NITREX
explosives engineering

Company profile

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ABOUT US

MISSION

Nitrex provides services in the field of explosives engineering, a little-known but well-proven, technically reliable engineering discipline which leaves little margin for error.
It is the primary objective of Nitrex to furnish, turnkey operations for its clients with total quality results. Nitrex accomplishes this objective through constant and direct client communication, adherence to professional protocols and utilization of its experienced team and specialty equipment. Its outstanding results are simply the result of using rigorous theoretical modeling crosschecked by decades of on-field experience.

KEY OF SUCCESS

Nitrex conducts business successfully throughout the world. Competence, experience, efficiency and flexibility are keys to solving the problem. But beyond those, one critical all factor to satisfy clients needs has been rapid response and completion times, even when performing work in remote areas of the World.

Its ability to meet quickly and successfully its clients needs' is based in part on the fact that Nitrex is "self-contained?" Thanks to its competent in-house personnel, SAP Business One software managed equipment inventory, Nitrex can mobilize the required equipment, materials and team members almost instantly for even large scale demolition projects anywhere in the world.

SAFETY

All blasting activities are performed in adherence to appli-cable regulations. For each project, the Technical Manager along with the Health & Safety Manager drafts the Safety Plan and HazOp analysis to provide and inform all personnel and parties involved in the project.

QUALITY BASED ON EXPERIENCE

Nitrex draws upon more than 30 years of institutional experience and knowledge from its team of reliable professionals working cutting edge technologies, meeting or exceeding the strictest international regulations and standards for quality. Nitrex has received certification for its quality systems according to the UNI EN ISO 9001:2000 for the EA28/EA35 sectors, which includes: design and controlled blasting with explosives, risk assessment for fire and/or explosion of explosives or energetic materials.

Reference customers:

AVIO SPACE
BOSKALIS
COLLINI LAVORI
CAYENNE PORT AUTHORITY
CARENA-IELPO jv
CMC Ravenna
CMC Ravenna - LAOS Branch
DE BOER dredging
EPC Italy
FIOCCHI MUNIZIONI
GILARDONI
IMPRESA PIETRO CIDONIO
ITALSARC (Ghella, CMB)
ILVA
JOINT RESEARCH CENTRE - ISPRA
MAXAM Italy
ORICA Germany
PIZZAROTTI & C
PEDELOMBARDA (SALINI-IMPREGILO, ASTALDI, PIZZAROTTI, ITINERA jv)
SALINI NIGERIA
SALINI-IMPREGILO
SELI
SIS jv (SACYR VALLEHERMOSO, FININC)
TECNIS
U.T.T.A.T. Italian ministry of defense
UTTAM BLAST INDIA
VTC USA jv (HEALY, IMPREGILO)

NITREX owns a worldwide All Risks insurance with no limitation of distance among target object and acceptors.

DRILLING & BLASTING ABOVE GROUND

Rock blasting in urban environment

PRECISION DRILLING & BLASTING
controlled blasting

EXPERTISE BY EXPERIENCE

Nitrex has developed and perfected its technical expertise through 30 years of experience in controlled blasting at an international level. It has undertaken a wide array of blasting projects and challenges associated with above ground, underground and underwater blasting.

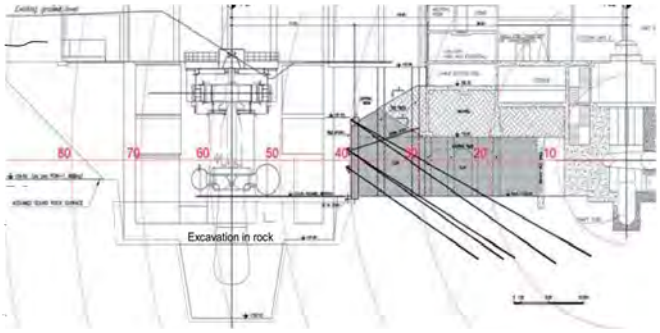
UNIQUE AND COMPLEX ENGINEERING

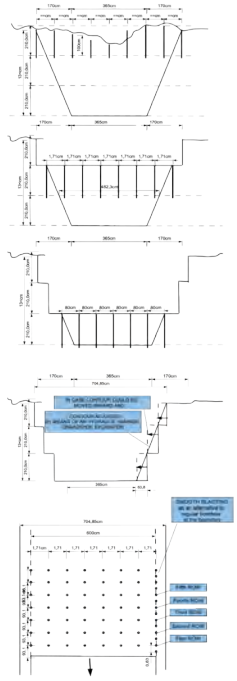
Nitrex has fortified its expertise through performing complex work where uncustomary studies and experimentation, balanced with environmental responsibility, was a constant.

RIGOROUS APPROACH AND COMPLETE DEDICATION

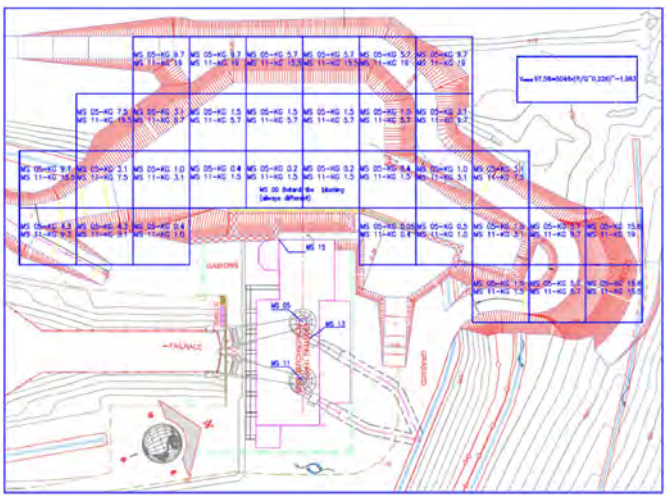
With a wide variety of rock and geologic structures, often in highly sensitive environs, Nitrex has strictly adhered to a rigorous approach involving the most current scientific theory reviews, field testing, data study and analysis. Through such approach Nitrex continues to deliver uncompromising results.

DRILLING & BLASTING ABOVE GROUND





			CLT RINORA
K	bench high [m]	1,0	1,0
i	hole angle on the horizon [°]	90	90
Ø	hole diameter [mm]	40	40
H	hole lenght [m]	1,2	1,2
U	sub drilling [m]	0,2	0,2
V	burden - geometrical [m]	1,00	0,50
E	spacing - geometrical [m]	0,80	0,80
	volume per hole (K*E*VA) [m 3]	0,64	0,32
Expl	explosive type	emulsion	
En	cartridges per hole [pc]	4,0	3,0
	% average compaction	5,0 %	0,0 %
Hb	stemming [m]	0,36	0,54
	stemming [% of V]	36 %	108 %
HE	esplosive column lenght [m]	0,8	0,7
QE	esplosive quantity in hole [kg]	0,81	0,61
	[MJ]	2,8	2,1
QD	priming (detonators/hole) "NONEL MS"	detcord	
QP sp	specific drilling [m/m² bench]	n.g.	n.g.
QE sp	powder farctor [kg/m³ bench] geometrical	1,27	1,91
	[MJ/m² bench]	4,5	6,7
QD sp	detonator need [n/m 3]	n.g.	n.g.



GROUND VIBRATION, OVERPRESSURE IN AIR, OVERPRESSURE IN WATER

Controlled blasting requires an advance understanding of the potential ground vibration, overpressure in air and water, as well as flyrock, in order to keep these potential hazards below threshold limits.

BLAST DESIGN

Nitrex's success in rock blasting is founded upon the blast design, which is built upon a thorough knowledge of physics, theory of detonation, geology, geotechnics and dynamics of fracturing.

100% flyrock confinement by use of blasting mats

DRILLING & BLASTING ABOVE GROUND

GEOLOGY AND GEOMECHANICS

Each project starts by Nitrex making a strategic assessment or study of the rock to be blasted. Such a geological and geomechanical survey initiates the blast design process.


Controlled blasting in a basalt quarry

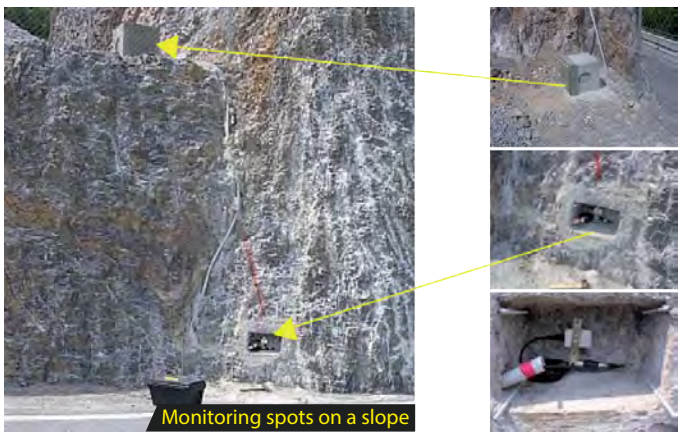

Varieties of geological contexts in a urban trench blasting

PRECISION IN EXECUTION, KNOWLEDGE OF EXPLOSIVE COMPUTATION AND OF THE PROPER FIRING-SEQUENCE

Precise execution is critical for a successful project.
Drilling detail, loading of explosives and firing sequence all contribute to the control of the blast effects. The combination of Nitrex skilled professional team and state-of-the-art equipment ensure that the precision required for success is executed on the project.

SEISMIC, ACOUSTIC AND VIDEO MONITORING

The monitoring of secondary effects, such as vibration, noise and flyrock, is necessary to demonstrate to clients and government agencies that threshold levels, as mandated in local or national standards, are not exceeded.
Nitrex personnel are highly trained and skilled in the use of seismic, acoustic and video monitoring equipments.


Monitoring spots on a slope

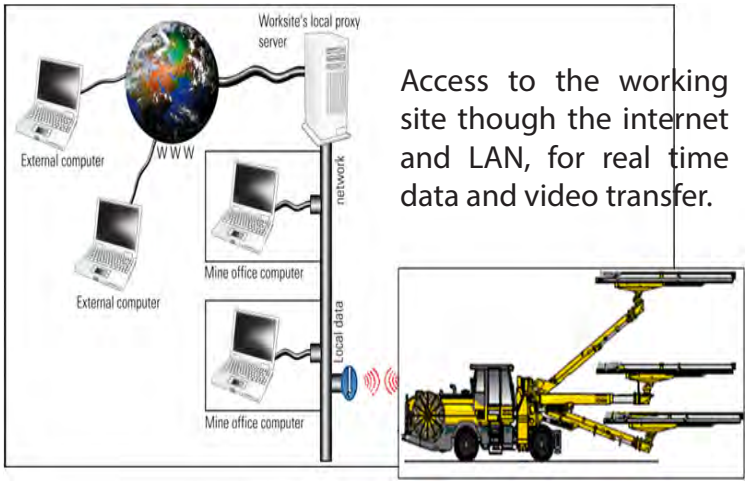
DRILLING & BLASTING ABOVE UNDERGROUND controlled blasting

All personnel, equipment and materials for underground excavation are in-house.

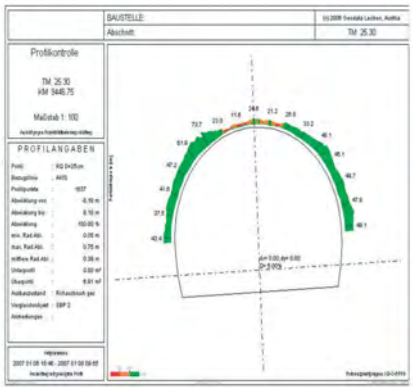
Work procedures are adjusted for each project to maximize safety and efficiency.
The design of the controlled blasting optimizes time and minimizes costs, ground vibration and back fracturing to levels below established thresholds.
Close monitoring of project parameters for each aspect of work such as timing, materials and resources, maintains efficiency while permits immediate and necessary adjust- ments.
Georeferenced, high precision, automated drilling minimizes over and underbreak as well as misalignment of cross sections which can impact on the volume of concrete needed for the tunnel lining.
Monitoring the geomechanical conditions of the rock mass through drilling up to 21 meters ahead of the blast front, allows for superior blast design and resource optimization, while preventing sliding and minimizing risks associated with gas interception.

Boreholes are filled completely with explosives cartridges using pneumatic loading equipment which minimizes drilling length and optimizes the performance of explosives. It also reduces loading times.
Blasting with the best equipment and materials, while incorporating redundancy for safety, minimizes the risk of misfires and their associated costs.
Near field seismic monitoring, in conjunction with an analysis of the muck pile geometry, aids in optimizing the blasting parameters and results in reducing time and costs.
Geological surveying of the blast front permits blast design adjustment to prevent sliding.
Environmental monitoring of air temperature, humidity, COx, NOx, dust, natural gasses, etc. continues throughout drilling and blasting operations.
Georeferenced 3D profiling of the excavation wallsand ceiling permits assessment of any over and underbreak, as well as mis- alignment of the cross section, providing for rapid adjust- ment of the blasting pattern.

Monitoring data collected during drilling and blasting operations is stored and shared through and Wi-Fi and LAN connections to a shelter site office adjacent to the excavation site. The project management therefore has constant, immediate access to the latest information regarding all sites conditions and progress.



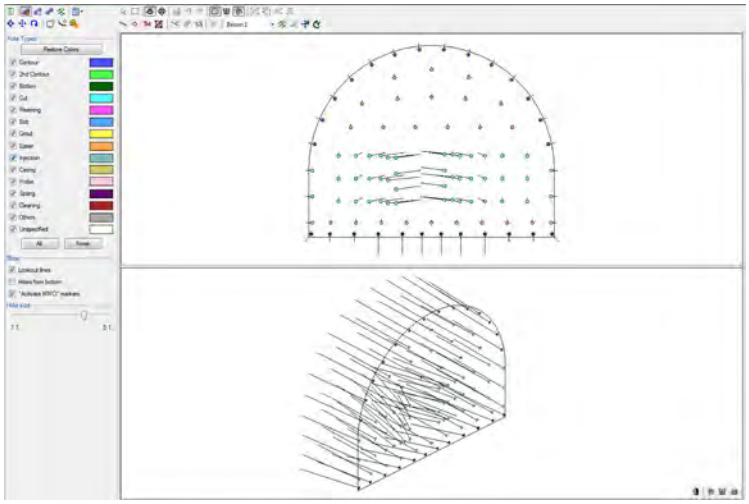
Access to the working site though the internet and LAN, for real time data and video transfer.



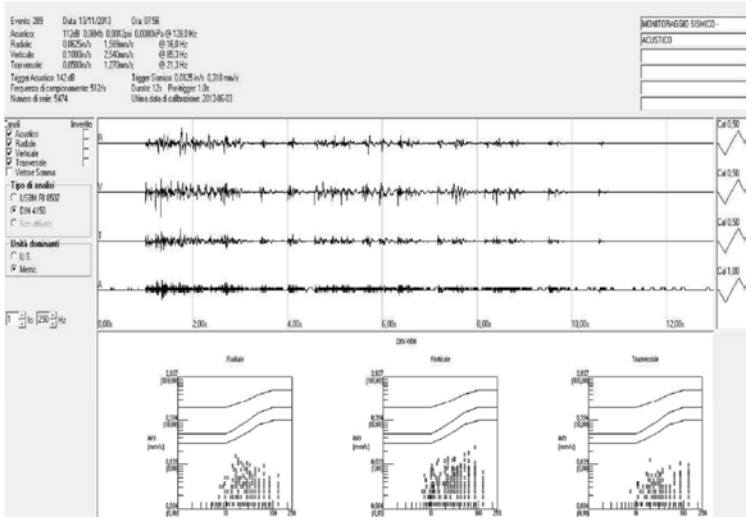
A 3D scanning system is used for rapid and high-precision tunnel profiling. A section can be scanned immediately before drilling for the next section blast. Data is processed on site using specia-lized software. The rig operator is then informed about any over or underbreak before drilling the contourholes. This means the drilling plans can be timely adjusted, with such fine tuning saving up to 5 cm in overbreak.

MEASURING WHILE DRILLING

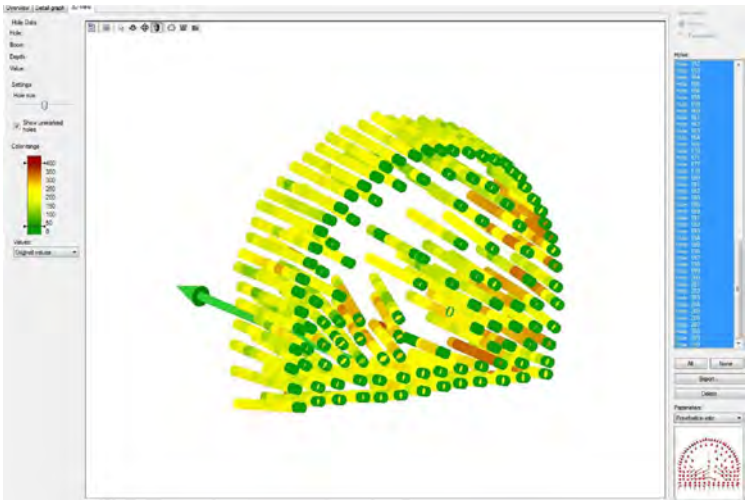
Penetration rate, feed force, rotation speed, pressure of the dumping system, water pressure and water quantity are all drilling conditions constantly monitored by a management system, which provides real-time feedback in the form of a geotechnical model of the rock mass.
Lithotype, rock resistance, crack zones and geometry of the formations are parameters made available to the site personnel and the project management via internet.
Through internet linking up Nitrex on and off-site com-puterized management system, optimal blasting patterns can be computed off-site and immediately adjusted and implemented on-site from one blast to the next.

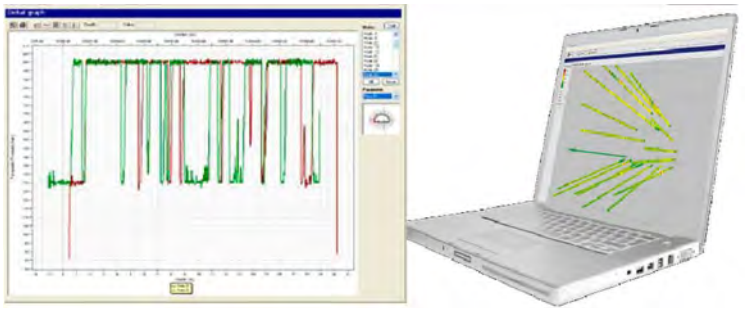


Through its comprehensive management system and remotely computed blasting pattern adjustments, the drilling rig position against the blast front and the bore locations are automatically computed, optimizing time and human resources.

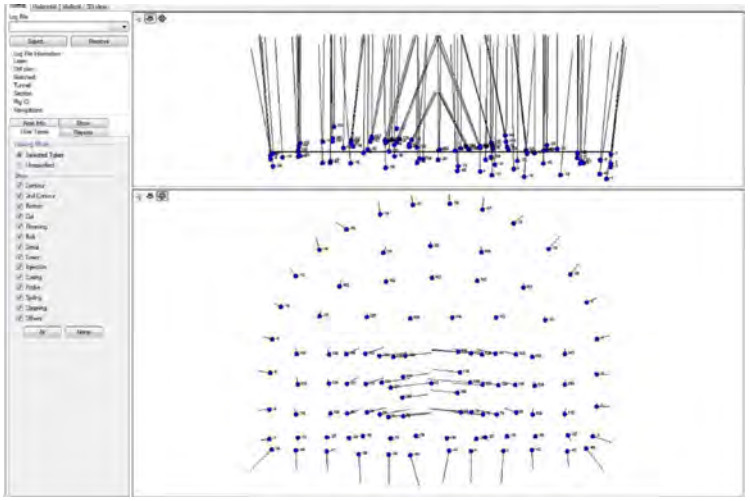


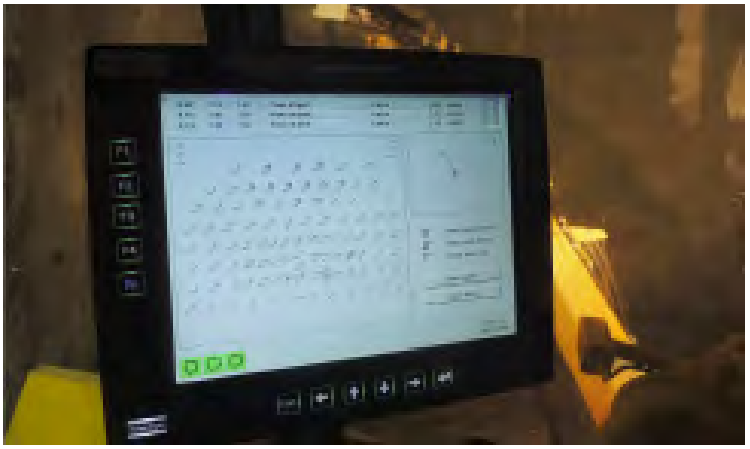
Through seismic monitoring feedback it is further possible to refine the blasting pattern which may result in a reduction of the number of boreholes required, saving additional time and money.



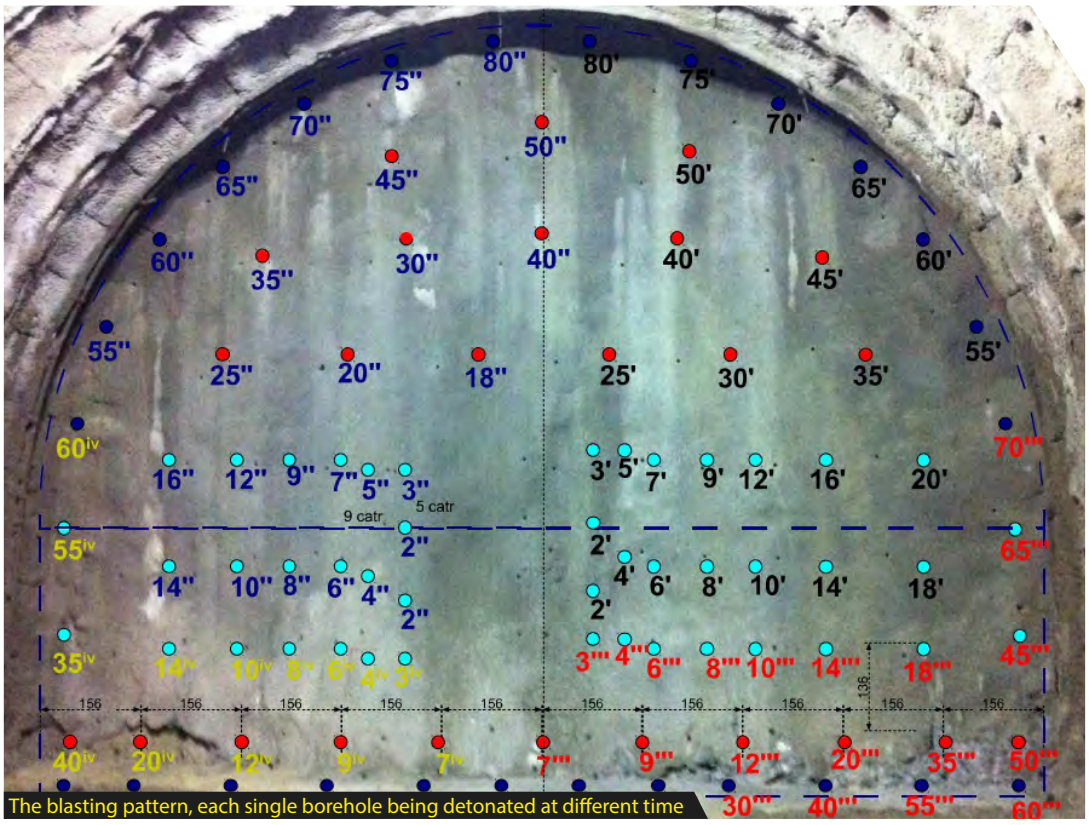


An analysis of the muck piles allows Nitrex to cross check blast efficiency and further fine tune the blasting pattern.





DRILLING & BLASTING ABOVE UNDERGROUND



The blasting pattern, each single borehole being detonated at different time


Automatic drilling


Pneumatic loading

Ready to load the blast

UNDERGROUND EXCAVATION COMPLETION AND TEMPORARY SUPPORT

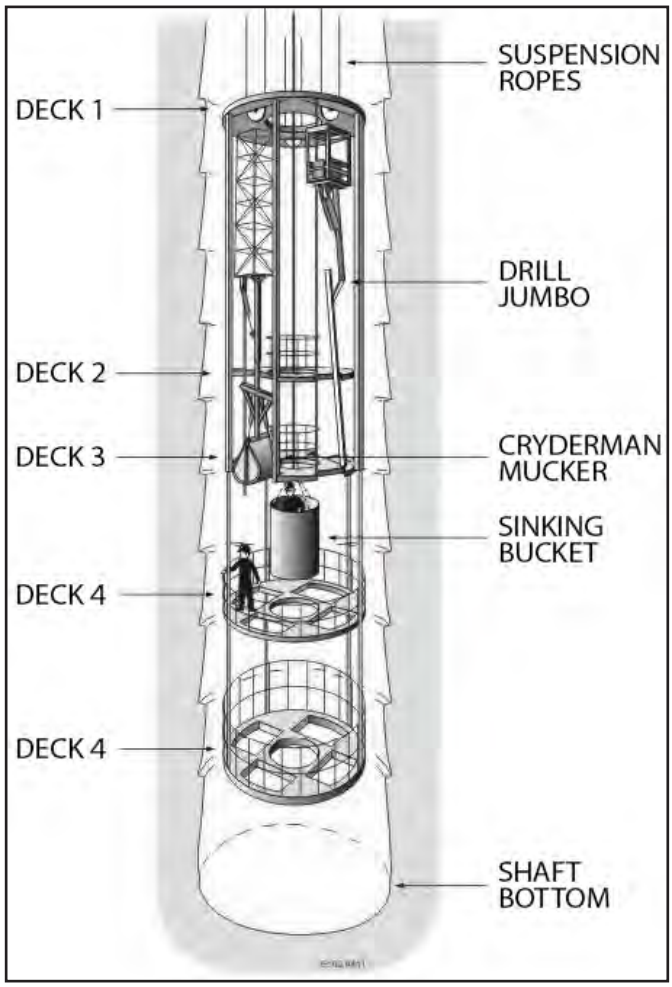
Excavation by means of hydraulic hammer

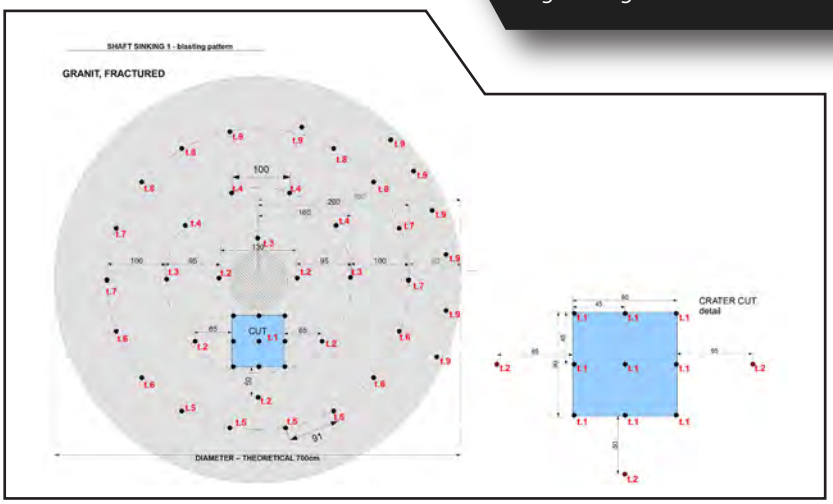
Mucking and haulage

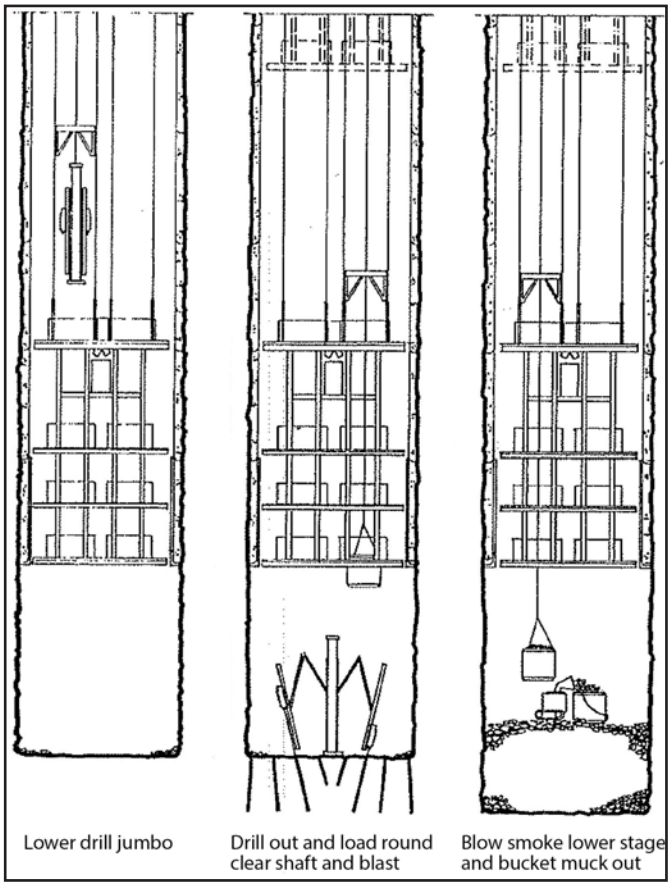
Shotcrete, laser based control system

Placing of iron ribs

SHAFT SINKING








Drilling


Mucking

CONTROLLED BLASTING OF VERTICAL STRUCTURES, BUILDING IMPLOSION

SKILL AND EXPERIENCE

Nitrex has distinguished skill and experience in the field of reinforced concrete structure demolition. Through years of experience Nitrex has established procedures to survey, plan and execute turn key high-rise demolition. Implosions are performed swiftly and safely, even on projects where there are nearby existing structures to be safeguarded. Nitrex is fully insured for demolition projects involving neighboring structures to be safeguarded even at a zero distance. The demolition work is carried out by a team of blasters using tested and proven equipment and materials. Nitrex blasters are trained and qualified to work with explosives and they have patented equipment and materials.

DECONSTRUCTION IN GENERAL: RISK OF MECHANICAL DEMOLITION OF HIGH-RISE STRUCTURES

Demolition, or "deconstruction" of low structures is usually carried out using hydraulic breaker, shears and hydraulic crushers attached to a backhoe or excavator. Taller structures must be "deconstructed" by means of crushers attached to excavators with arms extended or attached to a tower crane.

Mechanical deconstruction requires continuous physical contact with the structure due to the slow and precise breakdown of the concrete and for the subsequent cutting of rein-forcing steel.

This progressive, asymmetric removal of the building mass, entails an ever changing, asymmetrical modification of the structure's static equilibrium.

If the structure's mechanical resistance is not uniform (for example, because of localized weakening of the concrete after seismic loading or due to structural fatigue, or corrosion that reduces the reduced steel strength, etc.), there is a risk of unexpected and uncontrolled collapse of the structure which could endanger the equipment and operators below. History shows that this occurs more often than one might imagine.

These are reasons why demolition of high rise structures by use of high explosives is more advantageous and often required.

BUILDING IMPLOSION

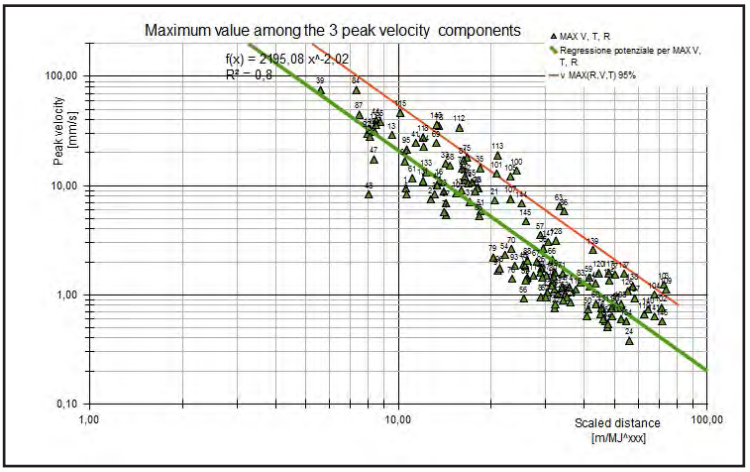
SAFETY

Demolition is designed to minimize or completely negate the impact and nuisance on surrounding structures and persons. The objective is to contain all blast effects to within established thresholds for a zero probability of damages to surrounding structures and annoyance to individuals. Blast effects results from:

- ground motion due to the impact of the explosive changes on the ground mass (seismic waves)
- "noise" due to the explosion of the charges (overpressure in air)
- flyrock
- dust

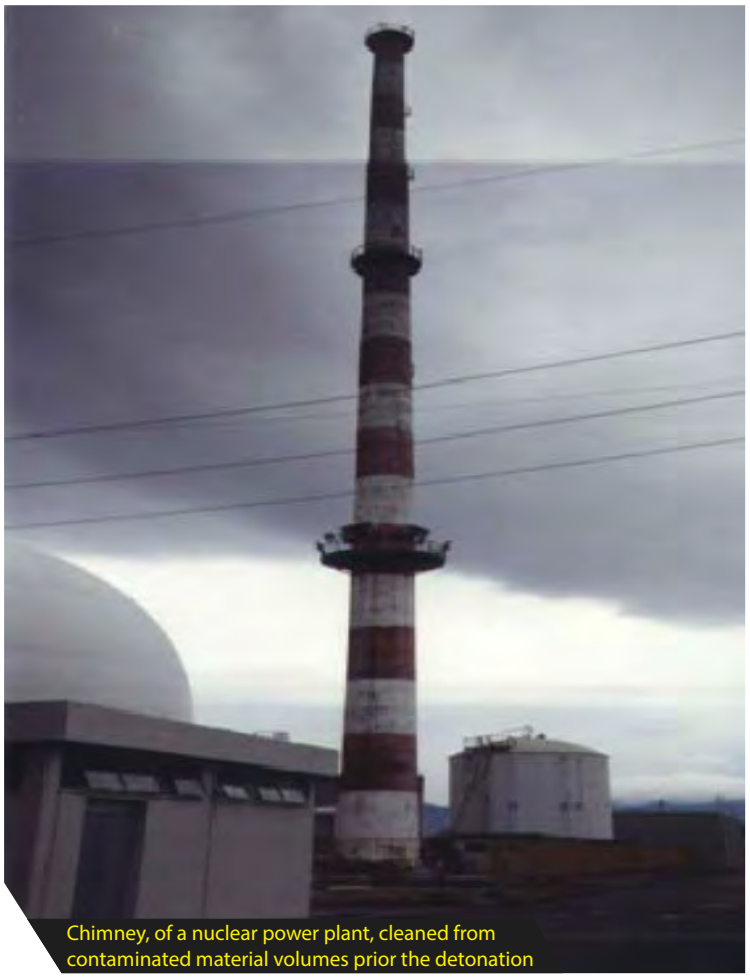
REFERENCE NORMS

- DIN 4150-1 2001: Erschütterungen im Bauwesen - Teil 1: Vorermittlung von Schwingungsgrößen (Vibrations in construtions: acquisition of the physical dimensions related to oscillations).
- DIN 4150-2 1992: Erschütterungen im Bauwesen - Teil 2: Einwirkungen auf Menschen in Gebäuden (effect on people).
- DIN 4150-3 1999: Erschütterungen im Bauwesen - Teil 3: einwirkungen im bauliche Anlagen (effect on buildings). Nitrex uses the British standards, USA standards, and Swiss standards.



Preliminary cuts - NO BOREHOLES

Demolition with explosive charges of Silo intercells with filled water 20 silo in one single blast. Never done before



Chimney, of a nuclear power plant, cleaned from contaminated material volumes prior the detonation

CONTROLLED BLASTING DEMOLITION COST EFFECTIVE AND SAFEST

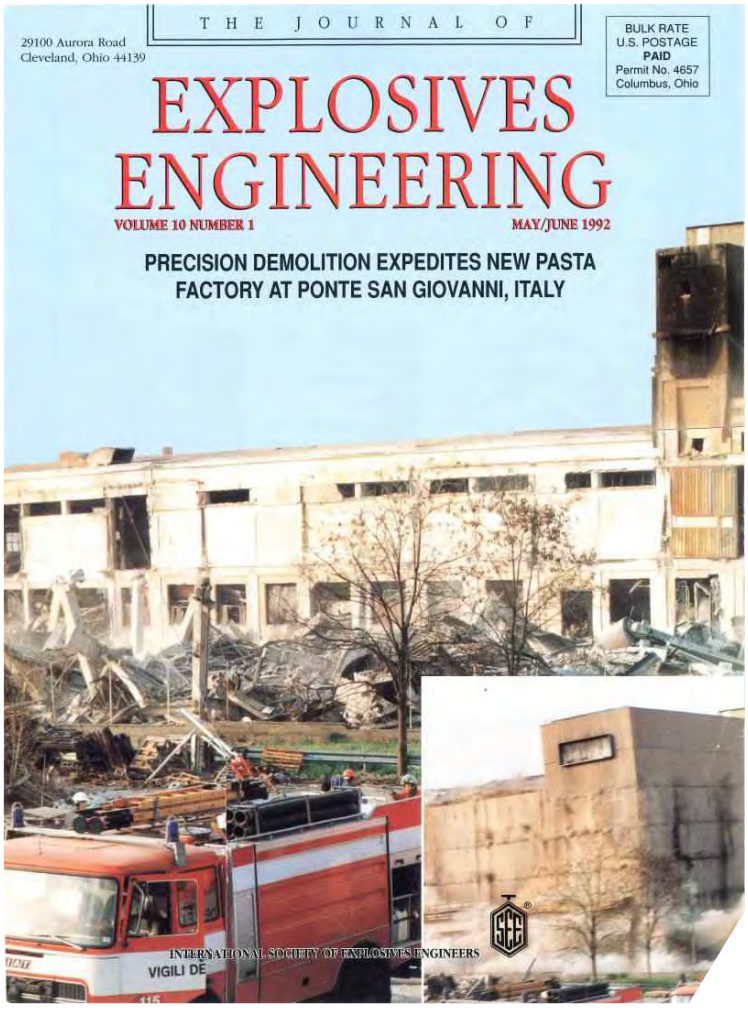
Unlike "deconstruction," controlled blasting makes it possible to work on the entire structure at once without upsetting its static equilibrium, and then, using a pre-set sequencing of blasts with precision of up to 1/100 of a second, completely raze or demolish the structure with the site cleared of all personnel and equipment to a safe distance.
Explosives demolition clearly provides for the best safety conditions, much more than is possible with mechanical demolition. Additionally, demolition time and costs have proven to be fewer that mechanical demolition.
The structure, once razed to the ground, can then be demolished with low cost equipment easily acquired anywhere around the world.

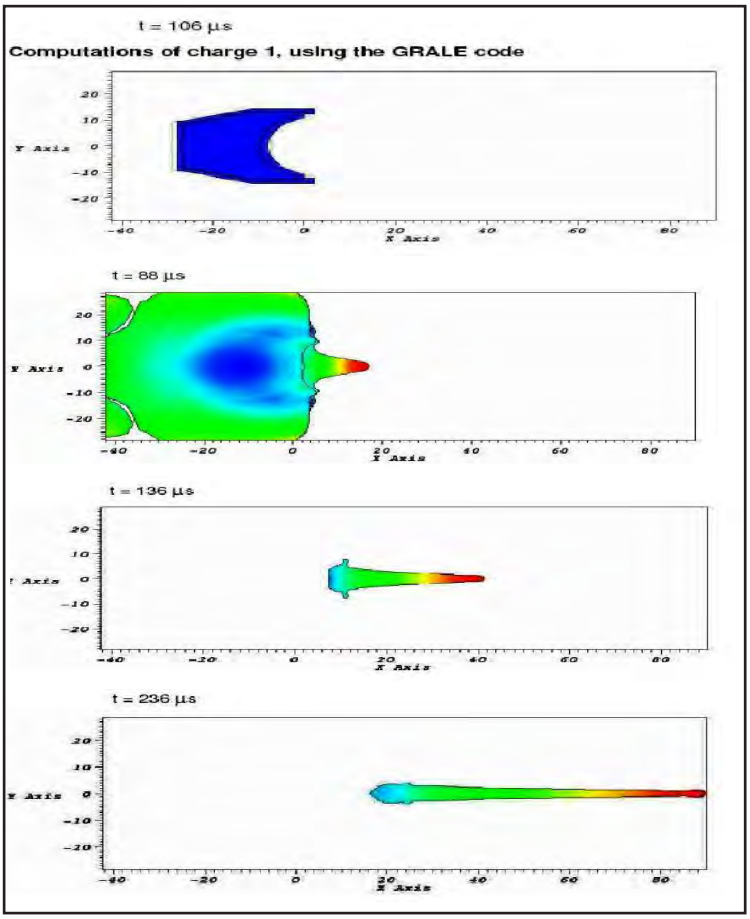
COLLAPSE POTENTIAL

Any possible danger of collapse of the structure only exists at the site for a few minutes, instead of a period of months as occurs with mechanical demolition. Thus, explosives demolition allows for significantly better safety conditions.

COLLAPSE SEQUENCE

The direction of the controlled collapse is established on the basis of the distance from nearby structures which must be safeguarded.
If the distance to existing structures to be safeguarded is greater than 150% of the height of the structure to be demolished, the demolition will incorporate collapse by spinning, which is less expensive than implosion. Implosion is required when the distance to existing structures is less than 150% of the structure's height.
Razing, both by spinning or implosion, triggered by removal of substantial concrete with explosives. Where necessary, structural steel or rebar is cut using shaped charges.
The modeling for the structure to be razed and structures to be safeguarded are identified and defined in the design documentation, through detailed surveying and analysis.



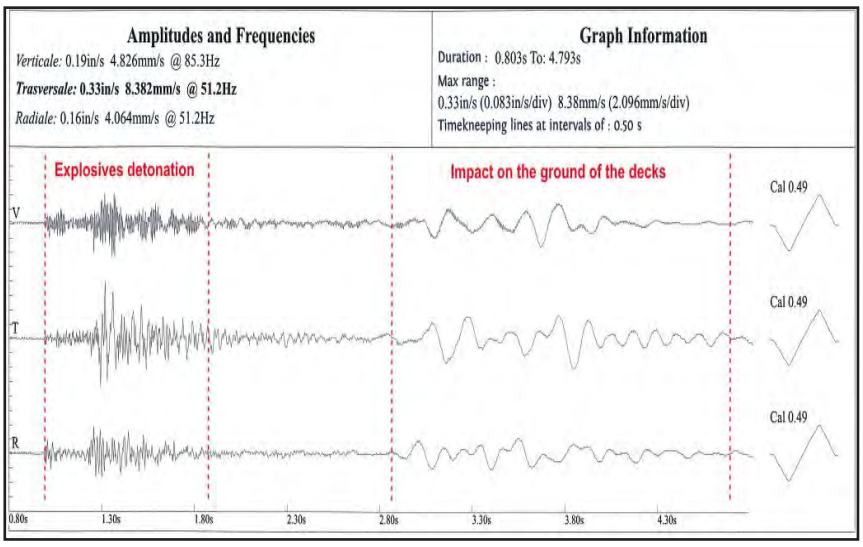


MONITORING

Seismic and acoustic monitoring equipment is installed by the existing structures to be safeguarded (the "acceptors") and also close to the blast site, thus permitting the computation of a blast-decay curve. Through such computations, the peak velocity versus distance may be interpolated for locations surrounding the site.
Nitrex uses as many as 20 seismic or acoustic monitoring locations for special projects such as those inside densely populated areas.
To control flyrock, video is set up on several locations. In post- demolition analysis, the recorded event is meticulously reviewed to demonstrate compliance with project monitoring specifications and to show that standard thresholds were not exceeded.

Nitrex presents a post-demolition report which includes:

- the monitoring equipment and its features
- the location of monitoring devices
- equipment set up
- sampling frequency
- modes of data acquisition
- applicable legislation, standards and rules of good practice
- post-demolition analysis



MASSIVE STRUCTURES

Spillway demolition in a concrete gravity dam in its late stage, with stop-logs at about 50 cm apart

PRECISE EXPLOSIVE DEMOLITION OF MASSIVE STRUCTURE

Explosive demolition is the best method for the demolition of massive, reinforced concrete structures in a short time period and at reasonable cost. In demolition of massive concrete structures, drilling is critical. The heavy steel reinforcement can be a barrier for drilling, requiring the use of specialized techniques, equipment and tools. Hydraulic drilling may suffice, but other circumstances may require diamond tools.
The explosive charges must be shaped and positioned so as to clear the concrete from the reinforcing steel. Extra precaution must be exercised to control the throwing of fragments, vibration and air overpressure.
In case of partial demolition, preliminary cuts by means of diamond cutting tools are needed.

Partial demolition in dam to host an intake tunnel


Bridge 1 km long , 44 decks . . .

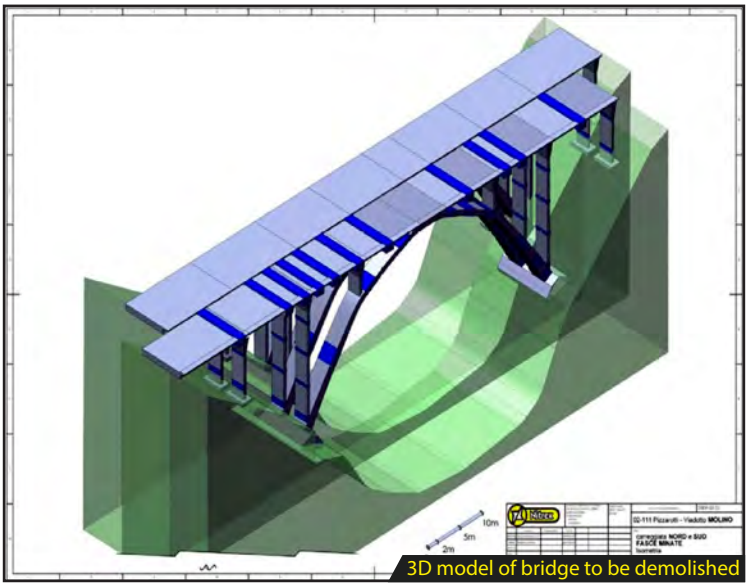
DEMOLITION OF BRIDGES

EXPERTISE AND EXPERIENCE

Through hundreds of demolition projects, Nitrex has developed a reputation for excellence in the field of bridge and freeway viaduct demolition. Nitrex's expertise includes demolition of both traditional steel reinforced concrete bridges and the Melan System bridge (Josef Melan-used rigid truss arches made of iron). Over decades of bridge demolition experience, Nitrex team has established and refined procedures for turnkey demolition operations which allow the work to proceed swiftly and safely from assessment and design to set up and execution.

This is often performed with a newly constructed bridge or viaduct already in place often at only few centimeters apart from the structure to be demolished.

Nitrex has public liability insurance coverage for its explosives demolition projects which involve bridges, viaducts or other structures which must be safeguarded, even at near zero distances. The demolition is carried out by Nitrex team of highly trained blasters who have honed their craft using specialized, tested and proven equipment and materials. These blasters have been qualified to work with high explosives, and often must use Nitrex's custom developed, patented equipment.


3D model of bridge to be demolished


. . . by reverse domino

BRIDGES DEMOLITION

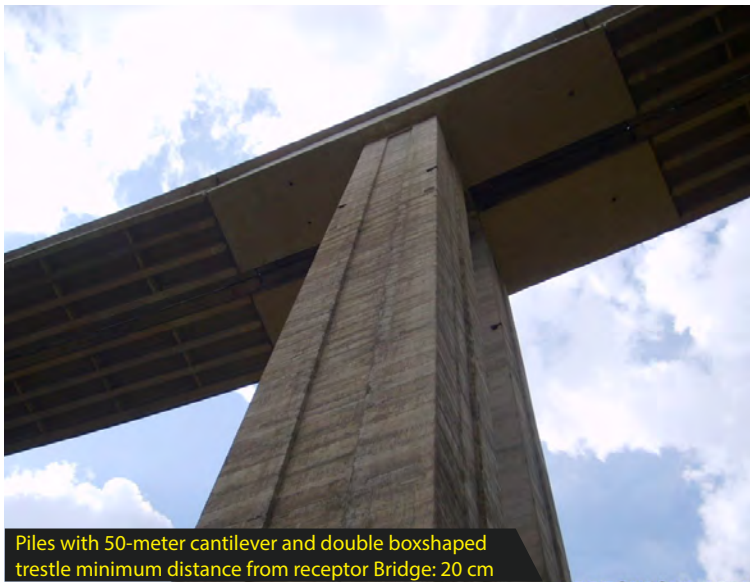
BRIDGES DEMOLITION

Nitrex has developed particular skill in bridge demolition work which involves protection of adjacent structures. These projects have included structures actually in contact with the bridge to be demolished, or some as close as a few centimeters, while other projects have required protection of overstanding objects such as new bridge construction, pipelines, electric power lines, fiber optic cables, residential structures, industrial plants, and more.

Reinforced concrete bridge with ribs and membrane

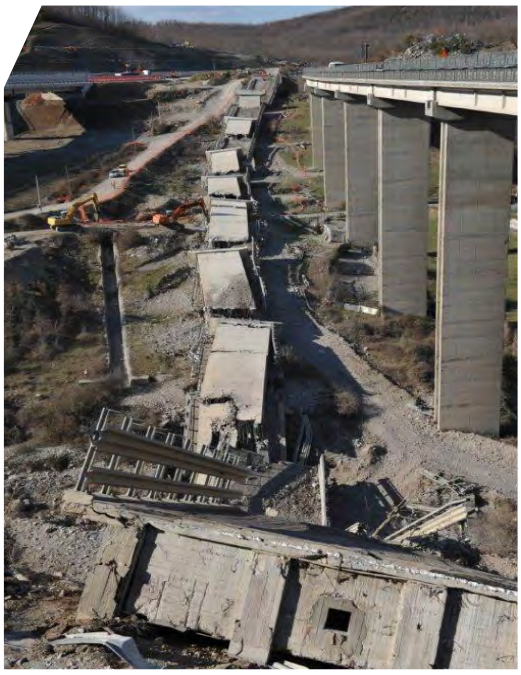
Arch bridge Melan system (steel beam embedded in the reinforced concrete) max height 150 m, access being provided by self designed and built FALABELLA platforms

BRIDGES DEMOLITION



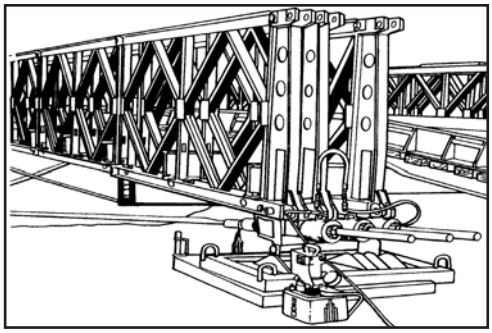
Piles with 50-meter cantilever and double boxshaped trestle minimum distance from receptor Bridge: 20 cm

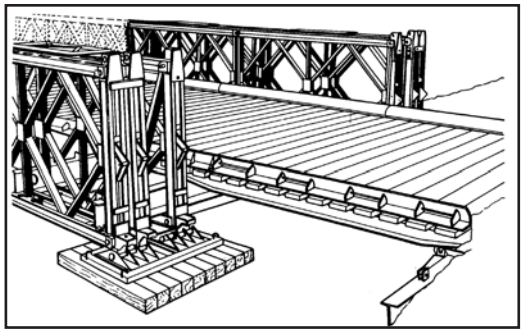
BRIDGES DEMOLITION

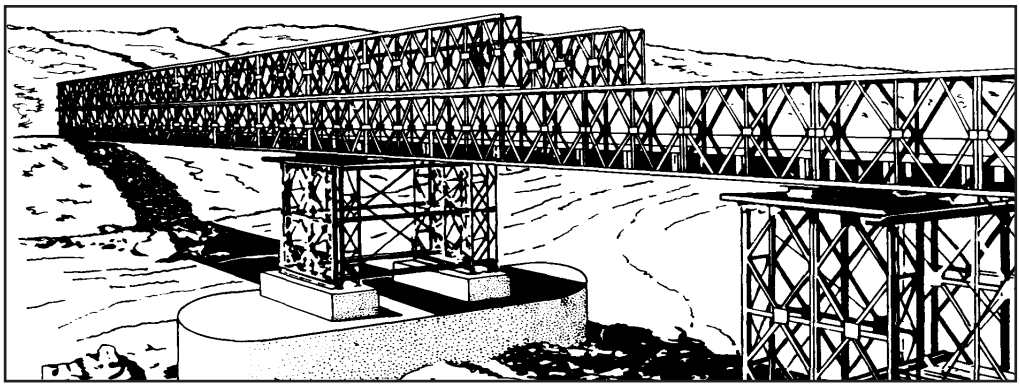


mechanical demolition sequence on the ground

TEMPORARY BRIDGES SET UP WITH BAILEY EQUIPMENT





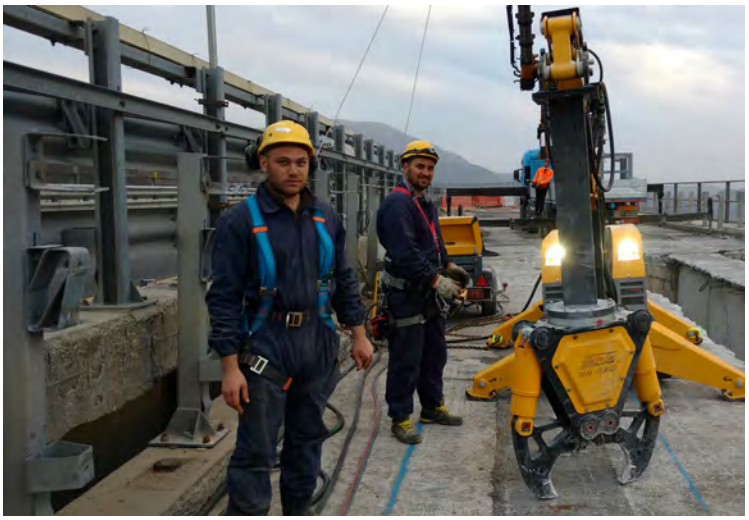


BRIDGES DEMOLITION

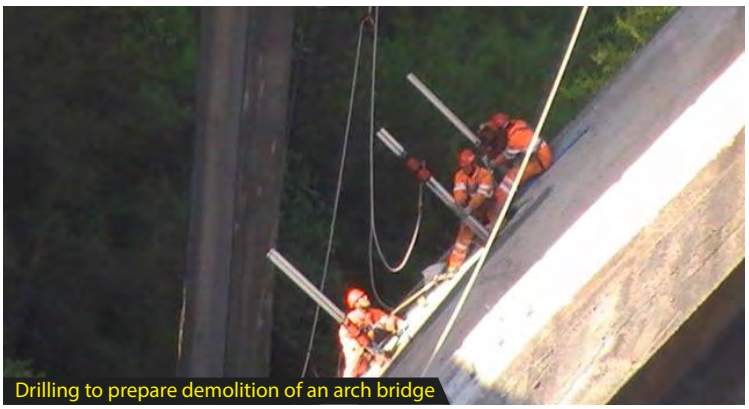

Preliminary cut of slabs


Diamond cut for decostruction


Precise preliminary mechanical demolition with remote controlled excavator




Access for personel by large diameter diamond coring


Drilling to prepare demolition of an arch bridge

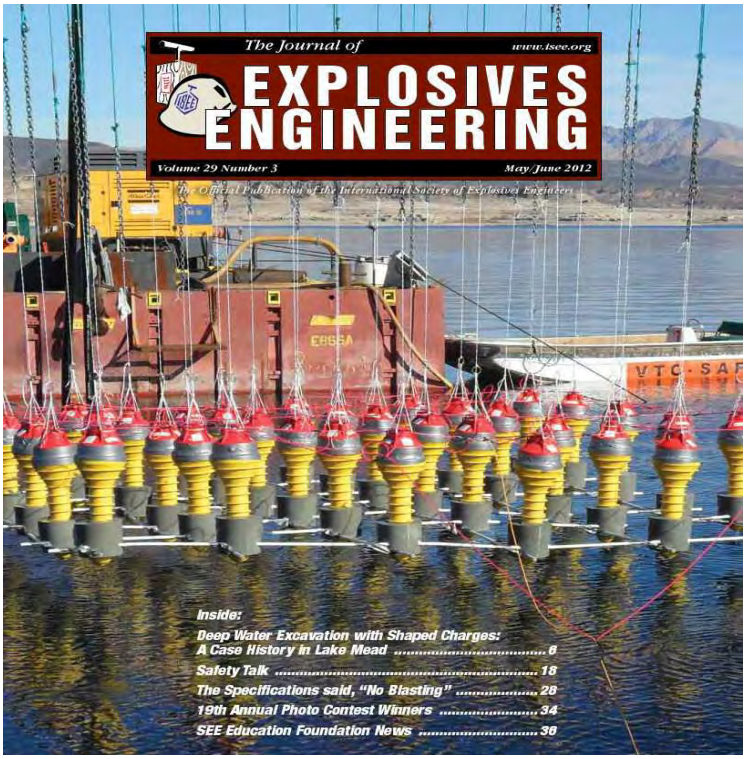

Remote controlled wagon-drill

UNDERWATER EXCAVATION
drilling & blasting, shaped charges

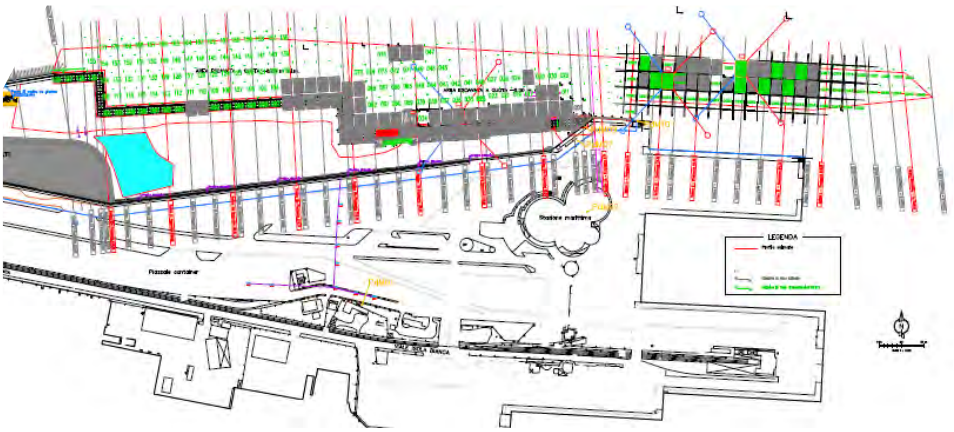
Underwater blasting has become a large part of Nitrex's activity across the world.
In shallow waters up to 20 meters, the blasting is carried out using OD (overburden) drilling and blasting. At greater depths, the complexity and cost of drilling and, above all, loading the blast holes with explosives becomes significantly more difficult and therefore cost prohibitive. Furthermore, at greater depths, uncertainty of execution increases as does the associated risks of misfires.
At depths exceeding 20 meters, blasting with shaped charges is most advisable.
Shaped charges is also most effective where the thickness of the rock layer to be removed is less than one meter, or where the volume of rock to be removed is so little that the cost of transporting and setting up a drilling platform (jack-up or pontoon) is economically unsound.

UNIQUE SKILLS IN DEEP WATER BLASTING WITH SHAPED CHARGES

Nitrex has few, if any peers, in underwater demolition. Through unique and challenging projects, Nitrex has developed proce-dures, loading and monitoring systems, custom designed and manufactured equipment and materials, including its self- designed and manufactured underwater shaped charges which may be used for demolition at depths up to 300 meters. With its 3 calibers standoff, this underwater shaped charge is unique to all the world.



UNDERWATER BLASTING

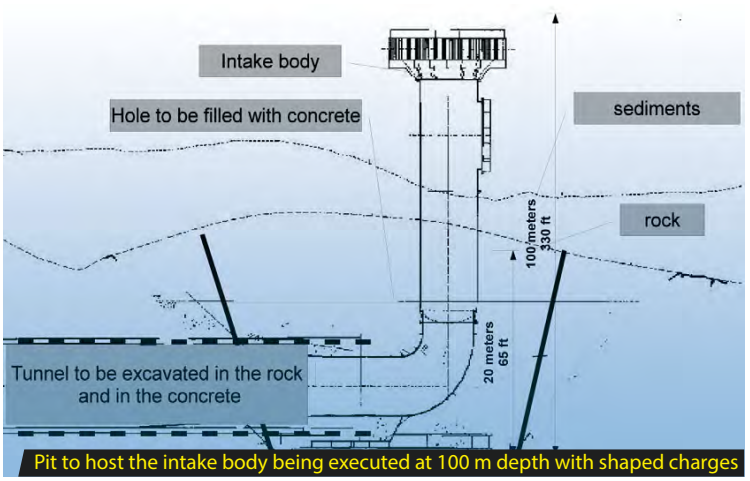


Jack-up with rails for operations with two OD wagon-drills

shock wave imprint on the water table after a blast with shaped charges at 100 meters depth

Divers loading holes with Composition B charges in pipes, for shallow waters drilling and blasting

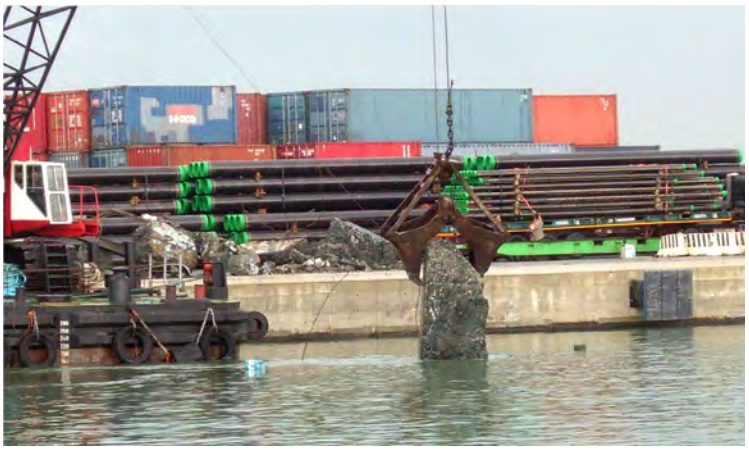
Mucking from underwater drilling and blasting



Pit to host the intake body being executed at 100 m depth with shaped charges

UNDERWATER BLASTING

Preparation of a blast, shot and removal of highly reinforced concrete segments demolished with shaped charges near dock .

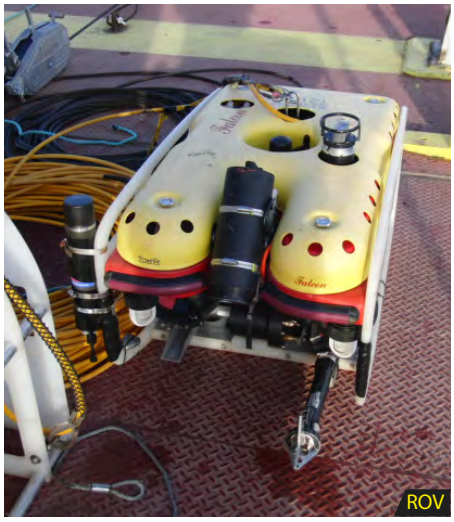


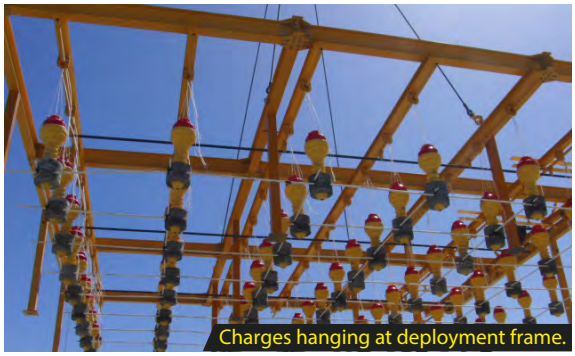
Composition A5 shaped charges for reinforced concrete demolition

Highly reinforced concrete foundations being cut into parts by use of Composition A5 shaped charges

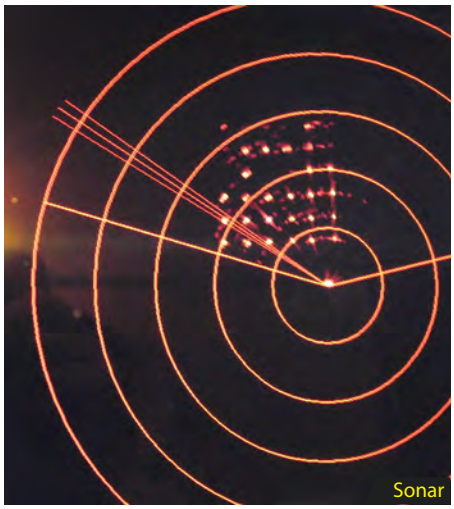

Barge, lowering the frame


Explosives day box


ROV


Charges hanging at deployment frame.

. . . and video monitoring of the deployment of shaped charges in deep waters blast


Sonar

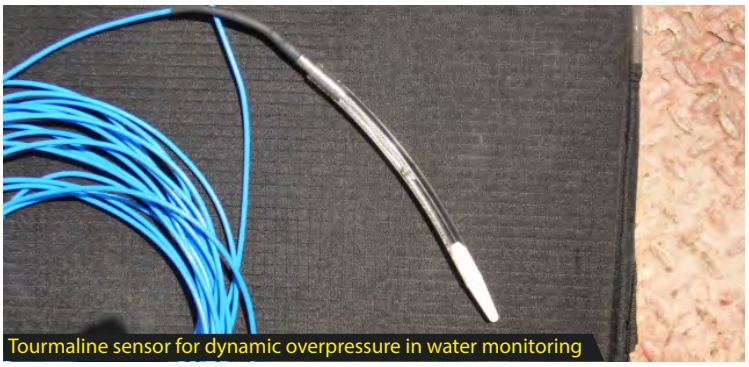

Detonation of 54 Composition B shaped charge at 115 m depth

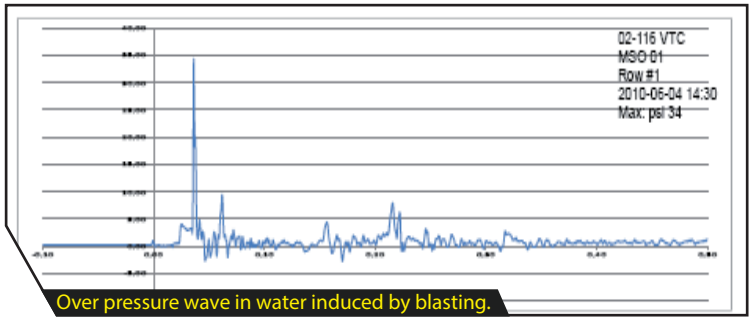
UNDERWATER BLASTING


Underwater blast charges in boreholes in shallow waters close to dock


Monitoring blast induced seismic waves from water to barge near filed


Monitoring ground vibration induced on docks by near field blasting


Tourmaline sensor for dynamic overpressure in water monitoring



Over pressure wave in water induced by blasting.

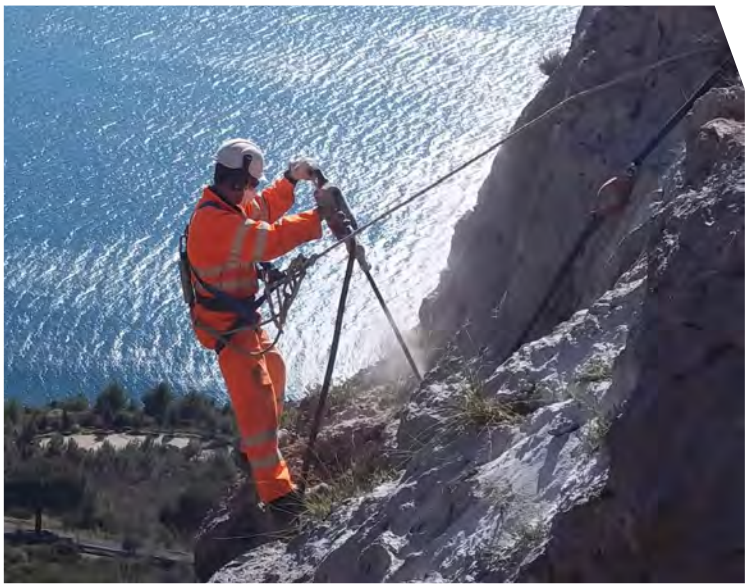
EARTH WORKS, ROAD WORKS

Organized and logical working system.

The opportunity to give, to general contractors, a turn key service for excavation, has induced Nitrex to increase its equipment fleet and extend the services offered to mucking and haulage.
The methodical and scientific approach followed in the activities with explosives has proved to be very effective also to earth moving, adding value to increase in safety, quality, preciseness and velocity of execution also in challenging contracts.

Accurate organization of job, lifelong training of personnel, field workshops and maintenance programs, as well as quality of equipment and spares, are Nitrex keys to guarantee results and time schedule.

SLOPE STABILIZATION



Blasting to clear a large boulder which moved by a flood and stood impending at 150 m heigh above housing

SLOPE STABILIZATION WITH EXPLOSIVES

COMPETENCE AND EXPERTIZE

Rock landslides can occur after heavy rains and flooding or just as a result of natural erosion in mountainous areas. The risks for traffic and inhabited buildings can be deadly.
Nitrex performs slope stabilization works, blasting large boulders or high slide areas to minimize risks to the population; in these case containing flyrock and minimizing ground vibration within safety limits are given top priority. For such works, Nitrex is ready to mobilize and act within 24 hour notice.

DRILLING

Operations which involve a sufficient volume of rock drilling are carried out using mini wagon drill. Where necessary, this small but powerful rig can be lifted by helicopter to reach difficult to access working areas.

FLYROCK

In order to completely contain the flyrock, reinforced covers and explosion gas-venting blasting mats are used.

Covering with venting blasting mats.

DESIGN

Each stabilization project requires specific design and planning:
GUIDELINES: a compilation of the applicable blasting standards and industry regulations which apply to the project, and includes a description of how to develop the design within the applicable thresholds for vibration and flyrock.
METHOD STATEMENT: a compendium of all operations described in detail, equipment and materials list and time schedule.
ACCEPTOR DATABASE: a database of information regarding the existing structures and installations (roads, buildings, electrical lines, etc.) in the surrounding area which are to be protected.
HEALTH & SAFETY PLAN AND RISK ASSESSMENT: this includes HazOps (Hazardous Operations) plan.
REPORTING: a summary of all monitoring activities, including seismic, acoustic and video.

SEISMIC AND ACOUSTIC MONITORING

Seismic and acoustic monitoring stations are installed to record the blast induced impact in the surrounding area and upon existing structures. Pre-blast, this same equipment is also used to develop a preliminary understanding of the environ-mental seismic context (in other words, ongoing earthquake activity which might impact the project, instability of rocks, etc.).
Recording is triggered by any impact event which exceeds a predetermined threshold. The monitoring devices are programed to send an alarm notice via SMS or Wi-Fi connection. The data recorded are analyzed and compared with thresholds set by government regulation which serve as guidelines to prevent damage to surrounding structures and the dislodging of unstable boulders.

Remote controlled monitoring stations

NITREX
explosives engineering

MAJOR ACCIDENT HAZARD RISK ASSESSMENT

EXPLOSION AND FIRE HAZARD ASSESSMENT FOR EXPLOSIVES, AMMUNITION AND FERTILIZING AGENTS FACILITIES

Quantification of the impact induced in the event of a major accident in energetic materials facilities is developed by analysis of:

- environmental context
- human resources
- dangerous goods danger and risks
- fault tree analysis of the working processes
- reference major accidents occurred in the past
- computation of the probability of occurrence
- analysis of induced impact for each probability of occurrence
- computation of the iso-damage area extension for:
  - over-pressure in air
  - primary fragmentation
  - secondary fragmentation
  - ground vibration
  - toxic release.

The algorithm used is being tuned fine by direct blasting experience and study of major accident in some explosives facilities. Vulnerability assessment and safety procedure and definition of a specification for monitoring are the final stage of the assessment process.

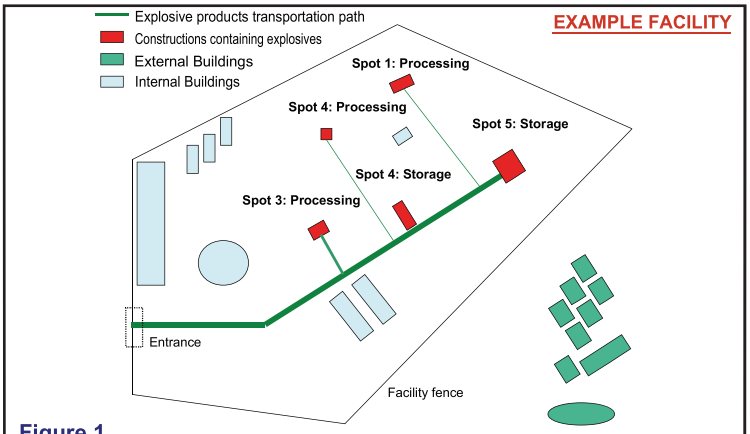


Figure 1

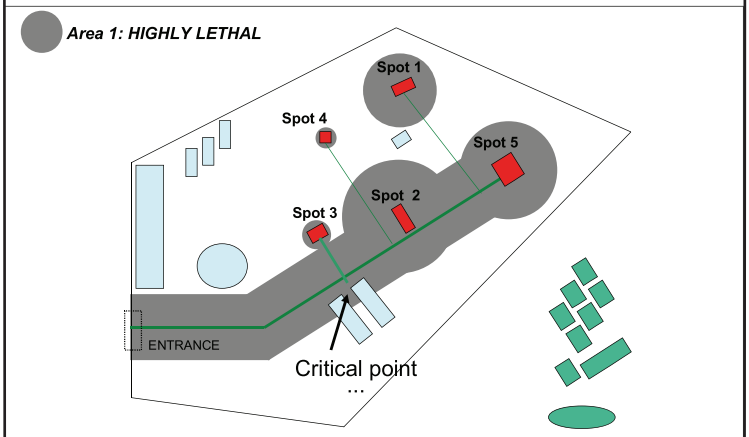


Figure 9c - Envelope of iso-damage areas of each spot of the hypothetical facility

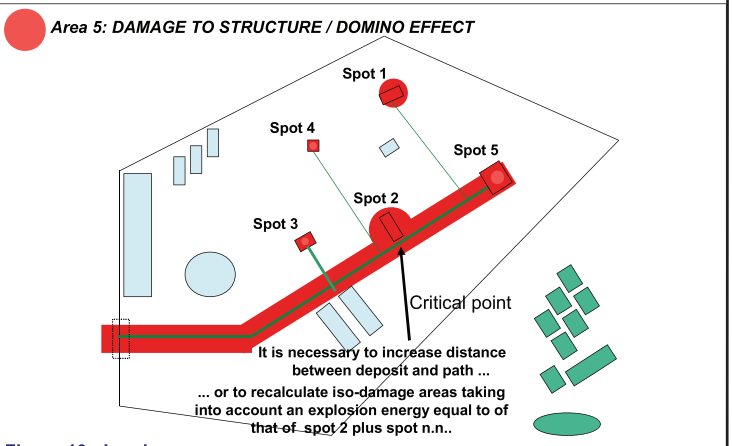


Figure 10 - Iso-damage areas

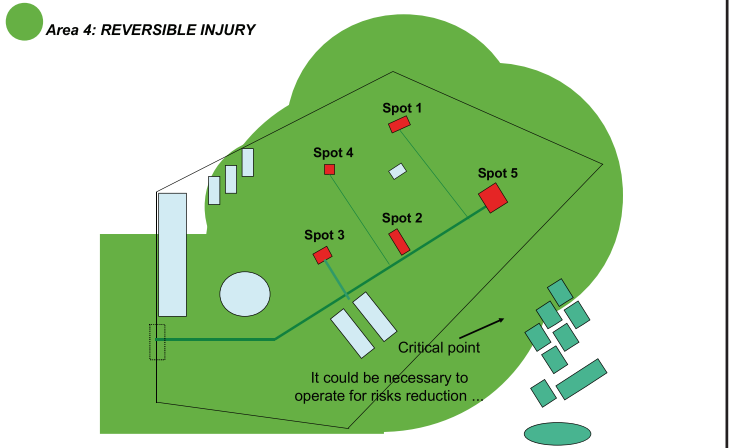


Figure 10 - Envelope of iso-damage areas of each spot of the hypothetical facility

SAFETY

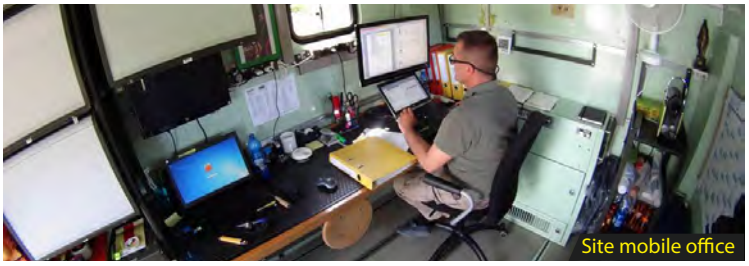
Nitrex staff is specially trained and qualified in industrial abseiling (rappelling) and drilling and blasting in precarious or difficult to access locations. They also received intense first aid and fire prevention training. Most of Nitrex personnel have years of international blasting experience in some of the most challenging environs.
Before any project operation starts, the team is trained and instructed in classroom regarding the specific project opera-tions and the Health & Safety Plan.
Each member team knows well his role and assignment on the project before execution.

IN GENERAL

QUICK RESPONSE FOR EMERGENCIES

Nitrex organization is specifically structured to take quick action on short notice.
All the equipment used is company-owned. The equipment selected for any process has been tested and there after is coded for applicable uses. The same process is unde rtaken for materials used.
Nitrex warehouses are always stocked with equipment and materials quantities sufficient to enable successful demolition of 10,000 cubic meters of rock or a large demolition. Thus, completion of work is never affected by procurement times.
All articles in the warehouse are marked with article-specific bar-codes. Warehouse stock and handling is managed with the company SAP management software which provides instantaneous accounting of all warehouse items, including current use, location and condition.

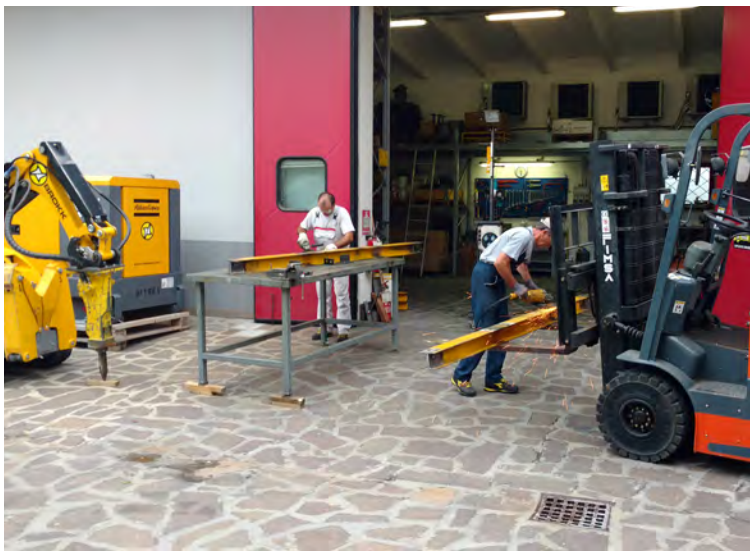
Site warehouse



Site mobile office

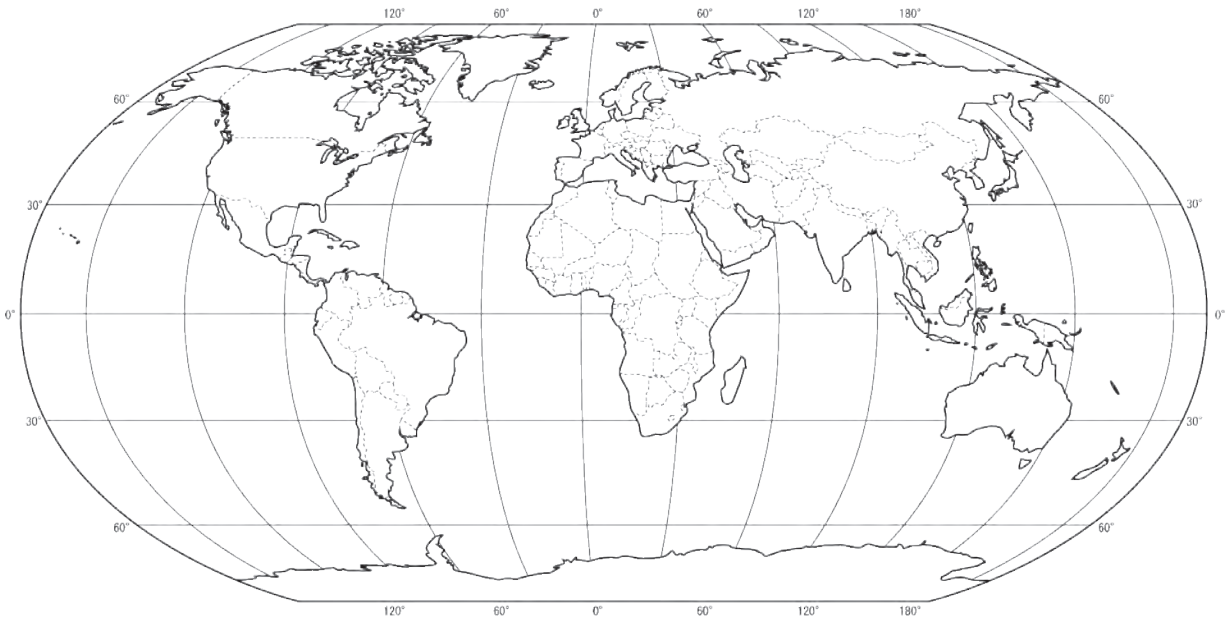
Nitrex headquartier in Lonato del Garda, Italy


Site camp



NOTE

NITREX owns a worldwide All Risks insurance with no limitation of distance target - acceptors.



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