roughened using flat chisels. A coat of *Xypex Concentrate* followed by a coat of *Xypex Modified* was then applied to all walls and floors of the swimming pool and the reservoir. Extensive concrete repair was also done using *Xypex Patch and Plug*.

1,445 m² was waterproofed on the swimming pool and 360 m² on the reservoir.

2575 kg of *Xypex Concentrate*, 1375 of *Xypex Modified*, and 950 kg, *Xypex Patch and Plug* were used on this project.

Tested after *Xypex* application, the reservoir and swimming pool showed no leakage. After testing, the internal surfaces of the reservoir were plastered and mosaic tiles were placed over the walls and floors of the pool.



**ORBIS CAR DEALERSHIP AND MAINTENANCE GARAGE,
Addis Abeba.**

788 m² of roof area and 189 m² of concrete retaining wall area at this car dealership were waterproofed using *Xypex* products. A total of 1786 kg of *Xypex Concentrate* and 890 kg of *Xypex Modified* were used.



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**RUSSIAN EMBASSY,
Addis Abeba.**

A 420 m³ underground concrete lined stone masonry water reservoir at the Russian Embassy in Addis Abeba was losing excessive amounts of water. To stop this water leakage, the smooth surfaces of the walls and floors of the reservoir were lightly chiselled and made ready for *Xypex* application.

A coat of *Xypex Concentrate* followed by a coat of *Xypex Modified* was then applied to the walls and floors of the reservoir. All vertical and horizontal joints were also treated with *Xypex Patch and Plug* and *Xypex Concentrate Dry-Pack*.

When the reservoir was filled with water 12 days after completion of the *Xypex* curing, it was found to be 100% water-tight.



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**MAIN WATER RESERVOIR OF THE CITY OF SEMERA,
Semera.**

Xypex was chosen for waterproofing this elevated water reservoir intended to supply the city of Semera with drinking water. The internal surfaces and roof of the water reservoir were waterproofed. The photograph below shows the reservoir before the external form work was stripped.

As temperatures in this region are usually around 45 °C, it was necessary to ensure continuous curing of the *Xypex*.

413kg of *Xypex Concentrate*, 197kg of *Xypex Modified*, and 125 kg of *Xypex Patch and Plug* were used for these waterproofing works.



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AXUM AIRPORT
Axum.

235 m² of roof areas (Generator House, Beacon Room, Fuel Station, Transformer House) and a 120 m³ capacity concrete water reservoir at this airport were waterproofed with a total of 821 kg of *Xypex Concentrate*, *Xypex Modified*, and *Xypex Patch and Plug*.



**ETHIOPIAN ELECTRIC POWER CORPORATION –
GONDER AND BAHR DAR SUBSTATIONS,
Gonder and Bahr Dar**

The roof slabs of these power distribution substation office buildings were waterproofed using *Xypex*. A cement-sand screed layer was then cast over the *Xypex* coating.



**SHUM ABO PUBLIC POOL,
Bahr Dar.**

When this pool was first constructed, no waterproofing was used. Ceramic tiles were placed over the walls and floors. However, when the pool was put to use, the water level was dropping by up to 5 cm a day.

The proposed solution was to remove all floor and wall tiles and the mortar backing and to apply *Xypex Concentrate* followed by *Xypex Modified* to the concrete surface. Where reinforcing bars were exposed, concrete repair work was done using *Xypex Patch and Plug*.

The pool was then filled with water and proved to be water tight. After the effectiveness of the *Xypex* treatment was established, the client chose to cast a nominal reinforced concrete wall in order to obtain a plumb wall. Specialized blue paint was then applied over the concrete wall.

The top photograph shows the appearance of the pool after the *Xypex* application while the bottom photograph shows the appearance of the pool after the application of the blue paint.



**ADDIS ABEBA BOLE INTERNATIONAL AIRPORT,
Addis Abeba.**

As part of the development project for the Addis Abeba International Airport, several service buildings were constructed to complement the services of the newly constructed terminal building. *Xypex* was specified for waterproofing of the roof slabs of these service buildings - a diesel units building, two substation buildings, a DVOR and a UHF shelter.

A total roof area of 600 m² of was waterproofed with a two coat system of *Xypex*: 1075 kg of *Xypex Concentrate* and 372 kg of *Xypex Modified*.



**ASSELA MALT FACTORY,
Assela.**

This malt factory has four germination chambers that are separated from each other by 1 metre wide corridors. During the germination process, the jet of water that is sprayed on the malt seeps through the walls and floors of the germination chambers and appears on the corridors. Water was also seeping into the drying rooms.

To prevent this seepage of water, the inside walls (to 50 cm height) and floors of the germination chambers were treated with *Xypex Concentrate* followed by *Xypex Modified*. All horizontal and vertical joints were treated with *Xypex Patch and Plug* and *Xypex Concentrate Dry-Pack*.

A total of 826 m² of wall and floor area were treated with 930 kg of *Xypex Concentrate*, 633 kg of *Xypex Modified*, and 597 kg of *Xypex Patch and Plug*.

The centre photograph shows the walls and floors after *Xypex* application.

After completion of the *Xypex* application, ceramic floor and wall tiles were placed over the *Xypex* (bottom photograph).



**AMBO HOTEL,
Ambo.**

Over 1,000 kg of *Xypex* products were used on all flat roofs and arched roofs and terraces at this hotel.



**AMHARA NATIONAL REGIONAL STATE GOVERNMENT –
AUDITOR GENERAL'S BUILDING,
Bahr Dar.**

Xypex was specified for waterproofing works on this project. 921 kg of *Xypex Concentrate*, 554 kg of *Xypex Modified*, and 52kg of *Xypex Patch and Plug* were used to waterproof approximately 515 m² of roofs and terraces. A screed layer was then applied over the *Xypex*.

The bottom right photograph shows the application of a screed layer over the *Xypex* coating.



**GUNA COFFEE PROCESSING PLANT,
Addis Abeba.**

The roof of the office block of this coffee processing plant (395 m²) was waterproofed with a two coat *Xypex* system. 518 kg of *Xypex Concentrate* and 325 kg of *Xypex Modified* were used.

After completion of the *Xypex* application, a cement-sand screed layer was applied over the *Xypex*.



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**KK ACRYLIC YARN DYEING FACTORY,
Akaki.**

All horizontal and vertical joints of the circular reservoirs and oxidation ponds at this factory were treated with *Xypex Patch and Plug*. Over 550 kg of *Xypex Patch and Plug* were used and proved effective in containing liquids within them.



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**AFAR STATE PLAN AND ECONOMY BUREAU,
Semera.**

Xypex was specified for waterproofing an underground water reservoir at this project located in a very hot and arid region of the country. A two coat system of *Xypex Concentrate* and *Xypex Modified* was applied to the floors, walls, and roof of the reservoir. Extensive concrete repair was also undertaken using *Xypex Patch and Plug*.

Due to the very hot temperatures it was necessary to do the *Xypex* applications in the early morning hours to avoid the *Xypex* drying up too rapidly. The bottom photograph shows the roof of the reservoir covered with damp burlap to ensure continuous curing.

Despite the extensive concrete repairs that were done on the concrete, the reservoir proved to be 100% water-tight and no further rectifications were necessary.



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**ASAITA MULTI-PURPOSE TRAINING CENTRE,
Asaita.**

Xypex was specified for all roof waterproofing works for this training centre located in a region where temperatures are about 45 °C. Flat slab areas of the administration block, library, workshops, transformer house, and guard houses were waterproofed using *Xypex* products. To prevent fast drying of the *Xypex*, the applications were done in the early morning and early evening hours. Continuous curing was ensured by keeping the treated areas constantly covered with damp burlap.

A total of 978 kg of *Xypex Concentrate*, 368 kg of *Xypex Modified*, and 88 kg of *Xypex Patch and Plug* were used to waterproof a total area of 373m².



**ASSOSA POLICE TRAINING CENTRE,
Assosa.**

Xypex was specified to waterproof all concrete structures at this police training centre. An elevated water reservoir, a ground level water reservoir, and concrete roofs were treated using *Xypex*.

Over 850 kg of *Xypex* products were used for these waterproofing works. *Xypex Patch and Plug* was used extensively to repair honeycombs and voids.

At testing, all treated areas were found to be water proof and no rectification works were done on the elevated reservoir despite the quality of the concrete encountered.



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**GERMAN SCHOOL,
Addis Abeba.**

Water was seeping through the plastered stone masonry basement walls and concrete floors of this building at the German School of Addis Abeba. To stop the seepage, the existing plaster was removed and the pointing raked out of the stone joints. The stone joints were re-pointed and *Xypex Concentrate* was applied to the stone surfaces and the pointing.

Within 24 hours, a new plaster coat was applied over the *Xypex Concentrate* coating and *Xypex Modified* was then applied over the plaster.

Xypex Concentrate was also applied to the parent concrete floor slab and flooring material was then placed over the *Xypex Concentrate* coating.

After this treatment, all seepage of moisture through walls and floors was halted and the basement became completely dry.



**AMHARA NATIONAL REGIONAL STATE GOVERNMENT –
DISASTER PREVENTION AND PREPAREDNESS COMMISSION,
Bahr Dar.**

All concrete roofs and gutters of this building were treated with 850 kg of *Xypex* products. A screed layer was then applied over the *Xypex* coating.



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**PHARMACURE PHARMACEUTICAL COMPANY,
Addis Abeba.**

A 245 m³ capacity concrete water reservoir at this pharmaceutical plant was waterproofed with a two coat system of *Xypex*. Prior to the application of the *Xypex* coating, some concrete repairs were done using *Xypex Patch and Plug*.

The *Xypex* coating was cured for 4 days and the reservoir filled with water 15 days after completion of the curing process. At testing, the reservoir proved to be completely water-tight.



**ETHIOPIAN MANAGEMENT INSTITUTE,
Addis Abeba.**

Underground water was seeping into a stone masonry septic tank at this project. As a solution to this problem of seepage, *Xypex Concentrate* was applied to the stone joints and pointing. The treated surfaces were then plastered. *Xypex Patch and Plug* was also used to stop heavy flowing water in some locations. The septic tank was completely dry after *Xypex* application.



An elevator shaft was also waterproofed with a two coat system of *Xypex*.



**CHRISTIAN RELIEF AND DEVELOPMENT ASSOCIATION (CRDA),
Addis Abeba.**

Xypex was chosen for waterproofing the elevator shaft and water storage tank at this building. On the exterior faces of the reservoir and pump house, a brick wall was constructed for aesthetic purposes.



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**DILLA HEALTH SCIENCE COLLEGE,
Dilla.**

Xypex was specified on this project to waterproof a 160 m³ concrete reservoir. A two coat system was applied to walls and floors. Plaster was then applied over the *Xypex* coating.



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**HEAD OFFICE COMPLEX OF THE COUNCIL OF THE REGIONAL STATE OF
OROMIA,
Addis Abeba.**

A two coat system of *Xypex* was specified for waterproofing this newly constructed concrete water reservoir. Tested after 15 days of *Xypex* application, the reservoir proved to be completely water-tight.



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**St. GABRIEL HOSPITAL,
Addis Abeba.**

The gutters at this hospital were leaking badly and needed urgent replacement. Therefore, the existing bituminous waterproofing layer was removed entirely and the underlying light weight concrete layer exposed. *Xypex Concentrate* followed by *Xypex Modified* was then applied to the light-weight concrete layer.

No leakage was observed after completion of *Xypex* application.



**RESIDENCE BUILDING,
Addis Abeba.**

The existing bituminous waterproofing layer on the accessible roof of this residence building was leaking and was in need of replacement. As *Xypex* was the chosen replacement, the existing waterproofing layer was removed, the light-weight concrete layer inspected and repaired wherever necessary. *Xypex Concentrate* followed by *Xypex Modified* was then applied to the light-weight concrete.

At the client's request a cement-sand screed layer was placed over the *Xypex* coating for aesthetic purposes.



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**RESIDENCE BUILDING,
Addis Abeba.**

Over 600 kg of *Xypex* products were used to waterproof roofs, terraces, balconies and bathroom floors at this residence building. On the terraces and balconies, marble flooring was placed over the *Xypex* while ceramic tiles were placed over the *Xypex* coating on the bathroom floors.



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