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CERCLA Administrative Record document, B886 - A - 000044

U.S. DEPARTEMENT OF ENERGY
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

GOLDEN, COLORADO

CORRES. CONTROL
OUTGOING LTR. NO.
DOE ORDER # 5700.1
02-RF-00401

DIST.	LTR	ENC
BRAILSFORD, M.D.		
FERRERA, D.W.		
FERRI, M.S.		
MARTINEZ, L. A.		
PARKER, A.M.		
POWERS, K.		
SCOTT, G.K.		
SHELTON, D.C.		
SPEARS, M.S.		
TRICE, K.D.		
TUOR, N. R.		
BUTLER, J. L.		
DIETERLE, S.		
GALLOB, J.		
GIANTI, S.		
GIBBS, F.	/	
RICHARDELLA, R.		
Archuleta, J.A.	/	
Kehler, K.	/	
Foss, D.	/	
CORRES.CONTROL	X	
ADMIN RECRD/080	X	X
TRAFFIC		
PATS/130	X	
CLASSIFICATION:		
UCNI		
UNCLASSIFIED	X	X
CONFIDENTIAL		
SECRET		

AUTHORIZED CLASSIFIER
SIGNATURE: C J Freiboth
Date: 02/14/02
IN REPLY TO RFP CC NO.

ACTION ITEM STATUS:
☐ PARTIAL/OPEN
☐ CLOSED
LTR APPROVALS:

ORIG. & TYPIST INITIALS:
DF:jlh

RF-46469(Rev.9/94)

KAISER•HILL
COMPANY

FEB 19 2001

02-RF-00401

John Schneider
Acting Manager of Projects
DOE, RFFO

COMPLIANCE WITH ROCKY FLATS CLEANUP AGREEMENT STANDARD OPERATING PROTOCOL (RSOP) FOR FACILITY DISPOSTION WITH RESPECT TO EXPLOSIVE DEMOLITION – DWF-008-02

In accordance with Section 4.2.2.6 of the RSOP for Facility Disposition, there are several additional steps required when using explosives as a demolition method. A walkthrough of the facility was conducted with the explosives subcontractor and the appropriate Site personnel on January 7, 2002. Core samples were not collected at this time, but a test shot will be conducted before the demolition and delamination of Room 101 in Building 886.

An evaluation of the health and safety, structural, environmental, and economic effects of the potential demolition methods was prepared for this project. The evaluation and the qualifications of the selected subcontractor are included as enclosures to this letter and have been placed in the administrative record.

The demolition activity has been sequenced to allow the soil remediation to occur before the demolition activities.

Several public briefings/consultations have been conducted with interested stakeholders regarding this project. The briefings conducted were the project briefing at the ER/D&D status meeting on December 4, 2001; project briefing at the ER/D&D status meeting on January 15, 2002; and demolition method evaluation working meeting on February 5, 2002. No significant issues or concerns have been raised by the stakeholders during these meetings. An additional project briefing is schedule for March 19, 2002.

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Mailing Address: P.O. Box 464, Golden, Colorado 80402-0464

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The requirements of the RSOP have been completed, and Kaiser-Hill will proceed with completing the Site requirements to use explosives to remove the roof and delaminate the walls in Room 101 of Building 886. Please contact Dyan Foss X7577 with questions or concerns.

Dennis Ferrera

Dennis W. Ferrera
Vice President, Project Manager
Remediation, Industrial D&D & Site Services Project
Kaiser-Hill Company, LLC

DLF:jlh

Enclosures:
As Stated

Orig. and 1 cc – John Schneider

cc:
Joe Legare

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Enclosure
John Schneider
DWF-008-02
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KAISER♦HILL, LLC

EVALUATION DEMOLITION METHODS

for

Building 886

RISS CLOSURE PROJECT

February 2002

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1. Introduction

This evaluation appraises the potential methods for the demolition of Building 886 (Room 101) at the Rocky Flats Environmental Technology Site (RFETS). The approaches to the Room 101 demolition were evaluated based on proposals from demolition subcontractors. The demolition subcontractors were asked to evaluate Room 101 and propose the safest and most efficient means for demolishing that portion of the facility. The methods evaluated include mechanical demolition to include excavators with attachments, implosion of the structure and a combination of explosives called harmonic delamination and mechanical means.

Harmonic delamination is the combination of small amounts of high-velocity explosive charges with millisecond delays in the initiation sequence to allow for the fracturing/delamination of concrete without major displacement of debris particles or generation of excessive overpressure or vibration. Detonation waves created by small, high velocity explosive charges dissipate in the direction of least resistance. When those waves pass through an object, the waves seek superficial face via the densest component of the mass. In passage, the detonation waves cause materials of differential density (such as, aggregate or reinforcing bar) to oscillate at differential velocity compared to the cement mix surrounding those components. The differential oscillation of those components causes delamination of both aggregate and rebar from the mass, disrupting the structural force system created by the combination of concrete and rebar.

The mechanical means of demolition recommended by demolition subject matter experts for Room 101 was excavator with attachments. The wrecking ball method of demolition was not evaluated because the method is difficult to control from a health and safety and dust perspective. Cabling was not evaluated because this method would not work on a structure of this size and construction. Non-explosive cracking agent was not evaluated because it is generally used on horizontal surfaces and small areas. Diamond wire cutting was not evaluated because it is too costly and time consuming.

2. Evaluation Scope

The evaluation only includes demolition activities for Room 101 and the associated hallway into Room 101 of Building 886. Activities before and after demolition are the same regardless of the demolition method. Before initiating demolition activities, the subject areas will be prepared in the following manner:

- The walls will be decontaminated
- The pre-demolition survey will be completed
- The walls will be draped in plastic to minimize the potential for cross contamination
- The slab in Room 101 will be removed through saw cutting
- The soil beneath the slab in Room 101 will be characterized and remediated, if necessary
- Confirmatory surveys will be performed on the walls to ensure that the concrete still meets the unrestricted release criteria
- The below grade opening will be plugged, capped, blind flanged or covered with protective covering, as appropriate
- The *Pre-Demolition Survey Report* will be approved by DOE and LRA
- The Demolition Plan will be completed

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The purpose of the evaluation is to determine which of the methods are viable for demolition of the Room 101. The evaluations developed by the individual subject matter experts are subjective and based on their years of experience. While many methods were considered, only a few were evaluated completely. For example, use of a wrecking ball was considered but not evaluated based on the inherent safety concerns, increased fugitive emissions, and increased amount of runoff generation due to dust suppression efforts. The methods evaluated are viable means for demolition of the structure, but certain aspects of each method may be preferable over the other methods. For example, complete implosion of Room 101 will be the fastest means of demolishing the structure and would have the least exposure to the workers for industrial hazards, but it would create more dust in a shorter period of time than mechanical means or by weakening the structure with explosives prior to mechanical demolition. This evaluation will not determine the demolition method for the subject structure, but the evaluation will be used by the decision-makers to understand all of the benefits or ramifications prior to making a decision.

2.1. Building 886

The continued presence of large quantities of fissile material in numerous forms at the Rocky Flats Plant made it necessary to maintain an active criticality safety program. A Nuclear Safety Group was formed in 1953 to perform the criticality experiments. Once Building 886 was commissioned, the Nuclear Safety Group conducted its work there. Since that time, the Nuclear Safety Group conducted about 1,700 critical mass experiments using uranium and plutonium in solutions, compacted powder, and metallic forms. Building 886 housed the Critical Mass Laboratory, and was operated from 1965 until 1987.

Building 886 is rectangular structure with a shallow-pitched gabled roof. Two shed-roof wings extend from its northeast and southeast corners. A 37-foot tall concrete windowless building (Room 101) is attached to the south. A temporary pre-fabricated trailer housing offices is attached to the northeast wing by a breezeway. Building 886 is 10,360 square feet on a single level.

Building 886 consists of three areas: the Radiological Area; office space; and a small electronics and machine shop. The Radiological Area is comprised of three rooms and a hallway. Almost all criticality experiments were conducted in Room 101, the assembly room. The walls are reinforced concrete, greater than or equal to 4 feet thick and the ceiling is 2 feet thick. Room 102, a storage vault, was constructed in the mid-1970s to meet the Department of Energy requirements for a Special Nuclear Material Vault. Both rooms, 101 and 102, have double reinforced concrete walls integrally cast to the ceiling. Room 103, the Mixing Room, was a fissile solution storage area; three walls are reinforced concrete, and the west wall is cinder blocks. The remainder of the load bearing walls in Building 886 are constructed of cinder blocks. The exterior wall of Room 102 is also lined with cinder block.

Currently, Kaiser-Hill Construction is conducting the Building 886 decommissioning. The general sequence of activities for the Building 886 Project decommissioning is:

- Isolate power to Building 886
- Install temporary power
- Strip-out office areas and radiological areas inside Building 886

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- Flush, isolate, cap traps and sanitary sewer lines
- Abate asbestos
- Decontaminate structure
- Partially remove HVAC system
- Perform pre-demolition survey
- Place plastic on the walls around Room 101 and around the sump in Room 103
- Remove slab in Room 101 and sump in Room 103
- Complete ventilation removal
- Characterization and remediate soil, as necessary
- Perform confirmatory surveys
- Plug the tunnel opening
- Demolish structure
- Remove tunnel to three feet below grade and backfill

The floor in Room 101, contains trenches for electrical conduit that were filled with concrete and are expected to contain contamination. The trenches will be removed along with the section of floor that encapsulates the ventilation exhaust duct feed for Room 101. Previous coring inside Room 101 reveals a variation in depth from 8 inches on the south side of Room 101 to 20 inches on the northwest. On the south side of Room 103, a pit area exists that housed storage tanks during facility operation (tanks were previously removed). Previous coring of the Room 103 Pit Area reveals the floor slab to be 8 inches in depth and the cores contained volumetric contamination.

Before removing the slab, Rooms 101 and 103 will be decontaminated and the pre-demolition surveys will be performed. The walls will be covered with flame retardant plastic to minimize the potential for cross contamination. Verification surveys will be conducted after the slab removal and soil characterization and remediation are complete to ensure that the walls have not been contaminated during the activity.

The contaminated concrete floors will be removed utilizing mechanical methods (i.e., jackhammers, pulverizing equipment) or an approved concrete cutting Subcontractor. Additional sampling performed in Room 102 indicates a limited amount of surface contamination. Therefore, the floor in Room 102 will be hydrolased to remove any surface contamination, as well as removing the paint for direct access to the floors to meet the requirements of the Pre-Demolition Surveying Checklists.

This evaluation specifically addresses the demolition of the walls around Room 101 and the hallway into Room 101. The load bearing walls are 4 feet thick, with the exception of a portion of the immediate hallway to Room 101, which is 5 feet thick. All walls are double reinforced with steel/re-bar. The ceilings are 2 feet thick and double reinforced.

In accordance with the Integrated Monitoring Plan, the Industrial Area RAAMP monitors will switch to a weekly filter collection a week before the Building 886 demolition is initiated and continue until a week after the demolition is complete. A hypothetical release of 1 curie U-234

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was modeled with CAP88-PC using the meteorological data from 2001 that indicated that Sampler 119 was the most impacted and Sampler 212 was the second most impacted. Sampler 119 is approximately 343 meters east of Building 886, and Sampler 212 is approximately 623 meters east-southeast of Building 886.

3. Evaluation Summary

Table 1 contains the demolition method evaluation for the Room 101 in Building 886 with explosives versus mechanical means. The following sections summarize the results of the evaluation of demolition techniques for Room 101. In addition, each section indicates the preferred method for demolition with respect to the criteria. The decision on what demolition method will be used for the Room 101 in Building 886 will not be made by this evaluation, but the evaluation will be used by the decision-makers.

3.1. Health and Safety Evaluation

A certified safety professional developed the activities, hazards, and controls associated with each method of demolition, and using that information, determined the positive and negative aspects of each method from a health and safety perspective. The demolition methods were evaluated assuming the hazards were not mitigated using a risk assessment code methodology. From a health and safety perspective, all of the hazards can be controlled thereby reducing the risk, which is why the methods are evaluated without the controls. Assuming the appropriate controls are in place, all demolition methods are essentially equivalent from a worker health and safety perspective. Both demolition methods using explosives have a shorter duration, statistically lowering the potential for incidents, which is why those methods are slightly more preferred.

3.2. Environmental

An environmental subject matter expert outlined the potential impacts associated with each method of demolition, and using that information, determined the positive and negative aspects of each method from an environmental perspective. In general, the demolition methods involving explosives had more positive/acceptable impacts than the straight mechanical demolition. The categories that differentiated the methods were soils and geology, air quality, water quality, human health and safety, and noise. The primary reason the methods involving explosives had more positive/acceptable impacts was primarily due to the decreased duration of project activities. None of the methods have significant environmental impacts.

3.3. Structural

An engineer evaluated the effectiveness of each method of demolition, and using that information, determined the positive and negative aspects of the effectiveness of the each method. The structural evaluation indicates that all of the demolition methods evaluated are viable demolition techniques. The combined explosive and mechanical method evaluated slightly better than the other two methods because dropping the structure to the ground and then mechanically busting up the larger rebar-free sectional pieces with much more direct access than the straight mechanical method, also allows for more absolute dust control via a hose stream than the implosion method. Overall, harmonic delamination and the excavator demolition method is the most efficient, is inherently safer, and has the best opportunity for dust control.

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3.4. Economic

The economic evaluation was based on fixed priced estimates provided by the subcontractors. The cost and duration for mechanical demolition are presented as ranges because walls of this thickness have not been demolished at Rocky Flats. The low end of the range represents the cost if everything goes perfectly, and the high end of the range represents a worse case scenario. An average was used to evaluate this cost against the other proposed methods. Costs associated with removing the material after demolition were not included due to those costs being required and necessary regardless of method used. The economic evaluation indicates that mechanical demolition is the most cost-effective method, although the range of the costs is insignificant.

Table 1. Demolition Evaluation[1]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Project Description[2]	The project area will be set up with at least a 100-foot radius around the building. Only authorized personnel will be allowed in this area. Two 345 excavators with process/shear attachments will be use to systematically demolish the structure. One of the excavators will have a hoe ram to break apart the thick walls and the other excavator will manage the pieces. In addition to the two equipment operators, a spotter will be required and two laborers operating hoses for dust control. During demolition activities, engineering controls will be implemented to limit dust. Water will be used as an engineering control to prevent dust levels from exceeding the OSHA PEL. Laborers will spray the demolition debris with water while the demolition activities are being performed. The duration of the demolition is three to four weeks.	The project area will be set up with at least a 100-foot radius around the building. Only authorized personnel will be allowed in this area. In order to implode room 101, approximately 53 holes will be drilled and approximately 12 pounds of explosive will be placed in each hole. The affected part of the building will be wrapped in 2 layers of 9-gauge wire fabric intertwined with 2 layers of 12-ounce geotextile fabric to minimize flying projectiles, approximately 600 lbs of explosives (NONEL) would be used. Dust control measures would be utilized during drilling activities with a filter system on the drill. The streets around the area would be swept after the post-implosion. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval and the actual demolition could be completed in 2 days.	The project area will be set up with at least a 100-foot radius around the building. Only authorized personnel will be allowed in this area. Harmonic delamination of Room 101 and removal of the roof will consist of drilling vertical holes, approximately 3.5-4 lineal feet for each cubic yard of concrete, and loading explosives in those holes. The roof will be removed with explosives before blasting the walls; it will be removed in quarters. Once the holes are drilled in the walls, exterior surfaces will be covered with one or more layers of chain link fence fabric and geotextile fabric. The fracturing of the walls will be conducted in no less than 4 and no more than 10 production delamination operations. A test shot will be required to determine the amount of explosives required. It is anticipated that less than 500 pounds of Exgel will be required. A Durapulse dust collector and water palletizing system will be used during drilling operations - a study indicates it cuts emissions by 92%. During blasting, the geotextile placed on the walls will be wet and water will be placed on the roof to control dust. The drilling could be completed in 11 days during the lag time for the pre-demolition survey approval, the harmonic delamination could be completed in 1 day, and actual demolition with an excavator could be completed in 4 days.

[1] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability

[2] The project descriptions are based on proposed demolition processes; the actual processes may differ slightly and will be documented in the Demolition Plan

Table 1. Demolition Evaluation[3]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Health and Safety[4]	Qualitative assessment of this demolition method is considered to have an average overall medium/high risk to Site workers, personnel, equipment, and property if hazards are not properly mitigated. However, when proper engineering, administrative, and Personal Protective Equipment (PPE) controls are implemented, the average overall risk is considered to be low. Major potential hazards/sources identified for the major operations include the following: • Contact w/electrical • Struck by moving vehicles • Caught between/pinch points • Contact with sharp objects • Contact with petroleum product (hydraulic fluid) • Overexertion from material handling • Struck by (debris, re-bar) • Exposure to dust (concrete) • Exposure to noise (breaker) • Equipment accident (heavy equipment)	Qualitative assessment of this demolition method is considered to have an average overall medium/high risk to Site workers, personnel, equipment, and property if hazards are not properly mitigated. However, when proper engineering, administrative, and PPE controls are implemented, the average overall risk is considered to be low. Major potential hazards/sources identified for the major operations include the following: • Fall from elevation (roof) • Contact w/electrical (drill) • Contact w/ sharp objects (drill bit) • Struck by debris (concrete) • Falling debris below (concrete) • Exposure to dust (drill, explosion) • Exposure to noise (drill, explosion) • Overexertion from material handling (equipment) • Unplanned detonation (explosives) • Unplanned structural collapse (walls) • Fall on same level (debris, re-bar)	Qualitative assessment of this demolition method is considered to have an average overall medium/high risk to Site workers, personnel, equipment, and property if hazards are not properly mitigated. However, when proper engineering, administrative, and PPE controls are implemented, the average overall risk is considered to be low. Major potential hazards/sources identified for the major operations include the following: Harmonic Delamination • Fall from elevation (roof) • Contact w/electrical (drill) • Contact w/ sharp objects (drill bit) • Struck by debris (concrete) • Falling debris below (concrete) • Exposure to dust (drill, explosion) • Exposure to noise (drill, explosion) • Overexertion from material handling (equipment) • Unplanned detonation (explosives) • Unplanned structural collapse (walls) • Fall on same level (debris, re-bar)

[3] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability
[4] Reference H&S Risk Assessment – 886 Demolition 1/31/02

Table 1. Demolition Evaluation[5]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Health and Safety[6]	Major controls include the following: • Work control document • Job Hazard Analysis • Pre-evolution Briefings & Awareness • Use of trained and qualified personnel • De-energizing electrical power • Establish exclusion zones • High visibility vests • PPE • Dust suppression	Major controls include the following: • Work control document • Job Hazard Analysis • Pre-evolution Briefings & Awareness • Use of trained and qualified personnel • De-energizing electrical power • Establish exclusion zones • High visibility vests • PPE • Dust suppression	Mechanical Demolition • Contact w/electrical (O/H power lines) • Struck by moving vehicles (heavy equipment) • Caught between/pinch points (attachment and boom) • Contact w/ sharp objects (equipment) • Contact with petroleum product (hydraulic fluid) • Overexertion from material handling (equipment) • Struck by (debris, re-bar) • Exposure to dust (concrete) • Exposure to noise (breaker) • Equipment accident (heavy equipment) Major controls include the following: • Work control document • Job Hazard Analysis • Pre-evolution Briefings & Awareness • Use of trained and qualified personnel • De-energizing electrical power • Establish exclusion zones • High visibility vests • PPE • Dust suppression
Overall Risk to Site Workers, personnel, equipment, and property	0[7]	+[8]	+[8]

[5] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability.

[6] Reference H&S Risk Assessment – 886 Demolition 1/31/02

[7] Overall, the use of an "Excavator with Attachments" may take a longer period time and require some workers to be in closer proximity to the demolition. Because of this and the fact that method's average overall mitigated risk rating was low, this method was given a neutral (0) aspect rating.

[8] It is estimated that use of this method would save approximately 3-4 weeks off the project schedule and, in turn, further mitigates potential risk exposures to Site workers, personnel, equipment, and property. Based on this, this method was given a positive (+) aspect rating.

Table 1. Demolition Evaluation[9]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Environmental	This method has medium environmental impacts: • Impacts to air quality: an operator wetting the structure with a fire hose will control fugitive dust. This will result in more dust generation during the lengthy demolition process. Vehicle and equipment emissions will be higher with this method due to the duration. • Impacts to surface water quality may occur, such as runoff generated during and after dust control. • Some impacts to soils are expected from dust control, the falling structure and vehicular traffic. No soil contamination is expected, as the facility will meet the unrestricted release criteria prior to demolition. • No impacts to wildlife are expected. Efforts will be taken to cordon off the area to wildlife. • This method may generate additional incidental waste (i.e., trash) during demolition due to the duration. It is expected to take three to four weeks. • Resource use is increased by this method due to the demolition duration.	This method has minimal environmental impacts. • Impacts to air quality: fugitive dust will be controlled by a filter system during drilling and a street sweeper and hoses after demolition. Vehicle and equipment emissions are less with this method due to the one-day duration. • Impacts to surface water quality may occur, such as runoff generated during and after dust control. • Minimal impacts to soils are expected from the falling structure. No soil contamination or erosion impacts are expected, as the facility will meet the unrestricted release criteria prior to demolition. • No impacts to wildlife are expected since the building is in the industrial area. However, efforts will be taken to cordon off the area to personnel and wildlife. • This method will generate little additional waste (chain link or geotextile containment only) when compared to the mechanical methods. • Resource use is minimized by this method, as the demolition duration is limited to one day.	This method has medium environmental impacts. • Impacts to air quality: fugitive dust will be controlled by chain link and/or geotextile containment during the harmonic delamination process, in addition to wetting prior to detonation. • Impacts to air quality: an operator wetting the structure with a fire hose during mechanical demolition will control fugitive dust. This will result in minor dust generation during the short demolition process. Vehicle and equipment emissions are a potential issue. • Impacts to water quality may occur, such as runoff generated during and after dust control. • Minimal impacts to soils are expected from dust control, the falling structure and vehicular traffic. No soil contamination is expected, as the facility will meet the unrestricted release criteria prior to demolition. • No impacts to wildlife are expected Efforts will be taken to cordon off the area to wildlife. • Resource use is decreased by this method as the demolition duration is expected to be approximately one and half weeks.
Soils and Geology	-	+	0
Air Quality	-	0	+
Water Quality	-	0	+
Human Health and Safety	-	+	0
Ecological Resources	0	0	0
Historical Resources	0	0	0
Visual Resources	0	0	0
Noise	-	+	0

[9] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability

Table 1. Demolition Evaluation[10]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Structural	This method is technically feasible. Of the three methods evaluated, this is the most labor intensive and purely mechanical machinery brute force. The floor will be removed prior to ceiling and walls, which will act as confinement for the contaminated floor removal. A typical method used for a six sided above grade concrete structure is to destroy one wall at a time until the ceiling collapses. However, this structure is not typical. It is two stories tall with extraordinarily thick walls. These 4 - 5 foot thick reinforced concrete walls will be difficult and time consuming for an excavator mounted ram to break apart and impractical for a shear to be useful other than rebar trimming for chunk separation. A shear attachment is often used on floor or ceilings, but in this case the ceiling thickness and height render this attachment useless, except for the rebar. Therefore, this method requires that nearly 100% of the demolition of the Room 101 structure be performed by an excavator mounted ram. Recent experience with thick concrete slab removal at PACS 1 took approximately 2 weeks to destroy with the advantage of being under the excavator vs. the vertical walls. The falling ceiling poses a distinct safety disadvantage when comparing to the other options.	This method is technically feasible. The mechanical portion of this method consists of drilling only. The explosives do nearly all the work and leave rubble that will be mostly ready for transport. Upon placement and detonation of the explosives, the structure would be 100% on the ground and sized to manageable chunks. Some mechanical separation of the larger rubble chunks from the rebar may be necessary after detonation so that the concrete may be recylable. If necessary, a combination of shear and ram attachment to an excavator would be used. When compared to the first all-mechanical method, this method relies nearly all on the explosive forces for the demolition. The time to execute this method is about ¼ of the first method and the schedule reliability is far higher due to the effectiveness of the methodology.	This method is technically feasible and is a combination of the first two. That is, explosives would do the brute force structure demolition, followed by mechanical destruction of the resulting larger sectional pieces. This methodutilizes drilling to place explosives, but the advantage over the second method is the reduced particulate emissions by a more sophisticated drilling system. The other large advantage of this method is the designed separation of concrete from rebar by the explosive layout and detonation timing. This gives tremendous advantage in that it brings the structure to the ground, and the resulting sectional elements are already separated from the rebar, without having to disintegrate the concrete into small chunks creating a considerable amount of dust, as in the second method. The separation of concrete from rebar is the most brute force intensive part of reinforced concrete destruction. This methodology has an advantage over the first methodology in that the resulting concrete will nearly all be directly recyclable. The advantage over the second method is significantly lower dust generation, and a controlled dropping of the ceiling. By first dropping the structure to the ground and then mechanically busting up the larger rebar-free sectional pieces with much more direct access than the first method, also allows for more absolute dust control via a hose stream than the second method. Overall, this method is the most efficient, is inherently safer, and has the best opportunity for dust control.
Technique is efficient, safe and responsible	–	0	+

[10] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability

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Table 1. Demolition Evaluation[11]

	Mechanical Demolition	Explosive Implosion	Harmonic Delamination and Mechanical Demolition
Economic	The cost for mechanically demolishing room 101 is $118,000 to $185,000. The average cost is $151,500.	The cost for explosive demolition of room 101 is $205,000.	The cost for harmonic delamination and mechanical demolition of room 101 is $188,000.
Cost	+	-	0

[11] Each area evaluated, has a narrative row followed by an evaluation of the criteria: + is a positive aspect, 0 is a neutral aspect, and – is a negative impact, indicating the ranking of hazards, impacts, or acceptability

A LOIZEAUX COMPANY

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over photo:
lympic National Life Building,
eattle, Washington, USA

hoto under tissue:
he Landmark Hotel,
as Vegas, Nevada, USA

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A TWO THOUSAND TON SKYSCRAPER COLLAPSES LIKE A HOUSE OF CARDS, CRUMBLING IN ON ITSELF – A WATERFALL OF WELL-FRACTURED STEEL AND CONCRETE DEBRIS. IT LASTS ONLY SECONDS, AND BUILDINGS WITHIN A FEW METERS STAND UNTOUCHED. THE VERY ESSENCE OF CONTROLLED DEMOLITION, INC. IS IN OUR NAME: CONTROL. ■ CDI DEMOLISHES STRUCTURES WITH THE KIND OF PRECISION AND PLANNING USUALLY ASSOCIATED WITH THEIR CREATION. EACH PROJECT IS HANDLED BY A WORLD-RENOWNED TEAM OF EXPERTS DRAWING ON BACKGROUNDS IN ENVIRONMENTAL REMEDIATION, ENGINEERING, DISMANTLING, TRADITIONAL DEMOLITION, EXPLOSIVES, MATERIAL HANDLING AND THE LATEST TECHNOLOGY TO GUARANTEE COMPLETE PREDICTABILITY. ■ HAVING IMPLODED, WORLDWIDE, MORE *BUILDINGS*, CHIMNEYS, TOWERS, BRIDGES *AND OTHER* STRUCTURES THAN OUR COMPETITORS *COMBINED*, CDI HAS THE TECHNICAL EXPERTISE AND TRACK RECORD TO TAKE ON PROJECTS OF ANY MAGNITUDE. ■ THIS EXPERIENCE IS USED TO SELECT PRECISELY THE BEST EQUIPMENT, MATERIALS AND METHODS FOR EVERY PROJECT, AND THE BEST STRATEGIC COMMUNICATION PLAN TO ENSURE ACCEPTANCE BY COMMUNITY GROUPS AND REGULATORY AGENCIES. ■ IN AN INDUSTRY WHERE EXPERIENCE IS EVERYTHING, CDI STANDS ALONE IN ITS PIONEERING VISION, INNOVATIVE SPIRIT, AND DECADES OF LEADERSHIP.

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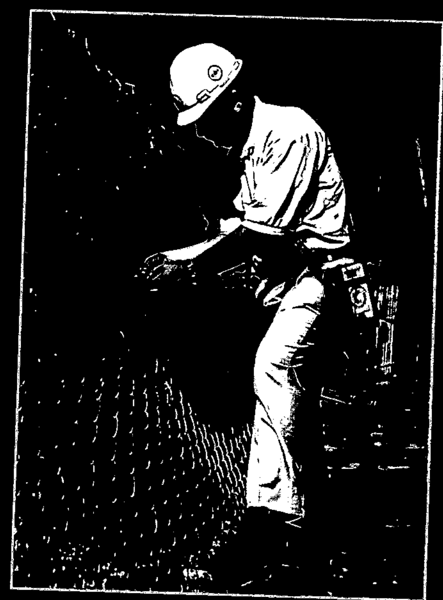
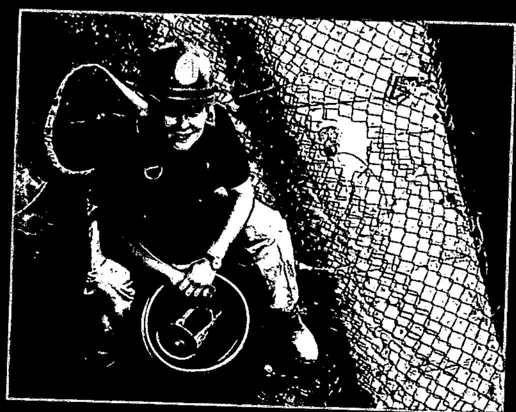
Despite appearances, the Art of Demolition is about people, not explosives. It's the expertise and experience of our team which guarantees the success of each project.

CDI relies on a half-century of experience to select the best approach for a client's needs, drawing on a network of global resources and suppliers for the support required for the job.

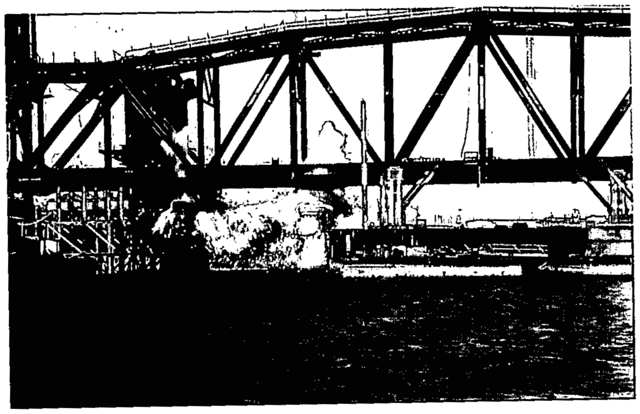
Proprietary environmental and demolition strategies and methods are applied to develop engineered solutions so predictable in the field that they are backed by insurers worldwide.



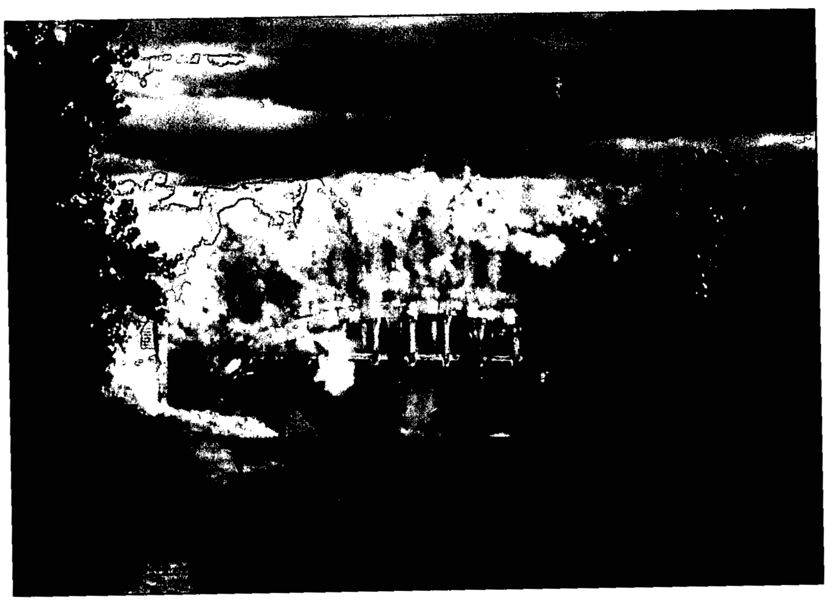


CDI's management and performance expertise helps complete each project within budget and ahead of schedule, with a personal touch that can adapt to changing conditions or sensitive circumstances.

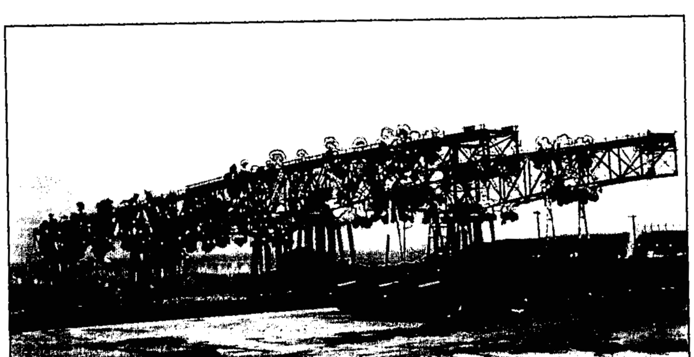
If the Art of Demolition was in the pure engineering or explosives alone, anyone could do it. CDI's greatest resource is is the experience of the team put to work for every client on every project.



▲ *Peoria Pekin R.R. Bridge, Peoria, Illinois, USA*



▲ *Court Street Bridge, Watertown, New York, USA*



▲ *George P. Coleman Bridge, Norfolk, Virginia, USA*

Bridge removal requires greater expertise, experience and coordination than demolishing anything on land — and the long list of failed marine contractors is hard proof.

CDI's experience in the successful demolition of thousands of suspension, arch, truss, and bascule bridge elements is critical in selecting a demolition method to meet the client's needs the *first* time.

Our DREXS™ (Directional Remote Explosives Severance) systems are engineered and applied to segment steel components into pieces matching the lifting capacity of the available equipment. State of the art, proprietary underwater blasting techniques guarantee fragmentation of concrete and masonry piers to removal limits, and maximize efficiency of debris removal.

Hands-on management, from design through preparation and completion of demolition operations ensures absolute safety and on-schedule performance while minimizing impact on aquatic life and water quality.

Parkersburg-Belpre Bridge, Parkersburg, West Virginia, USA ▶

Urban demolition projects demand complex coordination of scheduling, cost control and public relations. CDI understands the many issues facing urban development projects and has the experience to make a positive impact on any number of fronts.

If a project requires site clearance, CDI's professional application of environmental remediation, salvage, demolition, recycling and debris removal methods save time and reduce cost.

Where construction and space permit, CDI's implosion techniques provide site turnaround in weeks instead of months, promoting positive community relations that can be carried through the rest of the project.

Drawing on vast resources and knowledge, the CDI team can streamline an urban project with efficient, engineered solutions that meet any budget requirement and satisfy any timeline.

▲ *Lafayette Courts, Baltimore, Maryland, USA*

▲ *Hilton Hotel, Hartford, Connecticut, USA*

◀ *ANZ Bank Demolition, Perth, W.A. Australia*

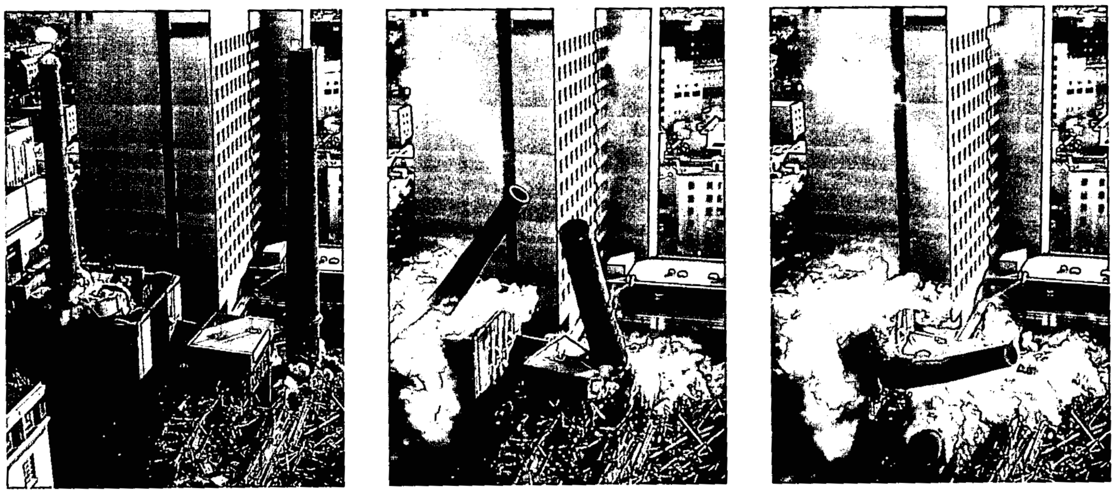
◀ *First Hawaiian Bank, Honolulu, Hawaii, USA*

Traditional removal of tall structures can put personnel and facilities at risk during demolition. The height of the structure, and its potential reach should an unplanned collapse occur, make CDI's remote operations the logical choice.

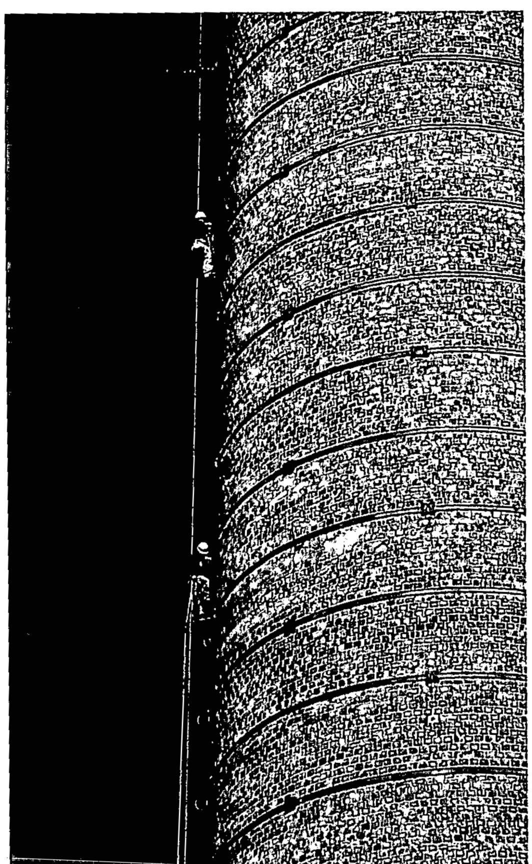
CDI has removed over a thousand chimneys and towers. Our experience is second to none in the industry, and helps ensure that every project is precisely executed according to plan.

CDI's controlled, remote process guarantees worker safety by eliminating the need to work in high places for extended periods. Our methods are designed for speed and efficiency, so that exposure is reduced to a brief, pre-planned window selected for minimum impact on adjacent operations.

The efficiency of our approach is even more apparent when structural damage or environmental contamination increases risk to workers and the surrounding community. Whether the structure is 100 or more than 1000 feet tall, made of brick, concrete or steel, CDI can remove it quickly and safely with just a few days of preparation.



▲ *Harvard Medical Center, Boston, Massachusetts, USA*



◀ *Phelps Dodge, Morenci, Arizona, USA*

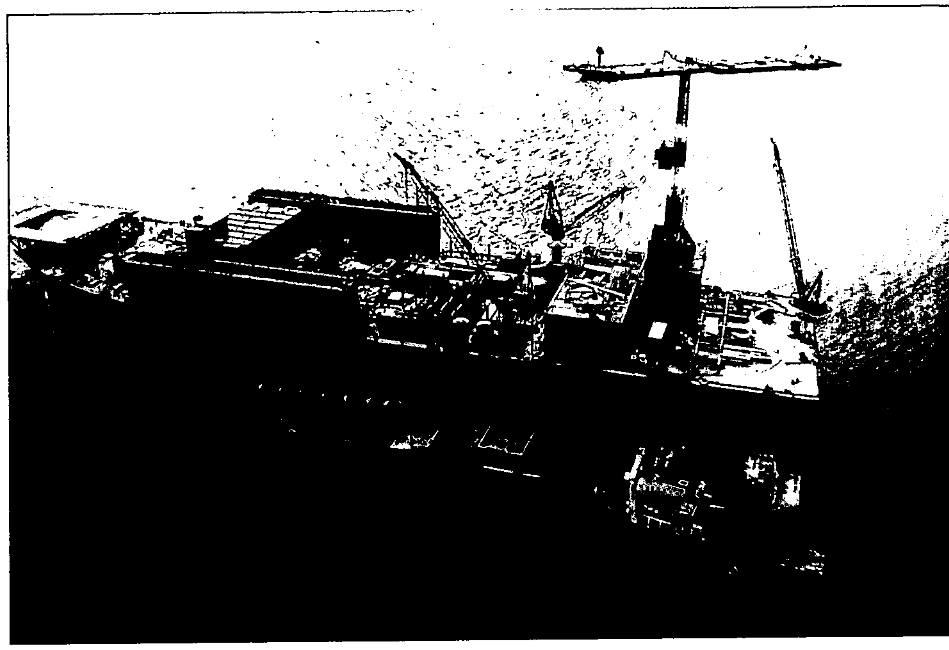
Phillips Petroleum, Pasadena, Texas, USA ▶

Isolated sites, gale-driven seas, crushing pressures, and massive support costs can cripple any offshore project not properly planned. Successful performance of off-shore projects requires a team of the most experienced specialists available. Where explosives play a part, CDI has no peer in the industry.

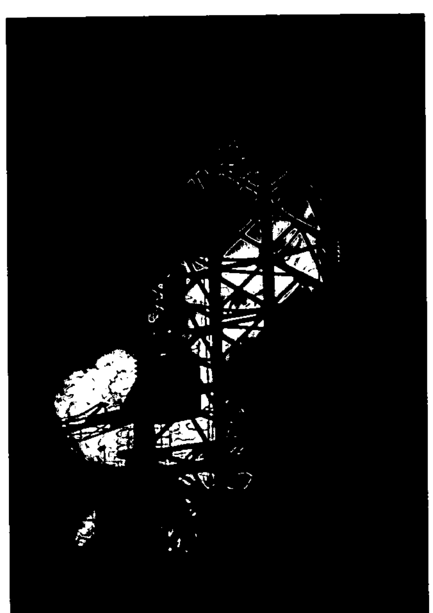
CDI partners with environmental and commercial fishing interests to identify problems and design mutually acceptable solutions. From design through performance, CDI accepts its role as a team player who must guarantee timely, professional results.

Whether segmenting topsides or jackets of massive offshore platforms, salvaging sunken vessels, fragmenting concrete structures or submarine rock formations, CDI's engineered approach reflects decades of experience — the kind of experience vital to completing offshore projects under the most unforgiving conditions on Earth.

▲ *Abkatun 91, Gulf of Campeche, Mexico*

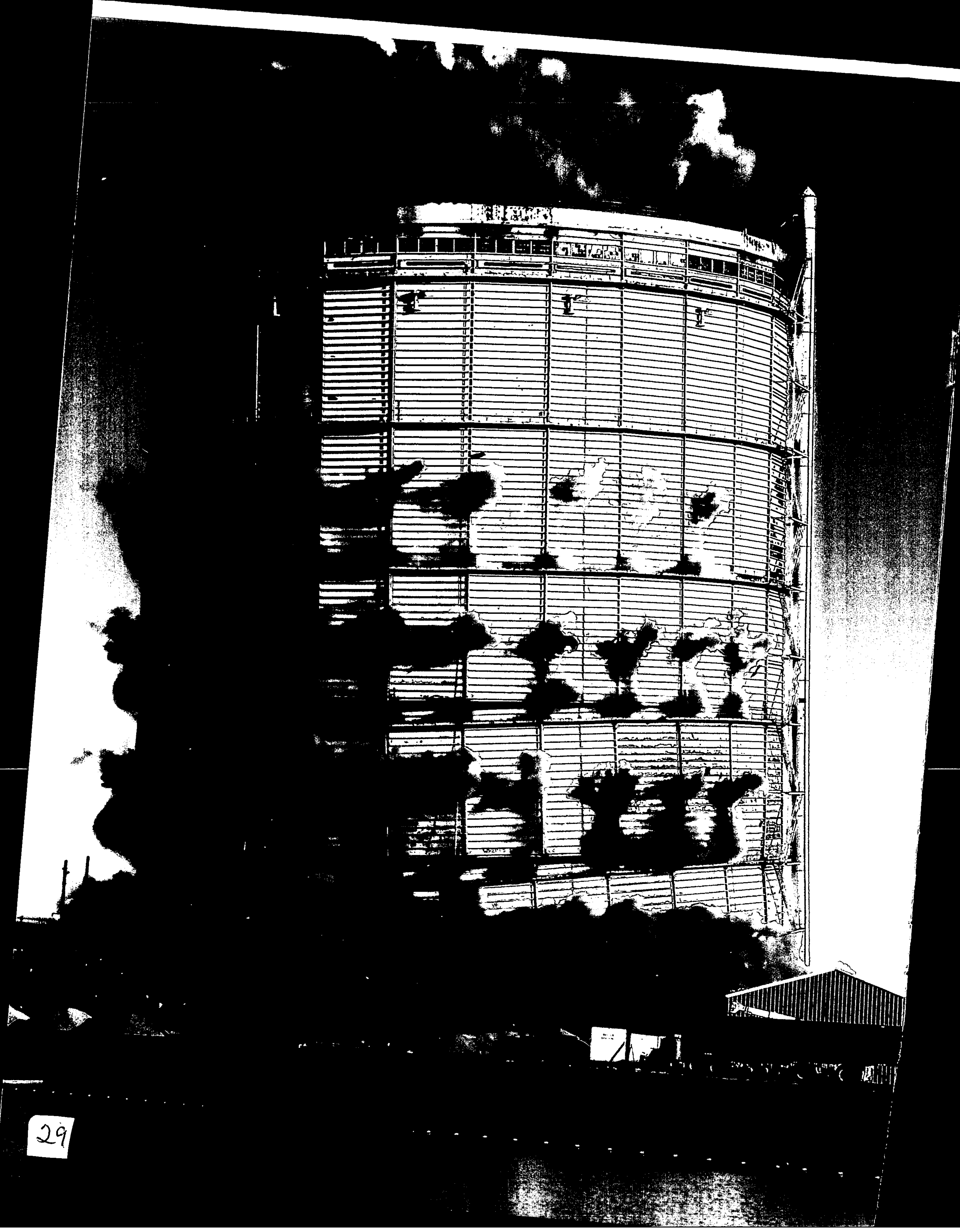


▲ *SSDC Modification, Arctic Circle, Canada*



◄ *Abkatun 91, Gulf of Campeche, Mexico*

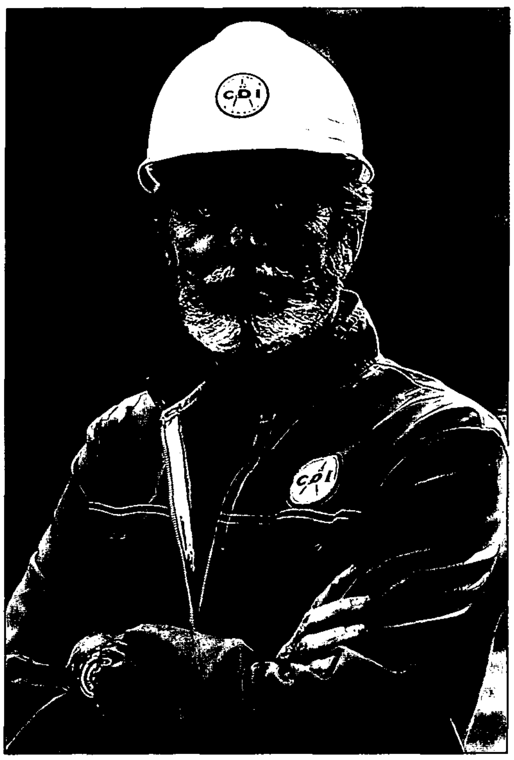
◄ *SSDC Modification, Arctic Circle, Canada*




COUNTDOWN TO
DEMOLITION

FOR OVER FIFTY YEARS, THREE GENERATIONS OF LOIZEAUX FAMILY INNOVATION, EXPERTISE AND LEADERSHIP HAVE CREATED A COMMERCIAL EXPLOSIVE DEMOLITIONS INDUSTRY WHICH HAS SAVED PROPERTY OWNERS AND CONTRACTORS HUNDREDS OF MILLIONS OF DOLLARS WORLDWIDE. ■ THAT LEADERSHIP AND UNPARALLELED EXPERIENCE GIVES CDI CLIENTS ACCESS TO A FULL RANGE OF SERVICES AND CAPABILITIES THROUGH A GLOBAL NETWORK OF OFFICES AND AGENTS, ALL DEDICATED TO THE PRECISION APPLICATION OF OUR TECHNOLOGY. ■ AND BEHIND EACH SUCCESSFUL PROJECT – EACH DEMOLITION THAT OCCURS ON TIME, UNDER BUDGET, ACCIDENT-FREE, AND WITHOUT DAMAGE TO THE ENVIRONMENT OR RESISTANCE FROM THE COMMUNITY – STANDS THE CDI TEAM, A TALENTED GROUP OF PROFESSIONALS WITH DECADES OF EXPERIENCE DEDICATED TO ABSOLUTE PERFECTION ON EACH NEW PROJECT.

CDI. THE ART OF DEMOLITION.

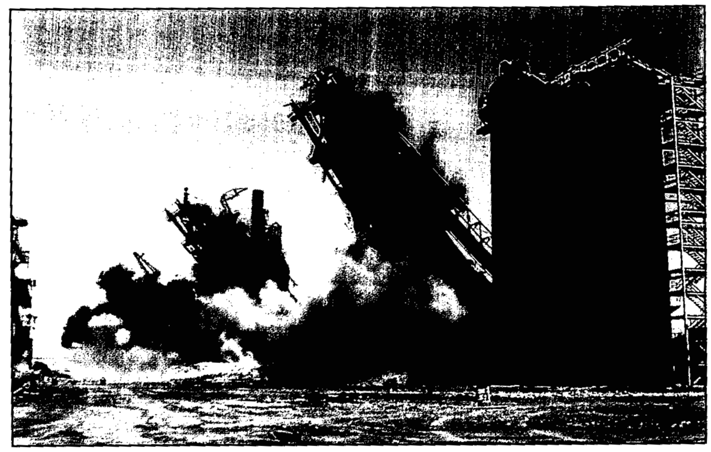


Jack Loizeaux, founder

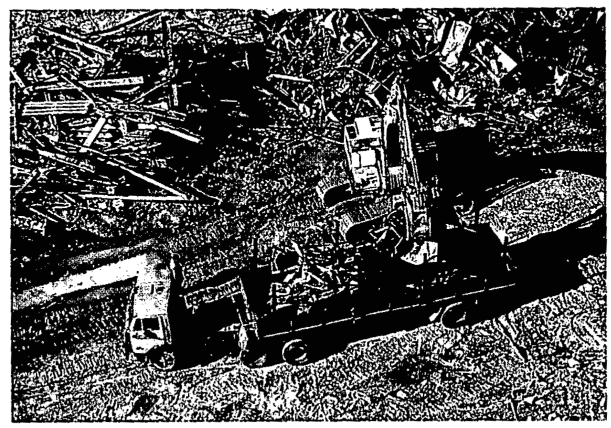
Industrial facilities are constantly affected by changes in the marketplace, manufacturing processes, or government regulations. When partial or complete removal of facilities is required, CDI's international experience in a diverse group of industries helps us choose the appropriate mix of environmental remediation, demolition and debris handling methods to remove selected facilities quickly and safely—without harming the environment or hampering remaining operations.

CDI can dismantle contaminated nuclear structures, fell massive blast furnaces, or fragment heavily reinforced foundations within the confines of operational facilities with surprising speed, and within a tight budget.

When structures are damaged, contaminated, or too difficult to reach with traditional methods, CDI's remote explosives operations, combined with minimal preparation requirements, dramatically reduces the risk to workers and the environment. As a result, CDI's industrial demolition operations are often completed in a fraction of the time and cost of traditional methods.



▲ *U.S. Steel, Youngstown, Ohio, USA*



▲ *LPAR Facility, Skrunda, Latvia*

◀ *LPAR Facility, Skrunda, Latvia*

◀ *Public Service Electric & Gas Company, Harrison, New Jersey, USA*

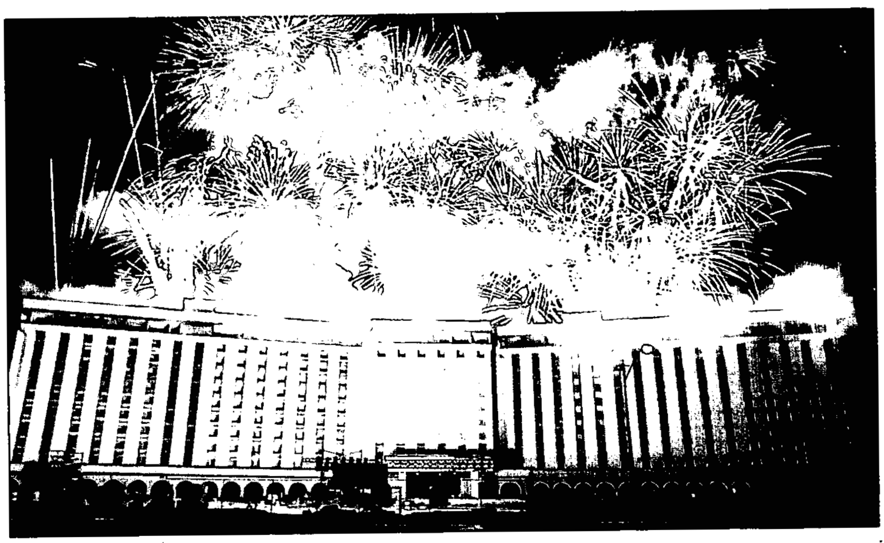
◀ *Dunes Hotel,*
for "Treasure Island: The Adventure Begins,"
Las Vegas, Nevada, USA

CDI's dramatic implosion of high-rise buildings has drawn millions of awestruck spectators, from Sao Paulo to Paris, Sydney to Seoul, and Los Angeles to London. One Las Vegas implosion drew 600,000 spectators, and entertained millions worldwide via satellite feed.

By teaming with the world's leading pyrotechnic and effects specialists, CDI can transform implosion projects into awesome public relations opportunities that would otherwise cost clients hundreds of thousands of dollars.

Our years of experience in media relations, special effects coordination, and Structural Effects™ for Hollywood uniquely qualifies CDI to work with property owners to create instant visibility for their new development projects.

Belknap Building, ▶
for MTV "Demolition Man" Promotion,
Louisville, Kentucky, USA



Hacienda Hotel ▶
For "Sinbad's Dynamite New Year's Eve,"
Las Vegas, Nevada, USA