Dynamic Compaction
For Site Development

DENSIFICATION, INC.

DYNAMIC COMPACTION SPECIALISTS IN
GROUND IMPROVEMENT AND UNCONTROLLED FILLS

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GEOTECHNICAL SPECIALTY CONTRACTORS IN DYNAMIC COMPACTION

DENSIFICATION, INC. is a nationally operating geotechnical specialty contracting company specializing in Dynamic Compaction. It was formed in 1984 to provide geotechnical consultants a personal and practical contracting link with owners/developers, and allow an attractive alternative when poor soils or questionable fills are encountered. Generally, with poor soils, one or more of the following is recommended:

- ❒ Do nothing and hope the structure doesn't settle
- ❒ Undercut and Replace with Structural Fill
- ❒ Bypass the Problem with Piles or Deep Foundations
- ❒ Modify or Enhance Engineering Properties of the soil through Ground Improvement Techniques

WE SPECIALIZE in Ground Improvement, and more specifically, Dynamic Compaction. Joe C. Drumheller, President of Densification, Inc., has performed more than 300 Dynamic Compaction projects since 1984. This represents approximately half of the entire Dynamic Compaction work done in the U.S. during the last 20 years. Mr. Drumheller also has 12 years experience with LAW Engineering, a major geotechnical consulting firm. Mr. Drumheller was the author of the Dynamic Compaction portion of the ASCE Geotechnical Book No. 69 on the 20 year update of Ground Improvement.

WHY USE IT?

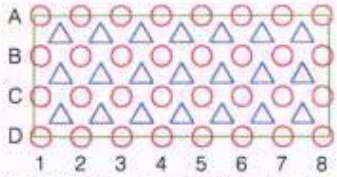
THE OBJECTIVE OF DYNAMIC COMPACTION is to reduce settlement and increase bearing capacity by improving the in-place strength and compressibility characteristics of subsurface soils. For fills, the theory is to create a uniform raft of densified material to reduce differential settlements. In most cases, Dynamic Compaction allows construction of conventional spread footings, typically for a bearing capacity of 2,000 to 3,000 per square foot for an uncontrolled debris or boulder fill.

Cinder fill site, Lakeshore Drive, Chicago

Rubble fill site, New York City

Casino on Hydraulic fill, the Missouri River, St. Louis

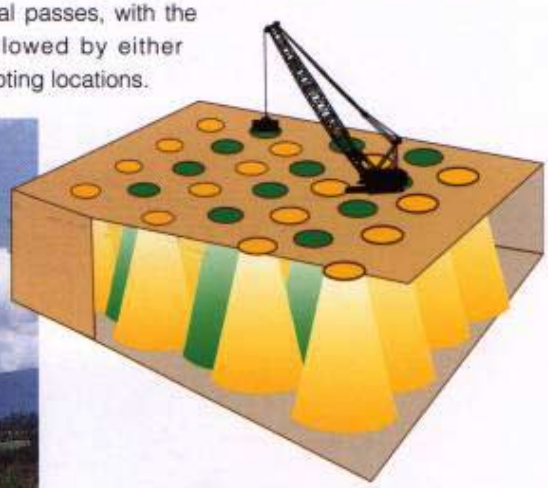
DYNAMIC COMPACTION: What Is It?

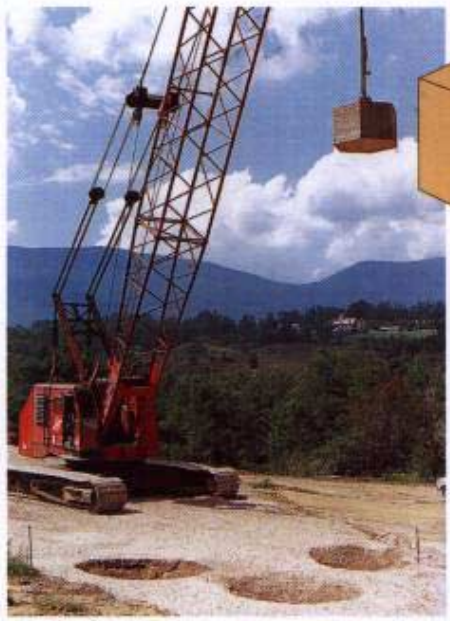


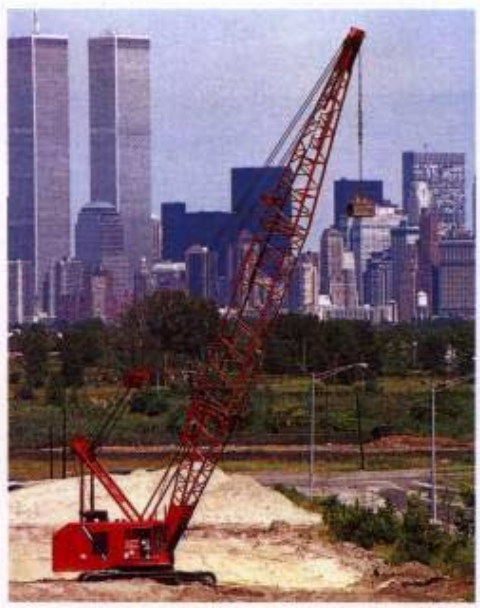
Typical CAD generated grid layout drawing

DYNAMIC COMPACTION is one of the most versatile and least expensive ground improvement techniques available to increase the ability of soil to support shallow foundations or greater loads. Although it was developed for the deep densification of virgin loose natural soils, the majority of the Dynamic Compaction work in the U.S. involves sites over questionable or uncontrolled old fills.

Dynamic Compaction involves the repeated dropping of large steel weights by means of crawler cranes on a predetermined grid pattern. Pounders range from 6 to 25 tons, and are dropped repeatedly from heights ranging from 40 to 70 feet. The repeated application of high energy impacts at the same impact points causes densification/ compaction of the soil mass to depths ranging from 10 to 25 feet. Energy is typically applied in several passes, with the initial pass on a 10 to 20 foot grid, followed by either additional area passes, or a tight grid at footing locations.



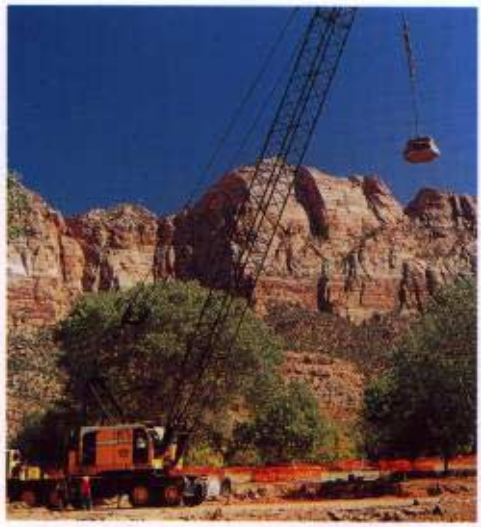

16-ton weight dropped from 75 feet for a highway over sanitary landfill in Manchester, VT


Rubble Fill, Jersey City, NJ


15-acre Army hospital site, Tacoma, WA (Mt. Ranier)


Publix Supermarket, West Palm Beach, FL

Densification, Inc. assisted the Chinese in Hong Kong during a Technology Transfer Program in 1998



Visitors Center, Zion Canyon National Park, Utah

Home Port Project, Corpus Christi, TX

ADVANTAGES:

- ❒ Allows conventional shallow spread footing foundations
- ❒ Replaces expensive deep pile foundations
- ❒ Relatively inexpensive
- ❒ Reduces settlement
- ❒ Increases bearing capacity
- ❒ Eliminates risk of hazardous waste exposure resulting from conventional undercut and replace (stays buried)
- ❒ Self-compensating—Softer areas are immediately apparent, and additional energy can be applied

Collapsible soils, Albuquerque, New Mexico

Crater in San Francisco, CA

TREATMENT FOR:

- ❒ Loose Sands
- ❒ Uncontrolled Fills
- ❒ Debris Fills
- ❒ Mine Spoils
- ❒ Sanitary Landfills
- ❒ Old Sand/ Clay Pits
- ❒ Boulder Fills
- ❒ Liquefiable Soils
- ❒ Sinkholes/ Mines
- ❒ Collapsible Soils
- ❒ Landfill Liner Preparation

Dynamic Replacement showing backfilling craters with stone prior to repounding. Questionable silty fill, Winchester, Virginia

Collapsible silts, Provo, UT

DEPTH OF IMPROVEMENT

The depth of improvement depends on the total applied energy (tonnage times drop height) with improvement depths to 20-25 feet common. Depth of improvement is a square root function of energy. ($D=n\sqrt{WH}$)

DYNAMIC REPLACEMENT

(for Clayey soils)

Dynamic Replacement Technique for clayey sites involves making a crater, backfilling with crushed stone, and repounding the stone into the ground, effectively making a large diameter "Stone Column."

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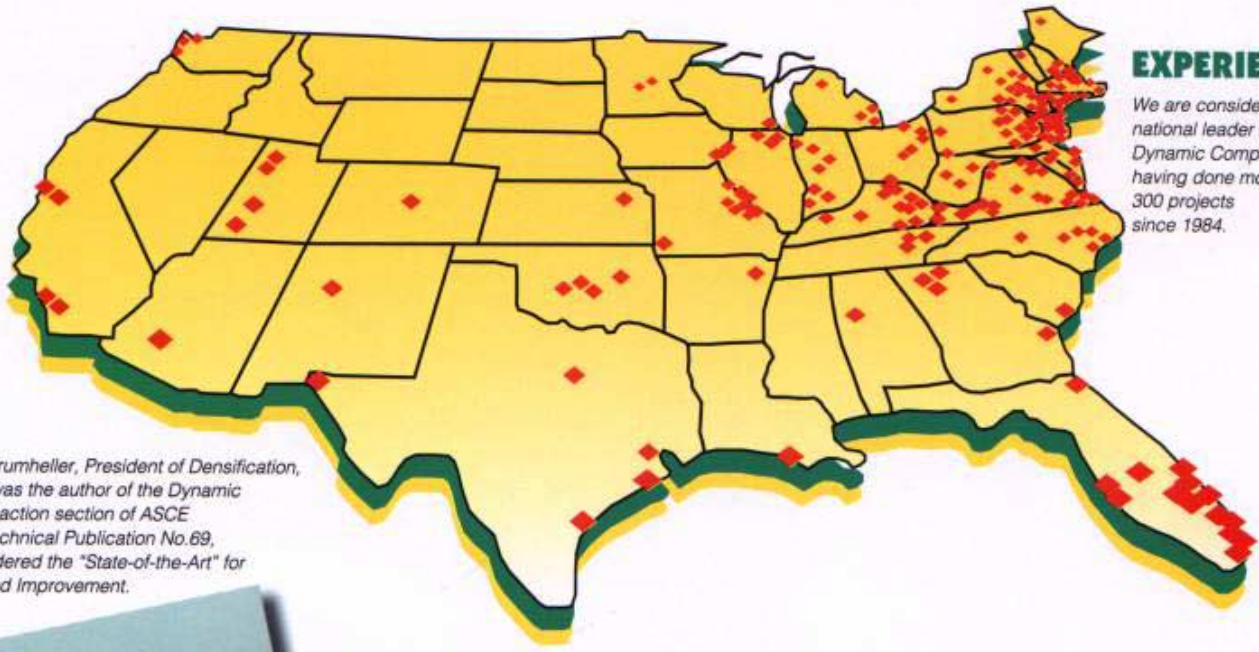

EXPERIENCE

We are considered the national leader in Dynamic Compaction, having done more than 300 projects since 1984.

Joe Drumheller, President of Densification, Inc., was the author of the Dynamic Compaction section of ASCE Geotechnical Publication No.69, considered the "State-of-the-Art" for Ground Improvement.

Collapsing sinkholes/soil voids at column locations, Valley Forge, Pennsylvania

Reconstruction of Stevenson Expressway, Chicago, IL

Loose sands at power plant near Jacksonville, FL improving to 25 ft.

Retail Center next to "Ping" residence, Phoenix AZ

500.000 SF warehouse, Trenton, NJ

Low energy, or "ironing" phase, Richmond, VA

DENSIFICATION, INC.

Ft. Lewis Army Hospital, Mt. Ranier, WA

Northwest Airlines Cargo Terminal, JFK Airport, New York, NY

I-25. north of Albuquerque, NM

Sheetrock Plant, Tampa, FL

Practical Solutions to Uncontrolled Fills

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—NATIONWIDE—

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