Perfect & simple perimeter protection through Fiber Optic Mesh Intrusion Detection System with fence skin concept

FOMGuard

- No false alarm due to environmental effects
- 100% detection of intrusion without being defeated by an intruder
- Pinpoint the intrusion location
- Negligible Maintenance
- Applicability not limited by terrain conditions or fence types

Innovative Fiber Optic Security & Safety System Manufacturer

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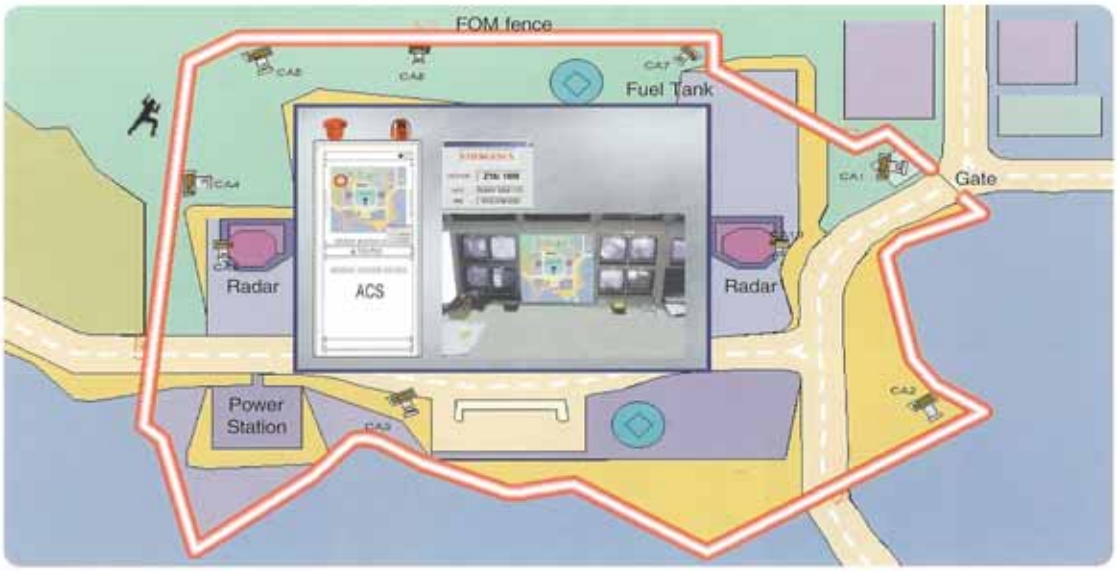
FOMGuard - Fiber Optic Mesh Intrusion Detection System

Overview

- The FOMGuard Intrusion detection system, surrounding and protecting important facilities, shall detect intrusion by generating audible alarm and pinpointing an intrusion spot on a display map within ±15 m accuracy. FOMGuard is based on Fiber Optic Mesh Sensor and Optical Radar Technology. The OSU(Optical Sensing Unit) injects Infrared Laser pulses into Fiber Optic Mesh and it detects Optical echoes of the Infrared Laser pulses caused & backscattered by a cutting or excess force when an intruder pulls or cut off the Fiber Optic Mesh. The ACS (Alarm Control Station) which is located at MCC (Main Control Center) receives the intrusion data from OSU and generates the audible alarm and pinpoints the intrusion spot.
- In early 1996 under Technical Business Incubating Problem of Korea Ministry of Industry and Resources, President Youn Bae, teamed with key engineers in Computer Engineering & Opto-Electronics, founded Potential Opto-Electronics Co., Ltd. The company name was changed to Fibertron Co., Ltd. in late 2000. He graduated from Korea Military Academy (Korea West Point) in 1969 and served as security guard officer along Korea Borderline (DMZ) for two years. He was selected by Korean Army Specialist Education Program to major Physics for eight years from B.S. at Seoul National University and M.S. at Korea Advanced Institute of Science and Technology (KAIST) to Ph.D. at University of Southern California in Los Angeles in 1981. Thereafter he invented Fiber Optic Perimeter Intrusion Detection System and started developing the system at Agency for Defense Development repeatedly field testing along Korea Borderline for fifteen years until his retirement as colonel in 1995.
- Fibertron went into production the upgraded system under worldwide trademark FOMGuard. In 1997 before installing to the sites, the system was throughly tested and evaluated and certified as "NT Certificate" by Korea Testing Institute which means new and superb over any other existing products.
- One month after terror disaster on September 11, 2001, eleven experts and officials from US Pentagon FCT (Foreign Comparative Testing) visited for testing FOMGuard operating systems at Incheon Int' Airport and LG-Caltex Gas Reservior and reported it reputing this system as "Marvelous products". For the first case among Asian products, US Congress funded US$500K for testing and tested to get succeeded until October 2004 since installed at Eglin Airforce Base in April 2003. In August 2003, six security specialists from Singapore Military and Police also visited for testing and reported as "The World Best".
- Since end 2004, FOMGuard was awarded to protect Middle East Important facilities including Saudi Oil Plants, Singapore Top Government Facilities and Japanese Nuclear Facilities replacing other sensors such as FO vibration sensors, tautwire sensors, E-Filds and IR sensors.
- FOM Guard offers a unique solution that provides 100% full proof detection of intrusions from digging to climbing over fences applicable unlimitedly by terrain conditions and fence types without the concern of false alarms. It is maximum cost-benefit solution to protect important facilities such as air force bases, airports, missile sites, nuclear power plants, gas/oil/water reservoirs, electric power plants, military headquarters, military sites, palaces, jewelry/semiconductor factories, jails, National Institutes, borders, VIP residential areas etc. against highly trained intruders such as spies, terrorists or guerrillas.

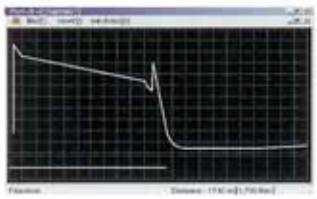
Perimeter Security by Manpower to be Reformed by Technology

Intrusion Alarm & Display



Log File Display by ACS

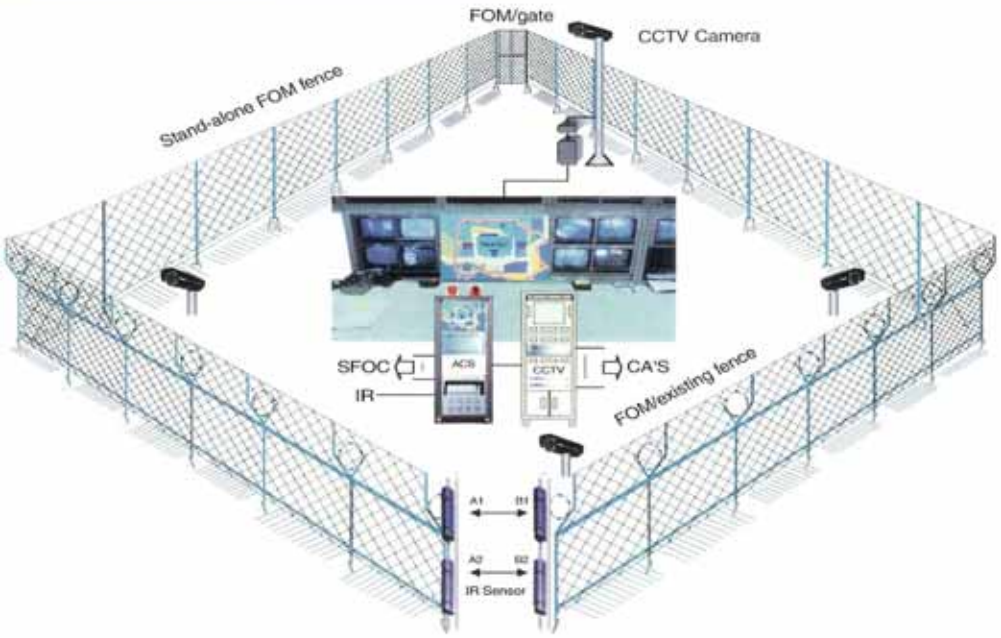
The intrusion alarm and event data Shall be automatically recorded in the system memory



OTDR Display by ACS

ACS can display OTDR pattern of FOM to check optical loss/fault/break.

Skin & Eyes Concept Protection



FOMGuard Reference Sites










FOMGuard Operational Performances Specifications, typical

■ Intrusion Detection and Alarm Performances;

- The system shall detect 100% intruders' cutting through the FOM or climbing over FOM top by excess force larger than 10 ~ 20 kg.
- Vulnerability to defeat (VtD) : The system shall not allow any hidden intrusion attempts such as silent cutting, slow/fast movements, crawling, jumping over or disassembling FOM by using commercial tools without being detected.

Importance of VtD : PIDS vulnerable to defeat by intruder becomes of no use like a fishing net having holes through which captured fishes escape or like an insurance which does not cover actual accidental cases.

- Intrusion location : The system shall locate one intrusion per optical port of OSU within ±15m accuracy (5m system error ± 10m installation error).

Importance of Location Accuracy : Location accuracy within ±15m is necessary because human eyes as well as CCTV Cameras have visible range of 30m. If CCTV Cameras interfaced with PIDS which is unable to pinpoint an intrusion location, CCTV Cameras should be placed at a spacing double of the unit sensing zone(typically at 200 m spacing when the unit sensing zone is 100m). FOMGuard can extend CCTV Camera spacing upto 400m by placing the cameras at selected locations with direct line-of-sight such that the cameras turn to aim at the intrusion spot upon the reception of the accurate location data from ACS. This may reduce CCTV system cost by as much as FOMGuard cost itself.

- The intrusion alarm / action event data shall be automatically logged in the system memory and be displayed / printed upon keyboard control.
- The system shall provide additional input ports for wireless sensors (IR sensors, Microwave sensors) in empty spaces such as gates, roads etc, exempting their own controller.

■ Environmental Characteristics;

- The system shall be immune to all kinds of environmental effects such as
  (1) electricity(EMI, power lines, lightning, electrostatic etc),
  (2) water (rain, snow, haze)
  (3) vibration (wind, storm, sound, vehicle vibration)
  (4) neighboring (blowing debris, birds, vegetations, sand storm, dust, pollution etc)
  (5) operating temperature : -40˚C ~ + 75˚C
- The system shall be affected neither by perimeter geometry nor ground instability.
- The system shall show false alarm less than 1 time per km for three months and shall have a 10 year life-time guarantee with proper maintenance.

Importance of no false alarms : PIDS is to detect very rare intrusions. (approximately one intrusion per year) PIDS giving frequent false alarms will be ignored by the operator and abandoned. In the case of the Taegu Subway Station Fire Disaster which occurred on Feb 18, 2003 and killed about 200 people and injured about 300 people, the casualties sharply increased because the security officers at the main control center ignored the fire alarms due to frequent false alarms in the past.

■ Maintenance;

- The Fiber Optic Mesh can not only bypass unwanted areas where other sensors are employed but also be installed exactly fitted to gates without any additional electronic equipment.
- The broken FOM can be either directly repaired or column-replaced using commercial splicing tools by trained persons.
- ACS can display OTDR patterns of FOM to check Optical loss/fault/break by keyboard control without disconnecting the Separation Fiber Optic Cables.

FOMGuard Description

- A perimeter as large as 2km x 3m can be controlled by an ACS at the MCC (Main Control Center). A larger area can be detected by a number of OSUs each covering an area of 2km x 3m, which are connected to and controlled by an ACS at MCC via FOCC (Fiber Optic Control Cable) remotely.
- An unit facility with a perimeter upto 2km x 3m can be controlled by an OIA (Optical Intrusion Alarm) which is a simple desk-top version of ACS/OSU.
- ACS can be interfaced with CCTV to automatically detect the intrusion spot and be interfaced with Warning or Access Control and be communicated and integrated with other servers.
- FOMGuard is virtually false alarm free because of the following:
  (1) immunity to all kinds of environmental effects such as water, electricity, vibration, neighbors as well as atmospheric temperature and (2) a negligible amount of electronic equipment outdoors which is affected by water, electricity and temperature.
- FOMGuard is applicable in any one of three installation types: (1) overlaid to existing fences, (2) free-standing or (3) over a wall. Therefore, it is unlimited by terrain conditions and fence types.
- Intrusion by digging below the fence can be detected by Grooved Rods, which are fixed to FOM and stuck underground. The grooved rods trigger alarms when pulled out by an intruder.
- FOMGuard provides effective anti-digging measures depending on terrain conditions: (1) FOM bottom fixed to the top of Grooved Rod on soil base, (2) FOM bottom fixed to the top of Grooved Rod and BFOSC (Buried Fiber Optic Sensor Cable) fixed to the middle of Grooved Rod on sand base and (3) FOSC (Fiber Optic Sensor Cable) weaving between FOM bottom and rock base.
- FOM is fixed to the top and bottom of the fence frames with special fixtures, which does not allow any intrusion without being detected.
- FOM is installed to gates or can be by-pass unwanted areas or surround security guard posts.
- For an open gate, field sensors (IR Sensors or Microwave Sensors) can be placed and also controlled by ACS which replaces the field sensors' existing controllers.
- Broken FOM can be repaired using commercial splicing tools in either direct repair or column replacement without any difficulty.

FOMGuard Hardware Specifications

1. FOM-HM (Fiber Optic Mesh)

- Environmental characteristics :
- Operating temperature : -30˚C ~ +75˚C
- The cable diameter/color : 3mm/black
- Optical fiber grade : 125㎛ multimode
- Mesh Width : H meters
- Cell size : 85cm below 1.5m height, 90-120cm over 1.5m, typical
- Lifetime : over 10 yrs with proper maintenance

2. OSU-nP (Optical Sensing Unit)

- Sensing coverage per Optical port : 3m x 250m for break, 3m x 200m for excess force stronger than 10-20kg,
- No of Optical Ports : n
- Fiber Optic connector type : FC multi-mode
- Dimension : 177 x 483 x 300mm
- Weight : 10kg, typical
- Operating condition : indoors, inside shelter for outdoors
- Power : AC220V±10% 50/60Hz,
  70Watt for OSU-2P, 250Watt for OSU-8P

3. ACS-nP/kT (Alarm Control Station)

- Operation mode : Normal, Test, Emergency, Setting, Stop
- Sensing mode : cutting , excess force , selectable
- Location Accuracy : ±15m error
- No of Optical ports : n (upto 8),
  No of terminals : k OSUs (upto 64 typical)
- External connection port : PC interface
- Fiber Optic test function : semi-OTDR
- Auto-logging : alarm, action, status, setting value etc
- Monitor : 17" color
- Communication port : RS232C/RS422/RS485[optional]
- CCTV interface : ON/OFF or other customer requirement
- Acceptable output devices : warning light, signal phone
- Acceptable input devices : IR/MW sensor, shock sensor
- O/S : Window XP
- Dimension : 195cm x 60cm x 75cm /150cm x 60cm x 75cm
- Operating condition : indoors
- Power : AC220V±10% 50/60Hz, 400Watt approx

4. OIA(Optical Intrusion Alarm)

- Operation mode : Normal, Test, Emergency, Setting, Stop
- Sensing mode : cutting , excess force , selectable
- Location Accuracy : ±15m,
- No of max optical ports : 8
- Auto-logging : alarm, action, status, setting value etc
- Monitor : 5.7" LCD ,
- Dimension : 45cm x 16cm x 35cm
- Weight : 10kg, typical
- O/S : Window XP
- Operating condition : indoors
- Power : AC220V±10% 50/60Hz, 100Watt approx

5. Accessories

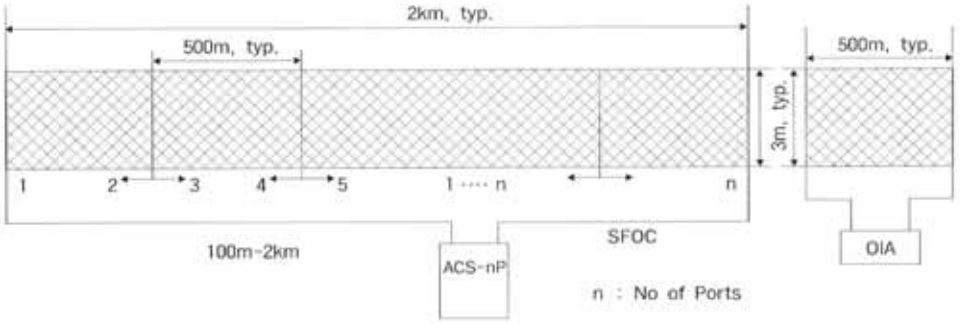
- SFOC(Separation Fiber Optic Cable) : 3ϕMM 1core,
- BFOSC(Buried Fiber Optic Sensor Cable) : 3ϕMM 1core
- FOCC(Fiber Optic Control Cable) : 3ϕSM 1core,
  repeaterless spacing upto 70km
- Extension Bar : 38x6t, S45C or 20x10, SUS
- Top Transducer : 60 x 140 x 50t, S45C
- Concrete Fixture : 22ϕx 40, S45C
- Short Grooved Rod : 19ϕx 80cm, S45C
- Long Grooved Rod : 19ϕx 120cm, S45C

Standing-free FOMGuard Demo Kit

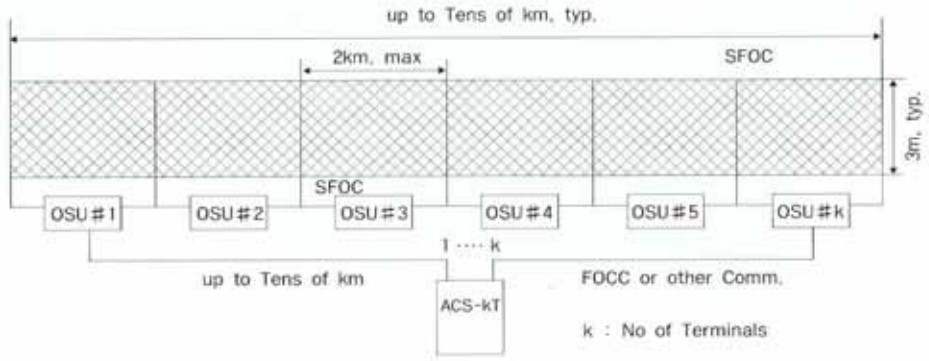
FOMGuard System Diagram

■ ACS alone

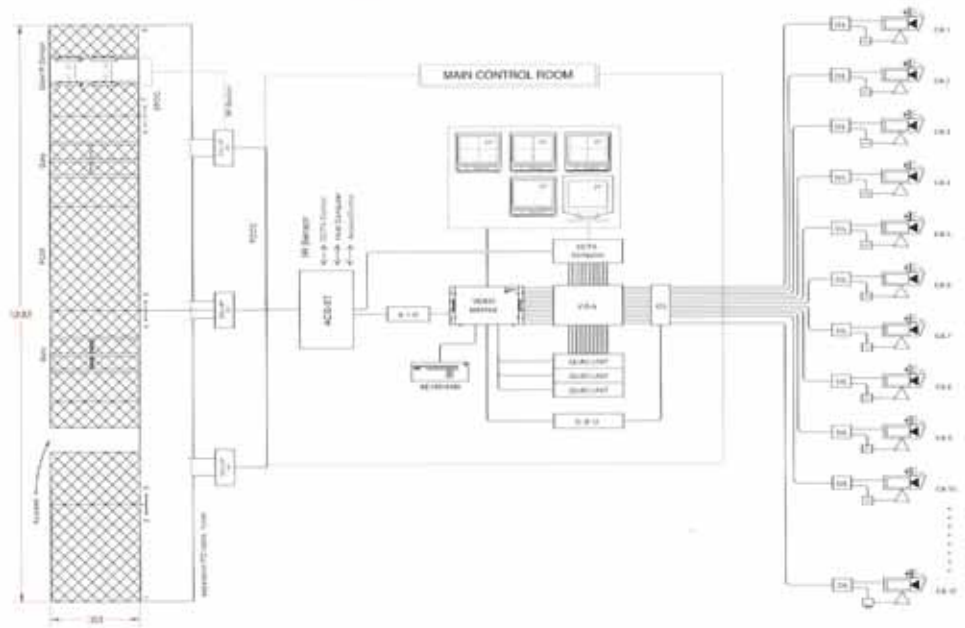
■ OIA alone



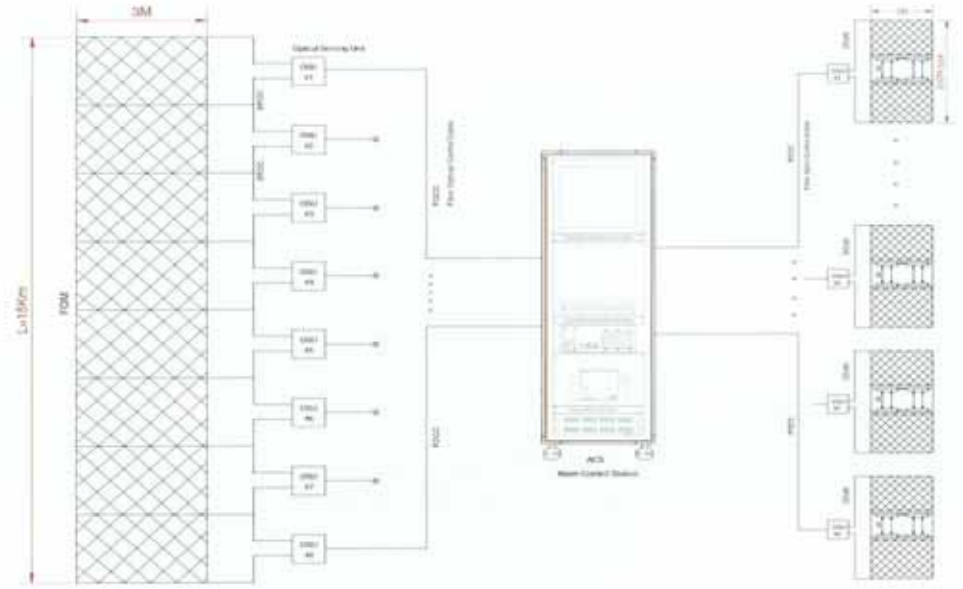
■ Multi OSU



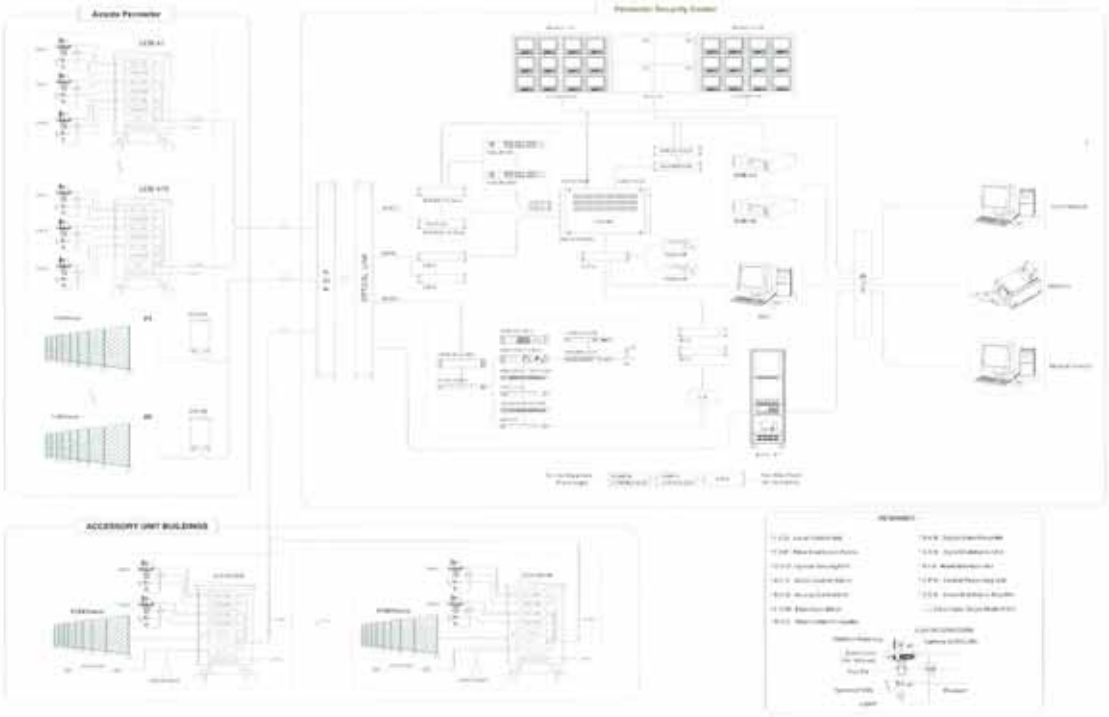
■ FOMGuard/IR Sensor/CCTV IPSS Diagram at 5km Perimeter



FOMGuard Diagram at an Airport



FOMGuard/IR Sensor/CCTV/Warning/Access Control IPSS(Integrated Perimeter Security System) Diagram at an Airport



Fiber Optic Mesh Installation Types

Fig. 1 FOM over Wall

Intrusions by climbing over any wall, even a 6m high wall with a rope can be detected by 1m FOM over a wall.

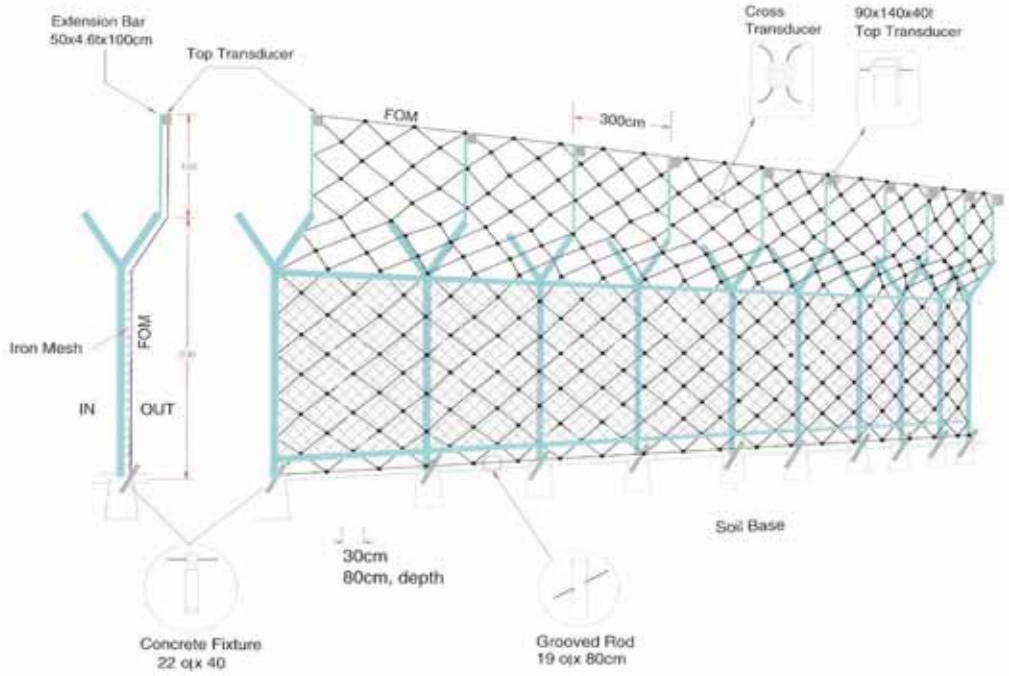


Fig. 2 FOM to existing Steel Fence on Soil Base

For the existing standard Steel Fence of Y-shape with 2.3 m height, FOM shall be overlaid to the entire surface from bottom to either a 70cm extension to detect penetration and climbing over or 1m extension to detect upto climbing over by using a ladder. FOM should be firmly fixed to the top and bottom of the fence frames with special fixtures(Concrete Fixture and Top Transducer). To protect against digging on soil base, put short grooved rod (80cm) underground at 30 cm spacing. FOM bottom shall be fixed to the top of the short grooved rod to detect being pulled out by an intruder. Intrusion by digging deeper than 80cm underground without being detected is almost impossible for an intruder. Buried Cable Sensors (H-Field, Leaky RF Cable, Vibration and Pressure Sensor Cable) are ineffective against digging due to false alarms and poor reliability. The sensitivity of those sensors severely degrades in rainy or humid conditions and surface thickness non-uniformity. For example, a leaky RF buried cable which is buried 10 cm underneath the ground is of no use in case of a large perimeter. The sensitivity of the cable severely degrades by the presence of other objects (trashes or grasses), water(rain and snow) and surface hardness variation due to temperature change.

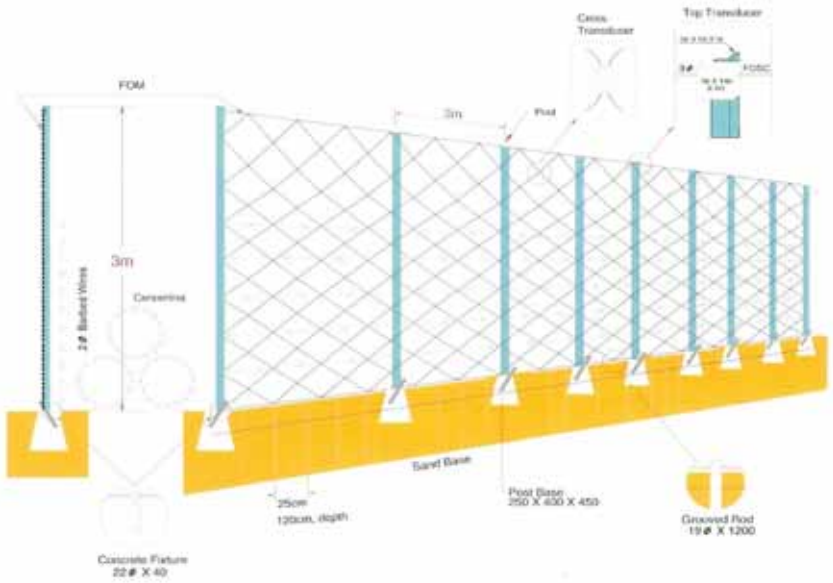


Fig. 3 Standing-free FOM Fence on Sand Base

Installing FOM without a fence or Y-frames reduces cost compared to installing FOM to a standard steel fence without degrading detection capability. Standging-free FOM with 3m height shall detect penetration and climbing over even if an intruder uses a ladder, which is equivalent to 3.3m FOM overlaid to the existing fence. To delay intrusion to allow the time required for the security guards to reach the intrusion spot after alarm by ACS, it is recommended to put a number of concertina rolls inside the free standing FOM fence. When installing a FOM fence, put steel posts (50x50x5 angle) typically at 4m spacing and attach 3m FOM and fix the top and bottom of the FOM with special fixtures (Concrete Fixture and Top Transducer). Against digging sand base, embed a long grooved rod (120cm) underneath the ground at 25cm spacing. FOM bottom fixed to the top of the long grooved rod and FOSC(Fiber Optic Sensor Cable) fixed to the middle of the long grooved rod before buried shall detect an intruder's pulling out the long grooved rod or lifting it upward to sneak below the FOM bottom. An intruder being aware of the FOMGuard measure should construct a tunnel below 120cm underground, which is almost impossible to do under intruder conditions.

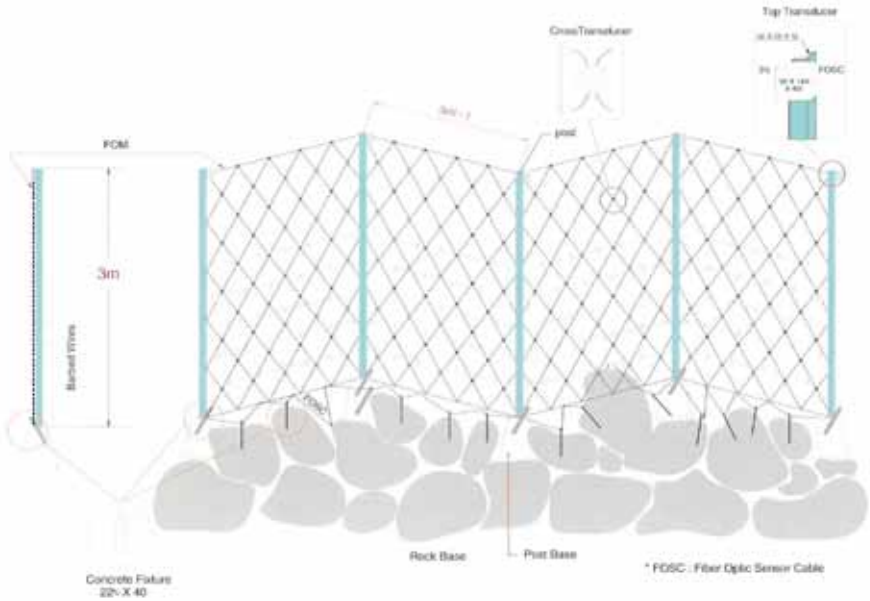


Fig. 4 Standing-free FOM Fence on Rock Base

The rock base naturally offers a good anti-digging deterrent like the concrete base. Standing-free installation on rock base is better than FOM to steel fence in both detection capability and cost. Usually, rock base surfaces are not flat leaving holes between the FOM bottom and rock base surface for a human body to pass through. This case can be blocked by weaving additional FOSC between the FOM bottom and rock base surface with more Concrete Fixtures (at 1m spacing for example.)

Review of various PIDS (Perimeter Intrusion Detection System) products

- There are about forty known PIDS products over the world being classified into four categories according to the sensor types: - Field Sensors, Vibration Sensors, Tautwire Sensors and Fiber Optic Mesh Sensors.
  The first two have a configuration of 1-dimensional Electro-Magnetic field sensor or a cable sensor while the latter two have 2-dimensional array configuration.

- However, each quality of the various PIDS systems is not acknowledged by clients as it is and there are two reasons why the clients are not aware of the quality: (1) It is difficult for the clients to evaluate the performance of the PIDS systems before using them for a long time and (2) the clients are reluctant to disclose the actual quality of their own security systems to others.
  In Nov., 1996, Korea National Inspection Department reported no successful case after testing all operating PIDS systems such as tautwires, vibration cable sensors, buried cable sensors, IR sensors and microwave sensors at thirteen important national facilities, but before testing, most of the security officials of the facilities told the inspectors that their systems were working properly.

- Israeli newspaper (Yediot Achronot dated 9/19/1997) reported that the tautwire system installed along Israeli borderline never detected 364 intrusions in 1996. Some intruders, after being arrested, demonstrated how to easily defeat the tautwire systems to Israeli Army officers.

- The tautwire system at the Korean Airport with a perimeter of 5.5km was reported by both Korean newspaper (Chosun 9/6/2001) and Korea National Congress as obsolete because the system gave frequent false alarms upto 900 times per day and it caused the security guards to switch off the system at midnight.

- A field sensor at Nuclear Power Plant with 2km fence in Korea was reported to be unable to sense slow movement at 9m/min and to give false alarms upto 10,000 times per day. The field sensor was replaced by FOMGuard in 1998 and there has been no false alarm reported since then.
  There are many other failure cases of the various PID systems.

- Israeli Fiber Optic Mesh systems also have vital defects which are unable to detect intrusion when an intruder opens plastic cross-over buttons, lifts up the bottom and lays down the top supports. And the systems might make severe false alarms by rain, wind, lightening, EPI/EMI/power lines because they use lots of electronic equipments outdoors.

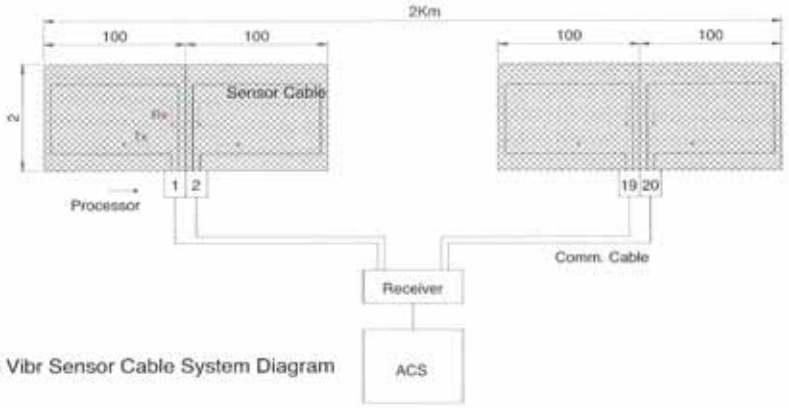


Fig. 5 Vibr Sensor Cable System Diagram

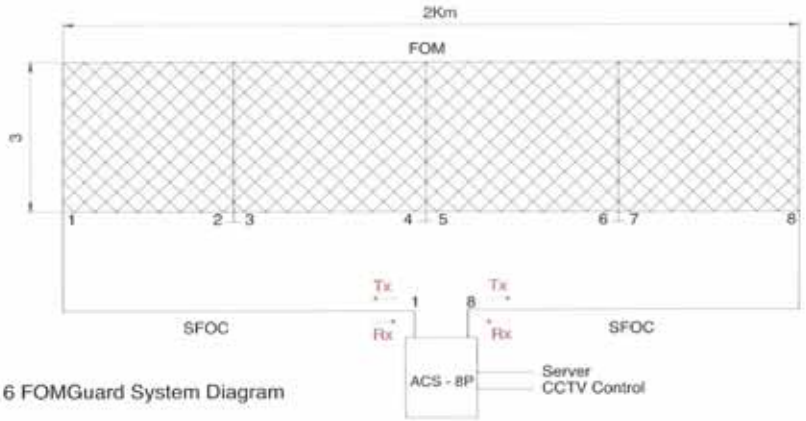


Fig. 6 FOMGuard System Diagram

Comparison between FOM Guard and Vibration Cable Sensor Systems

- Figs. 5&6 introduce typical diagrams of FOM Guard and Fiber Optic Vibration Cable Sensor systems respectively. In FOM Guard, the ACS (Alarm Control Station) at MCC (Main Control Center) injects Infrared Laser pulses into Fiber Optic Mesh and it operates like a Radar to detect intrusion. In case of seeing optical echoes due to intruder disturbances such as cutting or excessive forces, the system pinpoints intrusion spot on its monitor display map within 15m accuracy generating visible and audible alarm.
  In Vibration Cable Sensor, a sensor cable is attached to fence mesh (typically chain link mesh). One end must be connected to a Transmission Processor and the other end connected to a Reception Processor, which is connected to and controlled by the ACS at MCC to determine intrusion from the received signal disturbances due to vibration/shock created by cutting the fence mesh or climbing the fence and it detects the intrusion zone of 100m generating visible and audible alarm. Processor spacing determines the length of the detecting zone and accuracy.
- Other systems detect intrusion location by 100m unit typically while FOM Guard has 15m pinpointing accuracy.
  Along 2km fence, Cable Sensor systems put 20 Electronic Devices (Processors, Powers) at 100m spacing to detect intrusion location with 100m accuracy but those electronic devices cause malfunction by lightening, water and high/low temperature with difficulty in maintenance while FOM Guard has no electronic devices outdoors.
- Cable Sensor generates frequent false alarm due to strong wind, vehicle/airplane vibration, thunder but, since FOM Guard is completely immune to vibration/shock, it is free from such false alarms.
- A number of recent Cable Sensor Systems relying on Sensitivity Control degrades in detection reliability at wind. The cable sensor systems using Event Count (EC) and Time Window (TW) will be defeated by slow or fast movements beyond the values set by the operator. When EC = 40 and TW = 5 are set against penetration of cutting 40 points at a 5 second interval, it won't detect cutting 39 points or cutting at an interval of 6 seconds.
- Any Vibration Sensing System becomes useless against silent cutting. With a cutter having both blades with a dip at the center, an intruder can cut the fence mesh without creating vibration or shock. It is like cutting cheese with a knife without any vibration. The tests in Korea Airforce #20 Base in November1999 in Air Force and Incheon Int'l Airport in May 2000 shows that the most advanced Vibration Sensor System installed in a 10m sector did not detect fast climbing and silent cutting and it created several false alarms due to vibrations of aircrafts.
- Other systems have IDL (Intrusion Detection Level) of 2m (0 ~ 2m) height while FOM Guard has IDL of 4.5m (-1.2m ~ 3.3m) height. Vibration Sensor Systems detect intrusions with the height level of 0 ~ 2m and do not detect an intruder's climbing over 2m or digging underground. Buried Cable Sensors (H-Field, Leaky RF Cable, Vibration or Pressure Sensor Cable) are ineffective against digging and they cause false alarms with poor reliability. The sensing capability of those sensors severely degrades at rain, humidity and surface thickness non-uniformity. For example, a leaky RF buried cables to be buried 10 cm underneath the ground are practically of no effect due to presence of other objects (trashes or grass), water (rain and snow) and surface hardness variation caused in case of large perimeter. The sensitivity severely degrades by the presence of other objects (trashes or grass), water(rain and snow) and surface hardness variation due to temperature change.
- Installing Microwave Sensors in combination with Vibration Cable Sensor does not overcome the limitations mentioned above. The combination sensors might enhance detection probability within the same IDL of 2m (0 ~ 2m) but it still can not detect digging underground and climbing over 2m with doubling of false alarms, maintenance problems and increase in cost.
- CCTV Cameras interfaced with vibration sensors shall have dead zone.

The site uses CCTV Cameras for two purposes. The PZT cameras shall be put to watch forward or surrounding of the perimeter at usual time and shall display the image of the assigned area (wall side of gate front) on the area monitor under the control by operator. In case intrusion detected by PIDS, the nearest cameras should immediately turn to the intrusion point to catch view and pop up on the alarm monitor to alert the guard for attention.
But the sites installed Vibration Sensors which are known to put 100-1000 false/nuisance alarms / km / day actually use CCTV cameras to check at each false/nuisance alarm if it is false or true. Even if the vibration sensors successfully trigger alarm at intrusion, the cameras may miss to catch intruder view because the vibration sensors do not locate within CCTV camera preset coverage 50m. For example CCTV Cameras interfaced with a vibration cable having location accuracy ±50m will succeed to catch intruder view 50% missing the rest 50% (50% dead zone). In order to catch full proof intruder view, it is necessary to have two nearest cameras turn to the intrusion location detected which requires the operator to find intruder image out of one of two camera views.
With the CCTV cameras interfaced with FOMGuard, the operator does not have to take time in finding the intruder scene because he sees only one view with the intruder image.

Benefits by FOMGuard

- **Perfect Perimeter Protection with minimal security guards**
  The chance of Intrusion detection by human security guards has been recorded as 42%. Throughout the 1970s, there were 21 intrusions by North Korean commandoes along the 155 mile borderline and, only 9 out of 21 intrusions cutting through fence mesh below 1m were detected by the security guards which were placed about 100m apart. At 2:00 am on July 8, 2001 two intruders knocked down two security guards of an army site at Yeoung Cheon in Korea and robbed an M16 rifle. At 3:00 am on February 25, 2002 a similar incident occurred where two intruders attacked two security guards with knife at a Seoul Defense Site and robbed M16 rifles again. Such incidents illustrate that intruders can not be effectively detected by human eyes and ears. On Mar. 16, 2001, a Russian airplane landed at Istanbul Airport in Turkey was hijacked by Chechen intruders through a fence.
  FOMGuard shall enhance detection reliability upto 100% from 40% with about 10% cost of security by manpower.
- **Reduce Fence Cost**
  Intrusion can be made by cutting through a fence mesh in only a couple of minutes or climbing over a fence in a few seconds. Steel fences or thick walls are to be replaced by a thin fence with FOM to reduce the cost of the fence while enhancing security. Grooved Rods fixed with FOM provide better anti-digging protection than concrete basements and reduce costs. Standing-free FOM shall save fence the cost of the fence compared to FOM to the existing fence.
  Other systems such as vibration cable sensors attached to fence mesh do neither reduce the cost of the fence nor suit with standing-free installation.
- **Reduce CCTV Cost**
  Location accuracy within ± 15m is necessary because human eyes as well as CCTV Cameras have visible range of 30m typically. If PIDS is unable to pinpoint an intrusion location, CCTV Cameras interfaced with the PIDS should typically be placed every 200m which is double of the 100m unit sensing zone. CCTV Camera installation spacing can be extended upto 400m when interfaced with FOMGuard, which enables CCTV Cameras to be put at selected location with direct line-of-sight so that the cameras turn to aim exactly at the intrusion spot upon reception of the accurate data from the ACS of FOMGuard system. It may reduce the number of the cameras and cost.

Comparison of Various PIDS Performances

Products / Features	IR/MW/EH Field Sensors • E-field • H-field • leaky RF Cable • IR Sensor • Microwave	Vibration Cable Sensors • Coax Cable • FO Cable • Shock Sensors • Electric Cable • Microphone • Pressure sensor	Taut Wire Sensors	Other Fiber Optic mesh system	FOMGuard
Sensing Mode	Sense human body's EM disturbances to preformed EM-field or IR radiation.	Sense vibration due to cutting or climbing	Sense breakage of force change due to cutting or pulling the sensors	By monitoring Optical transmission, Fiber Optic mesh sences cutting and top Fiber Optic loop sences pulling respectively	By monitoring Optical echo from the intrusion spot, sence and locate cutting or pulling selectively
Sensing and Location performance	Sense normal speed walking and locate 100-300m zone	Sense normal speed cutting or climbing 100-300m zone	Sense normal speed cutting or pulling and locate 100-300m zone	Sense cutting and climbing and locate 100m zone	Sense and locate cutting or pulling with 10m accuracy within zone of 250m typically.
Vulnerability to defeat	• Defeated by slow or fast movement • Defeated by crawling or jumping over • Degraded at rainy/ snowy/windy weather	• silent cutting • slow cutting/climbing • fast cutting/climbing • intrusion at wind	• balanced cutting • taut wire clamping • tau twire -bypassing • collector wire clamping • spiral wire removing • detector cooling	• penetration after opening the cross over button by nipper and punch • crawling after separating mesh bottom fixture bolts to fence post • climbing after laying down the top supports.	Prevent any defeat attempts
Environmental Effects	• Severe false alarm due to wind, snow, rain, haze, lightening • Limited by harsh ground condition • Affected by near-by grass, trees, passengers, cars, power lines	• Severe false alarm due to wind and temperature change • Immune to terrain condition • Affected by grass, trees, passengers, cars, power lines	• Severe false alarm by rain, storm, frozen ground, tension change at high temp, • Damaged by lightening • Not applicable to harsh terrain condition • Affected by truck, airplane	• Transducer/EO Box/control Cu cable affected by rain, lightening, electrostatic etc. • Top tension sensing loop limited by harsh terrain condition and affected by surrounding • Bottom portion may require chicken net covering against small animal attacks	• Immune to all weather condition because of disturbance-free sensing method and no electronic equipement outdoors. • Not affected by ground conditions and surrounding conditions • Bottom portion may require chicken net covering against small animal attacks
Maintenance problems	• Frequency and sensitivity adjustments upon weather change	• Frequency and sensitivity adjustments upon weather change	• Tension/sensitivity adjustments upon temperature and wind variation. • Large man power to install • Large maintenance	• Transducer/EO Box/control cable maintenance problem • no OTDR function partial replacement difficult	• semi-OTDR • partial replacement easy • only seasonal check necessary
Applicable area	• Protected area • Roof top	• Rigid brick wall	• Not fit to existing fences, need separate posts and space • Concrete surface • Flat rigid base	• Limited to chain mesh fence only • Not fit to wall, gate and guard post	• Fit to may types of existing fences • standing-free FOM fence • Fit to gate, around post


YAEL-15


Maxi-Fence


DeTek


M-2005


FOMGuard

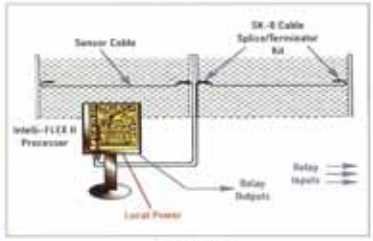

F-5000


Fiber Optic Vibration Sensor


Guardwire

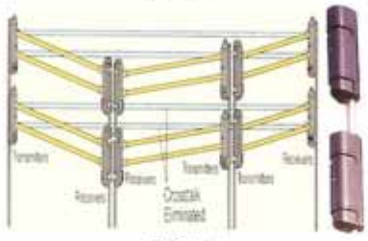

Coaxial Vibration Sensor

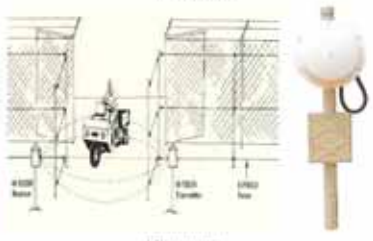

MultiSensor



Microphone

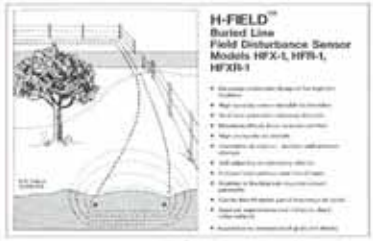

Shock Sensor


IR Sensor


Microwave

Pressure Sensor Cable

E-field



H-field


Leaky RF Cable

■ Site Questionnaire to propose FOMGuard and CCTV

1. Site lay-out map showing perimeter shape, length, gate, guard post, MCC (Main Control Center) etc.
2. Length and location of underground ducts between fence and MCC and of underground duct all around the fence.
3. Fence Type and dimension;
   a) Is FOM to be installed to an existing fence? If yes, provide the fence type, dimension and post interval, drawing and photo.
   b) In the perimeter with no existing fence, firstly consider Standing-free FOM fence for the maximum cost-effectiveness. To delay intrusion by enough time for the security guards to reach the intrusion spot, put additional concertina rolls inside the FOM.
4. Choose the required height of FOM among examples;
   a) 1m FOM over a wall to detect someone climbing over the wall.
   b) 3m FOM to 2.3m height steel fence to detect penetration and climbing over
   c) 3.3m FOM to 2.3m height steel fence to detect penetration and climbing over using a ladder
5. What is the fence base? (Concrete, Sole, Sand or Rock)
   a) Choose the required anti-digging measures in case except concrete.
   b) FOM bottom fixed to 80 cm Grooved Rods at 30cm spacing in soil base
   c) FOM bottom fixed to the top of and BFOSC (Buried Fiber Optic Sensor Cable) fixed to the middle of 120cm Grooved Rods at 25cm spacing in sand base.
   d) Weave FOSC between FOM bottom and rock base
6. What is the length of each underground duct between fence and MCC?
7. The working conditions along the perimeter such as road or geometry.
8. Are the gates to be protected by FOM or crossed by wireless sensors (IR Sensors or Microwave Sensors) which are connected and controlled by ACS also?
9. Does the site want to install CCTV Cameras interfaced FOMGuard? If yes, does the site plan to install security lightings around the fence or does the site plan not to install security lightings by choosing CCTV Cameras with search lights?
10. Any special customer requirements regarding the operational performances?
11. Name of site and location
12. Expected date of contract:
13. Expected date of operation start: