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Pond 15S Closure Plan

Volume 2

FMC Idaho, LLC
Pocatello, Idaho

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APPENDIX I

CONSTRUCTION QUALITY ASSURANCE PLAN, TECHNICAL SPECIFICATIONS, DATA SHEETS, AND DRAWINGS

CONSTRUCTION QUALITY ASSURANCE PLAN

Pond 15S Construction Quality Assurance Plan
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1. OBJECTIVE

This Construction Quality Assurance (CQA) Plan has been developed to ensure that the completed flexible membrane liner/composite liner cap system for the ponds meet or exceed all design criteria, plans, and specifications. This CQA plan also demonstrates that the guidance provided by the EPA ("Final Covers on Hazardous Waste Landfills and Surface Impoundments," EPA/530-SW-89-047, July 1989) for final cap covers has been followed. This plan will be used in monitoring and documenting the quality of material used and the construction practices employed in their placement. Deviations from this CQA plan, Specifications, Data Sheets, and Construction Drawings that are less stringent will require EPA concurrence prior to implementation

Included in this plan, together with the technical specifications, are the submittals, approvals, inspections, observations, testing, and documentation required during the preconstruction, construction, and post-construction periods. These plan requirements are listed below.

Preconstruction

- Qualifications and authority of CQA Manager and Construction Inspector(s).
- Review and approval of material submittals and shop drawings.

Construction

- Conformance to excavation and fill construction sequence and extent specified in the specifications and drawings.
- Daily inspection reports and photographs.
- High density polyethylene (HDPE) liner testing.
- Grade checks.

Post-Construction

- Final inspection.
- Final documentation report.

2. RESPONSIBILITY AND AUTHORITY

2.1 Responsible Parties

The following parties will participate in Construction Quality Assurance (CQA) for the closure of ponds at FMC Idaho LLC (FMC) phosphorus plant in Pocatello, Idaho.

2.1.1 Facility Owner

The facility owner is FMC Idaho LLC (FMC). This entity is also the operator of the facility. FMC will be responsible for permitting, design, and construction of the closure. FMC will also contract for the construction of the closure at the appropriate time, provide a senior construction person (its own or contracted) to be in charge, supervise the CQA activities, and carry out future monitoring of the closure with its own or contracted forces.

2.1.2 Design Engineer/Construction Manager

Bechtel Environmental, Inc. (BEI) is the design engineer, and will also be acting as agent for FMC and serve as the construction manager for the closure and is referred to as "Bechtel" in the technical specifications. The technical documents produced during the design have been reviewed and approved by FMC and are part of the closure plan. They will later be included in a future contract between FMC and a Contractor when the closure is carried out. As construction manager, Bechtel is responsible for coordinating all construction activities. Where specified in the specifications, matters relating to CQA requiring Bechtel approval will require approval from the CQA officer and will be forwarded to the CQA officer for his approval.

2.1.3 CQA Personnel

Qualifications - A senior representative of FMC (FMC employee or contracted) will provide oversight during construction. This person also will select the CQA officer, responsible for

implementing the CQA plan during construction. Responsibilities will include conducting inspections, reviewing documents and material certifications, and performing other activities as required to ensure the completed construction is in conformance with the requirements set forth in the technical specifications and design drawings. The CQA officer will be a registered professional civil or geotechnical engineer with sufficient practical, technical, and managerial experience to successfully oversee and implement CQA activities for installing cover systems over hazardous waste facilities. The CQA officer will ensure that communication of all CQA-related matters is conveyed to and acted upon by the affected organizations.

The inspection staff will possess adequate formal training and sufficient practical, technical, and administrative experience to execute and record inspection activities successfully.

The CQA officer and inspector(s) will function independently of the Owner/Operator or Construction Contractor.

Authority - The CQA officer will report to FMC's senior representative and will serve as FMC's liaison with the construction Contractor. The construction inspector(s) will report directly to the CQA officer.

Responsibilities - The CQA officer is singularly responsible for all aspects of executing the CQA program. The officer will train the inspector(s) and direct, oversee, and check his (their) work. The construction inspector(s) will conduct the daily on-site observations, testing, and recordkeeping. The major areas of responsibilities include the following:

1. Serve as FMC's liaison with the Contractor in interpreting and clarifying drawings and specifications. (At the CQA Officer's discretion, the design engineer or other professional suited to perform this task may be designated as needed).

2. Approve submittals required by the technical specifications. Evaluate "equal" materials proposed for use by Contractor. (Product literature and certification can be used to provide that "equal" material meets or exceeds the specified material.) (At the CQA Officer's discretion, the design engineer or other professional suited to perform this task may be designated as needed).

3. Review panel layout shop drawings. Ensure that every effort is taken to minimize fields seams especially in critical areas. (At the CQA Officer's discretion, the design engineer or other professional suited to perform this task may be designated as needed).

4. Ensure that the Contractor's personnel comply with the site safety regulations. (At the CQA Officer's discretion, a health and safety professional suited to perform this task may be designated as needed).

5. Complete daily inspection reports that will provide a chronological framework of the project. These reports should include, as a minimum, those items specified in the technical specifications.

6. Confirm that the testing equipment, personnel and procedures do not change over time or that any changes do not result in a deterioration of the inspection process.

7. Provide to the FMC senior representative reports on the inspection results including:

   - Review and interpretations of observation records and test results.

   - Identification of work that the CQA officer believes should be accepted, rejected, or uncovered for observation, or that may require special testing, inspection, or approval.

   - Reports that reject defective work and specify corrective measures.

8. Verify that the Contractor's construction quality control plan is being followed.

9. Verify that the equipment used in testing meets the test requirements and that the tests are conducted by qualified personnel according to the procedures defined in the Contractor's quality control plan.

10. Monitor all tests conducted by the Contractor's personnel as may be required by the contract and/or the technical specifications.

11. Perform independent on-site inspection of the work in progress to assess compliance by the Contractor with the plans and specifications.

12. Report to the Contractor results of all observations and tests as the work progresses and interact with the Contractor to provide assistance in modifying the materials and work to comply with the specified design.

13. Accept or reject units of work.

14. Prepare the final CQA report. The objective of the CQA report is to provide a permanent record of the construction to assure regulatory

agencies that the pond final cover system was constructed in accordance with the plans, specifications, and permit requirements. The detailed contents of the report are described in Section 5.2.

2.1.4 Construction Contractor

Responsibility - FMC will engage a Contractor to carry out the closure construction. The contract will stipulate the responsibility of the Contractor to comply with the quality assurance procedures, and to provide the appropriate documents, access, and opportunity to monitor the work. The Construction Contractor will be responsible for construction of the final cover system for the ponds, and inspecting and ensuring material delivered to the site for geosynthetic clay liner, flexible membrane liner, geonet and geotextile are in conformance with the material properties as specified in the construction specifications. The closure construction work shall be performed in strict accordance with plans and specifications, using the necessary construction procedures and techniques. The Contractor will submit its quality control plan to FMC for approval. The technical documents produced previously by the design engineer will specify the sampling and testing process to be carried out as the work progresses. This sampling and testing will be part of the Contractor's responsibilities as will the requirement to turn over copies of all sampling and testing results to the CQA officer.

Authority - The Construction Contractor has the authority to direct and manage its employees and the equipment they use to accomplish the construction.

2.2 Project Meetings

Frequent, planned meetings will be held to enhance communication between the parties involved. The structure of these meeting will be established by FMC, but will, as a minimum, consist of the following:

1. Preconstruction Meeting

   A preconstruction meeting will be held at the site. The purpose of the preconstruction meeting is to:

   - Review the responsibilities of each organization.
   - Review lines of authority and communication for and between each organization.

- Discuss and establish the material submittal review process and time allowance required.
- Discuss the established protocol for observations and tests.
- Discuss the established protocol for handling construction deficiencies, repairs, and retesting.
- Review methods for documenting and reporting inspection data.
- Review methods for distributing and storing documents and reports.
- Review work area security and safety protocol.
- Discuss any modifications of the CQA plan to ensure that site-specific considerations are addressed.
- Discuss procedures for the protection of materials and for the prevention of damage from inclement weather or other events.
- Conduct a site walk-around to verify that the design plans and specifications are understood and to review material and equipment storage locations.

The meeting will be documented by a designated person and minutes will be transmitted to all parties.

2. Progress Meetings

Progress meetings will be held daily at the work area at an agreed-upon time. The purpose of the meetings is to:

- Review the previous day's activities and accomplishments.
- Review the work location and activities for the day.
- Identify the Contractor's personnel and equipment assignments for the day.
- Discuss any potential construction or safety problems.

These meetings will be documented.

3. Problem or Work Deficiency Meetings

Special meetings will be held when a problem or deficiency has occurred or is likely to occur. The purpose of the meeting is to define and resolve the problem or recurring work deficiency in the following manner:

- Define and discuss the problem or deficiency.
- Review alternative solutions.
- Implement a plan and schedule to resolve the problem or deficiency.

These meetings will be documented.

3. INSPECTION ACTIVITY

The closure construction work will be performed in accordance with detailed technical specifications. The specifications contain detailed requirements for submittals of material samples, methods of working, sampling, and testing. They also contain the required level of quality to be met by each type of work activity. The Contractor's responsibility includes providing details of work methods, carrying out the required sampling, and arranging for proper testing.

The types of work activity to be inspected include:

- Earthwork and Grading

  1. Inspect and ensure that operations for subgrade preparation, including compaction of existing surface to receive fill and fills for depression are performed in accordance with Specification No. S-4, Subsection 3.2.

  2. Inspect and ensure excavations for the anchor trench for the geosynthetic materials and drainage piping conform to Specification No. S-4, Subsection 3.3.

  3. Inspect and ensure operations for liner subgrade, anchor trench backfill and sand and slag for the cover protective layer are performed conforming to Specification No. S-4, Subsection 3.4

4. Inspect and verify compaction requirements of slag fill are established in conformance with test section as specified in Specification S-4, Subsection 3.4.4.

5. Inspect and ensure drainage piping and culverts, if required, are installed conforming to Specification S-4, Subsection 3.5.

6. Inspect and ensure installation of channels and ditches conform to Specification S-4, Subsection 3.6.

7. Perform soil density testing in accordance with Specification S-4, Subsection 3.9.

- Geosynthetic Clay Liner (GCL)

  1. Visually inspect GCL for damage upon delivery to the site.

  2. Visually inspect GCL for damage prior to installation.

  3. Inspect and ensure surface to receive GCL is acceptable and has also been accepted by the installation Subcontractor.

  4. Inspect and ensure the installation of the GCL conforms to Specification S-5, Subsection 3.2.

- Flexible Membrane Liner (FML)

  1. Visually inspect FML for damage upon delivery to the site.

  2. Visually inspect FML for damage prior to installation.

  3. Inspect and ensure the installation of the FML conforms to Specification S-6, Subsection 3.3.

  4. Inspect and ensure the installed FML are tested in conformance with Specification S-6, Subsection 3.4.

- Temperature, Pressure and Gas Monitoring Systems, and Lift Stations

  1. Visually inspect piping materials for damage upon delivery to the site.

  2. Inspect and ensure the installations of the Temperature Monitoring Points conform to Specification S-9.

3. Inspect and ensure instrumentations and lift stations are installed in conformance with manufacturers' installation instructions.

- Geonet and Geotextile

1. Visually inspect geonet and geotextile for damage upon delivery to the site.

2. Visually inspect geonet and geotextile for damage prior to installation.

3. Inspect and ensure geonet and geotextile are installed in conformance with Specification S-7, Subsections 3.1 and 3.2 respectively.

4. Inspect and ensure geotextiles are covered within the time limit as specified in Specification S-7, Subsection 3.3.

- Topsoil and Seeding

1. Inspect and ensure seeding is performed within the periods as specified in Specification S-8, Subsection 1.6.

2. Inspect and ensure topsoil and seed mixture conforms to Specification S-8, Subsection 2.2.

3. Inspect and ensure surface to receive topsoil is acceptable prior to topsoil placement.

4. Inspect and ensure topsoil areas are acceptable prior to seeding.

5. Inspect and ensure topsoil and amendments are spread conforming to Specification S-8, Subsection 3.2.

6. Inspect and ensure seeding is performed in conformance with Specification S-8, Subsections 3.3 through 3.5.

7. Inspect and ensure seeded areas are acceptable after seed germination as specified in Specification S-8, Subsection 3.6.1.

An Independent Professional Engineer registered in the State of Idaho will inspect the work as they are performed to verify that closure of the pond(s) was conducted in conformance with the drawings and specifications. The Professional Engineer will perform site inspections during closure activities for closure certification purposes, as indicated in Table 1, and will sign the closure certification.

TABLE 1
CLOSURE INSPECTION/CERTIFICATION SCHEDULE

STAGE OF CLOSURE ACTIVITY	(APPROXIMATE) DAYS FROM BEGINNING OF CONSTRUCTION OF FINAL CAP
Completion of preparation of subgrade	20
During GCL placement and at completion	25 and 30
During FML placement, weld testing and completion	35 and 40
At completion of geonet and geofabric installation	60
At beginning, during compaction and at completion of installation of slag and filter layers	70, 80 and 90
At completion of top soil and permanent settlement monument installations	120

4. SAMPLING STRATEGIES

The sample numbers, frequencies, and methods to be followed in construction are detailed in the technical specifications and as outlined below:

- Earthwork testing and sampling to conform to Specification S-4, Subsection 3.9.1.
- GCL testing and sampling to conform to Specification S-5, Subsections 2.2.3 and 2.2.4.
- FML testing and sampling to conform to Specification S-6, Subsection 2.1.3 and 3.4.
- Geonet and Geotextile testing and sampling to conform to Specification S-7, Subsections 2.1.3 and 2.2.2 respectively.
- Minimum one sample of all supplied materials required for topsoil and seeding as specified in Specification S-8, Subsection 1.3(b)

5. DOCUMENTATION

5.1 Document Control

All CQA documents will be logged into a filing system, such that each document has a unique number and is filed sequentially. The system will maintain subject codes as needed for each document so as to permit searches by subject, date, etc.

5.2 Final Report

A final report of the closure will be prepared at completion of the closure. This report will contain all applicable documentation and will be certified correct by the CQA officer. Copies of the report will be filed with the permitting agency and also maintained at the facility.

Content - At a minimum, the report will contain:

1. General summary of work performed by the Contractor and his Subcontractors. Construction activities, observations, problems and corrective actions, deviations from design, etc. shall be included.
2. Daily inspection reports.
3. Manufacturer's literature and certification of materials used in the construction.
4. Test results and certification for soil tests performed and geosynthetic properties, including permeabilities, manufacturer testing data sheets, and welded seams.
5. Foundation acceptance form from lining Subcontractor.
6. Material samples.
7. Project photographs with dates and descriptions.
8. As-built drawings.
9. Certification from CQA officer that the document accurately represents the activities and findings of the CQA program.

SPECIFICATIONS

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

TECHNICAL SPECIFICATION
EARTHWORK AND GRADING

PROFESSIONAL ENGINEER REGISTERED 7890 STATE OF IDAHO ROBERT NG

5-2-02

REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR
0	5/2/02	ISSUED FOR CONSTRUCTION			

ORIGIN BECHTEL SF-BEI	**TECHNICAL SPECIFICATION EARTHWORK AND GRADING FINAL POND COVER**	**JOB NO. 24230** **SPECIFICATION NO. 15S-S-4 REV. 0** **SHEET 1 OF 17**

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1 GENERAL

This specification describes the requirements for grading of existing fill, and the materials and placement of a final cover over an existing pond at the FMC Idaho, LLC plant in Pocatello, Idaho. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

1.1 RELATED SPECIFICATIONS

The following specifications contain requirements that relate to this specification:

a. 15S-S-5 Geosynthetic Clay Liner

b. 15S-S-6 Flexible Membrane Liner

c. 15S-S-7 Geonet and Geotextile

d. 15S-S-8 Topsoil and Seeding

e. 15S-S-9 Temperature Monitoring Points (Wells)

1.2 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

1.3 SUBMITTALS

The Contractor shall submit the following documents for Bechtel's approval and acceptance prior to mobilization:

a. Fill placement method and plan.

b. Material certifications for concrete components, and drainage and culvert piping systems, including cement, aggregate, welded wire fabric, and piping materials.

2 EQUIPMENT AND MATERIALS

2.1 EQUIPMENT

Conventional earth-moving equipment shall be used for the construction of the final cover, including low-ground-pressure (LGP) equipment as required and needed for the placement of the initial soil layer over geosynthetic materials, or other equipment as approved by Bechtel. All equipment shall be decontaminated prior to arrival at the site, in good working condition, and suitable for its intended use.

2.2 MATERIALS

2.2.1 The following materials shall be furnished by the Contractor:

a. Subsurface drainage piping: Corrugated High Density Polyethylene (HDPE) pipe with smooth interior and corrugated exterior. The pipe shall be N-12 as manufactured by Advanced Drainage Systems, Inc. (ADS) or approved equal (Advanced Drainage Systems, 3300 Riverside Drive, Columbus, OH 43221, 1-800-733-8523) and shall be solid or with slotted perforations as specified on the drawings. The drainage piping will be located at the perimeter of the final cover as a means to drain water from the drainage layer. The pipe shall be manufactured to comply with AASHTO M 252. Pipe materials shall meet ASTM F 405.

The pipe joints and fittings shall also be manufactured to comply with ASTM F 405 requirements and manufactured by the same manufacturer as the pipe.

b. Pressure monitoring piping: PolyVinyl Chloride (PVC) pipe with and without perforations as specified on the drawings. Where specified, perforations shall consist of two rows of 1/2-inch diameter openings spaced at 6 inch centers or approved equal. The pipe shall be manufactured to comply with ASTM D 1785, Schedule 40.

Carbon steel pipe shall be manufactured in accordance with ASTM A 53, Type S. All buried portion of steel piping shall be externally coated and wrapped conforming to the requirements of AWWA C 209 cold applied primers and prefabricated tape type II or III meeting the following requirements:

- Coating material shall be Polyken 930, Tapecoat 10/40, No. 20, or approved equal.

- Primers and mastics shall be as recommended by the manufacturer of the selected coating system.
- The wrapping thickness shall be 60 mils minimum applied in 2 layers.

c. Culverts: Corrugated Metal Pipe (CMP) shall be in accordance with AASHTO M36. Size, corrugation, and gage shall be as shown on design drawings.

d. Drainage Fill: Material shall be a clean, durable graded sand and gravel conforming to the following gradation limits when tested in accordance with ASTM D 422:

U.S. Standard Series Sieve Size	Percent Passing
1 inch	100
3/4 inch	75 - 100
#4	0 - 40
#40	0 - 5

e. Gravel Filter: Material shall be crushed and screened slag or a clean, durable graded sand and gravel conforming to the following gradation limits when tested in accordance with ASTM D 422:

U.S. Standard Series Sieve Size	Percent Passing
4 inch	100
2 inch	49 - 87
1 1/2 inch	42 - 80
3/4 inch	22 - 60
3/8 inch	5 - 42
#4	0 - 20

f. Sand Filter: Material shall be crushed and screened slag or a clean, durable graded sand and fine gravel conforming to the following gradation limits when tested in accordance with ASTM D 422:

U.S. Standard Series Sieve Size	Percent Passing
3/4 inch	100
3/8 inch	87 - 100
# 4	66 - 96
# 40	2 - 32
# 200	0 - 22

This material shall be classified as non-plastic when tested in accordance with ASTM D 4318.

g. Liner Foundation Material: Material shall be crushed and screened slag or a clean, well-graded, fine-to-coarse sand and fine gravel conforming to the following gradation limits when tested in accordance with ASTM D 422.

U.S. Standard Series Sieve Size	Percent Passing
3/8 inch	100
#200	22 (max)

This material shall be classified as non-plastic when tested in accordance with ASTM D 4318.

h. Concrete: Concrete for settlement monuments, lining channels, and ditches shall be in accordance with ASTM C 94 having a minimum compressive strength at 28 days of 3,000 pounds per square inch (psi) and maximum aggregate size not exceeding 3/4 inch.

i. Miscellaneous Metal: Steel plates for settlement monuments and topsoil thickness indicators shall be in accordance with ASTM A 36. Steel pipe for settlement monuments and topsoil thickness indicators shall be in accordance with ASTM A 53.

j. Welded Wire Fabric: Welded wire fabric for ditch lining shall be in accordance with ASTM A 185 and as specified on the design drawings.

k. Sand-Cement Backfill Material: Sand-cement backfill material for the observation wells shall conform to the following:

Cement	2 90-pound sacks per cubic yard
Water	45 gallons per cubic yard
Coarse and Fine Sand	50% of remaining volume of mixture each or approximately 9.7 cubic feet per cubic yard each

The Contractor may propose alternative mixes for Bechtel's approval. It shall be demonstrated that the mix can fill the observation wells without voids and will develop a minimum 28-day unconfined compressive strength of 150 psi.

2.2.2 Owner will furnish the following materials at no charge to the Contractor:

a. Coarse Slag: Well graded slag will be derived from the FMC Idaho, LLC plant. The Contractor is responsible for loading, hauling, and delivery of the slag material to the jobsite, including, screening and/or crushing the slag to a well graded material having no particles larger than 12 inches and smaller than 1-1/2 inches in size.

b. Common Fill: Slag or soil excavated from the pond area or from plant borrow areas. Material shall have no particles larger than 12 inches in size.

3 EXECUTION

3.1 GENERAL

The work is to be performed at a pond which has stored sludge containing elemental phosphorus. Precaution shall be taken during any excavation at the site as elemental phosphorus may be encountered and exposed to air. Should elemental phosphorus be exposed by said activities, the exposed material shall be immediately covered and Bechtel immediately notified.

3.2 SUBGRADE PREPARATION

a. Prior to the placement of the Liner Foundation material, the temporary HDPE liner over the pond, the existing temporary settlement markers, and the existing dewatering piping are to be removed. The existing 2-inch diameter HDPE pipe inserts and 6-inch diameter drainage pipes are to be cut back and capped with concrete. The steel pipes for the observation

wells are to be cut and removed to top-of-finish subgrade and backfilled with sand-cement backfill as shown on the Design Drawings. The 2-inch diameter steel dewatering discharge piping and the steel dewatering header are to be disconnected, cut into manageable length, decontaminated, and disposed of on-site.

Any buried piping encountered within the limit of the final cover shall be excavated, decontaminated, and removed unless otherwise specified, or directed by Bechtel. These excavations are subject to approval of Bechtel and shall be in accordance with Section 3.3. Bechtel will inspect the work throughout the duration of the excavation and may stop all work if deemed unsafe and/or possibly exposing elemental phosphorus. The area is to be backfilled in accordance with Section 3.2.b only after approval from Bechtel.

The observation wells are to be backfilled in such a way so as the annular space of the wells is completely filled with the sand-cement mixture. The mixture shall not be dropped from the top of the wells, but tremied with hose or pipe starting from the bottoms of the wells.

The temporary liner shall be cut into manageable pieces in the same direction as existing seams, rolled and properly stored. The seam strips shall be cut out and properly disposed of. Care shall be taken as much as practical to not damage the liner in any shape or form, including over-stretching, or puncturing the material. Damaged areas are to be marked for later repair or cut out as approved by Bechtel. Handling and storage of the material shall be in accordance with Specification 15S-S-6.

b. The existing dike and the slag backfill over the pond shall be graded to the lines, grades, and cross sections as shown on the design drawings. The surface to receive fill shall be compacted with three coverages of a vibratory roller with a minimum static weight of 12 tons. Any soft area shall be immediately reported to Bechtel and the material removed and/or scarified and recompacted as directed by Bechtel.

Grading shall include excavating excess material and filling of depressed areas and bench widening as needed for constructing other works as shown on the drawings. Excavations shall be in accordance with Section 3.3. Depressed areas shall be filled with excavated material or general fill placed in maximum loose lifts of 12 inches and compacted with three coverages of a vibratory roller with a minimum static weight of 12 tons. The finished subgrade to receive the Liner Foundation material shall form a tight and smooth surface without any large rock protrusions after compactions; if required, the rocks shall be removed and replaced with finer materials, and recompacted as directed by Bechtel.

c. Materials removed, with the exception of the temporary HDPE liner, are to be disposed of on-site as directed by Bechtel.

3.3 EXCAVATION

a. Excavation is unclassified and includes excavation to required grade, or subgrade elevations, regardless of the character of materials and obstructions encountered.

b. Anchor trench excavation shall be performed to the line, grade, and cross section as shown on the design drawing and to the tolerances as specified herein. Anchor trench shall be excavated prior to geosynthetics placement.

The corners of the anchor trench where geosynthetics are to be placed shall be slightly rounded to avoid sharp bends in the geosynthetics. Sharp projections or irregularities on the surface of the finished subgrade or anchor trench will not be permitted.

c. Tolerance for all excavated surfaces shall be within ±0.1 foot of the elevation as specified in the design drawings.

d. Overexcavation required to suit the Contractor construction equipment or methods shall be backfilled and recompacted to the required grade by and at the Contractor's expense, conforming to the requirements as specified in Section 3.4.

e. Excavation for culverts and drainage piping where required shall consist of open cut trenches. The bottom width of the trench shall be the outside pipe diameter plus 2 feet. Shoring and bracing shall be placed to the extent necessary to retain the soil encountered, or the trench walls shall be sloped back to a minimum 1-to-1 slope or as shown on the design drawings, all in accordance with the safety requirements of the local and federal codes. The bottom of the trench shall be overexcavated by 6 inches to allow for bedding when coarse rock or slag are encountered.

The trench bottom shall be shaped to conform to the pipe barrel or shall be a bedding material consisting of drainage fill material.

3.4 FILL PLACEMENT AND COMPACTION

3.4.1 Liner Subgrade Preparation

a. After the completion of subgrade preparation, as specified in Section 3.2, a layer of Sand Filter material shall be placed and compacted in a single 6-inch compacted lift. On top of the compacted Sand Filter layer, a layer of Liner Foundation material shall be placed and compacted in a single 6-inch compacted lift.

The finished surfaces of both the Sand Filter and Liner Foundation layers shall receive a minimum of three coverages of a smooth steel wheel vibratory roller with a minimum static weight of 5 tons to ensure no sharp protrusions remain. No sharp particles or other hard objects shall be present in the top 1 inch of the surfaces where geosynthetics are to be placed.

The surface to be covered with Geosynthetic Clay Liner (GCL) shall be smooth and free of all rocks, sharp stones, sticks, roots, other sharp objects, or debris of any kind. The surface shall have no sudden, sharp, or abrupt changes or break in grade.

Deformations in the surface shall not be greater than 1 inch in depth. If bedding surface is frozen, then deformations shall be not greater than 0.5 inch in depth.

b. Prior to the installation of the GCL, the Contractor or GCL Installation Subcontractor, if other than the Contractor, shall, with concurrence from Bechtel, verify the conditions of the Liner Foundation surface on which the GCL will be placed to ensure that this surface represents a stable surface to support the material. The Liner Foundation surface preparation is deemed complete only after the GCL Installation Subcontractor notifies Bechtel in writing of acceptance of the prepared surface.

3.4.2 Backfilling Anchor Trench

a. The anchor trench shall be adequately drained to prevent ponding or softening of the adjacent soils while the trench is open. The anchor trench shall be backfilled after the geosynthetics are installed. The backfill material shall be placed in 6-inch loose lifts and well tamped.

b. Consideration shall be given to backfilling the geosynthetic liners at its most contracted state, preferably during the cool of the morning or extended period of overcast skies, to avoid stretching of the lining materials.

3.4.3 Sand Filter or Liner Foundation Material above Geosynthetic Materials

a. Sand Filter or Liner Foundation material, with a minimum compacted thickness of 12 inches, shall be spread over the drainage net and geotextile by an LGP Caterpillar D-6 tractor or approved equal. The tractor shall have a contact pressure not exceeding 5 psi, or equivalent, to initially spread the material. The material shall be spread in one lift, in a direction perpendicular to the underlying seams of the geosynthetic material, and when a sufficient area is completed, it shall immediately be covered with 18 inches of slag. Hauling equipment shall be permitted to move on slag only to prevent displacement of the Sand Filter/Liner Foundation material. Dozers or graders shall not be permitted to turn on the Sand Filter/Liner Foundation material.

b. The Sand Filter or Liner Foundation material shall be placed in a manner that does not damage, puncture, displace, or otherwise degrade the geotextiles. If damage to the liner occurs or the geotextile is considered by Bechtel to be endangered, the Contractor shall cease operation at the direction of Bechtel and modify his operations, equipment, or methods. Any damage to the fabric or other geosynthetics shall be repaired according to the more stringent of the techniques recommended by the manufacturer, pre-approved by Bechtel, or using methods included in the specifications at no expense to Owner/Bechtel.

3.4.4 Coarse Slag Fill

a. Coarse slag shall be placed in one 18-inch compacted layer. The slag shall be spread with a dozer. The slag is to be pushed by the dozer so that at all times the dozer will only be traveling on the newly placed slag. After placement, the slag shall be compacted with a smooth wheel vibratory roller in accordance with the procedures established under Section 3.4.4.b to achieve adequate compaction.

b. Prior to general placement of slag over the geotextiles, a test section having minimum dimensions of 30-foot wide by 50-foot long shall be constructed as specified herein. The coarse slag layer shall be compacted with a smooth wheel vibratory roller having a minimum static load of 5 tons. The settlement of the surface shall be measured and the number of coverages recorded, all to determine a relationship between the number of coverages and settlement. Adequate compaction shall be defined as the number of coverages to achieve 80 percent of the ultimate compaction settlement which is achievable by the specified method. A minimum of three coverages shall be required. Contractor's pricing shall be based on three coverages. Additional coverages will be paid as additional work.

3.4.5 Gravel Filter Layer

a. The gravel filter material shall be placed and compacted in a single lift.

b. The finished surface shall receive a minimum of three coverages of a smooth steel wheel vibratory roller with a minimum static weight of 5 tons.

3.4.6 Sand Filter Layer

a. The sand filter material shall be placed and compacted in a single lift.

b. The finished surface shall receive a minimum of three coverages of a smooth steel wheel vibratory roller with a minimum static weight of 5 tons.

3.4.7 Trench Backfill

a. Trench backfill shall be placed along both sides of the pipe equally in uniform layers. Care shall be taken to ensure the pipe is not displaced or damaged and the voids under the haunches are filled.

b. Backfill material and compaction requirements shall be as follows:

Compacted backfill material around culverts or pipes to 12 inches above pipe:

Pipe Material	Backfill Material	Max Loose lifts (inches)	% Max Dry Density[1]
HDPE	Drainage fill	6	well tamped
PVC, CMP Carbon steel	Local material as approved[2]	6	85

Trench backfill from 12 inches above pipe to finish grade:

Pipe Material	Backfill Material	Max Loose lifts (inches)	% Max. Dry Density[1]
HDPE	Drainage fill	12	well tamped
CMP	Local material as approved[3]	12	90

[1] In accordance with ASTM D 1557.
[2] No particle larger than 3 inches.
[3] No clay, frozen soil, brush, or any organic or deleterious materials. Maximum particle size not exceeding 6 inches.

c. All surfaces shall be restored to their original condition that existed prior to the trench excavation, including paved areas, where the surfaces shall be constructed to match those of the existing pavement sections.

3.4.8 Lift Station Backfill

a. Backfill materials shall consist of approved local materials and shall be free of expansive clay, frozen soil, brush, or any organic or deleterious materials. Maximum particle size shall not exceed 6 inches.

b. Backfill materials shall not be placed on snow, ice, or frozen ground surfaces. All surfaces to receive backfill shall be cleaned of all trash and debris.

c. Backfill shall be placed in uniform loose lifts not to exceed 8 inches in thickness and shall be compacted to not less than 85 percent of maximum dry density as determined in accordance with ASTM D 1557.

d. Backfill adjacent to lift stations shall be placed and compacted equally along both sides of the structure to prevent strain on or displacement of the structure.

e. Finished surfaces shall conform to the lines and grades shown on the drawings.

3.5 PLACING AND JOINTING OF CULVERTS AND DRAINAGE PIPING

3.5.1 Prior to lowering pipe into the trench, the joints shall be thoroughly cleaned and carefully checked. Pipe shall be laid true to line and grade according to the requirements as specified herein.

3.5.2 Laying shall start from the lowest end. Perforated pipe shall be laid with perforation down and centered about the flow line.

3.5.3 Pipe shall be installed in accordance with the manufacturer's instructions. The CMP shall be jointed with galvanized steel coupling bands with neoprene gaskets. Corrugated HDPE pipes shall be jointed with corrugated HDPE split couplings in accordance with manufacturer's instructions.

3.5.4 No vehicular traffic shall be permitted to travel across the HDPE pipes until a minimum of 2 feet of cover is placed and compacted over the pipes in accordance with Section 3.4.5.

3.6 CHANNELS AND DITCHES

3.6.1 Drainage channels and ditches shall be excavated true to the lines, grade, and cross sections as shown in the design drawings. If excavation beyond the specified grades is required in order to remove boulders or other obstructions, the voids remaining shall be backfilled with suitable local material as approved by Bechtel.

3.6.2 Backfill shall be placed in loose lifts of 6 inches with suitable excavated material free of expansive clay, organic, or deleterious material and compacted to not less than 90 percent of maximum dry density as determined in accordance with ASTM D 1557.

3.6.3 Vertical tolerance for unlined channels and ditches shall be 0.1 foot above and 0.2 foot below the specified grade of the channels and ditches.

3.6.4 Concrete-Lined Channels and Ditches

a. The area to be concrete-lined shall be prepared by shaping, compacting, and excavating of the channels or ditches including the cut-off walls. All depressions and overexcavation shall be filled and compacted in accordance with Section 3.6.2 or filled with lean concrete.

b. Concrete shall be placed directly on firm excavated surface to the line, grade, and dimensions shown on the design drawings. The surface on which concrete is to be placed shall be free of water. The vertical tolerance shall be plus or minus 0.04 foot.

c. Concrete shall be of such consistency that it can be placed on the slopes without flowing. All control joints shall be completed as shown on the design drawings. In the event it is not feasible to complete the entire placing in one operation, the placement shall be terminated with a construction joint.

d. As a minimum, the concrete surface shall be given a float finish and cured.

e. All concrete work shall be in accordance with applicable sections of ACI 301, 304, 305 and 306.

f. Methods such as gunite may be used for placing the lining. The proposed methods will be subject to approval of all details and be capable of

demonstrating to the satisfaction of Bechtel that they will achieve the thickness, flow line, finish, and durability as specified.

3.6.5 Settlement Monument

Concrete work shall be in accordance with Section 3.6.4.b and e. Welding shall be in accordance with AWS D1.1.

3.6.6 Topsoil Thickness Indicators

Concrete work shall be in accordance with Section 3.6.4.b and e. Welding shall be in accordance with AWS D1.1.

3.7 DRAINAGE AND WATER CONTROL

3.7.1 Contractor shall take measures as necessary to control soil erosion in the construction areas during the life of the Contract. Such measures shall include berms, dikes, dams, sediment basins, fiber mats, netting, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

3.7.2 Off-site drainage shall be diverted from the site and areas of work by such means as grading to drain away from the area of concern, and/or constructing temporary berms or ditches. Water in excavations shall be controlled and removed. Discharges from pumps shall be directed away from the area of the pond final cover to locations as directed by Bechtel.

3.8 TOLERANCES

Tolerances shall be plus and minus 0.10 foot unless otherwise specified herein.

3.9 TESTING

3.9.1 Tests for specified compaction for trench backfill shall be conducted by an authorized independent test laboratory at no extra cost to Owner/Bechtel in accordance with the following:

a. Maximum dry density and optimum moisture content shall be determined in accordance with ASTM D 1557, Method D.

b. In-place density shall be determined in accordance with the test procedure given in ASTM D 1556.

At the option of the Contractor, in-place density determined by ASTM D 2922 meeting the following requirements may be used. The nuclear densometer shall be calibrated by comparison with results from

ASTM D 1556. Initially, three (3) check tests of density and moisture shall be performed by the sand cone method. Thereafter, one (1) test in ten (10) shall be verified with a sand cone test. At least one check shall be performed each day for each material. Nuclear densometers shall not be used under freezing conditions.

c. Tests for maximum dry density and optimum moisture content shall be made for each type of material encountered or one test for each five sand cone tests with a minimum of one test for every 5 work days.

d. Field in-place density and moisture tests shall be made, as required, to verify that the specified compaction is achieved. A minimum of one test for every 1,000 cubic yards of compacted fill or one test per shift shall be made for each different type of material being placed or when materials or material sources change.

e. Where compaction of fill material does not meet the specified compaction, it shall be reworked until it complies with the specified in-place density.

3.10 DAILY QUALITY CONTROL LOG

a. The Contractor shall maintain a Daily Quality Control (QC) log during all phases of the earthwork and drainage piping installation. This log shall document the daily progression of these installations from the delivery of the materials to final acceptance. The log shall designate those construction activities that influence the integrity of the earthwork and drainage systems during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

- Weather: temperature, winds, and precipitation.
- Preparation activities, including removal of water, and over-excavation, backfilling, and recompaction of subgrade.
- Elemental phosphorus encountered, if any, during excavation and corrective action taken.
- Repairs and replacements of piping materials.
- Compaction operations including lift thicknesses, equipment used, and number of coverages, and the type of compaction equipment.
- Results, locations, and elevations of in-place density testing, including corrective action taken.

- Inspection and installation of drainage piping and culverts, including the excavation and backfilling of pipe trenches.

- Names of all personnel conducting work at the site.

- Names, dates, and times for when the jobsite is visited by regulatory personnel, Contractors or vendors, and the FMC Idaho, LLC personnel.

- Photographs of all phases of earthwork operations and piping installation.

- Limit and extent of excavation if required for removal of buried piping.

- Deviations from the Construction Quality Assurance Plan, drawings and specifications.

b. Prior to performing the work, the Contractor shall submit the Daily QC log format for approval by Bechtel.

3.11 INSPECTION

Bechtel will be present for the entire duration of the work. The Contractor shall provide access and support, as needed, for inspection by Bechtel while work is in progress as well as at the completion of each operation.

Inspection by Bechtel does not imply acceptance until all the requirements of this specification are met.

3.12 CLEANUP

At the end of the work, all temporary working areas shall be restored to their original conditions with all temporary construction materials removed and the site cleaned.

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

TECHNICAL SPECIFICATION
GEOSYNTHETIC CLAY LINER

PROFESSIONAL ENGINEER REGISTERED 7890 STATE OF IDAHO ROBERT NG

5-2-02

REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR
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ORIGIN

SF-BEI

TECHNICAL SPECIFICATION
GEOSYNTHETIC CLAY LINER
POND FINAL COVER

JOB NO. 24230

SPECIFICATION NO.
15S-S-5
REV. 0

SHEET 1 OF 12

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1 GENERAL

This specification includes requirements for the manufacture, supply, delivery, testing, storage, and installation of Geosynthetic Clay Liner (GCL) within the final cover system. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

The GCL will be installed over suitably prepared subgrade and underneath a Flexible Membrane Liner (FML) which are covered by separate and related specifications.

1.1 RELATED SPECIFICATIONS

The following specifications contain requirements that relate to this specification:

a. 15S-S-4 Earthwork and Grading

b. 15S-S-6 Flexible Membrane Liner

c. 15S-S-7 Geonet and Geotextile

d. 15S-S-8 Topsoil and Seeding

e. 15S-S-9 Temperature Monitoring Points

1.2 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

d. Installation Subcontractor: The party who will be responsible for the actual installation of the GCL liner, if other than the Contractor.

1.3 MATERIAL TESTING PROCEEDURES

Geosynthetic testing is evolving, should any of the test methods referenced in this specification become obsolete at the time of construction, more current test methods may be substituted at the discretion of Bechtel.

1.4 SUBMITTALS

The Contractor shall submit the following documents for Bechtel's approval and acceptance prior to mobilization of the GCL installer unless otherwise noted:

a. GCL placement method and plan per Section 3.2.a shall be submitted, including jointing of the liner material.

b. Certified reports presenting the results of the laboratory testing required by this specification shall be submitted to Bechtel for review and approval prior to delivery. The submittals shall clearly show the date the GCL to be used for this project was manufactured. The Contractor must satisfy Bechtel that the material proposed meets every requirement of this specification.

c. Within 2 weeks after award of the Contract, the Contractor shall submit two (2) samples of the materials to Bechtel for review and approval.

d. The Contractor shall submit, within 2 weeks after award of the Contract, the manufacturer's recommended installation procedures for the placement and jointing of the GCL material, including procedures for repair.

e. The Contractor shall provide Bechtel with Record (as-built) Drawings showing the limits of the installed GCL material. The Record Drawings shall also indicate the corresponding panel and roll numbers, and where samples were taken for plant testing. The record drawings shall be submitted within 2 weeks of completion of geosynthetics placement.

f. The GCL manufacturer's certification or written approval of the installation subcontractor, and the name and qualification of the manufacturer's representative shall be submitted to Bechtel 7 days prior to installation. The GCL manufacturer must have experience in manufacturing, or fabricating, at least 1,000,000 m^2 (10,000,000 ft^2) of similar geosynthetic material. The geosynthetic installer must have experience installing at least 1,000,000 m^2 (10,000,000 ft^2) of similar geosynthetic material.

1.5 DELIVERY, STORAGE, AND HANDLING

a. GCL material shall be delivered to the site only after Bechtel has approved the required submittals. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be accomplished in such a manner as to prevent damage to any part of the work. The Contractor shall provide sufficient labor and equipment to properly unload material upon delivery to the site.

Owner will provide an area near the site for storage of material. The material shall be stored in a reasonably smooth, well-drained, level portion of the storage area provided, away from sharp objects or rocks that may puncture the material; away from brush, oil, grease, or fuels; and in an area accessible for inspection. Stacking shall always allow access to at least one end of each roll. To prevent degradation or wetting of the materials, the protective wrapper on each GCL roll shall not be removed until the material is ready for deployment. Any damage to the wrapper during delivery shall be repaired to the satisfaction of Bechtel.

b. Identification tags attached to the rolls of GCL material delivered to the site shall not be removed until the material is installed. Each GCL roll or panel shall be identified with the following information:

1. Product type and/or name
2. Name of manufacturer
3. Manufacturing batch code
4. Manufacturing roll number
5. Dimensions of panel or roll (length and width)

c. GCL panels or rolls that are not clearly labeled shall be rejected for use on the Project until the labeling is corrected. The Contractor shall carefully inspect each roll or panel upon arrival at the site to ensure compliance with the labeling procedures. The Contractor shall also keep a record of the identification tags for each roll and panel. Any roll not properly identified prior to deployment activities may be rejected and deemed unacceptable for use by Bechtel, at the expense of the Contractor, until such information is provided/corrected.

2 EQUIPMENT AND MATERIALS

2.1 EQUIPMENT

The GCL shall be placed using suitable equipment that can pull and place the liner material over the area to receive the GCL, and as agreed upon between Contractor and Bechtel and approved by the GCL manufacturer. All equipment shall be decontaminated prior to arrival at the site, in good working condition, and suitable for its intended use.

2.2 MATERIALS

The GCL is a material consisting of a very thin layer of bentonite bonded to one or more geosynthetics and has a very low hydraulic conductivity that is suitable for use as a hydraulic barrier to restrict the penetration of water. At the option of the Contractor, the two types of GCL that can be used shall be either a Type I or a Type II material. The Type I material consists of a layer of bentonite mixture bonded to a High Density Polyethylene (HDPE) geomembrane backing on one side (see Table 1). The Type II material consists of a layer of bentonite bonded on both sides with a geotextile material.

2.2.1 The acceptable GCL materials shall meet all the requirements as specified herein.

2.2.2 The physical properties of the GCL shall be as specified in Tables 2 and 3.

Table 1
Physical Properties of HDPE Geomembrane
Used as GCL Backing Material for Type I GCL

Property	ASTM Test Method	Required Minimum Value[1]	Unit
Tensile strength @ yield	D 638	20	lb/in
Elongation @ yield	D 638	10	%
Puncture	D 4833	20	lb
Density	D 1505	0.94	g/cm^3

[1] Minimum average roll values.

Table 2
Mechanical and Hydraulic Properties
of Type I GCL

Property	ASTM Test Method	Required Minimum Value[2]	Unit
Bentonite density	D 5993[1]	0.75	lb/ft^2
Hydraulic conductivity: Overlapped Seam	D 5887	$5x10^{-11}$	m/sec (max.)
Hydraulic conductivity	D 5887	$4x10^{-14}$	m/sec (max.)

[1] At 0% adjusted moisture content.
[2] Minimum average roll values.

Table 3
Mechanical and Hydraulic Properties
of Type II GCL

Property	ASTM Test Method	Required Minimum Value[1]	Unit
Bentonite density	D 5993[2]	0.75	lb/ft^2
Grab tensile strength	D 4632	80	lb
Peel strength	D 4632	15	lb
Saturated hydraulic conductivity (Tested with water at 5 lb/in^2 effective stress and 2 lb/in head)	D 5084 or D 5887	$5x10^{-9}$	cm/sec (max.)

[1] Minimum average roll values.
[2] At 0% adjusted moisture content.

2.2.3 Raw Material Testing and Compliance

a. The active ingredient of all GCL materials shall be sodium bentonite. The bentonite shall exhibit a maximum fluid loss of 18 ml when tested in accordance with ASTM 5891 and a minimum swell index (free swell) of 24 ml / 2g when tested in accordance with ASTM D 5890. The GCL manufacturer shall conduct one of each of these tests on the sodium bentonite material used at a frequency of 100,000 pounds of bentonite used in GCL production.

b. The shipment container of the lot from which each test sample is collected shall be correlated to the GCL rolls produced. In addition, Certificates of Compliance shall be submitted by the bentonite suppliers to the GCL manufacturers certifying that the raw sodium bentonite satisfies the manufacturer's specifications. The GCL manufacturer shall collect and maintain these certificates for this Project. The Contractor shall submit certified reports presenting laboratory test results and copies of the Certificates of Compliance indicated above to Bechtel prior to installation of GCL material.

2.2.4 Conformance Testing

a. Geomembrane material used to form the backing layer of Type I GCL, if provided, shall be tested by the geomembrane manufacturer(s), prior to shipment to the GCL manufacturer, to ensure that the physical and mechanical properties of the material are in conformance with this

specification. The required material properties for the geomembrane backing material are presented in Table 1.

b. The Type I GCL itself, if provided, shall also be tested to verify that its weight and mechanical and hydraulic properties are in conformance with this specification. The required material properties for Type I GCL are presented in Table 2. The GCL shall be sampled and tested in conformance with the manufacturer's written quality assurance plan and in conformance with this specification. Bentonite density tests shall be performed one per every 40,000 ft^2 of GCL produced for this project. Hydraulic conductivity testing shall be performed a minimum of once weekly for the production line used to manufacture the GCL for this project, with the results of the last 20 tests being reported. In addition, one (1) coupon measuring 3 feet in length by the full roll width shall be collected by the Contractor for every 100,000 ft^2 of GCL produced shall be retained intact by the manufacturer until construction of the final cover system, for which the GCL is used, is complete. These coupons shall be submitted to Bechtel upon request. Conformance testing shall be performed on the GCL for the properties listed in Table 2.

c. The Type II GCL, if provided, shall be tested to ensure that the physical and mechanical properties of the material are in conformance with this specification. The required material properties for Type II GCL are presented in Table 3. Bentonite density and peal strength tests shall be performed one per every 40,000 ft^2 of GCL produced for this project. Grab tensile strength tests shall be performed one per every 200,000 ft^2 of GCL produced for this project. Hydraulic conductivity testing shall be performed a minimum of once weekly for the production line used to manufacture the GCL for this project, with the results of the last 20 tests being reported. In addition, one (1) coupon measuring 3 feet in length by the full roll width shall be collected by the Contractor for every 100,000 ft^2 of GCL delivered and shall be submitted to Bechtel. Conformance testing shall be performed on the GCL for the properties listed in Table 3.

d. If the average test values of any individual lot sampling unit (one roll of material) does not meet one or more specification values, the entire lot (total number of rolls to be deployed at the pond) shall be re-sampled and tested; the lot sampling unit that failed the initial testing will be rejected prior to resampling the lot. The entire lot will be rejected if all the lot sampling units fail the initial testing or if the average test values for any individual lot sampling unit from the re-sample do not meet one or more of the acceptable specification values.

2.2.5 Laboratory Testing

a. Unless otherwise indicated, the materials furnished by the Contractor shall be tested by the manufacturer or a certified independent geosynthetics testing laboratory and at the expense of the manufacturer or the Contractor.

2.2.6 Visual Inspection During Installation

a. During deployment of the GCL materials, the Contractor shall perform visual inspections of the material surfaces. Bechtel will also perform his own visual inspections in addition to those by the Contractor. Any faulty areas relating to material integrity, uniformity, rips or tears, seaming completeness, and seam overlap shall be repaired by the GCL Subcontractor using the more stringent of the techniques recommended by the manufacturer, pre-approved by Bechtel, or as specified in Section 3.2 of this specifications. Such repairs shall be reported to Bechtel by means of the Daily Quality Control (QC) log. At any point in the work, if the Daily QC log has not been submitted to Bechtel, Bechtel has the right to stop the GCL installation activities at the expense of the Contractor.

3 EXECUTION

3.1 SURFACE ACCEPTANCE BY INSTALLATION SUBCONTRACTOR

Prior to installation of the GCL, the Installation Subcontractor, with concurrence from Bechtel, shall verify the conditions of the installed material surface on which the GCL will be placed. He shall ensure that this surface provides stable support for the GCL and is free of all potentially harmful objects such as sticks, rocks, and sandbags. The Installation Subcontractor shall notify Bechtel, in writing, of acceptance of the prepared surface prior to installation of the GCL by completing, signing, and submitting the appropriate documentation to Bechtel. This acceptance shall be consistent with the requirements of the GCL manufacturer for the liner subgrade surface in order to preserve the warranty for the GCL. The surface on which the GCL is to be placed shall be maintained in a firm, clean, dry, and smooth condition during lining installation.

3.2 INSTALLATION PROCEDURE

a. The GCL panels shall be deployed and installed consistent with the most stringent of these specification, Bechtel-approved panel installation drawings or manufacturer's recommendations. The GCL shall not be placed during any precipitation, in the presence of excessive moisture, or

in the presence of excessive winds. The GCL shall be installed by the Contractor with personnel who are experienced in installation of such material. Bechtel's approval of the drawings does not relieve the Contractor of its responsibility to properly install the GCL material.

b. The Type I GCL, if provided, shall be handled and staged for installation with the geomembrane backing facing down (clay side up towards the Flexible Membrane Liner [FML]). If a Type II GCL is provided that has different weight geotextile on either side, then the side with the heavier geotextile shall be placed facing down. The GCL shall then be deployed in a generally downslope direction to provide for drainage, collection, and removal of precipitation away from the work area. Adjacent GCL panels shall be overlapped in accordance with manufacturer's recommendations.

c. GCL panels shall be of such lengths and widths and shall be placed in such a manner as to minimize seams. The overlying FML geomembrane material shall be placed over the GCL as soon as practical after placement of the GCL. Only those panels of GCL material that can be covered that same day with said material shall be unpacked and placed in position.

d. The GCL shall be dry when installed and covered. The Contractor shall have tarps and other materials available on-site for covering exposed GCL in the event that an unexpected rainfall event occurs. Any GCL material that becomes wet will be deemed unacceptable and rejected by Bechtel. The rejected material shall be removed off-site and replaced with acceptable material at the expense of the Contractor.

e. During times when wind is prevalent, GCL installation should start at the upwind side and proceed downwind. The leading edge of the GCL shall be secured by the Contractor at all times with sandbags or other means sufficient to hold it down during high winds.

f. The first and succeeding panels of GCL shall be adjusted to smooth out creases or irregularities in the panels. Once the first panel has been deployed, adjoining panels shall be laid with a minimum 6-inch overlap on each side, or a greater overlap if recommended by the manufacturer. End-of-roll seams shall be overlapped a minimum of 12 inches. All dirt shall be removed from the overlap area of the GCL panels. The GCL shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. The overlap shall conform to the contours of the panels laid with no gaps in between. Stretching of the GCL to fit required overlaps will not be allowed.

g. If required by the manufacturer for proper seaming, granular bentonite shall be dispersed evenly from the panel edge to the overlap limit at the

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

TECHNICAL SPECIFICATION
FLEXIBLE MEMBRANE LINER

PROFESSIONAL ENGINEER REGISTERED 7890 STATE OF IDAHO ROBERT NG

5-2-02

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REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR

ORIGIN BECHTEL SF-BEI	TECHNICAL SPECIFICATION FLEXIBLE MEMBRANE LINER POND FINAL COVER	JOB NO. 24230 SPECIFICATION NO. 15S-S-6 REV. 0 SHEET 1 OF 17

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1 GENERAL

This specification includes requirements for the manufacture, supply, delivery, testing, storage, and installation of the Flexible Membrane Liner (FML) within the final cover system. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

1.1 RELATED SPECIFICATIONS

The following specifications contain requirements that relate to this specification:

a. 15S-S-4 Earthwork and Grading

b. 15S-S-5 Geosynthetic Clay Liner

c. 15S-S-7 Geonet and Geotextile

d. 15S-S-8 Topsoil and Seeding

e. 15S-S-9 Temperature Monitoring Points (Wells)

1.2 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

d. Installation Subcontractor: The party who will be responsible for the actual installation of the FML, if other than the Contractor.

1.3 MATERIAL TESTING PROCEEDURES

Geosynthetic testing is evolving, should any of the test methods referenced in this specification become obsolete at the time of construction, more current test methods may be substituted at the discretion of Bechtel.

1.4 SUBMITTALS

The Contractor shall submit the following documents for Bechtel's approval and acceptance prior to mobilization of the FML installer unless otherwise noted.

a. FML placement method and plan per Section 3.3.1.a shall be submitted, including manpower, equipment, and a detailed description of field testing methods to be performed.

b. Certified reports presenting the results of the laboratory testing required by this specification shall be submitted to Bechtel for review and approval prior to delivery. The submittals shall clearly show the date the FML to be used for this project was manufactured. The Contractor must satisfy Bechtel that the material proposed meets every requirement of this specification.

c. Within 2 weeks after award of the Contract, the Contractor shall submit two (2) samples of the materials to Bechtel for review and approval.

d. The Contractor shall submit, within 2 weeks after award of the Contract, the manufacturer's recommended installation procedures for the placement and jointing of the FML material, including procedures for repair.

e. The Contractor shall provide Bechtel with Record (as-built) Drawings showing the limits of the installed FML material. The Record Drawings shall also indicate all factory and field seams, construction repairs, coupon test locations, repaired factory defects, patches, panel numbers with directions rolled, welds, and panel remnant locations. The Record Drawings shall also indicate the factory and field panel numbers from which coupons were taken prior to installation and the samples for manufacturing plant physical property testing, as required in Sections 2.1.3. The record drawings shall be submitted within 2 weeks of completion of geosynthetics placement.

f. The FML manufacturer's certification or written approval of the Installation Subcontractor, and the name and qualification of the manufacturer's representative shall be submitted to Bechtel 7 days prior to installation.

g. The manufacturer's Quality Assurance (QA) program and/or manual shall be submitted to Bechtel. The QA program or manual shall outline the factory and field quality control procedures to be used in the manufacture, installation, and field testing of these materials. This shall address, at a minimum, delivery and handling of raw materials, geomembrane sheet roll production, and Quality Assurance/Quality Control (QA/QC) of these

activities. It shall also address manufacturer's recommended installation and repair procedures with construction details for the installation of geomembrane, penetration and anchorage, including all necessary seaming equipment and accessories.

The requirements of this QA manual shall be considered minimum required standards and specifications for the manufacture, installation, and testing of the geomembrane; however, where the requirements of these specifications are more stringent than those of the QA manual, these specifications shall govern the construction. Where these specifications are of the less stringent standards, the requirements of the QA manual shall govern the construction.

h. Laboratory test results, certified by the testing laboratory, for the conformance tests required under Section 2.1.3 shall be submitted prior to installation of the geomembrane. These tests shall be performed on samples collected from geomembrane rolls to be used for this Project.

i. Shop drawings showing locations of proposed panel layout and associated field seams to cover the area as shown on the drawings. The panels shall be laid out for installation in such a way as to conform to the corresponding GCL panel layout, and the installation sequence and cover protection requirements as specified in Specification 15S-S-5. Shop drawings shall also indicate the direction the liner is folded or rolled, and shall show panel sizes consistent with the material quantity requirements as described herein. The panels shall also be laid out in such a manner as to minimize seams running parallel to the anchor trench, either inside or at the immediate vicinity of the trench.

j. Detailed sequence of installation.

k. Manufacturer's Warranty for the installed geomembrane.

l. Complete description of field-seaming procedures.

m. Manufacturer's nondestructive and destructive seams testing procedures shall be submitted. These procedures shall include type(s) of tests, list of equipment required, frequency of tests with locations, methods, qualifications of personnel that perform the tests, and acceptance/rejection criteria for tested seams.

n. Construction procedures for anchor trenches, including method of placement, equipment, and personnel. Details as required for a complete and sound installation shall also be included.

o. Contractor's Daily Quality Control (QC) log format to be used during geomembrane installation.

p. The Contractor shall submit written notification to Bechtel of the geomembrane field supervisor and welders' work experience relative to High Density Polyethylene (HDPE) geomembrane installation and welding. The installer's supervisor shall have been responsible for installing at least 250,000 ft^2 of HDPE geomembrane. Each welder is required to have a minimum of 1 year's experience welding HDPE geomembrane and the master welder shall have a minimum of 3 years' experience welding HDPE or similar geomembrane. No geomembrane welding shall begin until Bechtel has received the notifications and has approved the supervisor and individual welder qualifications.

1.5 DELIVERY, STORAGE, AND HANDLING

a. Each factory-fabricated panel, if any, shall be prominently and indelibly marked with the panel size. Panels shall be protected as necessary to prevent damage to the panel during shipment.

b. Identification tags attached to the rolls of FML material delivered to the site shall not be removed until the material is installed. Each FML roll or panel shall be identified with the following information:

1. Product type and/or name
2. Name of manufacturer
3. Manufacturing batch code
4. Manufacturing roll number
5. Panel number (if relevant)
6. Dimensions of panel or roll (length and width)

c. Materials shall be delivered to the site only after the required submittals have been furnished and approved. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be accomplished in such a manner as to prevent damage to any part of the materials. The Contractor shall provide labor and equipment to properly unload material upon arrival at the site.

Owner will provide an area near the site for storage of material. Storage shall be in the area provided and the Contractor is to take measures to store the materials in a manner reasonably free of dirt, dust, direct sunlight, extreme heat and disturbance.

The material shall be stored in a reasonably level area that is well-drained, away from oils/fuels, brush, debris, in an accessible area for inspection, and on a smooth surface so that the material is well-supported and not resting on sharp objects that could damage it. Stacking shall always allow access to at least one end of each roll. The protective covers used to wrap each roll of geomembrane, if used by the manufacturer, shall not be removed until immediately before the material is to be installed in the field.

2 MATERIALS

2.1 SHEET GEOMEMBRANE

a. The lining material shall be nominal 60 mil HDPE flexible geomembrane of uniform color, thickness, size, and surface texture. The finished sheet geomembrane shall be free from pinholes, blisters, and contaminants.

b. The lining material shall be manufactured from a composition of high-quality domestic virgin HDPE resin. Reprocessed or reground materials are not acceptable. The material's physical properties shall conform to Table 1.

c. Sufficient geomembrane panel material shall be fabricated and furnished to cover the area to be lined as shown on the drawings, including overlaps at field seams and perimeter anchorage. Two (2) percent shall be added to the area of each fabricated panel to allow for shrinkage and wrinkles.

2.1.1 Manufacturer Qualifications

The HDPE manufacturer shall be a specialist in the manufacturing of HDPE geomembrane and shall have produced and supplied at least 2 million ft^2 of said material that was used in successful applications.

2.1.2 Installer Qualifications

a. The HDPE Installation Subcontractor shall be experienced in all aspects of HDPE geomembrane handling, storage, and installation. The Installation Subcontractor shall have successfully installed at least 1 million ft^2 of HDPE geomembrane within the last 5 years.

b. The Installation Subcontractor shall employ a field installation supervisor experienced in the installation of HDPE geomembrane liner. The installation supervisor shall meet the requirements as specified in Section

1.4.p. The Installation Subcontractor shall be subject to the approval of Bechtel and authorized as a qualified installer by the liner manufacturer.

2.1.3 Material Testing

a. The HDPE geomembrane shall be tested in conformance with the manufacturer's testing procedures prior to shipment from the manufacturing plant to ensure that the physical and chemical properties (see Table 1) of the finished product are in conformance with these specifications.

In addition, conformance testing of geomembrane presented in Table 2 are also required. Acceptable test values for these tests shall be as indicated in Table 1. The FML shall be sampled and tested in conformance with the manufacturer's written quality assurance plan and in conformance with this specification. At a minimum, the test frequency shall be one (1) of each test for every 50,000 ft^2 of membrane produced for this project. The machine direction of each sample shall be clearly marked with indelible ink.

Within 2 weeks of award of Contract, the Installation Subcontractor shall also provide a certified statement (Certificate of Compliance) from the manufacturer that the geomembrane to be used meets the physical and chemical properties presented in Table 1. In addition, one coupon measuring 3 feet in length by the full width of the geomembrane roll per every 100,000 ft^2 of geomembrane produced shall be retained intact by the manufacturer until construction of the final cover system, for which the geomembrane is used, is complete. The machine direction of each sample shall be clearly marked in indelible ink. These coupons shall be submitted to Bechtel upon request.

b. Unless otherwise indicated, all field and laboratory testing of sheet geomembrane materials shall be performed by the manufacturer or an independent laboratory, approved by Bechtel, with materials furnished by and at the expense of the Contractor.

c. If the average test value of any individual lot sampling unit (one roll of material) does not meet one or more specification values, the entire lot (total number of rolls to be deployed at the pond) shall be re-sampled and tested; the lot sampling unit which failed the initial testing will be rejected prior to resampling the lot. The entire lot will be rejected if all the lot sampling units fail the initial testing or if the average test value for any individual lot sampling unit from the re-sample do not meet one or more of the acceptable specification values.

Table 1

Physical Properties of HDPE Geomembrane

Property	ASTM Test Method	Acceptable Test Results	Unit
Gauge (nominal)	D 5199	60	mils
Thickness	D 5199	54	mils (min)
Density	D 1505	0.935	g/cm^3
Elongation at break	D 638	500	%
Elongation at yield	D 638	12	%
Tensile strength at break	D 638	220	lb/in
Tensile strength at yield	D 638	120	lb/in
Tear resistance initiation	D 1004	40	lb
Carbon black content	D 1603 or D 4218	2 - 3	%
Carbon black dispersion	D 5596	Category 1 or 2	--
Puncture resistance	D4833	100	lb
Environmental stress crack	D 5397	200	hr (min)

Note: Above values are minimum average roll values (MARVs) unless otherwise noted.

Table 2

Conformance Testing Requirements for HDPE Geomembrane

Property	ASTM Test Method
Thickness	D 5199
Tensile properties	D 638
Tear resistance	D 1004
Puncture Resistance	D 4833
Density[1]	D 1505

[1] A minimum of one (1) density test shall be performed for each resin batch used.

3 EXECUTION

3.1 INSPECTION OF SHEET GEOMEMBRANE AT JOBSITE

a. The Contractor shall be responsible for the inspection of the geomembrane panels upon its arrival at the job site. Should panels show damage from transit, they shall be so identified by the Contractor and set aside for either return to the manufacturer or repaired in accordance with manufacturer's recommendations.

b. During unrolling of the geomembrane panels, the Contractor shall visually inspect the geomembrane sheet surface. Any faulty areas shall be repaired by the Contractor using the pre-approved techniques. Such repairs shall be recorded on the shop drawings (record) and reported to Bechtel by means of a Daily QC log per Section 3.5. At any point in the work, if the Daily QC log has not been submitted, Bechtel has the right to stop the geomembrane installation at the cost of the Contractor until the Daily QC log is submitted.

3.2 PROTECTION OF SURFACE TO RECEIVE FML

The geomembrane is to be installed over an installed Geosynthetic Clay Liner (GCL). Care shall be taken to ensure that the installed GCL is not damaged by the geomembrane installation. Vehicular traffic is not allowed on top of the installed GCL and FML liners. Equipment used to install and weld the geomembrane shall be subject to approval by Bechtel and GCL manufacturer, prior to the start of geomembrane installation. Geomembrane installation equipment shall also conform to the geomembrane manufacturer's requirements.

Any damages to the GCL during the installation of the geomembrane shall be repaired using GCL manufacturer-approved repair methods at the expense of the Contractor.

3.3 INSTALLATION

3.3.1 General

a. The limits of the HDPE geomembrane shall be as shown on the drawings. The geomembrane shall be laid out and installed in accordance with the most stringent of these specifications, applicable panel installation drawings approved by Bechtel or the manufacturer's recommendations. The geomembrane shall be installed by the geomembrane manufacturer or

manufacturer-approved installer. The installer shall take precautions that newly placed FML is not damaged during FML placement.

b. All geomembrane shall be installed in a generally downslope manner to minimize the potential of surface water flowing beneath the placed geomembrane. The geomembrane panels shall be placed to permit termination at the edge of the final cover within the perimeter anchor trenches as shown on the drawings. The anchorage geometry, backfill material, method of backfilling, and sequence shall be approved by Bechtel.

c. The geomembrane shall be installed in a relaxed condition and shall be free of tension or stress upon completion of the installation. Stretching of the geomembrane during installation will not be allowed.

d. A representative of the geomembrane's manufacturer shall be required to oversee portions of the installation. At a minimum, the representative shall observe and inspect installation procedures for QC conformance during the first day of membrane installation, during first seaming event, during the first day of geonet/geotextile installation, and during the first day of soil placement above the installed geosynthetic materials.

3.3.2 Field Panel Placement

The geomembrane placement shall be coordinated with the GCL placement activities. The geomembrane shall be installed in a sequence conforming to the cover protection requirements of the underlying GCL layer as specified in Specification 15S-S-5 and to the following requirements:

a. The geomembrane shall be placed over the installed GCL in such a manner as to ensure minimum handling. The geomembrane panels shall be of such lengths and widths and shall be placed in such a manner as to minimize field seaming. Only those panels of liner material that can be anchored and sealed together that same day shall be unpacked and placed in position.

b. Perimeter anchorage excavation and any preparation shall be completed before liner installation begins. All anchorages shall be prepared and maintained so as to preclude ponding of surface or subsurface water in trenches and to promote positive drainage away from anchorage locations.

c. Sandbags or rubber tires may be used as required to hold down the panels in position during installation. The Installation Subcontractor shall take all precautions as necessary to eliminate surface damage during installation.

Any and all damages to the geomembrane shall be repaired as specified in Section 3.3.2.h at the expense of the Contractor.

d. Field seaming shall only be performed when the sealed areas can be kept dry and in such a manner so as to prevent dust, dirt, or other foreign material from contaminating the seam. No field seaming will be allowed when the temperature measured within 6 inches of the liner surface is below 45 °F or above 100 °F unless otherwise approved by Bechtel. Seaming activities shall be coordinated with the GCL installation.

e. All seams shall be welded. Seams shall be overlapped at a minimum of 3 inches for extrusion welding and 4 inches for fusion welding, or a greater overlap if recommended by the manufacturer or warranted by field conditions. Welds shall be fusion-welded using an automatic double hot-wedge machine. Extrusion welds using a hand-held extrusion welder will only be used where needed for repairs or as approved by Bechtel. Welding devices shall have controls to regulate temperature to compensate for on-site conditions.

f. In addition to the qualification requirements set forth in Section 1.4.p, each welder shall be qualified by welding a test sample similar to the field weld to be used. A field peel test, which has a Film Tearing Bond (FTB) break, shall be performed to test the integrity of the sample weld and welding machine temperature settings. The trial weld shall be repeated, in its entirety, when any of the trial weld samples fail. When repeated trial welds fail, the welding apparatus and welder shall not be used for welding until the reason for the sample failure is identified and corrected.

   Welders must conduct a minimum of 6 feet of successful warm-up weld each day, checked by peel test, before commencing welding for the day. Each welder shall use only the specific welding equipment he was tested with for welding the geomembrane. Test strips or trial seams shall also be made twice per day or shift (for example, at the beginning of the work shift and after the lunch break). Trial seams shall also be made whenever personnel or equipment are changed, when climate conditions reflect wide changes in geomembrane temperature, or when other conditions occur that could affect seam quality.

g. Passage of construction equipment, other than that required for placement and welding of the geomembrane over exposed GCL and FML surface, is prohibited at any time during construction and after the liner has been placed.

h. Any tears, rips, or puncture of the liner during the installation shall be repaired by patching with a patch that extends at least 6 inches beyond

each edge of the defect (For example, if a 4-inch square hole requires patching, the patch must measure the size of the hole, plus 6 inches on every side, or 16 inches square.) and in accordance with the manufacturer's recommended procedure at the expense of the Contractor. Small tears (less than one inch long), pin holes, or other localized flaws may be spot welded. If Bechtel determines that patching of the damaged geomembrane becomes excessive, the entire roll will be rejected.

i. When installing the geomembrane, care shall be taken to minimize seam length. No more than three sheets may meet at any point unless special circumstances warrant and the approval of Bechtel is obtained in writing. Where more than three seams meet, the area shall be covered by a patch at least 4-foot square.

j. Seams, which run parallel to the anchor trench and are either inside or in immediate vicinity of the trench shall be minimized.

k. The deployed geomembrane shall not have excessive slack to the point where permanent creases fold over upon themselves, either during placement or seaming.

3.3.3 HDPE Boot Installation (Penetration)

Geomembrane penetrations shall be sealed with a HDPE boot installed in accordance with manufacturer's standard installation instructions. HDPE boots shall be prefabricated at the manufacturer's plant, all seams and boots shall be factory leak-tested, and the testing records shall be submitted to Bechtel for approval prior to delivery to the jobsite. HDPE boot shall be welded to the geomembrane in accordance with Section 3.3.2 and seal to the penetration with sealant and stainless steel clamp, unless otherwise shown on the Design Drawings.

3.4 TESTING AND QUALITY CONTROL

3.4.1 Non-destructive Seam Continuity Testing

a. All fusion joined seams shall be visually examined for voids or imperfect bonds.

b. The Contractor shall non-destructively test all field seams, including repair seams, over their full length using a vacuum test unit, air pressure (for double-fusion seams only), or other approved methods. Non-destructive testing shall be carried out as the seaming progresses and not at completion of all field seaming.

c. Vacuum Testing

The equipment shall, at a minimum, comprise the following:

- A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a gauge to indicate chamber vacuum.
- A steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections.
- A rubber pressure/vacuum hose with fittings and connections.

Vacuum testing shall consist of placing the vacuum box assembly over the liner seam. The suction chamber shall be connected to the vacuum pump. A foaming agent shall be applied to the seam area under test to indicate possible leaks. The seam shall be maintained under 5 psig suction for a minimum of 10 seconds. All areas where soap bubbles appear shall be marked. The test areas shall have a minimum 3-inch overlap from the previous section.

Defective seams found during the testing shall be repaired and retested. Such tests and adjustments shall be repeated until the seam is leak-free, and in the opinion of Bechtel, the repairs are satisfactory and complete. All repairs shall be made by and at the Contractor's expense.

d. Air Pressure Testing (for double seam with an enclosed space)

The equipment shall consist of the following:

- An air pump (manual or motor driven) equipped with pressure gauge capable of generating and sustaining pressure over 35 psi and mounted on a cushion to protect the liner.
- A rubber hose with fittings and connections.
- A sharp hollow needle or other approved pressure feed device.
- A pressure gauge with an accuracy of 1 psi.

The test procedure shall consist of the following steps:

- Seal both ends of the seam to be tested.
- Insert needle or other approved pressure feed device into the channel created by the double-wedge weld.

- Energize the air pump to a minimum pressure of 30 psi or 1/2 psi per mil of liner thickness, whichever is greater; close valve and sustain pressure for at least 5 minutes.

- If pressure loss exceeds 3 psi or does not stabilize, locate faulty area and repair as described in these specifications.

- Puncture opposite end of seam to release air. If blockage is present, locate and test seam on both sides of blockage.

- Remove needle or other approved pressure feed device and seal penetration holes by extrusion welding.

3.4.2 Destructive Testing

a. Random weld samples, selected by Bechtel, shall be removed from the installed welded sheeting at a frequency of one test location per 500 feet of seam length or as directed by Bechtel, whichever results in more test sample locations. The sampled locations shall be repaired in accordance with Section 3.3.2.h. Seam samples shall be tested by an independent testing laboratory at the Contractor's expense. The laboratory shall provide certified test results to the Contractor and Bechtel. The samples shall be tested in shear and peel in accordance with ASTM D 4437. For each sample, a minimum of four out of each five tested specimens shall meet the following requirements:

- Bonded Seam Strength (Shear): equal to or greater than 208 lb/in

- Peal adhesion: equal to or greater than 84 lb/in

- All peal adhesion specimen break types shall be the "FTB" classification, which is defined as the break occurring in the polymer material (parent material), not in the weld.

The Contractor shall repair all areas damaged by sampling immediately after the sample is taken at no additional expense to Bechtel.

b. If a seam fails to meet the requirements of Section 3.4.2.a, additional tests shall be taken 10 feet from each end of the original test location. This procedure will continue until samples from both ends pass. The weld between the acceptable samples shall be considered defective and repaired by capping the weld with a minimum 18-inch wide cap.

c. All samples shall be numbered and marked with permanent identification, including the machine direction. The reason for taking the sample shall

also be indicated (such as statistical routine, suspicious feature, change in sheet temperature, etc.).

3.5 DAILY QUALITY CONTROL LOG

a. The Contractor shall maintain a Daily QC log during all phases of the geomembrane installation. This log shall document the daily progression of the geomembrane installation from the delivery of the material to final acceptance. The log shall designate those construction activities that influence the integrity of the geomembrane during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

- Weather: temperature, winds, and precipitation.
- Preparation activities, including removal of water and sediment, geomembrane cleaning, or underlying GCL repair.
- Repairs and replacements.
- Seaming activities, including name of welder(s) for each seam and any leakage detected in testing of that seam.
- HDPE boot installation (penetration).
- Results and locations of destructive testing performed as part of geomembrane installation, including corrective action taken.
- Results and locations of non-destructive testing performed as part of geomembrane installation, including corrective action taken.
- Equipment used to place and weld the geomembrane.
- Inspection and backfilling of anchor trench.
- Calibration dates of each piece of seaming equipment and seam test equipment.
- Names of all personnel conducting work at the site.
- Names, dates, and times for when the job site is visited by regulatory personnel, subcontractors or vendors, and the FMC Idaho, LLC personnel.

- Photographs of geomembrane installation, seaming, and field testing.
- Deviations from the Construction Quality Assurance Plan, drawings and specifications.

b. Prior to performing the work, the Contractor shall submit the Daily QC log format for approval by Bechtel.

3.6 INSPECTION

Bechtel will be present during the entire geomembrane material installation. Bechtel will also inspect the geomembrane material as it is placed. The Contractor shall provide access and support, as needed, for the inspection of the geomembrane material.

Inspection by Bechtel does not imply acceptance until all the requirements of this specification are met.

3.7 CLEANUP

At the end of the work, all temporary working areas shall be restored to their original conditions with all temporary construction materials removed and the site cleaned.

recommended minimum rate and continuously along all seams and overlap areas. Granular bentonite shall be the same as that used to manufacture the GCL.

h. In hot weather, expansion of the Type I GCLs may occur soon after placement when no FML geomembrane material has yet been placed. In order to account for the possibility of shrinkage after covering with said geomembrane under these conditions, the longitudinal seam overlap shall be increased as required and approved by Bechtel.

i. Irregular shapes, cuts, or tears in installed GCL material shall be covered with sufficient GCL to provide a 12-inch overlap on all adjoining GCL panels, or a greater overlap if recommended by the manufacturer.

j. A representative of the GCL's manufacturer shall be provided by the installer to observe and inspect installation procedures for QC conformance during the first day of liner placement. If necessary, the GCL manufacturer's representative shall remain on-site at no additional cost to Owner/Bechtel, until, in the opinion of the representative, the installation procedures complies with the manufacturer's QC standards.

3.3 DAILY QUALITY CONTROL LOG

a. The Contractor shall maintain a Daily QC log during all phases of GCL installation. This log shall document the daily progression of the GCL installation from the delivery of the GCL to final acceptance. The log shall designate those construction activities that influence the integrity of the GCL during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

- Weather: temperature, winds, and precipitation.
- Preparation activities, including removal of water, sediment, GCL cleaning, or underlying support/bedding layer smoothing and repair.
- Repairs and replacements.
- Seaming activities.
- Equipment used to place the GCL.
- Inspection and backfilling of anchor trench.
- Photographs of GCL installation.

- Names of all personnel conducting work at the site.

- Names, dates, and times for when the jobsite is visited by regulatory personnel, subcontractors or vendors, and the FMC Idaho, LLC personnel.

- Deviations from the Construction Quality Assurance Plan, drawings and specifications.

b. Prior to performing the work, the Contractor shall submit the Daily QC log format for approval by Bechtel.

3.4 INSPECTION

Bechtel will be present during the entire GCL material installation. Bechtel will also inspect the GCL material as it is placed. The Contractor shall provide access and support, as needed, for the inspection of the GCL material.

Inspection by Bechtel does not imply acceptance until all the requirements of this specification are met.

3.5 CLEANUP

At the end of the work, all temporary working areas shall be restored to their original conditions with all temporary construction materials removed and the site cleaned.

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

TECHNICAL SPECIFICATION
GEONET AND GEOTEXTILE

PROFESSIONAL ENGINEER
REGISTERED
7890
STATE OF IDAHO
ROBERT NG

5-2-02

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REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR

ORIGIN BECHTEL SF-BEI	**TECHNICAL SPECIFICATION GEONET AND GEOTEXTILE POND FINAL COVER**	**JOB NO. 24230** **SPECIFICATION NO. 15S-S-7 REV. 0** **SHEET 1 OF 11**

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1 GENERAL

This specification includes requirements for the manufacture, supply, delivery, testing, storage, and installation of geonet and geotextile within the final cover system. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

1.1 RELATED SPECIFICATIONS

The following specifications contain requirements that relate to this specification:

a. 15S-S-4 Earthwork and Grading

b. 15S-S-5 Geosynthetic Clay Liner

c. 15S-S-6 Flexible Membrane Liner

d. 15S-S-8 Topsoil and Seeding

e. 15S-S-9 Temperature Monitoring Points

1.2 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

1.3 MATERIAL TESTING PROCEEDURES

Geosynthetic testing is evolving, should any of the test methods referenced in this specification become obsolete at the time of construction, more current test methods may be substituted at the discretion of Bechtel.

1.4 SUBMITTALS

The Contractor shall submit the following documents for Contractor's approval and acceptance prior to mobilization of geonet and geotextile installer unless otherwise noted:

a. Geonet and geotextile placement method and plan, including jointing of the materials shall be submitted.

b. Certified test reports presenting the results of the laboratory testing required by this specification shall be submitted to Bechtel for review and approval prior to the time the material is shipped. The submittals shall clearly show the date the material to be used for this project was manufactured. The Contractor must satisfy Bechtel that the material proposed meets every requirement of this specification.

c. Within 2 weeks after award of the Contract, the Contractor shall submit samples of the materials to Bechtel for review and approval.

d. The Contractor shall submit, within 2 weeks after award of the Contract, the manufacturer's recommended installation procedures for the placement and jointing requirements of the geonet and geotextile material, including procedures for repair.

e. The Contractor shall provide Bechtel with Record (as-built) Drawings showing the limits of the installed geonet and geotextile material. The Record Drawings shall also indicate the corresponding panel and roll numbers, and where geotextile samples were taken for plant and field testing. The record drawings shall be submitted within 2 weeks of completion of geosynthetics placement.

f. Any sewing of the geotextile shall be performed by trained personnel of the Contractor or his subcontractors; the geotextile installer must be approved by Bechtel. Any sewing must (1) use a thread type that is polymeric with chemical and ultraviolet light resistance properties equal to or greater than that of the geotextile itself, (2) use locking stitch, (3) use sewing thread color that contrasts with the color of geotextile being sewn, to allow ease of inspection, and (4) include a continuous seam. The Contractor may also be requested to submit training or experience records of the installer personnel for approval.

1.5 DELIVERY, STORAGE, AND HANDLING

a. Material shall be delivered to the site only after Bechtel has approved the required submittals. Storage and handling of the materials shall conform to the manufacturer's recommendations and shall be accomplished in such a manner as to prevent damage to any part of the material. The Contractor shall provide labor and equipment to properly unload material upon arrival at the site. Owner will provide an area near the site for storage of material. The material shall be stored in a reasonably level, smooth, and well-drained area that is away from sharp objects or rocks which may puncture or otherwise damage the material; away from brush, oil, grease, or fuels;

and in an accessible area for inspection. Stacking shall always allow access to at least one end of each roll.

To prevent ultraviolet degradation of the material, the protective wrapper on each geotextile roll shall not be removed until the material is ready for use. Any rolls that are delivered without protective wrappers shall be rejected by Bechtel at the expense of the Contractor. Any rolls of geotextile that will not be installed within 14 days following delivery to the site shall be covered with tarps to protect the rolls from the elements.

2 MATERIALS

Geonet and geotextile shall meet all the requirements as specified herein, but may be supplied as a geocomposite or separate individual materials.

2.1 GEONET

2.1.1 The physical properties of the geonet shall be as specified in Table 1.

Table 1

Mechanical and Hydraulic Properties of Geonet

Property	ASTM Test Method	Required Minimum Value[1]	Unit
Specific gravity	D 1505	0.94	g/cm^3
Carbon black content	D 1603 or D 4218	2	%
Transmissivity (1.0 gradient at 15,000 psf (min) compressive load)	D 4716	0.001	m^2/sec
Tensile strength (machine direction)	D 5035	25	lb/in

[1] Minimum average roll values (MARV).

2.1.2 Manufacturer Qualifications

The geonet manufacturer(s) shall be specialist(s) in the manufacturing of polyethylene geonet and shall have produced and manufactured a minimum of 1 million ft^2 of said geonet that was used in successful installations.

2.1.3 Conformance Testing

a. Geonet shall be tested by the manufacturer prior to shipment to ensure that the physical and mechanical properties of the finished product are in accordance with these specifications. The required material properties, test methods, values, and units are presented in Table 1. The geonet shall be sampled and tested in conformance with the manufacturer's written quality assurance plan and in conformance with this specification. At a minimum, conformance tests shall be performed one per every 200,000 ft^2 of geonet produced. In addition, one coupon 3 feet in length by the width of the entire geonet roll for every 200,000 ft^2 of geonet produced shall be retained by the manufacturer until construction of the final cap is complete. These coupons shall be submitted to Bechtel upon request.

b. Unless otherwise indicated, material testing shall be performed by the manufacturer or an approved independent geosynthetics testing laboratory; the materials shall be furnished by and at the expense of the Contractor.

c. If the average test values of any individual lot sampling unit (one roll of material) do not meet one or more specification values, the entire lot (total number of rolls to be deployed at the pond) shall be re-sampled and tested; the lot sampling unit that failed the initial testing will be rejected prior to resampling the lot. The entire lot will be rejected if all the lot sampling units fail the initial testing or if the average test values for any individual lot sampling unit from the re-sample do not meet one or more of the acceptable specification values.

2.1.4 Laboratory Testing

Unless otherwise indicated, testing shall be performed by the manufacturer or an approved independent geosynthetics testing laboratory with materials furnished by the Contractor and at the expense of the Contractor.

2.1.5 Visual Inspection During Installation

During deployment of the geonet, the Contractor shall perform visual inspections of the material surfaces. Bechtel will also perform its own visual inspections in addition to those by the Contractor. Any faulty areas relating to material integrity, uniformity, and seam overlap shall be repaired by the Contractor using techniques

recommended by the manufacturer, pre-approved by Bechtel, and included in these specifications, whichever is the more stringent. Such repairs shall be reported to Bechtel by means of the Daily Quality Control (QC) log. At any point in the work, if the Daily QC log has not been submitted to Bechtel, Bechtel has the right to stop the geonet installation activities at the expense of the Contractor.

2.2 GEOTEXTILE

Nonwoven, needle-punched geotextile shall be provided to meet the minimum physical and mechanical properties outlined in Table 2 and as designated on the drawings. The properties shown represent the minimum average roll values (MARVs) for the installed materials, unless otherwise indicated.

Table 2

Physical and Mechanical Properties of Geotextile

Property	Test Method	Required Minimum Value[1]	Unit
Unit weight	ASTM D 5261	(6[2])	oz/yd^2
Puncture strength	ASTM D 4833	95	lbs
Grab strength (MD)	ASTM D 4632	150	lbs
Grab elongation	ASTM D 4632	50	%
Trapezoidal tear strength	ASTM D 4533	60	lb
Mullen Burst strength	ASTM D 3786	325	psi
UV Resistance[3] (@ 500 Hours)	ASTM D 4355	70	% strength retained
Apparent opening size	ASTM D 4751	0.212	mm (max)
Permittivity	ASTM D 4491	1.3	sec^{-1}

[1] Minimum average roll values (MARVs).
[2] For information only; not a required property.
[3] Manufacturer's certification required which states product exceeds required value for typical roll values.

2.2.1 Manufacturer Qualifications

The geotextile manufacturer(s) shall be specialist(s) in the manufacturing of polyester, polyethylene, and/or polypropylene geotextile (as applicable). In addition, the manufacturer shall have produced and manufactured a minimum of 5 million ft^2 of said geotextiles that were used in successful installations.

2.2.2 Conformance Testing

a. The geotextile shall be tested by the manufacturer prior to shipment to ensure that the physical and mechanical properties of the finished product are in accordance with these specifications. The required material properties, test methods, values, and units are presented in Table 2. The geotextile shall be sampled and tested in conformance with the manufacturer's written quality assurance plan and in conformance with this specification. At a minimum, conformance tests shall be performed one per every 100,000 ft^2 of geotextile produced. In addition, one coupon 3 feet in length by the entire width of geotextile roll for every 100,000 ft^2 of geotextile produced shall be retained by the manufacturer until construction of the final cap is complete. These coupons shall be submitted to Bechtel upon request.

b. Unless otherwise indicated, material testing shall be performed by the manufacturer or an approved independent geosynthetics testing laboratory; *the materials shall be furnished by and at the expense of the Contractor.*

c. If the average test values of any individual lot sampling unit (one roll of material) does not meet one or more specification values, the entire lot (total number of rolls to be deployed at the pond) shall be re-sampled and tested; the lot sampling unit which failed the initial testing will be rejected prior to resampling the lot. The entire lot will be rejected if all the lot sampling units fail the initial testing or if the average test values for any individual lot sampling unit from the re-sample do not meet one or more of the acceptable specification values.

2.2.3 Laboratory Testing

Unless otherwise indicated, testing shall be performed by the manufacturer or an approved independent geosynthetics testing laboratory with materials furnished by and at the expense of the Contractor.

2.2.4 Visual Inspection During Installation

During deployment of the geotextile, the Contractor shall carry out visual inspections of the material surfaces. Bechtel will also perform its own visual inspections in addition to those by the Contractor. Any faulty areas relating to material integrity, uniformity, rips or tears, and seam overlap shall be repaired by the Contractor using techniques as recommended by the manufacturer, pre-approved by Bechtel, and included in these specifications, whichever is the more stringent. Such repairs shall be reported to Bechtel by means of the Daily QC log. At any point in the work, if the Daily QC log has not been submitted to Bechtel, Bechtel has the right to stop the geotextile installation activities at the expense of the Contractor.

3 EXECUTION

3.1 GEONET INSTALLATION

a. The geonet shall terminate in a perimeter anchor trench at the locations shown on the drawings and in accordance with manufacturer's recommended details.

b. Panels (rolls or roll segments) shall be overlapped 6 inches minimum and joined using electrical plastic cable ties at an average frequency of one every 6 feet on center along the length of the panel. End-to-end joining of panels on slopes shall be minimized, but when necessary, the panels shall be joined by using plastic cable ties at a frequency of one every 12 inches on center.

c. The geonet shall not be attached to the geomembrane.

d. Care shall be taken during installation of the geonet to avoid damage or disturbance of the underlying geosynthetic layers.

e. Any material placed on top of the geonet shall be done in such a manner so as not to damage the geonet or any underlying materials.

f. Trimming of geonet shall be performed using only upward-cutting hook blades.

3.2 GEOTEXTILE PLACEMENT

a. Geotextile shall be placed at the locations and to the limits shown on the drawings. The geotextile are to be jointed by overlapping the panels with a minimum of 18 inches or sewn with a minimum overlap of 4 inches. Cross-slope joints shall be avoided as much as possible. Geotextile shall

be laid out in such a way that the panels are perpendicular to the underlying Geosynthetic Clay Liner (GCL) panels.

b. Care shall be taken during installation of the geotextile to avoid damage or disturbance of the underlying geosynthetic layers.

c. A minimum of 12 inches of the sand filter material shall be placed, immediately above the geotextile, in accordance with Specification 15S-S-4, Section 3.4.3, to protect the underlying geosynthetic layers from subsequent construction activities. The material shall be spread in the same direction as the fabric is joined and perpendicular to the GCL seams.

d. During periods of high winds, sandbags or other methods approved by the manufacturer(s) shall be used by the Contractor to temporarily secure any exposed geotextile in place.

e. During placement, care must be taken not to entrap, either within or beneath geonet and geotextile, potentially harmful materials (stones, dirt, water, etc.) that could damage the geomembrane, clog the drains or filters, or hamper subsequent seaming. Once deployed, a visual examination shall be performed to ensure the surface of the geotextile is free of potentially harmful materials.

f. Trimming of geotextile shall be performed using only upward-cutting hook blades.

3.3 COVERING GEOTEXTILES

a. All geotextile shall be covered by sand filter material within 14 calendar days, following removal of their protective wrapping and their placement in the field, to protect them from ultraviolet degradation. The Contractor shall stage construction activities to accomplish this schedule. Any geotextile left exposed longer than the 14 calendar days shall, at Bechtel's direction, be removed and replaced at the expense of the Contractor.

3.4 DAILY QUALITY CONTROL LOG

a. The Contractor shall maintain a Daily QC log during all phases of geonet and geotextile installations. This log shall document the daily progression of the installations from the delivery of the materials to final acceptance. The log shall designate those construction activities that influence the integrity of the materials during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

- Weather: temperature, winds, and precipitation.
- Preparation activities, including removal of water, or sediment.
- Repairs and replacements.
- Equipment used to place the geonet and geotextile.
- Inspection and backfilling of anchor trench.
- Names of all personnel conducting work at the site.
- Names, dates, and times for when the jobsite is visited by regulatory personnel, subcontractors or vendors, and the FMC Idaho, LLC personnel.
- Deviations from the Construction Quality Assurance Plan, drawings and specifications.

b. Prior to performing the work, the Contractor shall submit the Daily QC log format for approval by Bechtel.

3.5 INSPECTION

Bechtel will be present during the entire geonet and geotextile installations. Bechtel will also inspect the materials as they are placed. The Contractor shall provide access and support, as needed, for the inspection of the geonet and geotextile materials.

Inspection by Bechtel does not imply acceptance until all the requirements of this specification are met.

3.6 CLEANUP

At the end of the work, all temporary working areas shall be restored to their original conditions with all temporary construction materials removed and the site cleaned.

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

TECHNICAL SPECIFICATION
TOPSOIL AND SEEDING

PROFESSIONAL ENGINEER
REGISTERED
7890
STATE OF IDAHO
ROBERT NG

5-2-02

REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR
0	5/2/02	ISSUED FOR CONSTRUCTION			

ORIGIN

SF-BEI

TECHNICAL SPECIFICATION
TOPSOIL AND SEEDING FOR
POND FINAL COVER

JOB NO. 24230

SPECIFICATION NO.
15S-S-8
REV. 0

SHEET 1 OF 13

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1 GENERAL

This specification describes the requirements for furnishing and placement of topsoil and completing the seeding of a final cover over an existing pond at FMC Idaho, LLC's plant in Pocatello, Idaho. Seed will be placed by the drill seeding method. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

1.1 RELATED SPECIFICATIONS

The following specification contains requirements that relate to this specification:

a. 15S-S-4 Earthwork and Grading

b. 15S-S-9 Temperature Monitoring Points (Wells)

1.2 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

1.3 SUBMITTALS

The Contractor shall submit the following documents for Bechtel's approval and acceptance prior to mobilization:

a. Details of all supplied products (i.e., imported topsoil, fertilizer, seed, seed mix, supplemental organic matter, straw, including name of supplier).

b. Sample of all supplied materials including imported topsoil, if applicable.

c. Analytical data of the proposed topsoil from an agricultural soils laboratory.

d. Certificates bearing the manufacturer's guaranteed analysis and physical or chemical make-up of the materials.

1.4 STORAGE AND HANDLING

a. Topsoil shall be stored on site in area designated by Bechtel prior to spreading.

b. Fertilizer and lime (if required) shall not be stored with any other landscape materials.

c. On-Site storage of materials shall be only in areas designated or as approved by Bechtel.

d. The seed containers and containers of all products to be used in this operation shall be stored immediately in a dry, weather- and damp-proof structure. Any seed or product, which has become wet, moldy, or is otherwise damaged in transit or storage will not be acceptable.

1.5 PERSONNEL

Seeding shall be performed by personnel familiar with procedures required of their trade and shall be supervised by a qualified foreman.

1.6 SEQUENCE OF WORK/SCHEDULE

Seeding shall not begin until Contractor receives approval to proceed from Bechtel. Contractor shall be responsible for scheduling the work and obtaining the necessary approvals. Seeding shall be performed only at either of the following periods and the surfaces to be seeded shall be protected until vegetation is established as specified in Subsection 3.1:

a. Late Fall: Prior to initial snow fall, when day time temperatures do not rise above 40°F; this could cause seed germination prior to the onset of winter.

b. Spring: When ground snow has melted and prior to the conclusion of spring rains that are needed for germination.

1.7 QUALITY

All work shall be of the highest quality and shall be subject to the approval of Bechtel. Any work that does not meet the requirements of this specification and the approval of Bechtel shall be removed by the Contractor immediately and replaced with work that is acceptable. Removal of defective work and replacement will be at the expense of the Contractor.

2 EQUIPMENT AND MATERIALS

2.1 EQUIPMENT

Conventional earth-moving and seeding equipment shall be used for the construction of the topsoil layer over the final cover. All equipment shall be decontaminated prior to arrival at the site, in good working condition, and suitable for its intended use.

Soil stabilization(pulverizing) equipment may be required to sufficiently break up frozen or over-compacted topsoil to ensure proper mixing of soil additives and performance of seeding operations.

2.2 MATERIALS

2.2.1 General

All materials shall be of standard, approved first-grade quality and shall be in prime condition when installed and accepted. Any commercially processed or packaged materials shall be delivered to the site in the original unopened containers bearing the manufacturer's guaranteed analysis and dealer's label.

2.2.2 Topsoil

a. General Qualifications

Composition - Use only locally obtained fertile, friable, well-drained soil, of uniform quality. The soil shall be free of stones over 1-inch diameter, sticks, oils, chemicals, plaster, concrete and other materials deleterious for the purposes of a planting medium. Some, or all, of the topsoil material may be furnished by the Owner. It is the responsibility of the Contractor to verify and ensure that all requirements of these specifications are satisfied, including all testing and amendment additives and mixing as specified herein.

b. Testing

- Parasites - Test all soils that have been used for agricultural purposes within the prior 12 months for parasitic nematodes. Soils shall be acceptable if the parasitic nematode population is less than 200 per 50 cubic centimeters of soil. Do not artificially dry soil prior to testing.

- Herbicide - Perform a radish/ryegrass growth trial as directed by Bechtel if herbicide contamination is suspected.

c. Areas to receive topsoil shall be as shown on the design drawings.

d. Topsoil: The Contractor shall perform tests and analysis as required to ensure Owner or Contractor furnished topsoil meets the standards specified under Section 2.2.2.a., including the following:

- Analysis - Obtain an agricultural suitability analysis of the proposed topsoil for each soil source from a State of Idaho (or equivalent) certified soils laboratory at Contractor's cost. This analysis is to include recommended amendments as required to support the growth of the plants specified in the seed mix.

- Acceptance - Submit soils analysis and recommendations to Bechtel for acceptance. Amend topsoil per accepted soils analysis report.

- Samples - Bechtel reserves the right to take samples of the topsoil delivered to the site for testing to verify conformance to the specifications.

- Pea Gravel - Clean, durable natural stone or rock with 100% passing the 3/8-inch sieve and 98% retained on the #10 sieve.

- Rejected Topsoil - Immediately remove rejected topsoil off the site at Contractor's expense.

2.2.3 Seed

a. Seed mixture shall be noxious-weed free, with the percent of purity and germination rate as specified in 2.2.3.b. All seed shall be re-cleaned Grade A "new crop" seed. The dealer may mix the seed provided a guaranteed statement of composition of moisture and percentages of purity and germination of each variety is attached to the sealed container. If the germination rates of any of the dealer's seeds are less than the rates specified in Table 1, then the weight per acre of those seeds shall be increased such that the specified rate of viable seed is provided.

b. Seed mix to be as specified in Table 1, supplied by S & S Seeds, 5690 Casitas Pass Road, Carpenteria, CA 94553-2205 (phone no. 805-684-0436, FAX no. 805- 684-2798) or approved equal. The seed mix was developed based on local climatic conditions in conjunction with past experiences of vegetation at the site locality and predominately consists of vegetation native to the area.

c. Application rate of seed mix: 46.5 pounds per acre.

Table 1

Seed	Lb/acre	% of Mix	Min. Pure/Germ
Indian Ricegrass	4	8.6	98/85
Rubber Rabbitbrush	4	8.6	10/65
Covar Sheeps Fescue	10	21.5	98/85
Great Basin Sagebrush	3	6.5	25/50
Sand Dropseed	2	4.3	90/75
Needle and Thread Grass	1	2.1	60/50
Lewis Blue Flax	1	2.1	98/70
Desert Globemallow	0.5	1.1	98/50
Sulfur Buckwheat	0.5	1.1	25/25
California Poppy	0.5	1.1	98/80
Wheat Hybrid	20	43.0	90/80
Totals	46.5	100	

2.2.4 Fertilizer

The type and quantity of fertilizer shall be determined from the specified agricultural suitability analysis.

2.2.5 Supplemental Organic Matter

a. Supplemental organic matter, if required by the agricultural suitability analysis, shall consist of approved compost, peat, or equivalent. Alternative mulches will be considered for approval by Bechtel.

b. Supplemental organic matter shall be certified to be free of noxious weeds.

c. Weight specifications of this material from suppliers and for all applications shall refer only to air dry weight of the organic material. A minimum of four representative samples of the proposed material shall be collected and submitted to a qualified laboratory for determination of the percentage of organic material. The application rate of the proposed material shall be increased to reflect the average non-organic portion.

d. The need for and application rate of supplemental organic matter shall be determined from the specified agricultural suitability analysis. For bidding purposes only, the application rate shall be assumed to be 15 tons of organic matter per acre.

e. The proposed material shall be tested by a qualified laboratory to determine the quantity of available Nitrogen and Phosphorus on a per-acre basis. The amount of Nitrogen or Phosphorus in the fertilizer required by subsection 2.2.4 shall be reduced by one pound per acre for each four pounds per acre of available Nitrogen or Phosphorus, respectively, in the proposed organic material. If the amount of available Nitrogen in the proposed organic material is more than four times the rate required by subsection 2.2.4, then that material shall be considered unacceptable.

2.2.6 Straw

a. The straw to be crimped to the finished surface shall be certified to be free of noxious weeds.

b. Application rate: 2 tons per acre.

3 EXECUTION

3.1 GENERAL

Prior to any application of topsoil, Contractor shall obtain approval of Bechtel for the completed underlying soil layer. Similarly, prior to any seeding, Contractor shall ensure that all finish grading in the area to be seeded has been completed and approved by Bechtel.

The area to be seeded is that shown on the drawings to receive topsoil and any grass area disturbed during construction and as directed by Bechtel. All topsoil and disturbed grass areas are to be protected by application of erosion control materials.

3.2 TOPSOIL SPREADING

3.2.1 Spreading of Topsoil

a. Verification: Do not commence spreading of topsoil prior to acceptance by Bechtel of underlying soil layer.

b. Topsoil Depth: Minimum depth of 42 inches after natural settlement and light rolling. Topsoil is to be placed in 12-inch maximum loose lifts. Pea gravel and any required supplemental organic material are to be incorporated into the top 12 inches of topsoil. The pea gravel material shall be added to the topsoil with a pug mill or other method as approved by Bechtel. The amount of pea gravel shall be 15 ± 3% by weight of the

topsoil mix. If pug mill is chosen, the pug mill and mixing process shall conform to the following requirements:

- Each material shall be measured by weighing. The weighing of each material shall be a distinct operation.
- A metering device shall measure and control any added water.
- Material retention time within the pug mill box shall be sufficient to assure a uniform mix.

c. Placement: Do not place topsoil under muddy conditions.

d. Topsoil Testing: Tests for the following specified in-place topsoil properties shall be conducted by an authorized independent test laboratory at no extra cost to Owner. Each test shall be conducted at a frequency of one for every 5,000 cubic yards of topsoil placed but not less than one per lift of material placed.

Soil Property	Test
Capillary-Moisture relationship	ASTM D 3152
Saturated Hydraulic Conductivity	ASTM D 5084

Bechtel will evaluate the test results and determine the acceptability of the topsoil based on the following:

Soil Property	Acceptable Value
Saturated Hydraulic Conductivity per ASTM D 5084	$< 9.35 \times 10^{-4}$ cm/s
Relative Hydraulic Conductivity vs. Degree of Saturation curve based on Van Genuchten Parameters derived from the Capillary-Moisture relationship per ASTM D 3152	Below curve plotted in Figure 1

The topsoil layer shall be modified by the addition of suitable topsoil to a thickness hydraulically equivalent to that of a topsoil layer meeting the above requirements should the in-place topsoil not satisfy the above requirements as directed by Bechtel. The cost for additional topsoil and re-testing will be paid as extras.

3.2.2 Amending of Topsoil

Amending of imported topsoil shall be determined from the specified agricultural suitability analysis. The following additives may or may not be required. The application rates shown are to be used for the add and deduct unit price for bidding purposes only and should not be included in the total bid price:

Application - Incorporate per acre

30 cubic yards	Nitrogen - Treated Sawdust
100 pounds	30-30-0 (N-P-K) Commercial Fertilizer, slow release
1,000 pounds	Dolomite Lime

Spread amendments on the previously placed topsoil by approved methods and thoroughly mix to a depth of three inches or as recommended by the agricultural suitability analysis.

3.3 DRILL SEEDING

The seed shall be drilled to a depth of ¾ to 1 inch uniformly at the rate specified in Subsection 2.2.3.c.

3.4 STRAW CRIMPING

After drilling the seed, straw shall be uniformly placed at the rate specified in Subsection 2.2.6.b and crimped into the topsoil using suitable equipment.

3.5 PROTECTION OF WORK

The seeded area shall be protected against trespassing and from damage at all times. If areas are damaged, they shall be reseeded at the Contractor's expense. No work shall be executed in or over the seeded area without proper safeguards. Protective barriers shall be removed at time of final acceptance.

3.6 INSPECTION

3.6.1 At the completion of work, the Contractor shall request a preliminary inspection by Bechtel to determine the condition of the seeding.

A final inspection shall be requested 48 hours in advance after seed germination. The Contractor and Bechtel will be present for the inspection. Seeded areas considered ready for final inspection shall show a uniform smooth ground surface without eroded ruts or gullies and evidence of uniform seed germination.

3.6.2 Acceptance:

If the installation is found satisfactory, Bechtel will approve the work in writing.

If the installation is found unsatisfactory, Bechtel will submit a punch list of conditions to correct by and at the Contractor's expense. The Contractor is responsible for requesting additional inspections after the conditions of the punch list have been corrected.

3.7 REPLACEMENT

Seed shall be replaced in any area, including washout gullies and/or slopes, where growth has not initiated during the first rainy season, November through April, following initial application. Washout gullies will require amended topsoil to fill washouts, and finish grading to this specification and Specification 15S-S-4 prior to reseeding. These replacements shall be at no additional cost to Bechtel.

3.8 DAILY QUALITY CONTROL LOG

a. The Contractor shall maintain a Daily QC log during all phases of topsoil installation and seeding operation. This log shall document the daily progression of the work from the delivery of the topsoil and seeding materials to final acceptance. The log shall designate those construction activities that influence the development and growth of plants for the vegetated cover during installation. The log, at a minimum, shall include entries and detailed documentation of the following:

- Weather: temperature, winds, and precipitation.
- Preparation activities, including soil amendments.
- Topsoil spreading.
- Equipment used for seeding.
- Repairs and replacements of topsoil and seeded areas.
- Photographs of the topsoil and seeding installation.
- Names of all personnel conducting work at the site.
- Names, dates, and times for when the jobsite is visited by regulatory personnel, subcontractors or vendors, and the FMC Idaho, LLC personnel.

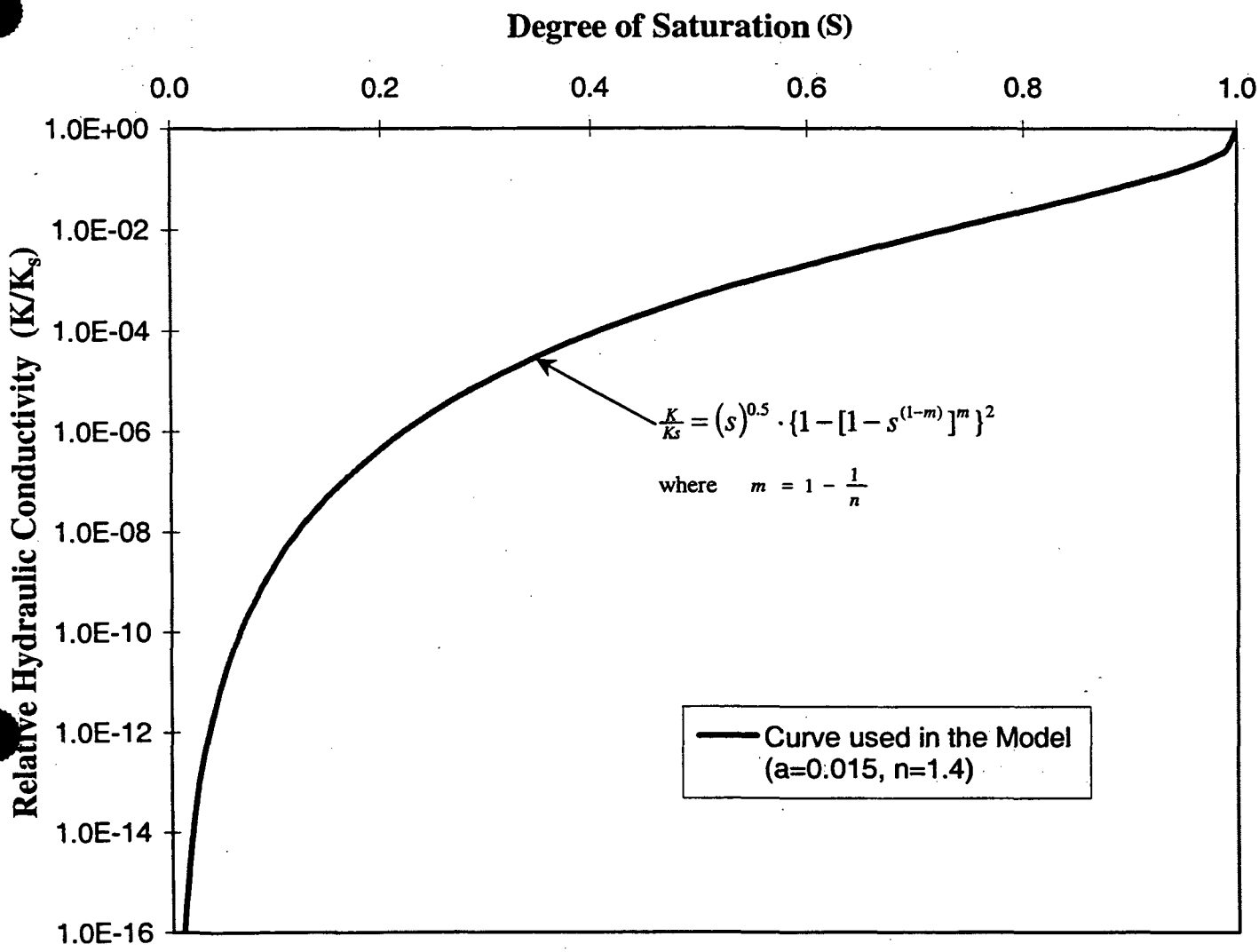
- Deviations from the Construction Quality Assurance Plan, drawings and specifications.

b. Prior to performing the work, the Contractor shall submit the Daily QC log format for approval by Bechtel.

3.9 CLEANUP

All areas of work shall be kept clean, neat, and orderly at all times.

At the end of the work, all temporary working areas shall be restored to their original conditions with all temporary construction materials removed and the site cleaned.



Soil Characteristic Curve

Figure 1

FMC IDAHO, LLC

POCATELLO, IDAHO

TECHNICAL SPECIFICATION AND SCOPE OF WORK FOR INSTALLATION OF TEMPERATURE MONITORING POINTS (WELLS)

PROFESSIONAL ENGINEER REGISTERED 7890 STATE OF IDAHO ROBERT NG

5-2-02

REV.	DATE	REASON FOR REVISION	BY	CH'K	APPR
0	5/2/02	ISSUED FOR CONSTRUCTION	RW		

ORIGIN

SF-BEI

TECHNICAL SPECIFICATION
TEMPERATURE MONITORING POINTS
FINAL POND COVER

JOB NO. 24230

SPECIFICATION NO.
15S-S-9
REV. 0

SHEET 1 OF 8

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1 GENERAL

This specification describes the requirements for Temperature Monitoring Points (TMPs) to be installed within a final cover over a pond at the FMC Idaho, LLC plant in Pocatello, Idaho. The TMPs will be used to monitor temperature underneath the final cover and will allow for gas sampling. Work will be performed in accordance with the Construction Quality Assurance Plan, Construction Drawings and task-specific health and safety plan.

1.1 SCOPE OF WORK

TMPs will be installed at locations as shown on the Design Drawings. The TMPs are installed in the cap area to monitor temperature near the pond solids and sand fill interface.

A typical construction profile of the TMP is shown on the Design Drawings. Each TMP will be installed to the depths as shown on the Design Drawings. Outer casings will be installed during drilling activities associated with TMP installation. The installation of the TMPs will entail drilling boreholes, installation of outer casing, and TMP sensor casing, installation of filter pack, and completion of the well.

All the TMPs shall be completed above grade using protective casings with lockable caps as shown on the Design Drawings, or approved equal, to protect the TMPs from any inadvertent damages while allowing ready access for sampling and repairs. The protective casing will be attached to the concrete at the base.

1.2 RELATED SPECIFICATIONS

The following specifications contain requirements that relate to this specification:

a. P4-S-4 Earthwork and Grading

b. P4-S-5 Geosynthetic Clay Liner

c. P4-S-6 Flexible Membrane Liner

d. P4-S-7 Geonet and Geotextile

e. P4-S-8 Topsoil and Seeding

1.3 TMP INSTALLER REQUIREMENTS

The execution of this work shall be performed by competent workers under the direct supervision of an experienced well driller. Any soil cuttings generated during TMP installation activities shall be placed as subsoil within the limit of final cover of the pond unless otherwise specified herein. Any soil cuttings encountered that contain elemental phosphorus, as evidenced by smoking or burning, shall be containerized and disposed at a permitted off-site facility. All casing and other TMP materials shall be of compatible materials to prevent reaction between components of the completed TMP. All accessories required for satisfactory completion of the TMPs shall be essentially standard products of reliable manufacturers regularly engaged in the production of such equipment.

1.4 DEFINITIONS

a. Owner: FMC Idaho, LLC.

b. Bechtel: Bechtel Environmental, Inc. and any of its authorized representatives, hereby acting as agent for FMC Idaho, LLC.

c. Contractor: The party to whom the Contract for the work described herein has been awarded and any of its authorized representatives.

d. Temperature Monitoring Point: A temperature monitoring point (TMP), referred throughout this specification, is a temperature monitoring well that is capable of providing access for continuous measurement of temperature underneath the closure cap at approximately the waste/fill interface.

1.5 SUBMITTALS

The Contractor shall submit the following documents for Bechtel's approval and acceptance prior to mobilization or as otherwise noted:

a. Work Plan: The Contractor shall submit a proposed plan for installing TMPs before beginning work. The work plan for installing the TMPs must be no less stringent than these specifications. The plan shall include, but not be limited to, the proposed method of boring and equipment to be used, details on proposed casing, grouting materials, filter pack materials, bentonite backfill materials and any equipment necessary for completion of the TMPs. No work shall be performed until the work plan has been approved and no deviation from the approved work plans will be permitted without prior approval of Bechtel. Details of specific methods to be employed to control potential contamination or pollution arising from TMP installation activities shall be included.

b. Permits: The Contractor shall submit copies of all permits, licenses, or other requirements necessary for execution of the work.

c. Temperature Monitoring Point Completion Record: The Contractor shall prepare a TMP completion record indicating completion details including, at a minimum, ground elevation, total well depth below grade, thermowell depth below grade, depth below grade to top of filter pack, thickness of bentonite seal, and stick-up above grade to the top of the monitoring head for each TMP.

1.6 ENVIRONMENTAL PROTECTION

The Contractor shall take all precautions necessary to prevent contamination of the ground surface or of surface waters resulting from installation of the monitoring point.

1.7 ABANDONMENT OF TMPs

In the event that the Contractor must abandon a TMP because of loss of tools or for any other cause, the Contractor, at the instruction of Bechtel, shall remove the monitoring point materials from the borehole and fill the abandoned hole from the bottom of the hole to ground surface with bentonite-cement grout placed with a tremie.

2 MATERIALS

2.1 MONITORING POINT OUTER CASING (hereafter referred to as "outer casing"): Each TMP well outer casing shall be constructed of standard weight carbon steel pipe, ASTM A 53, Type S, in the size and depth as shown on the Design Drawings. Casing shall be either a single piece construction or pipe sections that are welded together or connected with threaded joints. Slip-type connections will not be permitted.

2.2 MONITORING POINT WELL CASING: Each monitoring point well casing (thermowell) shall consist of a Schedule 40 PolyVinyl Chloride (PVC) pipe, size as designated on the Design Drawings, extending down to a depth below ground surface as shown on the Design Drawings. PVC pipe shall conform to ASTM D1785. Separate sections of PVC casing shall be connected with threaded joints. The bottom one-foot of the PVC casing shall be screened appropriately.

2.3 FILTER PACK: The filter pack sand shall be composed of round, hard water-worn silica sand, free of flat or elongated pieces, organic matter, or other foreign

matter. The sand shall be Colorado Silica Sand 10-20, or approved equal, and shall be a product of a commercial sand and gravel manufacturer.

2.4 BENTONITE BACKFILL: The bentonite backfill shall consist of 1/4 to 3/8-inch (typical) bentonite pellets, which shall be hydrated insitu with potable water at the ratio specified by the manufacturer.

2.5 MONITORING HEAD: The monitoring head shall be constructed on a 3-inch 150# flat face flange and include one sampling port for gas monitoring as shown on the Design Drawings. The sample port shall be supplied with a 3/8-inch shutoff ball valve and a 2-foot section of 1/4-inch Poly-Propylene tubing with 1/4-inch stainless steel compression fitting for connecting to Owner's gas sampler. The Temperature Transmitter shall be mounted on top of the monitoring head.

2.6 GROUT SEAL: The grout shall consist of a Portland Type I cement/bentonite/water ratio of 94 lbs/4 lbs/7.8 gallons.

2.7 PROTECTIVE CASING: All TMP stations shall be completed above grade using a protective casing with a lock and lockable cap as shown on the Design Drawings. The casing shall be sized to allow easy access for gas sampling and maintenance.

2.8 Resistance Temperature Detector (RTD): RTD shall conform to requirements as specified in data sheet.

3 EXECUTION

3.1 TMP CONSTRUCTION

3.1.1 Drilling of Borehole: Drilling of the borehole will be conducted using a hollow stem auger or other approved equipment. The well shall be drilled straight, plumb and circular from the bottom. The borehole shall be drilled to the depth shown on the Design Drawings.

3.1.2 Installation of TMP Casing: When the borehole has been completed and outer casing installed, the depth to the bottom of the borehole shall be measured using a weighted measuring tape. All depths shall be recorded relative to the ground surface at the borehole location. The PVC thermowell will then be inserted into the borehole. The thermowell shall be assembled first. Before lowering the thermowell into the borehole, the sand filter pack shall be poured into the bottom of the borehole for about three inches. Then, the thermowell shall be lowered into the hole by a method that will allow for control of the rate of fall of the thermowell. The thermowell shall not be dropped or allowed to fall uncontrolled

into the borehole. The end of the thermowell should rest firmly on the bottom of the borehole.

3.1.3. Installation of Filter Pack: After the thermowell has been lowered into the outer casing, the thermowell shall be centered in the outer casing and the filter pack shall be placed between the thermowell and the wall of the outer casing (centering devices shall not be used). The sand shall be installed around the thermowell by pouring the sand into the outer casing. The height of the sand shall be continuously measured. The sand shall not be added at a rate that will cause "bridging" between the thermowell and the outer casing. The filter pack shall be installed continuously until the sand has been placed to a height of three feet above the bottom of the thermowell. The depth to the top of the filter pack shall be measured relative to the ground surface with a weighted tape and recorded.

3.1.4 Installation of Bentonite Pellets: Following the installation of the filter pack, a bentonite seal shall be placed directly on top of the filter pack and completely filling the annular space between the thermowell and the outer casing. The bentonite seal shall be installed by pouring 1/4 to 3/8-inch bentonite pellets down the outer casing to allow the pellets to flow on to the top of the filter pack. The depth to the bentonite pellets shall be measured relative to ground surface and the addition of bentonite shall terminate when two feet of bentonite has been installed. The bentonite pellets shall then be hydrated with potable water according to the manufacturer's specifications. The depth to the top of the bentonite shall be measured relative to the ground surface with a weighted tape and recorded.

3.1.5 Installation of Grout Seal: The remaining annular space between the thermowell and the outer casing shall be filled with grout from the top of the hydrated bentonite pellets to the top of the outer casing. The grout shall be mixed in a grout mixer with potable water in the ratio specified in Subsection 2.6. The grout shall then be installed by inserting a tremie pipe down the inside of the outer casing and forcing the grout into the annulus between the casings starting from the top of the bentonite pellets and moving up toward the ground surface. Installation of this grout shall be done continuously in such a manner as to ensure that the entire annular space is filled in one operation.

3.1.6 Installation of GCL and HDPE Seals: The penetration of the outer casing through the GCL and HDPE membrane shall be sealed as shown on the drawings. The HDPE boot shall be welded to HDPE liner and sealed to the outer casing with sealant and stainless steel band.

3.1.7 TMP completion: The TMP sensor element, monitoring head, and protective casing shall be constructed and installed as shown on the Design Drawings.

3.2 CLEAN UP: Upon completion of the monitoring well construction and other incidentals, all debris and surplus materials resulting from the work shall be removed in accordance with appropriate disposal requirements.

DATA SHEETS

AND

ENGINEERING GUIDES

FMC
POCATELLO, IDAHO
POND 15S

INSTRUMENT DATA SHEETS

JOB NO. 24230

Data Sheet No.	No. of Sheets	Title
DS-J-01	1	Gas Detectors
DS-JP-15S-1	1	Pressure (Absolute) Transmitter
DS-JT-15S-1	3	RTD Temperature Transmitters
15S-DS-JF-001	1	Turbine Flowmeters
15S-DS-LS-001	1	Lift Pump Station

FMC POCATELLO, IDAHO **POND 15S** INSTRUMENT DATA SHEET	GAS DETECTORS				SHEET 1 OF 1	
	NO	BY	DATE	REVISION	DATA SHEET NO. DS-J-01	REV.
					CONTRACT 24230	DATE
					REQ. - P.O.	
					BY / CHK'D	APPR.

1	Tag Number	AE/AIT-001	AE/AIT-002	AE/AIT-003	
2	Service	GAS MONITORING WELL BOTTOM	GAS MONITORING WELL TOP	GAS MONITORING WELL BOTTOM	
3	Application	Portable Monitor	Portable Monitor	Portable Monitor	
4	Function	Sample/ Display/ Alarm	Sample/ Display/ Alarm	Sample/ Display/ Alarm	
5	Monitored Gas	Phosphine (PH_3)	Hydrogen (H_2)	Hydrogen Cyanide (HCN)	
6	Anticipated Concentration				
7					
8	Monitoring Wells				
9	Sample Line Size/Depth	3/8" / 23'	3/8" / 1"	3/8" / 23'	
10	Sample Line Material	316 SS Tube	316 SS	316 SS	
11	Sample Connection Line Size/Length	¼" / 2'	¼" / 2'	¼" / 2'	
12	Sample Connection Line Material	Polypropylene	Polypropylene	Polypropylene	
13	Sample Connection Size/Type	¼" Compression Nut	¼" Compression Nut	¼" Compression Nut	
14	Sample Connection 'Tag'	"Lower Sample"	"Upper Sample"	"Lower Sample"	
15					
16	Detector Data				
17	Type	Hand Held Portable	Hand Held Portable	Hand Held Portable	
18	Sensor Type *	MFR. STD.	MFR. STD.	MFR. STD.	
19	Range	0-1000 PPB	0-2000 PPM	0-20 PPM	
20	Resolution	10 PPB	1 PPM	0.1 PPM	
21	Gas	PH_3	H_2	HCN	
22	Repeatability	+/- 3%	+/- 3%	+/- 3%	
23	Linearity	+/- 2%	+/- 2%	+/- 2%	
24	Alarm Setpoint				
25	Low Battery	Yes	Yes	Yes	
26	Pump Out	Yes	Yes	Yes	
27	Audible Beeper	Yes	Yes	Yes	
28	Display: Type	LCD	LCD	LCD	
29	Lines/Characters	2 / 8	2 / 8	2 / 8	
30	Concentration	PPB or PPM	PPB or PPM	PPB or PPM	
31	Alarms	Yes	Yes	Yes	
32	Power: Type	Rechargeable Battery	Rechargeable Battery	Rechargeable Battery	
33	Min Operation	12 HR	12 HR	12 HR	
34	Electronic Rating	Intrinsically Safe	Intrinsically Safe	Intrinsically Safe	
35	Sample Pump	Internal	Internal	Internal	
36	Type *	Rotary Vane	Rotary Vane	Rotary Vane	
37	Rating *	400 CC/min	400 CC/min	400 CC/min	
38	Sample Connection	1/8" NPT - Note (1)	1/8" NPT - Note (1)	1/8" NPT - Note (1)	
39	Discharge Connection	Note (2)	Note (2)	Note (2)	
40	Accessories				
41	Storage Case	Yes	Yes	Yes	
42	Battery Charger	Yes	Yes	Yes	
43					
44	Manufacturer *	Analytical Technology Inc. (or equal)	Analytical Technology Inc. (or equal)	Analytical Technology Inc. (or equal)	
45	Model Number *	B16-32-1-1000-2	B16-18-1-2000-1	B16-22-1-0020-1	
46					
47	Notes:				
48					
49					
50					

ISA Form S20.3b

GENERAL	Pressure (Absolute) Instruments				
Instrument Number	15S-PT-001				Remarks
Item No.					
Service	15S Cap Press				
Transmitter type	Absolute Pressure				
Mounting	2" Pipe Stand				
Operating Temperature Range	-40 to 85°C				
Process Data					
Process fluid	Air				
Max. pressure (in HgA)	26				
Max. temp (°F)	120				
Norm pressure (in HgA)	23				
Calibration pressure range (in HgA) (see note 1)	20 to 30				
Adjustable range* (in HgA)	0 to 55				
Element type	Capacitance Diaphragm				
Element material	316 SS				
Body material	Aluminum				
Process connection	½" NPT				
Fill liquid	N/A				
Drain/Vent Vlv material	N/A				
Armor material/Capillary material/Capillary length	N/A				
Electrical					
Area classification	Non-Hazardous				
Power supply	24 Vdc (2-wire)				
Electrical connection	½ " NPT				
Output signal	4-20 mA				
Integral indicator	N/A				
Accuracy	0.2% Span				
Resolution	(S)				
NEMA rating req'd	NEMA 4X				
Air supply / Air connection / Airset w/gauge	N/A				
Transmitter Manufacture/Model	Rosemount/ 1151AP Smart (see note 2)				
ACCESSORIES					
1. Mtg bracket w/mtg hardware	Required				
2. Two valve manifold (stainless steel)	Required				

Notes

1. Certificate of calibration from the manufacturer is required.
2. Complete transmitter model number w/2-valve manifold is: 1151AP-5-S-22-B1-M7-Q4-T1413.

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

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BECHTEL BEI	PHASE IV PONDS, Pond 15S ASTARIS LLC Pressure (Absolute) Transmitter DATA SHEET	JOB NO. 24230	Rev. 0
		Data Sheet No: DS-JP-15S-1	Sheet 1 of 1

GENERAL	Resistance Temperature Instruments				
Instrument Number	15S-TE/TT-01	15S-TE/TT-02	15S-TE/TT-03	15S-TE/TT-04	Remarks
Item No.					
Service	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	
P&ID	N/A	N/A	N/A	N/A	
Location/Environment	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	
Process Data					
Process variable	Well air temp.	Well air temp.	Well air temp.	Well air temp.	
Transmitter					
Type	Resistance	Resistance	Resistance	Resistance	
Electrical Area Classification	Non-hazardous	Non-hazardous	Non-hazardous	Non-hazardous	
Housing type / Material	NEMA 4	NEMA 4	NEMA 4	NEMA 4	
Calib. Range °C (see note 1)	0 – 35	0 – 35	0 – 35	0 – 35	
Input / Output Signal (Isolated)	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	
Power supply	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	
Electrical connection size	½" NPT	½" NPT	½" NPT	½" NPT	
Burnout	Up scale	Up scale	Up scale	Up scale	
Local Indicator / Scale Range	N/A	N/A	N/A	N/A	
Accuracy	±0.2%	±0.2%	±0.2%	±0.2%	
Element					
Sensor	RTD	RTD	RTD	RTD	
Type	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	
Insulation / Sheath material	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	
Number of wires	4	4	4	4	
Mounting configuration	Direct Immersion	Direct Immersion	Direct Immersion	Direct Immersion	
Leads / Lead wires	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	
Screwed cover / Material	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	
Nipple size / Mounting thread	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	
Well or Tube	N/A	N/A	N/A	N/A	
Element length	15'-2"	14'-5"	14'-2"	14'-2"	
Xmtr manufacturer/model no.	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	
Element manufacturer/model no.	Rosemount /	Rosemount /	Rosemount /	Rosemount /	
ACCESSORIES					
1)					
2)					

Notes

1. Certificate of calibration from the manufacturer is required.
2. Temperature assembly to mount vertically on a 3" 150# blind flange drilled and taped for ½" NPT.
3. Nipple coupling to be 3" nominal length (mfr. standard material). Mfr. to provide sheath protecting tube with sensor.

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

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PHASE IV PONDS, Pond 15S
ASTARIS LLC
RTD Temperature Transmitters
DATA SHEET

JOB NO.
MR/PO NO. 24230

Rev. 0

Data Sheet No: DS-JT-15S-1

Sheet 1 of 1

GENERAL	Resistance Temperature Instruments				
Instrument Number	15S-TE/TT-05	15S-TE/TT-06	15S-TE/TT-07	15S-TE/TT-08	Remarks
Item No.					
Service	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	
P&ID	N/A	N/A	N/A	N/A	
Location/Environment	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	
Process Data					
Process variable	Well air temp.	Well air temp.	Well air temp.	Well air temp.	
Transmitter					
Type	Resistance	Resistance	Resistance	Resistance	
Electrical Area Classification	Non-hazardous	Non-hazardous	Non-hazardous	Non-hazardous	
Housing type / Material	NEMA 4	NEMA 4	NEMA 4	NEMA 4	
Calib. Range °C (see note 1)	0 – 35	0 – 35	0 – 35	0 – 35	
Input / Output Signal (Isolated)	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	
Power supply	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	
Electrical connection size	½" NPT	½" NPT	½" NPT	½" NPT	
Burnout	Up scale	Up scale	Up scale	Up scale	
Local Indicator / Scale Range	N/A	N/A	N/A	N/A	
Accuracy	±0.2%	±0.2%	±0.2%	±0.2%	
Element					
Sensor	RTD	RTD	RTD	RTD	
Type	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	
Insulation / Sheath material	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	
Number of wires	4	4	4	4	
Mounting configuration	Direct Immersion	Direct Immersion	Direct Immersion	Direct Immersion	
Leads / Lead wires	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	
Screwed cover / Material	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	
Nipple size / Mounting thread	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	
Well or Tube	N/A	N/A	N/A	N/A	
Element length	15'-0"	17'-7"	17'-8"	17'-8"	
Xmtr manufacturer/model no.	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	
Element manufacturer/model no.	Rosemount /	Rosemount /	Rosemount /	Rosemount /	
ACCESSORIES					
1)					
2)					

Notes

1. Certificate of calibration from the manufacturer is required.
2. Temperature assembly to mount vertically on a 3" 150# blind flange drilled and taped for ½" NPT.
3. Nipple coupling to be 3" nominal length (mfr. standard material). Mfr. to provide sheath protecting tube with sensor.

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

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PHASE IV PONDS, Pond 15S
ASTARIS LLC
RTD Temperature Transmitters
DATA SHEET

JOB NO.
MR/PO NO. 24230

Rev. 0

Data Sheet No: DS-JT-15S-2

Sheet 1 of 1

GENERAL	Resistance Temperature Instruments				
Instrument Number	15S-TE/TT-05	15S-TE/TT-06	15S-TE/TT-07	15S-TE/TT-08	Remarks
Item No.					
Service	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.	
P&ID	N/A	N/A	N/A	N/A	
Location/Environment	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	Monitoring Well/Outdoor	
Process Data					
Process variable	Well air temp.	Well air temp.	Well air temp.	Well air temp.	
Transmitter					
Type	Resistance	Resistance	Resistance	Resistance	
Electrical Area Classification	Non-hazardous	Non-hazardous	Non-hazardous	Non-hazardous	
Housing type / Material	NEMA 4	NEMA 4	NEMA 4	NEMA 4	
Calib. Range °C (see note 1)	0 – 35	0 – 35	0 – 35	0 – 35	
Input / Output Signal (Isolated)	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc	
Power supply	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	24 Vdc (2 wire)	
Electrical connection size	½" NPT	½" NPT	½" NPT	½" NPT	
Burnout	Up scale	Up scale	Up scale	Up scale	
Local Indicator / Scale Range	N/A	N/A	N/A	N/A	
Accuracy	±0.2%	±0.2%	±0.2%	±0.2%	
Element					
Sensor	RTD	RTD	RTD	RTD	
Type	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	Platinum 100Ω	
Insulation / Sheath material	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	Teflon / 316 SS	
Number of wires	4	4	4	4	
Mounting configuration	Direct Immersion	Direct Immersion	Direct Immersion	Direct Immersion	
Leads / Lead wires	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	Potted / Receptacle	
Screwed cover / Material	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	Yes / Aluminum	
Nipple size / Mounting thread	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	½" / ½" NPT	
Well or Tube	N/A	N/A	N/A	N/A	
Element length	15'-0"	17'-7"	17'-8"	17'-8"	
Xmtr manufacturer/model no.	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline	
Element manufacturer/model no.	Rosemount /	Rosemount /	Rosemount /	Rosemount /	
ACCESSORIES					
1)					
2)					

Notes

1. Certificate of calibration from the manufacturer is required.
2. Temperature assembly to mount vertically on a 3" 150# blind flange drilled and taped for ½" NPT.
3. Nipple coupling to be 3" nominal length (mfr. standard material). Mfr. to provide sheath protecting tube with sensor.

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

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PHASE IV PONDS, Pond 15S
ASTARIS LLC
RTD Temperature Transmitters
DATA SHEET

JOB NO.
MR/PO NO. 24230

Rev. 0

Data Sheet No: DS-JT-15S-2

Sheet 1 of 1

GENERAL	Resistance Temperature Instruments				
Instrument Number	15S-TE/TT-09	15S-TE/TT-10			Remarks
Item No.					
Service	Pond 15S Monitoring Well Temp.	Pond 15S Monitoring Well Temp.			
P&ID	N/A	N/A			
Location/Environment	Monitoring Well/Outdoor	Monitoring Well/Outdoor			
Process Data					
Process variable	Well air temp.	Well air temp.			
Transmitter					
Type	Resistance	Resistance			
Electrical Area Classification	Non-hazardous	Non-hazardous			
Housing type / Material	NEMA 4	NEMA 4			
Calib. Range °C (see note 1)	0 – 35	0 – 35			
Input / Output Signal (Isolated)	24Vdc / 4-20 mAdc	24Vdc / 4-20 mAdc			
Power supply	24 Vdc (2 wire)	24 Vdc (2 wire)			
Electrical connection size	½" NPT	½" NPT			
Burnout	Up scale	Up scale			
Local Indicator / Scale Range	N/A	N/A			
Accuracy	±0.2%	±0.2%			
Element					
Sensor	RTD	RTD			
Type	Platinum 100Ω	Platinum 100Ω			
Insulation / Sheath material	Teflon / 316 SS	Teflon / 316 SS			
Number of wires	4	4			
Mounting configuration	Direct Immersion	Direct Immersion			
Leads / Lead wires	Potted / Receptacle	Potted / Receptacle			
Screwed cover / Material	Yes / Aluminum	Yes / Aluminum			
Nipple size / Mounting thread	½" / ½" NPT	½" / ½" NPT			
Well or Tube	N/A	N/A			
Element length	17'-8"	16'-6"			
Xmtr manufacturer/model no.	Rosemount / Model 444RL Alphaline	Rosemount / Model 444RL Alphaline			
Element manufacturer/model no.	Rosemount /	Rosemount /			
ACCESSORIES					
1)					
2)					

Notes

1. Certificate of calibration from the manufacturer is required.
2. Temperature assembly to mount vertically on a 3" 150# blind flange drilled and taped for ½" NPT.
3. Nipple coupling to be 3" nominal length (mfr. standard material). Mfr. to provide sheath protecting tube with sensor.

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

REV.	DATE	REVISION	BY	CHECK	APP
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BECHTEL BEI	**PHASE IV PONDS, Pond 15S** **ASTARIS LLC** **RTD Temperature Transmitters** **DATA SHEET**	**JOB NO.** **MR/PO NO. 24230**	**Rev. 0**
		Data Sheet No: DS-JT-15S-3	Sheet 1 of 1

GENERAL	Turbine Flowmeters				
Instrument Number	15S-FE-001	15S-FE-002			Remarks
Meter Data					
Service	P15S Cap Drain North Side	P15S Cap Drain South Side			
Connection line size / pipe type	1-1/2" / HDPE	1-1/2" / HDPE			
Location/Environment	In-line	In-line			
Body rating (minimum)	150#	150#			
Nominal flow range	2.5 – 25 GPM	2.5 – 25 GPM			
Accuracy	± 1% FS	± 1% FS			
Linearity	± 1%	± 1%			
End connections –(flange)	150# RF	150# RF			
K Factor (cycles per volume unit)	(S)	(S)			
Materials: A) Body, Support, Flanges, B) Rotor	A) 316 SS B) 17-4 PH SST	A) 316 SS B) 17-4 PH SST			
Pickup coil type	Magnetic	Magnetic			
Bearings: Type	Cryogenic ball	Cryogenic ball			
Bearing/Shaft material	Tungsten Carbide or equal	Tungsten Carbide or equal			
Enclosure type	NEMA 4X	NEMA 4X			
Process Data					
Fluid	Drain water	Drain water			
Flow rate: Min. / Max. (GPM)	0 / 30	0 / 30			
Normal flow	25 GPM	25 GPM			
Operating pressure / Back pressure	≈ 5 PSI / ≈ 1 PSI	≈ 5 PSI / ≈ 1 PSI			
Operating temp.: Min. / Max.	33°F / 90°F	33°F / 90°F			
Operating Specific Gravity	1.0	1.0			
Percent solids and type	Clear	Clear			
Secondary Instrument					
Tag No.	15S-FI/FQI-001	15S-FI/FQI-002			
Function	Remote totalizer/rate indicator	Remote totalizer/rate indicator			
Mounting	2" pipe stand	2" pipe stand			
Power supply	Lithium battery	Lithium battery			
Rate indicator (GPM)	LCD, 6 digits	LCD, 6 digits			
Totalizer (gallons)	LCD, 8 digits	LCD, 8 digits			
Output range	N/A	N/A			
Enclosure NEMA rating	NEMA 4	NEMA 4			
Input signal	Freq: 0 – 2500 Hz.	Freq: 0 – 2500 Hz.			
Accuracy: Totalizer	± 1 count	± 1 count			
Accuracy: Rate indicator	± 1% FS	± 1% FS			
Turbine flowmeter w/indicator Manufacturer/Model No. (see note 2)	Sponsler / SP1-1/2-CB-PHL-D-6-X	Sponsler / SP1-1/2-CB-PHL-D-6-X			
ACCESSORIES					
1. One twenty foot connector cable Manufacture/Model No.	Sponsler / S-2F-T-G-2S-20	Sponsler / S-2F-T-G-2S-20			

Notes

1. Certificate of calibration is required for the turbine flowmeter.
2. .The totalizer/rate indicator is a Sponsler model no.: IT275N.
3. Sponsler Co., Inc., Westminster, South Carolina, 29693; Ph. No. (Toll Free: 1-800-258-1165).

Enter "NA" if not applicable or not required. Enter in ( ) source of information: S = Seller or verified by Seller, B = Buyer.

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BECHTEL BEI	**Pond 15S Astaris LLC Turbine Flowmeter DATA SHEET**	**JOB NO. 24230**	**Rev. 0**
		Data Sheet No: 15S-DS-JF-001	Sheet 1 of 1

GENERAL	Pump Lift Station				
Instrument Number	15S-LS-001	15S-LS-002			Remarks
Pump Data					
Service	Drain water	Drain water			
Connection line size / pipe type (inlet to sump)	6" / HDPE	6" / HDPE			
Connection line size / pipe type (outlet from sump)	1-1/2" / HDPE	1-1/2" / HDPE			
Nominal flow range	2.5 – 25 GPM	2.5 – 25 GPM			
Vertical lift	15 Ft.	15 Ft.			
Sump storage volume	250 Gallons	250 Gallons			
Impeller material/type	(S)	(S)			
Pump body material	(S)	(S)			
Power supply	480V, 3φ, 60 Hz	480V, 3φ, 60 Hz			
Control voltage	120 VAC, 1φ	120 VAC, 1φ			
Motor starter / HP	Required / (S)	Required / (S)			
Motor starter enclosure w/disconnect switch.	NEMA 4X	NEMA 4X			
H-O-A switch	Required	Required			
High water level and low level pump switch control	Required	Required			
Indicating lights on motor starter enclosure	Required	Required			
Enclosure type	NEMA 4X	NEMA 4X			
Process Data					
Fluid	ground water	ground water			
Flow rate: Min. / Max. (GPM)	0 / 25	0 / 25			
Normal flow	20 GPM	20 GPM			
Operating pressure / Back pressure	≈ 5 PSI / ≈ 1 PSI	≈ 5 PSI / ≈ 1 PSI			
Operating temp.: Min. / Max.	33°F / 90°F	33°F / 90°F			
Operating Specific Gravity	1.0	1.0			
Percent solids and type	Clear	Clear			
Sump Data					
Material	HDPE	HDPE			
Size	(S)	(S)			
Installation	Below grade	Below grade			
Level Switch Data					
Type	(S)	(S)			
Material of Construction	(S)	(S)			
Contact rating	(S)	(S)			

Notes
1. Performance curve of pump is required.
2. Pond 15S will use two sumps each with one pump and controls.

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BECHTEL BEI	**Pond 15S Astaris LLC Lift Pump Station DATA SHEET**	**JOB NO. 24230**	**Rev. 0**
		Data Sheet No: 15S-DS-LS-001	Sheet 1 of 1

ENGINEERING GUIDES

FMC IDAHO, LLC

PHOSPHORUS PLANT

POCATELLO, IDAHO

ENGINEERING GUIDE
FOR
PACKAGED LIFT STATION (PUMP) SYSTEMS

A	08/22/01	Issued for Closure Plan Submittal			
REV.	DATE	REASON FOR REVISION	BY	CHECK	APPR.

ORIGIN BECHTEL SF-BEI	POND 15S ENGINEERING GUIDE FOR LIFT STATION PACKAGE SYSTEMS	DOCUMENT NO.	REV.
		24230- LP-15S-001	A
		Page 1 of 9	

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ENGINEERING GUIDE
FOR
PACKAGED LIFT STATION SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED

1.01.1 Design, fabricate, furnish, test, and deliver a complete Lift Station pump system including associated motor/pump, wiring, piping, and/or tubing, required for the operation of the specified system and in accordance with this guide. These pump systems will be used for pumping ground water at the Astaris LLC plant in Pocatello, Idaho

1.01.2 Provide one set of special tools if other that standard tools are required to repair, maintain, or adjust the equipment.

1.02 WORK NOT INCLUDED

Receiving, installation, external connections, wiring and tubing between Seller's components unless connected devices are on the same skid, and acceptance testing.

1.03 SYSTEM DESCRIPTION

1.03.1 It is the intention of this guide is for equipment and installation conforms, as far as it is practical, to the Seller's standard offering. However, the Buyer reserves the right to select specific manufacturers for purposes of quality or of standardizing the instrumentation used in the plant. The Lift Station shall be in accordance with the attached Pond data sheets and Pond "Final Cap Sections & Details" drawings.

1.03.2 The Seller's control package shall be a complete stand-alone system, including controllers, instrumentation, local control panels, etc as required for the proper and safe operation of the system.

1.03.3 For electrical power supply for packaged equipment shall be as specified on the attached data sheets.

1.03.4 The following units shall be used for design parameters, calculations and scales. Refer to the principal technical specification for the system (English or metric) to be used.

	English	metric
a. Positive gauge pressure	inches H_2O or psig	bar or kPa gage
b. Vacuum	inches Hg or H_2O	bar, kPa or mm Hg

	c. Absolute pressure	inches Hg or psia	bar, kPa abs Or mm Hg
	d. Differential pressure	inches H_2O or psi	bar or kPa
	e. Temperature	degrees F	degrees C
f.	Flow: solids Liquids	ton/hr gal/min or LB/hr	tonne/hr l/min or kg/hr
	g. Level	inches, feet or percent	mm, m or percent

1.04 QUALITY ASSURANCE

Seller shall furnish instrument, control and electrical components that have been designed and manufactured to prevalent industry standards of quality, safety, maintainability and reliability.

1.05 SUBMITTALS

1.05.1 The Seller shall provide the following documents:

a. Hard copy of all equipment used in the Sellers Lift station package. The information contained for each pump package shall include at least the following as applicable:

- tag number
- service description
- schematic diagram
- manufacturers literature
- model numbers
- setpoint
- installation details as required for installing the pump package
- calibration range of all instrumentation

b. Control panel/cabinet wiring diagrams showing all wiring, instruments, and devices in their relative physical relationships, including the interconnecting wire numbers on the wire.

c. Instruction manuals covering operational adjustment, maintenance, troubleshooting, repair, site storage, installation, and startup.

1.05.2 Include Buyers standard tag numbers on all documents as applicable

1.05.3 Identify the electrical load requirements (peak and continuous) for each of the power sources.

1.06 PROJECT/SITE CONDITIONS

Provide equipment suitable for the environmental conditions

- Temperature -33 to 104 °F
- Relative Humidity 100%- 5%
- Snow 20 lbs./Ft^{-2}

PART 2 - PRODUCT

2.01 Pump process conditions are shown on the attached Pond data sheet. Seller shall select pumps and tank volumes to satisfy the process requirements.

2.01.1 Provide enclosures for outdoors in accordance to the attached data sheet . Locate components away from maintenance areas, excessive vibration, and extreme temperature environments.

2.01.3 Provide electrical/controls enclosures with thermostatically controlled space heaters, where required, to maintain internal temperature above dew point.

2.01.4 Provide copper ground bus, where required, to effectively ground the entire structure in accordance with standard practice.

2.01.5 Enclosures shall be completely assembled at the factory so that the entire assembly is an operating unit, tested and ready for installation in the field.

2.01.6 Mount, connect and wire each device so that adjustment, maintenance, removal and replacement may be accomplished without interruption of service to adjacent but unrelated items and without placing undue stress on installed wiring or devices.

2.02 POWER SUPPLY AND OPERATION

2.02.1 The power supply to each pump package shall be 480 VAC, 3 phase 60 Hz from the Buyer's power supply. All other power supplies requirements for the Lift station operation shall be derived by the Seller from the 480 VAC supply. Step-down transformers (480/120 VAC) shall be housed within the control panel and adequately shielded for personnel protection.

2.02.2 The Lift station shall shut down automatically if the incoming line voltage is not adequate, and shall automatically restart to normal operation when normal voltage is restored. The pump control panel shall be equipped with a key-locking Hand –Off – Auto Selector Switch. Key is removable in the OFF and Auto position only. In the Auto position the pump operates based on liquid level within the sump. Liquid level deadband high/low setpoints shall be adjustable. In the Hand position the pump operates regardless of liquid level in the sump.

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2.03 CONTROL AND INSTRUMENTATION WIRING

2.03.1 Provide cables and wire sizes and types for power, controls, and instrument in accordance with standard practice.

2.03.2 Provide No. 14 AWG minimum, copper stranded, for control transformer secondary leads and connect to short-circuiting type terminal blocks. Terminate conductors with compression type lugs.

2.03.3 Terminate all circuits, including shields at terminal blocks. Provide 20 percent spare points, uniformly distributed.

2.03.4 Terminate all wiring on one side of terminal blocks, leaving other side entirely free for Buyer's field cable connections. All terminal points must be capable of landing two No. 14 AWG wires with compression type lugs. Leave adequate space for field cables.

2.03.5 Identify each internal wire at each end with Seller's wire number on a plastic sleeve or similar permanent marker.

2.03.6 Do not connect more than two wires to one terminal point and jumper as necessary to avoid multiple connection of Buyer's conductors. Do not splice.

2.03.7 Route wiring so that devices may be removed or serviced without disturbing wiring. 120 V ac power to each device shall originate at a terminal block, i.e., do not "daisy chain" power to instruments.

2.03.8 Provide terminal blocks for connection to external circuits for devices mounted on skid-mounted equipment. These blocks shall be located for easy access. Run interconnecting wire in metallic conduit or flexible conduit if subjected to vibration. Use liquid-tight flexible conduit if outdoors.

2.04 POWER CABLE

2.04.1 Size and install power cable in accordance with the National Electrical Code. Temperature rating shall be 90^0C for continuous operation.

2.05 CONDUIT

2.05.1 Conduit terminating at vibrating equipment shall be connected with flexible metal conduit. The maximum unsupported length shall be 36 inches (914 mm).

2.05.2 Size and install conduit in accordance with National Electrical Code and IEEE 422.

2.06 GROUNDING

2.06.1 Provide skid with two ground terminals for No. 4/0 ground cables for attachment to Buyer's ground. Grounding of equipment to skid shall be in accordance with NEC Article 250.

2.06.2 Seller is responsible for grounding of circuits that are completely within his scope of supply. Circuits, which are wired to terminal blocks for Buyer's connection, shall be left ungrounded.

2.07 MISCELLANEOUS ELECTRICAL DEVICES

2.07.1 Provide dry contacts suitably rated for the intended service.

2.07.2 Furnish pushbuttons and switches with standard sized nameplate color-coded as follows:

Function	Color
Start	Black
Stop	Red
Jog	Green
Reset	Yellow
Others	Black

2.07.3 Provide plug-in type control relays with dust cover and retaining strap if applicable

2.07.4 Provide indicating light color caps in accordance with the following:

Green: "On" to indicate motor running, device energized, valve open or partially open (not fully closed)

Red: "On" to indicate motor not running, device not energized, valve closed or partially closed (not fully open)

Amber: "On" to indicate warning, abnormal equipment or system status, system not in the steady-state mode

White: "On" to indicate power supply available in a supervisory manner or "auto"

2.07.5 Provide motor starters with thermal overloads per standard practice.

2.07.6 Provide surge protectors for solid-state equipment, if not inherent in the equipment design, to prevent damage from the effect of lightning strikes or other electrical transients normally encountered in power plant operation.

2.08 NAMEPLATES AND TAGGING

2.08.1 Each instrument or device shall be tagged in accordance with the Seller's standard tagging requirements. However, as a minimum, the tag shall be constructed of a suitable permanent material (preferably stainless steel), be permanently attached to the device, and shall contain the following information:

- P. O. Number
- P. O. Item Number
- Tag Number

Deviations from these requirements shall be brought to the attention of the Buyer.

PART 3 - EXECUTION

3.01 FLOWMETERS

3.01.1 For flowmeters and valve trim which could be damaged during flushing and/or steam blow, furnish flowmeters and trim which can be easily removed.

3.01.3 For each flowmeter and each set of trim requiring removal, attach a warning tag stating "Removal Required Prior to Flushing."

3.02 DELIVERY, STORAGE, AND HANDLING

3.02.1 Remove rust, scale, manufacturing residue, and foreign material so that equipment can be put into operation without further cleaning.

3.02.2 Cover or plug all openings for shipment and storage.

3.02.3 Brace equipment and provide protection to preclude damage during shipment.

3.02.4 Provide desiccant for equipment subject to damage from moisture. Identify equipment that is provided with internal desiccant.

3.02.5 Identify packaging with equipment name and number and purchase order number.

3.02.6 Identify loose equipment such as tools, spare parts, etc., with name and tag number of associated equipment.

3.03 SHOP TEST

3.03.1 Pressure test all pressure-retaining components.

3.03.2 In the case of measurement and control systems involving electronic transmission, a simulated input signal shall be applied and varied over the full range and each device shall be calibrated and checked for correct operation.

3.03.3 The Seller shall perform standard wiring test procedures in accordance with NEMA Standard Publication ICS-1. Wiring tests shall include point-to-point continuity tests or functional testing. The Seller shall be responsible for the correctness of his wiring and for the proper functioning of equipment provided.

3.03.4 Perform a high potential test of not less than 1,500 volts, 60 hertz for 1 minute to verify the insulation and clearance to ground are acceptable for all electrical components except solid-state devices.

DRAWINGS

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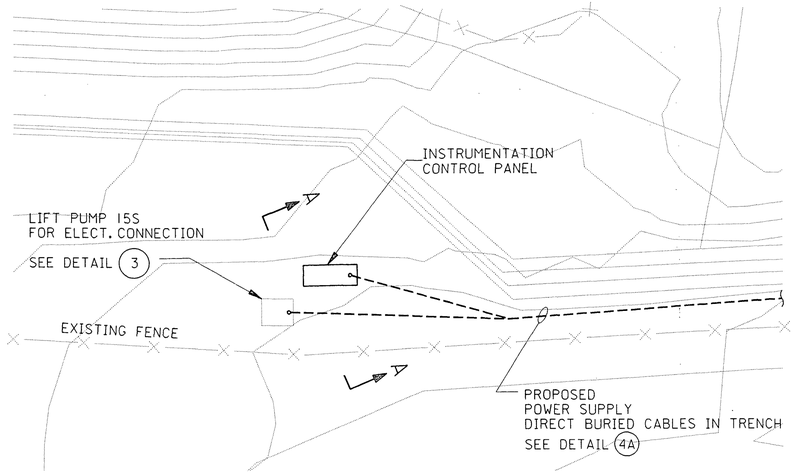

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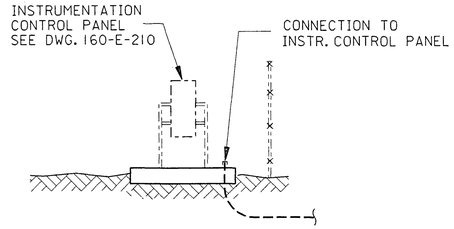

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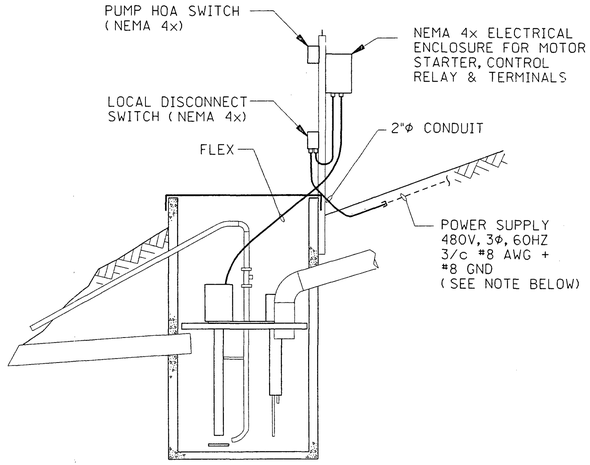
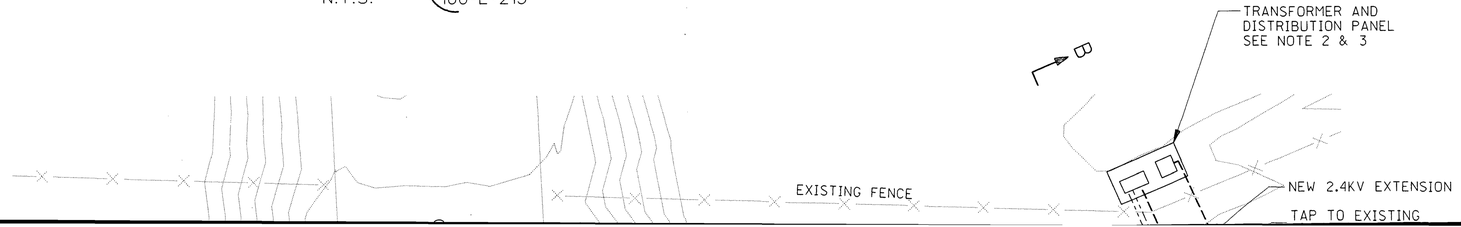
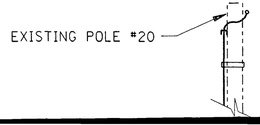


NOTE:

CONTRACTOR SHALL PROVIDE POWER CABLES SUITABLE FOR DIRECT BURIAL INSTALLATION.

DETAIL 3
N.T.S.





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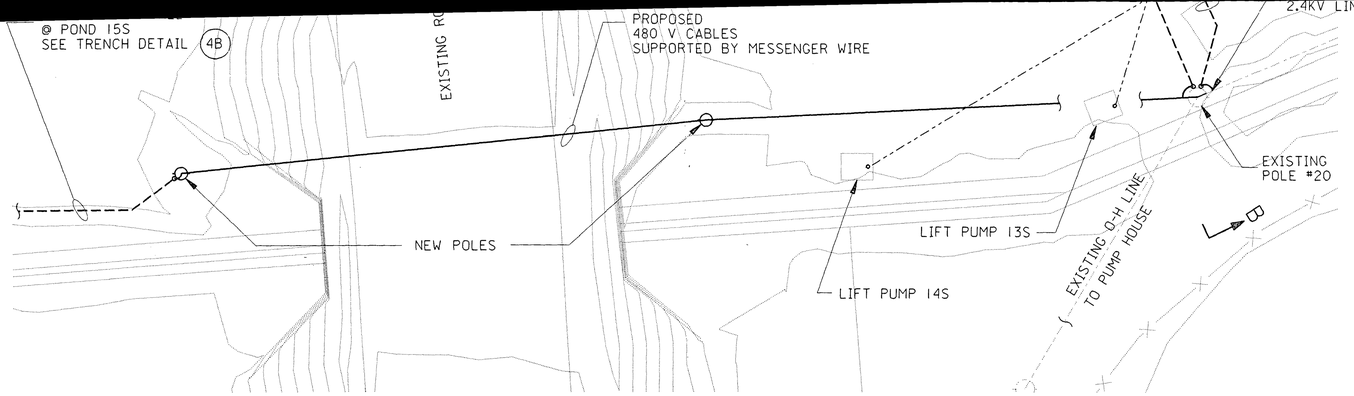

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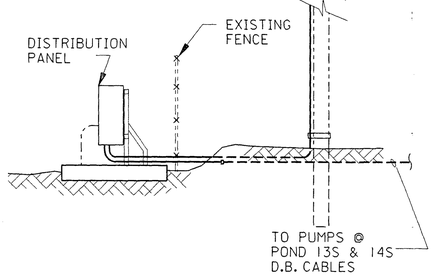

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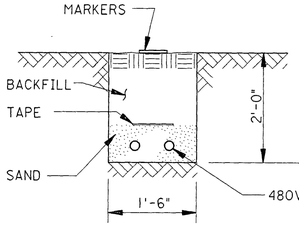

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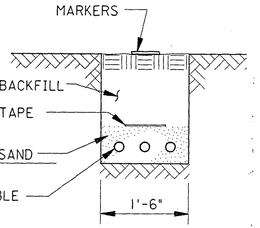

DETAIL 4B
N.T.S.

NOTES:

1.0 THE FOLLOWING TWO POWER SUPPLY INSTALLATION SYSTEMS ARE NEEDED FOR THE EQUIPMENT TO BE INSTALLED AT POND 15S:

A PROVIDE AN OVERHEAD 480V POWER LINE FROM THE DISTRIBUTION PANEL LOCATED NEAR EXISTING POLE #20 OVER TWO NEW POLES AT THE ROAD CROSSING.

B PROVIDE A CABLE TRENCH & CABLES SUITABLE FOR DIRECT BURIAL INSTALLATION. TRENCH SHALL BE LOCATED AND RUN PARALLEL TO WHAT IS PRESENTLY THE NORTH EDGE OF THE ACCESS ROAD AND FOLLOWING THE EXISTING PIPE RACK TO THE NEW POWER POLE LOCATED IN FRONT OF THE PIPE RACK OVERPASS.

2.0 TRANSFORMER, 45KVA WITH 2400V PRIMARY WINDING 480/277V SECONDARY, NEMA 3R, SIMILAR OR EQUAL TO GE TYPE 9T25B7832/45KVA OR APPROVED EQUAL.

3.0 DISTRIBUTION PANEL BOARD WITH 3R ENCLOSURE, 480V, 60Hz, 3Φ WITH MAIN CIRCUIT BREAKER RATED 100AMP AND (6) 3P 20 AMP BREAKERS, (3) 2P 20A BREAKERS AND (6) SPACES SIMILAR TO SQUARE D CLASS 1670 NF MERCHANDISE PANEL BOARD CAT # MH44WP I-LINE OR APPROVED EQUAL.

PROFESSIONAL ENGINEER REGISTERED 5/2/02 9359 STATE OF IDAHO VENKATRAM J. KOWSIK

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SCALE AS NOTED | DESIGNED J. KOWSIK | DRAWN R.H.STARCK | CHIEF ENGR

Bechtel
San Francisco

FMC IDAHO LLC
POCATELLO, IDAHO

POND 15S
SECTIONS & DETAILS

JOB No.	DRAWING No.	REV.
24230	160-E-216	0

FMC REF. No.

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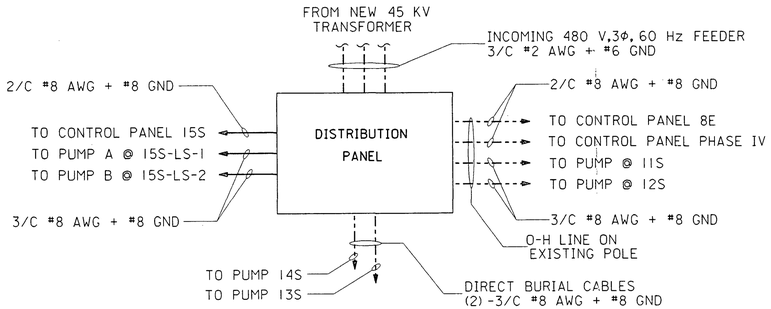

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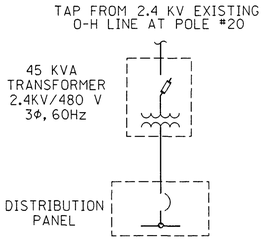
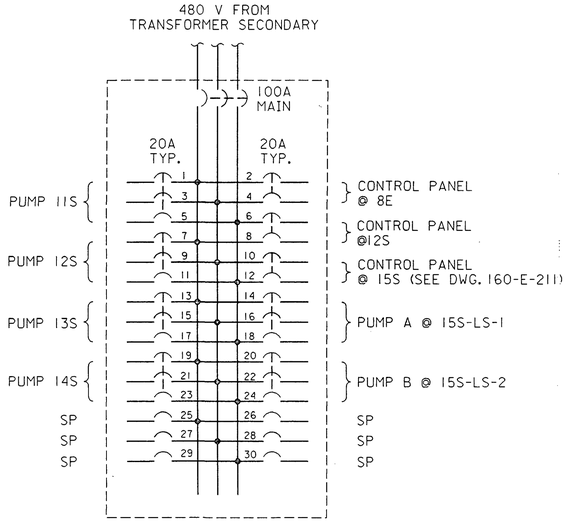


SINGLE LINE



DISTRIBUTION PANEL

NOTES:

1. DETAILS SHOWN ARE FOR INFORMATION ONLY. CONTRACTOR SHALL CONNECT TO THE DISTRIBUTION PANEL PROVIDED BY OTHERS.

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PROFESSIONAL ENGINEER REGISTERED 5/1/02 9359 STATE OF IDAHO VENKATRAM J. KOWSIK

FMC IDAHO LLC
POCATELLO, IDAHO

POND 15S
ELECTRICAL DIAGRAMS

JOB No.	DRAWING No.	REV.
24230	160-E-217	0

FMC REF. No.

22X34 'D'SIZE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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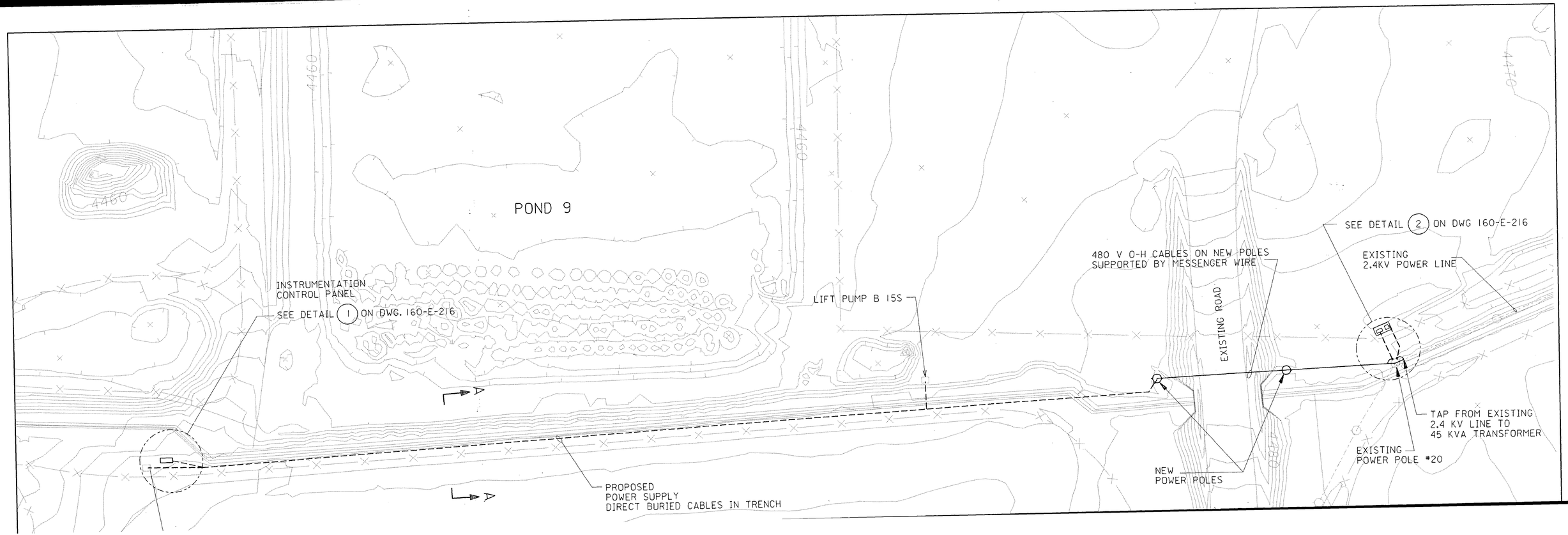

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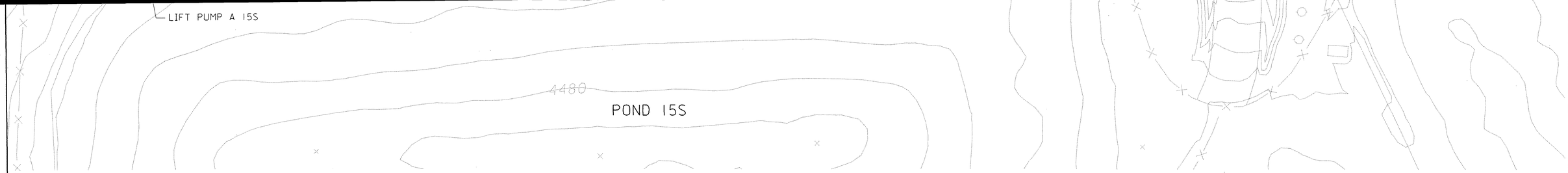
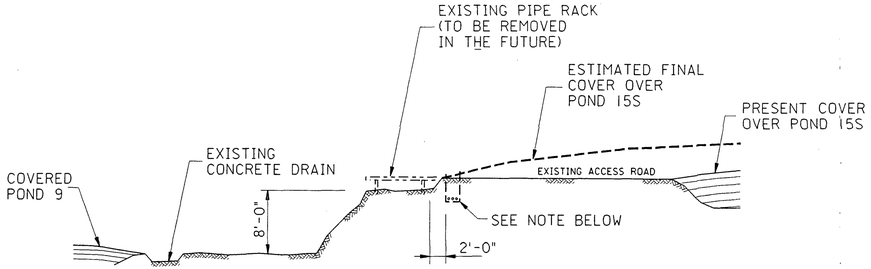


GENERAL NOTES:

1. INSTALLATION SHALL BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND COMPLY WITH ALL STATE AND LOCAL CODES.
2. CONTRACTOR TO PROVIDE NEW MESSENGER WIRES AND SUPPORT HARDWARE AS NEEDED BETWEEN EXISTING POLE #20 AND TWO NEW POLES IN THE VICINITY OF THE ROADCROSSING. MESSENGER CABLES INSTALLATION SHALL BE SIMILAR TO THOSE THAT ALREADY EXIST.
3. LOCATIONS OF NEW POLES ARE APPROXIMATE, CONTRACTOR TO VERIFY EXACT LOCATIONS.
4. FOR CABLE SIZES AND ROUTING, SEE BLOCK DIAGRAM ON DRAWING 160-E-217.
5. ALL CONDUITS ROUTED ABOVE GROUND SHALL BE RIGID STEEL (RSC), UNDERGROUND OR BURIED CONDUITS SHALL BE NON-METALLIC (NMC). MINIMUM SIZE 2".
6. CONTRACTOR SHALL PROVIDE ALL MATERIAL (BULK MATERIAL INCLUDED) REQUIRED FOR A COMPLETE INSTALLATION. ALL MATERIALS AND EQUIPMENT SHALL BE AS NOTED OR SHOWN ON DRAWINGS UNLESS APPROVED OTHERWISE.
7. THE CONTRACTOR SHALL ENSURE THAT ALL CABLES AND CONDUITS ARE APPROPRIATELY SECURED TO PANEL/EQUIPMENT SUPPORTS. CABLE AND CONDUIT ROUTING SHALL NOT CREATE ANY TRIP HAZARD OR BLOCK PERSONNEL MOVEMENT AROUND THE EQUIPMENT INSTALLED.



NOTE:

POWER SUPPLY FOR POND 15S SHALL CONSIST OF DIRECT BURIAL CABLES LOCATED IN A TRENCH AS SHOWN (ADJACENT TO THE PIPE RACK).

SECTION A
N.T.S.

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POND 15S
ELECTRICAL POWER LAYOUT

JOB No.	DRAWING No.	REV.
24230	160-E-215	0

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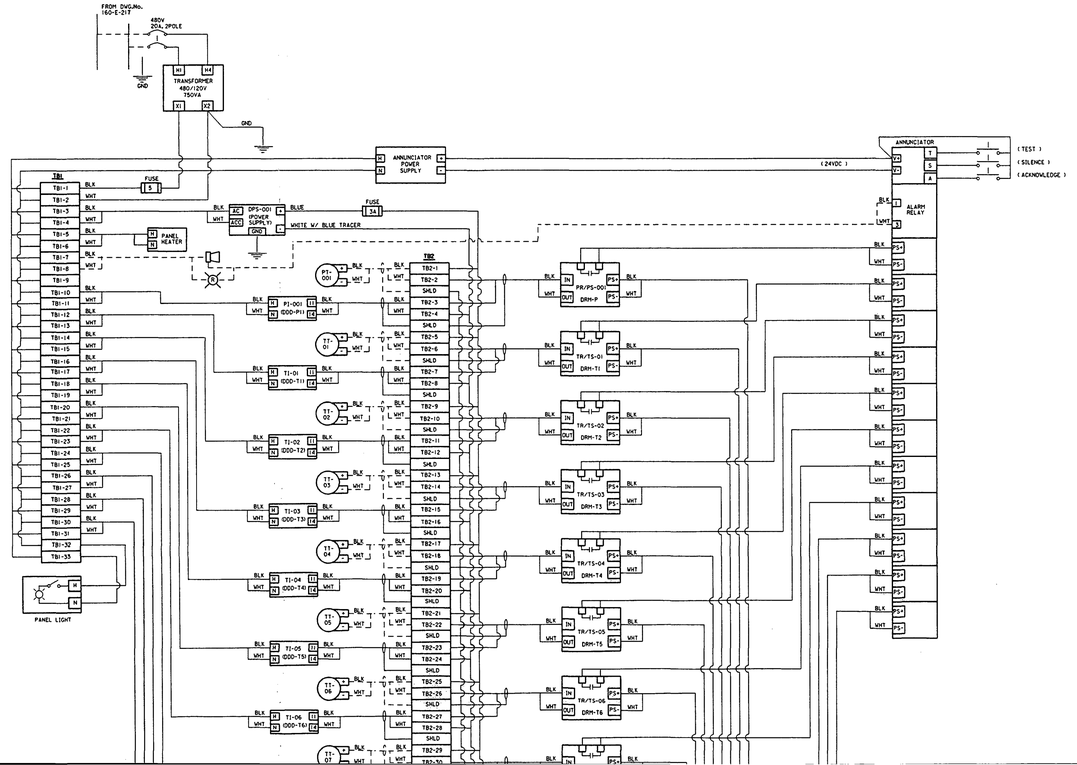
4 OF 13



LEGEND:

- - - - - FIELD WIRING

——— INTERNAL PANEL WIRING

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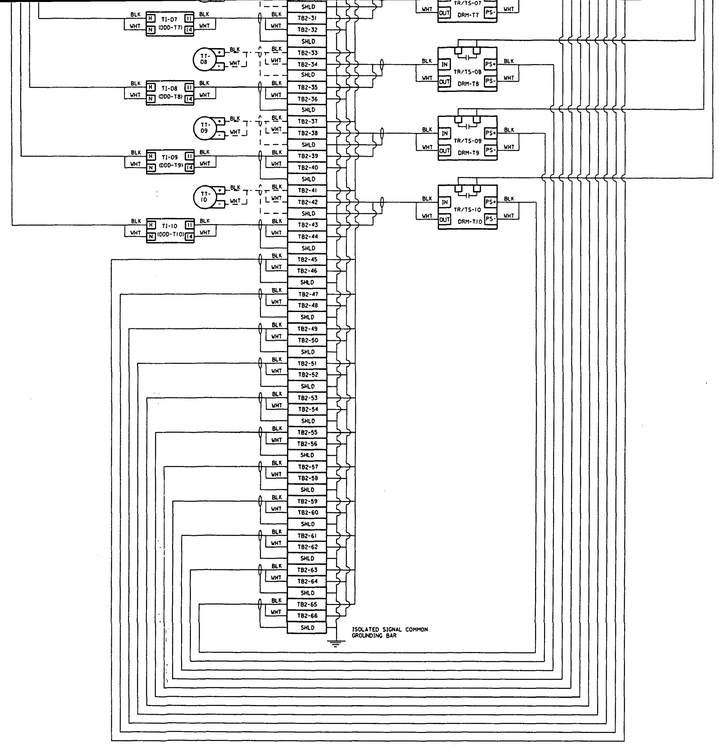

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POND 15S
PANEL INTERCONNECTION
WIRING DIAGRAM

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FMC REF. No.

JOB No.	DRAWING No.	REV.
24230	160-E-212	0

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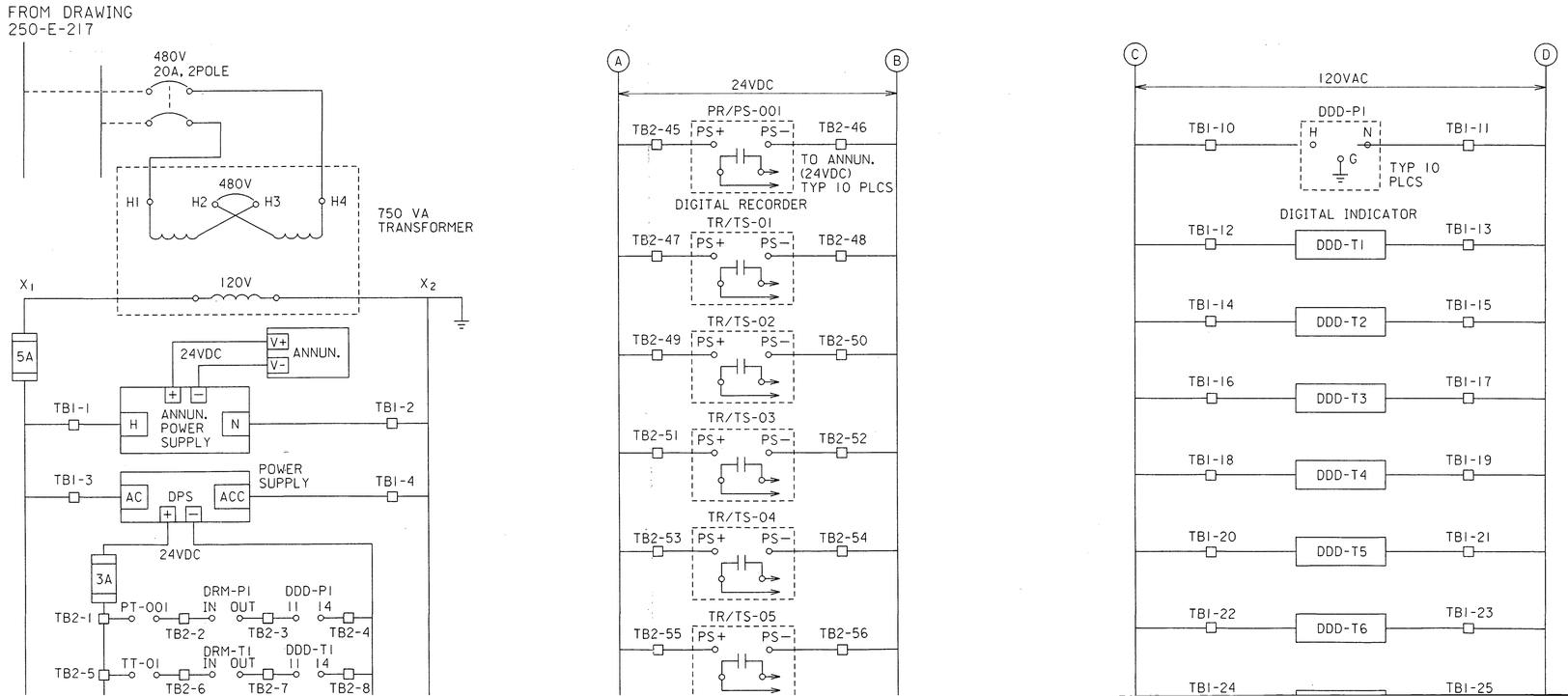

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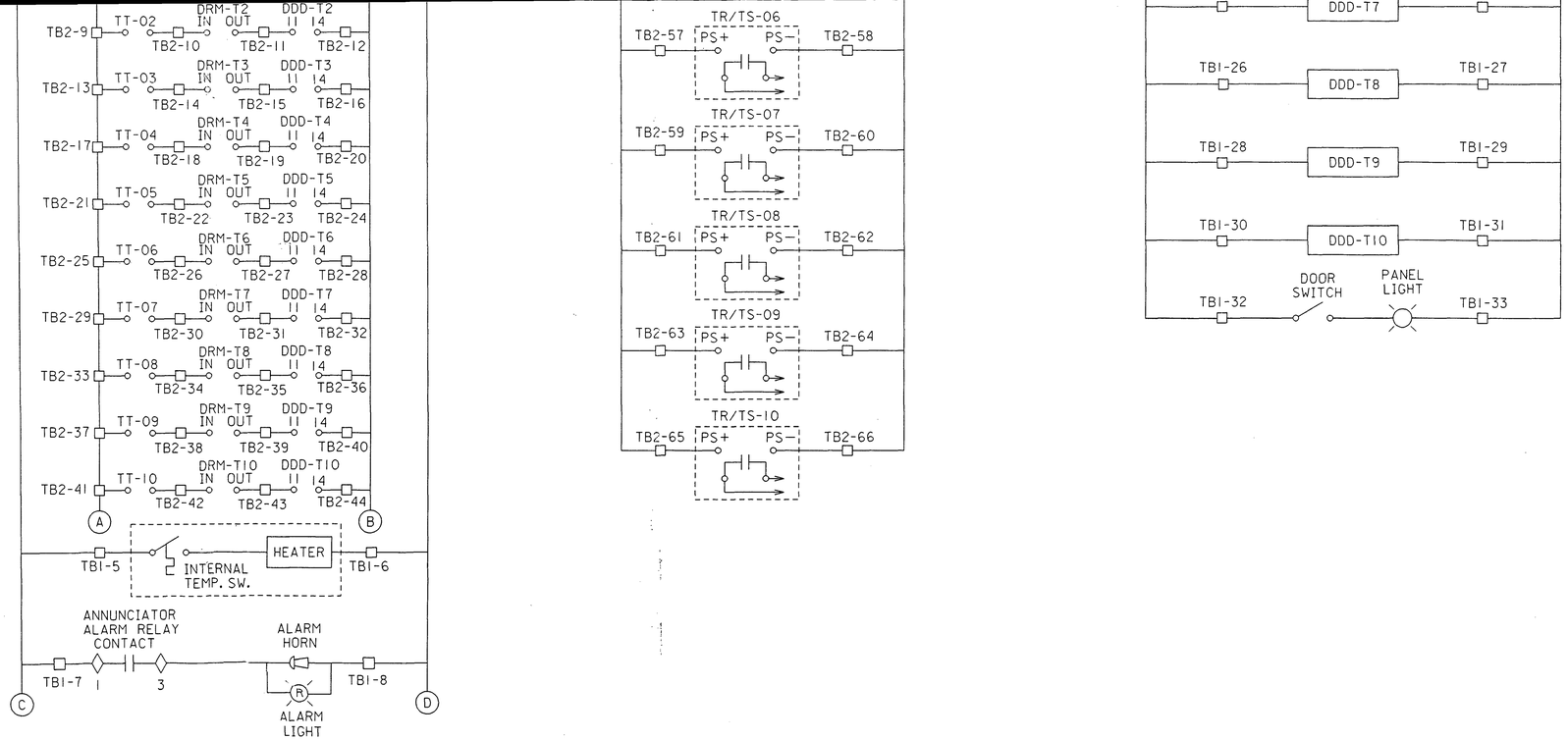

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POCATELLO, IDAHO

POND 15S
PANEL SCHEMATIC

JOB No.	DRAWING No.	REV.
24230	160-E-211	0

22X34 'D'SIZE

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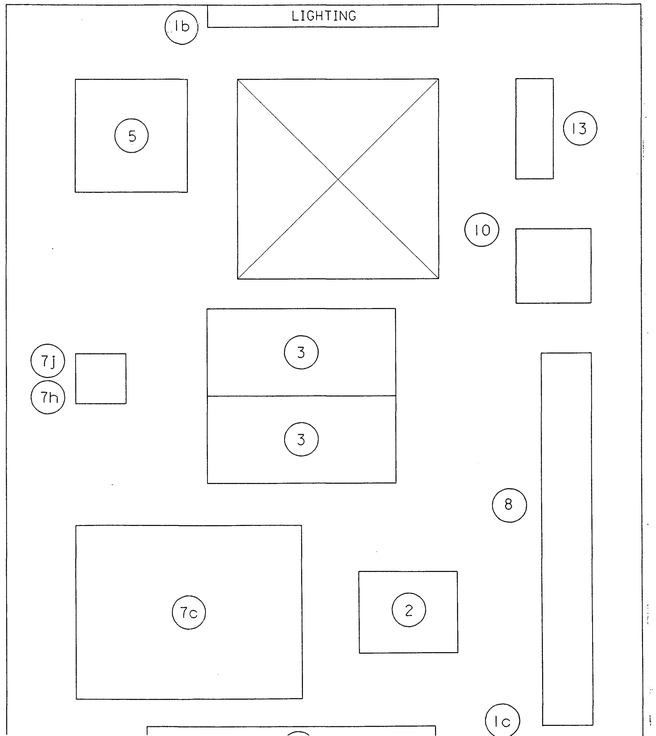

PANEL LMP-8E

ITEM #	QTY	DESCRIPTION
1	1 EA	a) HOFFMAN ENCLOSURE, NEMA 4, ANSI 61 GRAY, CAT #A-48H36FLP WITH b) SUB PANEL CAT #A-48P36, LIGHTING PACKAGE CAT # A-LF16D18 c) GROUNDING BAR SYSTEM # X-GS4K d) DRIP SHIELD KIT, CAT #A-DK36A
2	1 EA	MOORE INDUSTRIES, MAIN POWER SUPPLY 120 VAC/24 VDC 1200mA DIN RAIL MTG, CAT #DPS/24DC/1200mA/117AC [DIN]
3	11 EA	MOORE INDUSTRIES, DIGITAL RECORDER, CAT #DRM/4-20mA/RS232/12-42DC [DIN]
4	11 EA	MOORE INDUSTRIES, DIGITAL DISPLAY, 117 VAC POWERED, 4-20mA INPUT CAT #DDD/4-20mA/PRG/117AC/N4 [P]
5	1 EA	WESTINGHOUSE, MACHINE TOOL CONTROL TRANSFORMER, 230/460V TO 115V, 60HZ 750VA, WESCO STOCK No. 78-6680-09130 WESTINGHOUSE No. 1F0913 OR EQUAL
6	1 EA	FEDERAL SIGNAL, ROTATING WARNING LIGHT, MODEL #225/120 VAC/RED
7	AS NOTED	RONAN, a) 1 - ANNUNCIATOR MODEL 43x12-2000-IM-AS-0000 b) 3 - PUSHBUTTONS MODEL #202B, c) 1 - POWER SUPPLY, MODEL #115-24-125, d) 1 - SYSTEM DETAILS, MODEL #LM2-24, e) 1 - SUPPORT MODULES, MODEL #FHD-24000, f) 1 - FILTER, MODEL #RF-24-1, g) 1 - NEMA 4 DOOR, 43x12-1022N4, h) 1 - HORN RELAY, MODEL #KRP-24, j) 12 - BEZELS, MODEL #WB2-0 k) 1 - RELAY SOCKET, MODEL #146-103
8	AS REQ	ALLEN BRADLEY, 300V, 15A TERMINAL BLOCK CAT #1492-WF B242, W/ DIN RAIL: 199-DR1, END ANCHORS: 1492-EA35 OR EQUAL
9	1 EA	SELF CONTAINED THERMOSTAT CONTROLLED STRIP HEATER ADDED TO PROVIDE FREEZE PROTECTION
10	AS REQ	ALLEN BRADLEY, 600V, 30A TERMINAL BLOCKS CAT #1492-WFB1024, W/ DIN RAIL:199-DR1 END ANCHORS: 1492-N23 OF EQUAL

NOTES:

1.0 TERMINAL BLOCKS SHALL BE PROVIDED FOR ALL WIRING ENTERING (EXCEPT 480VAC POWER FEED) AND LEAVING THE PANEL, MOUNTED IN EASILY ACCESSIBLE LOCATIONS WHICH ALLOW ADEQUATE SPACE FOR HANDLING AND TERMINATING CABLES. TERMINAL BLOCKS SHALL HAVE 10 PERCENT SPARE TERMINALS. WIRE NUMBER SHALL BE MARKED ON TERMINAL BLOCKS.

2.0 INSTRUMENT WIRING SHALL BE LABELED AT EACH TERMINATION POINT WITH THE WIRE NUMBERS AS SHOWN ON THE PANEL WIRING DIAGRAMS. SELF-STICKING CABLE MARKERS SHALL BE USED TO IDENTIFY CABLES. SLEEVES SHALL BE USED TO IDENTIFY WIRES. TERMINAL BLOCKS SHALL BE IDENTIFIED ON EACH DRAWING.

3.0 24 VDC LOW-LEVEL ANALOG SIGNAL CIRCUITS SHALL BE RUN USING SHIELDED TWISTED CABLE PAIRS. WIRING SHALL BE RUN IN WIREWAYS OR SHALL BE NEATLY GROUPED IN PACKS BY USING NONMETALLIC WIRING CLEATS OR BANDS. SEPATATION BETWEEN AC POWER/ CONTROL WIRING AND DC mV/mA SIGNAL WIRING SHALL BE PROVIDED TO PREVENT NOISE INTERFERENCE AND SHALL NOT BE RUN IN THE SAME WIREWAY.

4.0 PANEL SHALL BE PROVIDED WITH A GROUNDING PAD, BUS OR LUG FOR FIELD CONNECTION TO EXISTING GROUND.

5.0 POWER AND CONTROL CABLES SHALL BE RATED 600V AND INSTRUMENTATION CABLES SHALL BE RATED 300V FOR CONTINUOUS OPERATION AT A CONDUCTOR TEMPERATURE OF 90°C FOR DRY LOCATIONS AND 75°C FOR WET LOCATIONS.

6.0 CONDUCTORS SHALL BE STRANDED, COATED SOFT OR ANNEALED COPPER, CLASS B.

7.0 UNLESS SPECIFIED OTHERWISE, CONTROL WIRING MINIMUM SIZE SHALL BE No. 14 AWG, POWER WIRING MINIMUM SIZE SHALL BE No. 12 AWG, AND INSTRUMENTATION WIRING SHALL BE MAXIMUM No. 16 AWG.

8.0 INSTRUMENTATION CABLES SHALL BE SHIELDED TWISTED PAIR.

9.0 THE SELLER SHALL PERFORM CIRCUIT CONTINUITY AND FUNCTIONAL TESTS AND SUBMIT RESULTS. ALL INSTRUMENTS SHALL BE INSPECTED AND FULLY FUNCTIONALLY TESTED IN THE SELLER'S SHOP PRIOR TO SHIPMENT TO THE JOBSITE.

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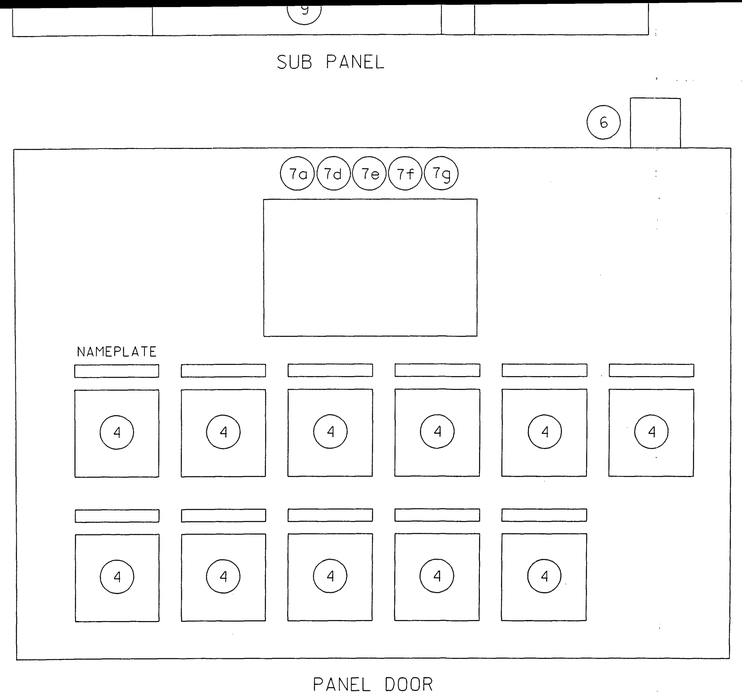

LOCAL MONITORING PANEL LMP-15S

11	AS REQ	BUSSMAN FUSE SIZE 5x20mm CAT #GDA-3.15A
12	AS REQ	BUSSMAN FUSE SIZE 13/32x1½" CAT #KTK-R-5
13	1	ALLEN BRADLEY, 20A CIRCUIT BREAKER, 2 POLE, 480V CAT #1492-CB2G060 W/ MOUNTING RAIL #199-DR1

NAMEPLATE LEGEND:

1.	PI-001	PRESSURE IN, HgA
2.	TI-01	TEMPERATURE °C
3.	TI-02	TEMPERATURE °C
4.	TI-03	TEMPERATURE °C
5.	TI-04	TEMPERATURE °C
6.	TI-05	TEMPERATURE °C
7.	TI-06	TEMPERATURE °C
8.	TI-07	TEMPERATURE °C
9.	TI-08	TEMPERATURE °C
10.	TI-09	TEMPERATURE °C
11.	TI-10	TEMPERATURE °C

10.0 PANELS TO BE SUPPLIED WITH ALL ITEMS MOUNTED AND INTERNAL WIRING COMPLETE. ITEMS ATTACHED TO PANEL TO BE WIRED. (ALARM HORN, ALARM LIGHT & PUSHBUTTONS)

11.0 SEPARATE ISOLATED TERMINAL STRIPS TO BE SUPPLIED FOR TERMINATING FIELD SIGNAL WIRES, SHIELD WIRES AND POWER WIRING.

12.0 ALARM SET POINTS SHALL BE 27 INCHES OF MERCURY ABSOLUTE PRESSURE FOR PRESSURE SENSOR AND 22°C (71.6°F) FOR TEMPERATURE SENSOR.

13.0 SUBPANEL ARRANGEMENT MAY VARY DUE TO GOOD ENGINEERING JUDGEMENT.

14.0 ANNUNCIATOR ENGRAVING SIZE TO BE USED: ¼"

PROFESSIONAL ENGINEER REGISTERED 5-2-02 9359 STATE OF IDAHO VENKATRAM J. KONSIK

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POND 15S
PANEL LAYOUT

JOB No.	DRAWING No.	REV.
24230	160-E-210	0

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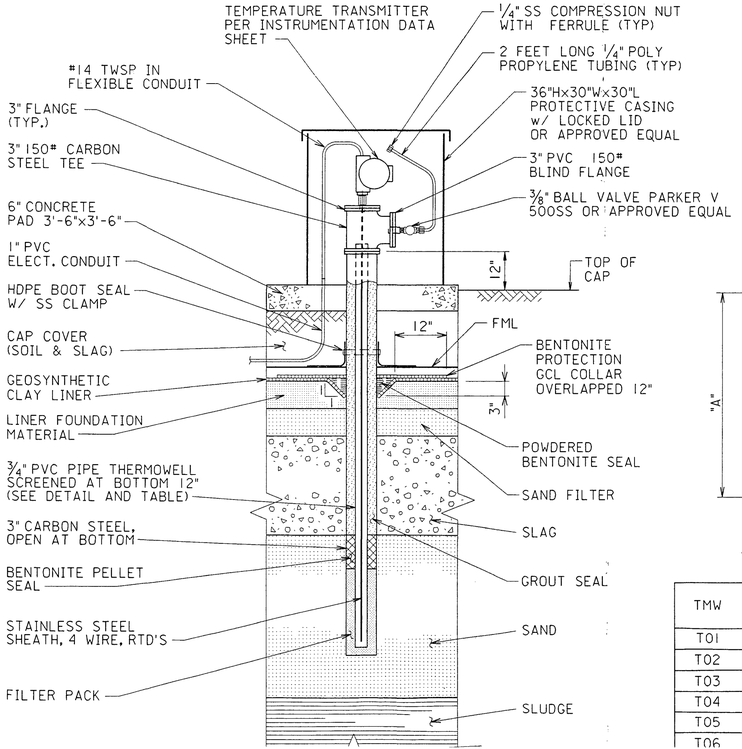
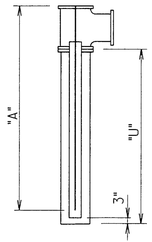
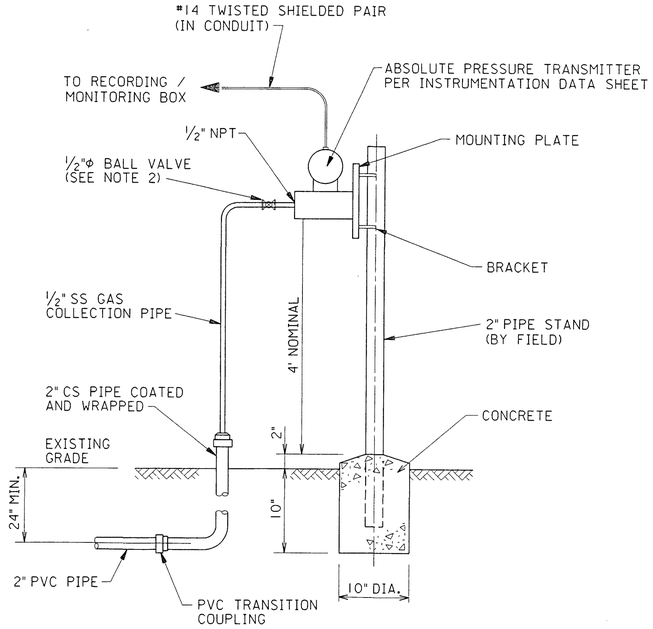




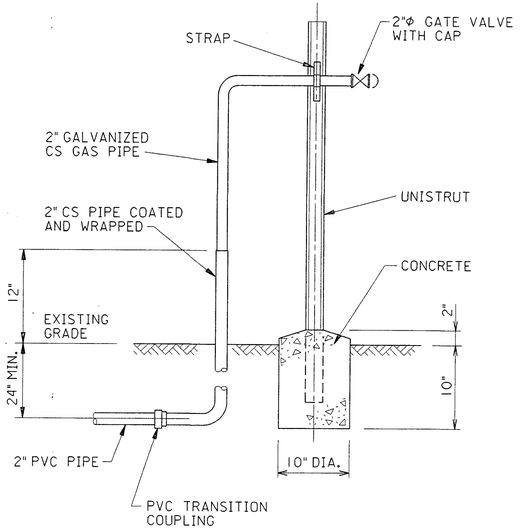
DETAIL

TMW	WELL LENGTH "U"	SENSOR LENGTH "A"
T01	15'-2"	15'-2"
T02	14'-6"	14'-6"
T03	14'-2"	14'-2"
T04	14'-2"	14'-2"
T05	15'-0"	15'-0"
T06	17'-8"	17'-8"



NOTE:

SYSTEM TO BE INSTALLED PER MANUFACTURER'S INSTALLATION INSTRUCTIONS



DETAIL 4

NTS

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T07	17'-10"	17'-10"
T08	17'-10"	17'-10"
T09	17'-10"	17'-10"
T10	16'-7"	16'-7"

NOTE:

1. SYSTEM IS TO BE INSTALLED PER MANUFACTURER'S INSTALLATION INSTRUCTIONS.
2. WELL LENGTH "U", THERMOWELL AND SENSOR LENGTH "A" ARE ALL THE SAME, SEE DETAIL.
3. FINAL DIMENSION TO BE VERIFIED IN THE FIELD.

TEMPERATURE SENSOR AND TRANSMITTER SCHEMATIC INSTALLATION DETAILS

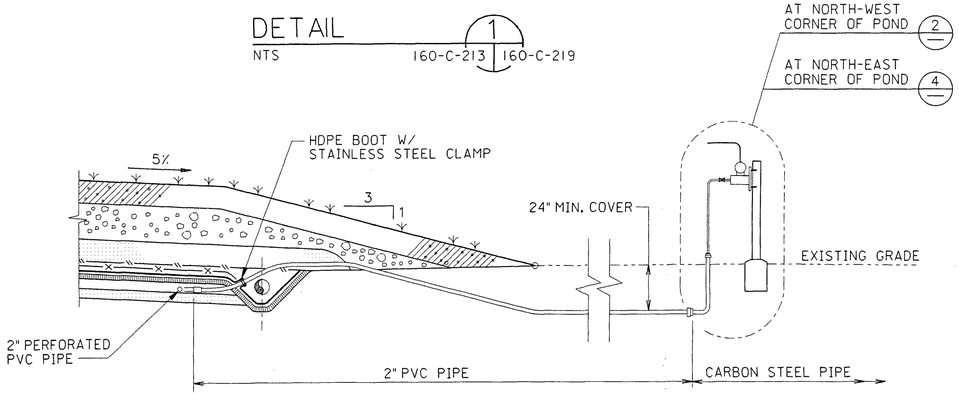
DETAIL 1
NTS 160-C-213 | 160-C-219

PRESSURE SENSOR / TRANSMITTER SCHEMATIC INSTALLATION DETAILS

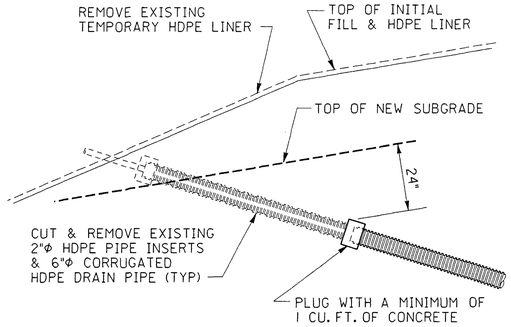
DETAIL 2
NTS

NOTES:

1. FOR NOTES SEE DWG 160-C-210.
2. THE STAINLESS STEEL BALL VALVE HAS A 1 PIECE BODY WITH FEMALE PIPE THREAD, 316 SS, NIBCO MODEL T-560-S6-R-66 OR APPROVAED EQUAL.



SECTION A
NTS 160-C-213 | 160-C-219



EXISTING PIPING DETAIL 3
NTS 160-C-210 | 160-C-219

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POND 15S
FINAL CAP
SECTIONS & DETAILS SHEET 3

PROFESSIONAL ENGINEER REGISTERED 7890 STATE OF IDAHO ROBERT NG
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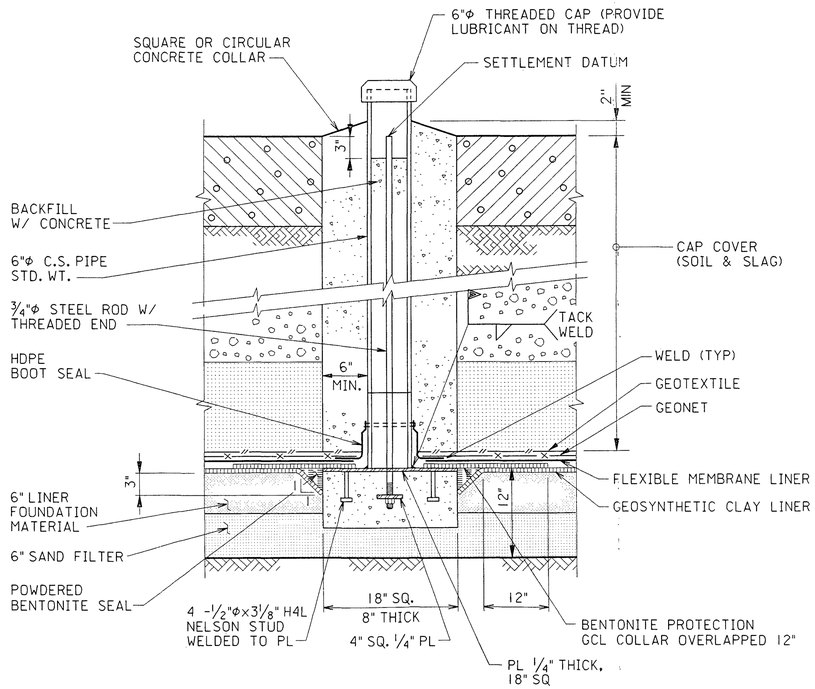

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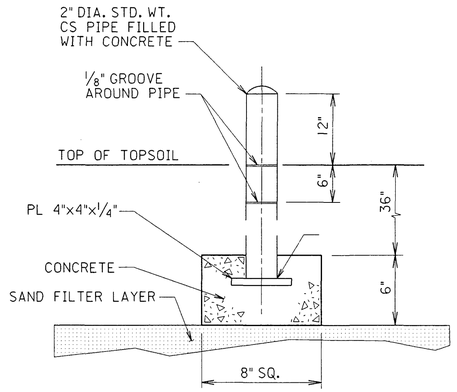
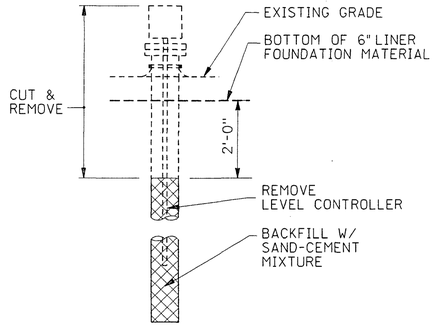


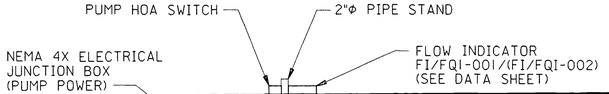
TOPSOIL THICKNESS INDICATOR

DETAIL 2
NTS 160-C-213 | 160-C-218



OBSERVATION WELL

DETAIL 3
NTS 160-C-210 | 160-C-218



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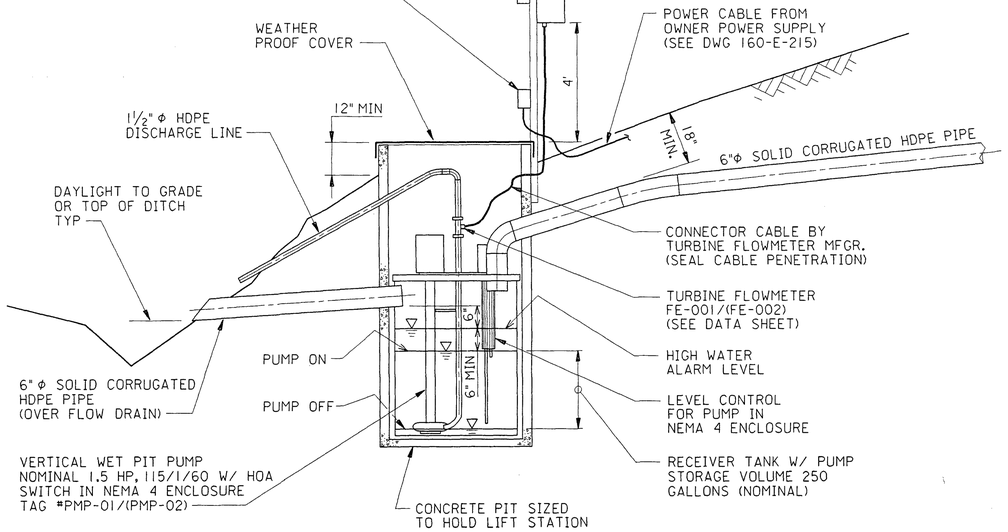
SEE NOTE 2



LIFT STATION LS-1 (LS-2)

PACKAGE SYSTEM COMPLETE WITH PUMP PMP-01, LEVEL CONTROL, HIGH LEVEL ALARM & RECEIVER TANK. ALL PREWIRED & READY FOR FIELD CONNECTONS. SOURCE: VANTON PUMP & EQUIPMENT CORP. (OR EQUAL)

DETAIL 4
NTS 160-C-217 | 160-C-218

NOTES:

1. FOR NOTES SEE DWG 160-C-210.
2. DELINEATOR POST 4 FEET ABOVE GRADE WITH BRIGHT COLOR MARKING SHALL BE PROVIDED AT ALL SETTLEMENT MONUMENTS.

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5-2-02

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San Francisco

FMC IDAHO LLC
POCATELLO, IDAHO

POND 15S
FINAL CAP
SECTIONS & DETAILS SHEET 2

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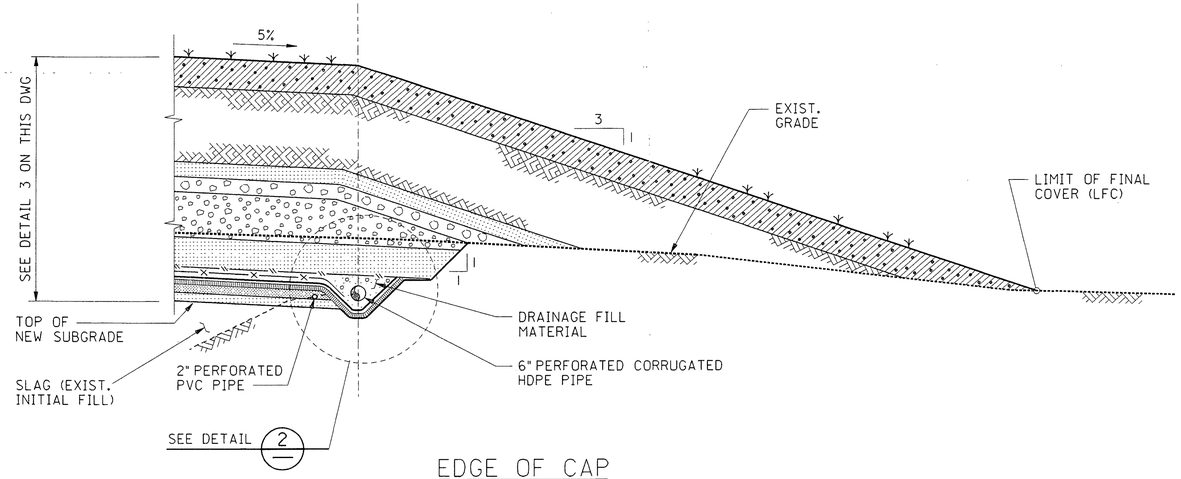

EDGE OF CAP

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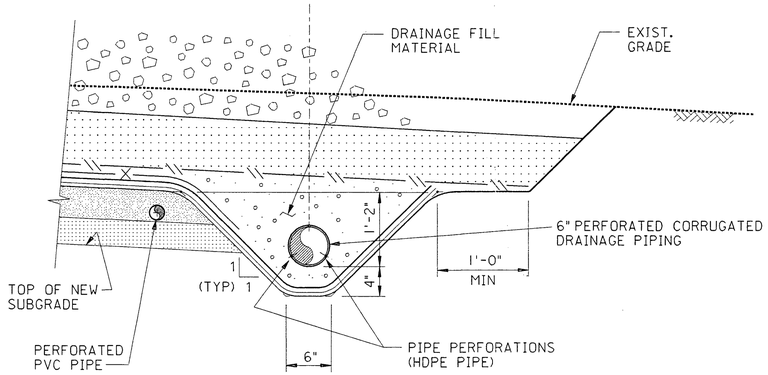
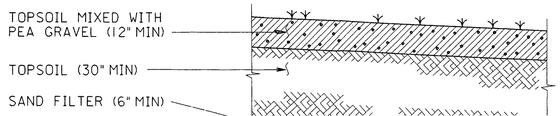
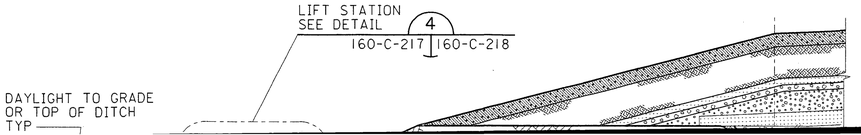
160-C-216 | 160-C-217



ANCHOR TRENCH

DETAIL 2
NTS





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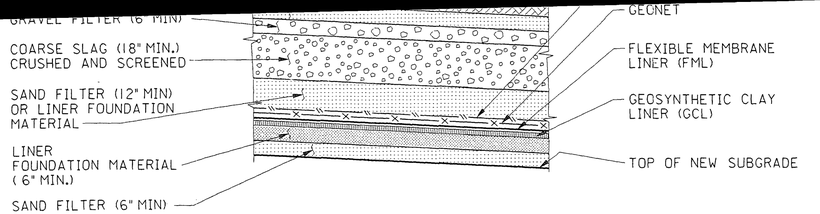
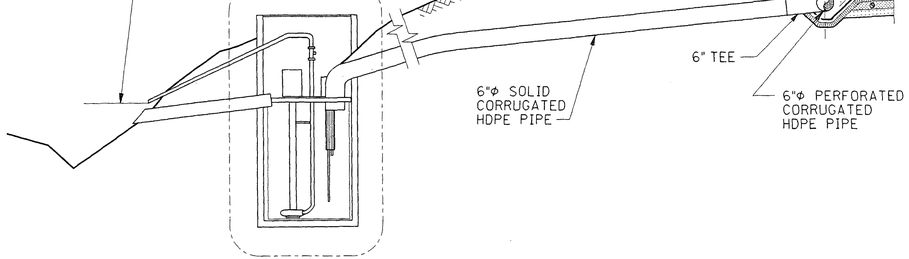


TYPICAL COVER SECTION

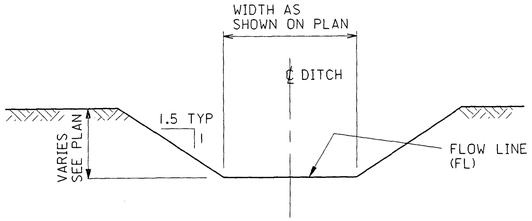
DETAIL 3
NTS 160-C-216 | 160-C-217



SECTION A
NTS 160-C-213 | 160-C-217

NOTES:

1. FOR NOTES SEE DWG 160-C-210.



UNLINED DITCH

SECTION B
NTS 160-C-212 | 160-C-217

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POCATELLO, IDAHO

POND 15S
FINAL CAP
SECTIONS & DETAILS SHEET 1

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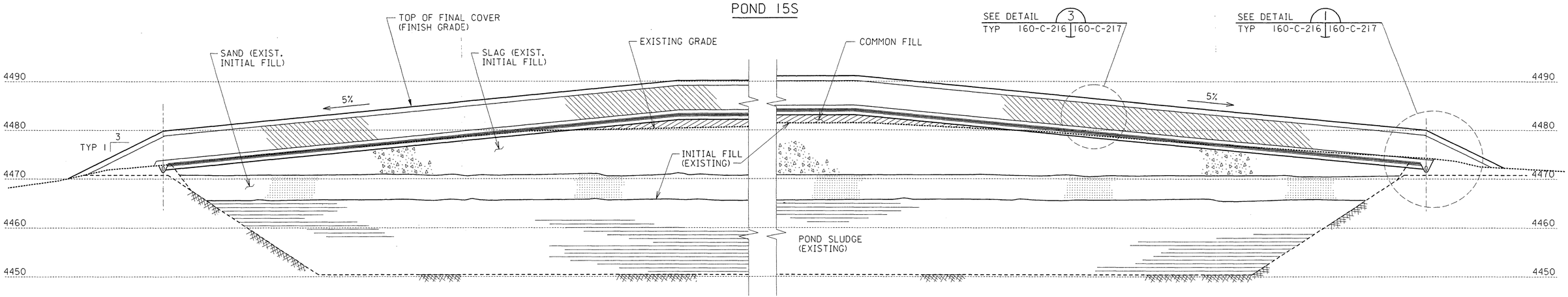

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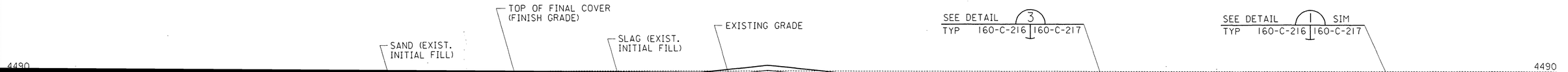
SECTION A

HORIZ.: 1" = 20'
VERT.: 1" = 10'

160-C-213 | 160-C-216



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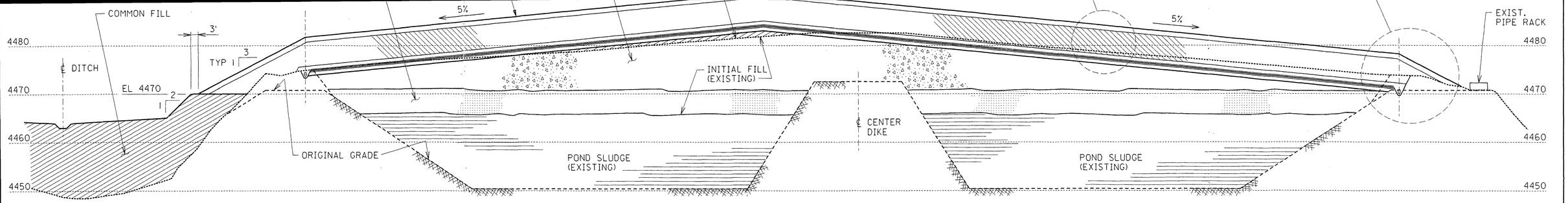

SECTION B

HORIZ.: 1" = 20'
VERT.: 1" = 10'

160-C-213 | 160-C-216

NOTES:

1. FOR NOTES SEE DWG 160-C-210.

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FINAL CAP SECTIONS

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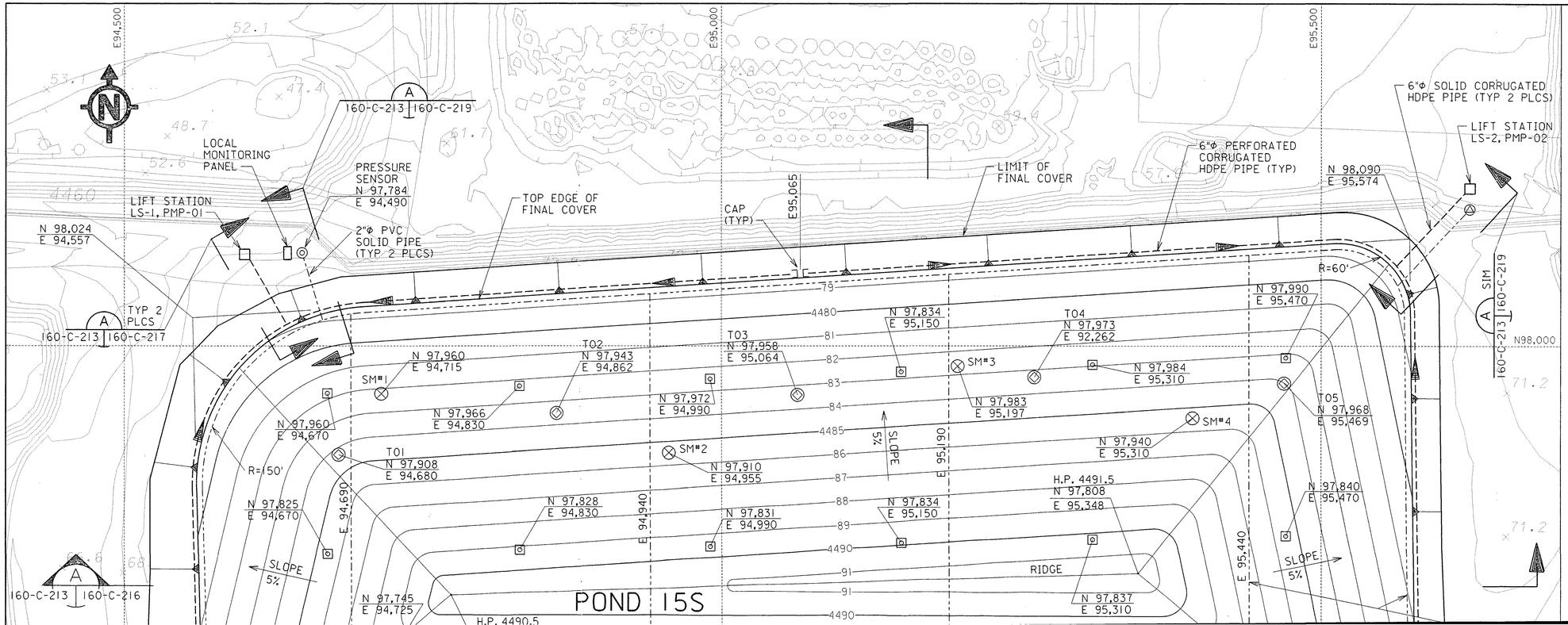

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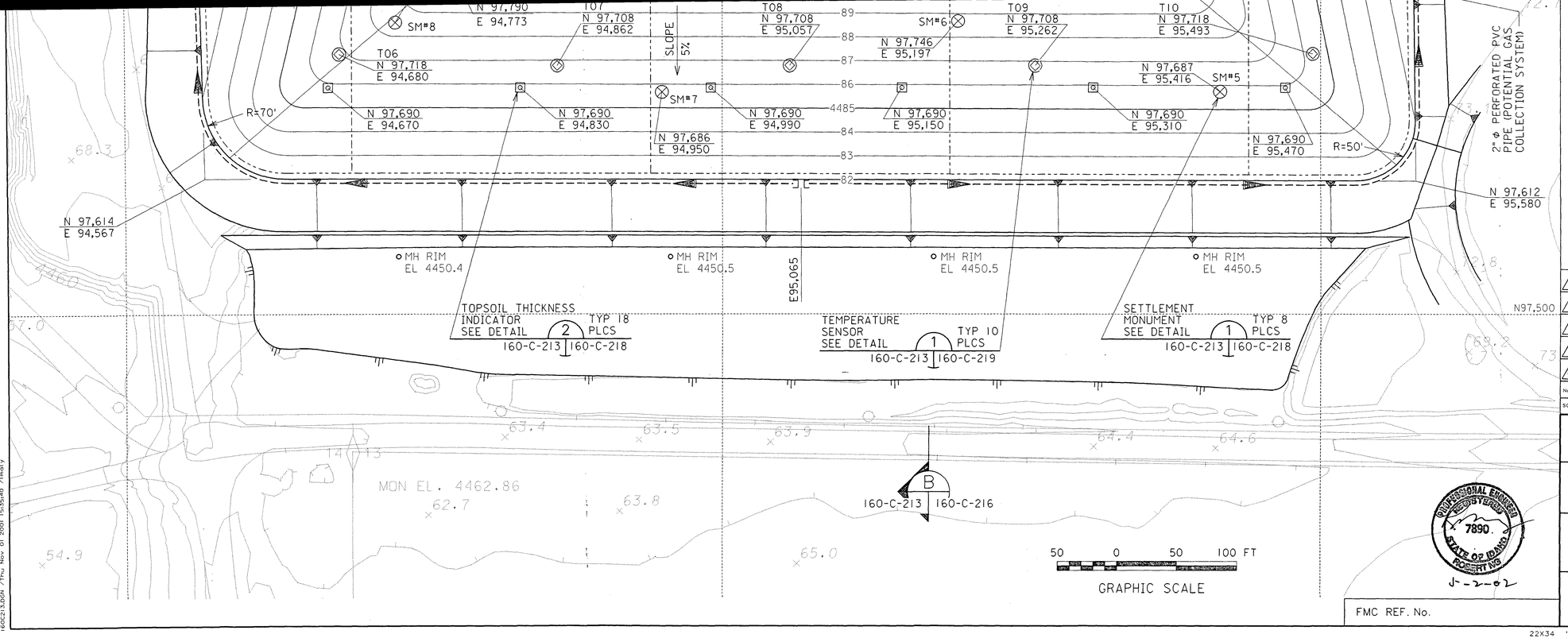

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POND 15S
FINAL COVER
FINAL CAP PLAN

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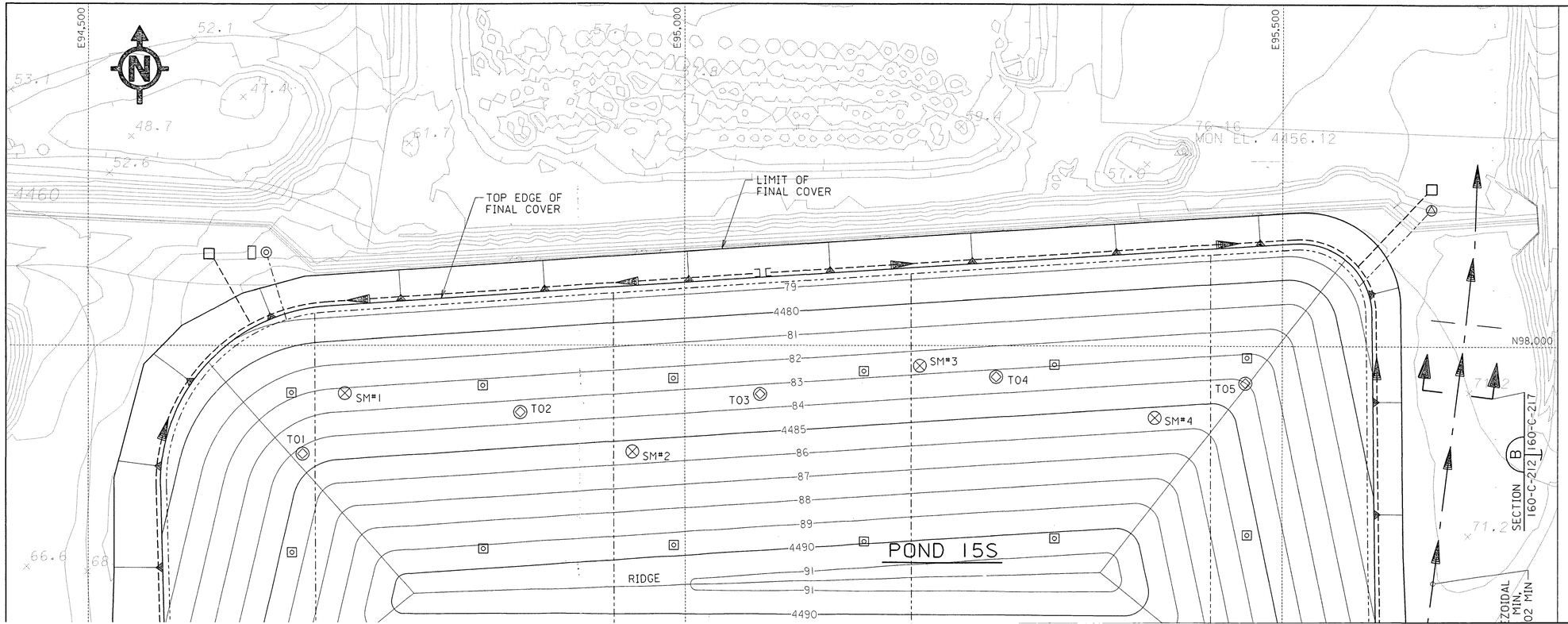

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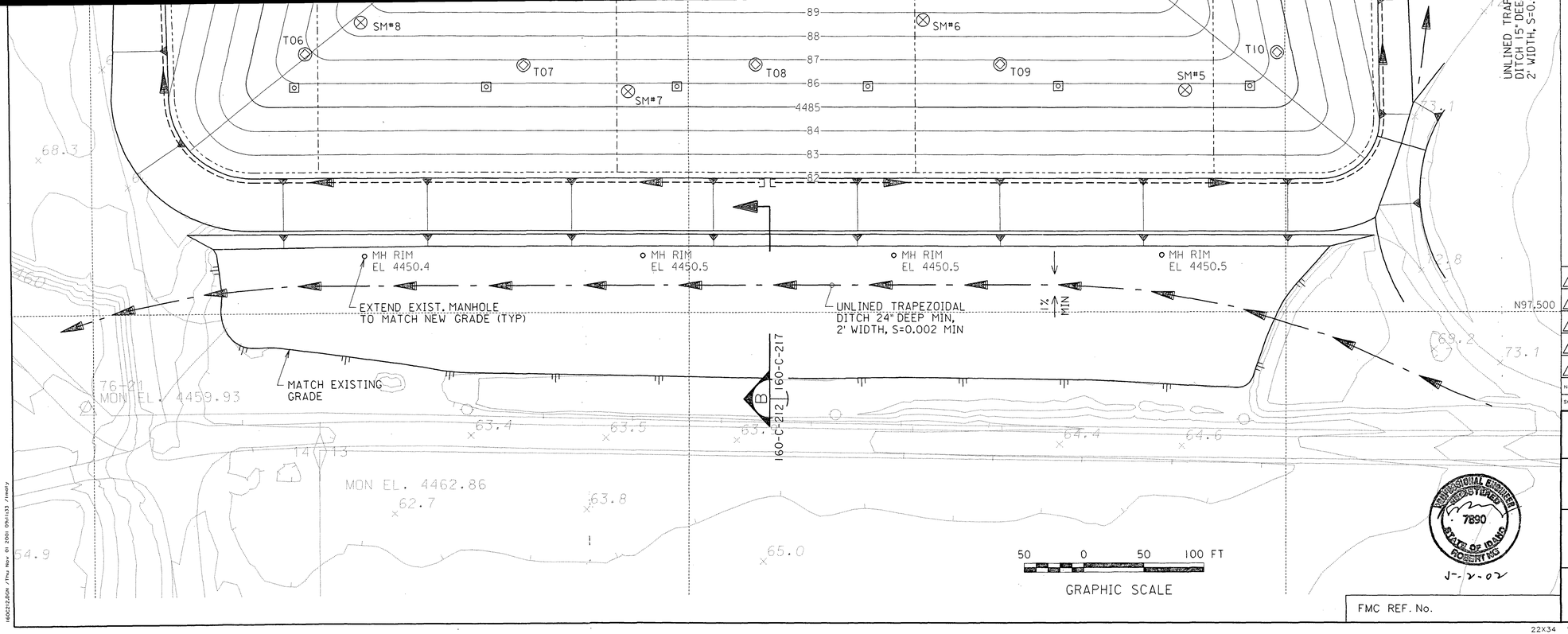

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POND 15S
FINAL COVER
FINISH GRADING AND DRAINAGE PLAN

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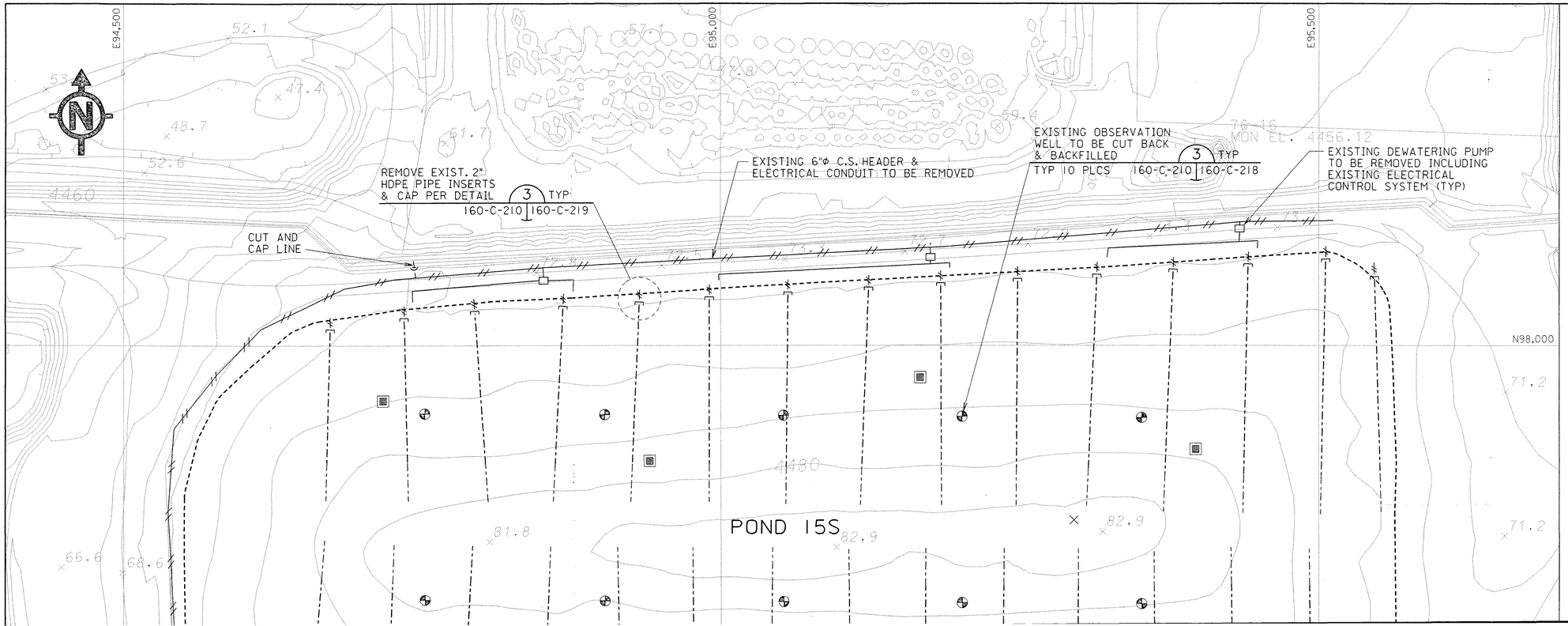

NOTES

1. BACKGROUNDS ARE REPRODUCED FROM TOPOGRAPHIC MAPS BY A&E ENGINEERS, DATED APRIL 2000.
2. MATERIAL AND CONSTRUCTION REQUIREMENTS SHALL BE IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

15S-S-4	EARTHWORK AND GRADING
15S-S-5	GEOSYNTHETIC CLAY LINER
15S-S-6	FLEXIBLE MEMBRANE LINER
15S-S-7	GEONET & GEOTEXTILE
15S-S-8	TOPSOIL & SEEDING
15S-S-9	INSTALLATION OF TEMPERATURE MONITORING POINTS (WELLS)

3. COORDINATES SHOWN ARE BASED ON FMC PLANT GRID.
4. ELEVATIONS SHOWN ARE BASED ON NAD 1983 COORDINATES AND FMC ELEVATIONS

LEGEND

- 4470 — EXISTING CONTOURS
- 4470 — FINISH CONTOURS
- SIDE SLOPES
- PERIMETER DRAIN
- GAS COLLECTION SYSTEM
- SETTLEMENT MARKER
- T06 — TEMPERATURE MONITORING WELL

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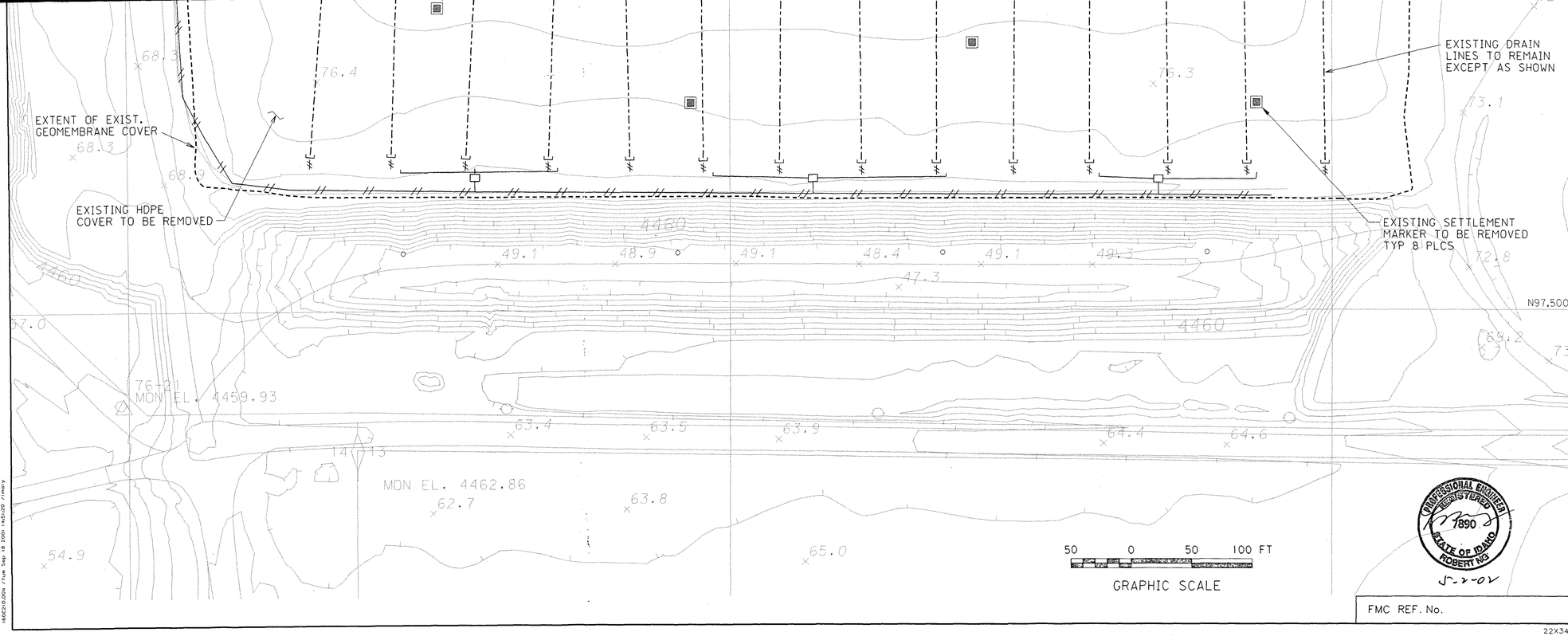

H.P.	HIGH POINT
L.P.	LOW POINT
	EXISTING PIPE TO BE REMOVED
SM#1	SETTLEMENT MONUMENT
	EXIST. OBSERVATION WELL
	PRESSURE SENSOR
	TOPSOIL THICKNESS INDICATOR

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POND 15S
DEMOLITION PLAN

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Appendix J

APPENDIX J

NOT USED

(CONSOLIDATION/SETTLEMENT ANALYSIS

has been replaced by Calc. No. 24230-016-4)

SEE APPENDIX M

Appendix K

APPENDIX K

FIELD GEOTECHNICAL INVESTIGATION – FMC PONDS 8S AND 15S

FIELD GEOTECHNICAL INVESTIGATION
EASTERN MICHAUD FLATS PROJECT
FMC PONDS 8S AND 15S
POCATELLO, IDAHO

Submitted to:

BECHTEL ENVIRONMENTAL

San Francisco, California

Submitted by:

BCI

Lakeland, Florida

BCI File No. 938858

January 1994

BCI
BROMWELL & CARRIER, INC.

P.O. Box 5467
Lakeland, FL 33807-5467
USA

(813) 646-8591
FAX: (813) 644-5920

ENGINEERS • DESIGNERS • SCIENTISTS

January 6, 1994
BCI File 938858

SENT VIA FEDERAL EXPRESS (AIRBILL NO. 8191974980)

Ms. Alison Jones, Ph.D.
Bechtel Environmental, Inc.
50 Beale Street
San Francisco, CA 94105-1895

RE: FMC Corporation
Eastern Michaud Flats Project
Scope of Work No. 20906-15S-1
Final Geotechnical Field Investigation Report

Dear Dr. Jones:

BCI is pleased to submit our final report summarizing the geotechnical field investigations of Ponds 8S and 15S at FMC's Pocatello, Idaho operations.

Please call us if you have any questions or need additional information.

Sincerely,

BCI

Cornelis Winkler III, P.G.
Project Manager

CW3/kav
Enclosures
8858001C.REP

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2.4-2	Moisture Count Rate vs. Percent Moisture, FMC Pond 15S

INTRODUCTION

In November 1993, BCI (Bromwell & Carrier, Inc.) personnel completed a geotechnical field investigation at the FMC Pocatello, Idaho facility. The investigation included sampling the soft pond sludge and completing in-situ tests in disposal Ponds 8S and 15S. Sampling and testing were completed to obtain data for the design of the planned closure of the tailings ponds.

Our field work was completed from a pontoon barge on the water surface of the ponds. FMC provided the barge and the personnel to move it within the ponds. Bechtel provided a geotechnical engineer to direct the investigation and a site health and safety officer. The test locations at each pond and the testing completed at each bore hole were selected by Bechtel's on-site engineer.

Samples of the pond sludge were collected at various depths using two types of piston tube samplers. Samples were transported by Bechtel's engineers to the FMC chemical laboratory for analyses. In-situ tests included the undrained shear strength using a shear vane, pore pressure measurements, and density and moisture content determinations using a nuclear density probe. Locations of probes are indicated in Figures 1.0-1 and 2.0-1 for Pond 8S and 15S, respectively.

This report is organized in two sections. Section 1.0 presents procedures and data for Pond 8S. Section 2.0 presents procedures and data for Pond 15S. Field reports, formula derivations, and test references are presented in the Appendices.

1.0 POND 8S SAMPLING AND TESTING

On November 15, 1993, BCI mobilized a two-man field sampling and testing crew from Lakeland, Florida to Pocatello, Idaho. BCI personnel attended a site-specific hazard and safety training orientation provided by FMC. All work was completed in accordance with FMC safety policies and the task-specific Health and Safety Plans for the closure activities.

The field work was completed from a pontoon barge on the water surface of Pond 8S. Typical values for water depth to the top of the sludge were five to seven feet. FMC provided a field office, the barge, and the personnel to move the barge within the pond. Bechtel provided a geotechnical engineer to direct the investigation and a site health and safety officer. The test locations within Pond 8S and the tests completed at each location were selected by Bechtel's on-site engineer. The locations of all field tests are shown on Figure 1.0-1. Table 1.0-1 summarizes the work schedule and testing completed on Pond 8S. Appendix A includes field reports for work completed on Pond 8S.

Field testing of the pond sludge included vane shear testing, pore pressure measurements, and in-situ density and moisture testing. The test methods were selected to obtain data required to characterize physical properties of the sludge. Vane shear testing was completed to determine the in-situ and remolded shear strength of the sludge. Pore pressure data was gathered to obtain information regarding the consolidation characteristics of the sludge. Density and moisture content were determined using a nuclear density probe.

1.1 Pond 8S Vane Shear Testing

Shear strength was determined at sample locations BH-1A, BH-2, BH-3, BH-4, BH-5A, BH-6, and BH-7 (Figure 1.0-1). Shear strength testing was completed with a modified torque wrench system and field vane/rod combinations capable of testing very soft to firm soils. Two different sized vanes were used to accurately test the range of soil strengths encountered. Each vane consisted of four blades at 90 degree angles.

The hand-operated vane was pushed to the desired test depth, after which the wrench was slowly turned clockwise until the sludge failed. The peak torque in inch pounds was recorded along with the test depth and the vane size. Next, the vane was turned 360 degrees five times, the torque wrench reset to zero, and the procedure repeated to determine the remolded torque. The vane was pushed to the next test depth and the procedure repeated until resistance to penetration precluded the advancement of the vane further. The process was repeated at each test depth using only the rod without a vane to determine rod-only values.

Two different sized vanes were utilized for varying shear strengths. For weak or soft sludge, a medium sized vane was used; a small vane was used for firmer sludge. Listed below are the dimensions of the vanes used to test the sludge in Pond 8S.

Vane Designation	Vane Height (inches)	Vane Diameter (inches)	k (ft^3)
Small	6.0	2.0	0.02424
Medium	8.5	2.9	0.07107

A computer spreadsheet was used to reduce the data based on the applied torque and the size of the vane. The shear strength of the sludge was calculated using the following formula as found in ASTM D2573 (Appendix C).

$$S = T \div k$$

where: S = the shear strength of the sludge in pounds per square foot (psf)
T = the applied torque in inch-pounds
k = a constant dependent on the size of the vane in cubic feet

The constant k(ft^3) was determined using the following formula as found in ASTM D2573:

$$k = (\pi/1728) \times (D^2H/2) \times [1 + (D/3H)]$$

where: D = the diameter of the vane in inches
H = the height of the vane in inches

Shear strength profiles in Pond 8S extend to depths that range from 4.3 feet to 20.5 feet below the mud line. Vane shear testing was terminated when impenetrable material was encountered. For each shear strength profile, initial and remolded shear strengths were determined with depth on one to three foot intervals. The accuracy of the test results are primarily dependent on the accuracy of the torque wrench. The torque wrench used has an accuracy of 2.5 inch pounds which corresponds to a shear strength of approximately three and nine pounds per square foot (psf) for the medium and small vane respectively. Vane shear testing was terminated when impenetrable material was encountered.

Tables 1.1-1 through 1.1-7 include vane shear data for Pond 8S. Peak strength values range from 0 to 400 psf, values which are typical of very soft to soft soils. The remolded strength data range from about 0 to 80 psf. Figures 1.1-2 through 1.1-8 include plots of shear strength versus depth for bore hole locations in Pond 8S.

Peak strength values were generally very low (<100 psf) in the upper two to six feet of pond sludge and typically increased significantly downward. Measurements reflecting reduced peak strength values with depth occurred when the same size vane was used (BH2, nine feet below mud line) and when deeper measurements were made with the small vane (BH2, seven feet below the mud line). The variable strength values reflect the heterogeneous nature of the pond sludge deposit.

In some instances, the value recorded for the remolded rod torque exceeded that of the remolded vane torque. We have attributed this to lateral variations in the

pond sludge strength at the same depth and increased resistance along the length of rod in the rod-only measurements compared with measurements made with the vane.

We attempted to normalize the remolded rod only torque data by plotting all the Pond 8S values and determining a best fit curve for rod only torque versus depth. The expression below was used to calculate the normalized remolded rod only values. As noted on Tables 1.1-1 through 1.1-7, a few calculated remolded rod only values exceed vane and rod values.

$$\text{Remolded Rod Torque} = 0.71449 \times \text{Depth}^{1.0277}$$

1.2 Pond 8S Piston Tube Sampling

Piston tube sampling techniques were used at three locations in Pond 8S. The piston tube samplers were operated by manually pushing the sampler into the sludge to a specified depth and holding the piston stationary while advancing the sampling tube. Two types of piston tube samplers were used to collect samples of Pond 8S sludge. The first, a gun-type sampler, has a small orifice at the bottom through which the sample enters the piston. The orifice (about 3/8 inch in diameter) allows very soft sludge to be sampled. Use of this sampler resulted in increased sample recovery in the near-surface sludge.

A more traditional, cylindrical piston tube sampler was typically used to sample sludge from five feet below the mud line to depths where refusal was encountered. A locking mechanism on the cylindrical sampler prevents sludge from displacing the piston as it is advanced to the sample depth.

At each location, sampling was generally completed within one foot of the top of the mud line and at three-foot intervals thereafter. Upon retraction, samples were immediately extruded into labeled glass jars, the lid was screwed on, the jar was rinsed, and the jar was placed under water in a cooler. It was necessary to store the samples under water because of their flammable nature on contact with air. The recovered sample was not undisturbed, but because each sample is saturated, the laboratory calculated total unit weight should provide an indication of the in-situ

density. By taking a series of samples at various depths at the same location, a vertical profile of unit weight and solids content was determined.

The maximum sampling depth that can be obtained with the hand-operated piston tube sampler is a function of solids content (typical maximum of about 60 percent, which corresponds to a wet unit weight of 100 pounds per cubic foot). Piston sampling in Pond 8S reached a maximum depth of about 13 feet below the mud line.

Table 1.2-1 includes the field data for the piston tube sampling completed by BCI. The total unit weight, percent solids content, and percent moisture content data were provided by Bechtel based on laboratory analyses completed by FMC.

1.3 Pond 8S Pore Pressure Measurements

Pore pressure measurements were recorded at various depths within the pond sludge. Pore pressure profiles were completed adjacent to piston sampling locations.

The measurements were completed using two GEONOR model 600 vibrating-wire pore pressure probes and a model P-520H digital vibrating wire gauge indicator. Each probe is calibrated when manufactured and does not require further calibration by the user; however, the probe was checked after shipment to the job site in a swimming pool for verification of manufacturer's calibration.

The basic operational principle of the gage is as follows: the frequency at which a stretched wire vibrates is dependent on the amount of tension in the wire. As the tension in the wire is relaxed, the frequency that the wire vibrates decreases. The vibrating wire probes used for this field investigation operate according to this basic principle. A pre-tensioned wire located in the probe is attached to a circular membrane on one side, and the housing of the probe on the other. As pressure is applied to the membrane, the tension in the wire is relaxed and the frequency decreases. If the pressure on the membrane decreases, the tension in the wire and the resulting frequency increases. A diagram of the pore pressure configuration and calibration data for the two pore pressure probes utilized in Pond 8S are included in Appendix D.

Pore pressure is calculated in accordance with the formula provided by the manufacturer as shown below:

$$P = A(f - f_o) + B(f - f_o)^2$$

Where P = Applied load on the transducer in bars
f = output frequency from transducer measured in Hz
f_o = output frequency from transducer with no load in Hz
A & B are constants which vary for each instrument

The probes are capable of measuring pressures from 0 to 2 Bars and can operate in temperatures from -20 to +60 degrees celsius. The accuracy of the probe is less than one percent of the frequency measured which corresponds to approximately one-half inch.

Prior to taking measurements in the field, the porous stone and tip assembly of the pore pressure probe must be deaired. The procedure used for deairing the assembly was to boil it for ten minutes, allow it to cool, insert it in a rubber membrane (under water), and transport it to the barge in a small container of water. Prior to inserting the probe into the pond, the porous stone and tip assembly was attached to the probe housing utilizing a large drum of water to keep the assembly saturated. Next, the entire probe assembly was placed into a closed-end, PVC pipe filled with water to enable the probe to be placed in the pond. Once the probe was placed in the pond, the PVC pipe was removed.

The device was advanced by manually pushing the probe to the desired depth and allowing the pore pressure generated from inserting the probe in the sludge to dissipate. Once the pressure appeared to reach equilibrium, the oscillating frequency of the vibrating wire was recorded, the probe was pushed to the next depth, and the procedure was repeated.

Equilibrium decay time at each depth interval typically ranged from about twenty minutes to several hours at various depths within the sludge profile. Because the sludge behaves in accordance with the theory of finite strain consolidation, where both consolidation and permeability characteristics change significantly with changes in void ratio, the time for the pore pressure to reach equilibrium depended on the amount of excess pore pressure developed during the probe advancement and the permeability of the sludge at the pore pressure sensor location.

Results of the ten pore pressure probe measurements completed in Pond 8S are shown in Table 1.3-1 along with the depths of the measurements below the water surface and mud line. The hydrostatic pore pressure is equal to the depth below the water surface at each test depth. The probe locations are correlated to sampling locations as indicated in Table 1.0-1. The dissipation curve for each pore pressure results are graphically presented in Figures 1.3-1 through 1.3-9. The dissipation curve for BH-6 at 12 feet below the mud line is not included because of erroneous data (Table 1.3-1).

1.4 Pond 8S Nuclear Density Measurements

Bulk density and moisture content measurements were made using a Campbell Pacific Nuclear (CPN) Model 501 DepthProbe. The unit consists of a sealed probe containing a gamma ray source (Cesium 137) and gamma detector for density measurements, and a neutron source (Americium 241) and thermal neutron detector for moisture determinations. The probe is connected via cable to an electronic data display and data logger unit.

The density channel of the DepthProbe consists of a gamma source and gamma detector separated by a shield to minimize direct contact with the detector. Gamma rays interact with matter in two ways: by compton scattering and photoelectric absorption. In low density materials (< 90 pcf) scattering effects dominate, resulting in an increase in detected counts with increasing density. In higher density materials (>90 pcf) absorption effects dominate and detected counts decrease with increasing density.

The moisture channel consists of a source of fast (or high energy) neutrons and a detector of slow (or thermal) neutrons. The fast neutrons lose energy through interaction with matter, reducing their energy to the thermal level. Hydrogen is extremely effective in slowing down the fast (high energy) neutrons in comparison with other elements. Thus the number of detected slow neutrons is generally proportional to the amount of hydrogen (and water) in soil matter. The presence of other elements such as chlorine and boron can affect the slow neutron count since they absorb thermal neutrons.

The CPN DepthProbe is supplied with several factory calibrations based on standards of low, medium, and high density concrete aggregates. The instrument can also be calibrated in the field against known soil densities and moisture contents.

Density and moisture depth profile measurements were made at several locations in ponds 8S (Table 1.0-1). For calibration purposes, sludge samples were collected for laboratory analysis of bulk density and moisture content at 24 of the 31 measurement points. Field procedures consisted of lowering the probe into a sealed, 2" PVC well casing that had been driven into the sludge. At the specified depth, readings of density count rate, moisture count rate, and machine calculated values (based on factory calibrations) of wet density, dry density, and moisture content were recorded. A count interval of 64 seconds was used for all but one of the measurements where a count interval of 256 seconds was used.

Results for density count rates and moisture count rates along with corresponding laboratory measured values for wet density and solids content for Pond 8S are tabulated in Table 1.4-1. As shown, laboratory measured density values ranged from 67 to 93 pcf. Laboratory measured solids content ranged from 14 to 45 percent. FMC personnel, who completed the laboratory testing, are of the opinion that the solids content values are unrepresentatively low. During the drying phase of the procedure, combustible solids contained in the pond sludge were burnt off, and were not therefore included when solids content was determined.

During field data collection, results calculated using the machine factory calibrations were shown to be erroneous. Machine calculated values for wet density, dry density, and moisture content are not therefore provided. Figures 1.4-1 and 1.4-2

are plots of density count rates versus laboratory measured wet density and moisture count rates versus laboratory measured moisture content. As shown, there is no discernable relationship between the laboratory measured density and moisture content values and detected count rates. Reasons for this lack of correlation may include the following:

1) Interference from gamma radiation sources in the sludge may have affected measured density count rates. Relatively high radionuclide levels in the sludge indicate this is a possibility.

2) Neutrons may have been absorbed by possible chlorine and bromide containing compounds in the sludge, which would have reduced measured moisture count rates.

3) Laboratory measurements of solids content are unrepresentatively low due to the drying procedure used in the FMC laboratory.

POND 8S TABLES

TABLE 1.0-1
FMC POCATELLO
POND 8S WORK SUMMARY

DATE	POND NUMBER	BORE HOLE NUMBER / COORDINATES	VANE SHEAR TESTING		PISTON TUBE SAMPLING		PORE PRESSURE PROBE		NUCLEAR DENSITY TESTING
			SIZE	NUMBER OF TESTS	SAMPLER TYPE	NUMBER OF SAMPLES	PROBE NUMBER	NUMBER OF TESTS	(NUMBER OF TESTS)
11/19/93	8S	BH1A H-3	MED SMALL	7 2	GUN PISTON	3 2	2	4	7
11/18/93	8S	BH2 G-3	MED SMALL	6 5	---	---	---	---	---
11/16/93	8S	BH3 E-3	---	---	PISTON	4	2	4	---
11/17/93	8S	BH3 E-3	MED SMALL	6 5	---	---	---	---	9
11/17/93	8S	BH4 D/C 3	MED	7	---	---	---	---	---
11/18/93	8S	BH5 I-5 BH5A I/H-5	SMALL MED SMALL	1 10 2	--- ---	--- ---	--- ---	--- ---	--- ---
11/18/93	8S	BH6 G-5	MED SMALL	12 4	---	---	---	---	---
11/20/93	8S	BH6 G-5	--- ---	--- ---	GUN PISTON	3 4	2 1	1 1	5
11/17/93	8S	BH7 E-5	MED SMALL	5 1	---	---	---	---	---

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TABLE 1.1-1
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 1A
COORDINATES H-3
FIELD TESTING NOVEMBER 19, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	6	3	0	0	6	3	7	0.3	4	0.2
1.0	Medium	7	2	0	1	7	1	8	0.4	2	0.1
3.0	Medium	22	14	1	2	21	12	25	1.2	14	0.7
6.0	Medium	100	11	1	5	99	6	116	5.6	8	0.4
9.0	Medium	132	17	5	7	127	10	149	7.1	12	0.6
12.0	Medium	192	21	10	9	182	12	213	10.2	14	0.7
13.0	Medium	235	23	9	10	226	13	265	12.7	15	0.7
15.0	Small	126	8	17	12	109	0 *	375	17.9	0	0.0
17.0	Small	93	8	26	13	67	0 *	230	11.0	0	0.0

* - Corrected remolded torque less than or equal to zero.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-2
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 2
COORDINATES G-3
FIELD TESTING NOVEMBER 18, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	2	0	0	0	2	0 *	2	0.1	0	0.0
1.0	Medium	2	0	0	1	2	0 *	2	0.1	0	0.0
2.0	Medium	15	6	0	1	15	5	18	0.8	5	0.3
3.0	Medium	103	7	2	2	101	5	118	5.7	6	0.3
4.0	Medium	111	3	2	3	109	0	128	6.1	0	0.0
5.0	Medium	141	11	4	4	137	7	161	7.7	9	0.4
7.0	Small	42	4	5	5	37	0 *	127	6.1	0	0.0
8.0	Small	70	5	8	6	62	0 *	213	10.2	0	0.0
9.0	Small	62	6	8	7	54	0 *	186	8.9	0	0.0
10.0	Small	90	8	15	8	75	0 *	258	12.3	0	0.0
11.0	Small	145	5	11	8	134	0 *	461	22.1	0	0.0

* - Corrected remolded torque less than or equal to zero.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-3
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 3
COORDINATES E-3
FIELD TESTING NOVEMBER 17, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	71	19	0	0	71	19	83	4.0	22	1.0
1.0	Medium	35	2	1	1	34	1	40	1.9	2	0.1
2.0	Medium	25	3	1	1	24	2	28	1.3	2	0.1
3.0	Medium	92	6	1	2	91	4	107	5.1	4	0.2
4.0	Medium	115	12	8	3	107	9	125	6.0	11	0.5
5.0	Medium	172	19	6	4	166	15	195	9.3	18	0.9
6.0	Small	31	13	6	5	25	8	86	4.1	29	1.4
7.0	Small	41	5	8	5	33	0 *	113	5.4	0	0.0
9.0	Small	74	7	15	7	59	0 *	203	9.7	0	0.0
12.0	Small	112	12	32	9	80	3	275	13.2	10	0.5
13.5	Small	250	36	**	10	250	26	859	41.2	88	4.2

* - Corrected remolded torque less than or equal to zero.
** - Refusal Encountered With Rod At 12.0 Feet
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-4
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 4
COORDINATES D/C-3
FIELD TESTING NOVEMBER 17, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	21	1	0	0	21	1	25	1.2	1	0.1
1.0	Medium	16	6	2	1	14	5	16	0.8	6	0.3
3.0	Medium	24	3	4	2	20	1	23	1.1	1	0.0
5.0	Medium	55	4	5	4	50	0 *	59	2.8	0	0.0
7.0	Medium	175	6	8	5	167	1	196	9.4	1	0.0
9.0	Medium	255	16	11	7	244	9	286	13.7	11	0.5
11.0	Medium	255	24	27	8	228	16	267	12.8	18	0.9

* - Corrected remolded torque less than or equal to zero.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-5
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 5A
COORDINATES I/H-5
FIELD TESTING NOVEMBER 18, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	19	4	0	0	19	4	22	1.1	5	0.2
1.0	Medium	21	4	0	1	21	3	25	1.2	4	0.2
2.0	Medium	9	0	0	1	9	0 *	11	0.5	0	0.0
3.0	Medium	13	3	0	2	13	1	15	0.7	1	0.0
4.0	Medium	11	6	0	3	11	3	13	0.6	4	0.2
6.0	Medium	39	6	2	5	37	1	43	2.1	2	0.1
8.0	Medium	91	14	0	6	91	8	107	5.1	9	0.4
10.0	Medium	147	11	6	8	141	3	165	7.9	4	0.2
12.0	Medium	153	16	11	9	142	7	167	8.0	8	0.4
15.0	Medium	265	25	11	12	254	13	298	14.3	16	0.8
17.0	Small	116	19	19	13	97	6	333	16.0	20	1.0
20.5	Small	119	10	25	16	94	0 *	323	15.5	0	0.0

* - Corrected remolded torque less than or equal to zero.
Note: Borehole 5 encountered slag at 0 feet below mud line and >250 inch-pounds initial torque reading with small vane.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-6
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 6
COORDINATES G-5
FIELD TESTING NOVEMBER 18, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	9	2	0	0	9	2	11	0.5	2	0.1
1.0	Medium	6	0	0	1	6	0 *	7	0.3	0	0.0
2.0	Medium	11	2	3	1	8	1	9	0.4	1	0.0
3.0	Medium	34	9	1	2	33	7	39	1.9	8	0.4
4.0	Medium	27	3	1	3	26	0 *	30	1.5	0	0.0
5.0	Medium	43	4	1	4	42	0 *	49	2.4	0	0.0
6.0	Medium	58	11	2	5	56	6	66	3.1	8	0.4
7.0	Medium	161	9	3	5	158	4	185	8.9	4	0.2
8.0	Medium	203	14	4	6	199	8	233	11.2	9	0.4
9.0	Medium	208	14	21	7	187	7	219	10.5	8	0.4
10.0	Medium	206	6	11	8	195	0 *	229	10.9	0	0.0
11.0	Medium	215	26	10	8	205	18	240	11.5	21	1.0
12.0	Small	55	11	13	9	42	2	144	6.9	6	0.3
14.0	Small	96	7	26	11	70	0 *	241	11.5	0	0.0
16.0	Small	134	17	18	12	116	5	399	19.1	16	0.8
18.0	Small	154	11	20	14	134	0 *	461	22.1	0	0.0

* - Corrected remolded torque less than or equal to zero.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.1-7
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 8S
BORE HOLE 7
COORDINATES E-5
FIELD TESTING NOVEMBER 17, 1993
TESTED BY C. WINKLER & T. SMITH

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.50	Medium	17	6	3	0	14	6	16	0.8	7	0.3
1.50	Medium	56	7	3	1	53	6	62	3.0	7	0.3
2.50	Medium	70	10	6	2	64	8	75	3.6	10	0.5
3.50	Medium	145	10	4	3	141	7	165	7.9	9	0.4
4.25	Medium	205	46	10	3	195	43	229	10.9	50	2.4
4.33	Small	130	30	10	3	120	27	413	19.8	92	4.4

* - Corrected remolded torque less than or equal to zero.
(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 1.2-1
POND 8S SAMPLING DATA
FMC POCATELLO
PROJECT NO. 938858

SAMPLED BY: C. WINKLER, T. SMITH
AND R. TROTTIER

DATE	BORE HOLE LOCATION	FIELD DATA				LABORATORY DATA			
		SAMPLER TYPE	SAMPLE NUMBER	DEPTH BELOW WATER (feet)	DEPTH BELOW MUD LINE (feet)	TOTAL UNIT WEIGHT (g/cm3)	TOTAL UNIT WEIGHT (pcf)	SOLIDS CONTENT (%)	MOISTURE CONTENT (%)
16NOV93	BH-3	PISTON	3/1	6	0	1.19	74.3	17.4	169
16NOV93	BH-3	PISTON	3/2	8	2	1.49	93.0	22.9	56
16NOV93	BH-3	PISTON	3/3	9	3	1.49	93.0	19.1	57
16NOV93	BH-3	PISTON	3/4	10.5	4.5	1.31	81.8	17.1	48
19NOV93	BH-1A	GUN	1A/1	7.7	0	1.25	78.0	19.9	274
19NOV93	BH-1A	GUN	1A/2	8.7	1	1.28	79.9	20.8	268
19NOV93	BH-1A	GUN	1A/3	10.7	3	1.27	79.3	18.8	240
19NOV93	BH-1A	PISTON	1A/4	13.7	6	1.32	82.4	44.5	121
19NOV93	BH-1A	PISTON	1A/5	16.7	9	1.38	86.2	45.1	121
20NOV93	BH-6	GUN	6/1	7.7	0	1.22	76.2	21.3	285
20NOV93	BH-6	GUN	6/2	8.7	1	1.08	67.4	14.8	420
20NOV93	BH-6	GUN	6/3	10.7	3	1.48	92.4	33.8	118
20NOV93	BH-6	PISTON	6/4	13.7	6	1.42	88.7	42.4	133
20NOV93	BH-6	PISTON	6/5	16.7	9	1.49	93.0	45.8	121
20NOV93	BH-6	PISTON	6/6	19.7	12	1.43	89.3	41.0	107
20NOV93	BH-6	PISTON	6/7	20.9	13.2	1.43	89.3	44.8	89

TABLE 1.3-1
POND 8S
PORE PRESSURE DATA
FMC POCATELLO
PROJECT NO. 938858

PORE PRESSURE CALIBRATION DATA

PROBE DESIGNATION	fo (Hz)	A (Bars)	B (Bars)	Calibration Temperature (C)	Temperature Sensitivity (Hz/C)
2 (NEW)	1794.5	-6.5686E-03	-1.7681E-06	15.0	0.7
1 (OLD)	1924.0	-6.9780E-03	-1.8732E-06	15.0	0.6

TEST NUMBER	BORE HOLE NUMBER	PROBE NUMBER	FIELD DATA					CALCULATED VALUES		
			TOP OF MUD TEMPERATURE (Degrees C)	DEPTH BELOW WATER (Feet)	DEPTH BELOW MUD (Feet)	STABILIZED FREQUENCY (Hz)	ELAPSED TIME (Minutes)	CORRECTED FREQUENCY (Hz)	CALCULATED PRESSURE (Bars)	CALCULATED PRESSURE (Feet)
1*	BH3	2	3	6.5	0	1756.7	7	1786.1	0.1916	6.41
2	BH3	2	6	7.5	1	1752.5	13	1788.2	0.2322	7.77
3	BH3	2	6	10	3.5	1749.7	15	1788.2	0.2503	8.37
4	BH3	2	6	13	6.5	1739.0	29	1788.2	0.3189	10.67
5	BH1A	2	4	8.7	1	1743.7	12	1786.8	0.2798	9.36
6	BH1A	2	4	10.7	3	1732.6	25	1786.8	0.3508	11.74
7	BH1A	2	4	13.7	6	1718.2	40	1786.8	0.4423	14.80
8**	BH1A	2	4	16.7	9	1723.6	85	1786.8	0.4081	13.65
9**	BH6	2	2	19.1	12	1754.0	275	1785.4	0.2045	6.84
10**	BH6	1	2	26.1	19	1953.2	275	1916.2	-0.2608	-8.72

* - Not equilibrated
** - Suspect erroneous data due to cold or low battery voltage

File: PORE8S.

Table 1.4-1

Pond 8S - Nuclear Density Data

Date: 11/17/93
Time: 13:45
Location: Pond 8S, BH3
Units: PCF, Counts = 64 sec.

Depth ft. BML	Density Counts	Moisture Counts	Laboratory Measured % Solids	Laboratory Measured % Moisture	Laboratory Measured Wet Den.
0	8483	1170	17.41	169	74.29
1	8361	1302			
2	7007	664	22.88	56	93.02
3 *	6879	617	19.07	57	93.02
4	6793	578			
5	6684	552			
6	6902	644			
+1 **	8643	1704			
+3 **	8711	1695			

BML = "Below Mud Line", from bottom of probe
* - 256 second test count
** - Test depth ABOVE mud line

Date: 11/19/93
Time: 10:40
Location: Pond 8S, BH1A
Units: PCF, Counts = 64 sec.

Depth ft. BML	Density Counts	Moisture Counts	Laboratory Measured % Solids	Laboratory Measured % Moisture	Laboratory Measured Wet Den.
0	6912	725	19.91	274	78.03
-1	6995	721	20.83	268	79.91
-2	6555	675			
-3	5290	535	18.81	240	79.28
-6	6891	614	44.46	121	82.40
-9	6863	599	45.10	121	86.15

BML = "Below Mud Line", from bottom of probe

Table 1.4-1

Pond 8S - Nuclear Density Data

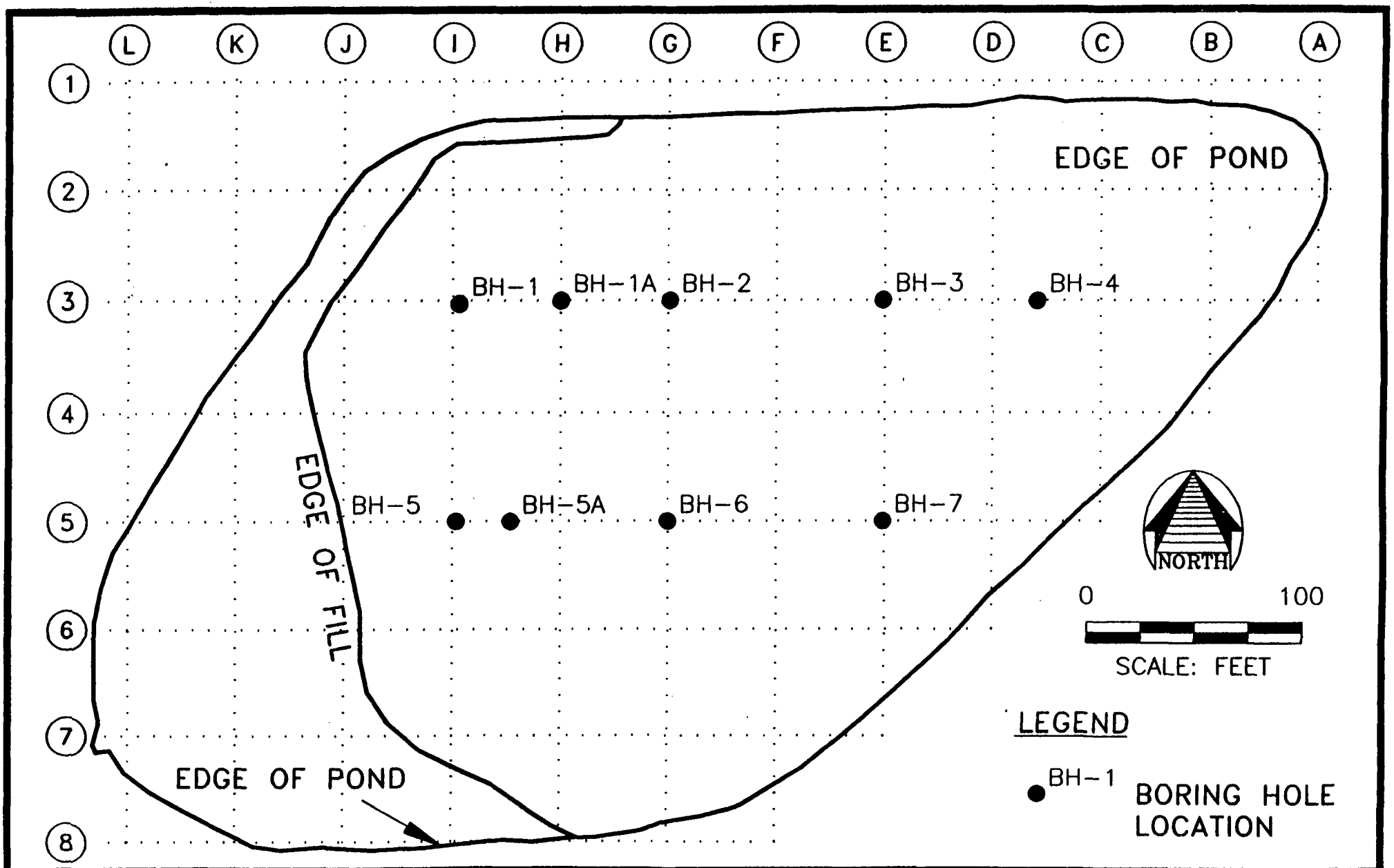
Date: 11/20/93
Time: 16:30
Location: Pond 8S, BH6
Units: PCF, Counts = 64 sec.

Depth ft. BML	Density Counts	Moisture Counts	Laboratory Measured % Solids	Laboratory Measured % Moisture	Laboratory Measured Wet Den.
0	7115	750	21.29	285	76.16
-1	7007	604	14.75	420	67.42
-3	6917	682	33.75	118	92.39
-6	7001	549	42.44	133	88.65
-9	6919	665	45.78	121	93.02

BML = "Below Mud Line", from bottom of probe

POND 8S FIGURES

8858001A.DWG

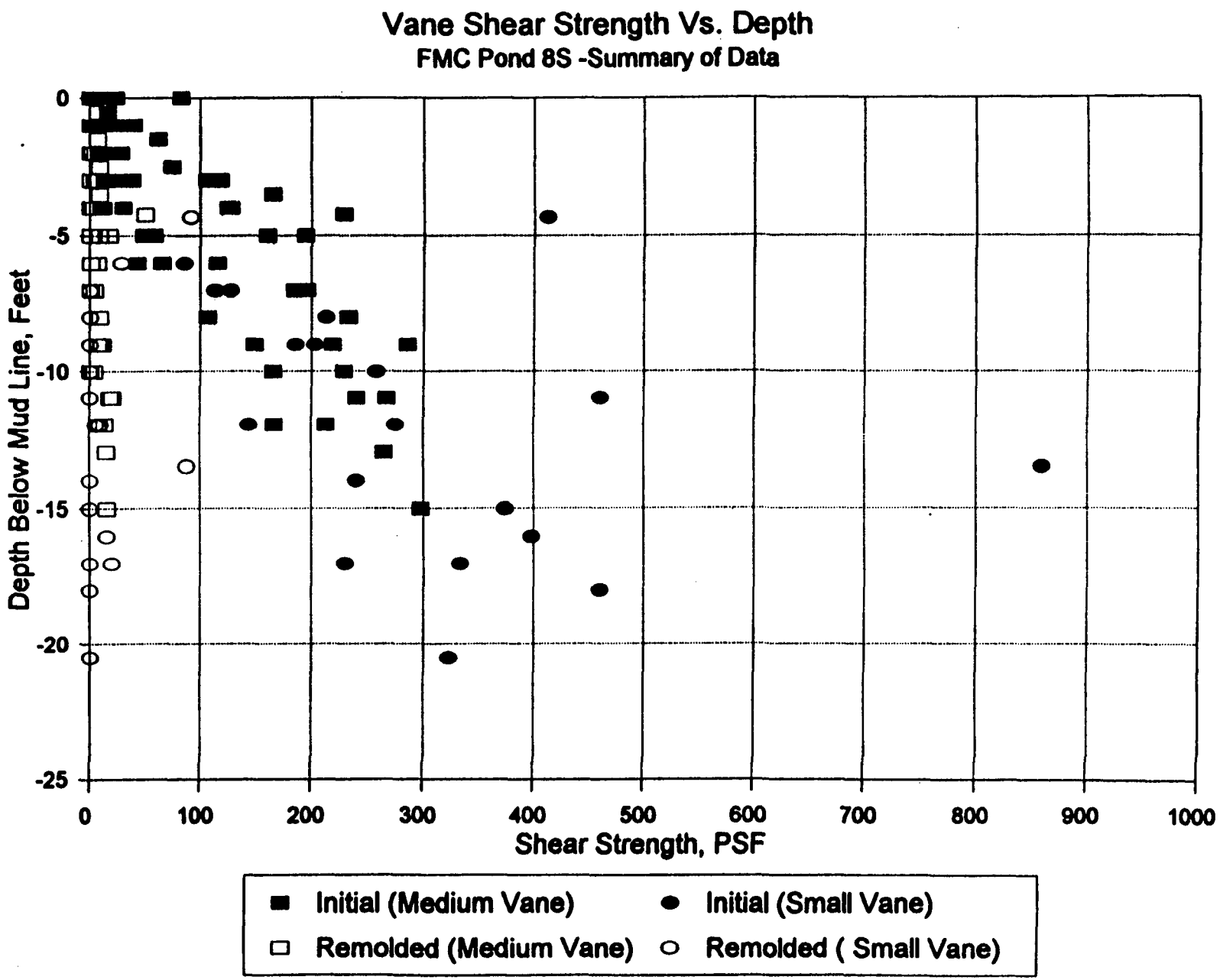


DATE:	12/31/93
DRAWN BY:	L.B.D.
SCALE:	AS SHOWN
PROJECT NO.:	938858

BCI
BROMWELL & CARRIER, INC.
5925 IMPERIAL PARKWAY, LAKELAND, FL 33860
PHONE: (813) / 646-8591

PREPARED FOR
Bechtel

FIGURE 1.0-1
POND 8S
BORE HOLE LOCATIONS



NOTE: Depth is measured from top of vane.

FIGURE 1.1-1

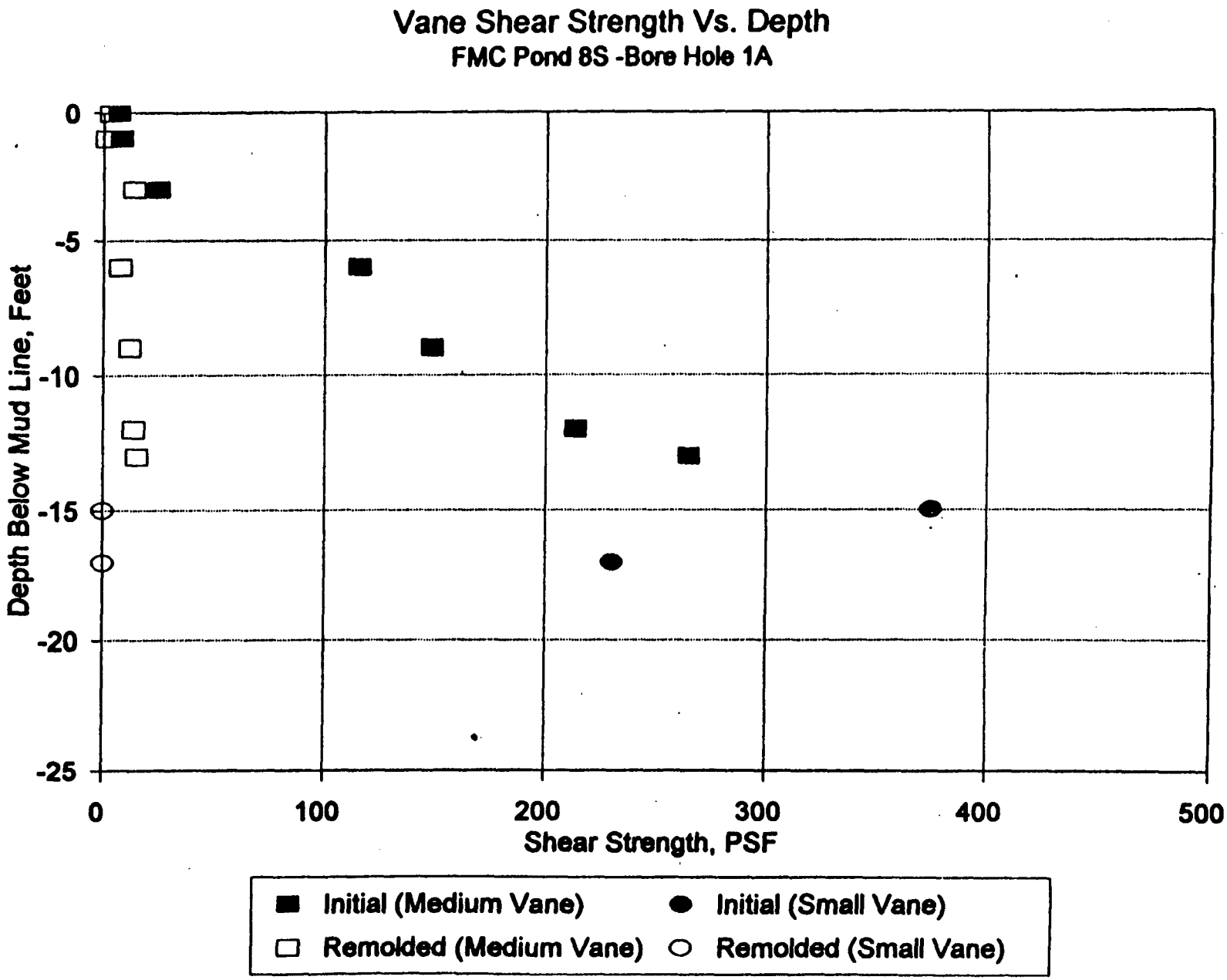


FIGURE 1.1-2

NOTE: Depth is measured from top of vane.

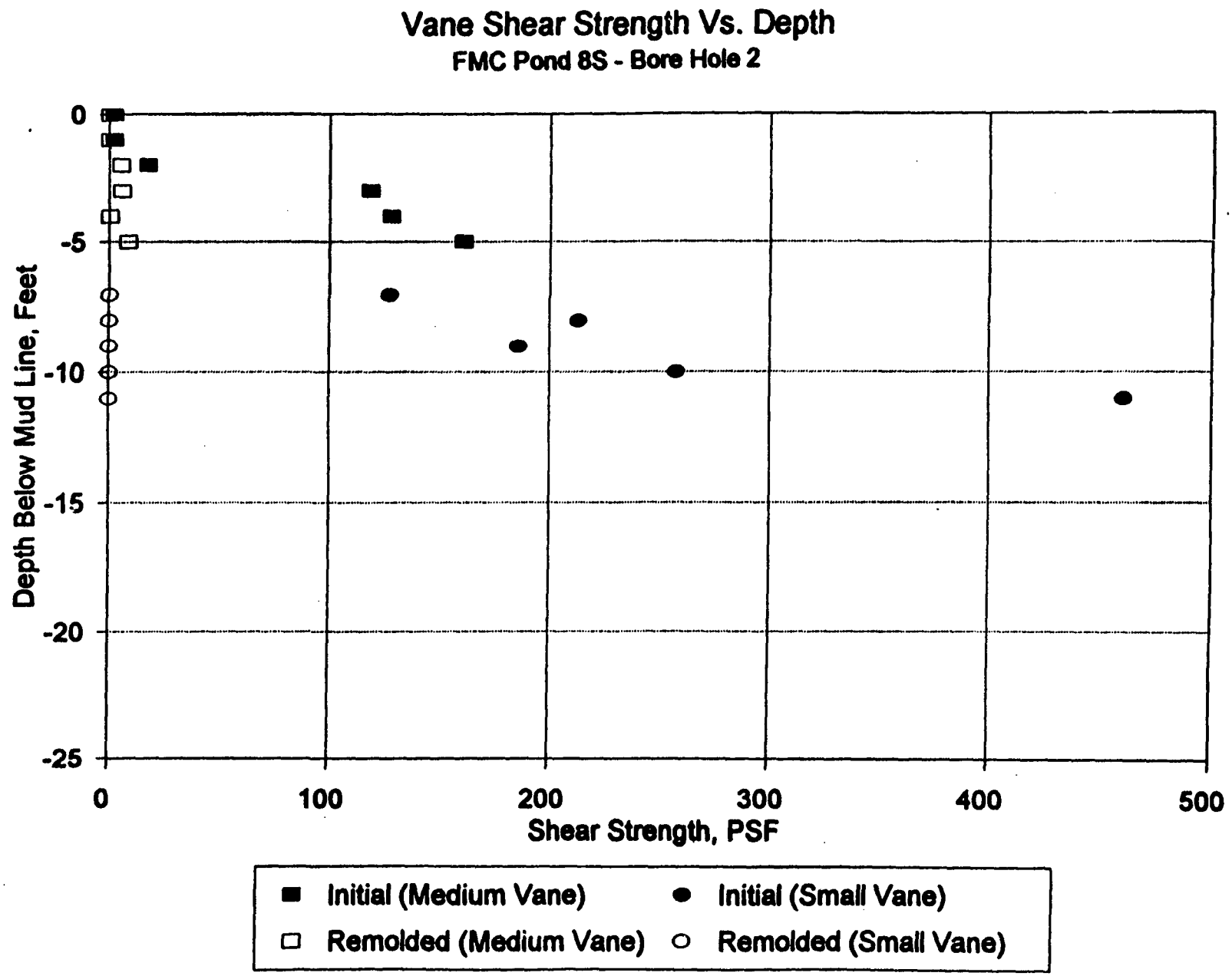
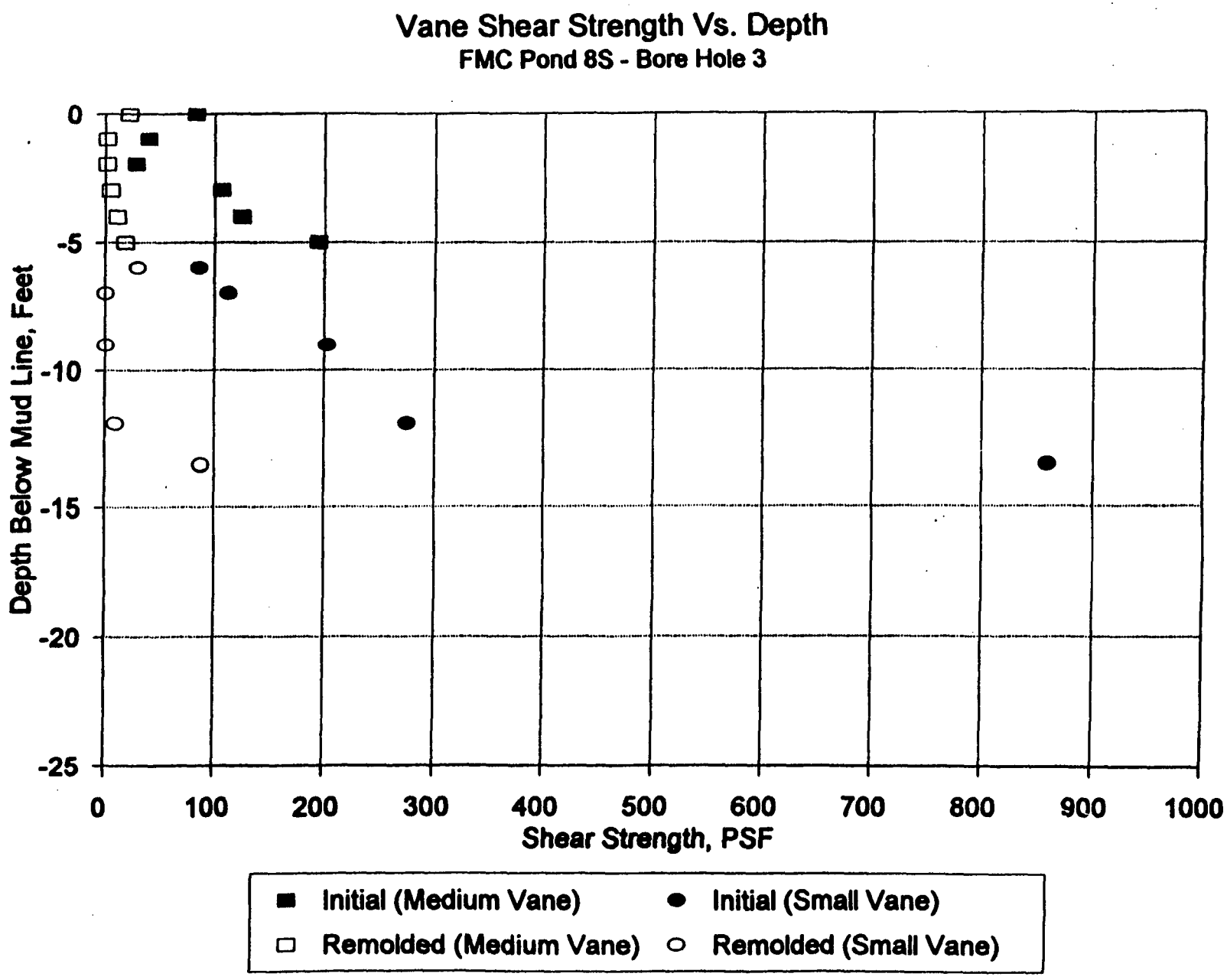

Vane Shear Strength Vs. Depth
FMC Pond 8S - Bore Hole 2
Depth Below Mud Line, Feet
0
-5
-10
-15
-20
-25
0
100
200
300
400
500
Shear Strength, PSF
Initial (Medium Vane)
Initial (Small Vane)
Remolded (Medium Vane)
Remolded (Small Vane)

FIGURE 1.1-3



NOTE: Depth is measured from top of vane.

FIGURE 1.1-4

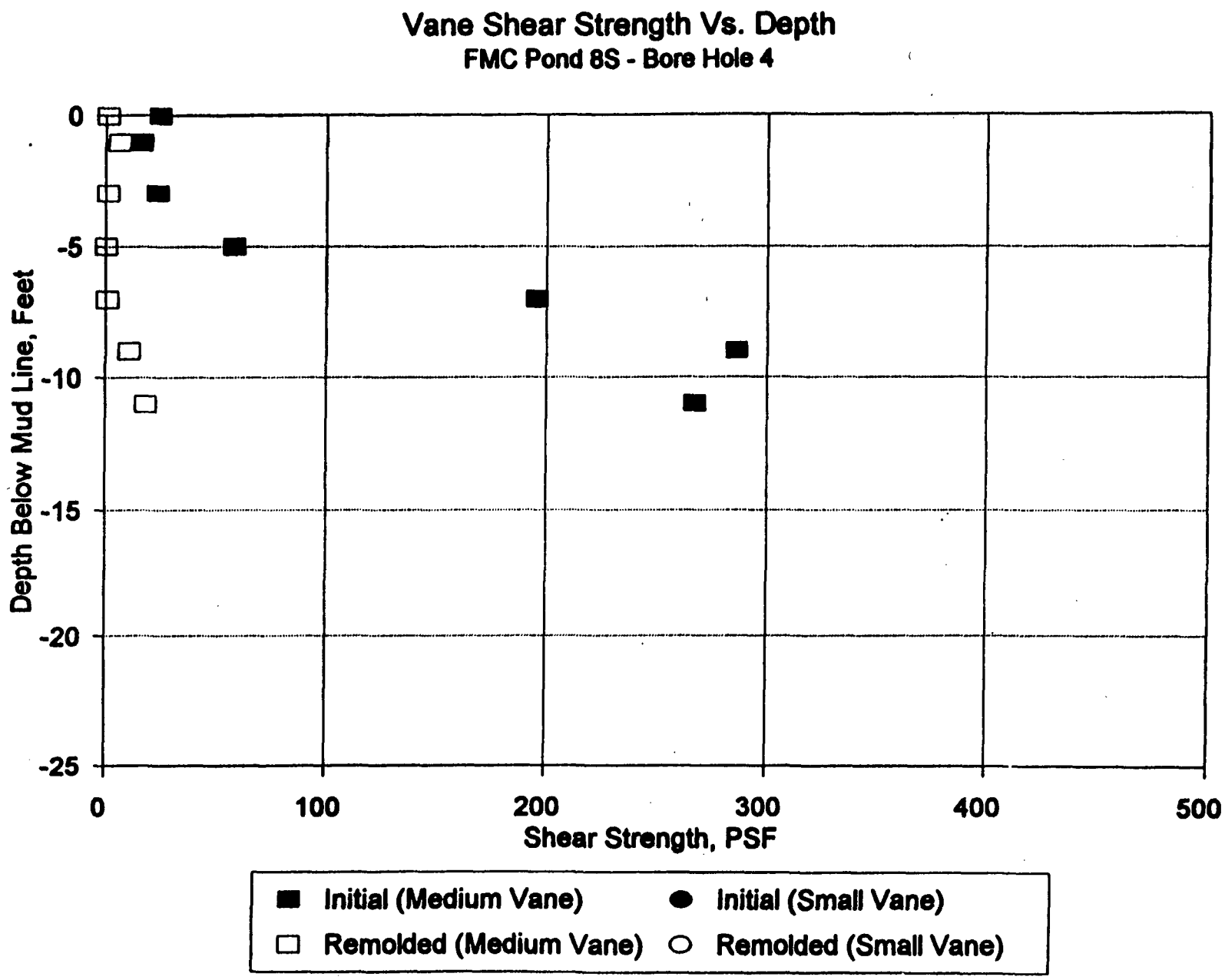


FIGURE 1.1-5

NOTE: Depth is measured from top of vane.

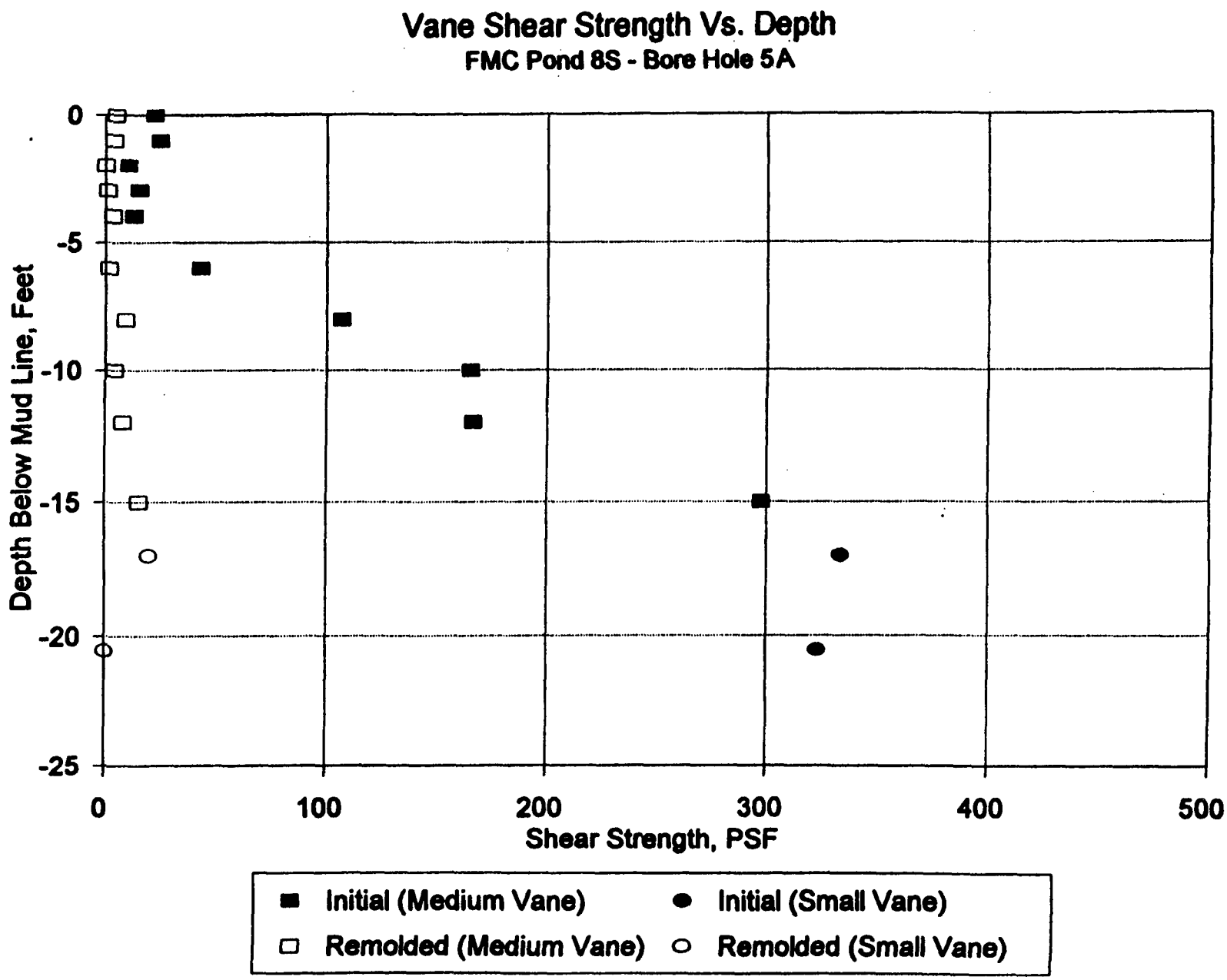


FIGURE 1.1-6

NOTE: Depth is measured from top of vane.

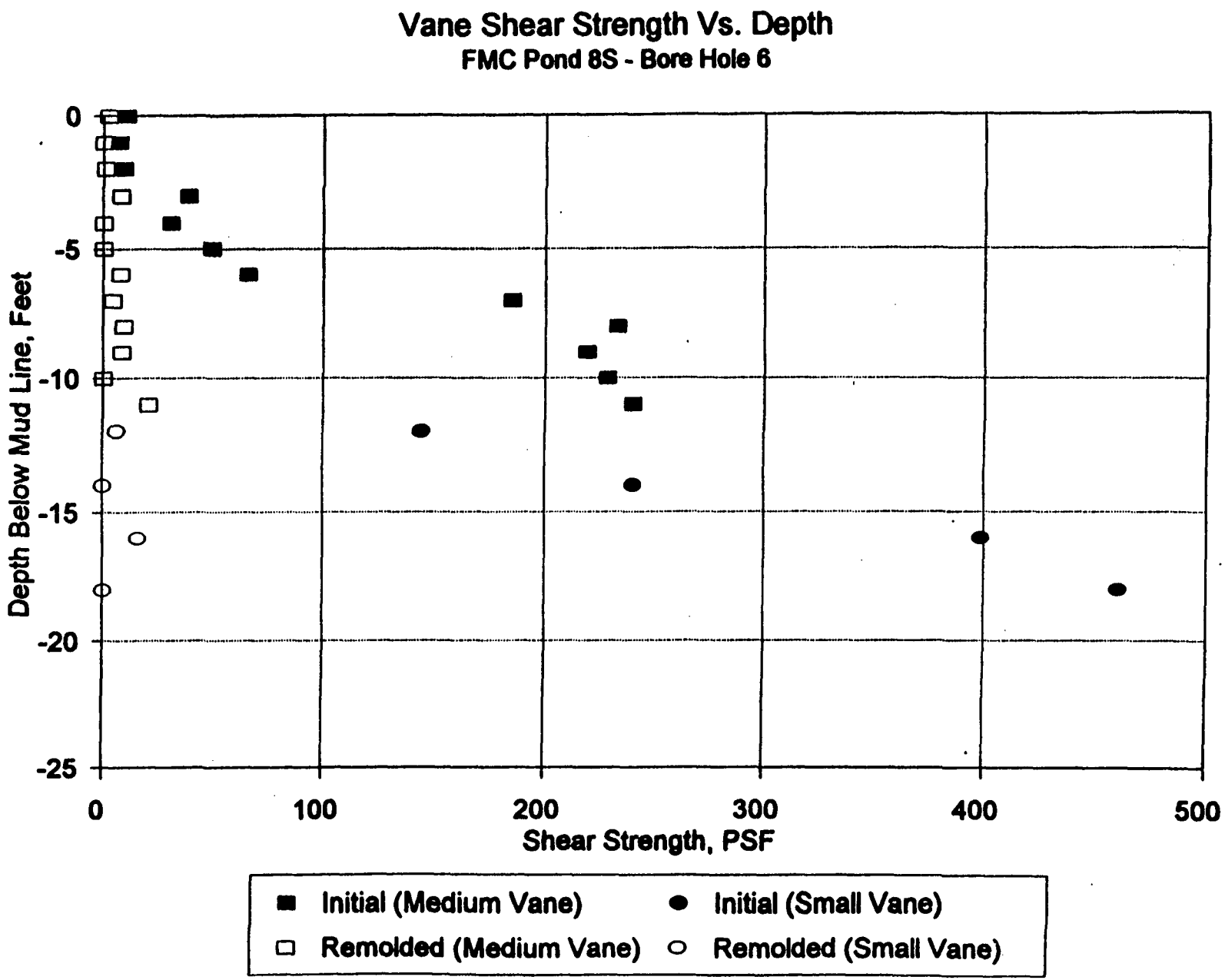


FIGURE 1.1-7

NOTE: Depth is measured from top of vane.

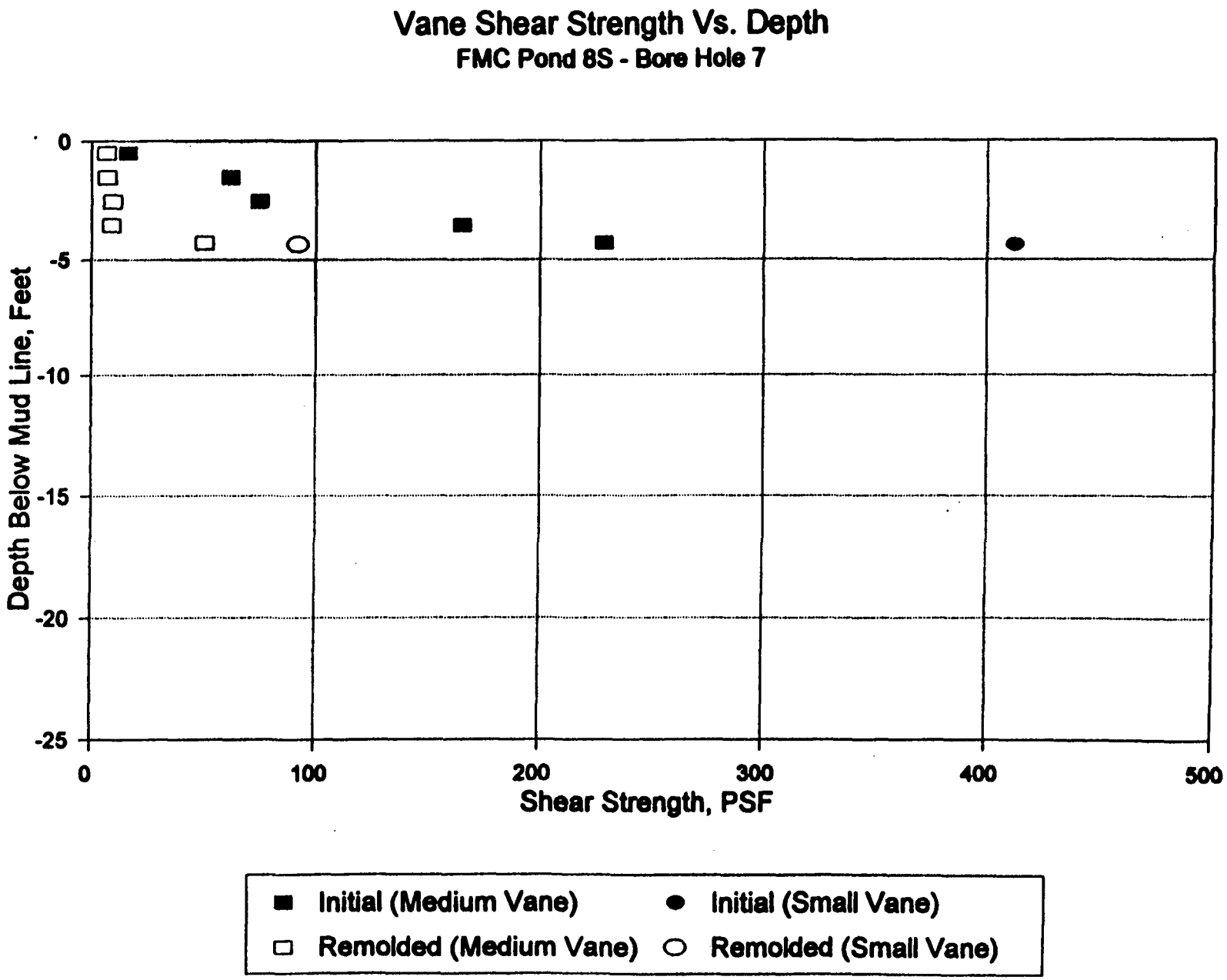


FIGURE 1.1-8

NOTE: Depth is measured from top of vane.

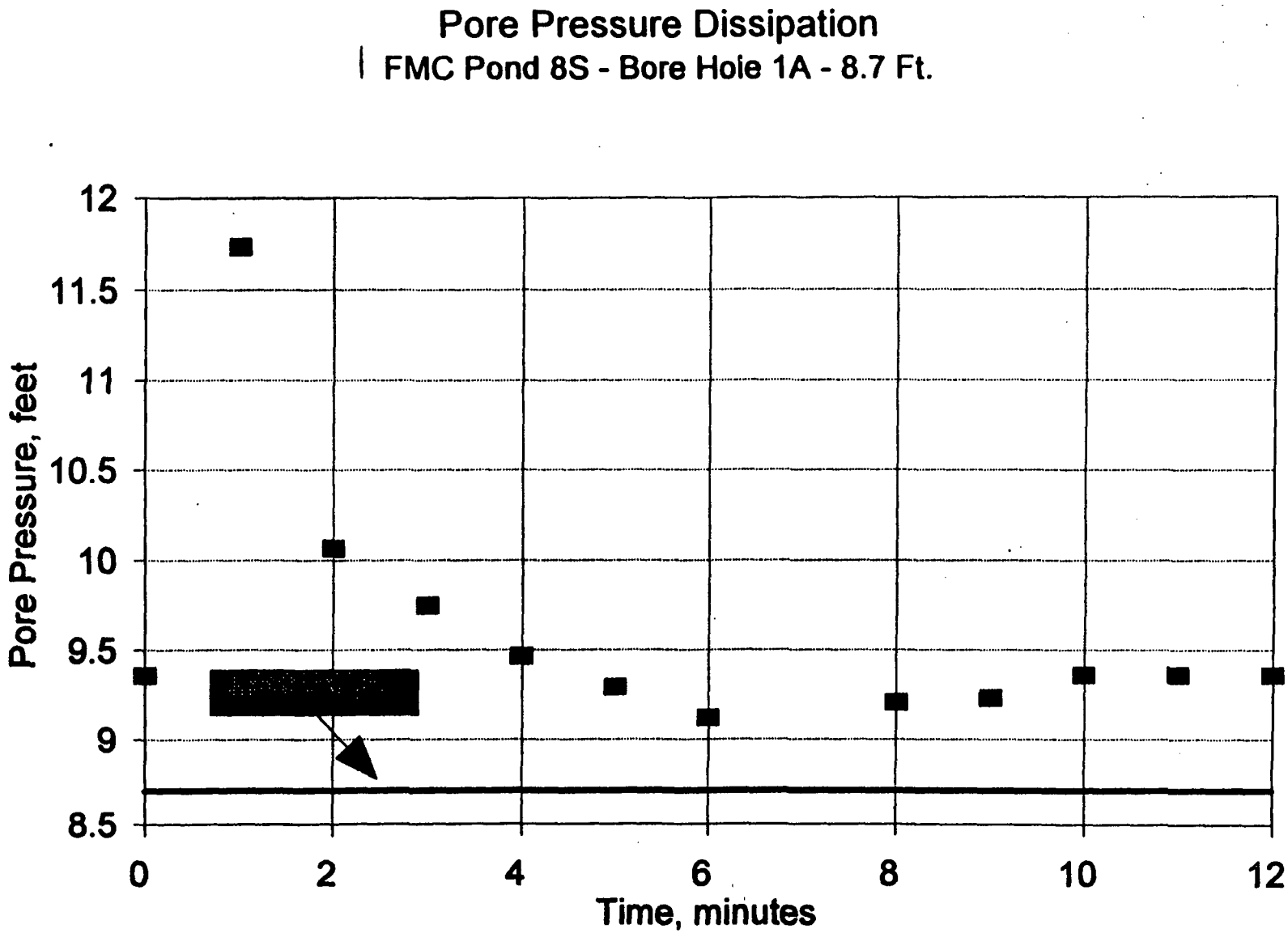

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 1A - 8.7 Ft.
Pore Pressure, feet
12
11.5
11
10.5
10
9.5
9
8.5
0
2
4
6
8
10
12
Time, minutes

FIGURE 1.3-1

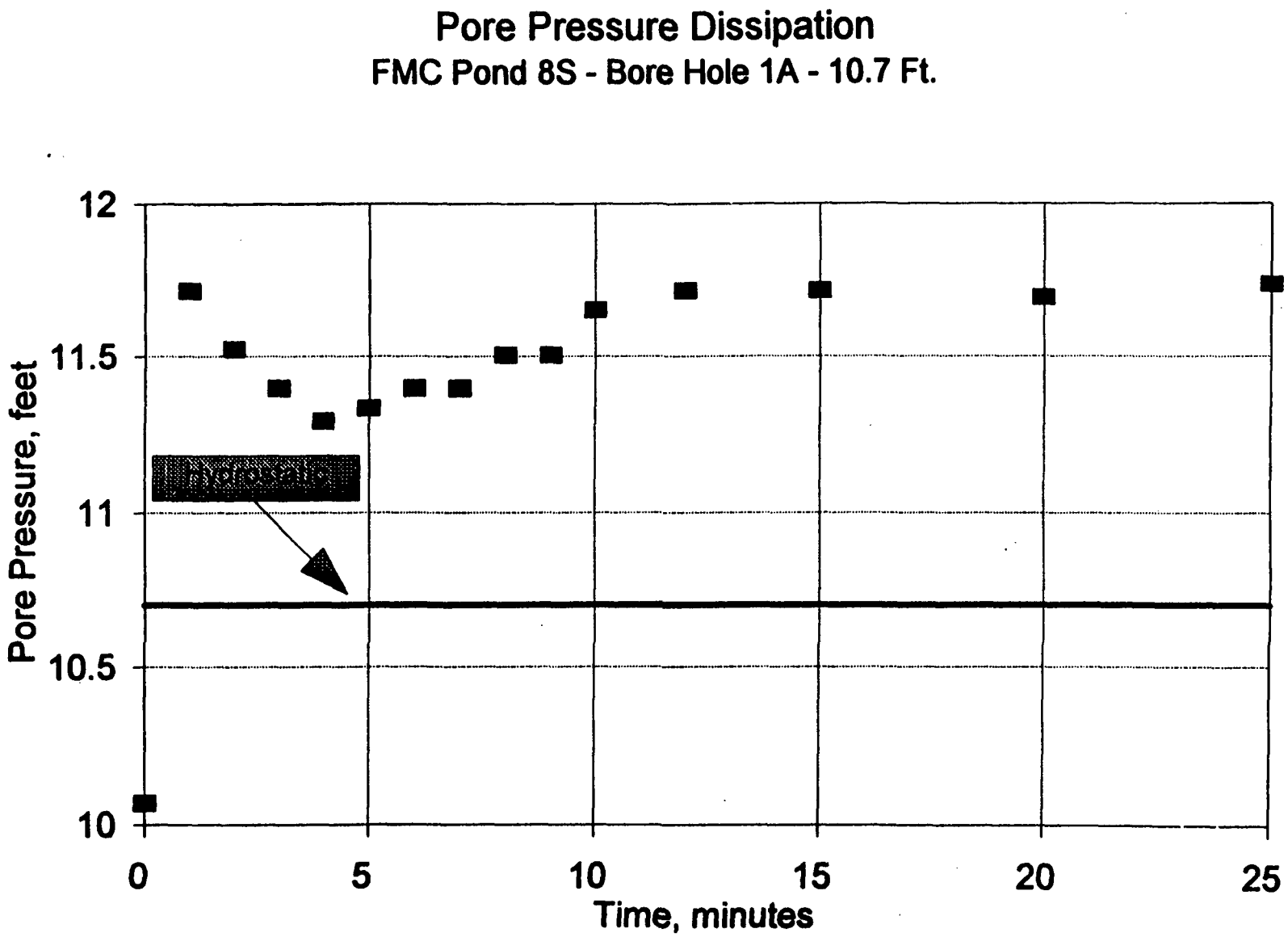

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 1A - 10.7 Ft.
Pore Pressure, feet
12
11.5
11
10.5
10
0
5
10
15
20
25
Time, minutes

FIGURE 1.3-2

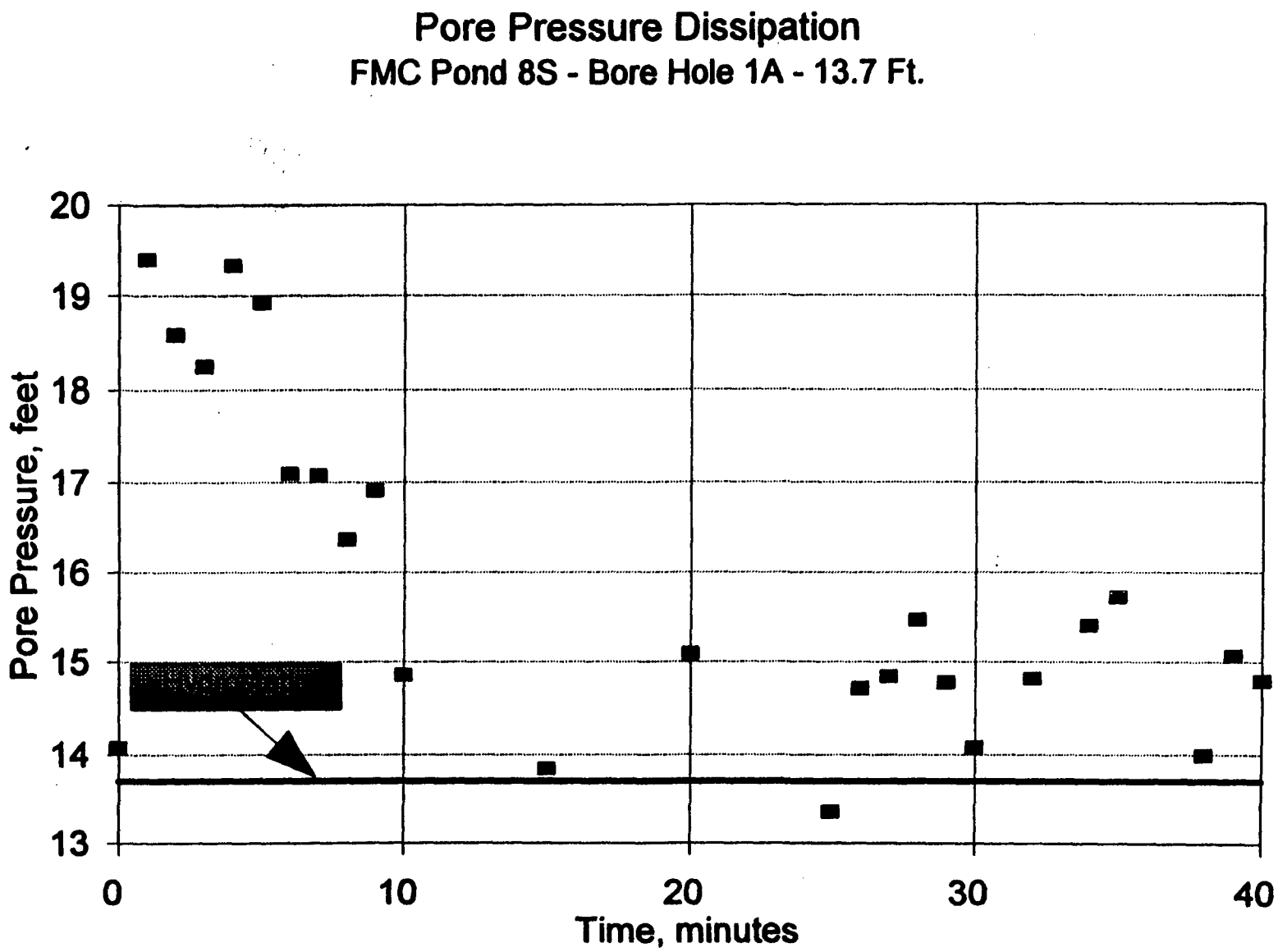

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 1A - 13.7 Ft.
Pore Pressure, feet
20
19
18
17
16
15
14
13
0
10
20
30
40
Time, minutes

FIGURE 1.3-3

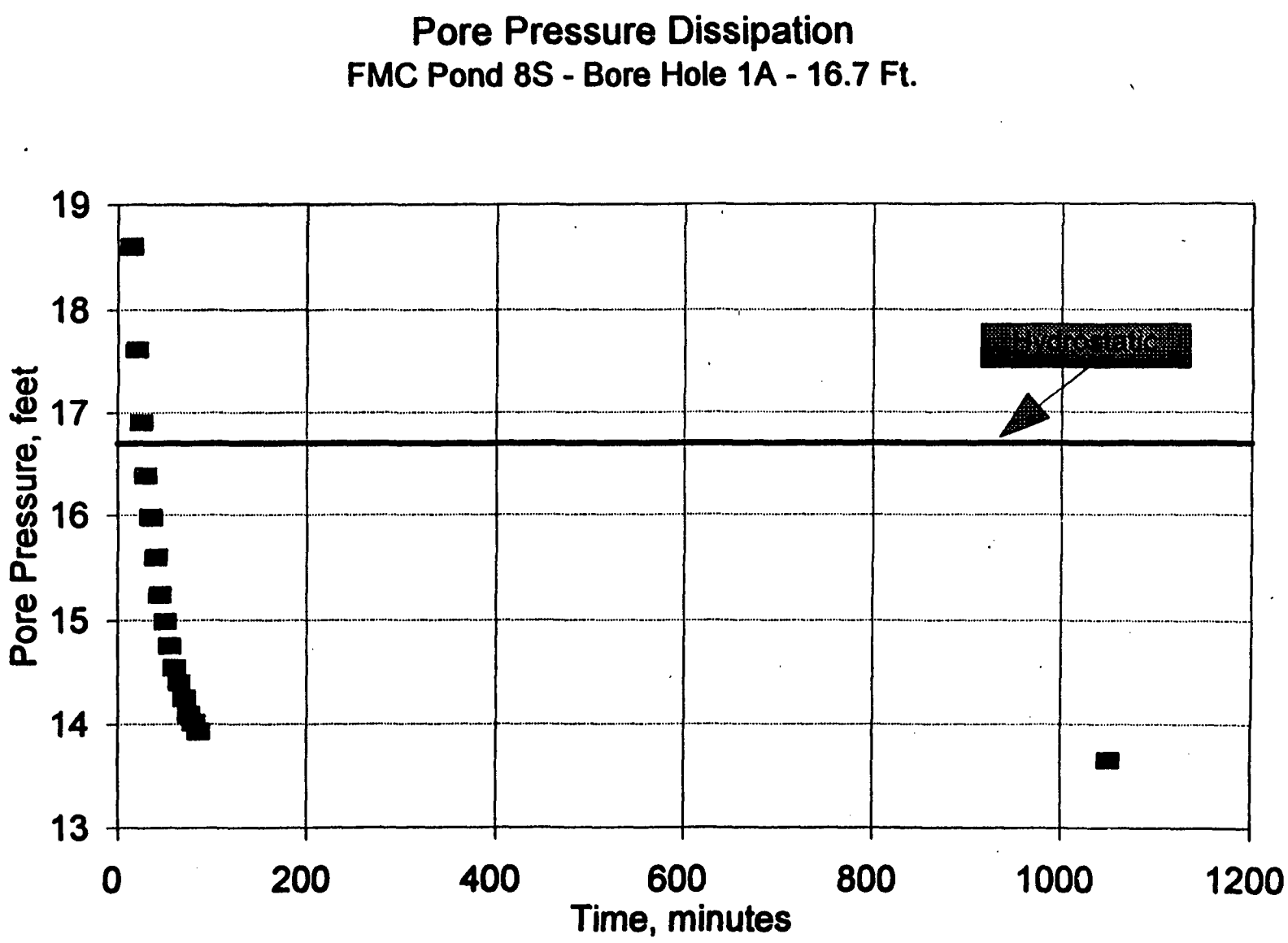

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 1A - 16.7 Ft.
Pore Pressure, feet
19
18
17
16
15
14
13
0
200
400
600
800
1000
1200
Time, minutes

FIGURE 1.3-4

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 3 - 6.5 Ft.

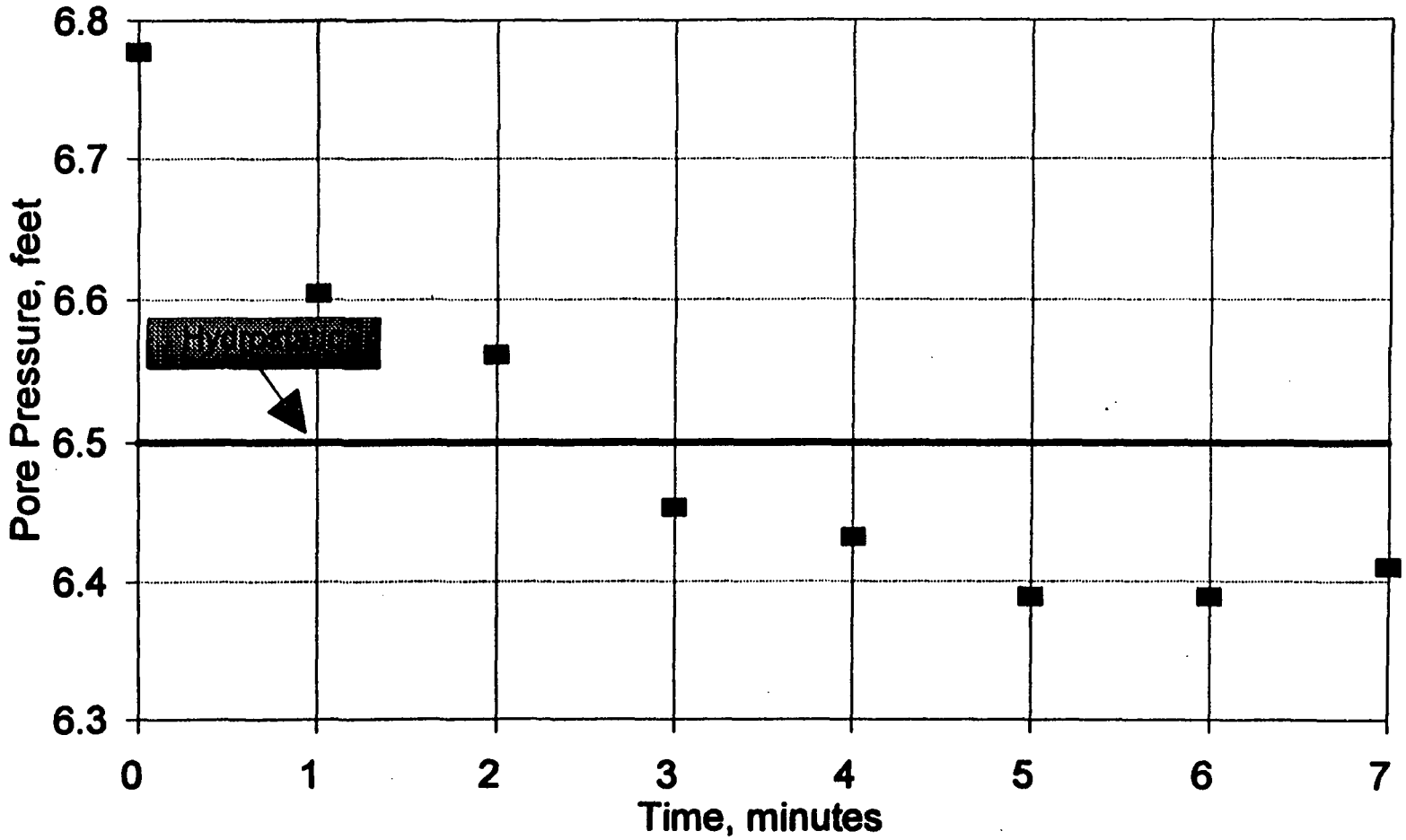


FIGURE 1.3-5

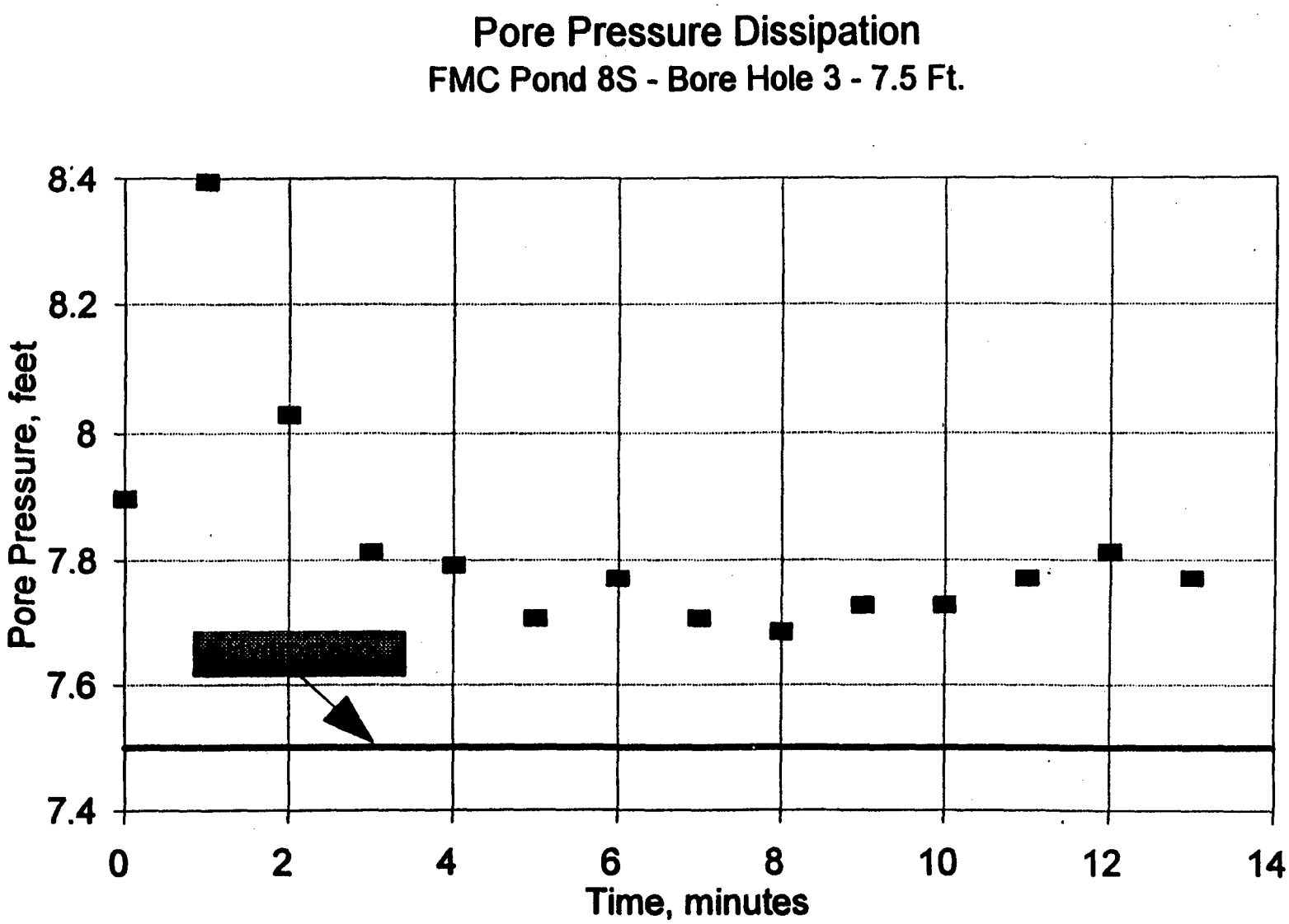

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 3 - 7.5 Ft.
Pore Pressure, feet
8.4
8.2
8
7.8
7.6
7.4
0
2
4
6
8
10
12
14
Time, minutes

FIGURE 1.3-6

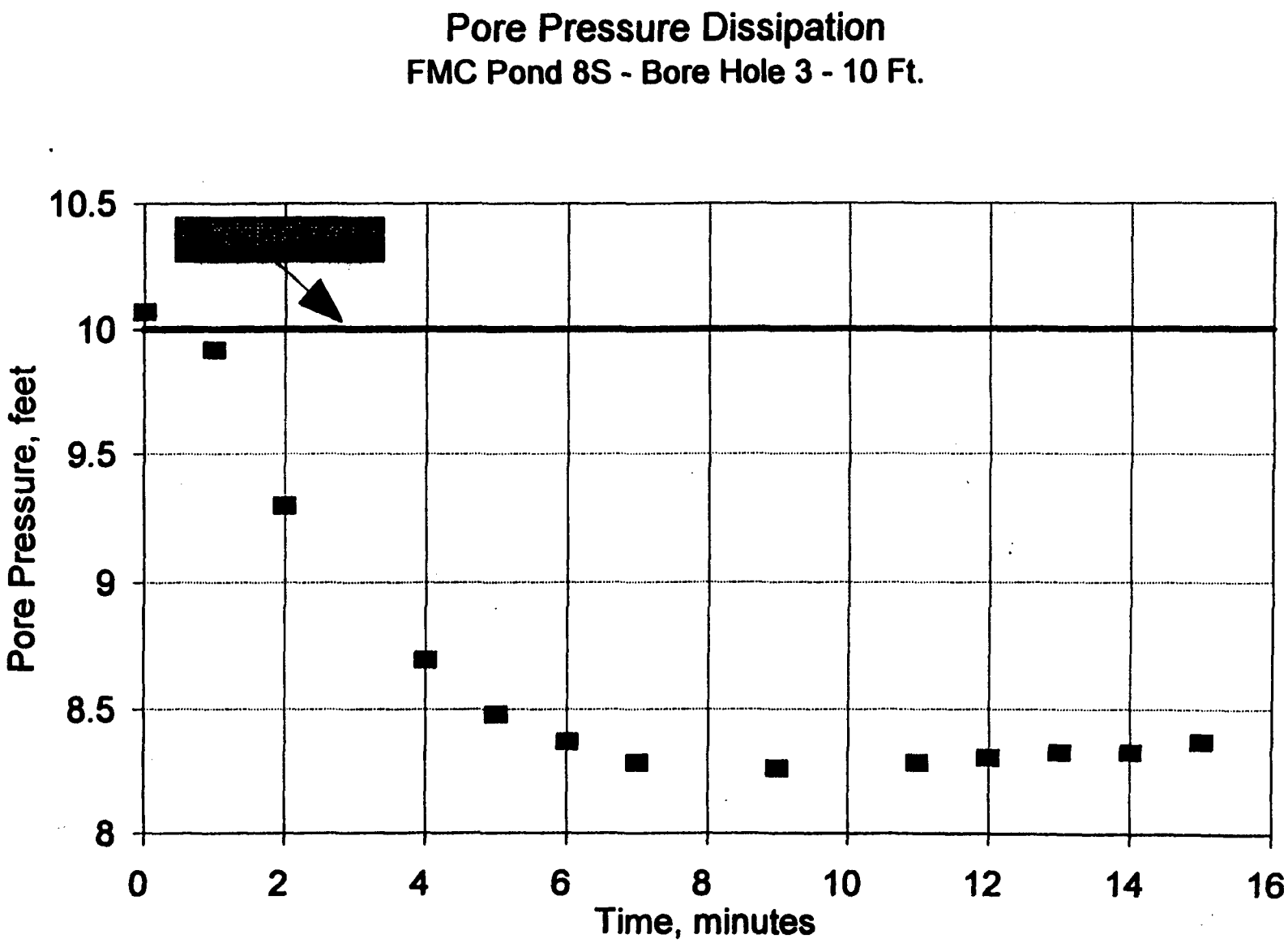

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 3 - 10 Ft.
Pore Pressure, feet
10.5
10
9.5
9
8.5
8
0
2
4
6
8
10
12
14
16
Time, minutes

FIGURE 1.3-7

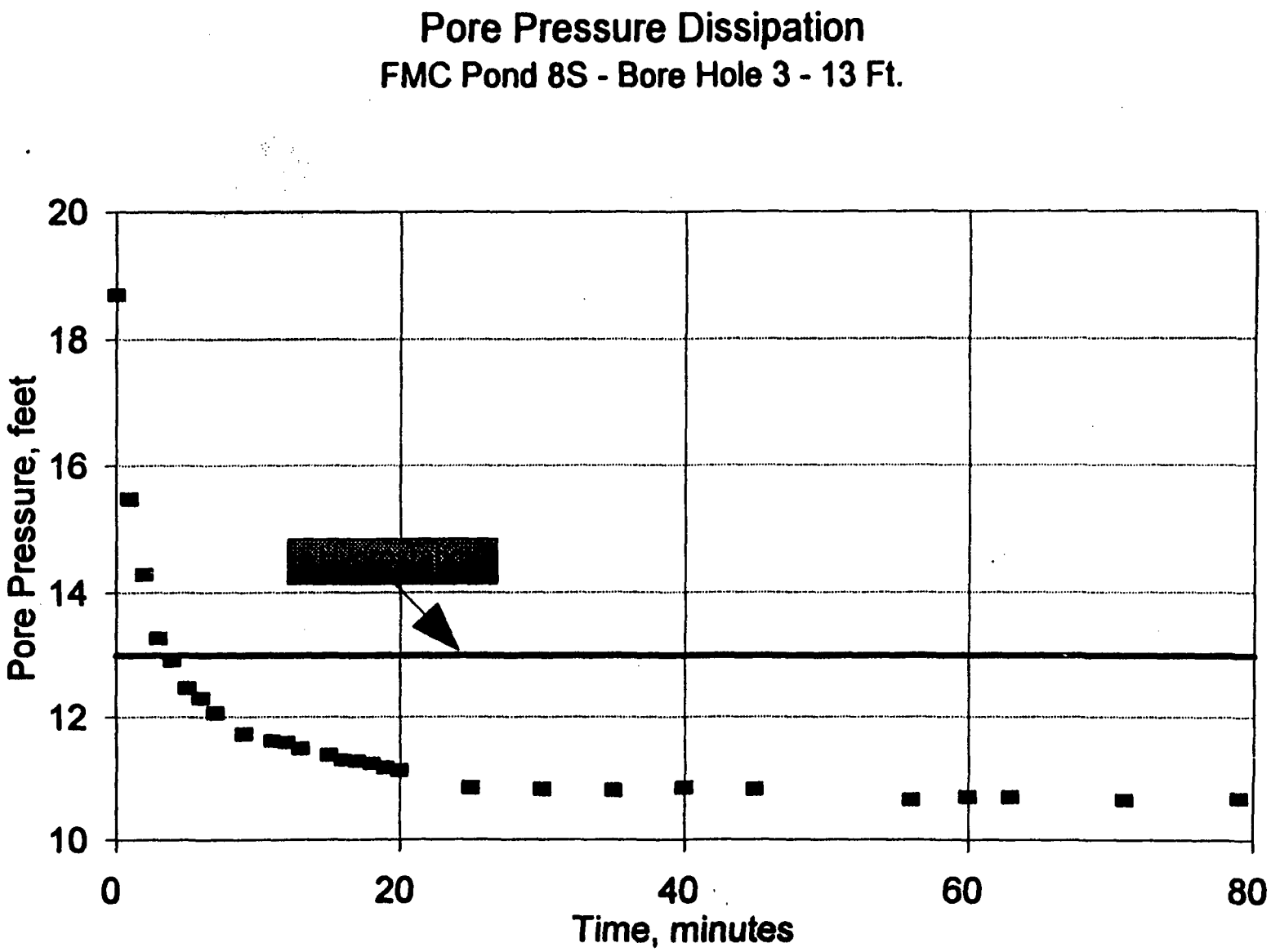

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 3 - 13 Ft.
Pore Pressure, feet
20
18
16
14
12
10
0
20
40
60
80
Time, minutes

FIGURE 1.3-8

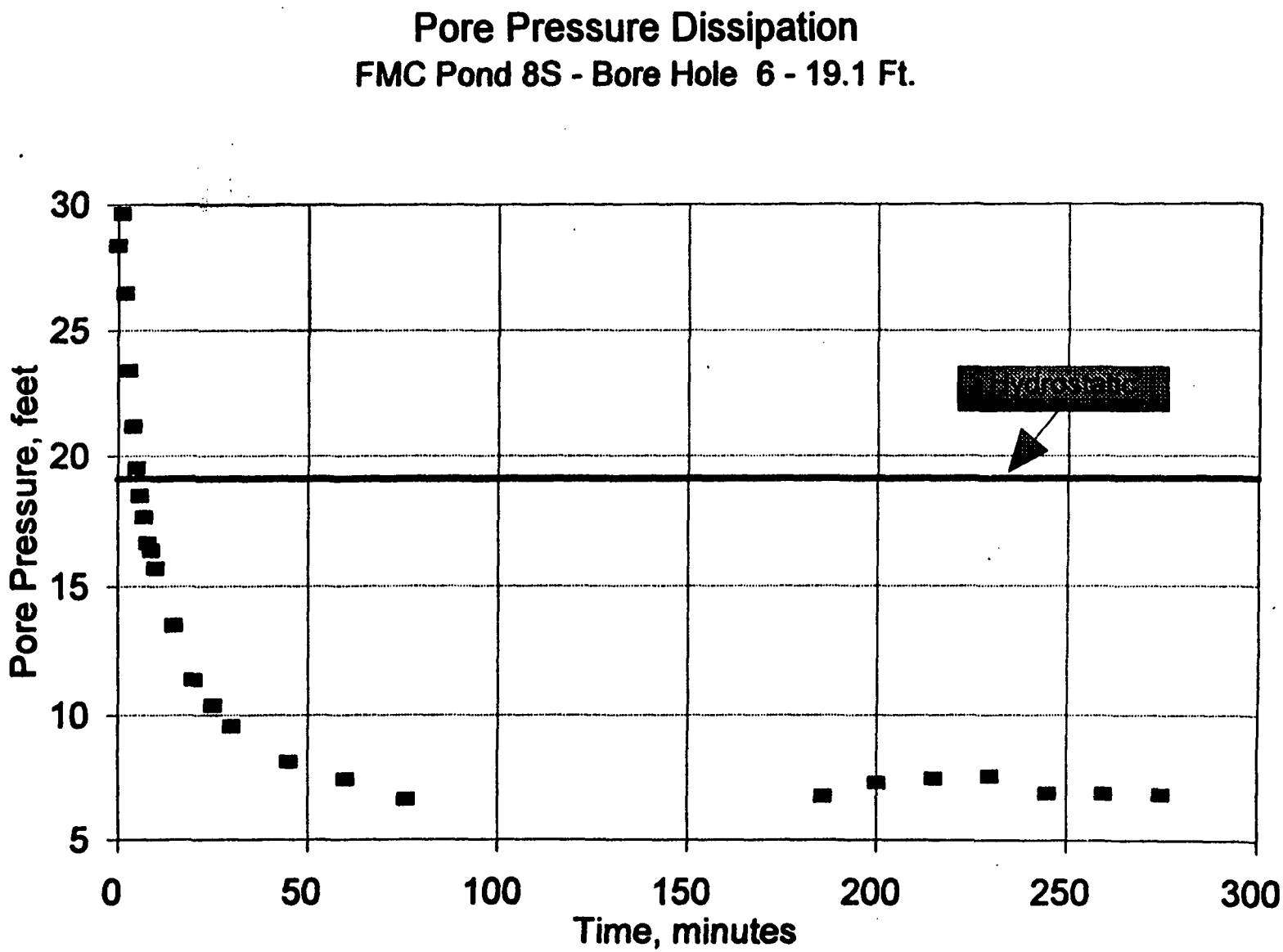

Pore Pressure Dissipation
FMC Pond 8S - Bore Hole 6 - 19.1 Ft.
Pore Pressure, feet
30
25
20
15
10
5
0
50
100
150
200
250
300
Time, minutes
Hydrostatic

FIGURE 1.3-9

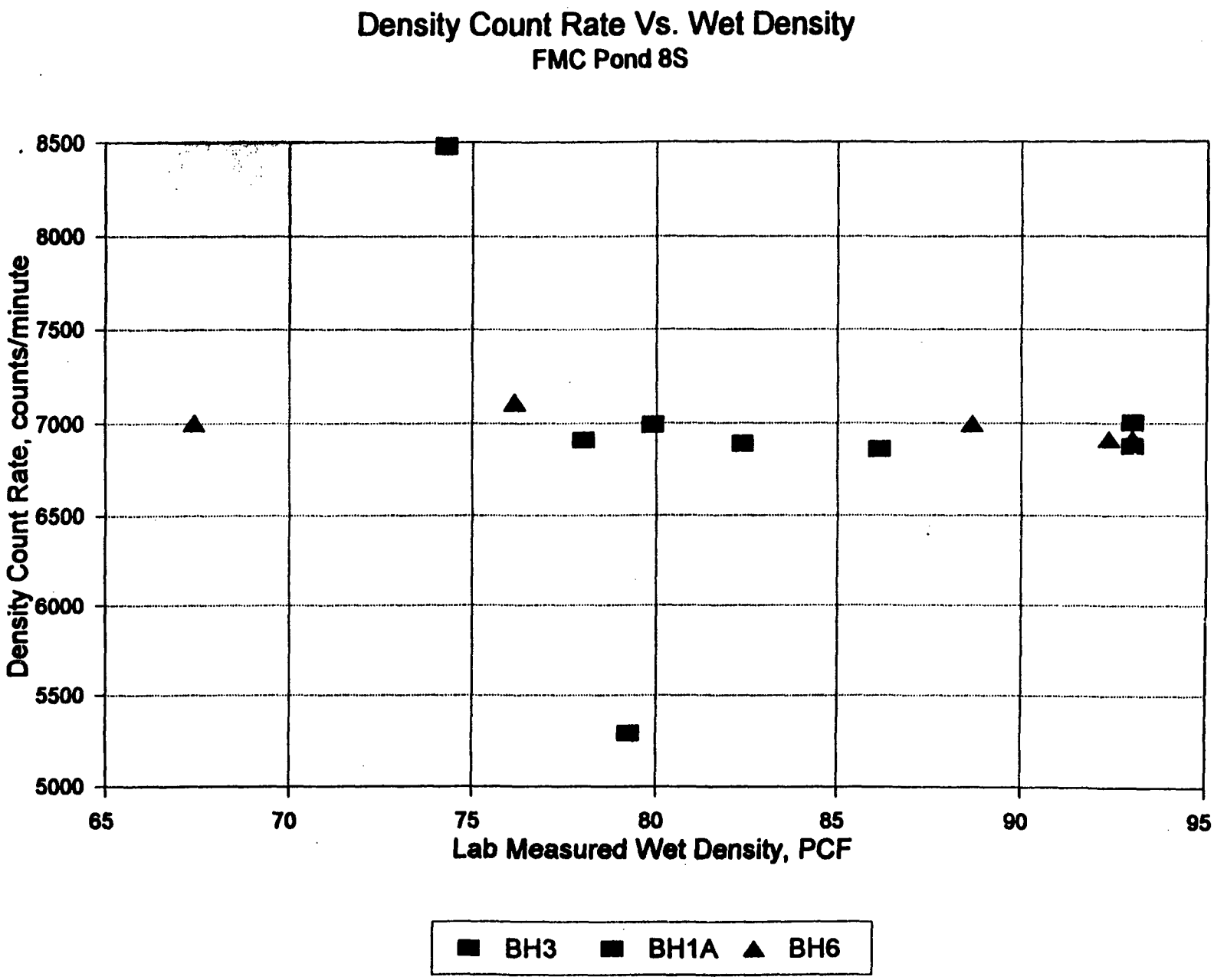

Density Count Rate Vs. Wet Density
FMC Pond 8S
Density Count Rate, counts/minute
8500
8000
7500
7000
6500
6000
5500
5000
65
70
75
80
85
90
95
Lab Measured Wet Density, PCF
BH3
BH1A
BH6

FIGURE 1.4-1

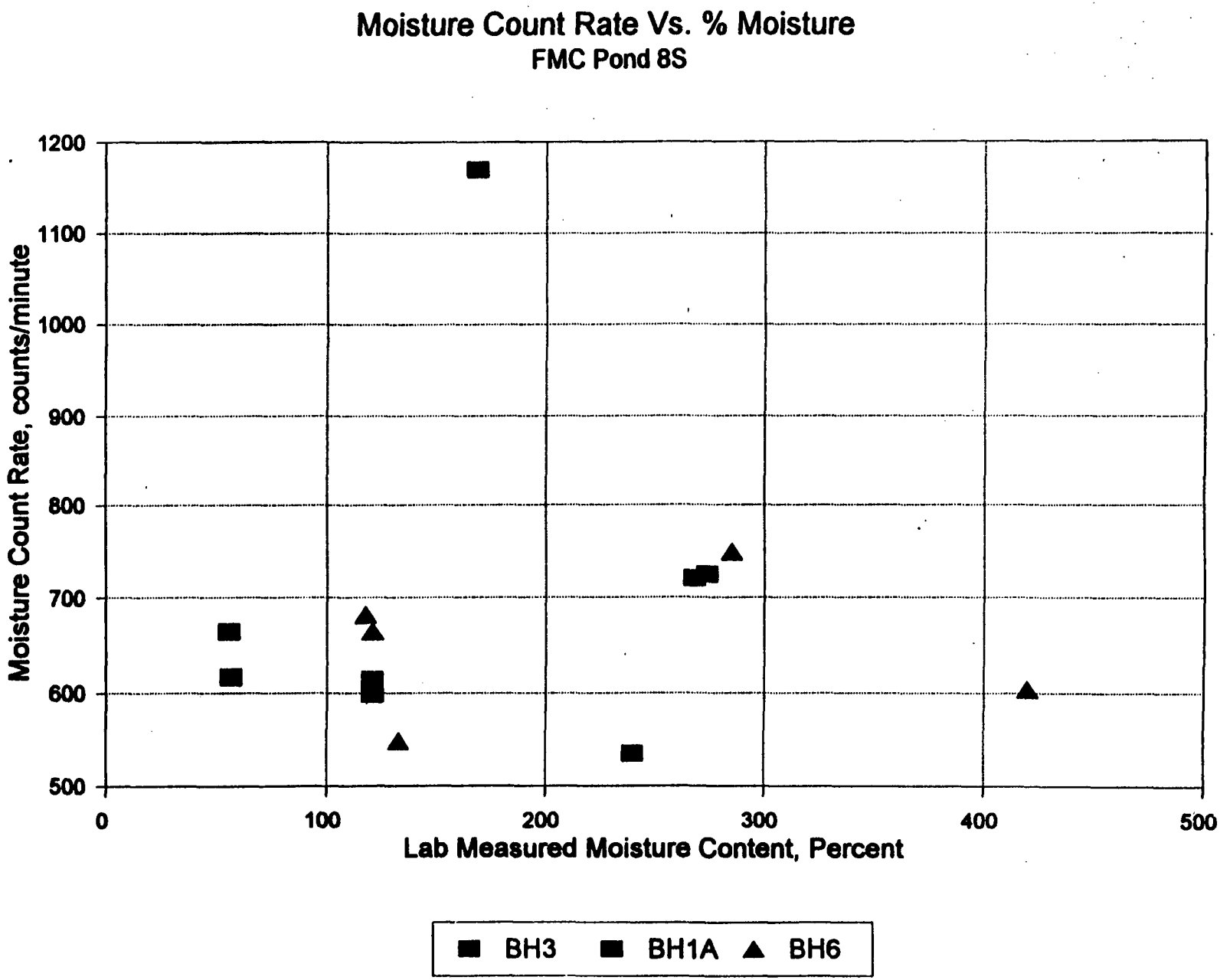

Moisture Count Rate Vs. % Moisture
FMC Pond 8S
Moisture Count Rate, counts/minute
1200
1100
1000
900
800
700
600
500
0
100
200
300
400
500
Lab Measured Moisture Content, Percent
BH3
BH1A
BH6

FIGURE 1.4-2

2.0 POND 15S SAMPLING AND TESTING

On November 15, 1993, BCI mobilized a two-man field sampling and testing crew from Lakeland, Florida to Pocatello, Idaho. BCI personnel attended a site-specific hazard and safety training orientation provided by FMC. All work was completed in accordance with FMC safety policies and the task-specific Health and Safety Plans for the closure activities.

The field work was completed from a pontoon barge on the water surface of Pond 15S. Typical values for water depth to the top of the sludge were one to two feet. FMC provided a field office, the barge, and the personnel to move the barge within the pond. Bechtel provided a geotechnical engineer to direct the investigation and a site health and safety officer. The test locations within Pond 15S and the tests completed at each location were selected by Bechtel's on-site engineer. The locations of all field tests are shown on Figure 2.0-1. Table 2.0-1 summarizes the work schedule and testing completed on Pond 15S. Appendix B includes field reports for work completed on Pond 15S.

Field testing of the pond sludge included vane shear testing, pore pressure measurements, and in-situ density and moisture testing. The test methods were selected to obtain data required to characterize physical properties of the sludge. Vane shear testing was completed to determine the in-situ and remolded shear strength of the sludge. Pore pressure data was gathered to obtain information regarding the consolidation characteristics of the sludge. Density and moisture content were determined using a nuclear density probe.

2.1 Pond 15S Vane Shear Testing

Shear strength was determined at sample locations BH-1, BH-2, BH-3, BH-4, and BH-5 (Figure 2.0-1). Shear strength testing was completed with a modified torque wrench system and field vane/rod combinations capable of testing very soft to firm soils. Two different sized vanes were used to accurately test the range of soil strengths encountered. Each vane consisted of four blades at 90 degree angles.

The hand-operated vane was pushed to the desired test depth, after which the wrench was slowly turned clockwise until the sludge failed. The peak torque in inch pounds was recorded along with the test depth and the vane size. Next, the vane was turned 360 degrees five times, the torque wrench reset to zero, and the procedure repeated to determine the remolded torque. The vane was pushed to the next test depth and the procedure repeated until resistance to penetration precluded the advancement of the vane further. The process was repeated at each test depth using only the rod without a vane to determine rod-only values.

Two different sized vanes were utilized for varying shear strengths. For very soft sludge, a large vane was used; a medium sized vane was used for soft sludge. Listed below are the dimensions of the vanes used to test the sludge in Pond 15S.

Vane Designation	Vane Height (inches)	Vane Diameter (inches)	k (ft^3)
Medium	8.5	2.9	0.07107
Large	12.0	6.5	0.54409

A computer spreadsheet was used to reduce the data based on the applied torque and the size of the vane. The shear strength of the sludge was calculated using the following formula as found in ASTM D2573 (Appendix C).

$$S = T \div k$$

where: S = the shear strength of the sludge in pounds per square foot (psf)
T = the applied torque in inch-pounds
k = a constant dependent on the size of the vane in cubic feet

The constant k(ft^3) was determined using the following formula as found in ASTM D2573:

$$k = (\pi/1728) \times (D^2H/2) \times [1 + (D/3H)]$$

where: D = the diameter of the vane in inches
H = the height of the vane in inches

Shear strength profiles in Pond 15S extend to depths that range from 12 feet to 16 feet below the mud line. Vane shear testing was terminated when impenetrable material was encountered. For each shear strength profile, initial and remolded shear strengths were determined with depth on one to three foot intervals. The accuracy of the test results are primarily dependent on the accuracy of the torque wrench. The torque wrench used has an accuracy of 2.5 inch pounds which corresponds to a shear strength of approximately 3.0 psf for the medium and 0.5 psf for the large vane respectively. Vane shear testing was terminated when impenetrable material was encountered.

Tables 2.1-1 through 2.1-5 include vane shear data for Pond 15S. Peak strength values range from 0 to 40 psf, values which are typical of very soft to soft soils. The remolded strength data range from about 0 to 90 psf. Figures 2.1-1 through 2.1-6 include plots of shear strength versus depth for bore hole locations in Pond 15S.

Pond sludge peak strength values were generally very low (<40 psf) and typically increased slightly downward. Measurements reflecting reduced peak strength values with depth occurred when the same size vane was used (BH1, six and twelve feet below mud line) and when deeper measurements were made with the medium vane (BH4, six feet below the mud line). The variable strength values reflect the heterogeneous nature of the pond sludge deposit.

2.2 Pond 15S Piston Tube Sampling

Piston tube sampling techniques were used at three locations in Pond 15S. The piston tube samplers were operated by manually pushing the sampler into the sludge to a specified depth and holding the piston stationary while advancing the sampling

tube. Two types of piston tube samplers were used to collect samples of Pond 15S sludge. The first, a gun-type sampler, has a small orifice at the bottom through which the sample enters the piston. The orifice (about 3/8 inch in diameter) allows very soft sludge to be sampled. Use of this sampler resulted in increased sample recovery in the near-surface sludge. This type sampler was used at location BH-5.

A more traditional, cylindrical piston tube sampler was used to sample sludge at BH-4. A locking mechanism on the cylindrical sampler prevents sludge from displacing the piston as it is advanced to the sample depth.

At each location, sampling was generally completed within one foot of the top of the mud line and at three-foot intervals thereafter. Upon retraction, samples were immediately extruded into labeled glass jars, the lid was screwed on, the jar was rinsed, and the jar was placed under water in a cooler. It was necessary to store the samples under water because of their flammable nature on contact with air. The recovered sample was not undisturbed, but because each sample is saturated, the laboratory calculated total unit weight should provide an indication of the in-situ density. By taking a series of samples at various depths at the same location, a vertical profile of unit weight and solids content is determined.

The maximum sampling depth that can be obtained with the hand-operated piston tube sampler is a function of solids content (typical maximum of about 60 percent, which corresponds to a wet unit weight of 100 pounds per cubic foot). Piston sampling in Pond 15S reached a maximum depth of about 15 feet below the mud line.

Table 2.2-1 includes the field data for the piston tube sampling completed by BCI. The total unit weight, percent solids content, and percent moisture content data were provided by Bechtel based on laboratory analyses completed by FMC (Table 2.2-1).

2.3 Pond 15S Pore Pressure Measurements

Pore pressure measurements were made at two locations in Pond 15S. The measurements were completed using a GEONOR model 600 vibrating-wire pore pressure probe and a model P-520H digital vibrating wire gauge indicator. The probe is calibrated when manufactured and does not require further calibration by the user; however, the probe was checked after shipment to the job site in a swimming pool for verification of manufacturer's calibration.

The basic operational principle of the gage is as follows: the frequency at which a stretched wire vibrates is dependent on the amount of tension in the wire. As the tension in the wire is relaxed, the frequency that the wire vibrates decreases. The vibrating wire probe used for this field investigation operates according to this basic principle. A pre-tensioned wire located in the probe is attached to a circular membrane on one side, and the housing of the probe on the other. As pressure is applied to the membrane, the tension in the wire is relaxed and the frequency decreases. If the pressure on the membrane decreases, the tension in the wire and the resulting frequency increases. A diagram of the pore pressure configuration and calibration data for the pore pressure probe utilized in Pond 15S are included in Appendix D.

Pore pressure is calculated in accordance with the formula provided by the manufacturer as shown below:

$$P = A(f - f_o) + B(f - f_o)^2$$

Where P = Applied load on the transducer in bars
f = output frequency from transducer measured in Hz
f_o = output frequency from transducer with no load in Hz
A & B are constants which vary for each instrument

The probe is capable of measuring pressures from 0 to 2 Bars and can operate in temperatures from -20 to +60 degrees celsius. The accuracy of the probe is less than one percent of the frequency measured which corresponds to approximately one-half inch.

Prior to taking measurements in the field, the porous stone and tip assembly of the pore pressure probe must be deaired. The procedure used for deairing the assembly was to boil it for ten minutes, allow it to cool, insert it in a rubber membrane (under water), and transport it to the barge in a small container of water. Prior to inserting the probe into the pond, the porous stone and tip assembly was attached to the probe housing utilizing a large drum of water to keep the assembly saturated. Next, the entire probe assembly was placed into a closed-end, PVC pipe filled with water to enable the probe to be placed in the pond. Once the probe was placed in the pond, the PVC pipe was removed.

The device was advanced by manually pushing the probe to the desired depth and allowing the pore pressure generated from inserting the probe in the sludge to dissipate. Once the pressure appeared to reach equilibrium, the oscillating frequency of the vibrating wire was recorded, the probe was pushed to the next depth, and the procedure was repeated.

Equilibrium decay time at each depth interval typically ranged from about twenty minutes to several hours at various depths within the sludge profile. Because the sludge behaves in accordance with the theory of finite strain consolidation, where both consolidation and permeability characteristics change significantly with changes in void ratio, the time for the pore pressure to reach equilibrium depended on the amount of excess pore pressure developed during the probe advancement and the permeability of the sludge at the pore pressure sensor location.

Test results for the measurement completed at BH-6 are shown in Table 2.3-1 along with the depth of the measurement below the water surface and mud line. The hydrostatic pore pressure is equal to the depth below the water surface at the test depth. The probe location is correlated to sampling locations as indicated in Table 2.0-1. The dissipation curve for the pore pressure results are graphically presented in Figure 2.3-1.

Test results for the measurement completed at BH-2 are not included in Table 2.3-1 because no reasonable data were obtained. This was most likely due to extreme cold, low batter voltage, and/or insufficient equilibration time.

2.4 Pond 15S Nuclear Density Measurements

Bulk density and moisture content measurements were made using a Campbell Pacific Nuclear (CPN) Model 501 DepthProbe. The unit consists of a sealed probe containing a gamma ray source (Cesium 137) and gamma detector for density measurements, and a neutron source (Americium 241) and thermal neutron detector for moisture determinations. The probe is connected via cable to an electronic data display and data logger unit.

The density channel of the DepthProbe consists of a gamma source and gamma detector separated by a shield to minimize direct contact with the detector. Gamma rays interact with matter in two ways: by compton scattering and photoelectric absorption. In low density materials (< 90 pcf) scattering effects dominate, resulting in an increase in detected counts with increasing density. In higher density materials (>90 pcf) absorption effects dominate and detected counts decrease with increasing density.

The moisture channel consists of a source of fast (or high energy) neutrons and a detector of slow (or thermal) neutrons. The fast neutrons lose energy through interaction with matter, reducing their energy to the thermal level. Hydrogen is extremely effective in slowing down the fast (high energy) neutrons in comparison with other elements. Thus the number of detected slow neutrons is generally proportional to the amount of hydrogen (and water) in soil matter. The presence of other elements such as chlorine and boron can affect the slow neutron count since they absorb thermal neutrons.

The CPN DepthProbe is supplied with several factory calibrations based on standards of low, medium, and high density concrete aggregates. The instrument can also be calibrated in the field against known soil densities and moisture contents.

Density and moisture depth profile measurements were made at two locations in Pond 15S (Table 2.0-1). For calibration purposes, sludge samples were collected for laboratory analysis of bulk density and moisture content at all of the nuclear density measurement points. Field procedures consisted of lowering the probe into a sealed, 2" PVC well casing that had been driven into the sludge. At the specified

depth, readings of density count rate, moisture count rate, and machine calculated values (based on factory calibrations) of wet density, dry density, and moisture content were recorded. A count interval of 64 seconds was used for all of the measurements in Pond 15S.

Results for density count rates and moisture count rates along with corresponding laboratory measured values for wet density and solids content for Pond 15S are tabulated in Table 2.4-1. As shown, laboratory measured density values ranged from 78 to 90 pcf. Laboratory measured solids content ranged from 25 to 51 percent. FMC personnel, who completed the laboratory testing, are of the opinion that the solids content values are unrepresentatively low. During the drying phase of the procedure, combustible solids contained in the pond sludge were burnt off, and were not therefore included when solids content was determined.

During field data collection, results calculated using the machine factory calibrations were shown to be erroneous. Machine calculated values for wet density, dry density, and moisture content are not therefore provided. Figures 2.4-1 and 2.4-2 are plots of density count rates versus laboratory measured wet density and moisture count rates versus laboratory measured moisture content. As shown, there is no discernable relationship between the laboratory measured density and moisture content values and detected count rates. Reasons for this lack of correlation may include the following:

1) Interference from gamma radiation sources in the sludge may have affected measured density count rates. Relatively high radionuclide levels in the sludge indicate this is a possibility.

2) Neutrons may have been absorbed by possible chlorine and bromide containing compounds in the sludge, which would have reduced measured moisture count rates.

3) Laboratory measurements of solids content are unrepresentatively low due to the drying procedure used in the FMC laboratory.

POND 15S TABLES

TABLE 2.0-1
FMC POCATELLO
POND 15S WORK SUMMARY

DATE	POND NUMBER	BORE HOLE NUMBER	VANE SHEAR TESTING		PISTON TUBE SAMPLING		PORE PRESSURE PROBE		NUCLEAR DENSITY TESTING
			SIZE	NUMBER OF TESTS	SAMPLER TYPE	NUMBER OF SAMPLES	PROBE NUMBER	NUMBER OF TESTS	(NUMBER OF TESTS)
11/21/93	15S	BH1	MED	10	---	---	---	---	---
11/21/93	15S	BH2	LARGE	10	---	---	---	---	---
11/23/93	15S	BH2	---	---	---	---	2	1	---
11/21/93	15S	BH3	LARGE	10	---	---	---	---	---
11/22/93	15S	BH4	LARGE MED	4 6	PISTON	7	---	---	6
11/22/93	15S	BH5	LARGE	6	GUN	6	---	---	5
11/23/93	15S	BH6	---	---	---	---	2	1	---

T:\ACTIVE\938858\8858TAB.2

TABLE 2.1-1
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 15S
BORE HOLE 1
FIELD TESTING NOVEMBER 21, 1993
TESTED BY T. SMITH & R. TROTTIER

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)				
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Medium	0	0	0.0	0	0.0	0	0	0.0	0	0.0
1.0	Medium	0	0	0.0	0	0.0	0	0	0.0	0	0.0
2.0	Medium	30	1	0.0	0	30.0	1	35	1.7	1	0.1
3.0	Medium	1	0	0.0	0	1.0	0	1	0.1	0	0.0
4.0	Medium	9	1	0.5	0	8.5	1	10	0.5	1	0.1
5.0	Medium	13	1	0.0	0	13.0	1	15	0.7	1	0.1
6.0	Medium	11	1	0.0	0	11.0	1	13	0.6	1	0.1
9.0	Medium	19	2	0.5	0	18.5	2	22	1.0	2	0.1
12.0	Medium	18	3	0.5	0	17.5	3	21	1.0	4	0.2
14.0	Medium	25	2	1.0	0	24.0	2	28	1.3	2	0.1

(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 2.1-2
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 15S
BORE HOLE 2
FIELD TESTING NOVEMBER 21, 1993
TESTED BY T. SMITH & R. TROTTIER

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	2.42E-02	7.11E-02	5.44E-01

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)				
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Large	40	3	0.0	0.0	40.0	3.0	6	0.3	0	0.0
1.0	Large	54	14	0.0	0.0	54.0	14.0	8	0.4	2	0.1
2.0	Large	109	10	0.0	0.0	109.0	10.0	17	0.8	2	0.1
3.0	Large	75	12	0.0	0.0	75.0	12.0	11	0.6	2	0.1
5.0	Large	85	17	0.5	0.0	84.5	17.0	13	0.6	3	0.1
6.0	Large	102	11	1.0	0.0	101.0	11.0	15	0.7	2	0.1
9.0	Large	157	15	3.0	1.0	154.0	14.0	24	1.1	2	0.1
12.0	Large	179	29	3.0	0.5	176.0	28.5	27	1.3	4	0.2
14.0	Large	210	27	3.0	1.0	207.0	26.0	32	1.5	4	0.2
16.0	Large	266	25	4.0	2.0	262.0	23.0	40	1.9	4	0.2

(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 2.1-3
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 15S
BORE HOLE 3
FIELD TESTING NOVEMBER 21, 1993
TESTED BY T. SMITH & R. TROTTIER

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	0.0242407	0.0710667	0.5440897

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)				
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Large	24	3	0	0	24	3	4	0.2	0	0.0
1.0	Large	44	5	0	0	44	5	7	0.3	1	0.0
2.0	Large	75	5	0	0	75	5	11	0.6	1	0.0
3.0	Large	68	11	0	0	68	11	10	0.5	2	0.1
4.0	Large	86	10	0	0	86	10	13	0.6	2	0.1
5.0	Large	82	14	1	0	81	14	12	0.6	2	0.1
6.0	Large	116	14	2	0	114	14	17	0.8	2	0.1
9.0	Large	161	14	1	0	160	14	25	1.2	2	0.1
12.0	Large	198	22	3	0	195	22	30	1.4	3	0.2
13.0	Large	206	33	1	0	205	33	31	1.5	5	0.2

(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 2.1-4
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 15S
BORE HOLE 4
FIELD TESTING NOVEMBER 22, 1993
TESTED BY T. SMITH & R. TROTTIER

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	0.0242407	0.0710667	0.5440897

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)				
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Large	105	3	0	0	105	3	16	0.8	0	0.0
1.0	Large	96	14	0	0	96	14	15	0.7	2	0.1
2.0	Large	116	25	1	0	115	25	18	0.8	4	0.2
3.0	Large	252	12	0	0	252	12	39	1.8	2	0.1
6.0	Medium	13	4	1	0	12	4	14	0.7	5	0.2
9.0	Medium	31	3	0	0	31	3	36	1.7	4	0.2
12.0	Medium	24	3	4	0	20	3	23	1.1	4	0.2
13.0	Medium	24	8	3	0	21	8	25	1.2	9	0.4
14.0	Medium	28	8	1	0	27	8	32	1.5	9	0.4
15.0	Medium	29	8	4	2	25	6	29	1.4	7	0.3

(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 2.1-5
VANE SHEAR DATA
FMC POCATELLO
PROJECT NO. 938858

POND 15S
BORE HOLE 5
FIELD TESTING NOVEMBER 22, 1993
TESTED BY T. SMITH & R. TROTTIER

VANE SIZE	SMALL	MEDIUM	LARGE
Diameter (inches)	2.0	2.9	6.5
Height (inches)	6.0	8.5	12.0
k (cu. ft.)	0.0242407	0.0710667	0.5440897

		FIELD DATA						SHEAR STRENGTH			
		(1)	(2)	(3)	(4)	(5)	(6)				
DEPTH (ft)	VANE SIZE	INITIAL VANE+ROD (in-lbs)	REMOLDED VANE+ROD (in-lbs)	INITIAL ROD (in-lbs)	REMOLDED ROD (in-lbs)	INITIAL VANE (in-lbs)	REMOLDED VANE (in-lbs)	INITIAL (psf)	INITIAL (kPa)	REMOLDED (psf)	REMOLDED (kPa)
0.0	Large	41	4	0	0	41	4	6	0.3	1	0.0
1.0	Large	56	13	0	0	56	13	9	0.4	2	0.1
3.0	Large	136	11	0	0	136	11	21	1.0	2	0.1
6.0	Large	149	21	1	0	148	21	23	1.1	3	0.2
9.0	Large	203	21	1	0	202	21	31	1.5	3	0.2
12.0	Large	215	29	3	1	212	28	32	1.6	4	0.2

(5) = (1) - (3)
(6) = (2) - (4)
(7) = [(5) ÷ 12 in./ft.] ÷ k
(8) = (7) ÷ 20.88 KPa/psf
(9) = [(6) ÷ 12 in./ft.] ÷ k
(10) = (9) ÷ 20.88 KPa/psf
12/30/93

TABLE 2.2-1
POND 15S SAMPLING DATA
FMC POCATELLO
PROJECT NO. 938858

SAMPLED BY: R. TROTTIER & T. SMIT

DATE	BORE HOLE LOCATION	FIELD DATA				LABORATORY DATA			
		SAMPLER TYPE	SAMPLE NUMBER	DEPTH BELOW WATER (feet)	DEPTH BELOW MUD LINE (feet)	TOTAL UNIT WEIGHT (g/cm3)	TOTAL UNIT WEIGHT (pcf)	SOLIDS CONTENT (%)	MOISTURE CONTENT (%)
22NOV93	BH-4	PISTON	15S 4-1	1.1	0	1.35	84.3	51.7	21
22NOV93	BH-4	PISTON	15S 4-2	2.1	1	1.34	83.7	35.6	77
22NOV93	BH-4	PISTON	15S 4-3	4.1	3	1.30	81.2	27.7	75
22NOV93	BH-4	PISTON	15S 4-4	7.1	6	1.29	80.5	28.7	134
22NOV93	BH-4	PISTON	15S 4-5	10.1	9	1.25	78.0	28.1	132
22NOV93	BH-4	PISTON	15S 4-6	13.1	12	1.34	83.7	38.6	120
22NOV93	BH-4	PISTON	15S 4-7	16.1	15	1.29	80.5	39.7	124
22NOV93	BH-5	GUN	15S 5-1	1.8	0	1.41	88.0	25.8	89
22NOV93	BH-5	GUN	15S 5-2	2.8	1	1.42	88.7	32.8	130
22NOV93	BH-5	GUN	15S 5-3	4.8	3	1.44	89.9	32.6	108
22NOV93	BH-5	GUN	15S 5-4	7.8	6	1.45	90.5	32.3	116
22NOV93	BH-5	GUN	15S 5-5	10.8	9	1.45	90.5	32.3	105
22NOV93	BH-5	GUN	15S 5-6	13.8	12	1.43	89.3	40.1	110

01/03/94

File: 15SSOL.WQ1

TABLE 2.3-1
POND 15S
PORE PRESSURE PROBE DATA
FMC POCATELLO
PROJECT NO. 938858

PORE PRESSURE CALIBRATION DATA

PROBE DESIGNATION	fo (Hz)	A (Bars)	B (Bars)	Calibration Temperature (C)	Temperature Sensitivity (Hz/C)
2 (NEW)	1794.5	-6.5686E-03	1.7681E-06	15.0	0.7

TEST NUMBER	BORE HOLE NUMBER	PROBE NUMBER	FIELD DATA					CALCULATED VALUES		
			TOP OF MUD TEMPERATURE (Degrees C)	DEPTH BELOW WATER (Feet)	DEPTH BELOW MUD (Feet)	STABILIZED FREQUENCY (Hz)	ELAPSED TIME (Minutes)	CORRECTED FREQUENCY (Hz)	CALCULATED PRESSURE (Bars)	CALCULATED PRESSURE (Feet)
1*	BH6	2	0	4.8	3	1764.8	21	1784	0.1268	4.24

*Note: Suspect erroneous data due to cold or low battery voltage

File: PORE15S.WQ1

Table 2.4-1

Pond 15S - Nuclear Density Data

Date: 11/22/93
Time: 15:10
Location: Pond 15S, BH4
Units: PCF, Counts = 64 sec.

Depth ft. BML	Density Counts	Moisture Counts	Laboratory Measured % Solids	Laboratory Measured % Moisture	Laboratory Measured Wet Den.
0	6891	1422	51.67	21	84.28
-1	6955	556	35.57	77	83.65
-3	7037	666	27.67	75	81.16
-6	7274	588	28.74	134	80.53
-9	7248	679	28.14	132	78.03
-12	7057	723	38.61	120	83.65

*BML = "Below Mud Line", from bottom of probe

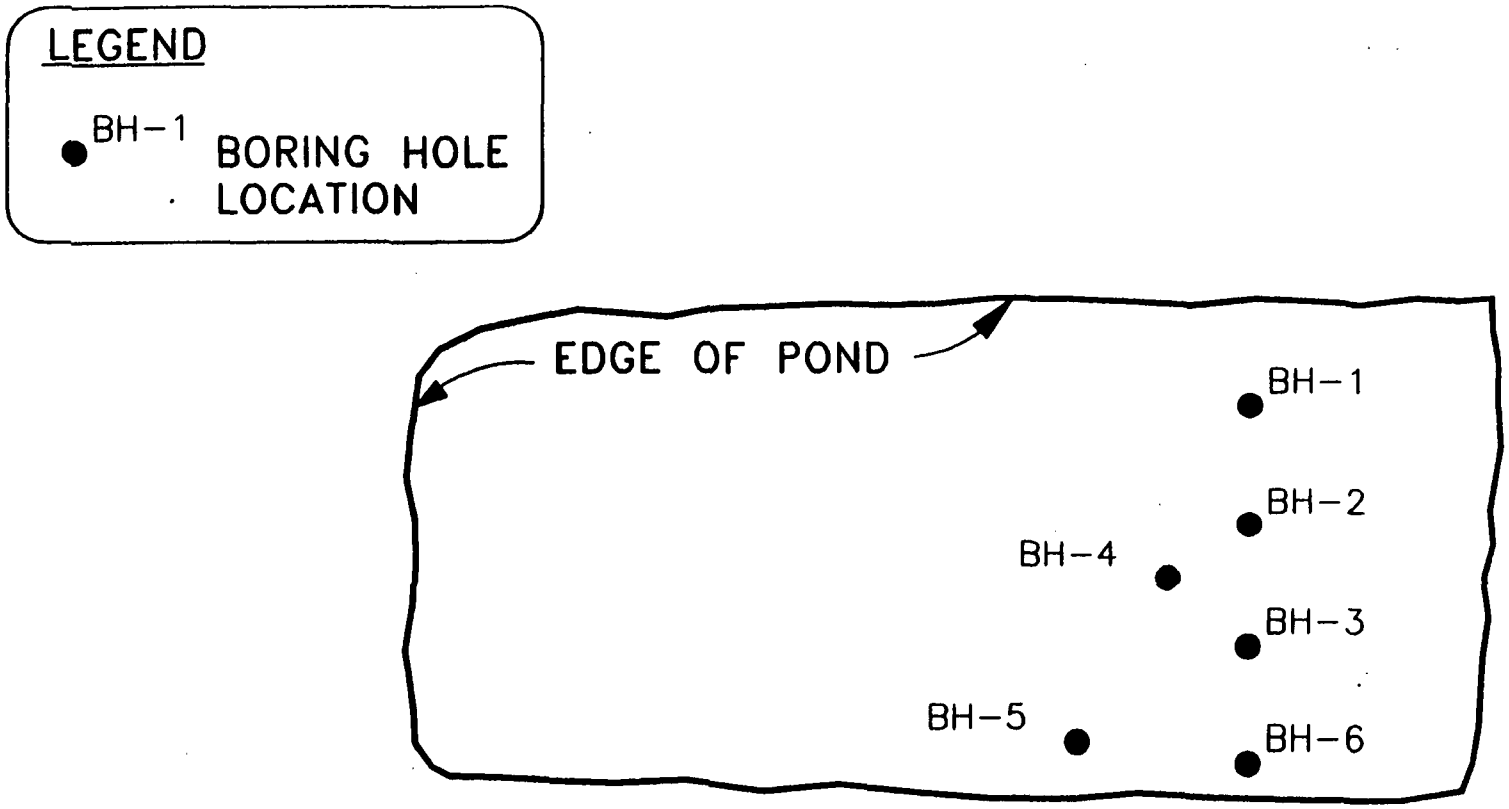
Date: 11/22/93
Time: 14:15
Location: Pond 15S, BH5
Units: PCF, Counts = 64 sec.

Depth ft. BML	Density Counts	Moisture Counts	Laboratory Measured % Solids	Laboratory Measured % Moisture	Laboratory Measured Wet Den.
0	7107	722	25.77	89	88.02
-1	7191	715	32.80	130	88.65
-3	7075	598	32.63	108	89.90
-6	7153	725	32.28	116	90.52
-9	7003	675	32.31	105	90.52

*BML = "Below Mud Line", from bottom of probe

POND 15S FIGURES

8858002A.DWG



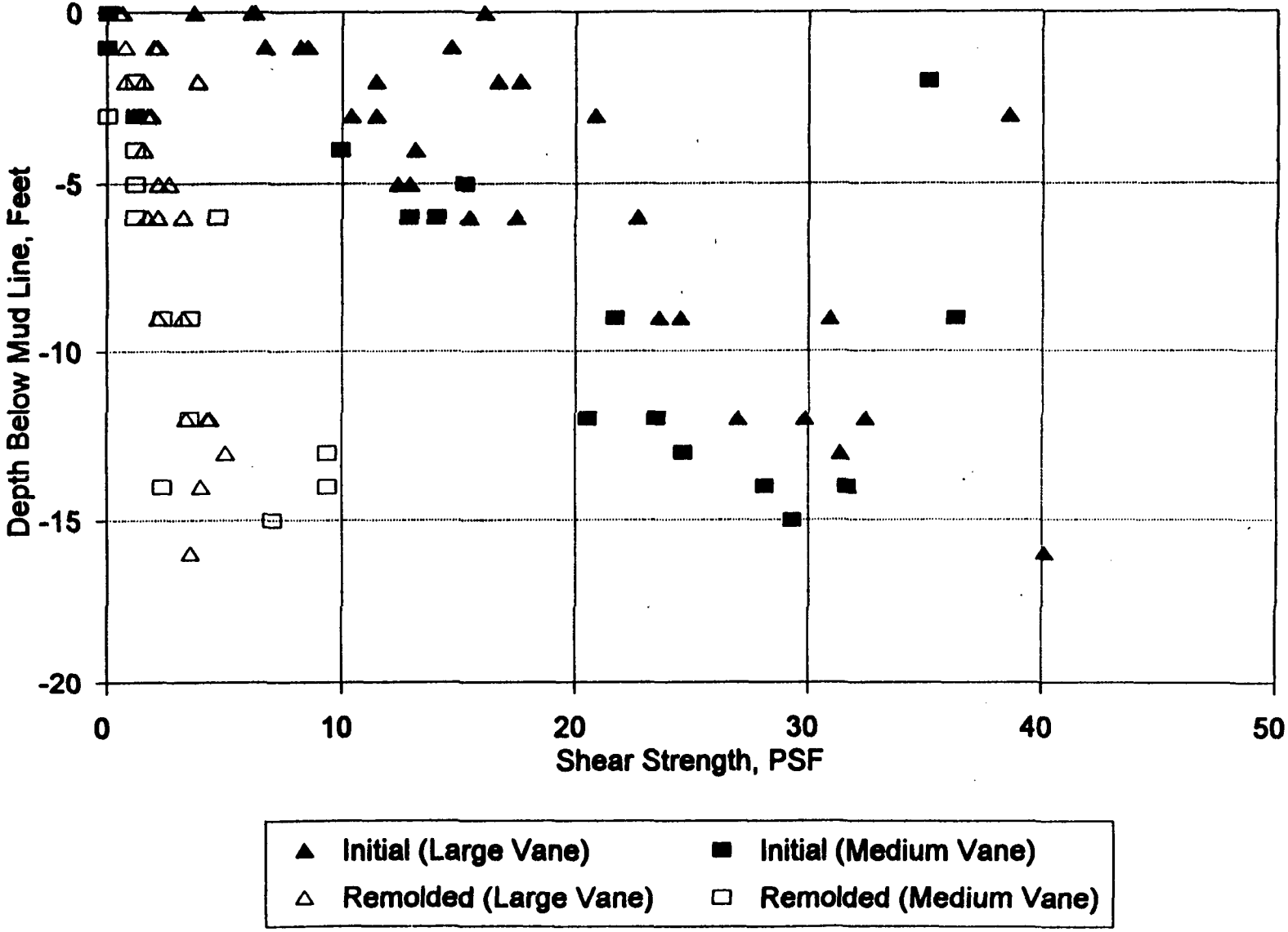
DATE:	12/31/93
DRAWN BY:	L.B.D.
SCALE:	1"=200' (Approx)
PROJECT NO.:	938858

BCI
BROMWELL & CARRIER, INC.
5925 IMPERIAL PARKWAY, LAKELAND, FL 33860
PHONE: (813) / 646-8591

PREPARED FOR
Bechtel

FIGURE 2.0-1
POND 15S
BORE HOLE LOCATIONS

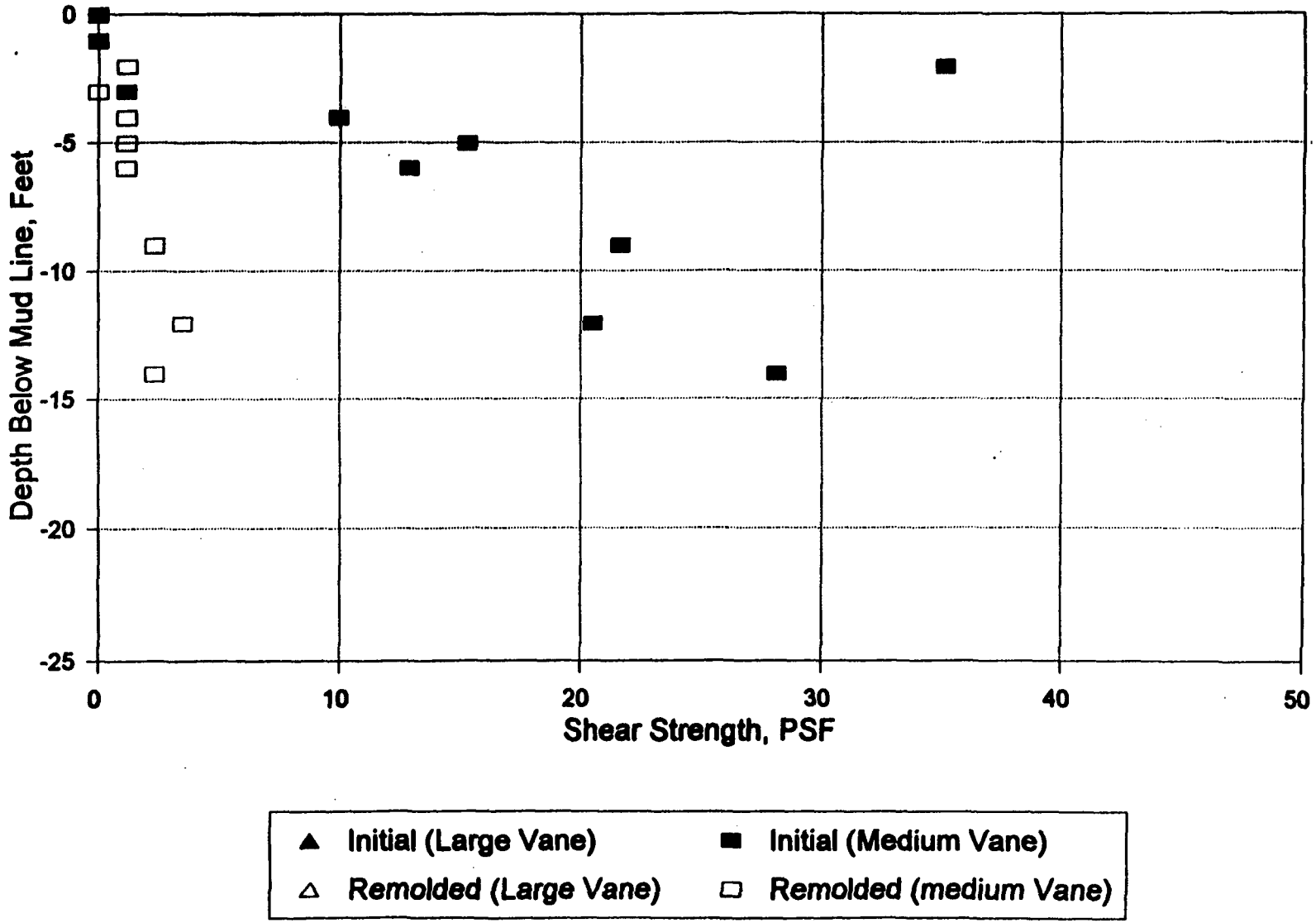
Vane Shear Strength Vs. Depth
FMC Pond 15S - Summary of Data



NOTE: Depth is measured from top of vane.

FIGURE 2.1-1

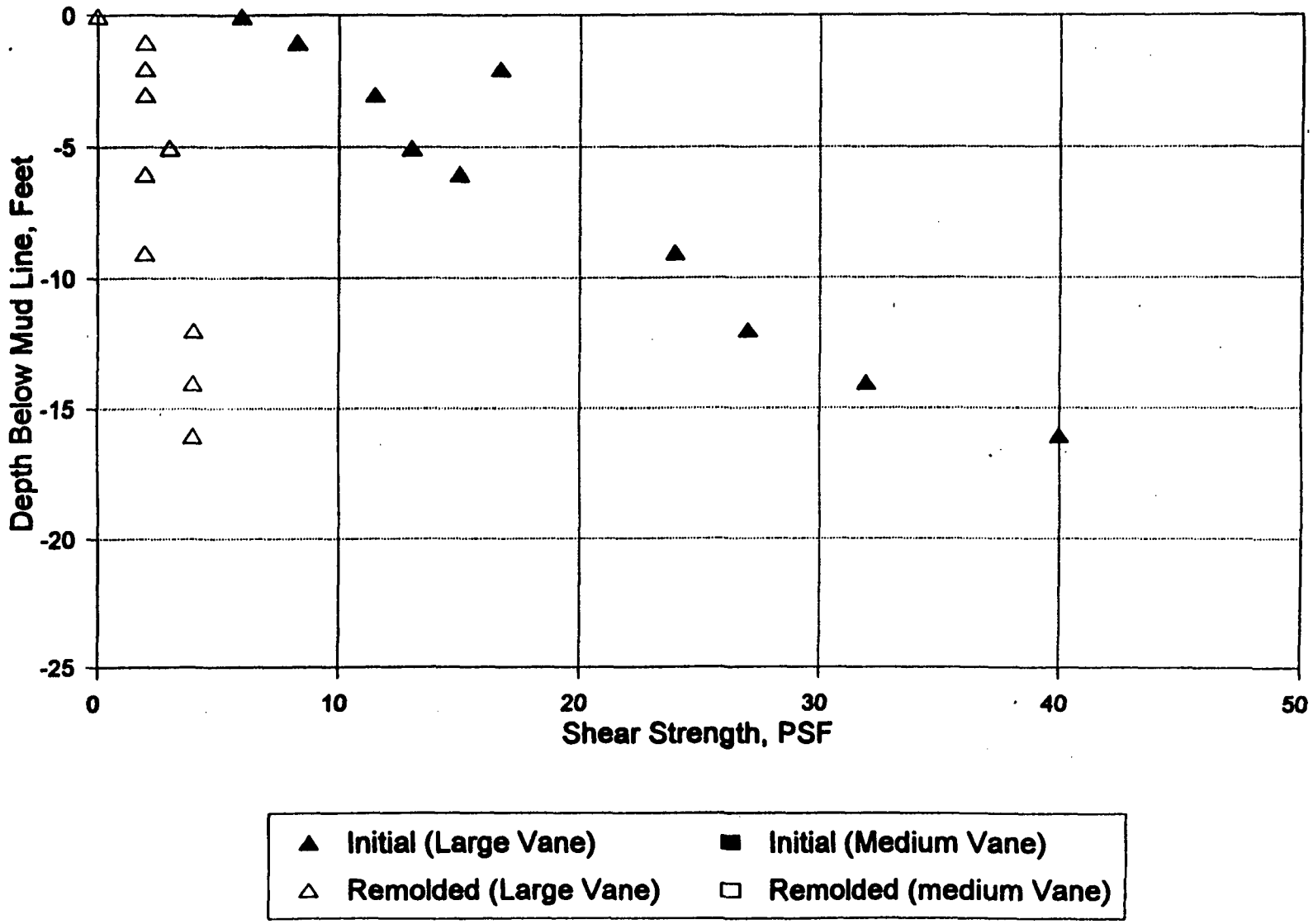
Vane Shear Strength Vs. Depth
FMC Pond 15S - Bore Hole 1



NOTE: Depth is measured from top of vane.

FIGURE 2.1-2

Vane Shear Strength Vs. Depth
FMC Pond 15S - Bore Hole 2

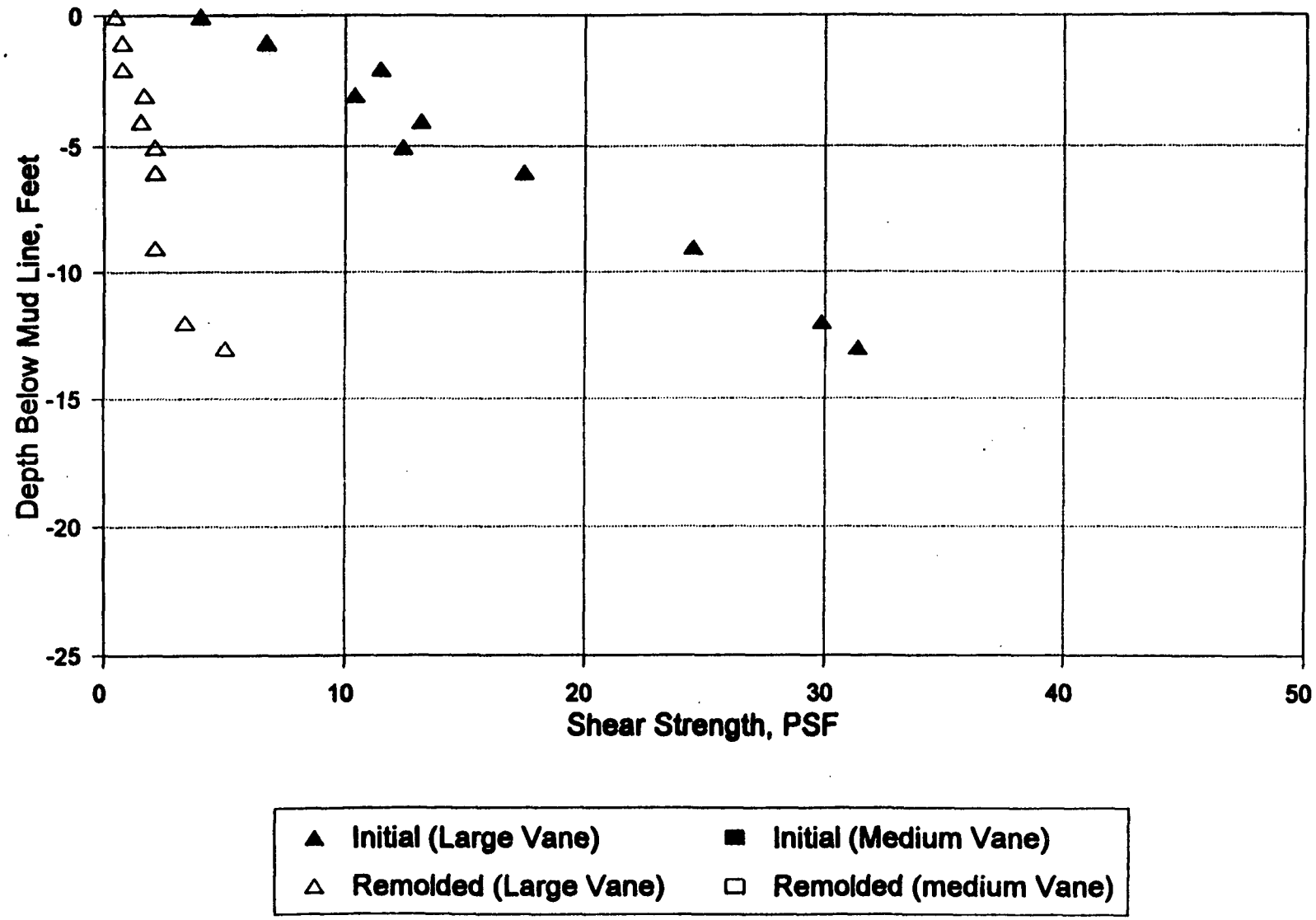


NOTE: Depth is measured from top of vane.

FIGURE 2.1-3

Vane Shear Strength Vs. Depth

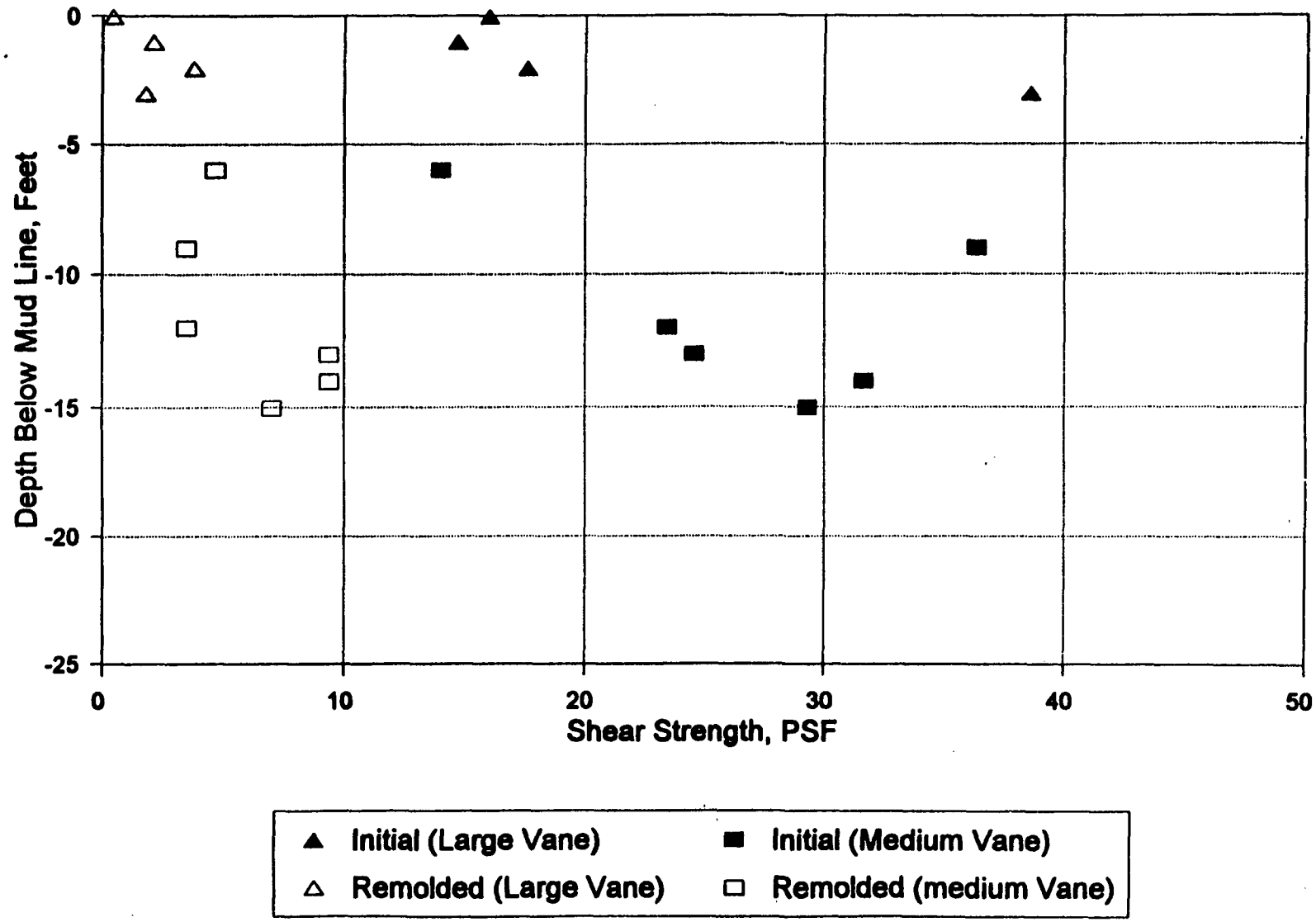
FMC Pond 15S - Bore Hole 3



NOTE: Depth is measured from top of vane.

FIGURE 2.1-4

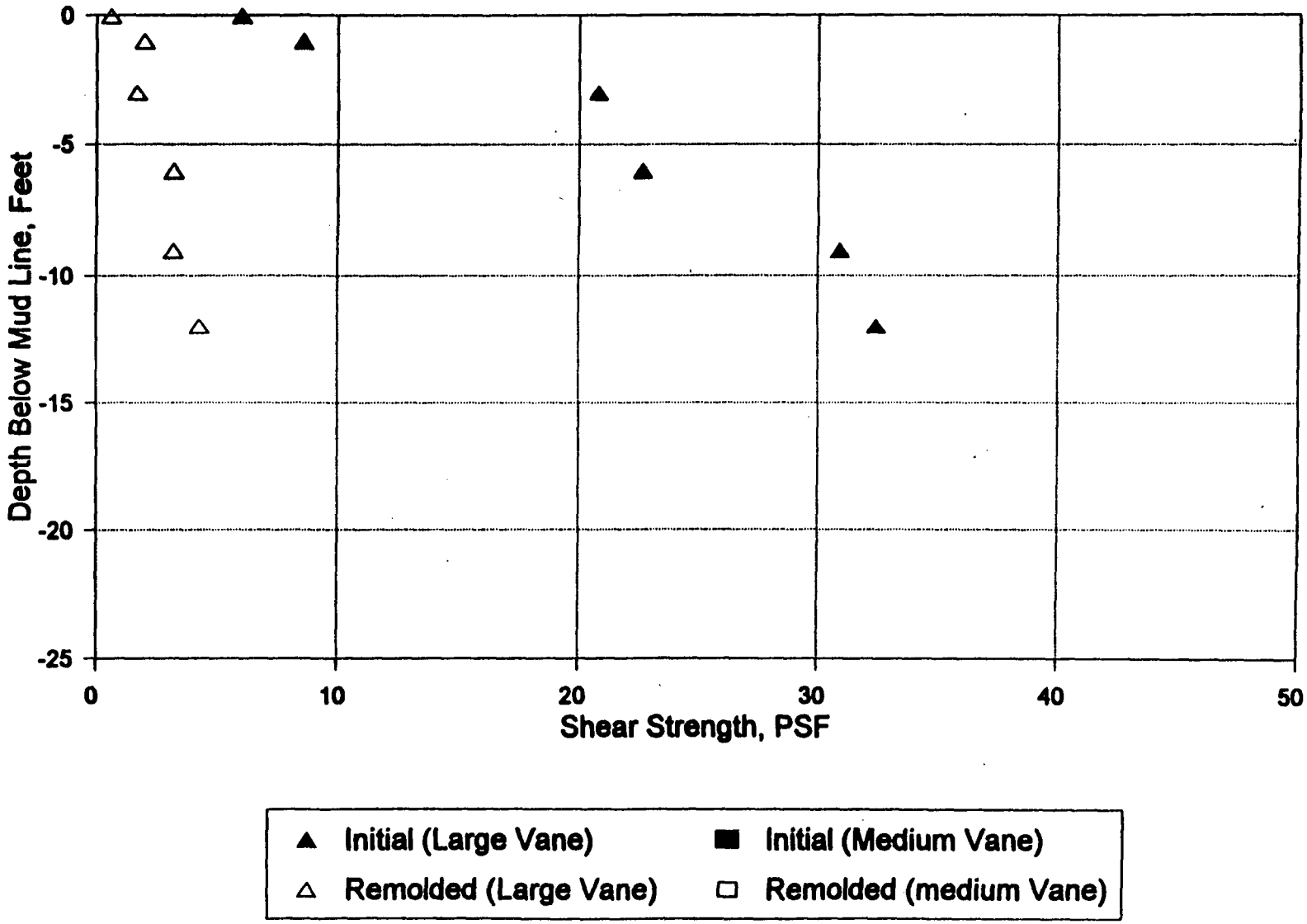
Vane Shear Strength Vs. Depth
FMC Pond 15S - Bore Hole 4



NOTE: Depth is measured from top of vane.

FIGURE 2.1-5

Vane Shear Strength Vs. Depth
FMC Pond 15S - Bore Hole 5



NOTE: Depth is measured from top of vane.

FIGURE 2.1-6

Pore Pressure Dissipation
FMC Pond 15S - Bore Hole 6 - 4.8 Ft.

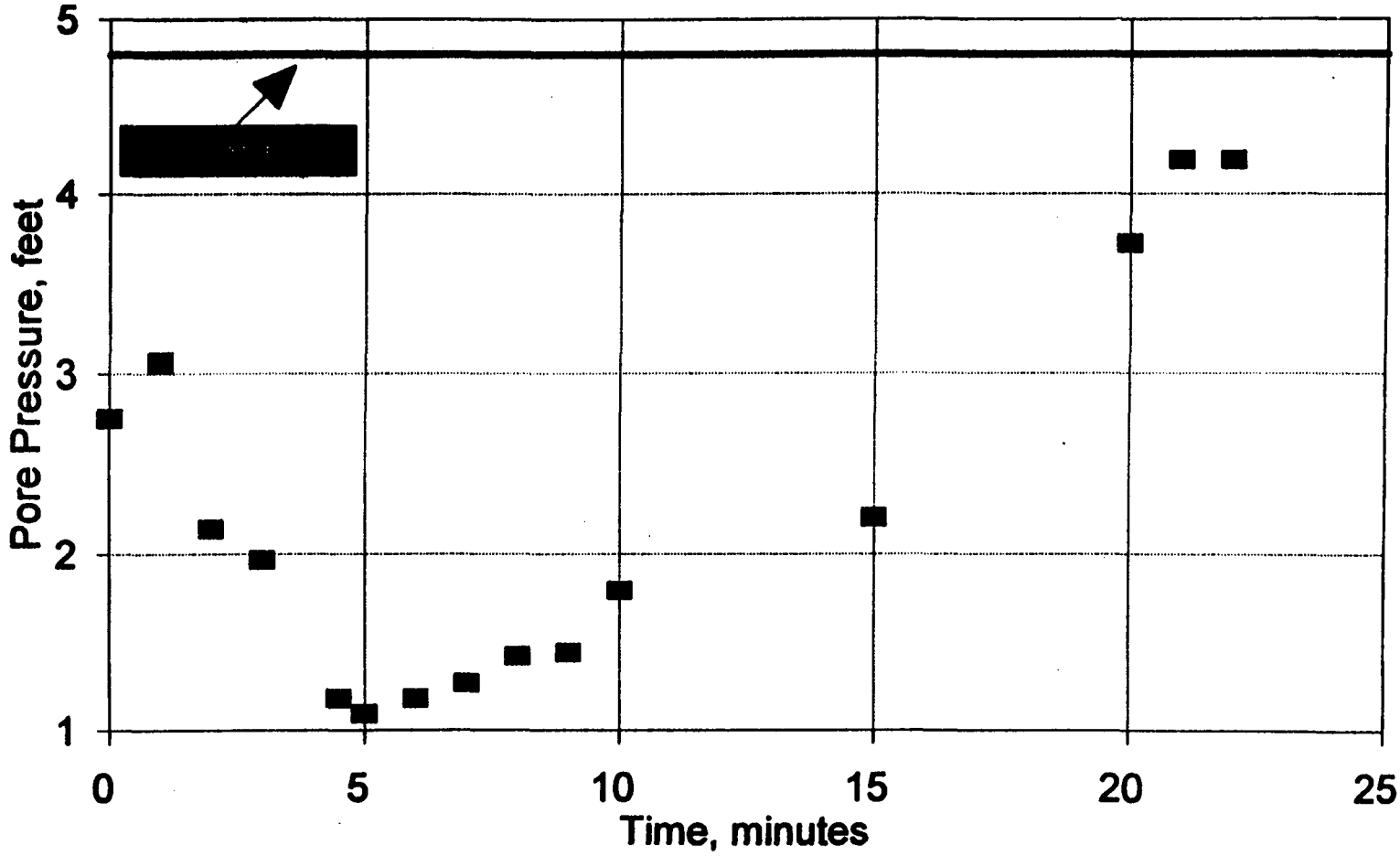


FIGURE 2.3-1

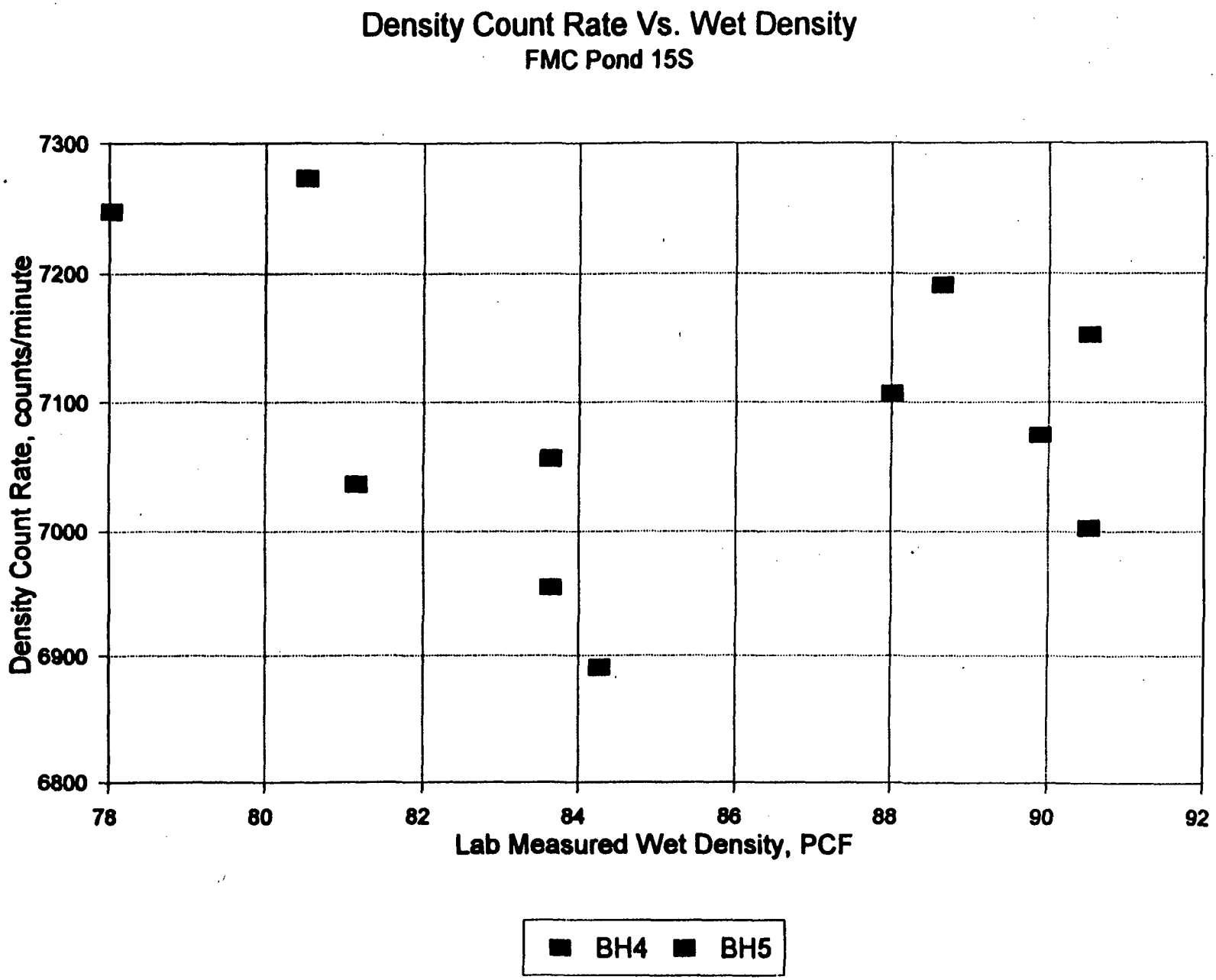

Density Count Rate Vs. Wet Density
FMC Pond 15S
Density Count Rate, counts/minute
7300
7200
7100
7000
6900
6800
78
80
82
84
86
88
90
92
Lab Measured Wet Density, PCF
BH4
BH5

FIGURE 2.4-1

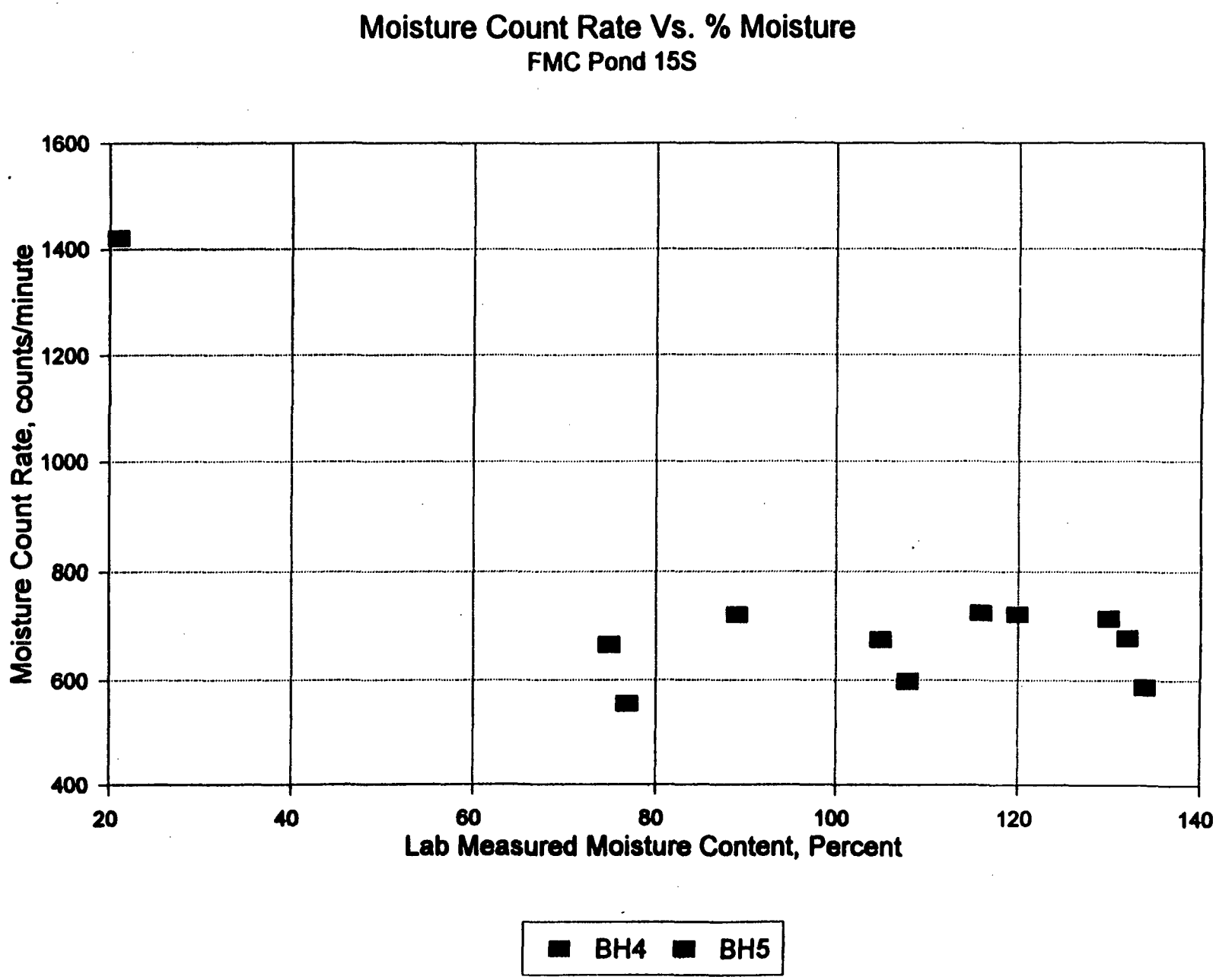

Moisture Count Rate Vs. % Moisture
FMC Pond 15S
Moisture Count Rate, counts/minute
1600
1400
1200
1000
800
600
400
20
40
60
80
100
120
140
Lab Measured Moisture Content, Percent
BH4
BH5

FIGURE 2.4-2

ACKNOWLEDGEMENTS

The following BCI personnel worked on this project:

President	W. David Carrier, III, P.E.
Senior Project Manager	Wayne A. Ericson, P.E.
Project Manager	Cornelis Winkler III, P.G.
Project Manager	Ted J. Smith, P.G.
Staff Engineers	Richard D. Trottier, E.I.
	Mark E. Plaskett, E.I.
Clerical	Kris Verdier
Drafting/CADD	Linda B. Douberly

The following personnel provided valuable support to the completion of the BCI field investigation:

Alison Jones, Geotechnical Engineer, Bechtel
James E.F. Davidson, Site Health & Safety Officer, Bechtel
Dale Oosterhouse, Environmental Engineer, FMC
Larry Anderson, Project Services Supervisor, FMC
Kirk Nellis, Maintenance Mechanic, FMC
John Elle, On-Site Coordinator, Bithell Engineering

Key Words
FMC
Bechtel
Idaho
Phosphorus

Latitude	42° 50′ North
Longitude	112° 25′ West

REFERENCES

American Society for Testing and Materials (1990). 1990 Annual Book of ASTM Standards Volume 04.08 Soil and Rock; Dimension Stone; Geosynthetics.

GEONOR (1993). "GEONOR Vibrating-Wire Pore Pressure Measurement Systems M-600, S-411," Oslo, Norway.

APPENDIX A

FIELD REPORTS, POND 8S

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE 15NOV93 MONDAY	JOB NO. 938858
PROJECT FMC POND CLOSURE	
LOCATION POCATELLO, ID	
CONTRACTOR BECHTEL ENV.	OWNER FMC
WEATHER SUNNY COLD	TEMP. ~40°
PRESENT AT SITE BCI - T. SMITH, C. WINKLER III	
BECHTEL - A. JONES, J. DAVIDSON, M. KOSTANIAN FMC - D. OOSTERHOUSE BITHEL ENG. - J. ELLE	

TO ALISON JONES

BECHTEL ENVIRONMENTAL

THE FOLLOWING WAS NOTED:

THE DAY WAS SPENT IN SAFETY TRAINING, SITE RECONNAISSANCE, AND PROJECT MEETINGS.

TIME LOG:

7:30-8:00 LOAD EQUIPMENT AND TRAVEL TO FMC SITE

8:00-10:00 SAFETY TRAINING BY FMC

10:00-12:30 POND 8S RECONNAISSANCE, CHECK OUT BARGE, REVIEW SAFETY PROCEDURES

NB 12:30-1:30 LUNCH

1:30-3:30 PROJECT PLANNING MEETING W/ FMC & BECHTEL

3:30-4:30 CHECK OF FMC PROVIDED SAFETY EQUIPMENT

4:30-5:30 TRAVEL TO BITHEL ENG., PROJECT MEETING WITH JOHN ELLE, PICK UP EQUIPMENT & CONSULT WITH SUPPLIER OF EQUIPMENT.

5:30-6:00 BUY ADDITIONAL EQUIPMENT & TRAVEL

NB 7:00-8:00 MEETING WITH BECHTEL

8:00-10:00 CALIBRATE PORE PRESSURE PROBES IN MOTEL POOL

NB = NON-BILLABLE

TOTAL BILLABLE HOURS = 11.5

cc:

SIGNED Rachel Winkler

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE 16NOV93 TUESDAY	JOB NO. 938858
PROJECT FMC – POND 8S	
LOCATION POCATELLO, ID	
CONTRACTOR BECHTEL ENV.	OWNER FMC
WEATHER SUNNY	TEMP. ±40°
PRESENT AT SITE BCI T. SMITH, C. WINKLER III	
BECHTEL - A. JONES, J. DAVIDSON, M. KOSTANIAN FMC - D. OOSTERHOUSE	

TO ALISON JONES

BECHTEL ENVIRONMENTAL

THE FOLLOWING WAS NOTED:

PROJECT TASKS COMPLETED INCLUDED FINAL EQUIPMENT MOBILIZATION, PORE PRESSURE PROBES, AND PISTON TUBE SAMPLING.

TIME LOG:

	7:00-7:30	F_0 CALIBRATION OF PORE PRESSURE PROBES
	7:30-7:50	LOAD EQUIPMENT & TRAVEL TO SITE
	7:50-11:30	DEAIR PORE PRESSURE TIPS & MOBILIZE EQUIPMENT TO BARGE
		FABRICATE PORE PRESSURE FLOAT
	11:30-3:30	PORE PRESSURE READINGS & PISTON TUBE SAMPLING @ B.H.3
	3:30-4:00	DEMOB OFF POND FOR SAFETY REASONS @ BECHTEL'S DIRECTION
		AIR MONITORING EQUIPMENT SHOWED HIGH PHOSPHENE GAS LEVELS
	4:00-5:00	ADDITIONAL PIEZOMETER WORK AT B.H.3
		UNABLE TO PENETRATE @ 6.5' MUD DEPTH.
	5:00-6:00	RETURN TO SHORE, TRANSFER EQUIPMENT, DEMOB
NB	7:00-9:00	MEETING WITH BECHTEL
	9:00-10:00	EQUIPMENT MAINTENANCE & VANE SHEAR CHECK-OUT.

NB = NONBILLABLE HOURS

TOTAL BILLABLE HOURS = 12.0

cc:

SIGNED Conrad Winkler III

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE 16NOV93 TUESDAY JOB NO. 938858

PROJECT FMC- POND 8S

LOCATION

CONTRACTOR OWNER

WEATHER TEMP.

PRESENT AT SITE

TO ALISON JONES
BECHTEL ENV.

THE FOLLOWING WAS NOTED:

DATA COLLECTED: BORE HOLE 3

PIEZOMETER READINGS AT 0', 1', 3.5', 6.5' BELOW MUD LINE

COLLECTED PISTON TUBE SAMPLES LOST SAMPLE @ SURFACE (SOFT)

SAMPLE @ 2'

SAMPLE @ 3'

SAMPLE @ 4.5'

COMMENTS:

PROBLEM WITH VANE / VANE ROD THREADS

PHOS BURN ON TED'S PANTS @ 2:50

FAIRLY RAPID EQUILIBRATION OF PIEZOMETER DATA

EVENING MEETING W/ CLIENT TO DISCUSS FIELD PROCEDURES

FMC NEEDS TO IMPROVE ON KEEPING BARGE IN POSITION

WORKING OVER THE RAILING IS UNSAFE & NOT PRODUCTIVE

SINGLE TASKS THROUGH CENTER HOLE WILL BE UTILIZED

DUE TO CONFINED SPACE ON BARGE

CC:

SIGNED Cornelis Winkler

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE	17NOV93 WEDNESDAY
JOB NO.	938858
PROJECT	FMC - POND 8S
LOCATION	POCATELLO, ID
CONTRACTOR	BECHTEL ENV
OWNER	FMC
WEATHER	SUNNY - MILD
TEMP.	MAX ± 45-50°
PRESENT AT SITE	BCI - T. SMITH, C. WINKLER III BECHTEL - A. JONES, M. KOSTANIAN, J. DAVIDSON FMC - D. OOSTERHOUSE

O ALISON JONES

BECHTEL ENVIRONMENTAL

THE FOLLOWING WAS NOTED:

COMPLETED VANE SHEAR AND NUCLEAR DENSITY PROBE TESTING IN POND 8S.

TIME LOG:

6:00-6:30	LOAD EQUIPMENT & TRAVEL TO SITE
6:30-8:15	EQUIPMENT CHECK OUT & LOAD BARGE
8:15-8:30	WAIT ON CLIENT TO MOB & GET INTO PPE
8:30-12:00	POSITION BARGE AT B.H.3, COLLECT VANE SHEAR DATA, RETURN TO SHORE.
12:00-12:15	GET OUT OF PPE
NB 12:15-12:45	LUNCH
12:45-1:00	GET INTO PPE
1:00-5:15	NUCLEAR DENSITY TESTING @ B.H.3 VANE SHEAR TESTING @ B.H.7 & B.H.4
5:15-6:30	DEMOB EQUIPMENT, STORE PPE, MEET WITH BECHTEL REGARDING SCHEDULE AND NUCLEAR DENSITY DATA.

NB = NONBILLABLE

BILLABLE HOURS = 12.0

cc:

SIGNED Cornelis Winkler III

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE 17 NOV 93 WEDNESDAY	JOB NO. 938858
PROJECT FMC POND 85	
LOCATION	
CONTRACTOR	OWNER
WEATHER	TEMP.
PRESENT AT SITE	

TO ALISON JONES
BECHTEL ENVIRONMENTAL

THE FOLLOWING WAS NOTED:

1. SHEAR VANE DATA

BOREHOLE NO.	VANE SIZE	NO. OF TESTS	DEPTH RANGE
BH 3	MED (HT=8.5")	6	0' TO 5'
BH 3	SMALL (HT=6")	5	6' TO 13.5'
BH 7	MED (HT=8.5")	5	0.5' TO 4.25'
BH 7	SMALL (HT=6")	1	4' 4"
BH 4	MED (HT=8.5")	7	0' TO 7'

2. NUCLEAR DENSITY DATA COLLECTED AT B.H.3 FROM 3' ABOVE MUD LINE TO 9' BELOW MUD LINE

COMMENTS:

DENSITY DATA NOT REASONABLE - WILL CHECK WITH MANUFACTURER.
WORKING OUT OF CENTER OF BARGE WORKING WELL
FMC IMPROVED BARGE POSITIONING

CC:

SIGNED Cornelis Winkler

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE	18 NOV 93 THURSDAY
JOB NO.	938858
PROJECT	FMC POND 8S
LOCATION	POCATELLO, ID
CONTRACTOR	BECHTEL ENV
OWNER	FMC
WEATHER	WINDY SNOWFLURRIES
TEMP.	32°
PRESENT AT SITE	BCI T. SMITH, E. WINKLER III BECHTEL - A. JONES, JIM DAVIDSON FMC - P. OOSTERHOUSE

TO ALISON JONES
BECHTEL ENVIRONMENTAL

THE FOLLOWING WAS NOTED:

VANE SHEAR TESTING WAS COMPLETED AT 4 LOCATIONS IN POND 8S.

TIME LOG

	6:00-6:30	LOAD EQUIPMENT & TRAVEL TO SITE
	6:30-8:30	ASSEMBLE SOFT SEDIMENT SAMPLER, MOBILIZE EQUIPMENT, TEST NUCLEAR GAUGE, SUIT UP IN PPE. INCLUDES WAITING FOR FMC TO SET UP WATER HOSE
	8:30-10:40	ON POND - VANE SHEAR TESTING AT B.H.2
	10:40-11:20	SAFETY BREAK DUE TO COLD 30°F 18/23 KNOT WINDS
	11:20-1:45	ON POND - VANE SHEAR TESTING AT B.H.6
	1:45-2:45	SAFETY BREAK DUE TO EXTREME COLD ±32° 25/30 MPH WINDS
	2:45-5:00	ON POND - VANE SHEAR TESTING AT B.H. 5 & 5A
	5:00-5:30	DEMOB & GET OUT OF P.P.E.
	5:30-6:00	PAPERWORK & XEROXING DATA
NB	7:00-8:00	PROJECT COORDINATION MEETING. (CW3)
NB	9:30-11:00	PAPERWORK (CW3)

NB. NON-BILLABLE

TOTAL BILLABLE HOURS = 12.0

cc:

SIGNED Charles Winkler III

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE 18 NOV 93 THURSDAY JOB NO. 938858
PROJECT FMC POND 8S
LOCATION
CONTRACTOR OWNER
WEATHER TEMP.
PRESENT AT SITE

TO ALISON JONES

THE FOLLOWING WAS NOTED:

DATA COLLECTED

BOREHOLE #	VANE SIZE	NUMBER OF SAMPLES	DEPTHS (FROM
BH2	8.5"H	6	0', 2', 3', 4', 5'
BH2	6.0"H	5	7', 8', 9', 10', 11'
BH 6	8.5"H	12	0', 1', 2', 3', 4', 5', 6', 7', 8', 9', 10', 11'
BH6	6.0"H	4	12', 14', 16', 18'
BH5	6.0"H	1	0'
BH5A	8.5"H	9	0', 1', 2', 3', 4', 6', 8', 10', 12', 15'
BH5A	6.0"H	2	17', 20.5'

COMMENTS

BCI CREW COLD AT END OF 1ST AND 2ND TESTING PERIOD
WINDY CONDITIONS & COLD RESULTED IN TOUGH WORKING CONDITIONS
GOOD PRODUCTIVITY CONSIDERING THE WEATHER

CC:

SIGNED [signature]

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE	Nov. 19, '93
JOB NO.	938858
PROJECT	Bectel
LOCATION	FMC Pond 8S, Pocatello, ID
CONTRACTOR	Bectel
OWNER	FMC
WEATHER	Calm, P. Cloudy, 11°C (main) - 40° (noon)
TEMP.	
PRESENT AT SITE	BCI - T. Smith, W. Winkler, R. Trottier
	Bectel - A. Jones, Jim Davidson, FMC - D. Oosterhouse

TO Allison Jones - Bectel

THE FOLLOWING WAS NOTED:

Performed vane shear testing (0', 1', 3', 4'8", 6', 9', 12', 13', 15', 17'), pushed probe rods, set pvc casing, ran nuclear density gauge profile → B1A

Performed pore pressure tests (1', 3', 6', 9' in mud) (probe tip), collected 5 samples (0-1', 1'-2', 3'-4', 6'-7' - in mud) → B1A

Time Log

6:30 - Sign in at FMC gate

6:30 - 8:30: Equip. setup and prep. (boiled pore pressure tip, nuclear den. gauge, samplers. Suit up PPE, loaded barge. R. Trottier at safety training

8:30 - 11:45: On pond → vane shears, ran nuclear density probe

11:45 - 12:15: Unloaded equip fr. barge, equip. prep. Removed PPE

3 12:15 - 12:45: Lunch

12:45 - 1:00: Suit up PPE, loaded barge

1:00 - 5:15: On pond, pore pressure tests, collected samples (Smith, Winkler, Trottier on barge for BCI)

5:15 - 6:00: Unloaded equip, decon, removed PPE, called Calif. regarding nuclear density gauge.

3 8:00 - 9:00: Project meeting (Winkler, Trottier, Smith)

Billable hours = 11.0 hrs

* w/ new calibration settings, nuc. den gauge density readings OK, moisture calibration still off however.

cc: AC Jones Bechtel

SIGNED [signature]

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE: [illegible] Nov [illegible] '93	JOB NO. 938558
PROJECT: [illegible]	
LOCATION: FMC Pond 85, Pocatello ID	
CONTRACTOR: Bectel	OWNER
WEATHER: Calm Clear, 10°(AM) to +40° (PM)	TEMP.
PRESENT AT SITE: BCI - Ted Smith, R. Trottier	
Bectel - A. Jones, R. Trottier FMC - D. Oosterhouse	

TO Alison Jones. Bectel

THE FOLLOWING WAS NOTED:

Performed pore pressure tests (2 locations, ~12' mud & ~18' mud).
[illegible]ected 7 samples (0', 1', 3', 6', 9', 12', 15'), set PVC casing
ran nuclear density profile

Time log

6:30 - Arrived at FMC

6:30 - 8:30: Equip setup → boiled probe tip, installed couplings on new steel rods, threaded probe wire in rods

8:30 - 8:50: Suit up w/ PPE, loaded barge

8:50 - 2:15: On pond. Moved to piezometer left overnight, took readings. Moved. Set probe (new). Set (old) probe. Collected 7 mud samples

B 2:15 - 2:45: Lunch

2:45 - 5:15: Suit up loaded barge. On pond. Pulled new probe (v. difficult) Set ~~pvc~~ casing, ran nuc density profile. Decon unloaded barge.

5:15 - 5:30: Removed PPE

B 5:30 - [illegible]: Organized notes, equipment

Billable hours = 10½

cc: Al Jones Bechtel

SIGNED [signature]

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE: Sunday Nov. 21 '93	JOB NO. 9388558
PROJECT: Bechtel	
LOCATION: FMC Pond 8S, Pocatello ID	
CONTRACTOR: Bechtel	OWNER
WEATHER: P. Cloud, calm	TEMP. 15° (AM) to 40° (PM)
PRESENT AT SITE: BCI - T. Smith & Trotter, Bechtel - A. Jones	

TO Alison Jones - Bechtel

THE FOLLOWING WAS NOTED:

Pore pressure tests - Pond 8S Vane shear measurements (3 locations) - Pond 15S

7:00 - Arrived at FMC

7:00 - 7:45: Worked on vane rods, pore pressure tip, equip. loading.

7:45 - 8:00: Suited up PPE, loaded barge. Short wait for FMC to bleed ice

8:40 - 10:15: On pond 8S. Collect readings on pore pressure probe (old tip). Pulled probe (difficult). Unloaded gear, removed PPE

-by 10:15 - 12:00: Standby, waiting for FMC to move barge + equip to pond 15S. Worked on daily reports. R. Trotter to town for supplies

VB 12:00 - 12:30: Lunch

12:30 - 1:30: Suit up PPE. Loaded barge on Pond 15S.

1:30 - 4:45: In Pond 15S. 3 vane shears test locations. 1st test → med. vane. 2nd + 3rd test → large vane

4:45 - 5:00: Unload barge. Dress down

Billable hrs = 9 1/2 hrs

cc:

SIGNED A Jones - Bechtel

APPENDIX B

FIELD REPORTS, POND 15S

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE: Sunday, Nov. 21 1993	JOB NO. 938658
PROJECT: Bechtel	
LOCATION: FMC Pond 8S, Pocatello ID	
CONTRACTOR: Bechtel	OWNER
WEATHER: 3 Cloud, calm, 15° (AM) to +40° (PM)	TEMP.
PRESENT AT SITE: BCI - Smith & Trotter, Bechtel - Jones	

TO Alison Jones - Bechtel

THE FOLLOWING WAS NOTED:

Pore pressure tests - Pond 8S Vane shear measurements (3 locations) - Pond 15S

7:00 - Arrived at FMC

7:00 - 7:45: Worked on vane rods, pore pressure tip, equip. loading.

7:45 - 8:40: Suited up PPE, loaded barge. Short wait for FMC to break ice.

8:40 - 10:15: On Pond 8S. Collect readings on pore pressure probe (old tip). Pulled probe (difficult). Unloaded gear, removed PPE

Stby 10:15 - 12:00: Standby, waiting for FMC to move barge + equip to pond 15S. Worked on daily reports. R. Trotter to town for supplies

NB 12:00 - 12:30: Lunch

12:30 - 1:30: Suit up PPE. Loaded barge on Pond 15S.

1:30 - 4:45: In Pond 15S. 3 vane shears test locations. 1st test → med. vane. 2nd + 3rd test → large vane

4:45 - 5:00: Unload barge. Dress down

Billable hrs = 9 1/2 hrs

cc:

SIGNED A Jones - Bechtel

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE: Monday Nov 22 '93	JOB NO.: 938858
PROJECT: Bectel	
LOCATION: FMC Pond 15S Pocatello, ID	
CONTRACTOR: Bectel	OWNER:
WEATHER: Cloudy windy (+30 mph) 35-40°F	TEMP.:
PRESENT AT SITE: BCI - T Smith, R Trotter Bectel - A Jones, Jim Davidson FMC - D Casterhouse	

TO: Alison Jones - Bectel

THE FOLLOWING WAS NOTED:

Pond 15S: Vane Shear tests at BH5 (0', 1', 3', 6', 9', 12' mud) and BH4 (0', 1', 2', 3', 6', 9', 12', 13', 14', 15' mud). Collected samples at BH4 (0', 1', 3', 6', 9', 12', 15') (piston tube) and BH5 (0', 1', 3', 6', 9', 12') (grease gun) for 13 total samples. Performed nuclear densit, profiles BH4, BH5.

me log

6:30-8:30: Arrive FMC. Boiled pore pressure tips, worked on vane shear rods, piezometers, labeled sample jars.

8:00-9:30: Suit up. Wait for FMC at 15S. Loaded barge.

9:30-1:10: On 15S. Vane shear tests - 2 locations. Collected 13 samples - 2 locations using piston tube & grease gun samplers.

1:10-1:30: Unload. Decon. Dress. down.

NB 1:30-2:00: Lunch

2:00-2:15: Suit up, load equipment.

2:15-4:00: Set pvc casing, ran nuclear densit, profiles at 2 locations.

4:00-4:40: Off pond early due to weather & fading light. Unload gear, dress. down.

4:40-5:00: Equipment disassembly, called CA on nuclear densit probe.

Total Billable = 10 hrs

cc: AC Jones Bechtel

SIGNED [signature]

FIELD REPORT

BCI

BROMWELL & CARRIER, INC.
P.O. Box 5467, Lakeland, FL 33807
(813) 646-8591

DATE: Tuesday, Nov. 23, '93	JOB NO.: 938858
PROJECT: Bechtel	
LOCATION: Pond 15S, FMC, Pocatello, ID	
CONTRACTOR: Bechtel	OWNER
WEATHER: Snow, windy, cold - 15 to 20°F	TEMP.
PRESENT AT SITE: BCI - T. Smith, R. Trotter, Bechtel - A. Jones, J. Davidson, FMC - D. Oesterhouse	

TO Alison Jones - Bechtel

THE FOLLOWING WAS NOTED:

Pond 15S - Attempted to measure pore pressures in pond 15S, in 2 locations. Initially, Geonor "brain" did not operate due to low temperatures. Tried 2nd test off barge teathered to shore. Collected readings at 3' mud depth. Bottom of pond at ~4.5'. Packed equipment for demob. off project.

Time log:

7:00 - 8:00: Arrive FMC, prep. & load equipment

8:00 - 9:00: Suit up w/ PPE. Wait at pond for FMC to break ice loaded barge.

9:00 - 10:00: On pond 15S. Set pore pressure probe. "Brain" not operative. Returned to shore.

NB 10:00 - 11:00: Worked on "brain". Checked all connections. Unit operated properly with "normal" temps. A. Jones called Geonor - Eva Ericson ~~indicated~~ that unit required moderate temps to operate properly.

11:00 - 1:30: Suit up w/ PPE. ~~Stem~~ probe off barge from shore in 3' mud. Collected data. Total pond depth ~ 4½'. Locked gear. Removed PPE.

1:30 - 4:00: Packed equipment for returned to FL.

Total Billable = 8 hrs

cc: A. Jones Bechtel.

SIGNED: Jeff Smith

APPENDIX C

ASTM D2573

Designation: D 2573 - 72 (Reapproved 1978)

Standard Test Method for Field Vane Shear Test in Cohesive Soil[1]

This standard is issued under the fixed designation D 2573; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This method covers the field vane test in soft, saturated, cohesive soils. Knowledge of the nature of the soil in which each vane test is to be made is necessary for assessment of the applicability and interpretation of the test.

2. Summary of Method

2.1 The vane shear test basically consists of placing a four-bladed vane in the undisturbed soil and rotating it from the surface to determine the torsional force required to cause a cylindrical surface to be sheared by the vane; this force is then converted to a unit shearing resistance of the cylindrical surface. It is of basic importance that the friction of the vane rod and instrument be accounted for; otherwise, the friction would be improperly recorded as soil strength. Friction measurements under no-load conditions (such as the use of a blank stem in place of the vanes, or a vane that allows some free rotation of the rod prior to loading) are satisfactory only provided that the torque is applied by a balanced moment that does not result in a side thrust. As torsional forces become greater during a test, a side thrust in the instrument will result in an increase in friction that is not accounted for by initial no-load readings. Instruments involving side thrust are not recommended. The vane rod may be of sufficient rigidity that it does not twist under full load conditions; otherwise a correction must be made for plotting torque-rotation curves.

3. Apparatus

3.1 The vane shall consist of a four-bladed vane as illustrated in Fig. 1. The height of the vane shall be twice the diameter. Vane dimensions shall be as specified in Table 1. Sizes other than those specified in Table 1 shall be used only with the permission of the engineer in charge of the boring program. The ends of the vane may be tapered (see Fig. 1). The penetrating edge of the vane blade shall be sharpened having an included angle of 90°.

3.2 The vane shall be connected to the surface by means of steel torque rods. These rods shall have sufficient diameter such that their elastic limit is not exceeded when the vane is stressed to its capacity (Note 1). They shall be so coupled that the shoulders of the male and female ends shall meet to prevent any possibility of the coupling tightening when the torque is applied during the test. If a vane housing is used, the torque rods shall be equipped with well-lubricated bearings where they pass through the housing. These bearings shall be provided with seals to prevent soil from entering them. The torque rods shall be guided so as to prevent friction from developing between the torque rods and the walls of casing or boring.

NOTE 1—If torque *versus* rotation curves are to be determined, it is essential that the torque rods be calibrated (prior to use in the field). The amount of rod twist (if any) must be established in degrees per foot per unit torque. This correction becomes progressively more important as the depth of the test increases and the calibration must be made at least to the maximum depth of testing anticipated.

3.3 Torque shall be applied to the torque rods, thence to the vane. The accuracy of the torque reading should be such that it will produce a variation not to exceed ±25 lb/ft^2 (1.20 kPa) shear strength.

3.4 It is preferable to apply torque to the vane with a geared drive. In the absence of a geared drive, it is acceptable to apply the torque directly by hand with a torque wrench or equivalent. The duration of the test should be controlled by the requirements of 4.3.

4. Procedure

4.1 In the case where a vane housing is used, advance the

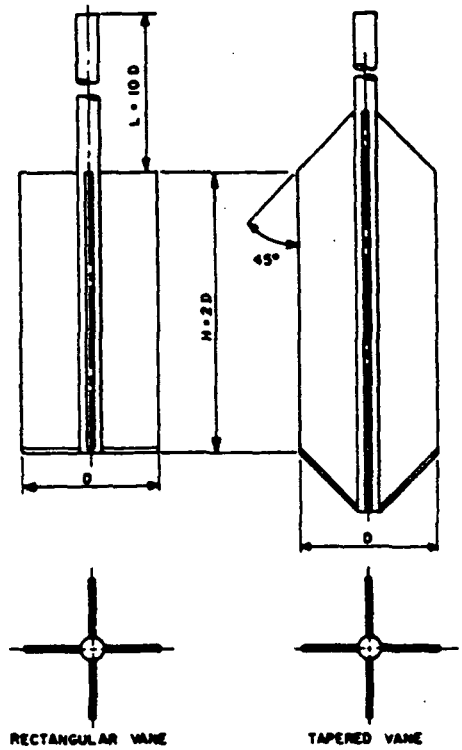


FIG. 1 Geometry of Field Vane

[1] This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock and is the direct responsibility of Subcommittee D18.02 on Sampling and Related Field Testing for Soil Investigations.

Current edition approved Jan. 17, 1972. Published February 1972. Originally published as D 2573 - 67 T. Last previous edition D 2573 - 67 T.

TABLE 1 Recommended Dimensions of Field Vanes[A]

Casing Size	Diameter, in. (mm)	Height, in. (mm)	Thickness of Blade, in. (mm)	Diameter of Vane Rod, in. (mm)
AX	1½ (38.1)	3 (76.2)	1/16 (1.6)	½ (12.7)
BX	2 (50.8)	4 (101.6)	1/16 (1.6)	½ (12.7)
NX	2½ (63.5)	5 (127.0)	⅛ (3.2)	½ (12.7)
4 in. (101.6 mm)[B]	3⅝ (92.1)	7¼ (184.1)	⅛ (3.2)	½ (12.7)

[A] Selection of the vane size is directly related to the consistency of the soil being tested, that is, the softer the soil the larger the vane diameter.
[B] Inside diameter.

housing to a depth which is at least five vane housing diameters less than the desired depth of the vane tip. Where no vane housing is used, stop the hole in which the vane is lowered at a depth such that the vane tip may penetrate undisturbed soil for a depth of at least five times the diameter of the hole.

4.2 Advance the vane from the bottom of the hole or the vane housing in a single thrust to the depth at which the test is to be conducted. Take precautions to make sure no torque is applied to the torque rods during the thrust.

4.3 With the vane in position, apply the torque to the vane at a rate which should not exceed 0.1°/s. This generally requires a time to failure of from 2 to 5 min, except in very soft clays where the time to failure may be as much as 10 to 15 min. In stiffer materials, which reach failure at small deformations, it may be desirable to reduce the rate of angular displacement so that a reasonable determination of the stress-strain properties can be obtained. During the rotation of the vane, hold it at a fixed elevation. Record the maximum torque. With apparatus with geared drives, it is desirable to record intermediate values of torque at intervals of 15 s or at lesser frequency if conditions require.

4.4 Following the determination of the maximum torque, rotate the vane rapidly through a minimum of 10 revolutions; the determination of the remoulded strength should be started immediately after completion of rapid rotation and in all cases within 1 min after the remoulding process.

4.5 In the case where soil is in contact with the torque rods, determine the friction between the soil and the rod by means of torque tests conducted on similar rods at similar depths with no vane attached. Conduct the rod friction test at least once on each site; this shall consist of a series of torque tests at varying depths.

4.6 In apparatus in which the torque rod is completely isolated from the soil, conduct a friction test with a blank rod (Note 2) at least once on each site to determine the magnitude of the friction of the bearings. In a properly functioning vane apparatus, this friction should be negligible.

NOTE 2—In some cases it is not necessary to remove the vane for the friction test. As long as the vane is not in contact with the soil, that is, where it is retracted into a casing, the friction measurement is not affected.

4.7 Conduct undisturbed and remoulded vane tests at intervals of not less than 2½ ft (0.76 m) throughout the soil profile when conditions will permit vane testing (Note 3). Do not conduct the vane test in any soil that will permit drainage or dilates during the test period, such as sands or silts or in soils where stones or shells are encountered by the vane in such a manner as to influence the results.

NOTE 3—This spacing may be varied only by the engineer in charge of the boring program.

5. Calculation

5.1 Calculate the shear strength of the soil in the following manner: The turning moment required to shear the soil is as follows:

$$T = s \times K$$

where:
T = torque, lbf·ft (or N·m),
s = shear strength of the clay, lbf/ft^2 (or kPa), and
K = constant, depending on dimensions and shape of the vane, ft^3 (or m^3).

5.2 Assuming the distribution of the shear strength is uniform across the ends of a cylinder and around the perimeter, calculate the value of K as follows:

Inch-Pound Units:

$$K = (\pi/1728) \times (D^2H/2) \times [1 + (D/3H)]$$

Metric Units:

$$K = (\pi/10^6) \times (D^2H/2) \times [1 + D/3H)]$$

where:
D = measured diameter of the vane, in. (or cm), and
H = measured height of vane, in. (or cm).

It is important that these dimensions are checked periodically to ensure the vane is not distorted or worn.

5.3 As the ratio of length to breadth of the vane is 2:1, the value of K may be simplified in terms of the diameter so that it becomes the following:

Inch-Pound Units:

$$K = 0.0021D^3$$

Metric Units:

$$K = 0.00000366D^3$$

5.4 Since the value of s is required, it is more useful to write the equation as follows:

$$s = T \times k$$

where:
k = $1/K$ and
T, the torque, is measured so that s can be calculated.

5.5 For the tapered vane of Fig. 1, the following modified equation may be used for the vane constant:

Inch-Pound Units:

$$K = 1/1728\ [\pi D^3 + 0.37\ (2D^3 - d^3)]$$

Metric Units:

$$K = 1/10^6\ [\pi D^3 + 0.37\ (2D^3 - d^3)]$$

where:
d = rod diameter, in. (cm). For a ½-in. (1.27-cm) rod this reduces to:

Inch-Pound Units:

$$K = 0.00225D^3 - 0.00003$$

Metric Units:

$$K = 0.00000388D^3 - 0.00000076$$

6. Report

6.1 For each vane test record the following observations:

6.1.1 Date of the test,

6.1.2 Boring number,

6.1.3 Size and shape of the vane (tapered or rectangular),

6.1.4 Depth of the vane tip,

6.1.5 Depth of the vane tip below the housing or bottom of the hole,

6.1.6 Maximum torque reading, and intermediate readings if required for the undisturbed test,

6.1.7 Time to failure of the test,

6.1.8 Rate of remoulding,

6.1.9 Maximum torque reading for the remoulded test, and

6.1.10 Notes on any deviations from standard test procedure.

6.2 In addition, record the following observations for the boring:

6.2.1 Boring number,

6.2.2 Location,

6.2.3 Log of the soil conditions,

6.2.4 Reference elevation,

6.2.5 Method of making the hole,

6.2.6 Description of the vane, that is, housed or not,

6.2.7 Description of the method of applying and measuring the torque,

6.2.8 Notes on the driving resistance,

6.2.9 Name of the drilling foreman, and

6.2.10 Name of the supervising engineer.

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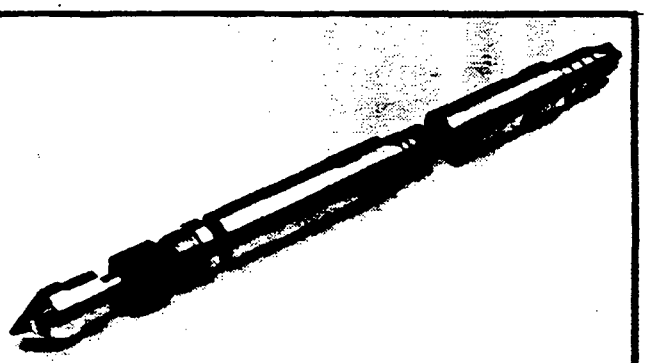
APPENDIX D

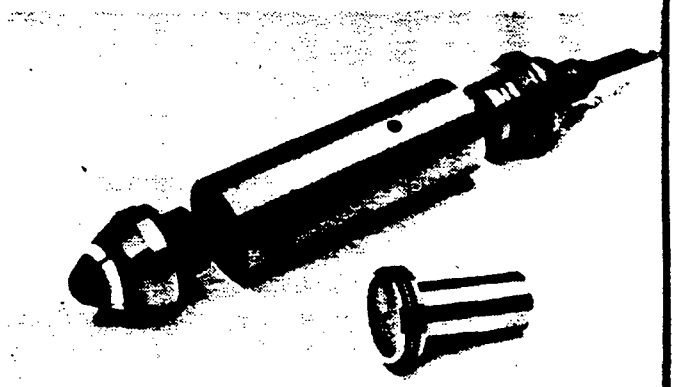
GEONOR CALIBRATION DATA AND PROBE CONFIGURATION

GEONOR VIBRATING-WIRE PORE PRESSURE MEASUREMENT SYSTEMS
M-600
S-411

Installation of M-603 transducer.



M-600 transducer with in-situ zero point check.



S-411 embankment transducer.

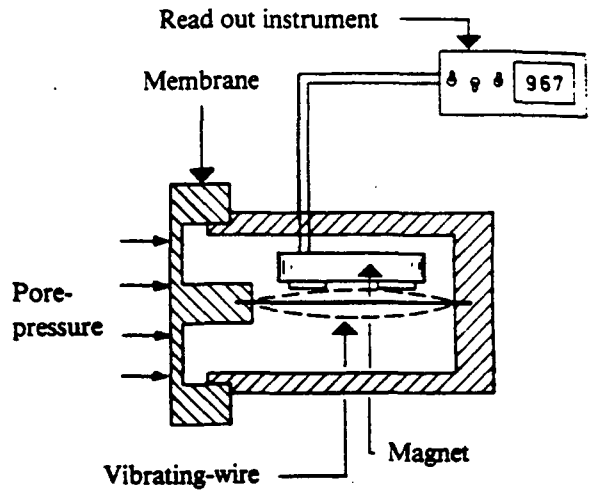
GEONOR

P.O. Box 99 Røa • N-0701 Oslo 7, Norway
Telex: 77 306 genor n • Telephone: (472) 24 75 50 • Telefax: (472) 24 58 46

GEONOR PORE PRESSURE MEASUREMENT SYSTEMS M-600 S-411

- **Vibrating-wire type transducers**
- **No signal losses in cables**
- **Long term stability**
- **In-situ zero point check (optional)**
- **Two cable types**
- **Various filters**
- **Sub-atmospheric pressure measurements possible**

Vibrating-wire principle



General description

The GEONOR vibrating-wire pore pressure measurement systems normally consist of a vibrating-wire pressure transducer, a signal cable and a frequency indicator. The main advantages of these systems are:

High sensitivity, short response time, good remote reading possibilities, long life, robust, trouble-free installation, elimination of frost problems, signal transmission over long distance and use of long cables.

The M-600 and M-603 transducers are mostly used as displacement gauges pressed into the soil extended by EW-rods. Sealing is obtained by the contact established between the clay and the steel rod.

The S411 transducers is mostly used in embankments or in prebored holes which upon installation of the transducer are sealed.

GEONOR can also deliver similar hydraulic piezometers described in separate leaflets.

The basic principle of the vibrating-wire transducer is that the change in natural frequency of a stretched wire depends on the change of the tension in the wire. In this instrument one end of the gauge-wire is attached to the center of the circular membrane; the other end is secured to the top of the tranducer housing.

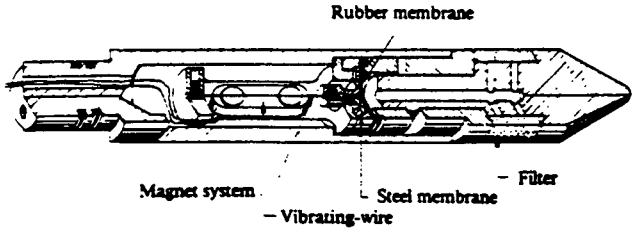
A fluid pressure applied to the membrane, causes a deflection of the membrane and consequently the tension in the gauge-wire and its resonant frequency of vibration will be changed. For an increase in fluid pressure the frequency of vibration of the gauge-wire will be lowered and vice versa. Thus the frequency of the gauge-wire is a measure of the deflection of the membrane and, in turn, a measure of the pressure acting on the membrane. The difference in the square of the frequencies is proportional to the pressure change.

Transducers
M600/-603/-600a

For the M-600 system 3 different tranducers are available:

M-600 Standard type, 0–20 bar. For P-540 cable.
M-603 With in-situ zero point checking facility, 0–6 bar. For P-540 cable.
M-600a Same as M-600, but for P-430 cable.

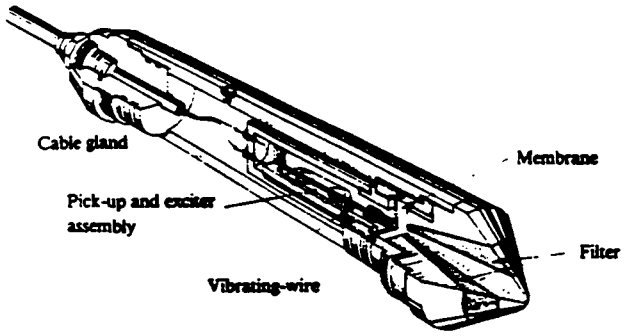
The transducers can be delivered with sintered bronze filter (standard), high air entry resistance filter or epoxy filter.



M-603 Transducer

S-411

S-411 is a stainless steel, embankment type piezometer for adverse environments. The transducer is normally delivered with high air entry resistance filter for use in unsaturated soils, but other filters are available upon request.



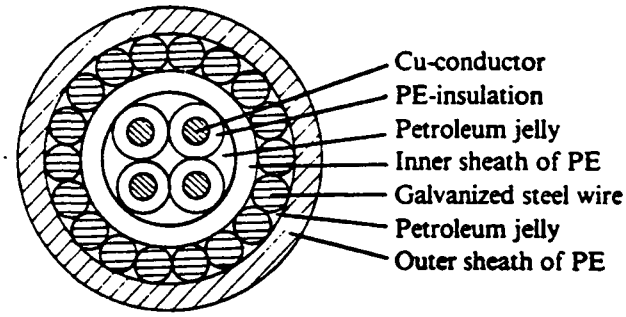
S-411 Transducer (embankment type).

All transducers are protected against induced overvoltage (electrical storms) by special Transzorb diodes.

The membranes and wires are temperature treated before calibration to minimize long-term drift.

Cables

P-540 Signal cable is a one pair shielded OD 5 mm cable in an OD 10 mm protective PE tubing. This cable is delivered with the M-603 transducers and is suitable for borehole installations and other installations where small forces are acting on the cable.



P-430 Signal cable

The P-430 signal cable is a 2 pair steel armoured cable with petroleum jelly filling to avoid longitudinal water penetration. It is specially designed to withstand strong forces and has an ultimate tensile strength value of 11 kN.

Recording instruments

Normally the frequency is measured by the P-520 F frequency indicator. This is a light-weight instrument for field use with built-in exciter circuit, frequency indicator and rechargeable battery (operating time 20 hours for fully charged battery). A 4 digit frequency display is standard (5 digit display optional).

Automatic data acquisition is possible by use of the Geonor P-900 concept. The P-900 equipped with an RS 232 output, in conjunction with the P-900 software, provide logging, storing and presentation of data. IBM PC compatible software.

Calibration

All transducers are individually calibrated with precision apparatus, and calibration schemes are delivered together with the transducers.

Equation: $P = K(f_o^2 - f^2) + A$

or

$P = A'(f_o - f) - B(f_o - f)^2$

K, A, A', B = constants

f_o, f = frequencies

Installation and operation

The GEONOR pore pressure transducers are easy to install. M-600 type transducers are normally pressed directly into the soil by extension EW-rods or lowered into prebored holes. S-411 type transducers are normally installed in embankments (rock/earthfill dams etc.), but may also be used in borehole applications. Detailed instruction and advice is given in the Users Manual which is delivered together with the transducers. Different installation procedures and sealing techniques may be applied and GEONOR can give advice for special solutions if required.

Accessories

GEONOR offers a wide range of additional equipment to be used together with the pore pressure systems. Some of the most commonly used equipment is listed in the specification section. All products are listed in the price list.

Accessories

For use with / Accessories	Transducers					Cables	
	Stock No.	M-600 401000	M-603 403000	M-600a 402000	S-411 405000	P-540 461000	P-430 461400
EW-Extension steel rods 1 m (order No. 42000), 2m (421000), 3m (42200) Connection piece (42300)		X	X	X		X	X
M-600-42, insulation piece for corrosive soils (406000)		X	X	X		X	X
M-603-1 Compressed air bottle (403500)		X	X				
Watertight junction box (462600) for embedding in soils. 2-12 gauges and multicable				X	X		X
Glands (461600) for junction box (452600) and P-430 cable (461400)				X	X		X
Cable termination switch boxes for 13 (462400), 25 (462200) transducers.		X	X	X	X	X	X

Cables	P-540 (461000)	P-430 (461400)
Conductors	1 pair annealed, tinned copper 7 × 0,24 mm. White/blue	Annealed plain, solid copper 0,9 mm 2 pair blue/red/green/black
Shielding	Braided annealed copper	—
Insulation	PVC	Polyethylene (PE)
Armouring	—	15 × 1,6 mm galv. steel wires
Filling	—	Petroleum jelly
Outer diameter (mm)	5 (inside PE tubing)	16
Loop resistance	110 Ω/km	56, 1 Ω/km
Protective tubing	PE tubing, OD 10 mm	None (OD 25 mm PE, optional)

SPECIFICATIONS

Transducers Stock No.	M-600 401000	M-603 403000	M-600a 402000	S-411 405000
Ranges (bar)	2, 4, 6, 10, 16, 20	2, 4, 6	2, 4, 6, 10, 16, 20	2–60 (customer specified)
Accuracy (% FR)	< 1 (< 0,5 option)	< 1 (< 0,5 option)	< 1 (< 0,5 option)	< 1 (< 0,5 option)
Temperature range	÷ 20 to + 60°C	÷ 20 to + 60°C	÷ 20 to + 60°C	÷ 20 to + 60°C
Resolution (% FR) Depending on read-out equipment	0,1 (0,01 option)	0,1 (0,01 option)	0,1 (0,01 option)	0,1 (0,01 option)
Max. temp. coeff. (% FR/°C)	0,2	0,2	0,2	0,2
Max. operating pressure (bar)	1 × range	1 × range	1 × range	1 × range
Max. overpressure Without damage (bar)	1,5 × range	1,5 × range	1,5 × range	1,5 × range
Filter type (standard)	Sintered bronze	Sintered bronze	Sintered bronze	High air-entry resistance value
Carborundum Filter Order No. 401400	Option	Option	Option	
High air-entry resistance value filter. Stock No 401500 Bubbling pressure 2,5 bar	Option		Option	Standard
Material in housing/ membrane	Ferromangan-bronze	Ferromangan-bronze	Ferromangan-bronze	UHB44 (ASTM 329)
Size (mm)	OD 32 × 305	OD 32 × 305	OD 32 × 338	OD 78 × 325
Overvoltage pretection	Yes	Yes	Yes	Yes
Cable type	P-540 (401000)	P-540	P-430 (401400)	P-430
Delivered with customers specified cable length	Yes	Yes	Yes	Yes
Sensitive to athmospheric pressure variations	Yes	No	Yes	Yes
Sub-atmospheric measurements possible	Yes (option)	No	Yes (option)	Yes (standard)

Read out equipment

	P 520F	P 520G	P 520H	P900-1	P900-2/256	P900-software	P 548
Stock No	454000	456000	458000	459500	459000	460000	457000
Output	Frequency	Frequency	Frequency and eng. units	Frequency time & date	Frequency and time & date	Eng. units frequency graphic	Engineering units
Display	4 digit LCD	5 digit LCD	2×16 char. LCD	Option: 2×16 char. LCD	Option: 2×16 char. LCD		12 char.LED
Resolution	1 Hz	0,1 Hz	0,1 Hz	0,1 Hz	0,1 Hz		0,1 Hz
Size (wxdxh) in mm	95×175×50	120×120×34	120×120×34	Single Europe 100×160×10	19" rack	5¼" discette any IBM compatibel PC	Rackmount 21 Ex 220×3U
Temp range	-10°C—+70°C	-10°C— +70°C	-10°C —+70°C	0°C—+70°C	0°C—+70°C	0°C—+70°C	0°C—+70°C
Power/capacity	12V NiCd 300mAh approx 20 hours	Lithium approx 15000 readings	Lithium approx 100 hours	12V—100mA	220V AC		220/110VAC
Interfacing	-	-	-	RS 232C	RS 232C		0-10V 4-20mA RS 232 / 2 prog. alarm relays
Printer	-	-	-	Option	Option	Yes	Option
No of Channels	1	1	1	1	2—256	1—256	1 (2)
Options	0,1 Hz resolution	NiCd rechargeable battery	NiCd rechargeable battery		110VAC 24 or 48VDC Memory	The P-900 concept enables automatic data acquisition. The software provides logging, storing and presentation of data.	DC power
Environmental	Waterproof	Waterproof	Splashproof	Printed circuit	Splash proof		Rackmount

PROBE 1 (OLD)

GEONOR A/S
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Telephone: 02-24 75 50
Telex: 77306 geonor n
Telefax: 02-24 58 46
Bank account: 6233.05.06259
Postal account: 0808 5134176

CALIBRATION CERTIFICATE

for

Transducer type: Piezo Meter

Serial number: 12891

Least square fit of curved line through datasets achieved by recording the changing frequency output from the transducer to find coefficients A and B in the equation:

$$P = A(f - f_0) + B(f - f_0)^2$$

where:

P = Applied load on transducer in Bar
f = output frequency from transducer measured in Hz
f_0 = output frequency from transducer with no load

P	f	f - f_0	$P_{computed}$	P - $P_{computed}$	% FR
0.0	1924.0	0.0	0.0000	0.0000	0.00
0.4	1865.7	-58.3	0.4005	0.0005	0.01
0.8	1805.6	-118.4	0.7999	0.0001	-0.00
1.2	1743.4	-180.6	1.1991	-0.0009	-0.02
1.6	1678.8	-245.2	1.5984	0.0016	-0.04
2.0	1611.3	-312.7	1.9989	0.0011	-0.03
2.4	1540.6	-383.4	2.4000	0.0000	0.00
2.8	1466.4	-457.6	2.8009	0.0009	0.02
3.2	1388.0	-536.0	3.2021	0.0021	0.05
3.6	1305.0	-619.0	3.6017	0.0017	0.04
4.0	1216.9	-707.1	3.9976	-0.0024	-0.06
3.2	1388.1	-535.9	3.2016	0.0016	0.04
2.4	1540.7	-383.3	2.3995	-0.0005	-0.01
1.6	1678.9	-245.1	1.5978	-0.0022	-0.06
0.8	1805.7	-118.3	0.7993	-0.0007	-0.02
0.0	1924.0	0.0	0.0000	0.0000	0.00

Temperature sensivity: 0,6 Hz/°C positive.

A = -0.00697804532 = -6.97805E-03
B = -0.00000187319 = -1.87319E-06
f_0 = 1924.0

Max nonlinearity error.: 0.06% of full range
Project.....: 32291
Tag no.....: M-603
Units of P.....: Bar
Calibration date.....: 7/ 2 1991
Signature.....: TE
Comment : Calibr at temp.15 deg.C.Baron.reading: 1026.0 mB

PROBE 2 (NEW)

GEONOR A/S
P.O.Box 99 Røa, 0701 Oslo, Norway
Office: Grinidammen 10, 1343 Eiksmarka
Telephone: 472-24 75 50
Telex: 77306 genor n
Telefax: 472-24 58 46
Postal account: 0808 5134176
Bank: Kreditkassen. Pay to:
Hydro Finans
RE: GEONO NOK FIN
0240 OSLO
Account: 600105.19899

CALIBRATION CERTIFICATE

for

Transducer type: Piezo Meter

Serial number: 43703

Least square fit of curved line through datasets achieved by recording the changing frequency output from the transducer to find coeffisients A and B in the equation:

$$P = A(f - f_o) + B(f - f_o)^2$$

where:

P = Applied load on transducer in Bar
f = output frequency from transducer measured in Hz
f_o = output frequency from transducer with no load

P	f	f - f_o	$P_{computed}$	P - $P_{computed}$	% FR
0.00	1794.5	0.0	0.0000	0.0000	0.00
0.20	1763.8	-30.7	0.2000	-0.0000	-0.00
0.40	1732.7	-61.8	0.3992	-0.0008	-0.04
0.60	1700.9	-93.6	0.5993	-0.0007	-0.03
0.80	1668.5	-126.0	0.7996	-0.0004	-0.02
1.00	1635.5	-159.0	0.9997	-0.0003	-0.01
1.20	1601.8	-192.7	1.2001	0.0001	0.01
1.40	1567.3	-227.2	1.4011	0.0011	0.06
1.60	1532.2	-262.3	1.6013	0.0013	0.07
1.80	1496.7	-297.8	1.7993	-0.0007	-0.03
2.00	1460.0	-334.5	1.9994	-0.0006	-0.03
1.60	1532.2	-262.3	1.6013	0.0013	0.07
1.20	1601.7	-192.8	1.2007	0.0007	0.04
0.80	1668.3	-126.2	0.8008	0.0008	0.04
0.40	1732.4	-62.1	0.4011	0.0011	0.05
0.00	1794.4	-0.1	0.0007	0.0007	0.03

A = -0.00656861404 = -6.56861E-03
B = -0.00000176805 = -1.76805E-06
f_o = 1794.5 TEMPERATURE-SENSITIVITY: 0.7 Hz/°C POSITIVE.

Max nonlinearity error.: 0.07% of full range
Project.....: 800693
Tag no.....: M-600
Units of P.....: Bar
Calibration date.....: 12/11 1993
Signature.....: PØ
Comment.....: Calibrated at 15 deg. C Baro: 995.5 mbar

APPENDIX L

FINAL REPORT, GEOTECHNICAL LABORATORY RESULTS – POND 15S SAMPLES

APPENDIX L

FINAL REPORT, GEOTECHNICAL LABORATORY RESULTS – POND 15S SAMPLES

Applied Geotechnical Engineering Consultants, Inc.

FINAL REPORT
GEOTECHNICAL LABORATORY
TEST RESULTS
POND 15S SAMPLES
FMC'S ELEMENTAL PHOSPHORUS PLANT

Eastern Michaud Flats Project, Pocatello, ID
Contract No. 21372-AS-01
Amendment 4

Submitted to:

Bechtel Environmental, Inc.
50 Beale Street
San Francisco, CA 94105-1895
Attn: Alison C. Jones, Ph.D.

Submitted by:

Mountain States Analytical, Inc.
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&
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November 18, 1994

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1.0 SCOPE OF WORK

Mountain States Analytical, Inc. (MSAI) and Applied Geotechnical Engineering Consultants, Inc. (AGEC) were requested to collaboratively conduct geotechnical laboratory tests for Pond 15S sludge samples at the FMC Inc. Elemental Phosphorus Plant in Pocatello, Idaho. The work was conducted in accordance with our proposal submitted to Bechtel Environmental, Inc. (BEI) dated August 19, 1994. The tests were conducted to characterize and provide parameters for the closure design of pond 15S.

The following tests were requested and conducted in general accordance with the listed test methods.

TEST	TEST METHOD	NO. TESTS COMPLETED
Moisture Content	ASTM D 2216	49
Gradient Ratio	ASTM D 5101	3
Specific Gravity	ASTM D 854	3
Atterberg Limits	ASTM D 4318	10
Hydraulic Conductivity	ASTM D 2434	2
Hydrometer/Gradation	ASTM D 422	12
One Dimensional Consolidation	ASTM D 2435	4

The sludge samples contained elemental phosphorus and had a consistency of a slurry, which required special procedures for conducting the tests. The development of the special procedures involved acquiring special equipment, preparing/testing the equipment and conducting preliminary tests with phosphorus laden samples. A description of the special handling techniques and any modifications to the test methods listed above are included in the report.

As a part of the developmental task, MSAI acquired and setup a glove box for conducting Atterberg Limit tests and moisture content tests in a nitrogen atmosphere. MSAI also developed a method for determining the soil moisture content using a standard convection drying oven as opposed to determining the moisture content thermogravimetrically with a Moisture Analyzer (Moisture Balance) as was originally proposed. The moisture balance did not prove to be an appropriate piece of equipment for use with phosphorus laden sludge.

Mobilization to the FMC facility in Pocatello, Idaho occurred on September 14, 1994. The equipment was setup and tests were conducted in the FMC Mining Laboratory from September 14-26, 1994. The final consolidation tests and moisture content tests were conducted in the AGEC laboratory in Salt Lake City from September 27- October 11, 1994.

2.0 METHOD DEVELOPMENT SUMMARY

The following is a summary of the method development conducted by MSAI for testing of FMC Pond 15S Samples.

Task 1. Method Development was divided into three sub-tasks for which MSAI was directly responsible: glovebox acquisition and preparation, moisture analyzer acquisition and preparation, and analytical procedure development. These three sub-categories will be discussed in some detail in this report.

Glovebox Acquisition and Preparation. The glovebox was obtained used at significant savings compared to the price of a new glovebox. However it required some refurbishing, as well as alterations to the original design to provide an oxygen-free nitrogen environment. The box interior was covered with several layers of epoxy spray paint. Fittings were installed in a wall and on the roof of the box and in a wall and the roof of the transfer chamber. A gas manifold and exhaust system was installed to flush the glovebox with nitrogen. A fan was placed inside of the box to prevent stratification or localization of gaseous contaminants and to facilitate contaminant removal from the box. The plate glass window could not withstand the pressure fluctuations (slight vacuum to 0.3 psi) and was replaced with Plexiglass plate. To maintain the integrity of the glovebox atmosphere, the window and fittings were sealed with silicone glues and the doors with high density foam rubber weather strip.

Moisture Analyzer Acquisition and Preparation. The moisture analyzer was acquired and tested with wet, phosphorus-free soil samples. The analyzer was connected by cable to a printer for data collection.

Prior to testing the moisture analyzer in the glovebox, a sample of phossy Pond 15s sludge was dried in the glovebox in a watchglass covered beaker on a hotplate. Because of the tendency of the sample to splatter as it dried, the experiment was repeated with a thin layer of fiberglass on top of the sludge to minimize or eliminate sample splatter. The splatter was eliminated, but white phosphorus was seen distilling out of the sample with the water. This demonstrated that a phossy sample dried in the moisture analyzer would release white phosphorus which would collect in the analyzer and damage the instrument upon exposure to oxygen in the atmosphere.

Analytical Procedure Development. A series of tests was conducted attempting to react the phosphorus with Cu^{++} to prevent phosphorus loss during drying. All of the tests were unsuccessful.

Since white phosphorus could not be retained quantitatively in the sample, attempts were made to remove it quantitatively from the sample. Heating on a hotplate or in an oven while venting the vapors did not effectively remove the phosphorus. However, heating in an oven at 145°C for four to 48 hr (depending on the phosphorus content) under an N_2 purge, successfully produced a dry sample nearly completely free of white phosphorus. The presence of white phosphorus in the sample container was determined visually: clear

or slightly yellow beads of liquid on the inner wall of the drying vessel after several hours of drying. To obtain a more accurate moisture analysis, the percent phosphorus would have to be determined (probably by CS_2 extraction and gas chromatography with phosphorus detection) in another aliquant of the sample and added to the percent dry sample weight.

It was determined that all of the geotechnical tests selected for this project, except the determination of Atterberg Limits (ASTM D 4318), could be conducted outside of the glovebox. A sample would have to be maintained moist during equipment assembly and experimentation to prevent spontaneous combustion.

3.0 DESCRIPTION OF TEST METHODS

All testing was carried out in accordance with ASTM procedures except where the nature of the material (very soft consistency and phosphorus content) required that special procedures be adopted. Variances from the ASTM procedures are described in this section. The number system of the ASTM procedures have been maintained to provide cross referencing. Those sections of the procedures which were adhered to as specified in the ASTM documents, have not been reproduced here.

Moisture Content (ASTM D 2216-80)

This method is a adaptation of the ASTM standard D 2216-80, "Standard Method for Laboratory Determinations of Water (Moisture) content of Soil, Rock, and Soil-Aggregate Mixtures". As such, in determining the moisture contents of elemental white phosphorus laden materials, method D2216-80 should be followed as written, incorporating the modifications noted below:

1. Scope

1.1 This method includes laboratory moisture determinations of elemental white phosphorus laden materials.

1.3 Since white phosphorus is vaporized out of the sample during the analysis, the accuracy of this method is inversely proportional to the relative concentration of white phosphorus in the sample. To improve the accuracy, the sample is analyzed for percent white phosphorus (by FMC Method No. G-2, Toluene Insolubles for Sludge and Precipitator Dust), and the moisture content values corrected accordingly.

2. Summary of Method

2.1 The sample is dried to a constant mass in a drying oven controlled at 150 ± 5° C. The mass lost is that of the water and the white phosphorus. The remaining mass is that of the dry material minus the elemental white phosphorus.

3. Significance and Use

3.4 The sample is dried at 150°C.

4. Apparatus

4.1 Drying oven, heated to 150 ± 5° C.

4.3 Specimen containers, consisting of Erlymeyer flasks fitted with two-hole rubber stoppers. Two metal or Teflon tubes are inserted through the holes in each stopper, one to purge the flask with dry O_2-free N_2, the other to exhaust N_2 and vapors from the sample. The exhaust tube should reach to the outside of the oven to avoid contaminating the oven with phosphorus and/or phosphorus oxides.

4.4 Desiccators are not used in this method.

6. Test Specimen

6.2.1 Test specimen masses are approximately 20 g.

7. Procedure

7.2 Determine the mass of a clean, dry flask; introduce the test specimen; and determine the mass of the specimen.

7.3 Insert the two-hole stopper into the mouth of the flask, purge the flask with N_2 (20mL/min or faster), and heat it in an oven controlled at 150 ± 5° C, and dry the specimen to a constant mass.

7.4 After the material has reached a constant weight, remove the flask from the oven and allow the flask to cool to room temperature under the N_2 purge. Remove the stopper and determine the mass of the flask and its contents.

ATTERBERG LIMITS (ASTM D 4318-93)

1. Scope

1.1 This test method covers the determination of the Liquid Limit, Plastic Limit and Plasticity Index of phosphorus laden samples.

4. Summary of Test Method

4.1 Due to the presence of elemental phosphorus in the samples, the tests were conducted inside a glove box with a nitrogen atmosphere. The portion of the liquid limit test conducted with the liquid limit device and the rolling of the soil into a thread for the plastic limit test were conducted inside the glove box. The moisture determinations were conducted using the modified ASTM D 2216 method described above.

6. Apparatus

6.1 The standard equipment described in the ASTM test method was used to conduct the test. In addition, the tests ere conducted in a glove box purged with dry, O_2 -free N_2 to create an oxygen free atmosphere.

10. Preparation of Test Specimens

10.1 Wet Preparation - The samples tested had very high moisture contents, much higher than the Liquid Limit and Plastic Limit values, thus requiring drying of the samples prior to testing. Approximately 100 percent passed through the No. 40 sieve, based on visual observation as verified with gradation tests.

The drying of samples was accomplished by blotting the sample with paper towels repeatedly.

14. Procedure (Liquid Limit)

14.1 The ONE-POINT LIQUID LIMIT- METHOD B option was used. The liquid limit was performed inside the glove box and the select portion of the sample for moisture determination was placed in an Erlenmeyer flask and dried using the modified ASTM D 2216 method described above.

17. Procedure (Plastic Limit)

17.1 The glove box was equipped with neoprene gloves. Silver lining gloves were placed over the neoprene gloves for protection.

18/19. Calculation

The uncorrected and P_4 corrected moisture contents were calculated.

SPECIFIC GRAVITY TEST (ASTM D 854-92)

1. Scope

1.1 This test method covers the determination of specific gravity of phosphorus laden sludge samples (100 % passing the No. 4 sieve) by means of a pycnometer.

5. Apparatus

5.1 A 250 ml volumetric flask was used. The entrapped air was removed by a vacuum with less than 30 inches of absolute pressure.

6. Reagents

6.1 Distilled water was used for the reagent.

7. Test Specimen

7.1 Oven dried samples were used. The samples were dried in the oven described by the moisture determination method. (Modified ASTM D 2216)

9. Procedure

Test Method A - the procedure for Oven-Dried specimens was used.

10. Calculation

The specific gravity was calculated based on the measured weight, no correction for phosphorus content was applied as the majority of the phosphorus had been vaporized in the drying process prior to testing..

GRADATION/HYDROMETER TESTS (ASTM D 422-63)

1. Scope

1.1 This test method covers the quantitative determination of the particle size distribution of phosphorus laden sludge samples.

3. Apparatus

3.1 Standard equipment was used for the test. Apparatus A was used for stirring the sample.

4. Dispersing Agent

4.1 A solution of sodium hexametaphosphate (40 g/L) was used.

5. Test Sample

5.1.2 Each sample was prepared by placing in a sample dish the amount of wet sample that would dry to approximately 50 to 65 g of dry sample, based on the predetermined moisture content of the sample.

7. Determination of Composite Correction for Hydrometer Reading

7.1 The correction was determined as described in the ASTM method.

8. Hygroscopic Moisture

8.1 A hygroscopic moisture was not determined, but the previously conducted moisture content on a sample from the sample jar was assumed to be representative of the moisture content of the gradation/hydrometer sample.

9. Dispersion of Soil Sample

9.1 The dispersion of the sample was accomplished as described in the ASTM method using stirring apparatus A.

10. Hydrometer Test

The hydrometer portion of the test was conducted as described in the ASTM method.

11. Sieve Analysis

Following the last reading for the hydrometer test, the sample was transferred to a No. 200 sieve and washed. The sample was washed in the sink in the FMC lab room adjacent to the mining lab area. The material retained on the No. 200 sieve was dried in the drying oven according to the modified ASTM D 2216 method. After drying a sieve analysis was conducted on the sample.

12. Calculation

The test was calculated as described in the ASTM method. A specific gravity of 2.70 was used.

CONSOLIDATION TESTS (ASTM D 2435-90)

1. Scope

This test covers procedures for determining the magnitude and rate of consolidation of phosphorus laden sludge when it is restrained laterally and drained axially while subjected to incrementally applied controlled-stress loading.

1.1.2 Test method B- Time deformation readings were taken on all load increments. Successive load increments were applied after less than 0.0003 inches of deformation occurred over 1 hour.

1.2 The samples could also be chemically altered and may require special evaluation techniques.

5. Significance and Use

5.2 The test results can be greatly affected by sample disturbance. The phosphorus laden samples were slurry-like in consistency. The samples were not undisturbed or remolded but placed at the approximate consistency and moisture content as they appeared in the sample jars.

6. Apparatus

6.1 Load Device- A standard loading device was used.

6.2 Consolidometer-The consolidometer for conducting the tests on the slurry like samples consists of a 4-inch (I.D.) ring. 4 inches in height.

6.3 Porous Disks - A porous disk was embedded into the a stainless steel loading disk. The ring was placed over a 5 inch diameter porous disk and inside of 6 inch (I.D.) plex-glass dish with a stainless steel bottom.

6.3.1 Diameter- The top loading disk was machined to slide into the ring with a very small tolerance. (less than the standard) The small tolerance was to reduce the potential for the sludge to escape around the top disk during loading.

6.5 Deformation Indicator- The deformation was electronically monitored using a Linear Displacement Transducer (accurate to 0.0001 inches) and stored using a data acquisition system on a PC.

9. Specimen Preparation

9.1 The specimen was prepared by placing the slurry into the ring at approximately the same consistency and moisture content as was sampled. No additional vibration, stirring or distortion was conducted.

9.7 An initial weight of the sample was not obtained.

9.10 An initial moisture content was obtained on a separate portion of the sample from the same sample jar.

11. Procedure

11.1 The sample dish was filled with water after placing the sample in the ring.

11.5.2 Test Method B was used. The height of each sample was recorded at the following intervals ninety (90) 10 second readings, ninety (90) 1 minute readings, ninety (90) 10 minute readings, ninety (90) 15 minute readings, ninety (90) 30 minute readings and any additional readings at 1 hour intervals.

11.6 Moisture contents were obtained on a portion of the sample tested after completion of the test.

12. Calculation

The void ratio for each test was calculated based on the after test moisture content.

GRADIENT RATIO (ASTM D 5101-90)

1. Scope

1.1 This test method is a performance test applicable for determining the phosphorus laden sludge-geotextile system permeability and clogging behavior under unidirectional flow conditions.

6. Apparatus

6.1 Soil-Geotextile Permeameter - The test apparatus consists of a 2 piece, 5.375 inch (I.D.) permeameter. The top section (approximately 6 inches in height) contains 3 pairs of manometer ports 1-inch apart from the bottom of the section and 1 manometer port approximately 1 inch from the top . The bottom section is approximately 3¼ inches in height and contains an additional manometer port. The top and bottom caps are machined aluminum and contain ports for in/out flow.

6.4 A manometer board with tubing attached was used to measure head values.

6.5 One soil support screen was placed between the two sections. .

6.6 A piece of the geosynthetic filter fabric from a Mebra 88 wick drain was placed over the support screen.

7. Sampling and Test Specimens

7.1 The geosynthetic filter fabric was taken off the wick drain and a 5.375 inch diameter piece was cut from the center of the sample.

9. Procedure

9.1.2 All valves and openings were covered with filter paper and taped to the inside of the permeameter.

9.4 Approximately 4 inches of the slurry sample was placed over the filter fabric. The sample appeared to be placed at the same moisture and approximate density as existed in the sample jar although no measurements were recorded.

9.6 Additional saturation techniques were not used. The sample was primarily saturated.

9.7 Running the Test

The first test resulted in a piping failure along the outside wall of the sample approximately 6 hours after initiation of the test at a head of 4.3 feet. Photos of the failure were taken and provided to BEI. Prior to the piping failure, a permeability value of 2.8×10^{-4} cm/sec was measured. The outflow water was observed to be cloudy and the sand in the bottom section appeared to be contaminated with the slurry. The height of the sample was also observed to have decreased by an estimated ¼ inch.

The second test was modified by using silicone sealant around the perimeter to seal the filter fabric to the permeameter. A head of 4.4 feet was applied to the sample. Flow through the manometer tubes and outflow tube was observed approximately 1 hour after applying the head of water to the sample. Measurements after 4½ hours indicated a gradient ratio of less than 1 and a permeability value of 1.3×10^{-4} cm/sec. The test continued over-night, but failed again due to piping along the perimeter of the sample when

the test was observed the following morning. As before, the outflow water was observed to be cloudy and the sand in the bottom section was observed to be contaminated with the slurry. The height of the sample was also observed to have decreased by an estimated ¼ inch.

A third test was setup using a bentonite paste rather than silicone. A head of 2.2 feet was applied. After a period of approximately 24 hours the head was raised to approximately 6 feet. The head was again raisad to approximately 9.7 feet after an additional 36 hour period. Various piping problems were observed during the last stage.

PERMEABILITY TESTS (ASTM D 2434-68)

The permeability tests were conducted using Rigid-Wall, compaction mold permeameters with a double ring in the bottom porous disk. The standard ASTM D 2434-68 is applicable for granular soils (typical permeability values greater than 1×10^{-5} cm/sec). A standard test method using rigid-wall, compaction mold permeameters has recently been presented to ASTM Subcommittee D18.04 by D.E. Daniel and Craig H. Benson for final approval. A draft copy of this standard was referenced for conducting these tests.

1. Scope

1.1 This test method covers the determination of the permeability coefficient by the constant head method for the phosphorus laden sludge samples.

4. Apparatus

4.1 Permeameter - The permeameters consisted of 4 inch diameter rigid mold, 4 inches in height. The base plate contains a double ring.

6. Preparation of Specimens

6.4 The sample was placed into the mold at approximately the same consistency and moisture content as was sampled.

7. Procedure

The head values increments at which the test was conducted ranged from 2.7 to 13.5 feet. Several piping failures occurred during the tests. After each failure, the sample was remixed, measured, and restarted. Several moisture contents were measured at various stages of the tests.

4.0 DISCUSSION OF TEST RESULTS

MOISTURE CONTENTS

Forty (40) moisture content tests were conducted on Pond 15S samples at the moisture content as sampled and nine (9) moisture contents conducted on samples after consolidation, permeability and gradient ratio tests.

Initial moisture content values ranged from 155 to 324 percent of the dry weight uncorrected and 92 to 216 percent corrected for P_4 content. The accuracy of the corrected values is dependant upon the accuracy of the P_4 content.

The results of the tests are listed in Table 1 and the data calculation sheet is found in Appendix A.

ATTERBERG LIMITS

The results of the tests indicate liquid limit values ranging from 75 to 123 percent uncorrected and 48 to 91 percent corrected for P_4 content. The plastic limit tests indicate values of 62 to 108 percent uncorrected and 39 to 72 percent corrected for P_4 content. The plasticity index of the uncorrected values ranges from non-plastic to 35 percent and from non-plastic to 26 percent corrected for P_4 content. The values indicate an Elastic Silt (MH) classification according to ASTM D 2487. The accuracy of the corrected values is dependant upon the accuracy of the P_4 content.

The Atterberg Limit tests were conducted inside of a glove box with a oxygen free atmosphere. The samples were obtained at relatively high moisture contents that required drying. Initially, drying was attempted by air circulation with the fan inside the glove box. Several samples were placed in open dishes, but drying was slow. It was observed during pressing, rolling and mixing the samples, the samples appeared to take on additional moisture. Samples were then dried using blotting techniques with paper towels.

The neoprene and silver lining gloves resulted in a loss of dexterity for conducting the plastic limit tests. The difficulty involved rolling the thread down to ⅛ inch diameter. There was an obvious loss of accuracy in conducting this portion of the test. The tests were all conducted by the same individual, which would provide consistency.

The results of the tests are listed in Table 1 and the data-calculation sheet shown in Appendix B.

SPECIFIC GRAVITY

Specific gravity tests were conducted on three samples of the sludge. The values range from 2.62 to 2.77 with an average value of 2.71.

A value of 2.70 was used in calculations for other test results. The results of the test are listed in Table 1 and the data-calculation sheet in Appendix C.

GRADATION\HYDROMETER

Grain size distribution tests were conducted on 10 samples of the sludge. The samples contained 96 to 100 percent passing the No. 200 sieve. The samples contained 39 to 84 percent clay size particles (<0.005 mm) with an average of 64 percent.

The samples were prepared wet. The dry weight was determined using the moisture content obtained from the same sample jar. Inaccuracies could result from any differences in the moisture content of the test sample and the moisture content sample. Any inaccuracies would probably not be significant.

Results of the tests are shown graphically in Figures 1 through 5 and the data-calculation sheets are included in Appendix D.

CONSOLIDATION

We conducted 4 one-dimensional consolidation tests on samples of the sludge. The samples were tested in a modified consolidometer. The tests were loaded at pressures of 10, 25, 50, 100, 250, 500, 1000, 2000 and 4000 psf. Time deformation readings were taken for each increment. The void ratio,(e) vs. log of pressure results are shown graphically on Figures 7-10. Time consolidation plots for deformation vs. square root of time are shown on Figures 11-46 and plots for deformation vs. log of time are shown on Figures 47-82. The test data and calculations for the tests are listed in Appendix E.

Initial void ratios were 3.40, 3.47, 3.49 and 5.35. The void ratio values were calculated based on the final moisture content as opposed to the initial moisture content. The initial moisture content was taken from the same sample jar and final moisture content from the actual sample tested. The final P_4 corrected moisture contents ranged from 75 to 98 percent.

Following three of the tests, pocket penetrometer tests were conducted, which resulted in pocket penetrometer values of 0.3, 0.4 and 0.55 tons per square foot (tsf).

GRADIENT RATIO

A gradient ratio test was conducted on composite sample of the sludge using a piece of the geosynthetic filter fabric from a Mebra 88 wick drain.

The test resulted in gradient ratio values of < 1, which may indicate internal instability of the soil with some particles adjacent to the geotextile moving out of the system. It may also indicate some clogging at the manometer ports. Some clogging was observed in port No. 4 (port 1 inch above geosynthetic). We also observed some particles moving through the geosynthetic. A photo was taken of the contaminated silica sand below the geosynthetic and a sample of the top 1 inch of sand was also obtained. A gradation/hydrometer test was performed on the sample and is shown along with an uncontaminated sample test result in Figure 6. The sand contained only 1 percent passing the No. 200 sieve. The outflow water was also observed to be cloudy.

To verify that material was passing through the fabric, a small test was conducted by placing a small amount of sample over a piece of fabric and filling with water. The fabric was placed inside a 3 inch diameter sieve prior to filling with water. The water was observed to be cloudy after filtering through the fabric. A photo of the test was also taken and provided to BEI.

During various stages of the test, piping along the perimeter of the gradient ratio permeameter occurred. If during piping the sample was contaminated with silica sand or the manometer ports required cleaning, the test was terminated.

The results of the test are listed on Table 2 and the test and calculation data are listed in Appendix F.

PERMEABILITY

Permeability tests were not initially requested, but were determined to be helpful in defining the hydraulic conductivity of the sludge. AGEC provided two double ring, rigid-wall compaction mold permeameters. The base plate of the permeameter contains a ring that provides outflow measurements from the central part of the test specimen and is separated from flow near the sidewalls. The collector ring protrudes into the test specimen and completely separates flow entering the base plate through the inner zone from flow entering the outer zone. The double ring provides a means for identifying erroneous measurements caused by side-wall leakage.

Head values of 2.7 to 13.5 feet were applied to the samples incrementally. Several times piping occurred, generally around the perimeter. After a piping failure, the sample was generally remixed, a new sample height obtained, and the test restarted.

The test results indicate permeability values of approximately 1×10^{-5} to 7×10^{-7} cm/sec. The permeability decreased with an increase in the head value. The test results are listed on Table 2 and the data-calculation sheets in Appendix F.

SECTION V

SUMMARY OF TEST RESULTS

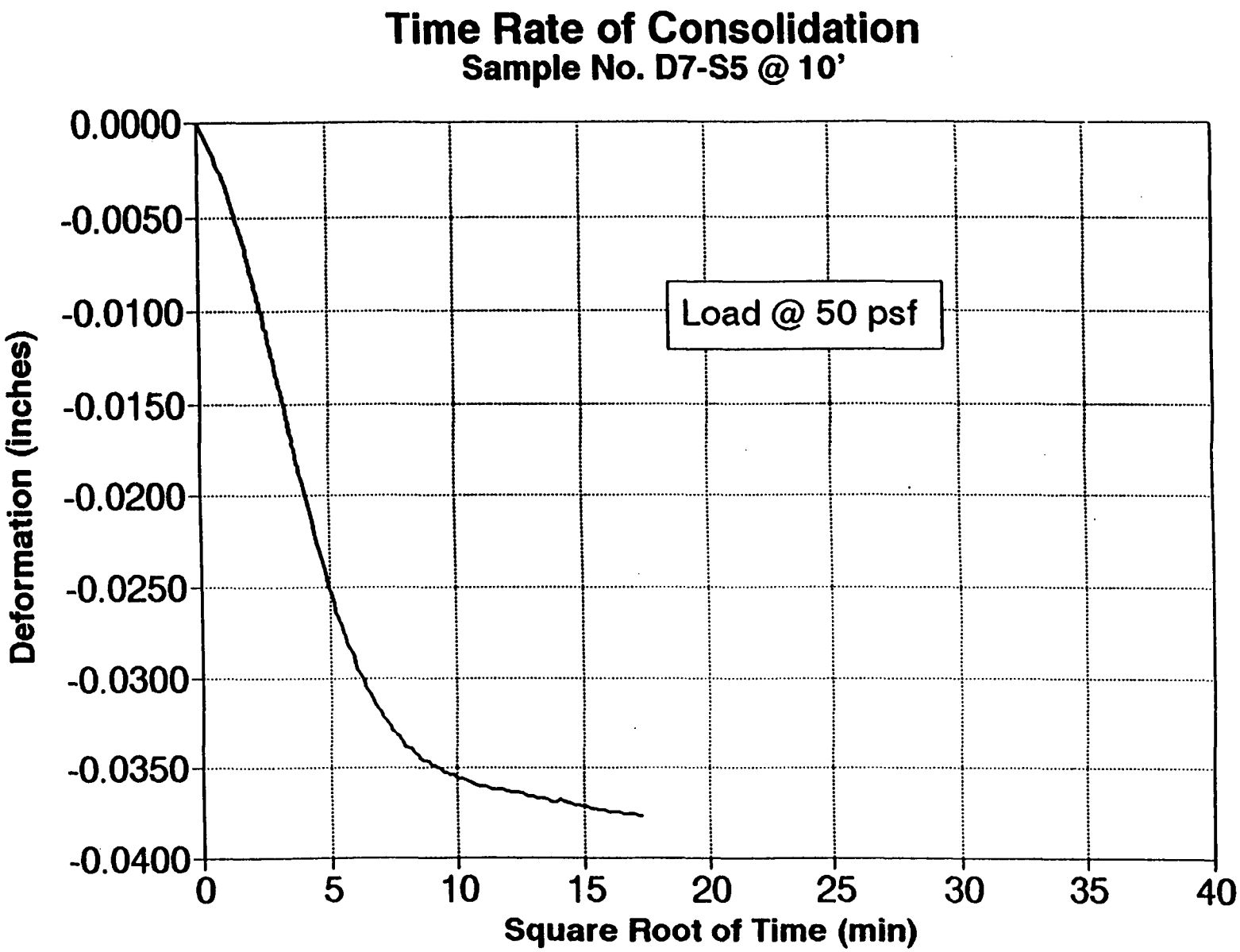

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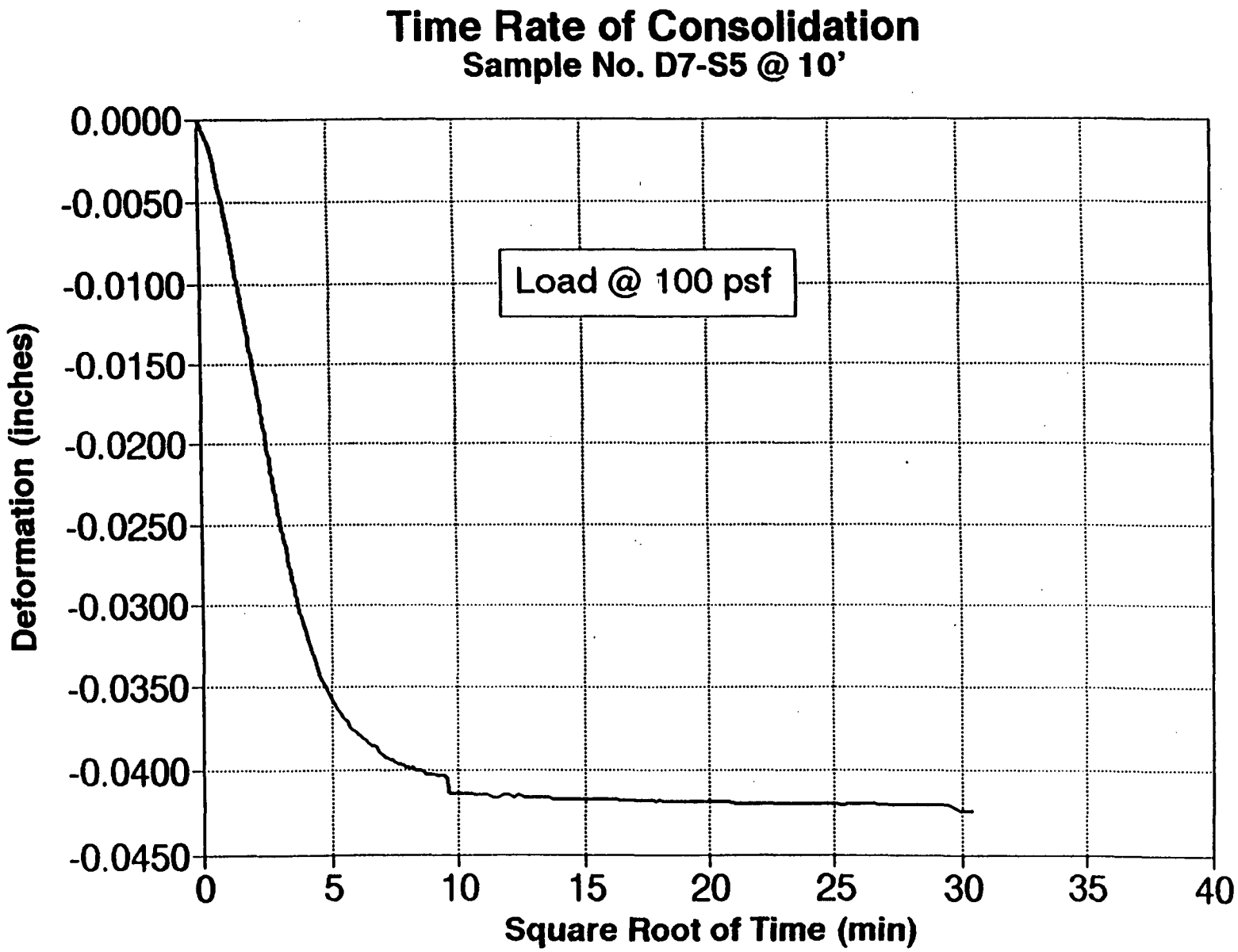
Figure 13



Project No. 41194

Figure 14

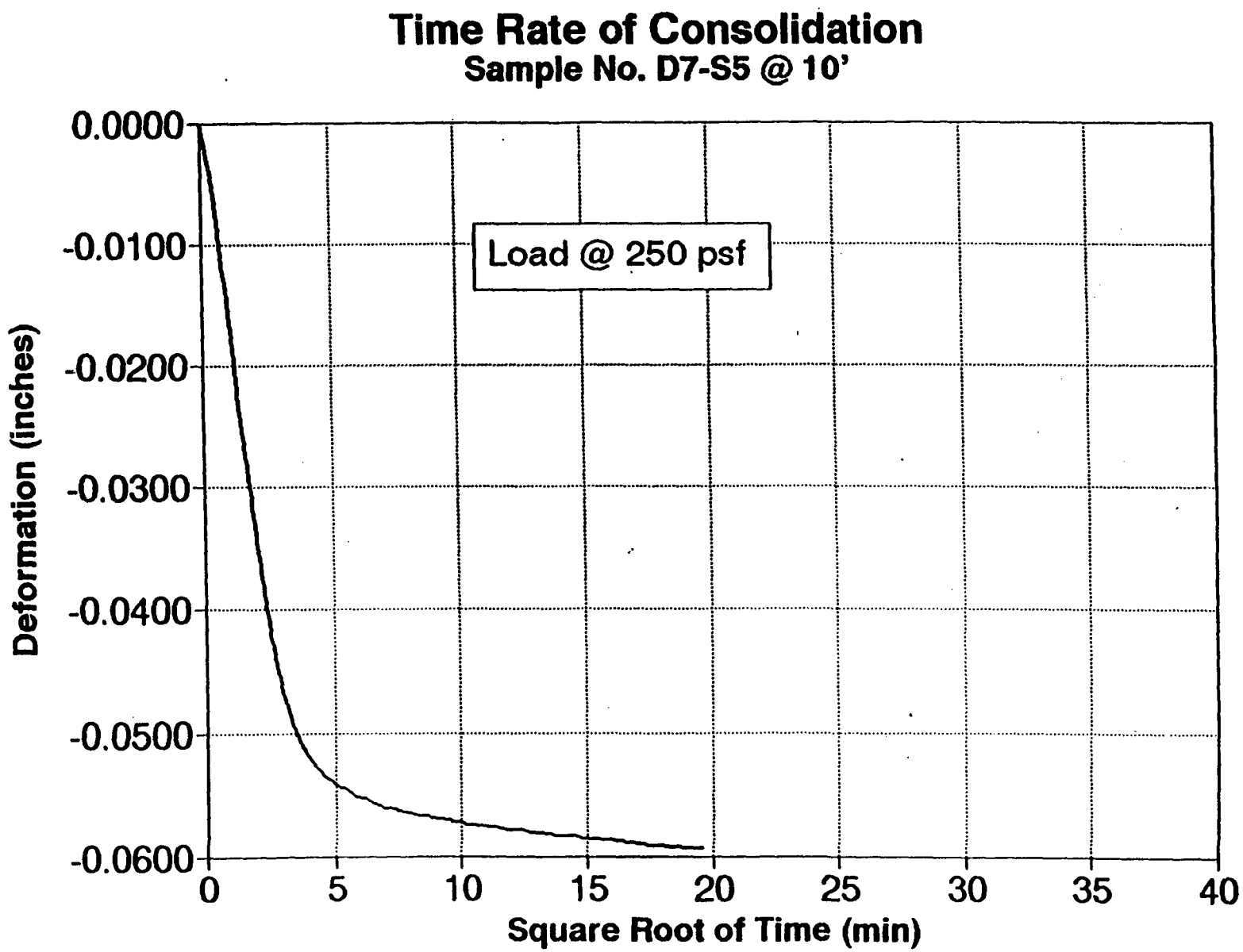


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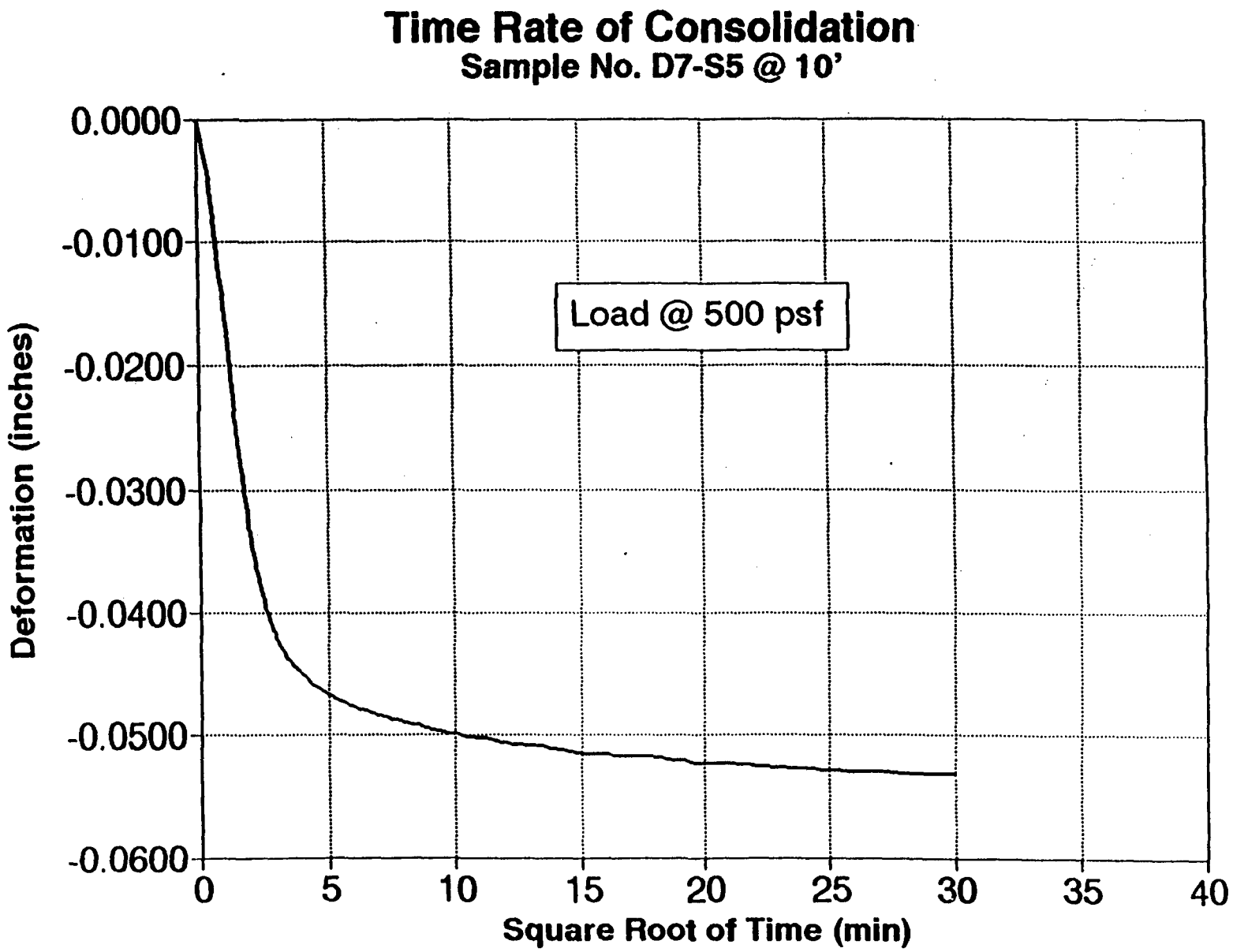
Figure 15



Project No. 41194

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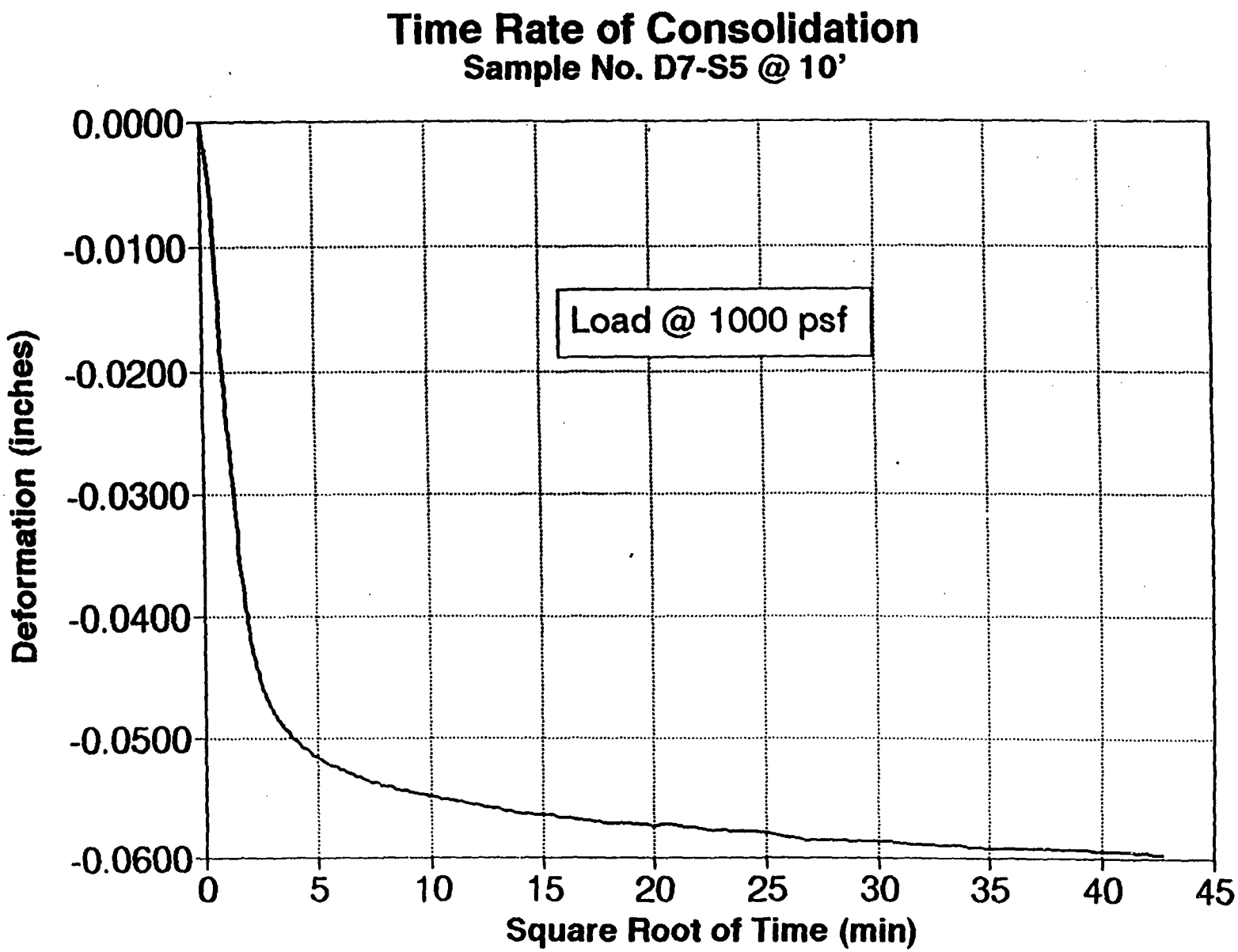

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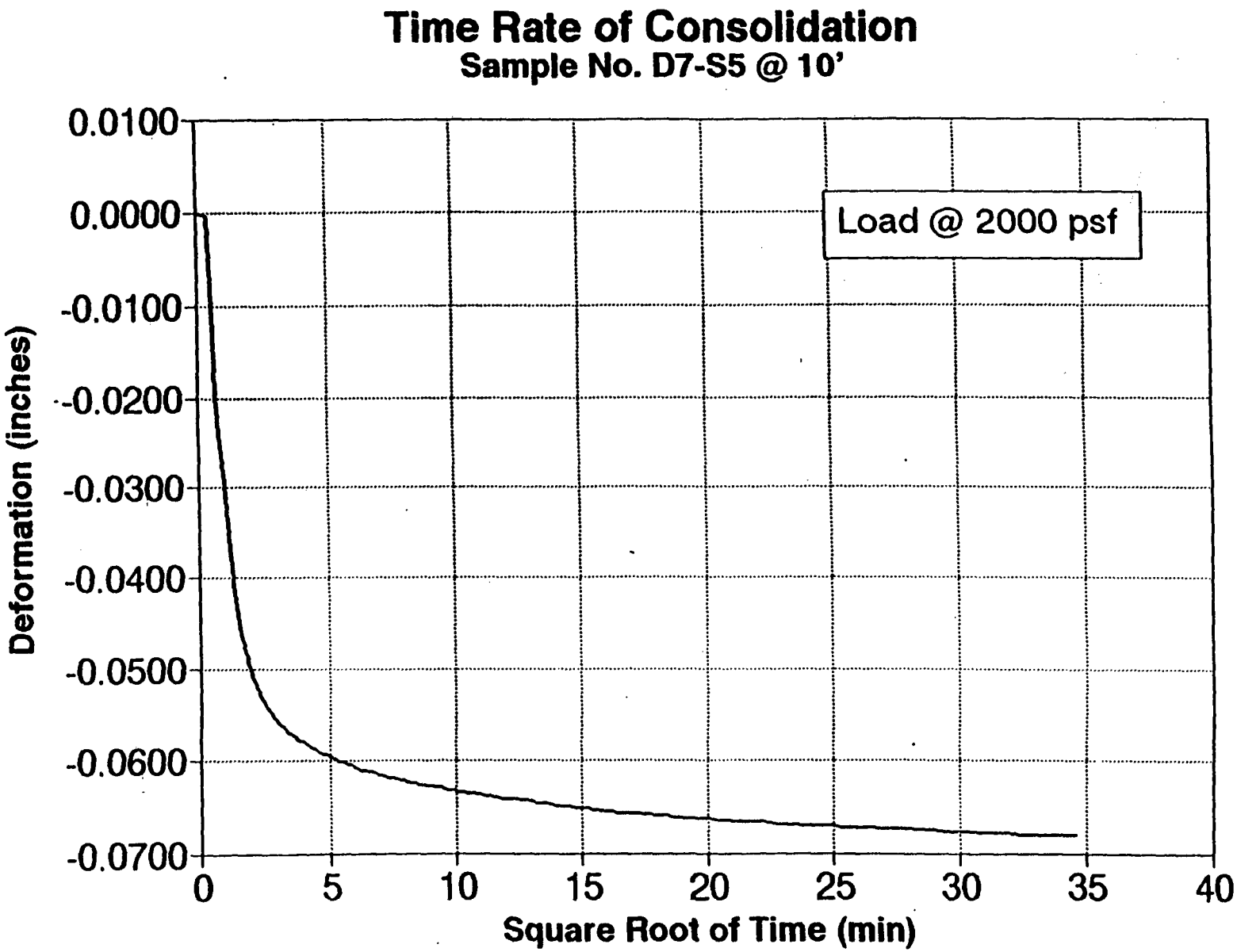

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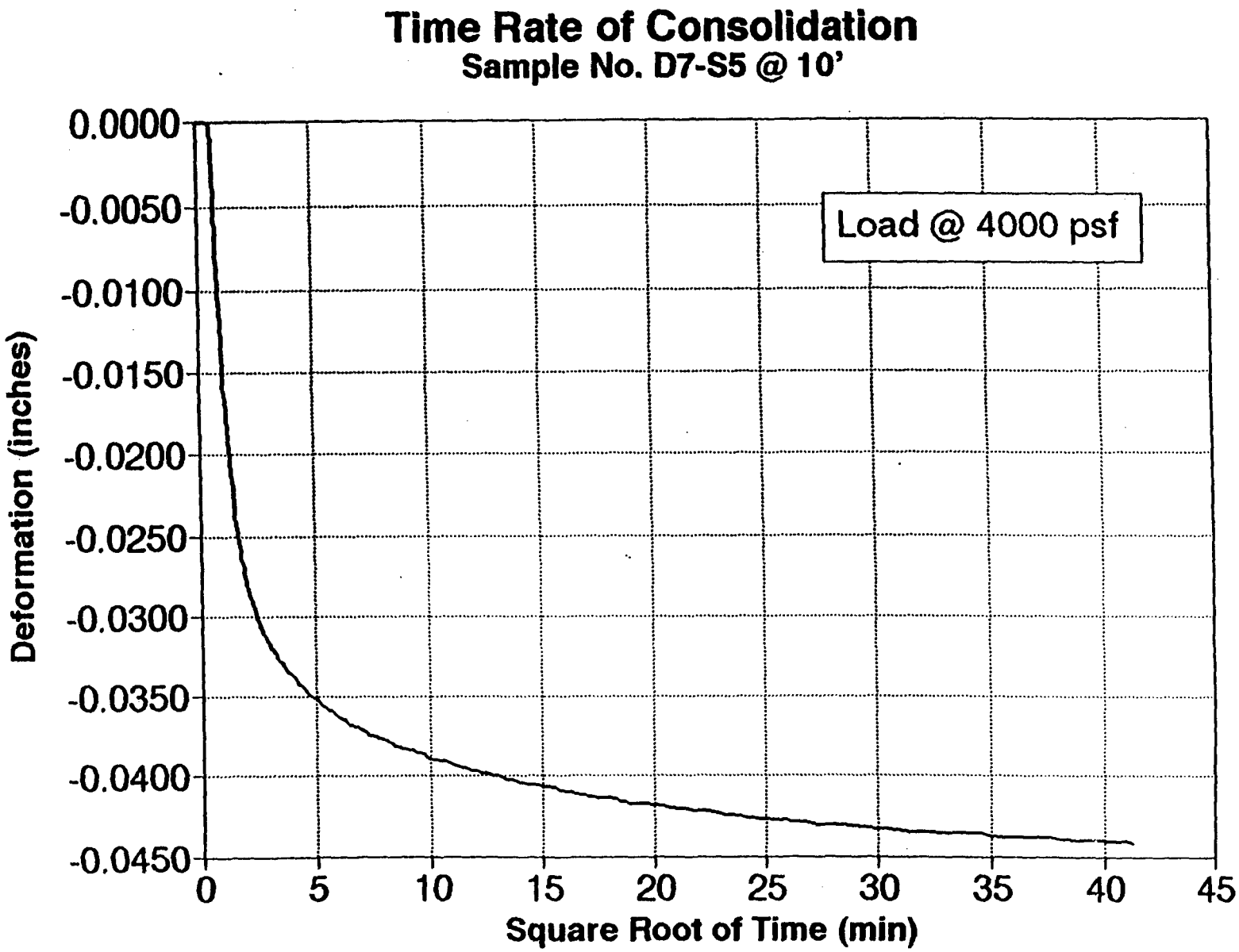

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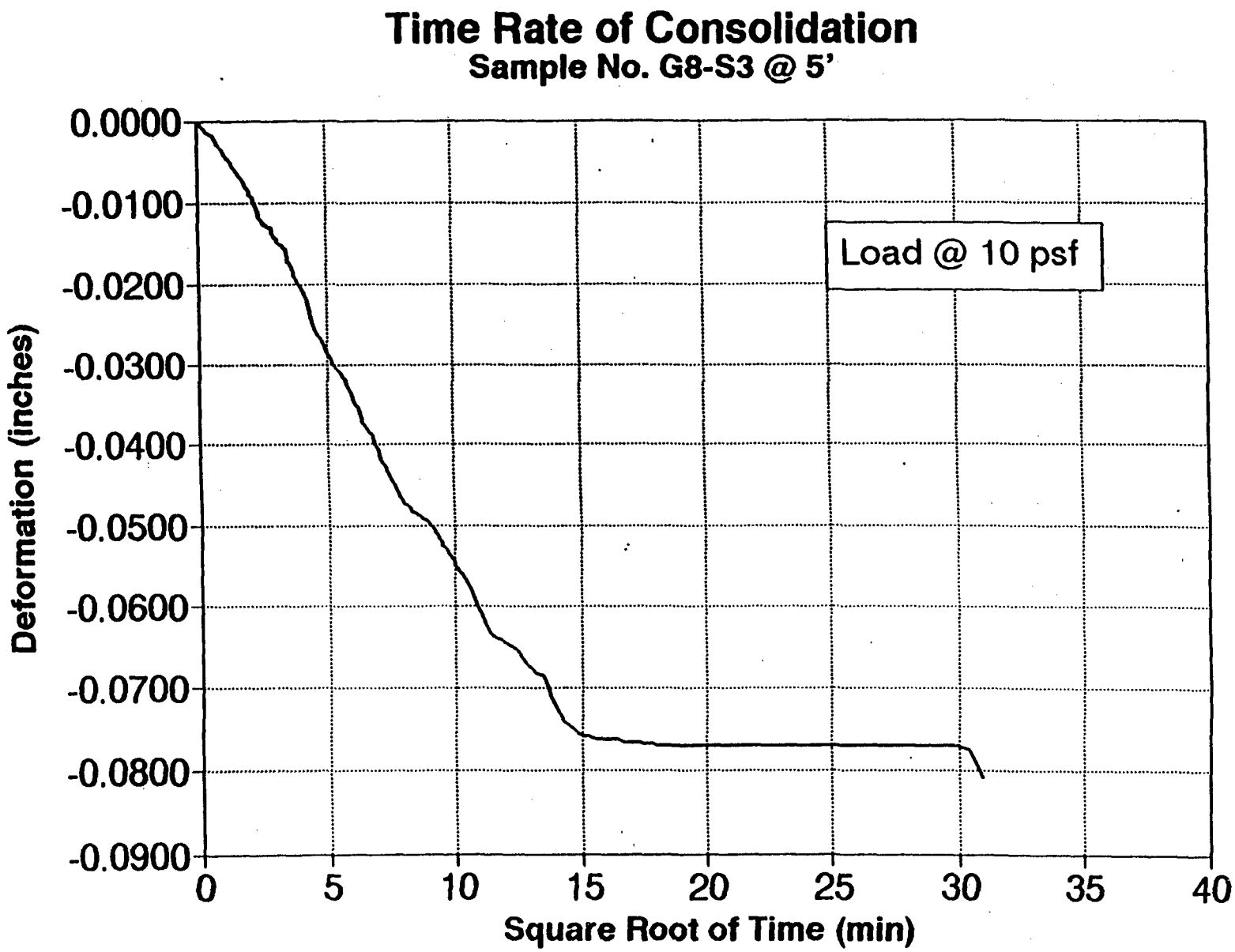

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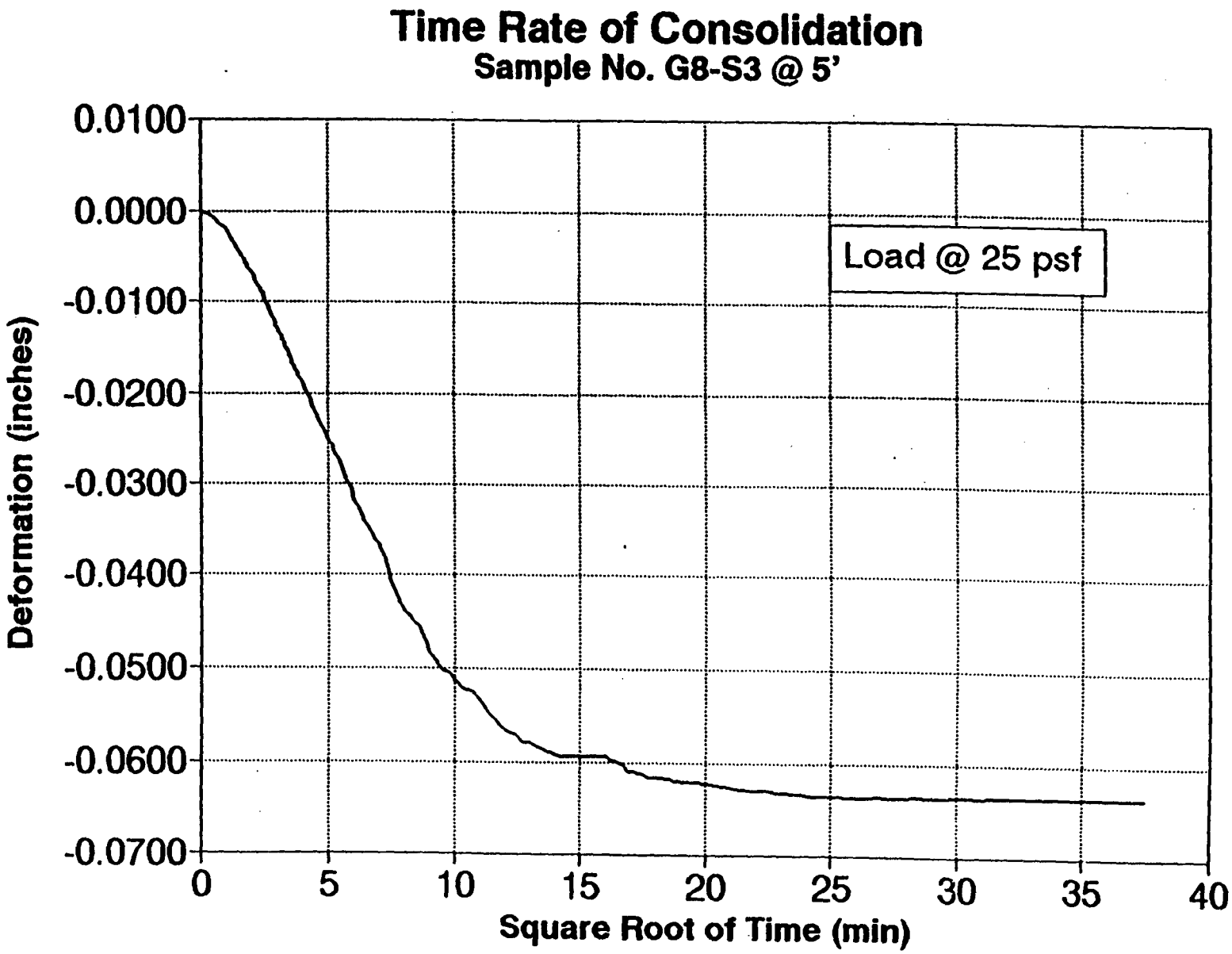

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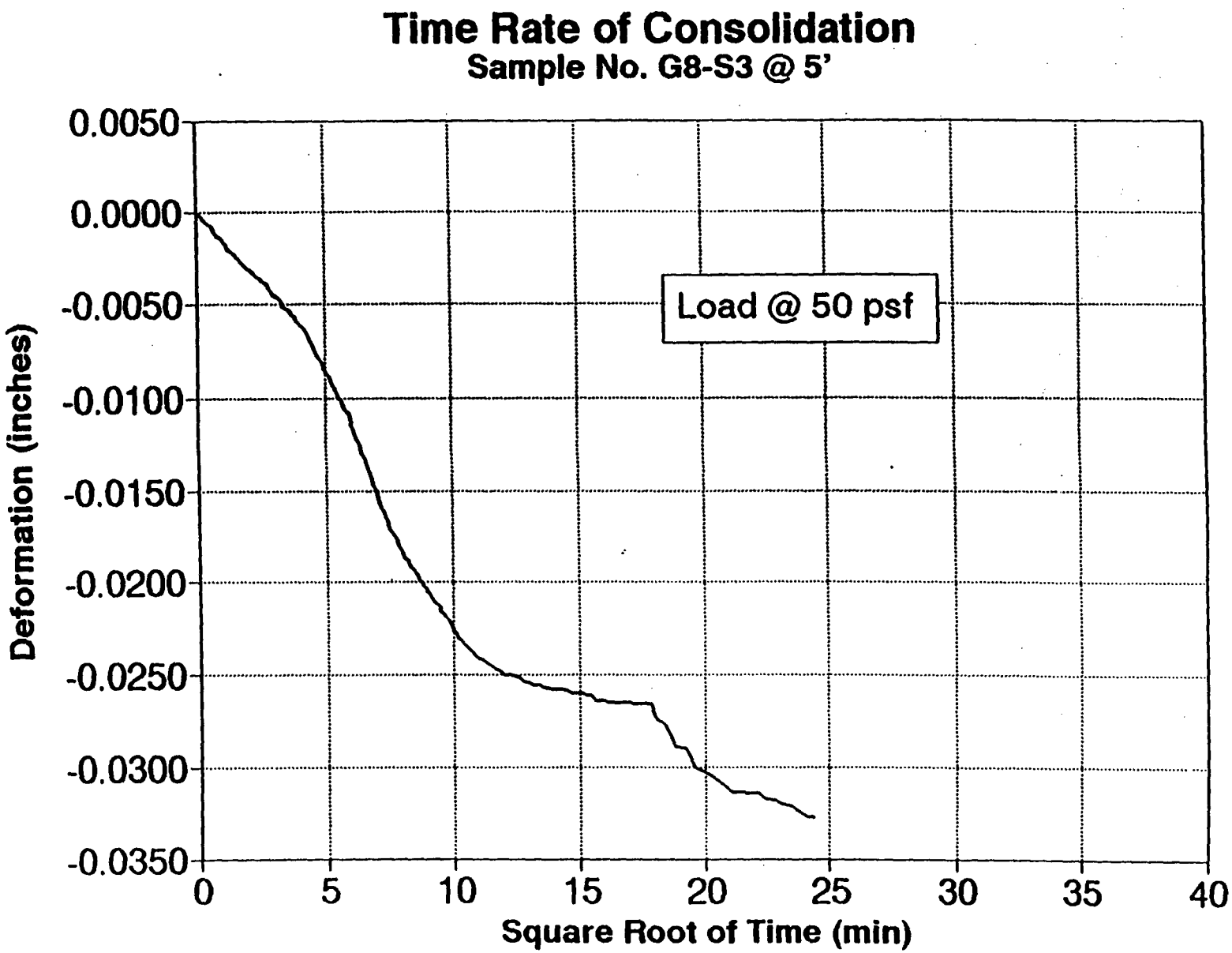

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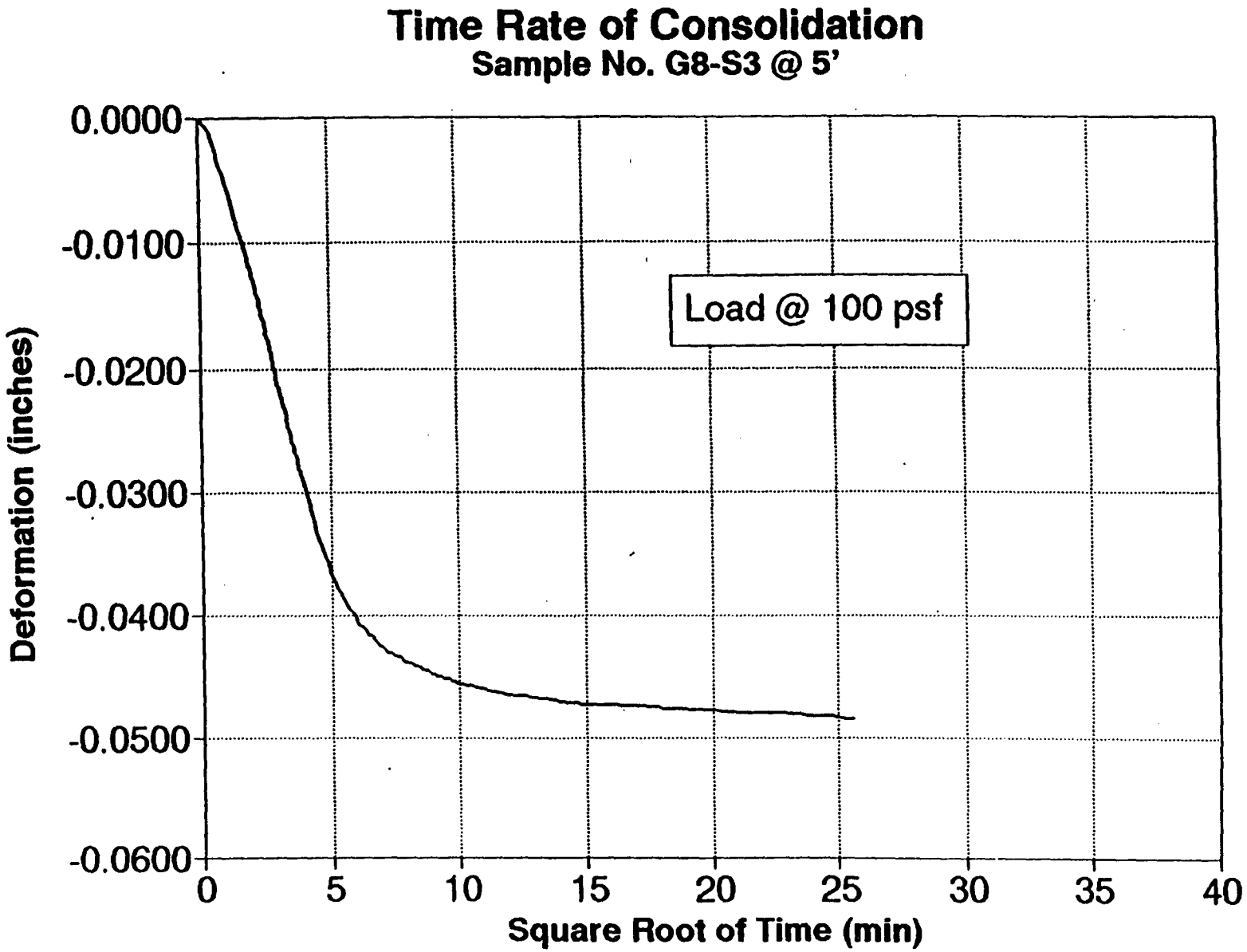

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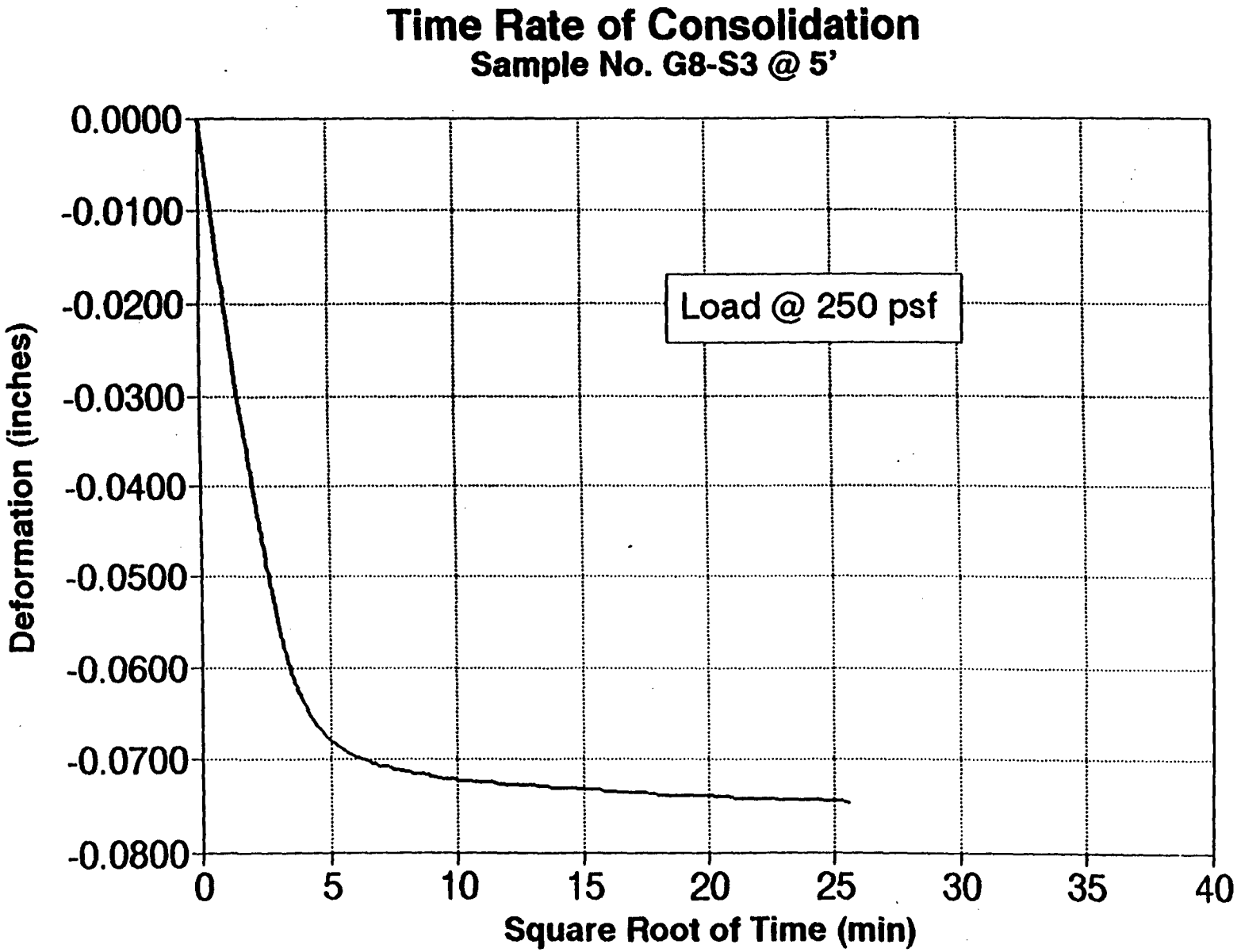

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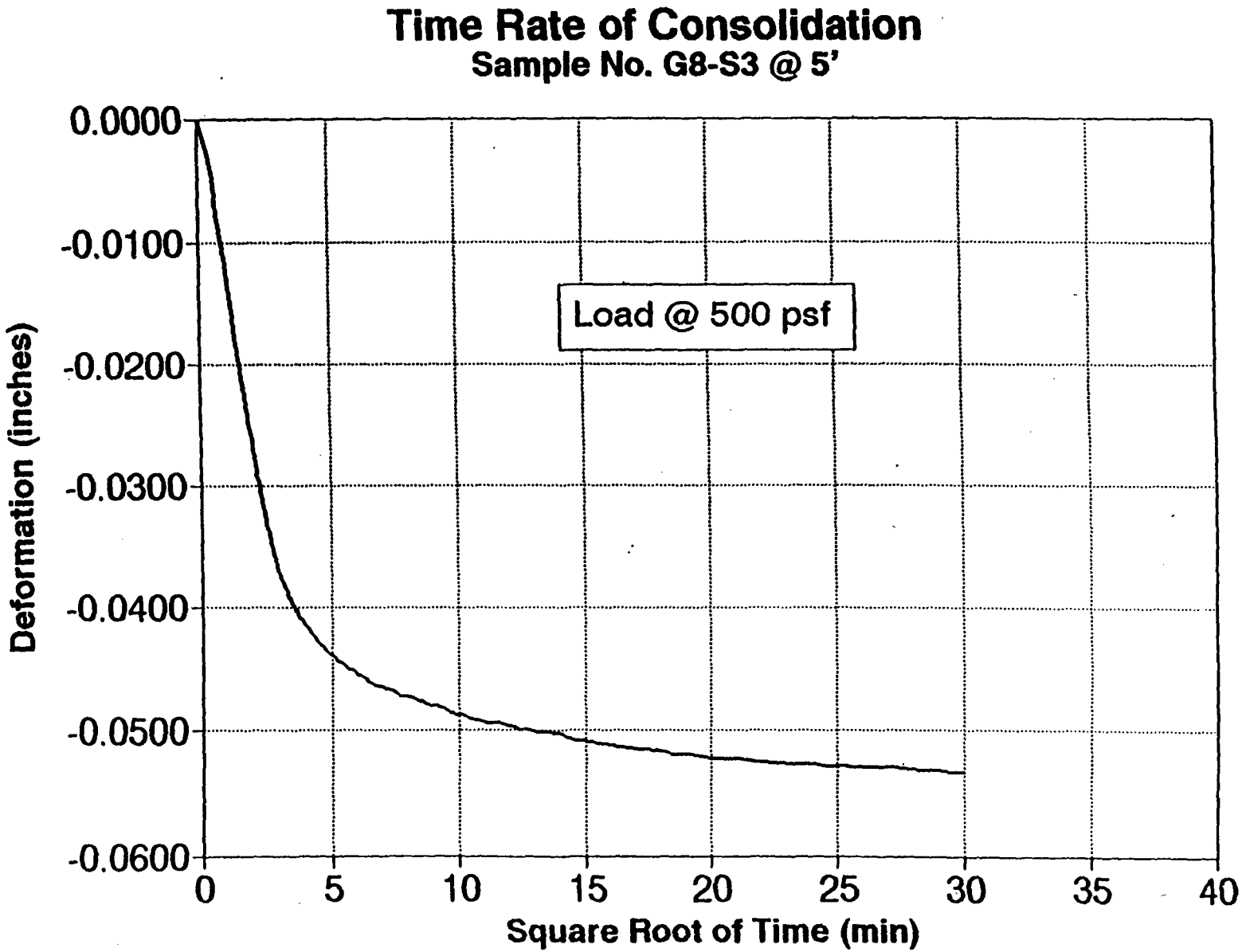

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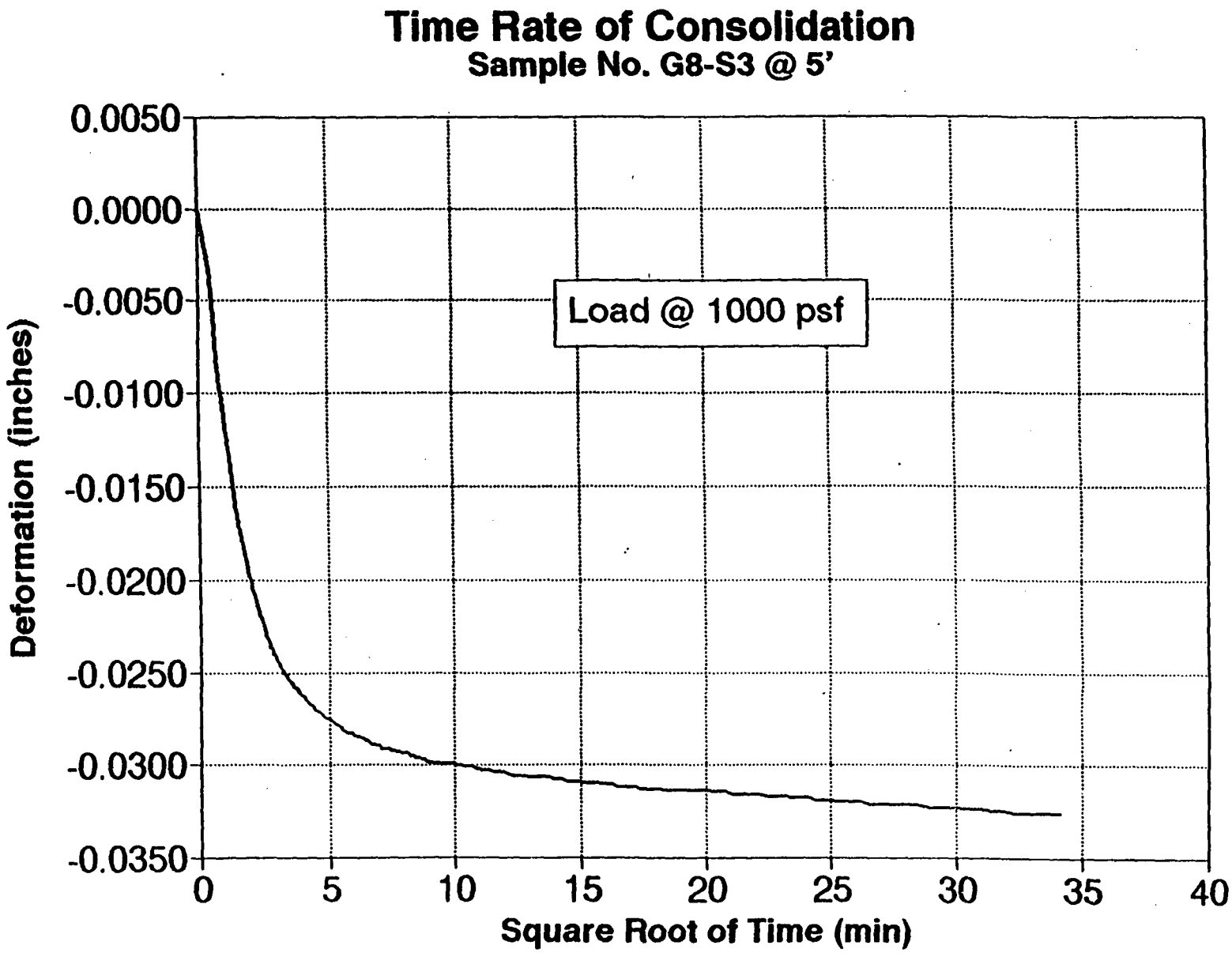

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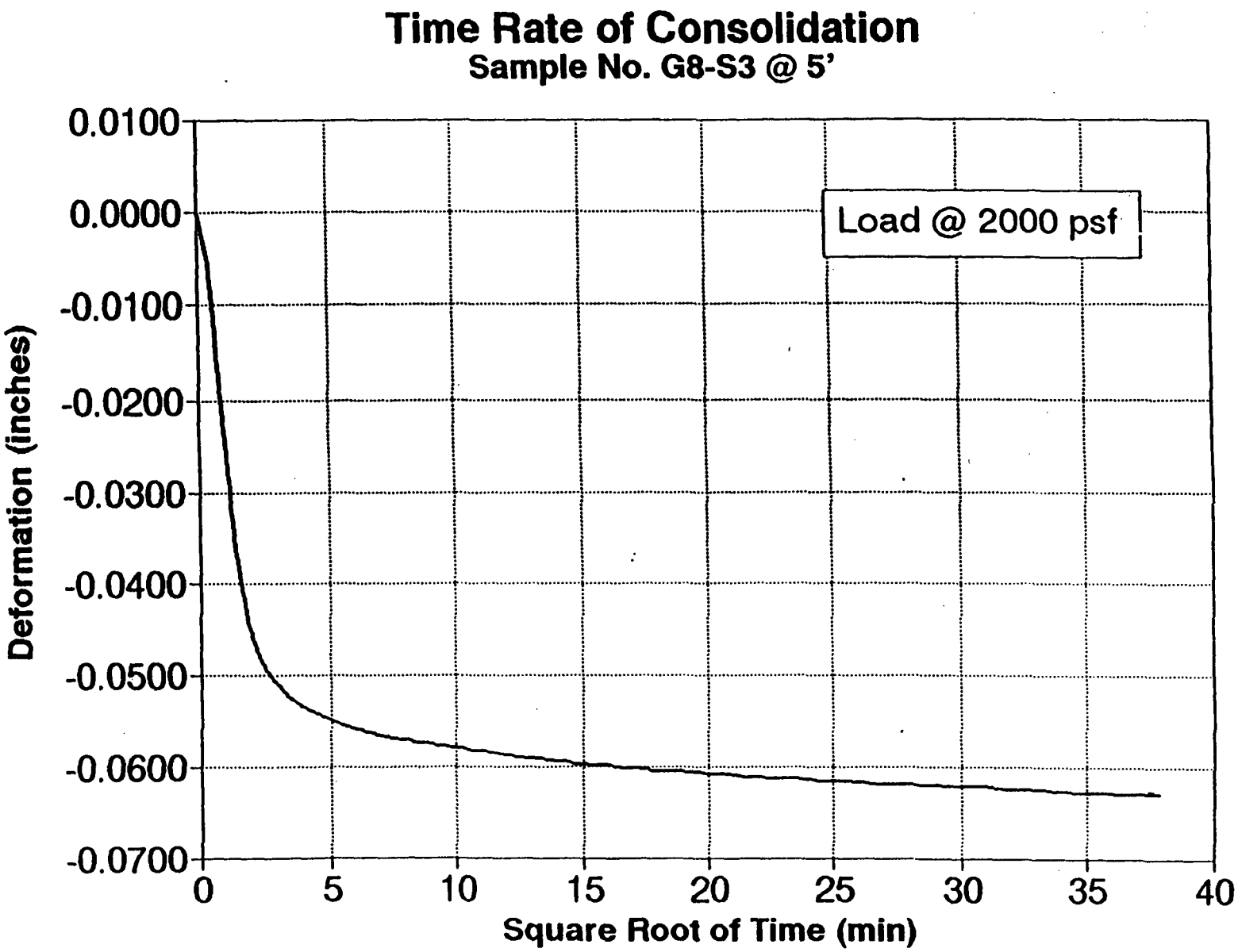

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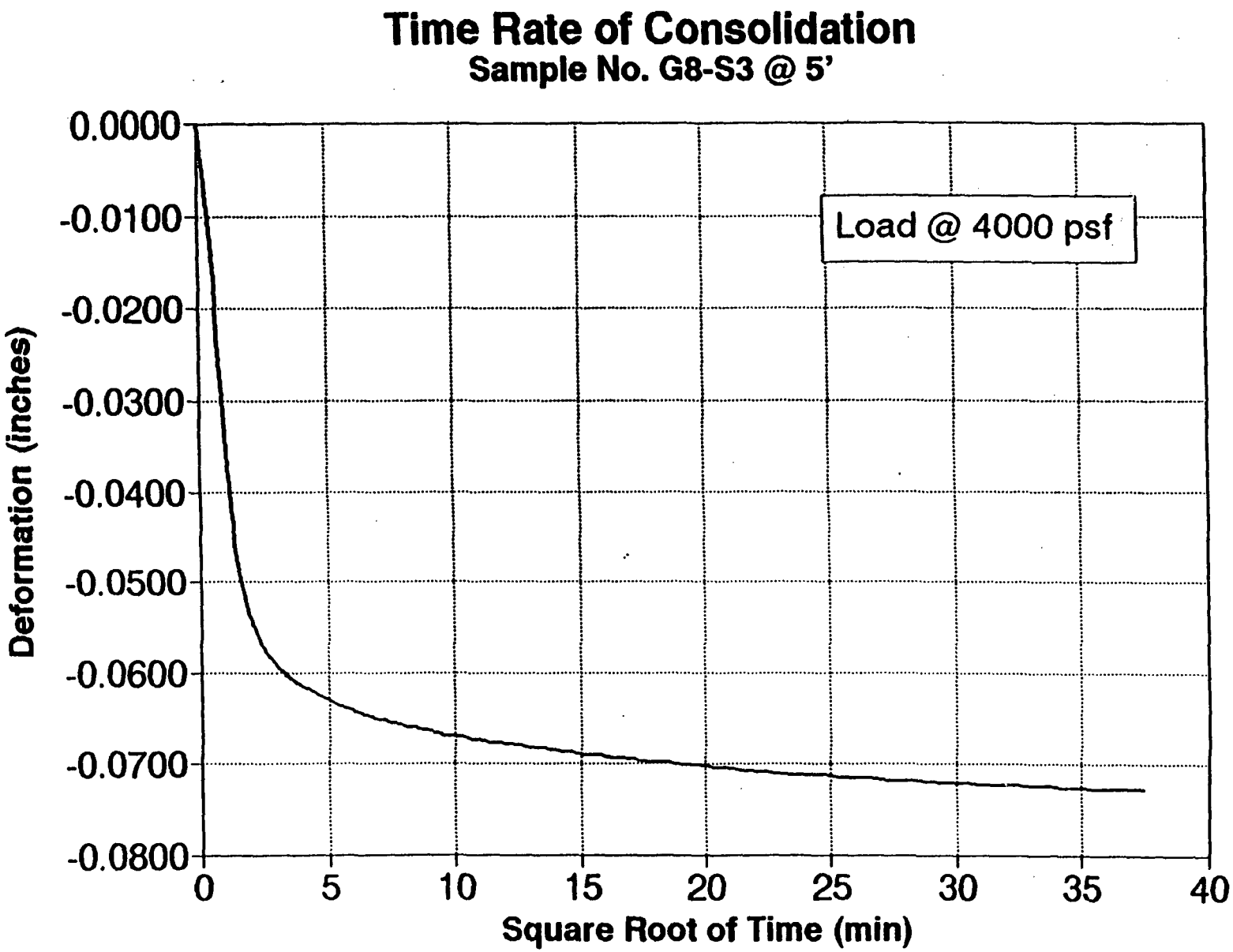

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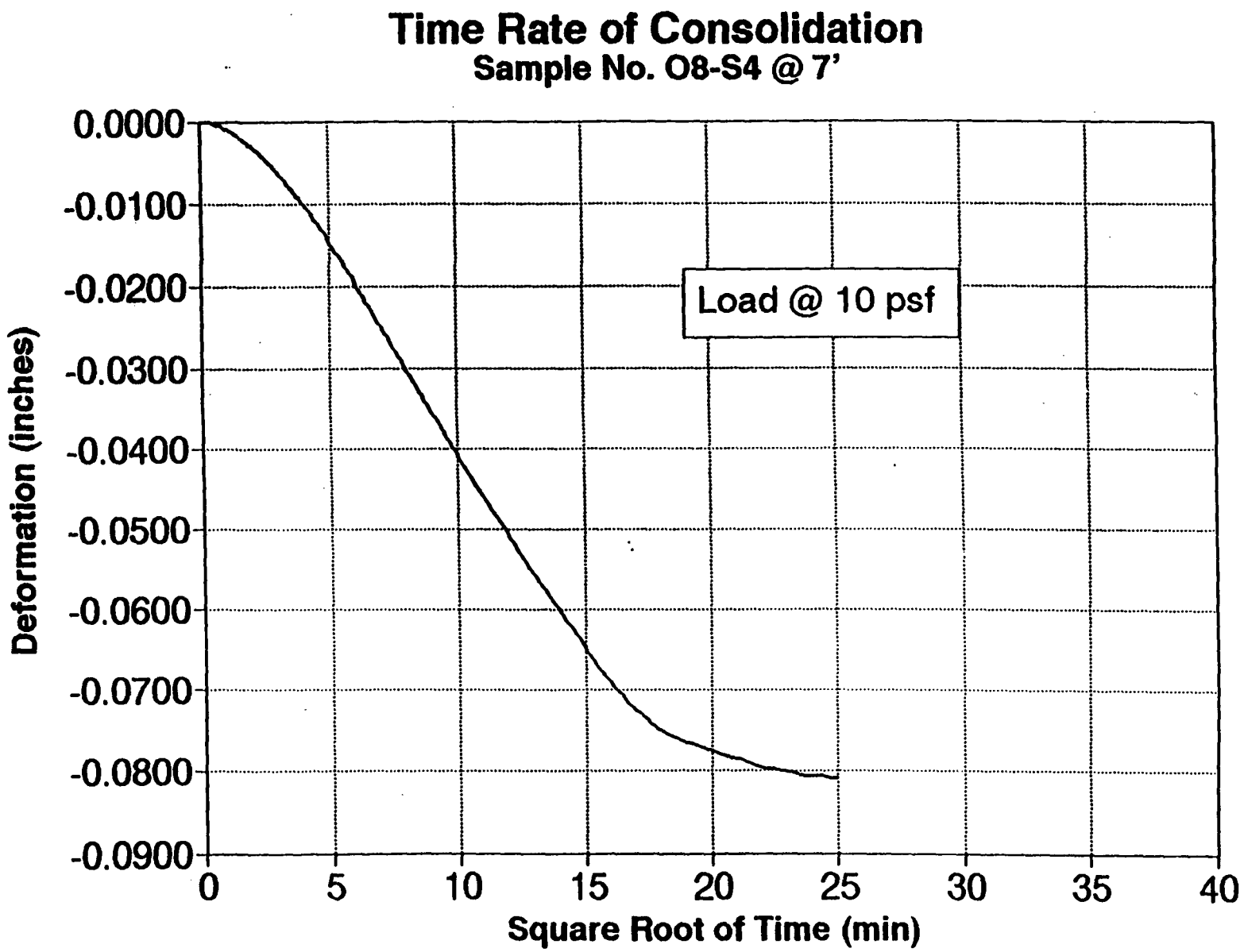

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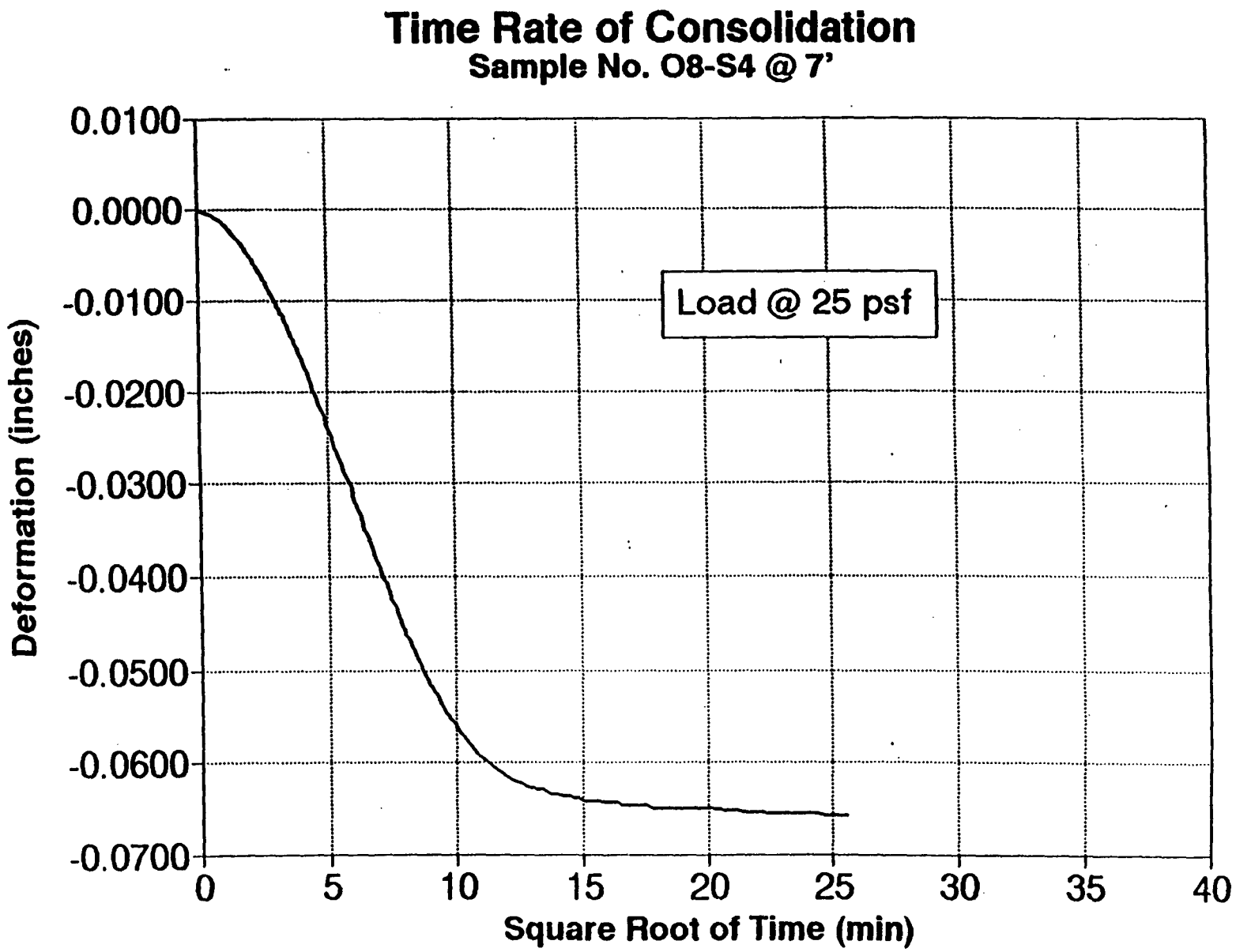

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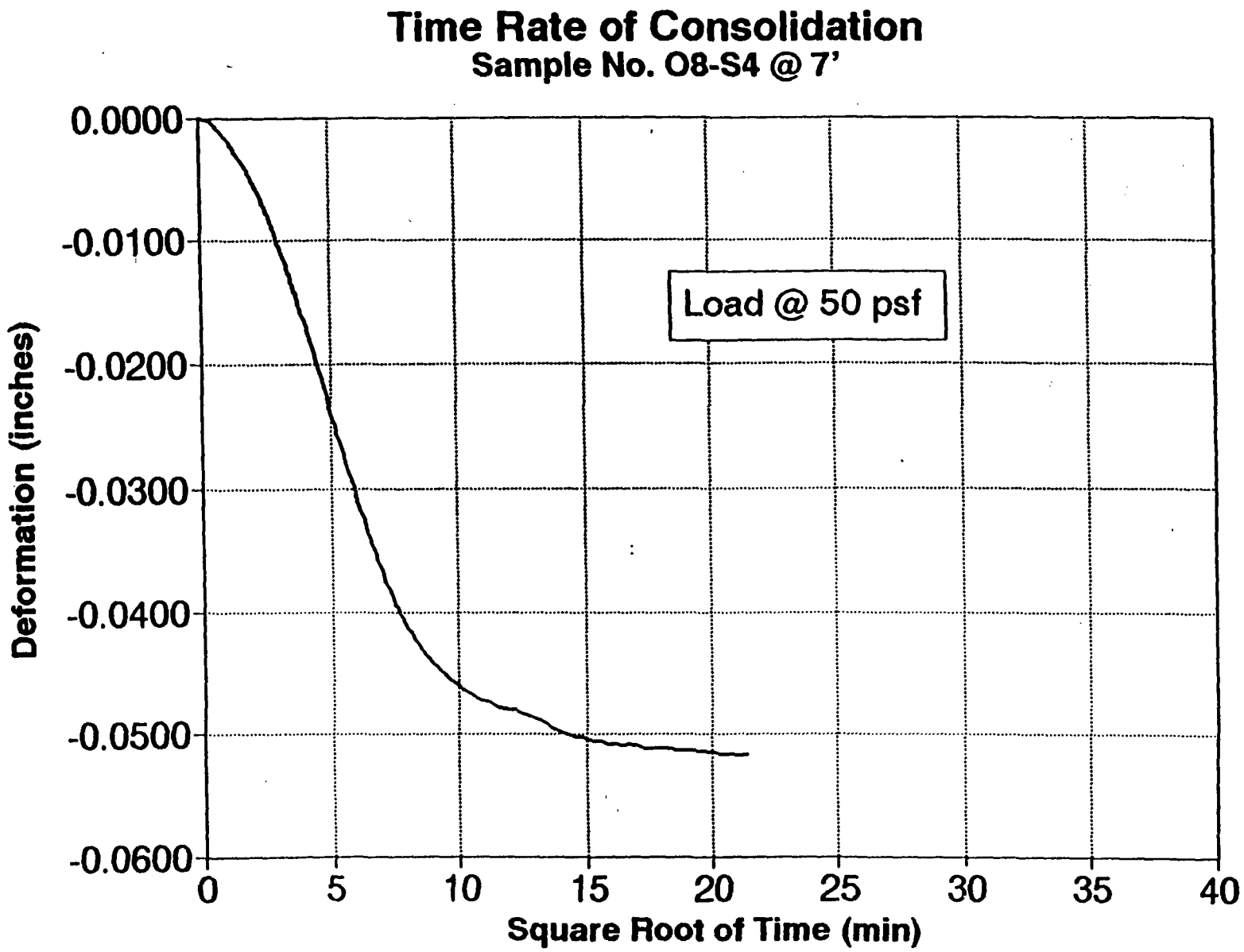

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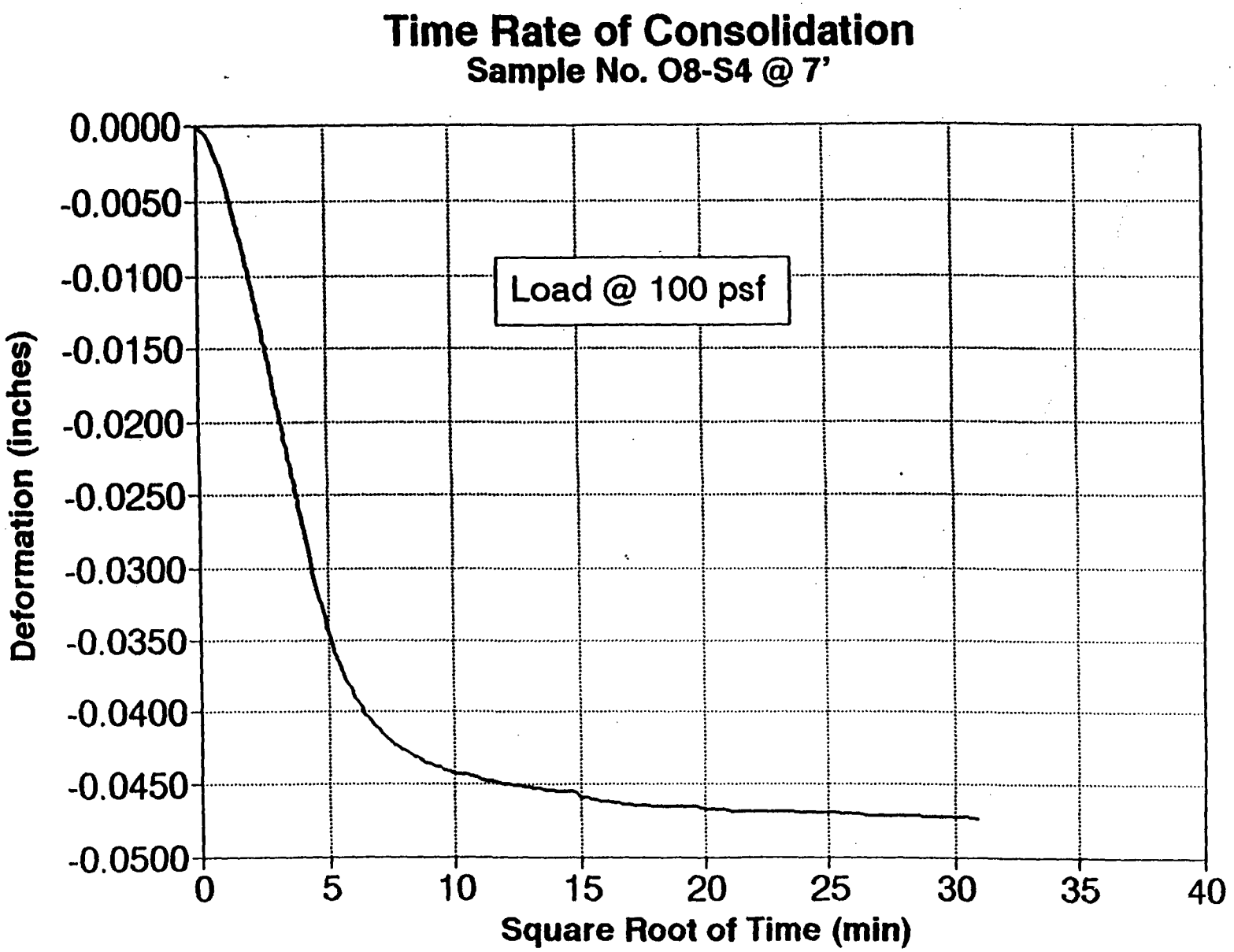

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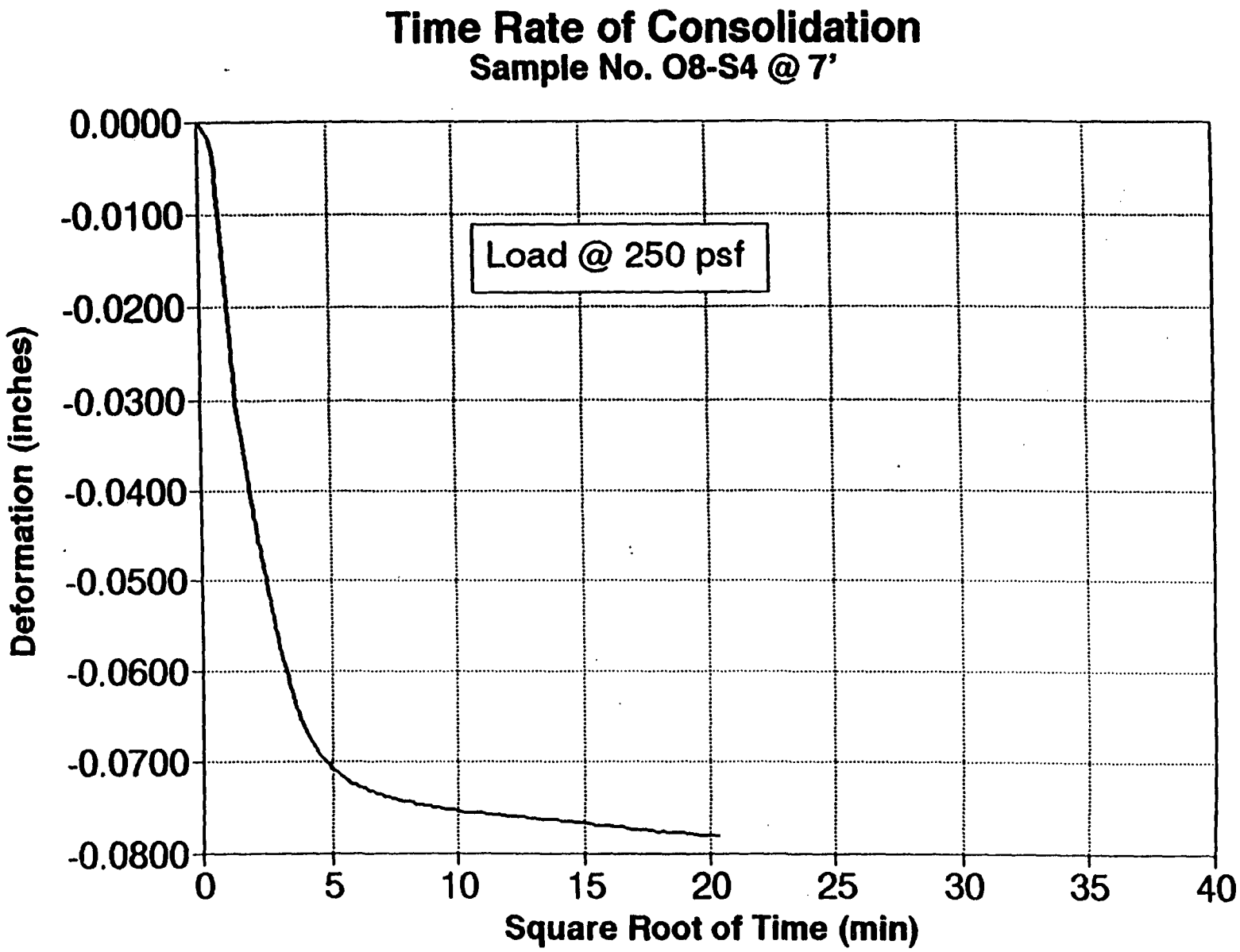

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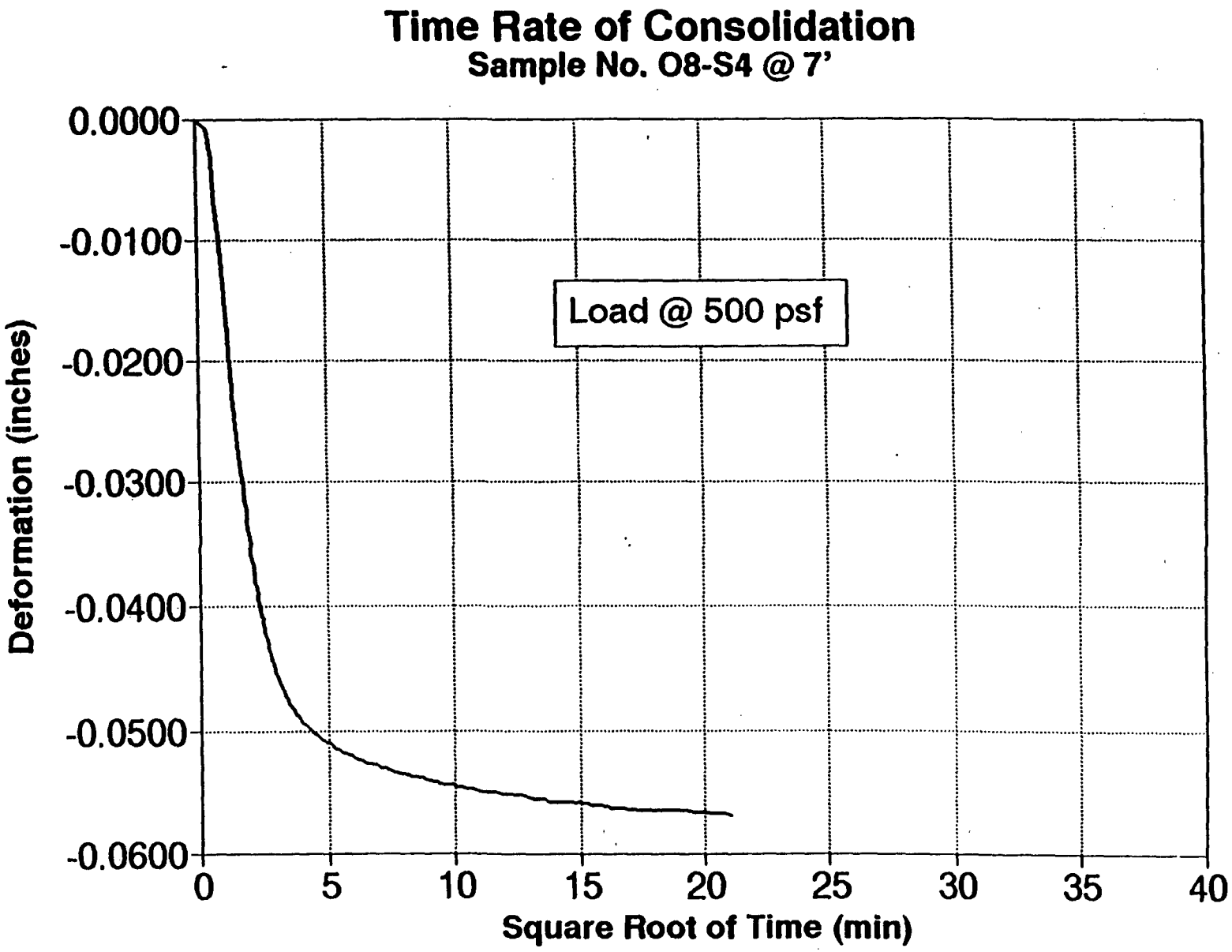

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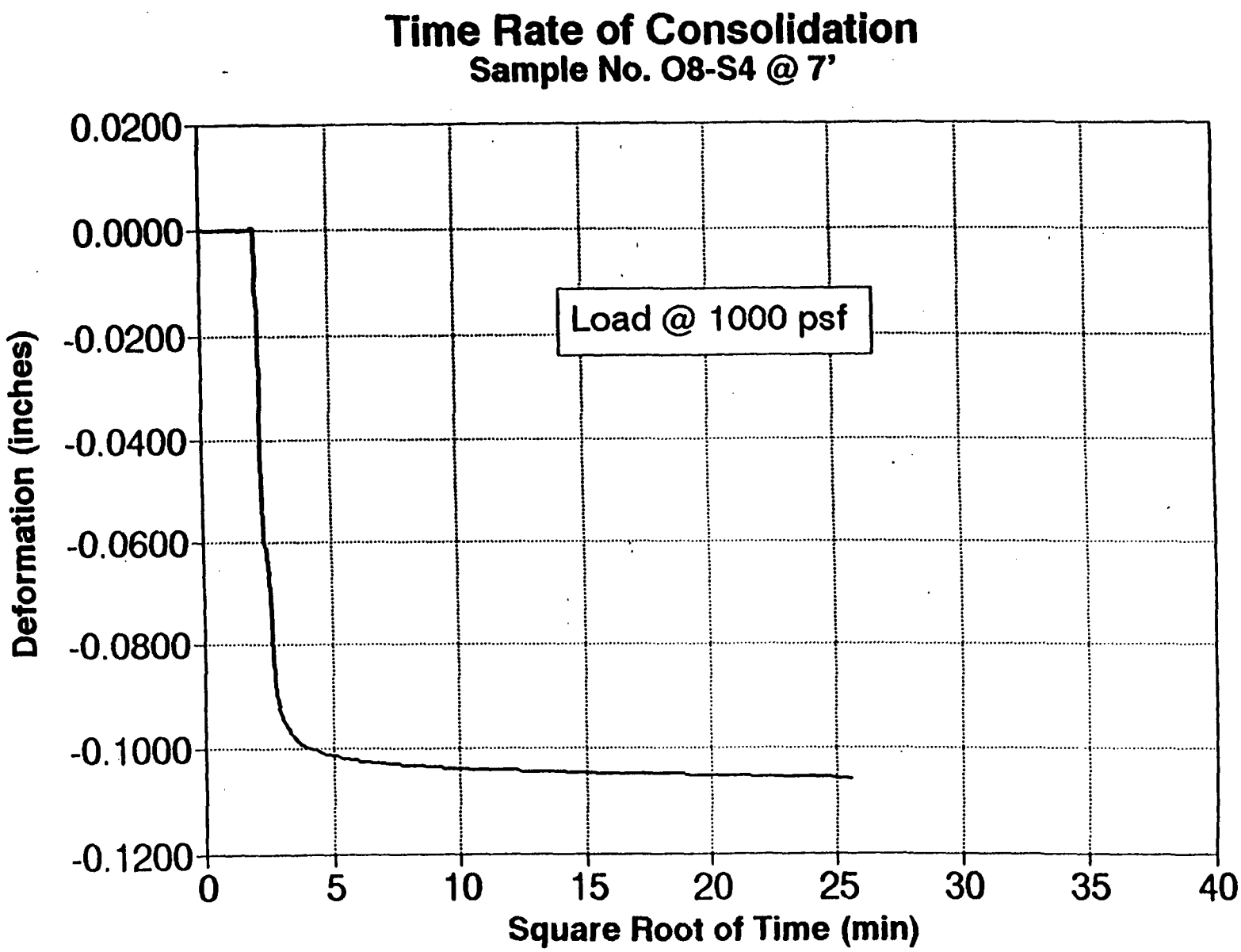

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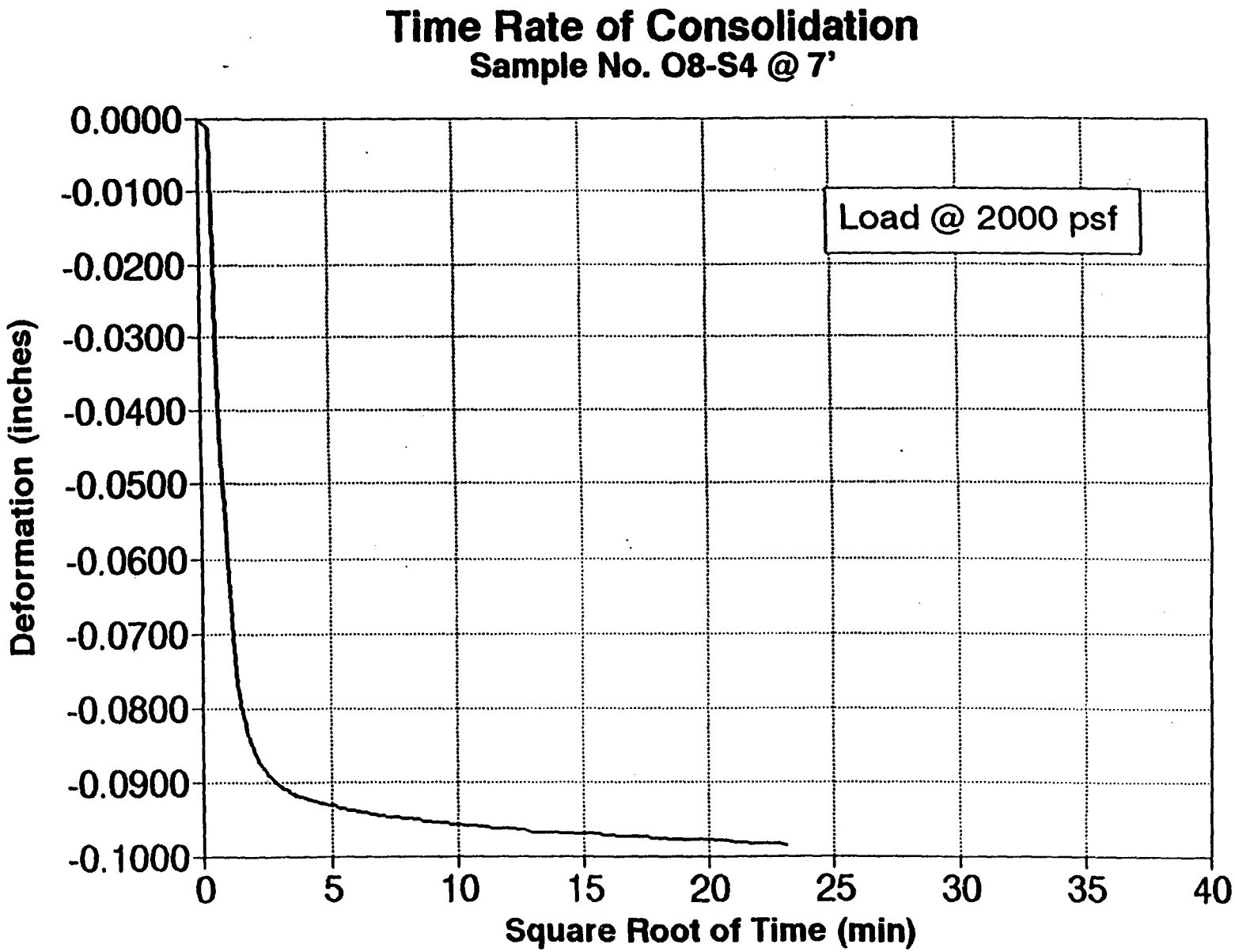

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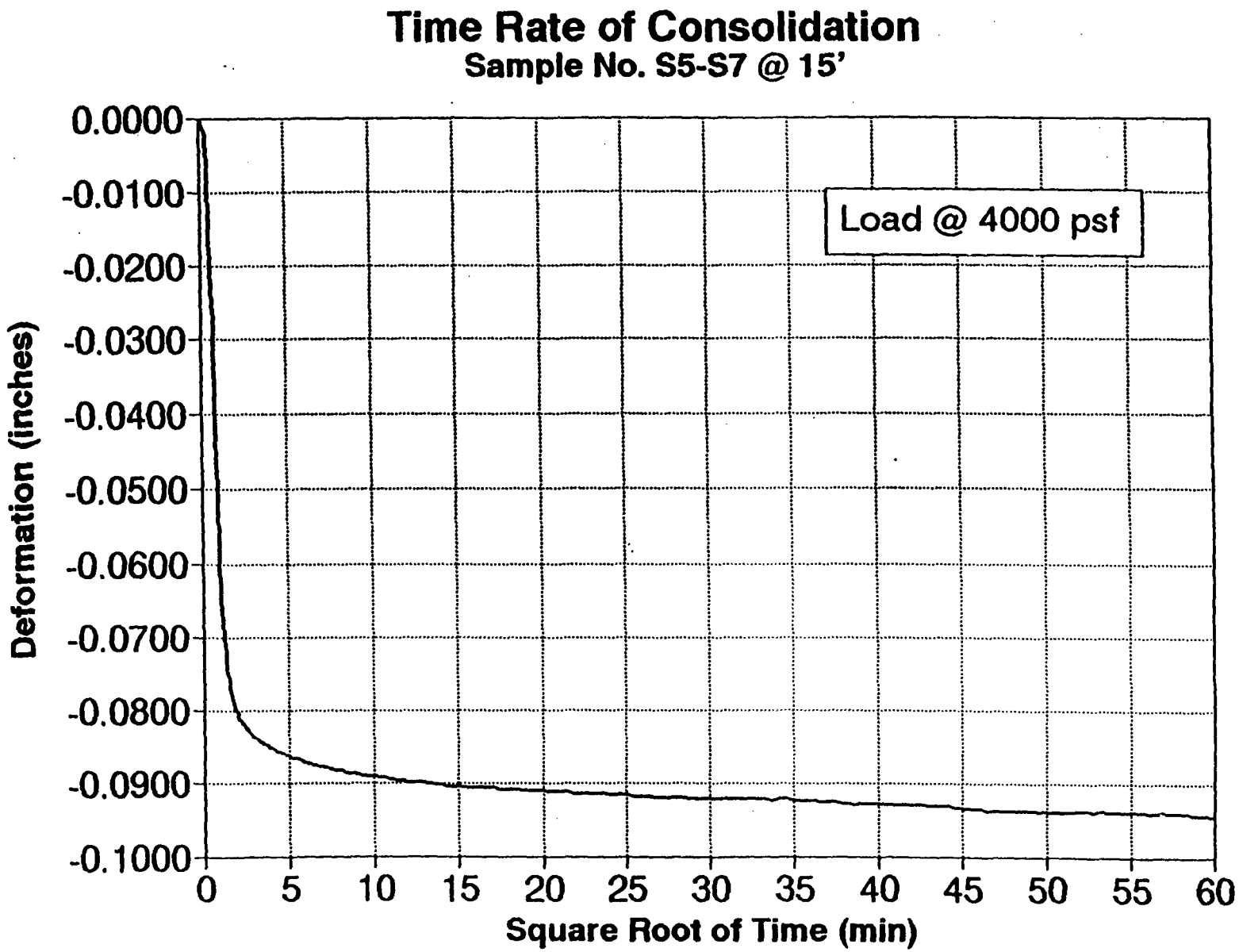

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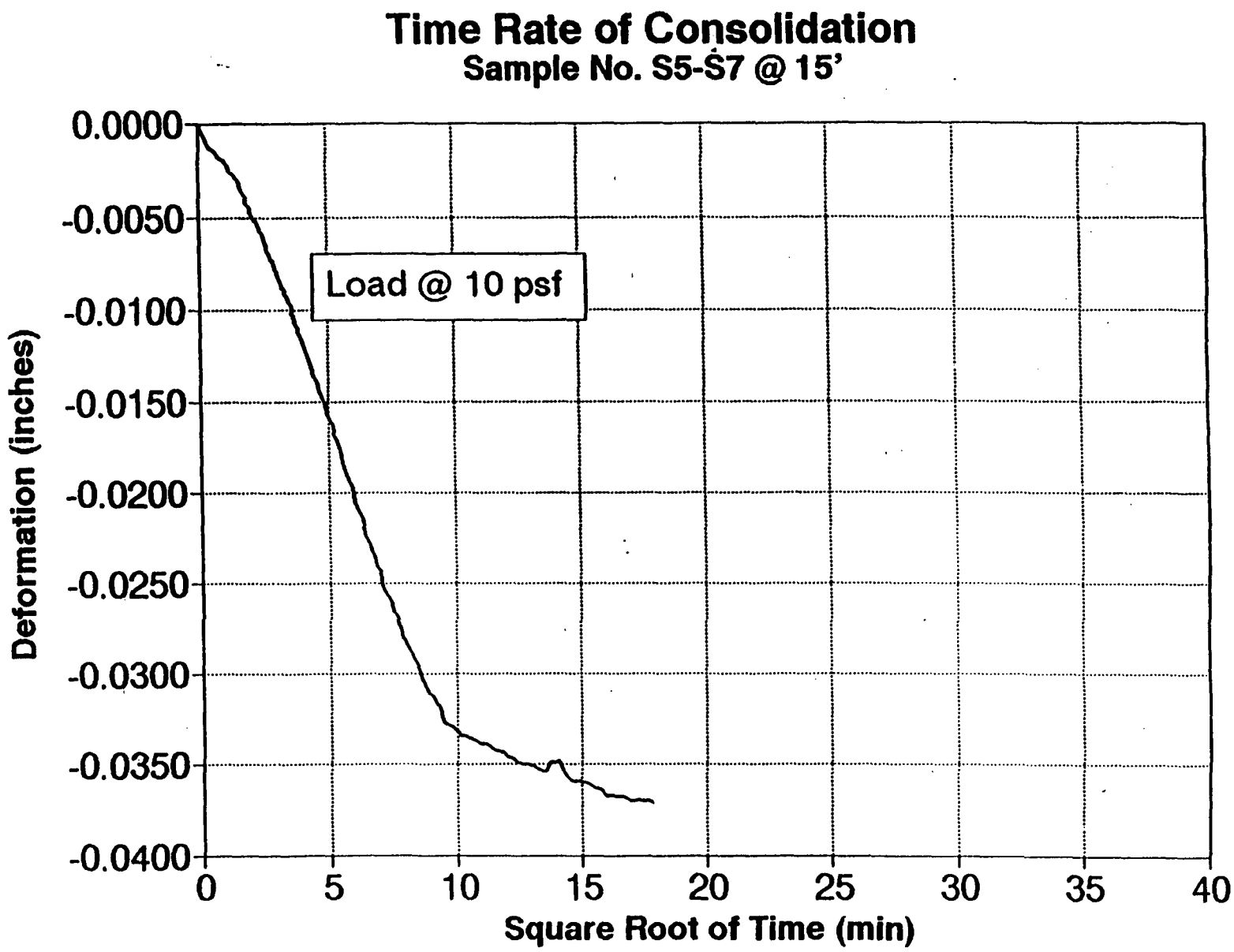

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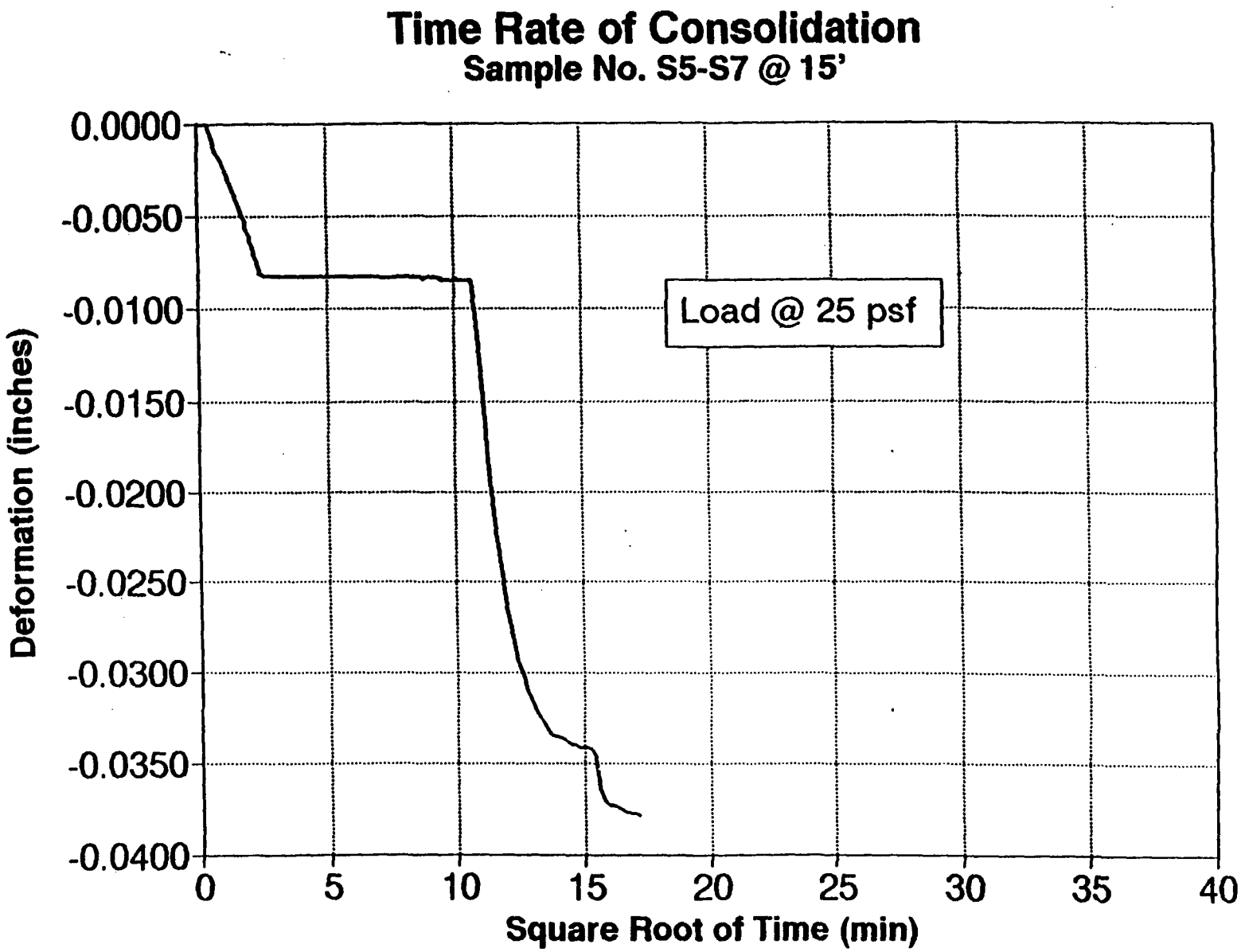

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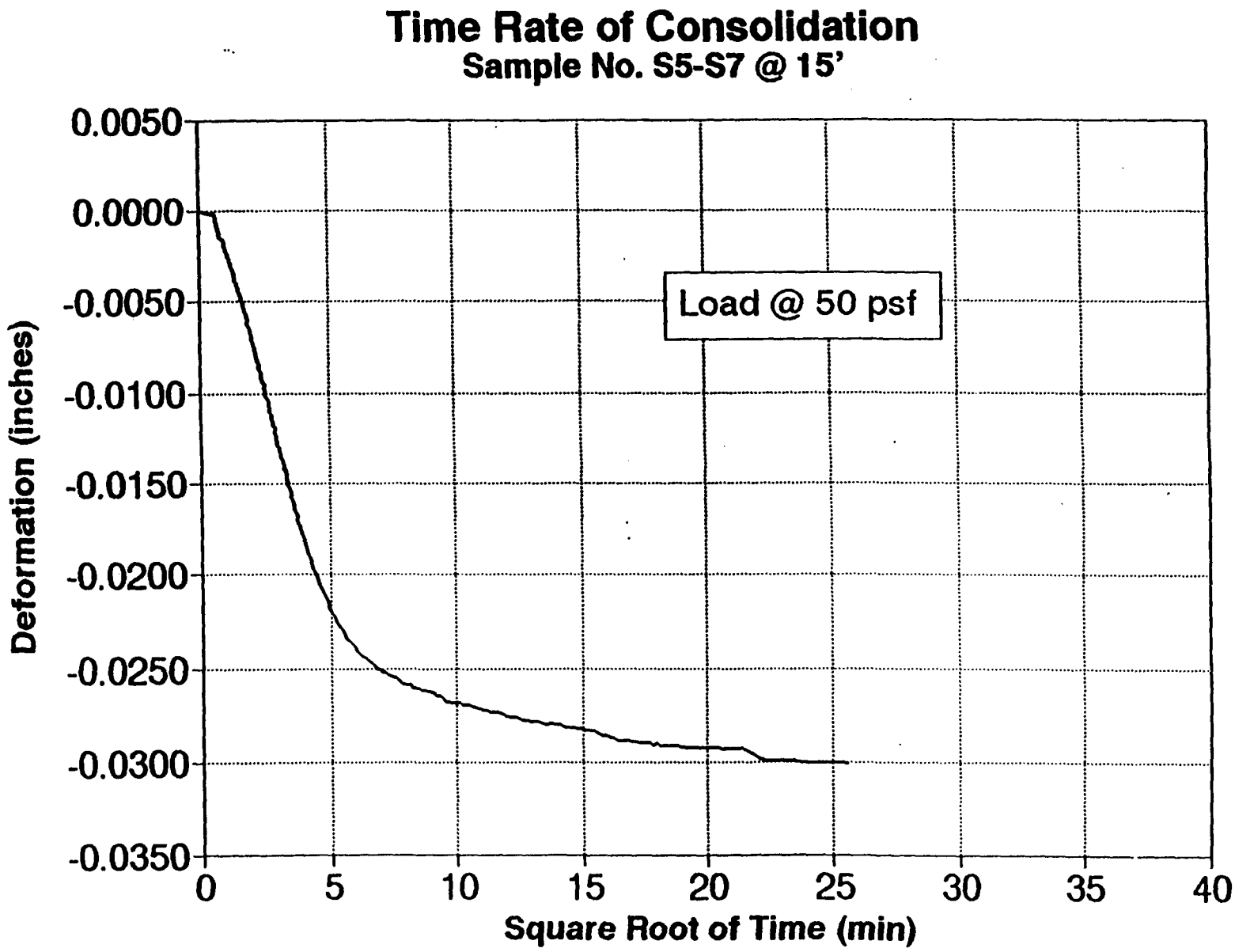

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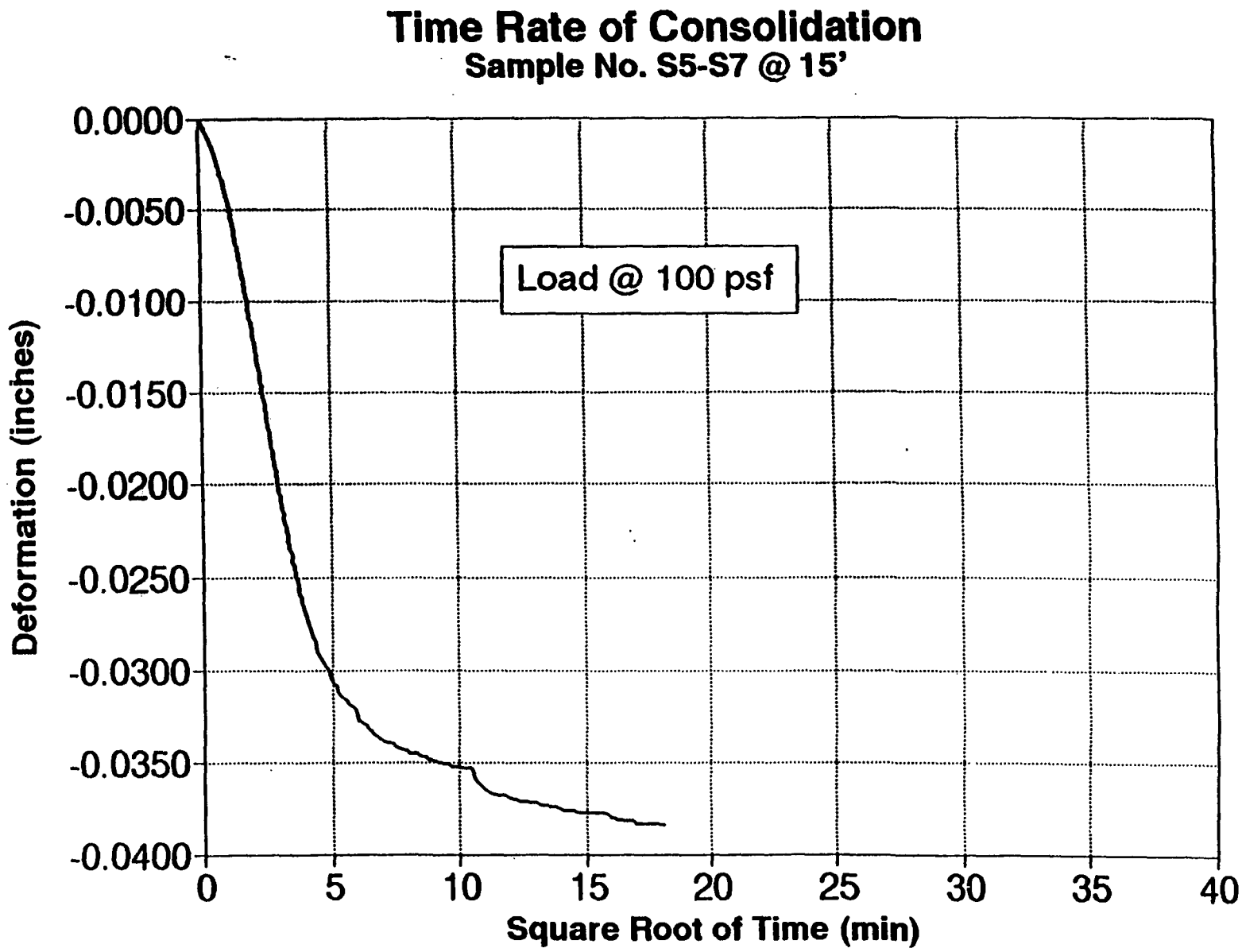

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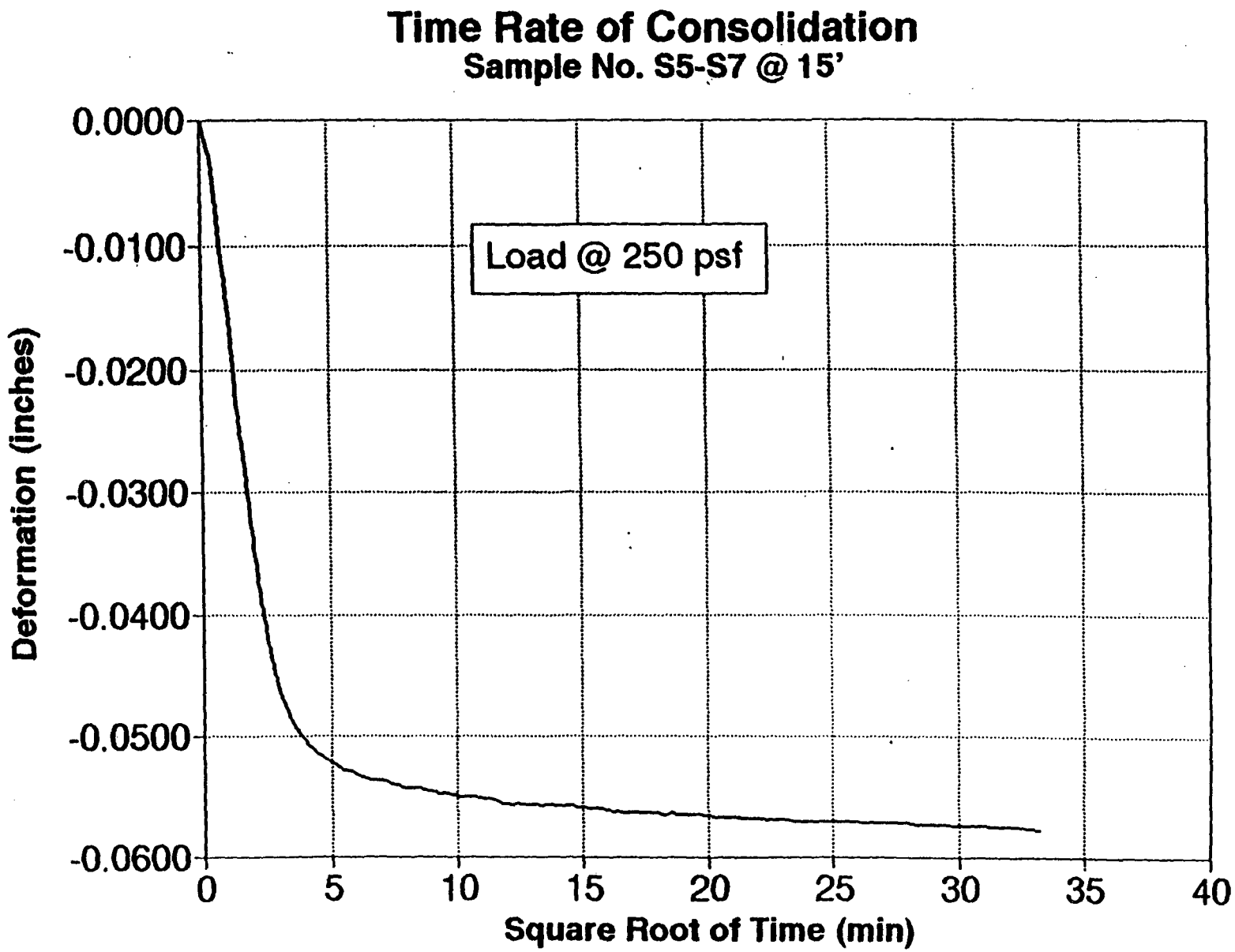

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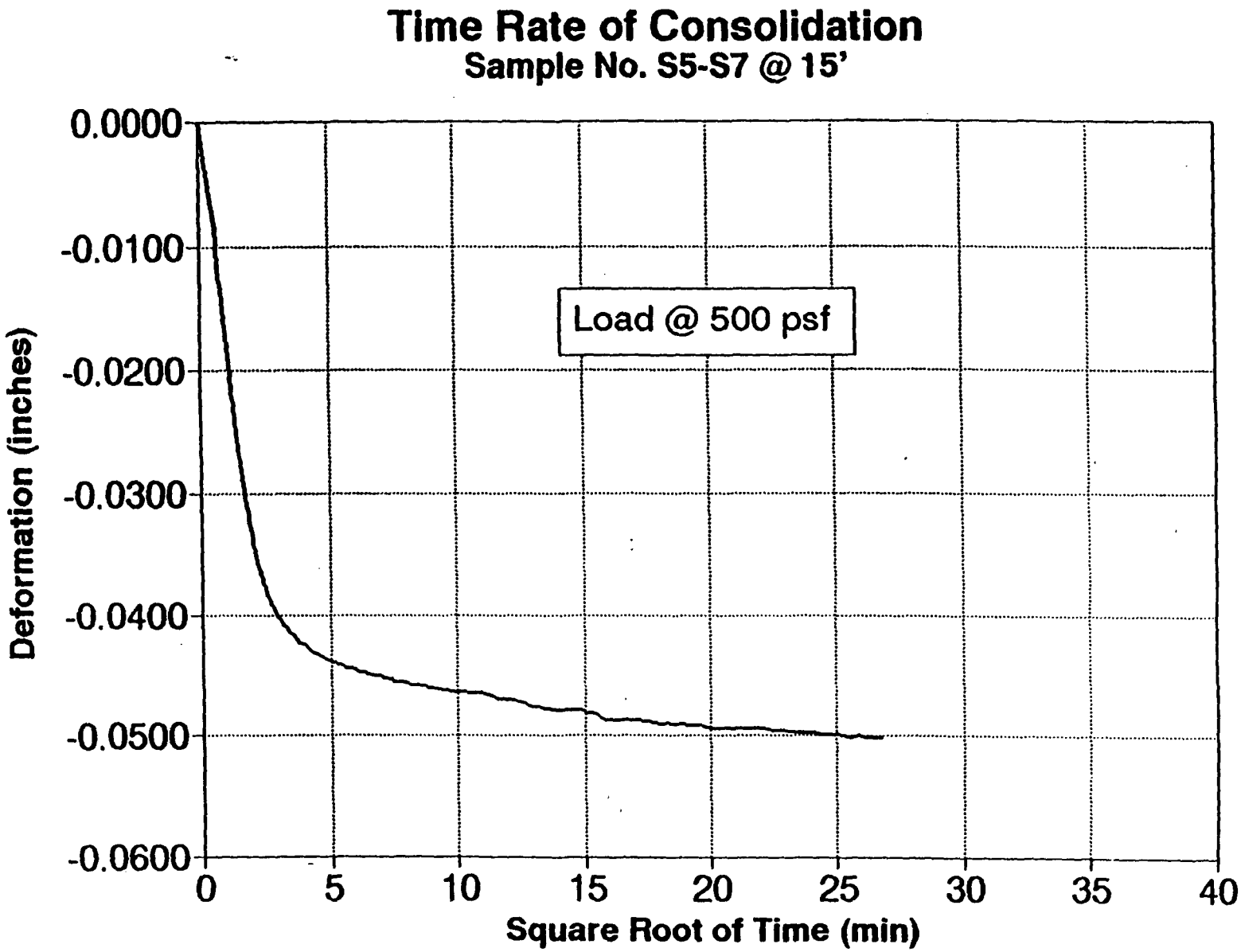

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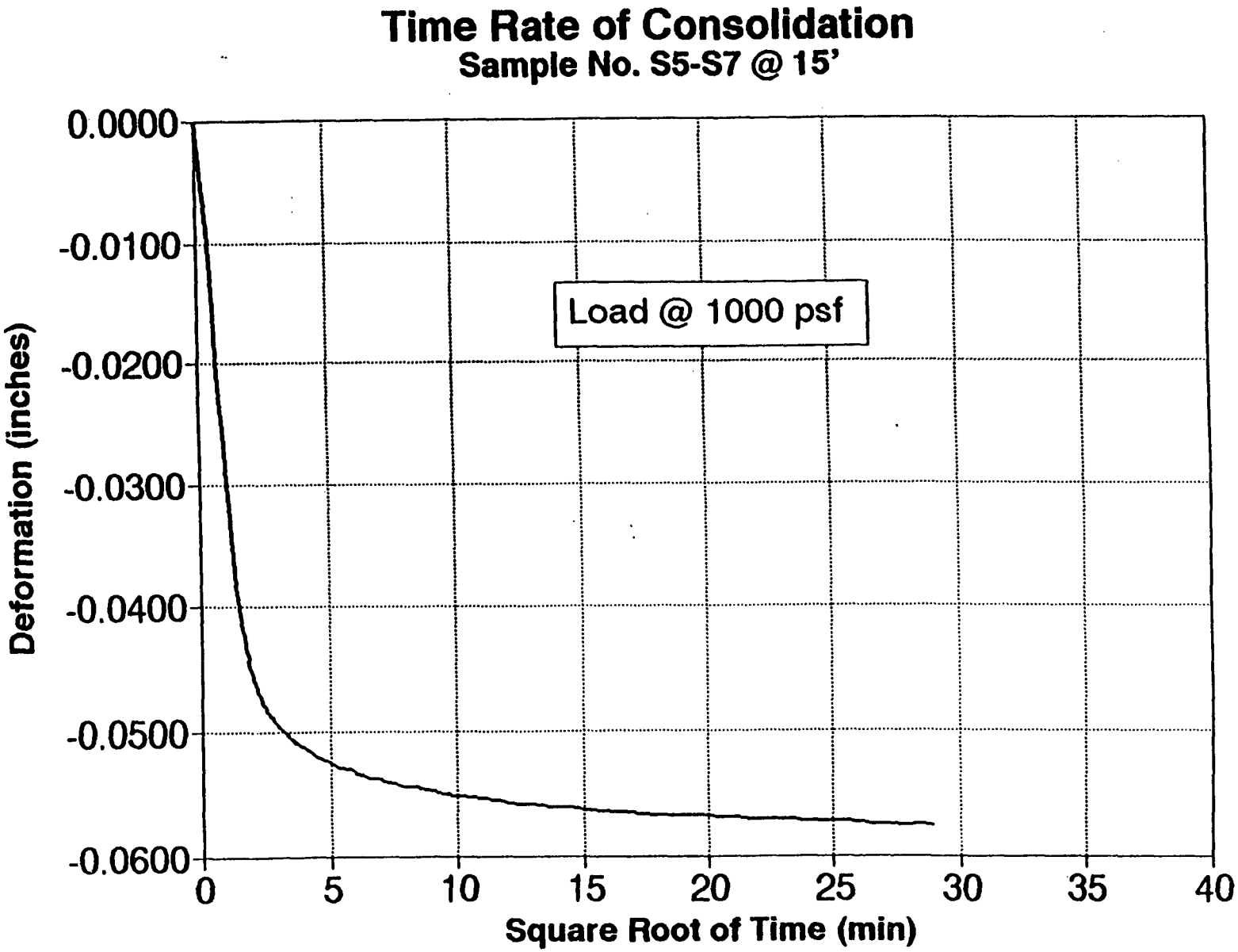

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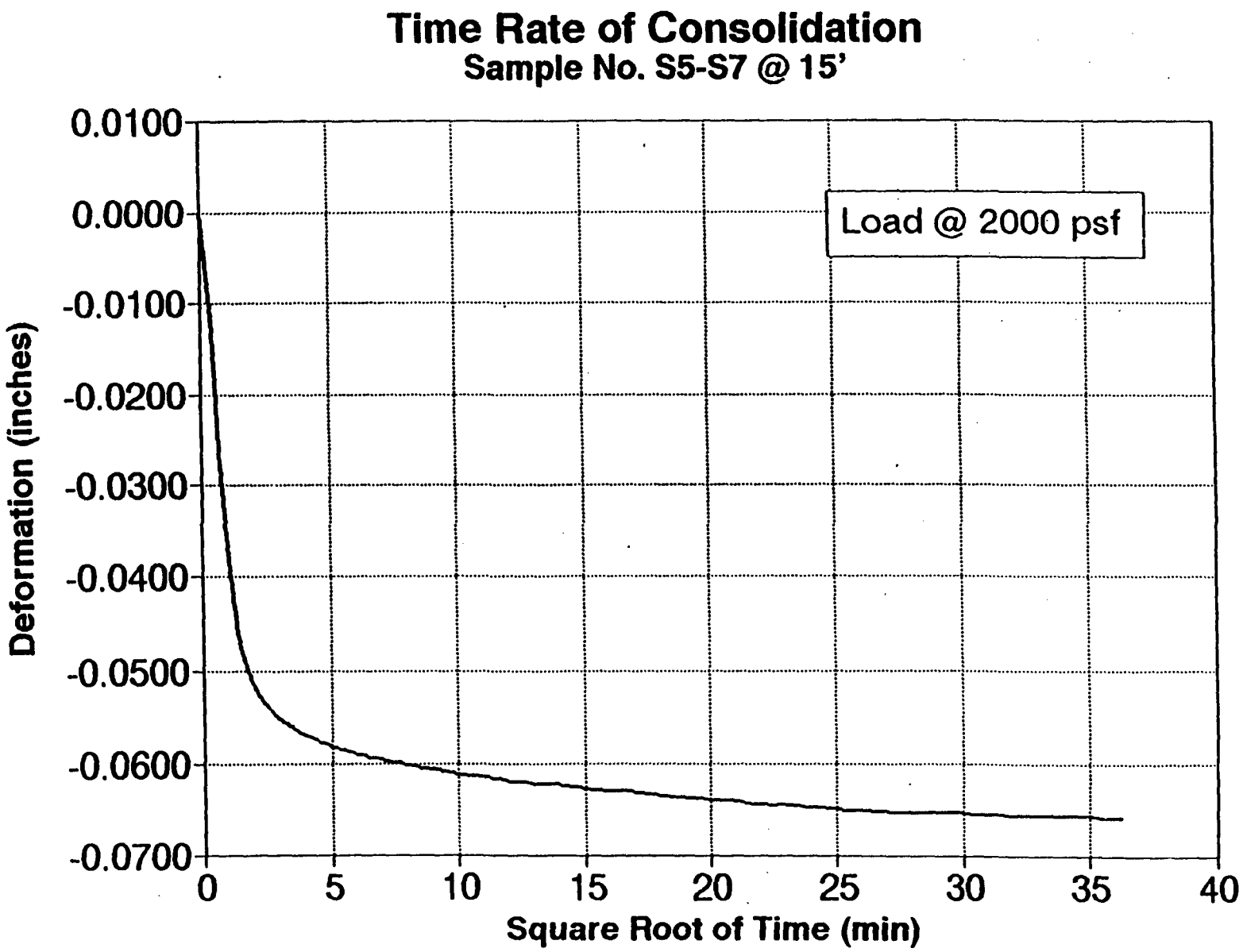

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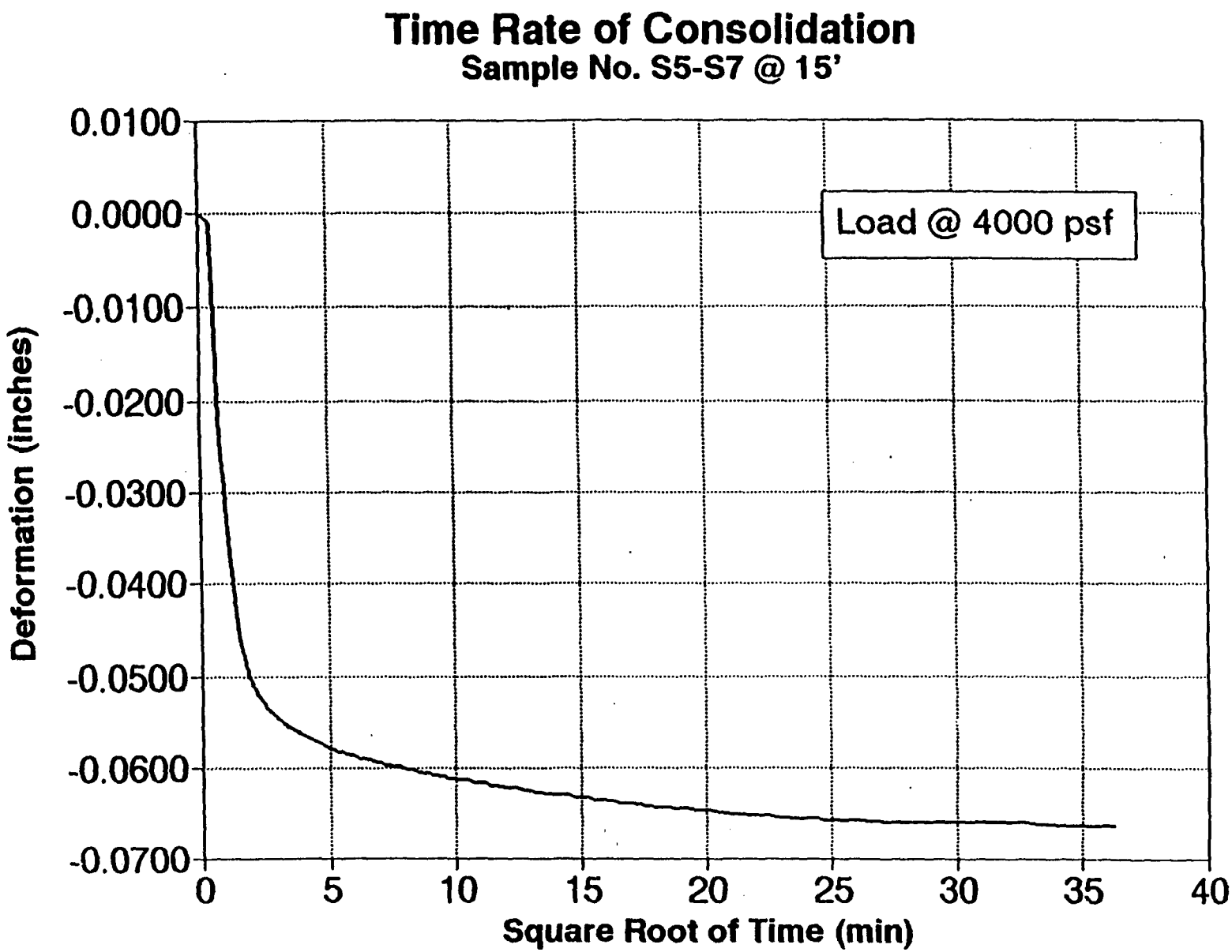

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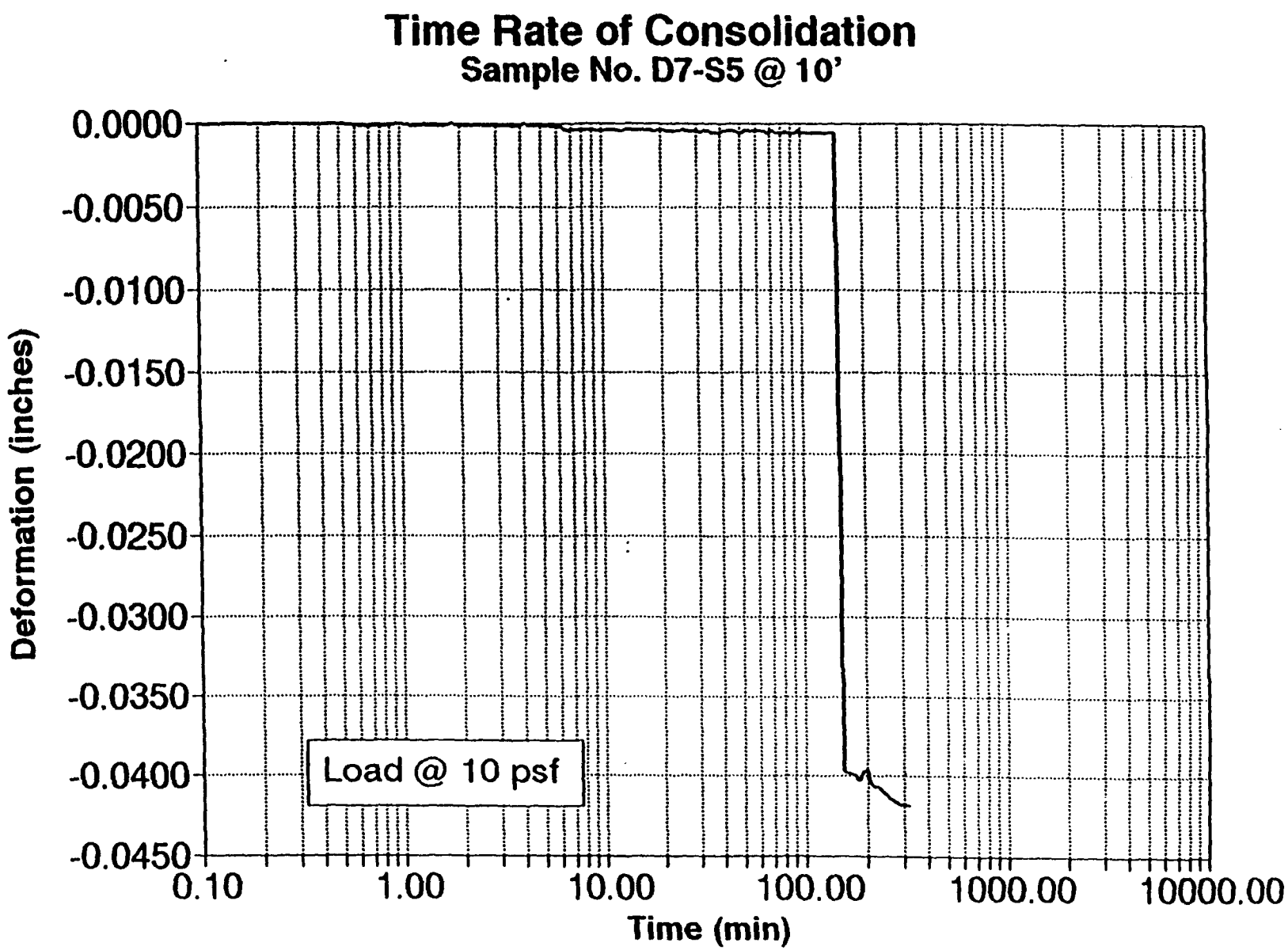

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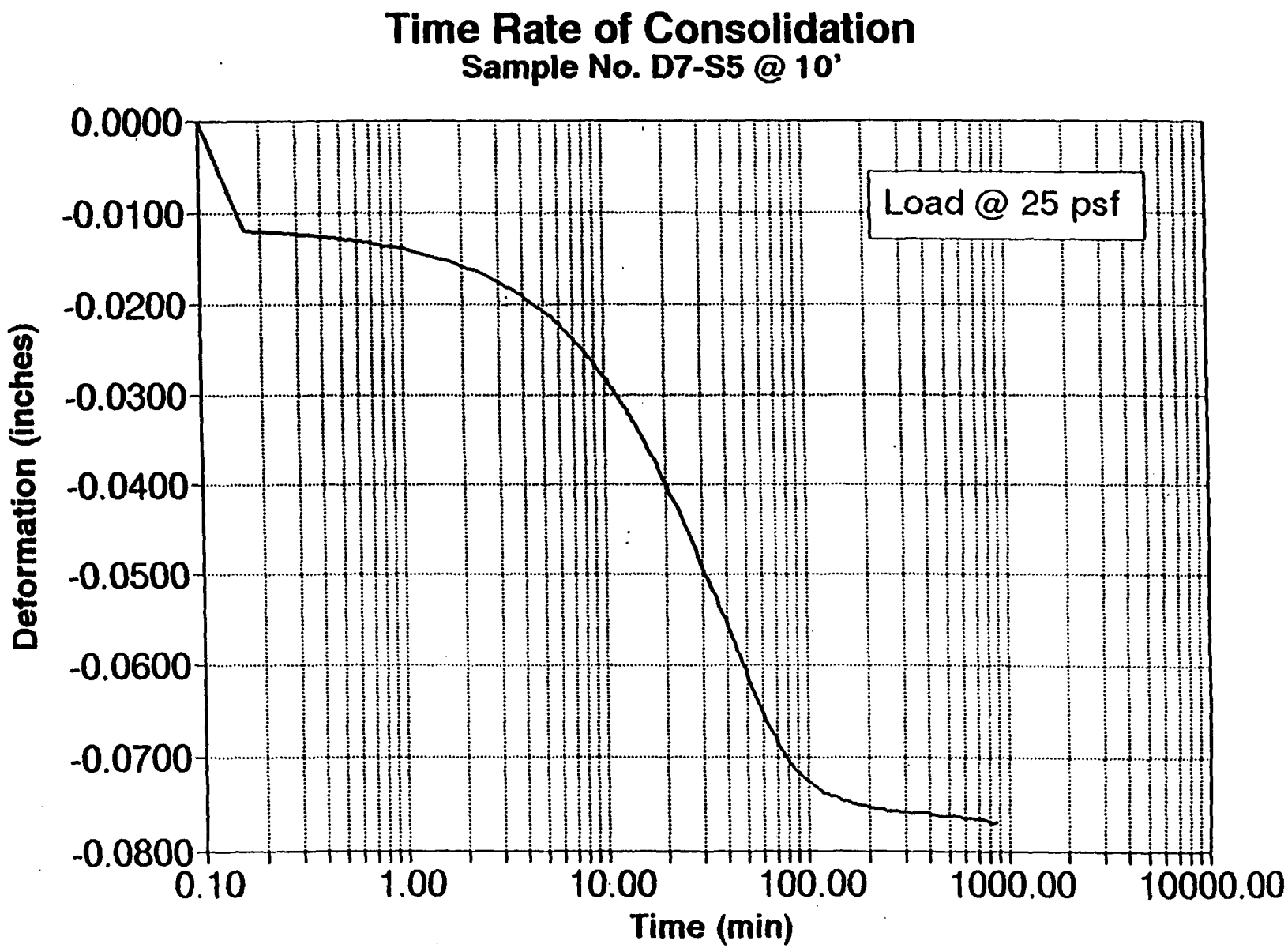

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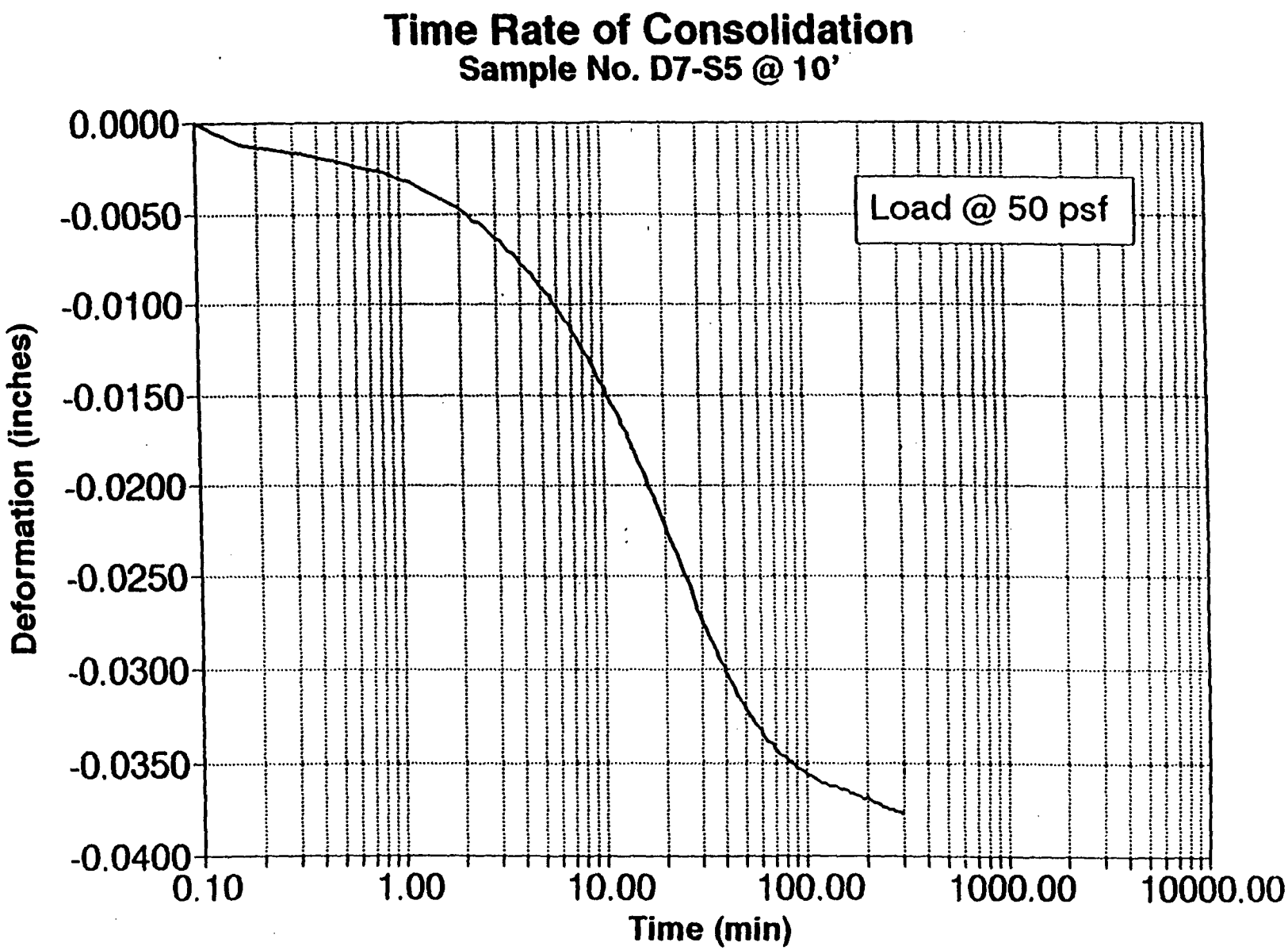

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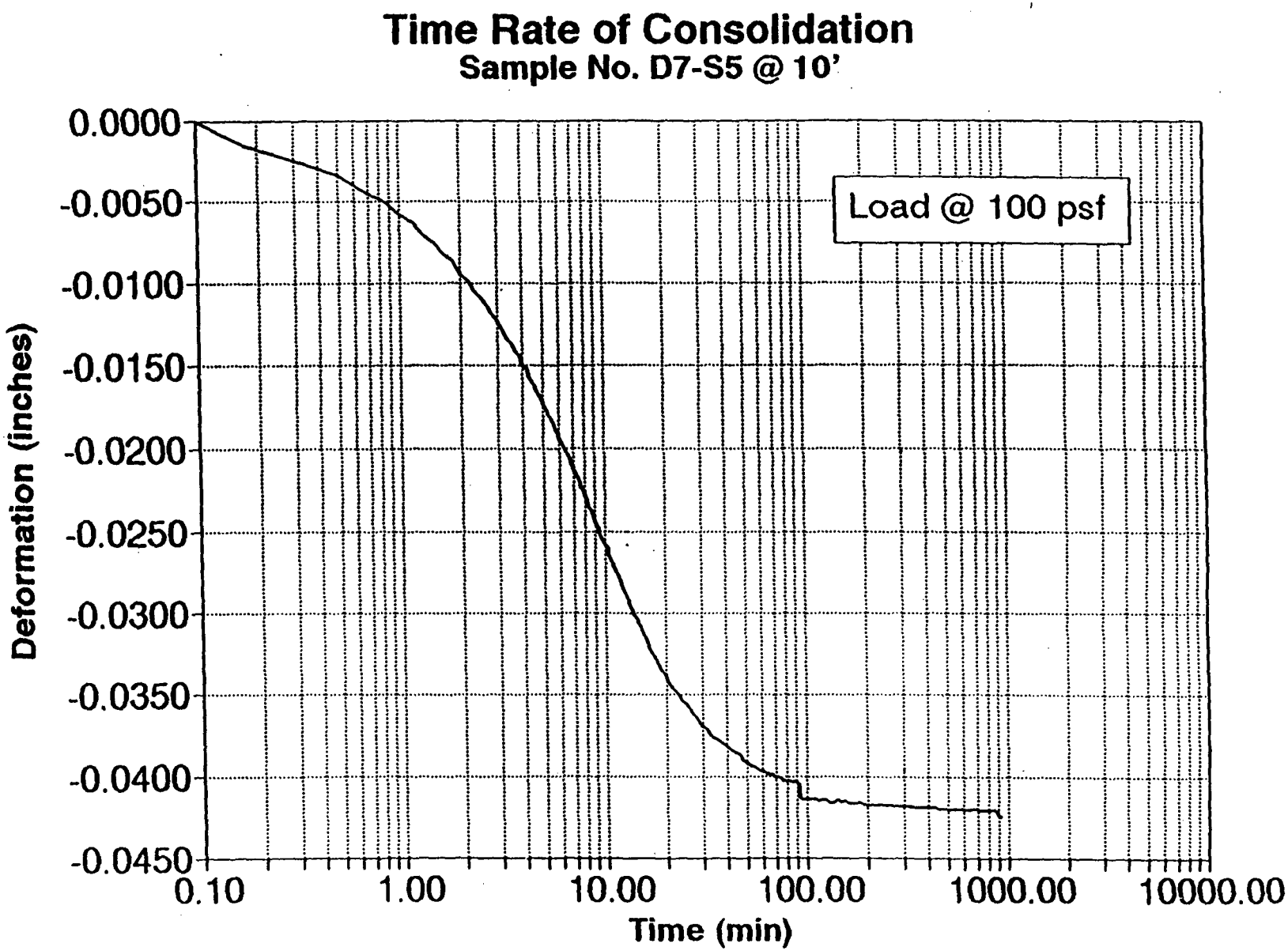

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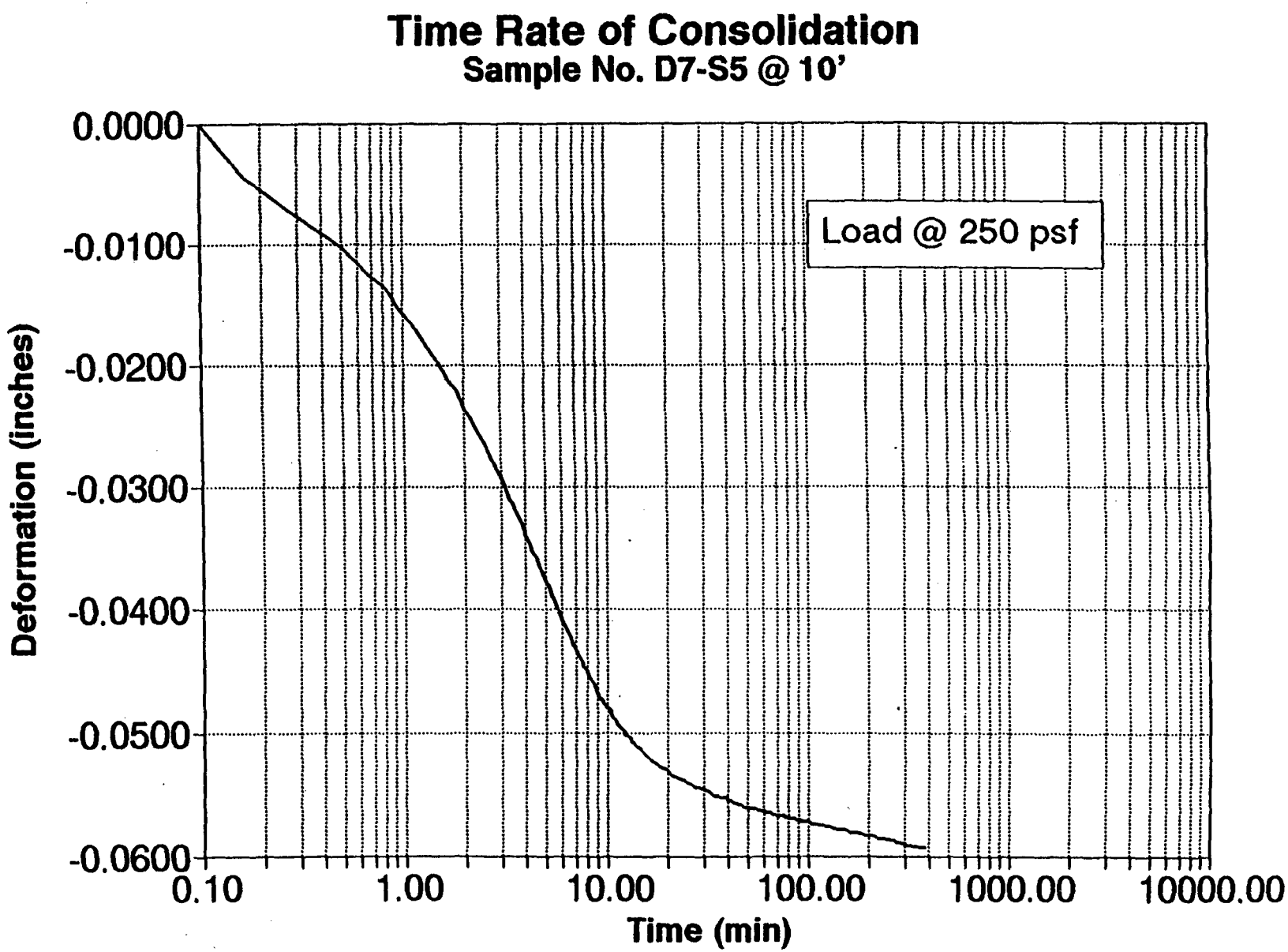

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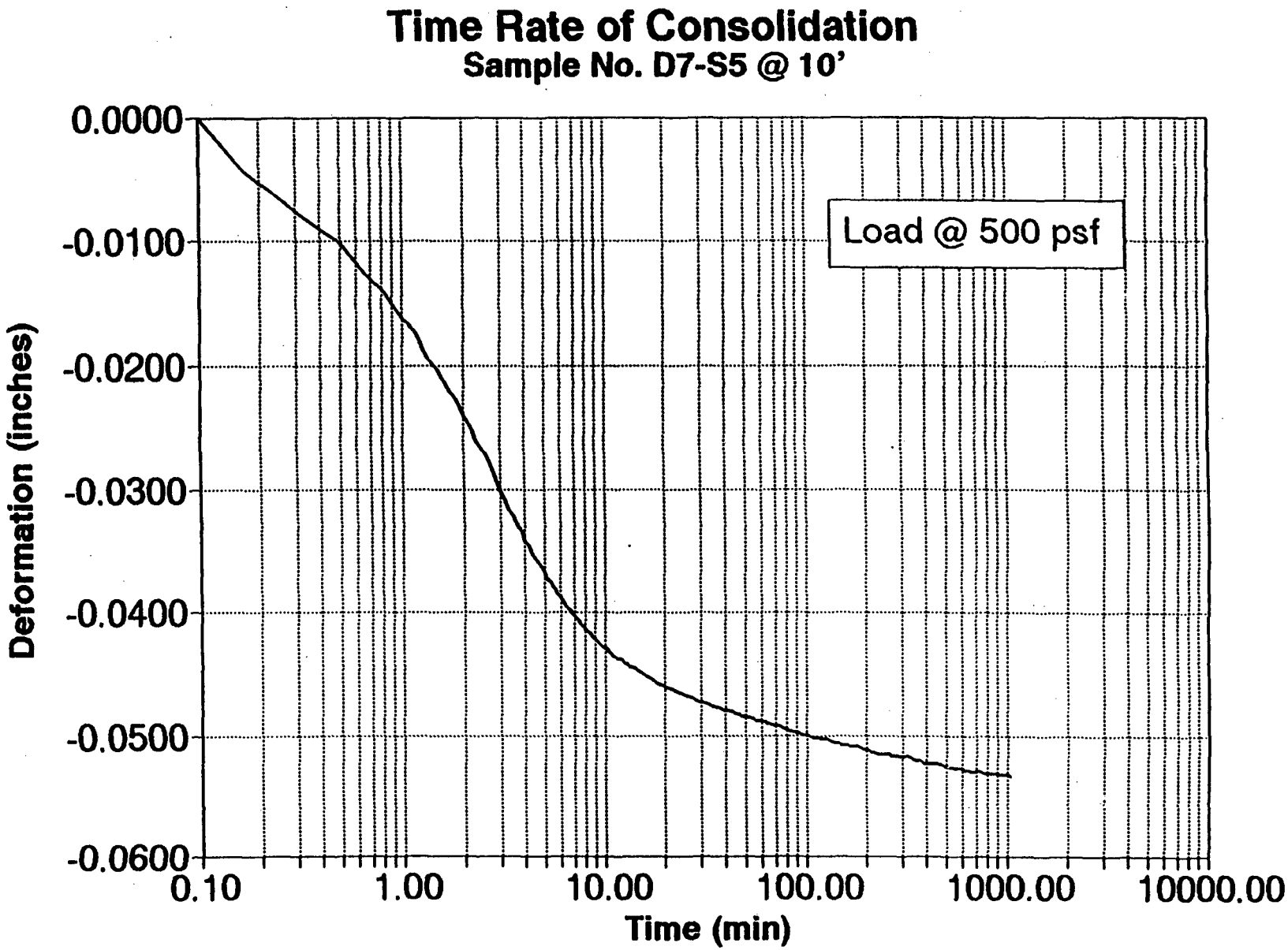
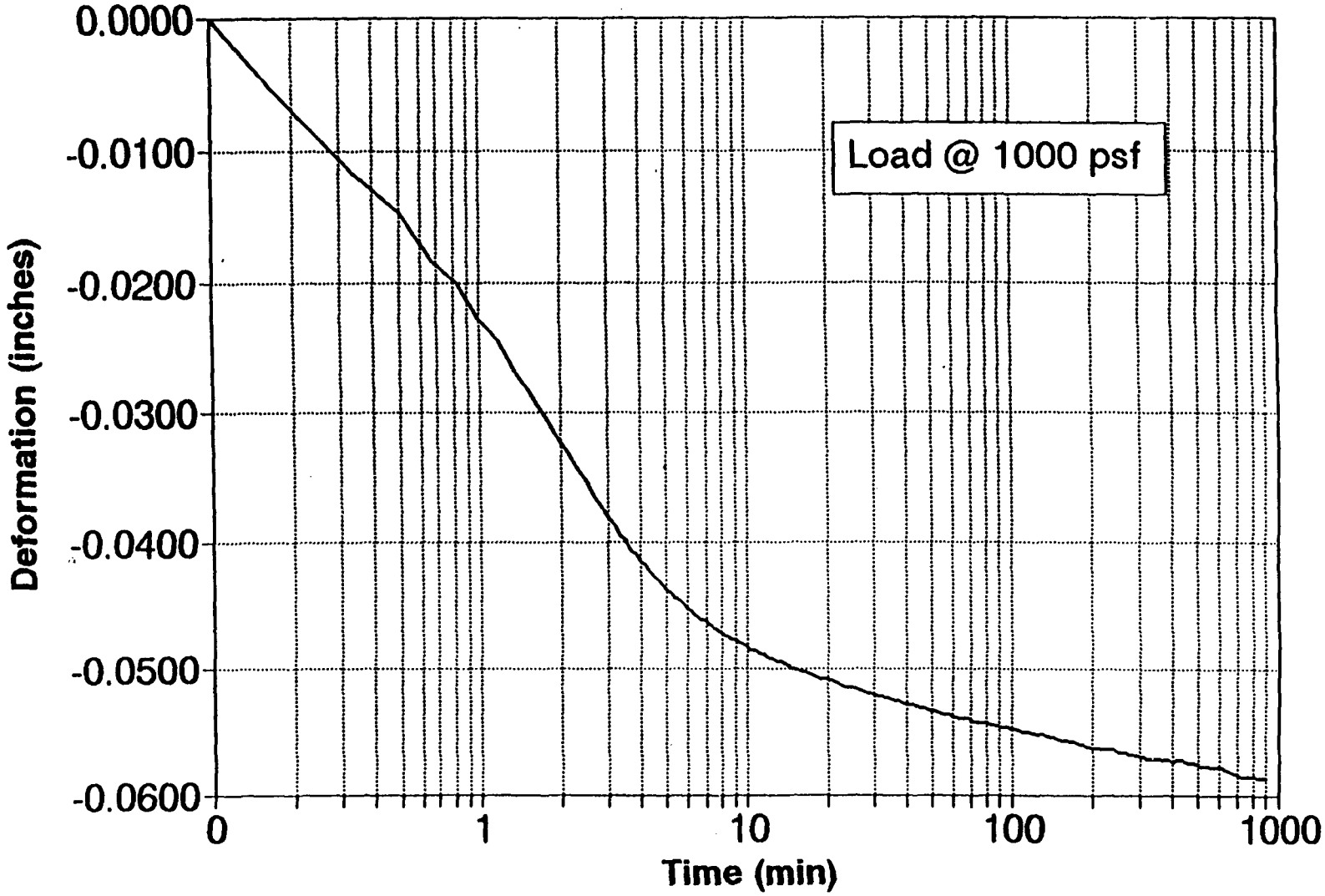


Project No. 41194

Figure 52

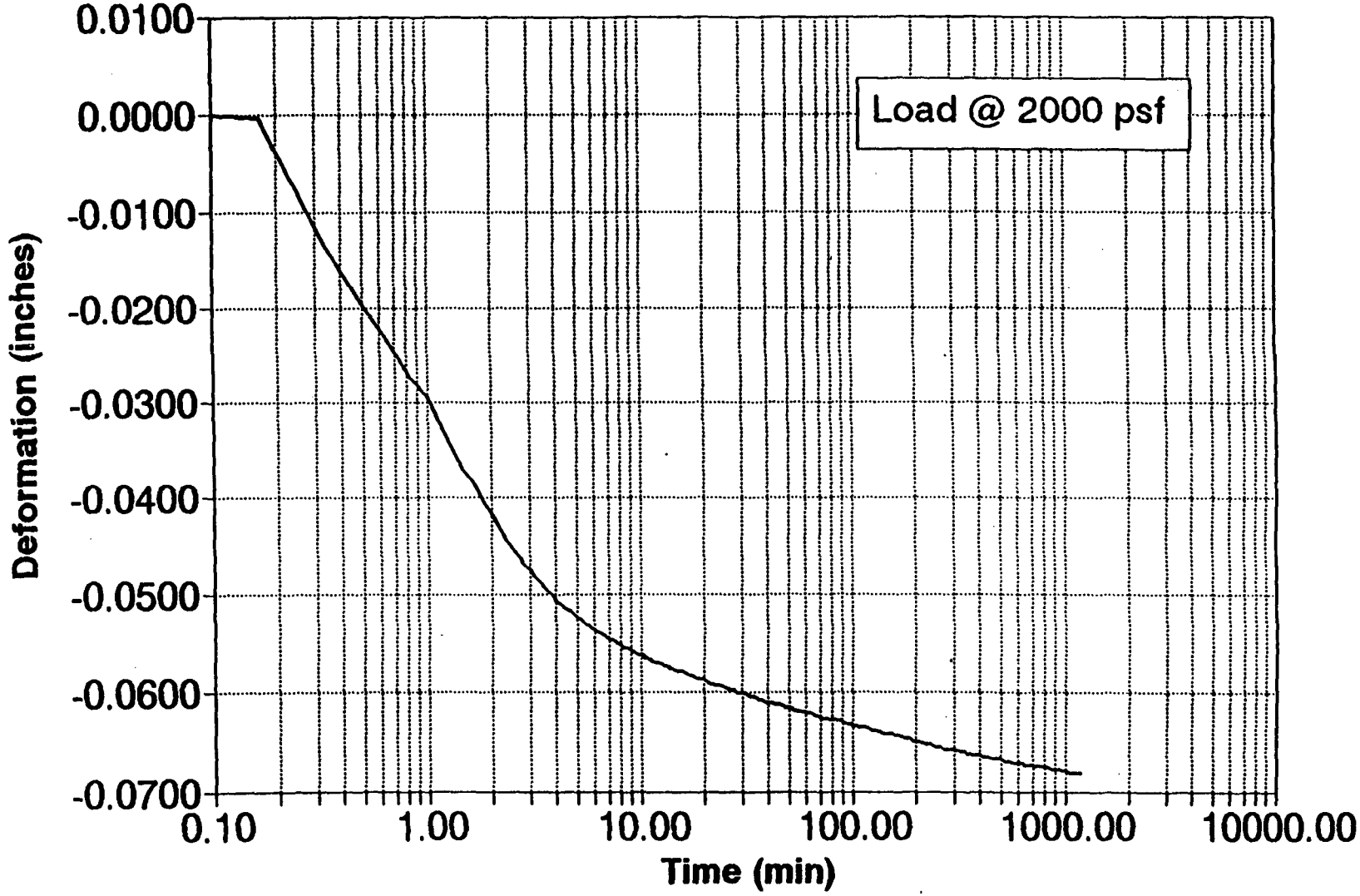
Time Rate of Consolidation
Sample No. D7-S5 @ 10'



Project No. 41194

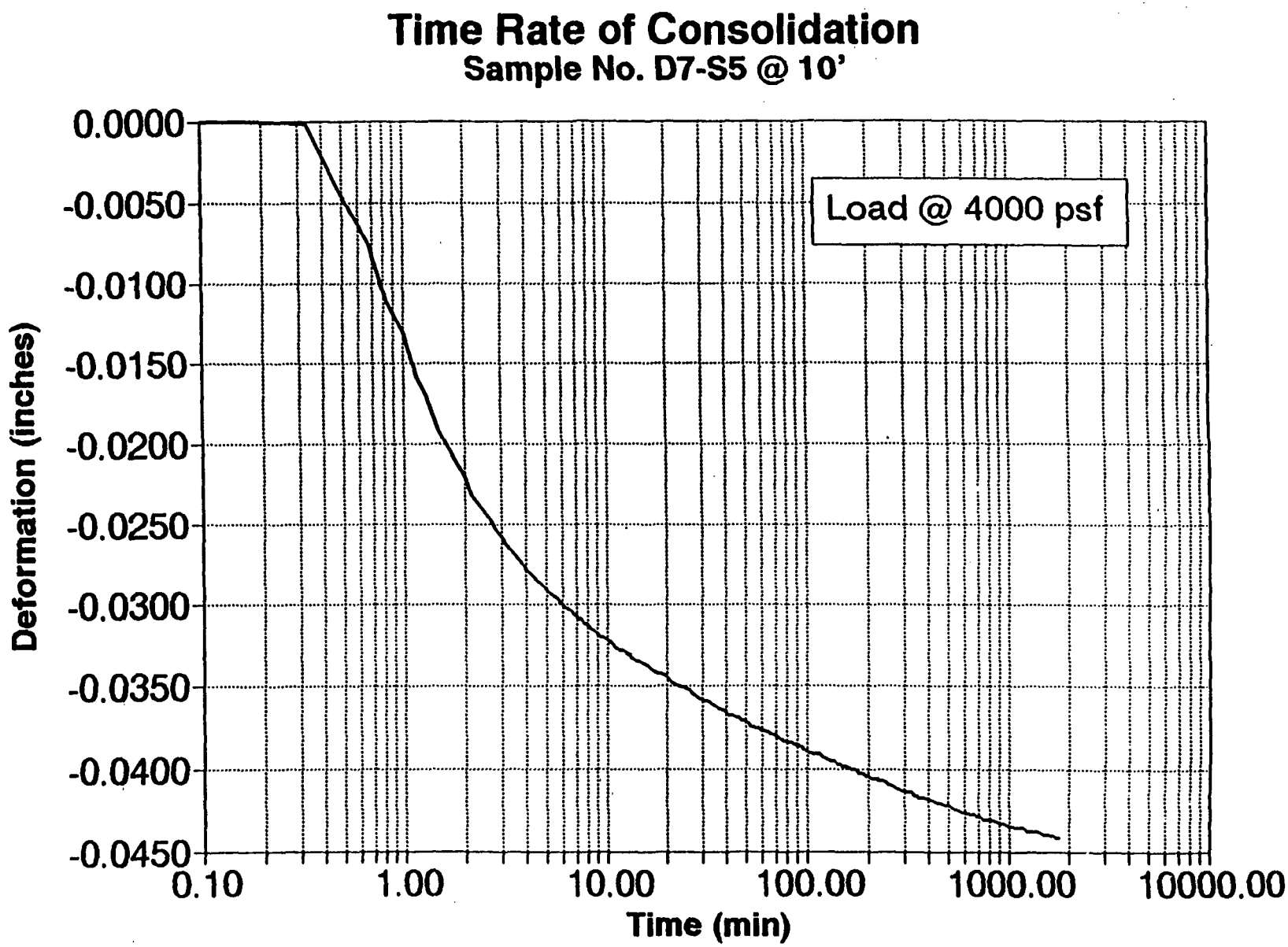
Figure 53

Time Rate of Consolidation
Sample No. D7-S5 @ 10'



Project No. 41194

Figure 54



Project No. 41194

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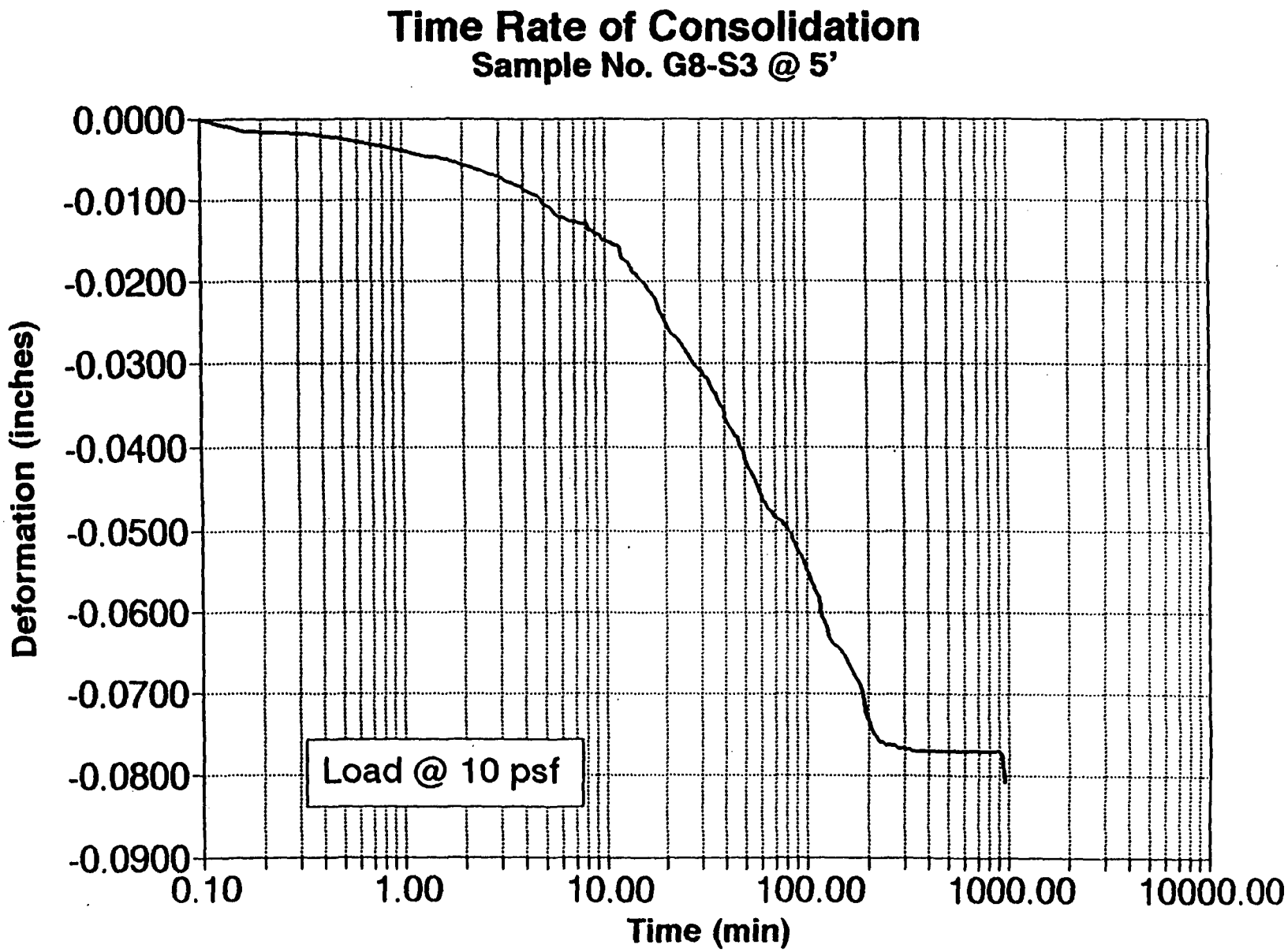
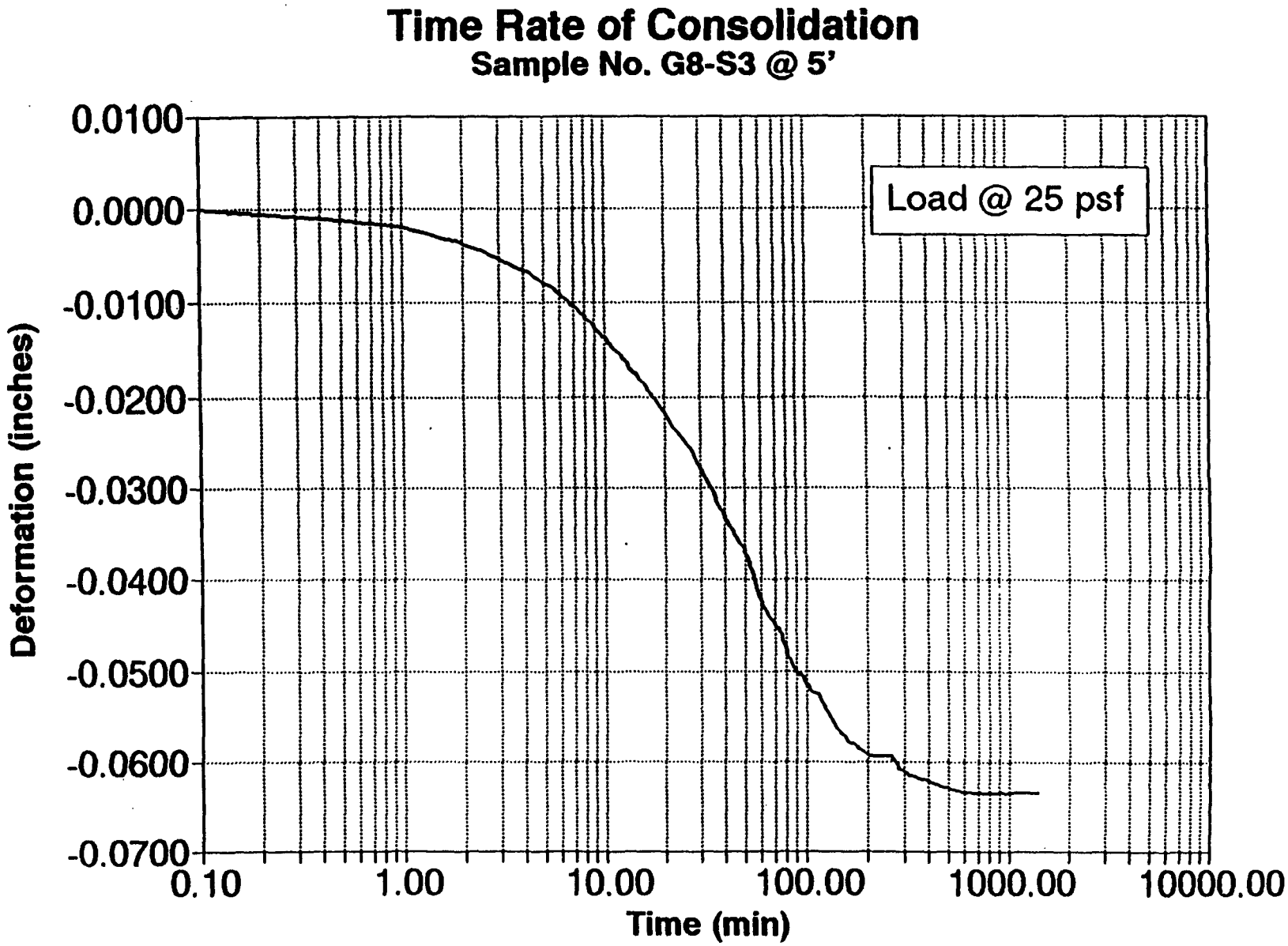


Project No. 41194

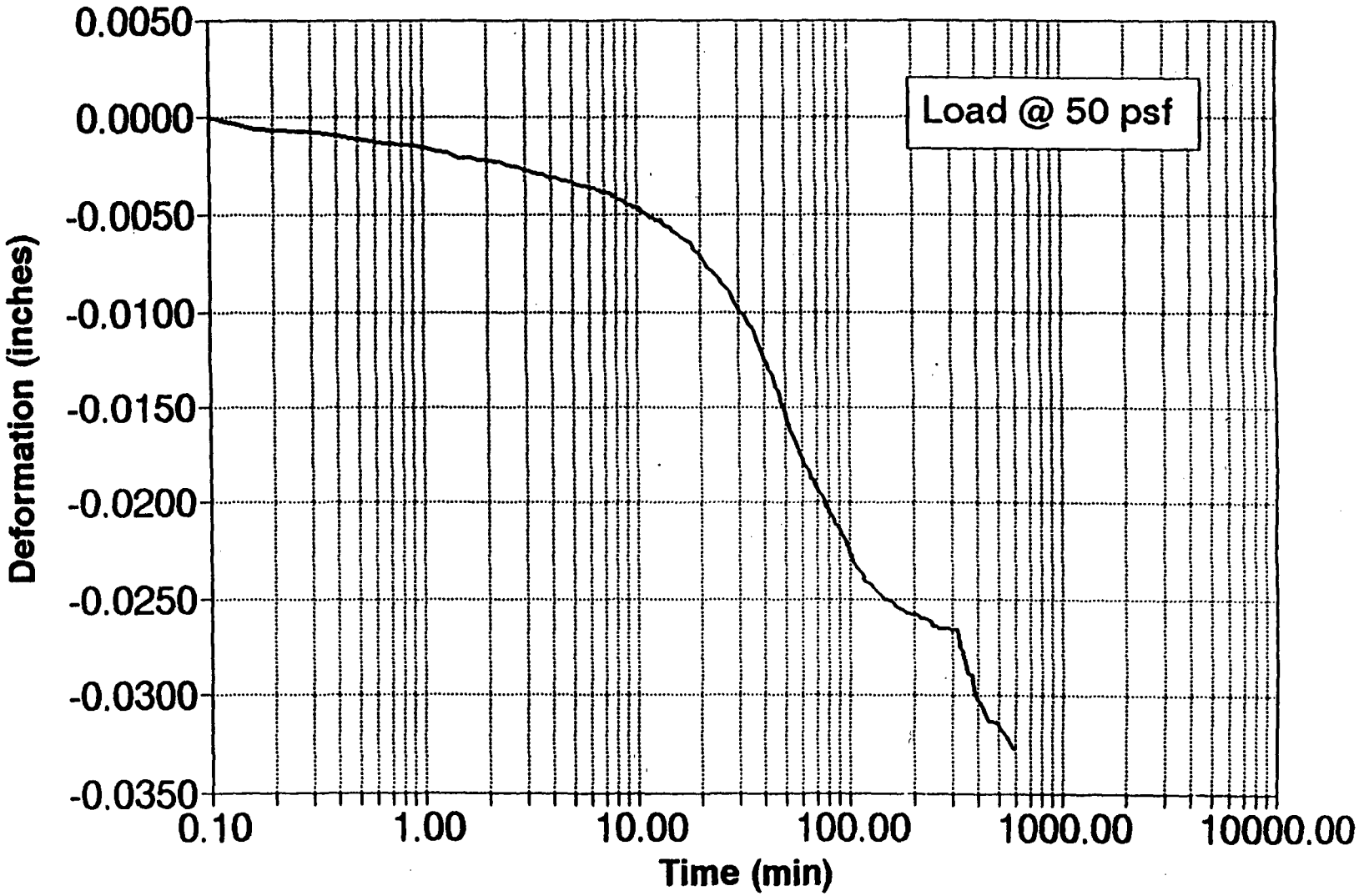
Figure 56



Project No. 41194

Figure 57

Time Rate of Consolidation
Sample No. G8-S3 @ 5'



Project No. 41194

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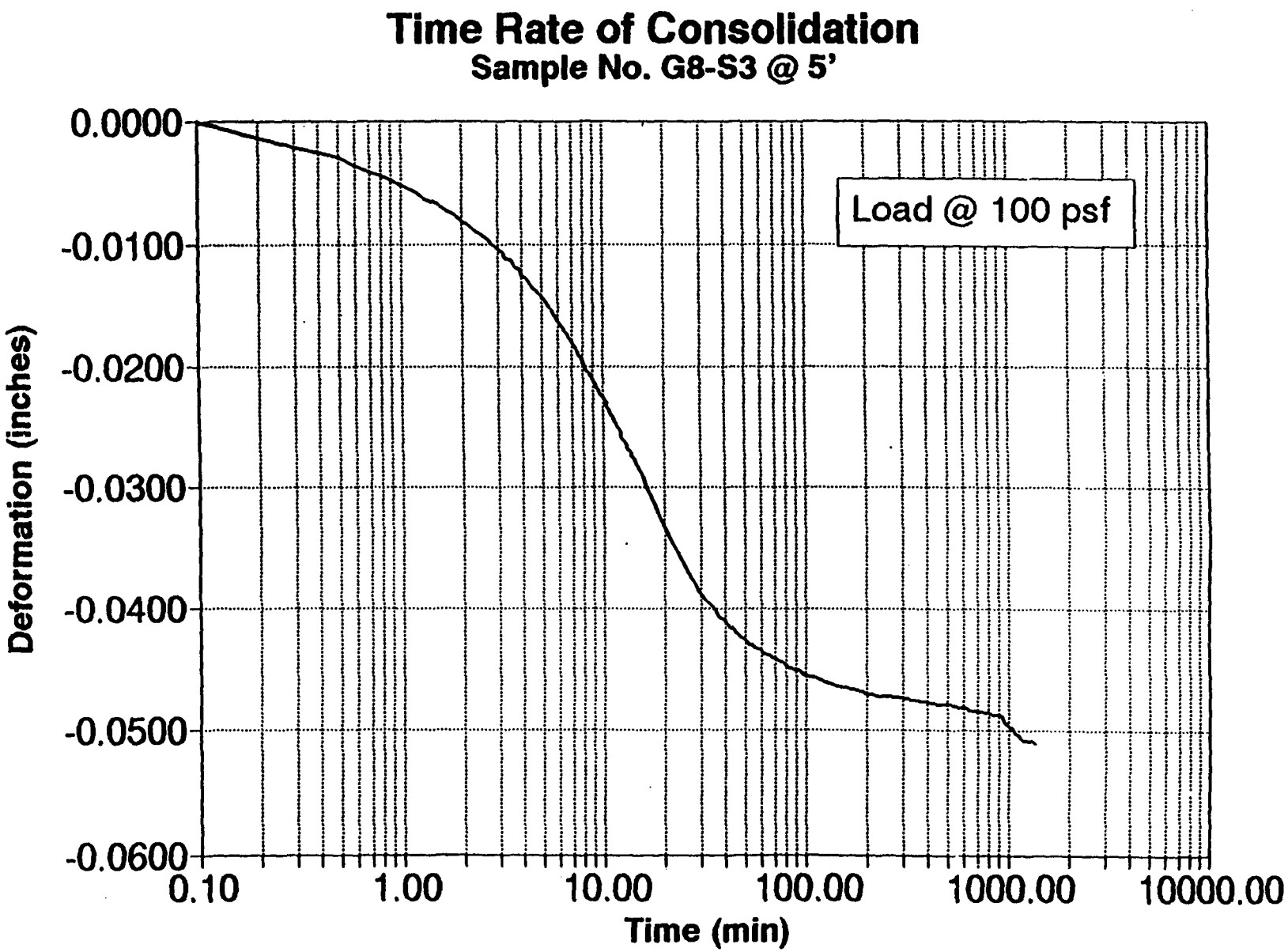
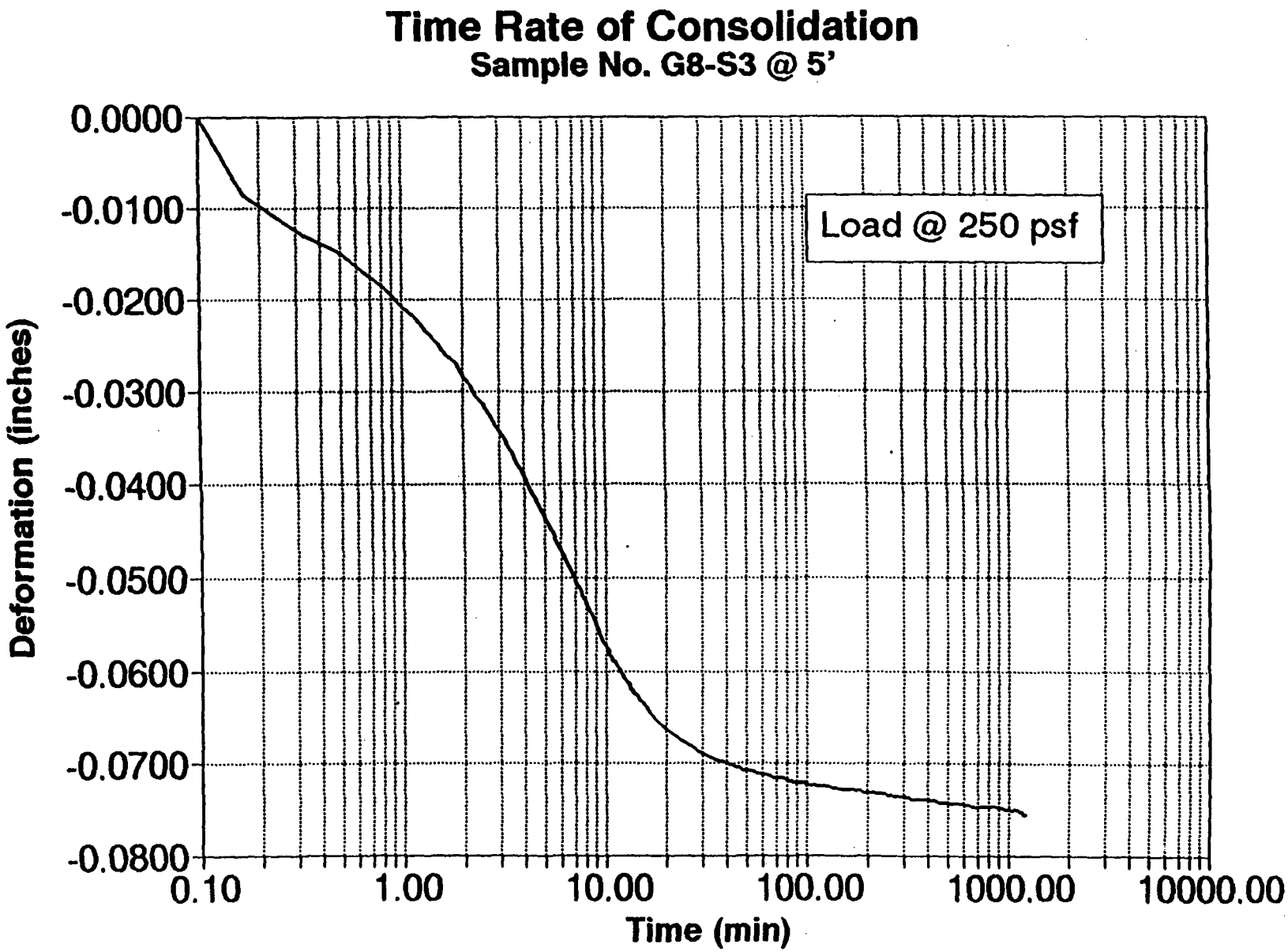


Project No. 41194

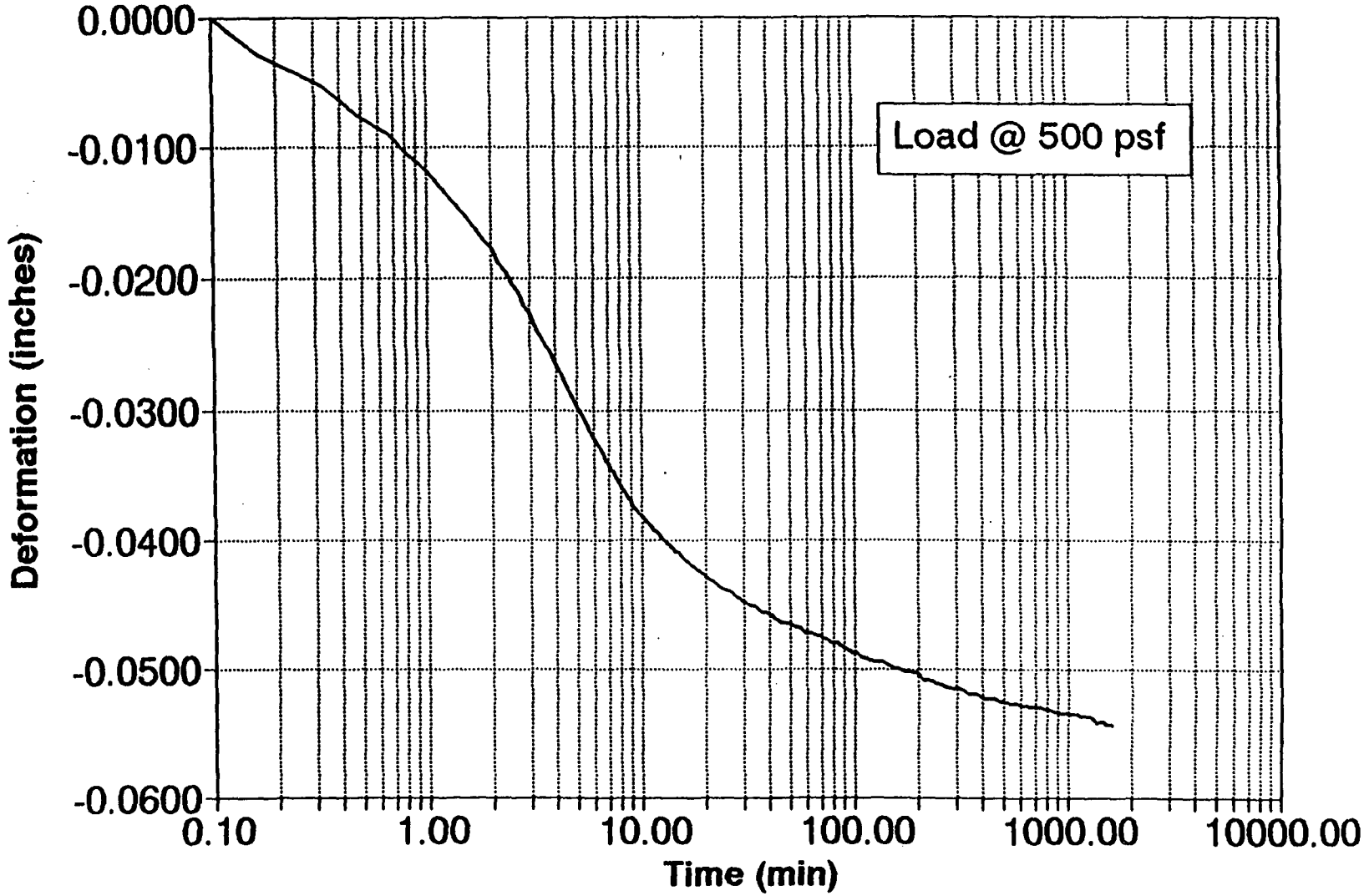
Figure 59



Project No. 41194

Figure 60

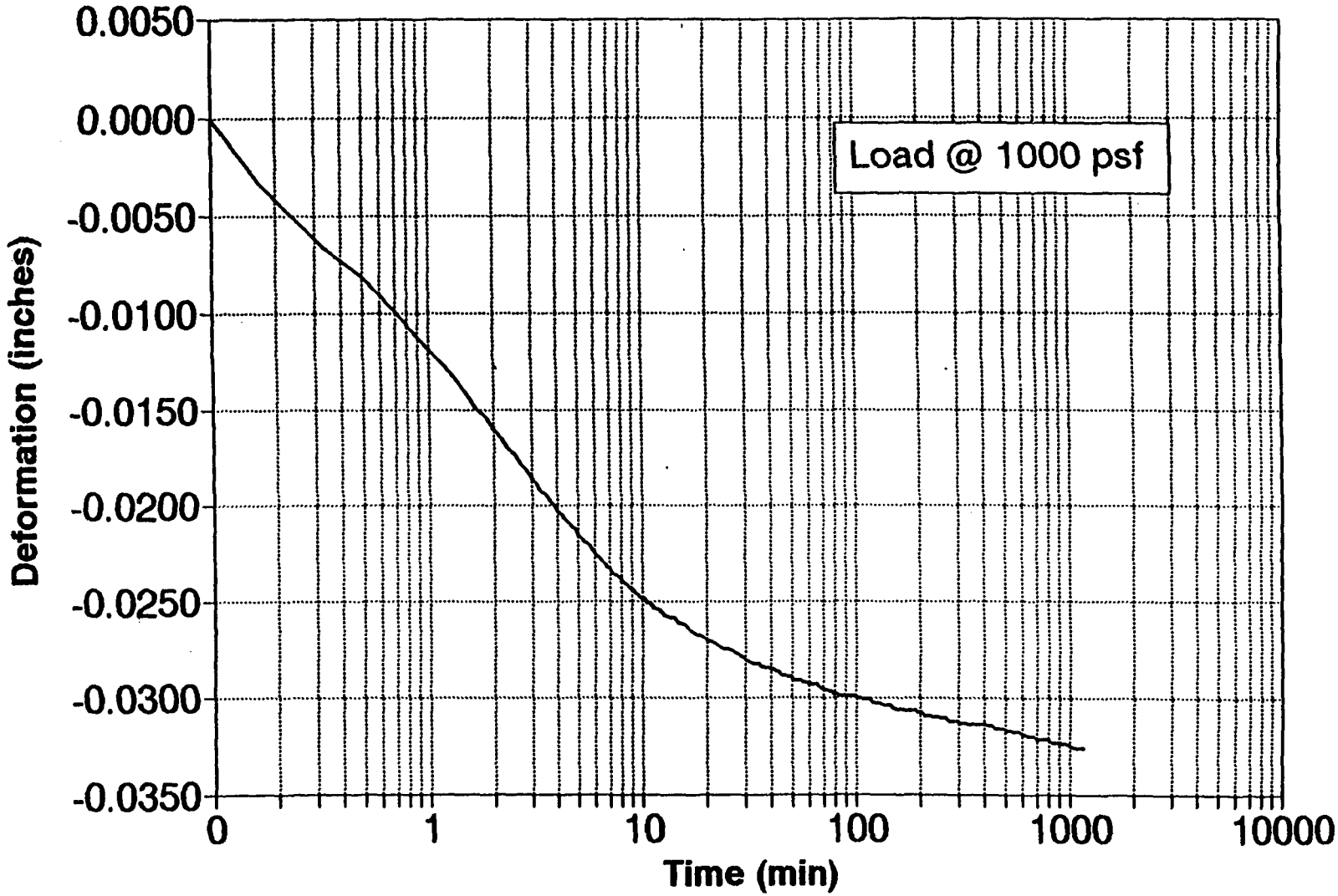
Time Rate of Consolidation
Sample No. G8-S3 @ 5'



Project No. 41194

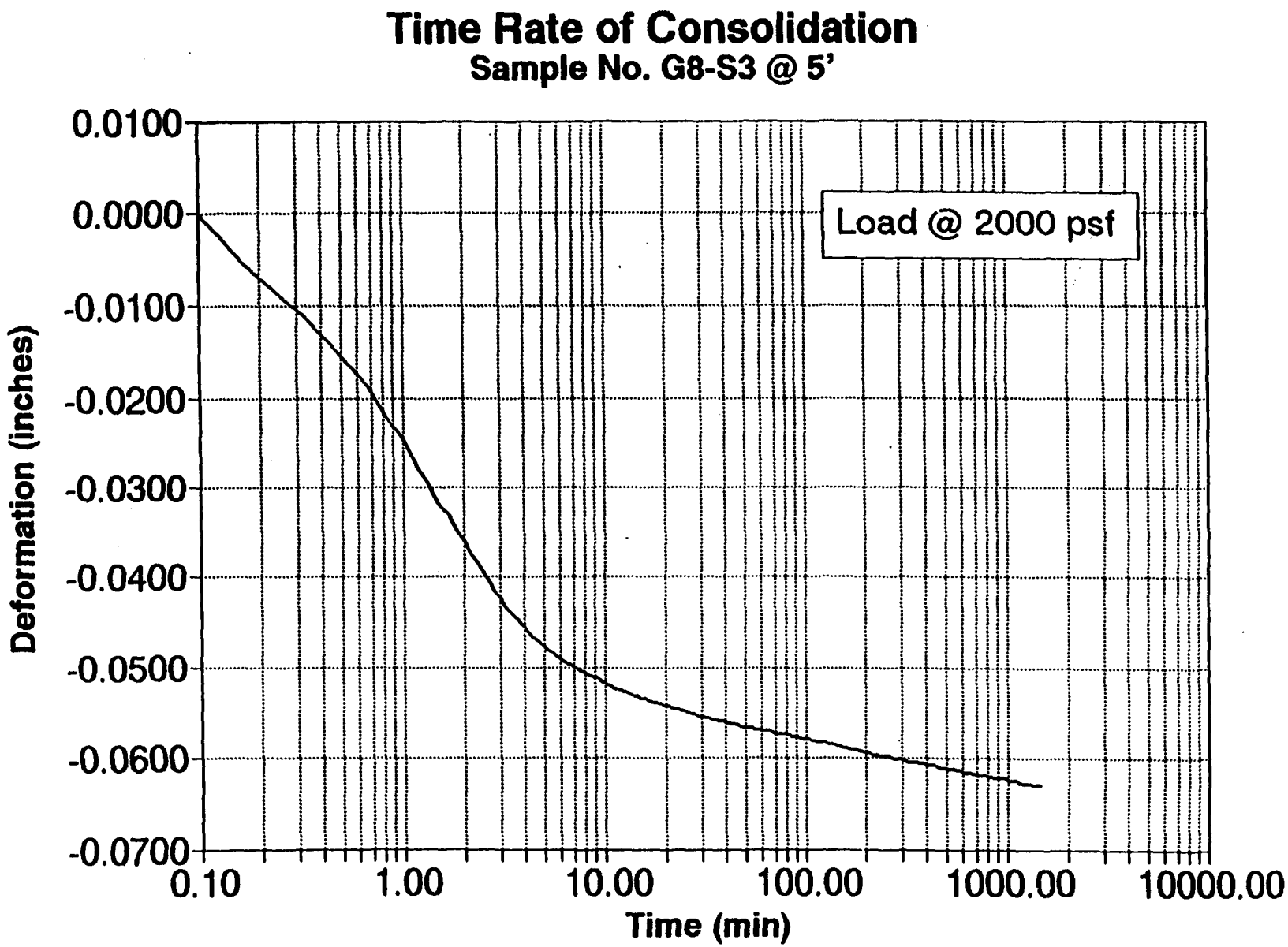
Figure 61

Time Rate of Consolidation
Sample No. G8-S3 @ 5'



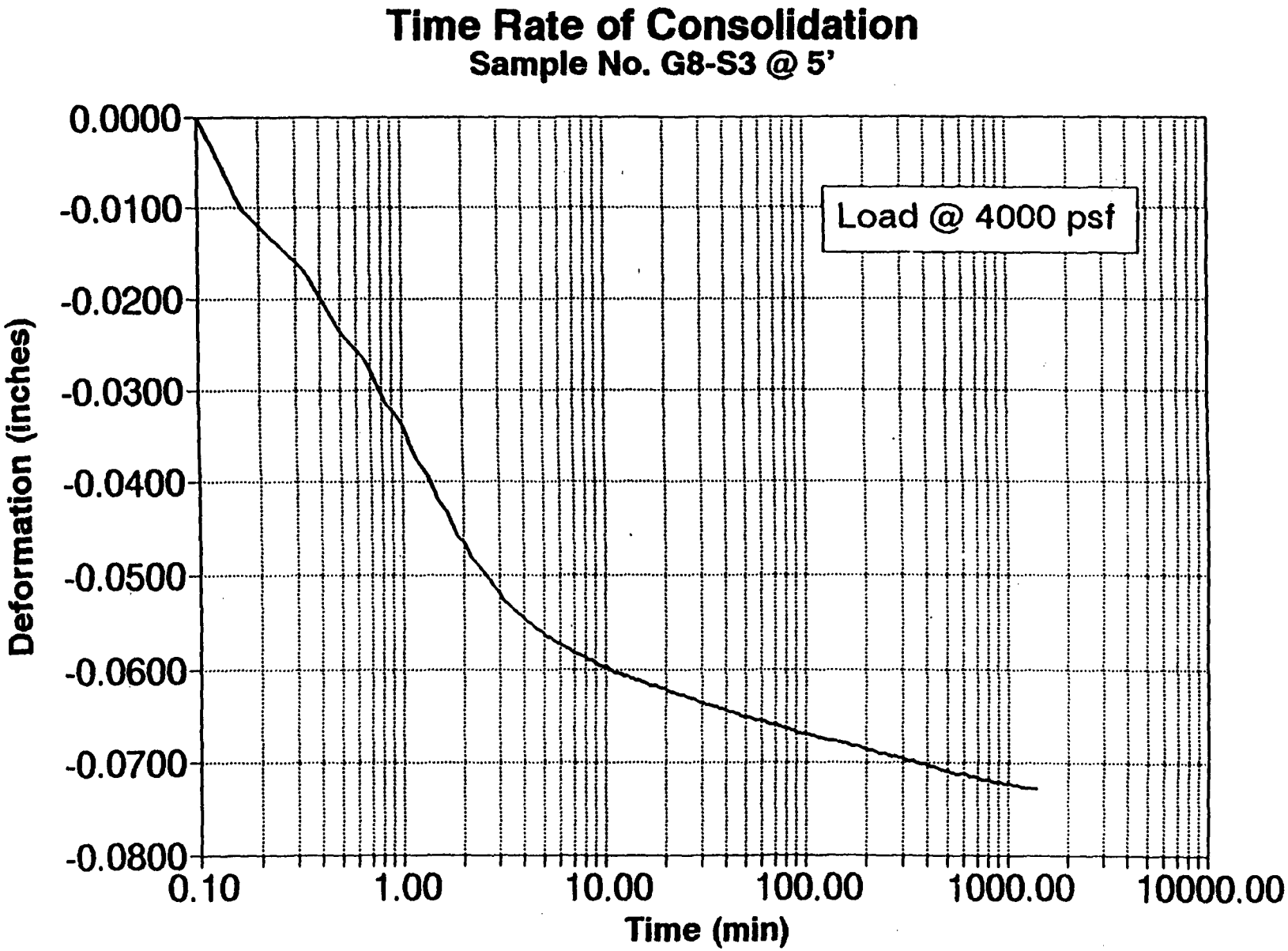
Project No. 41194

Figure 62



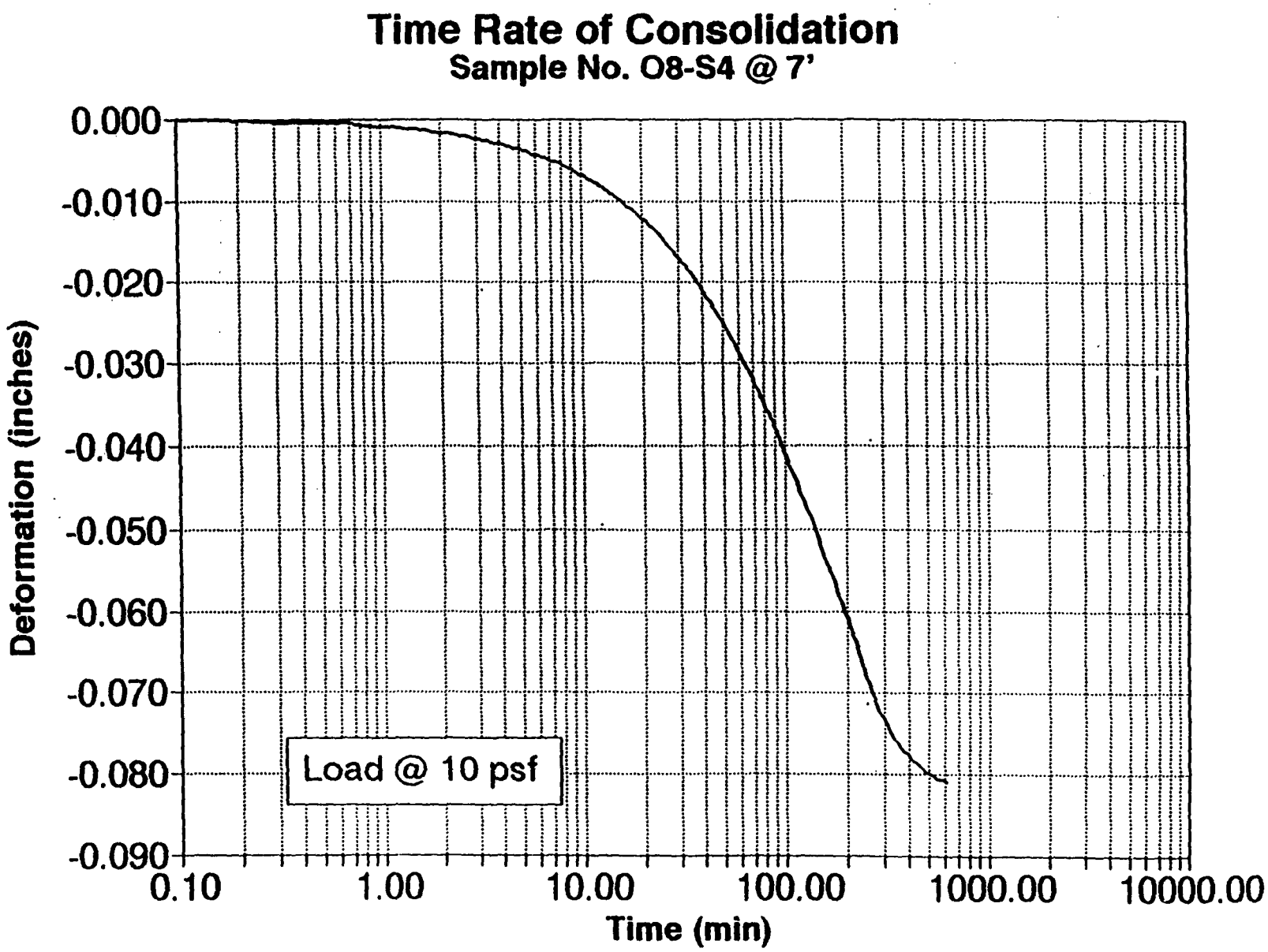
Project No. 41194

Figure 63



Project No. 41194

Figure 64



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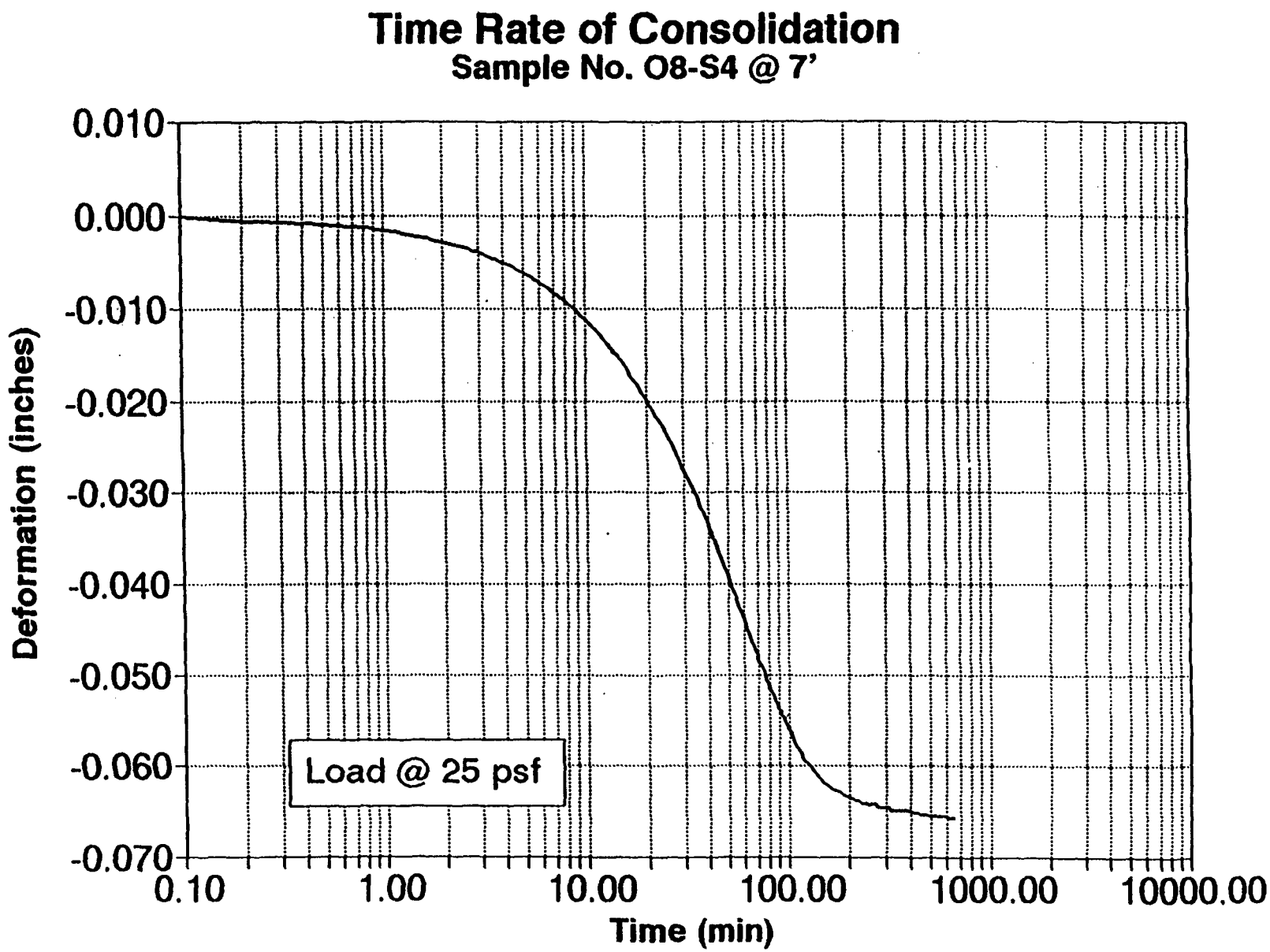

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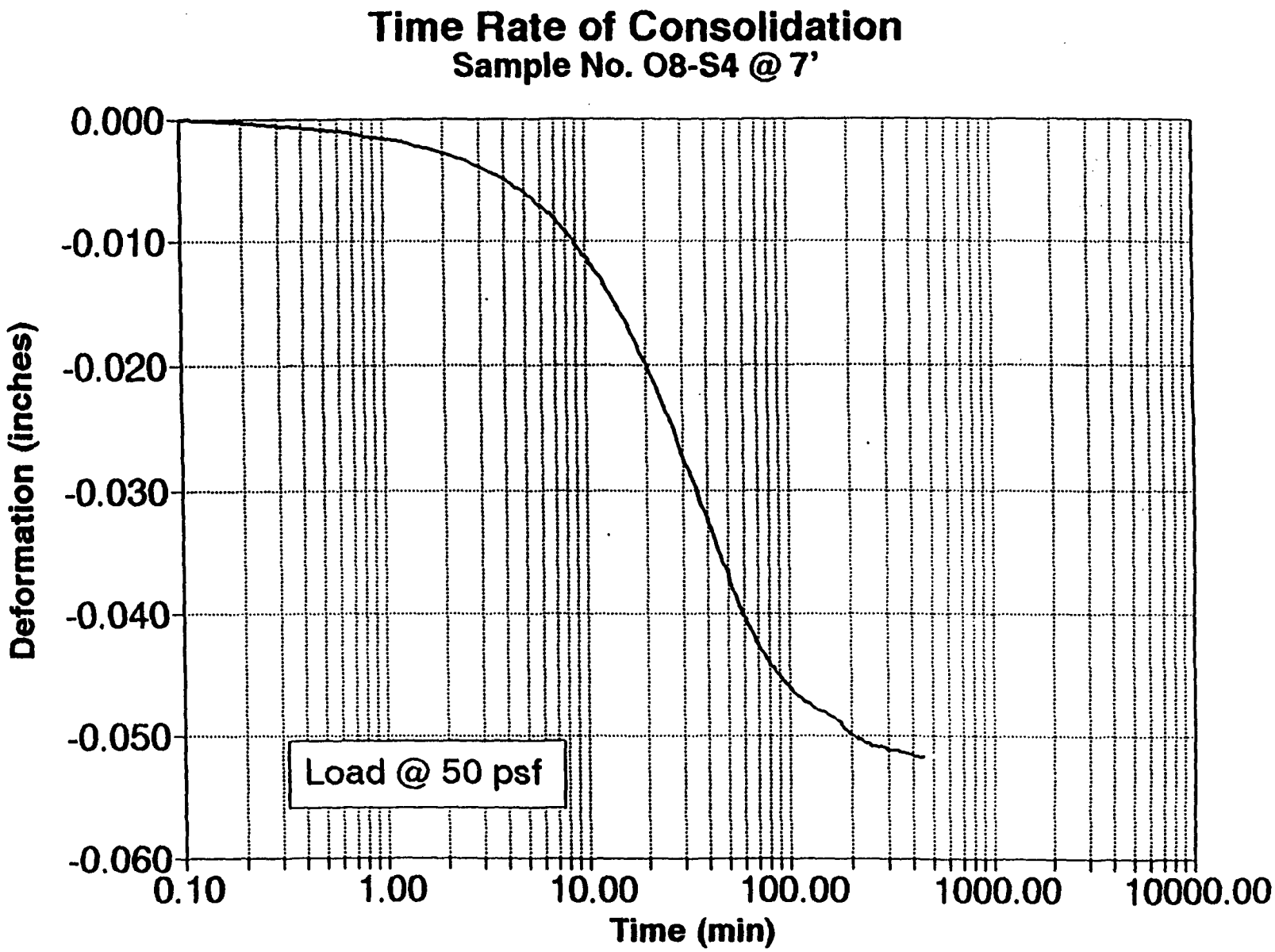
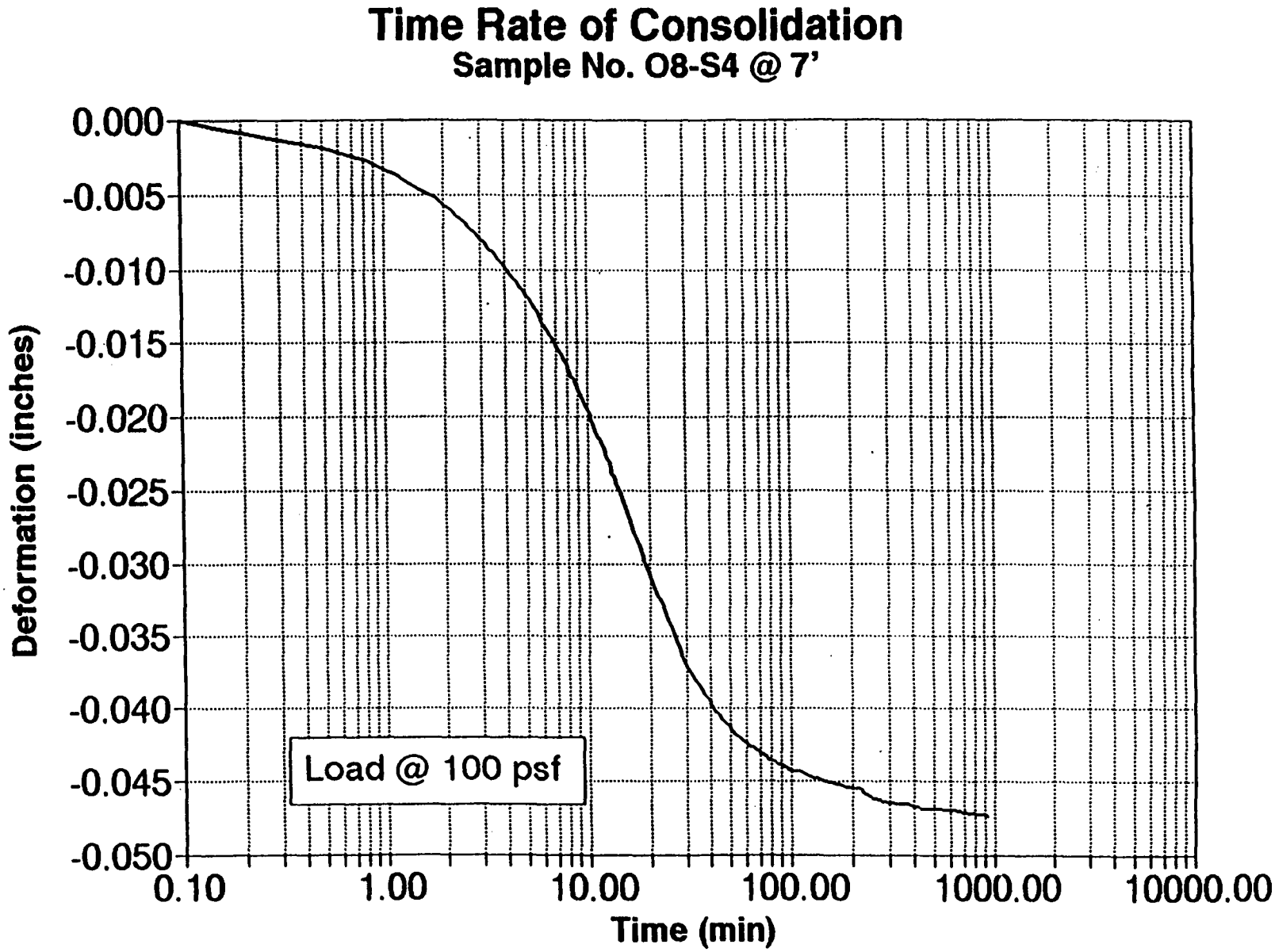
Figure 66



Project No. 41194

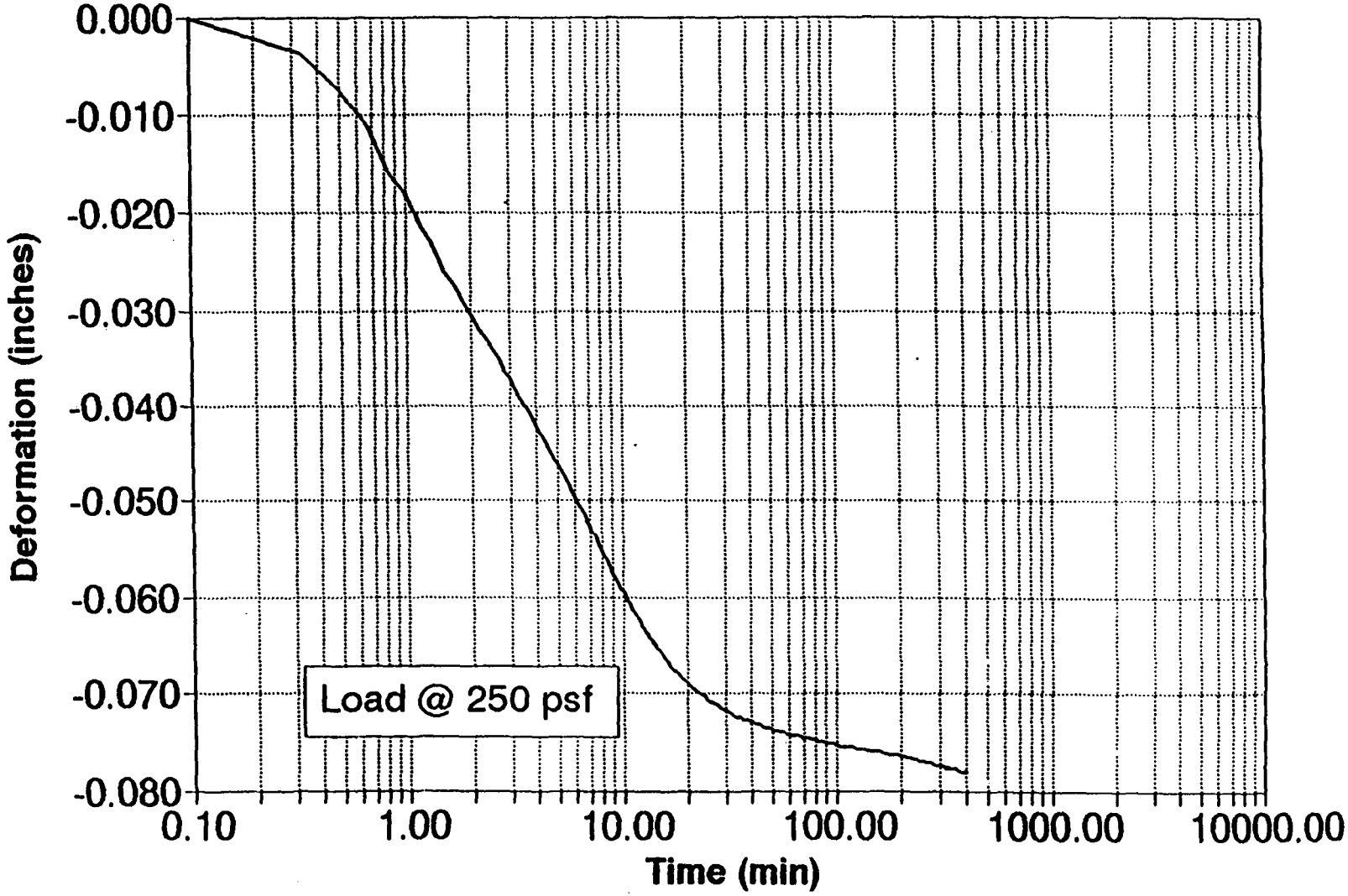
Figure 67



Project No. 41194

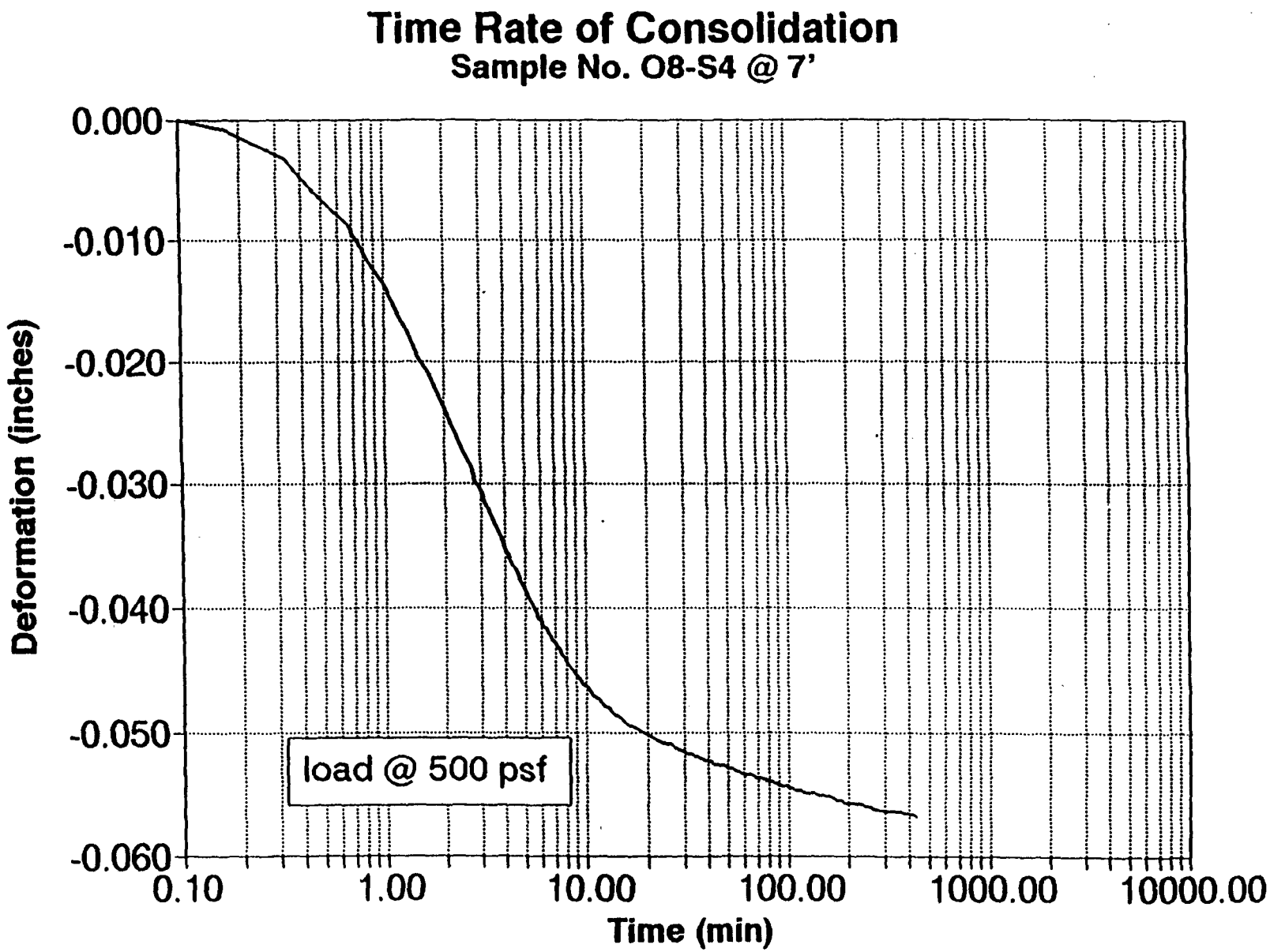
Figure 68

Time Rate of Consolidation
Sample No. O8-S4 @ 7'



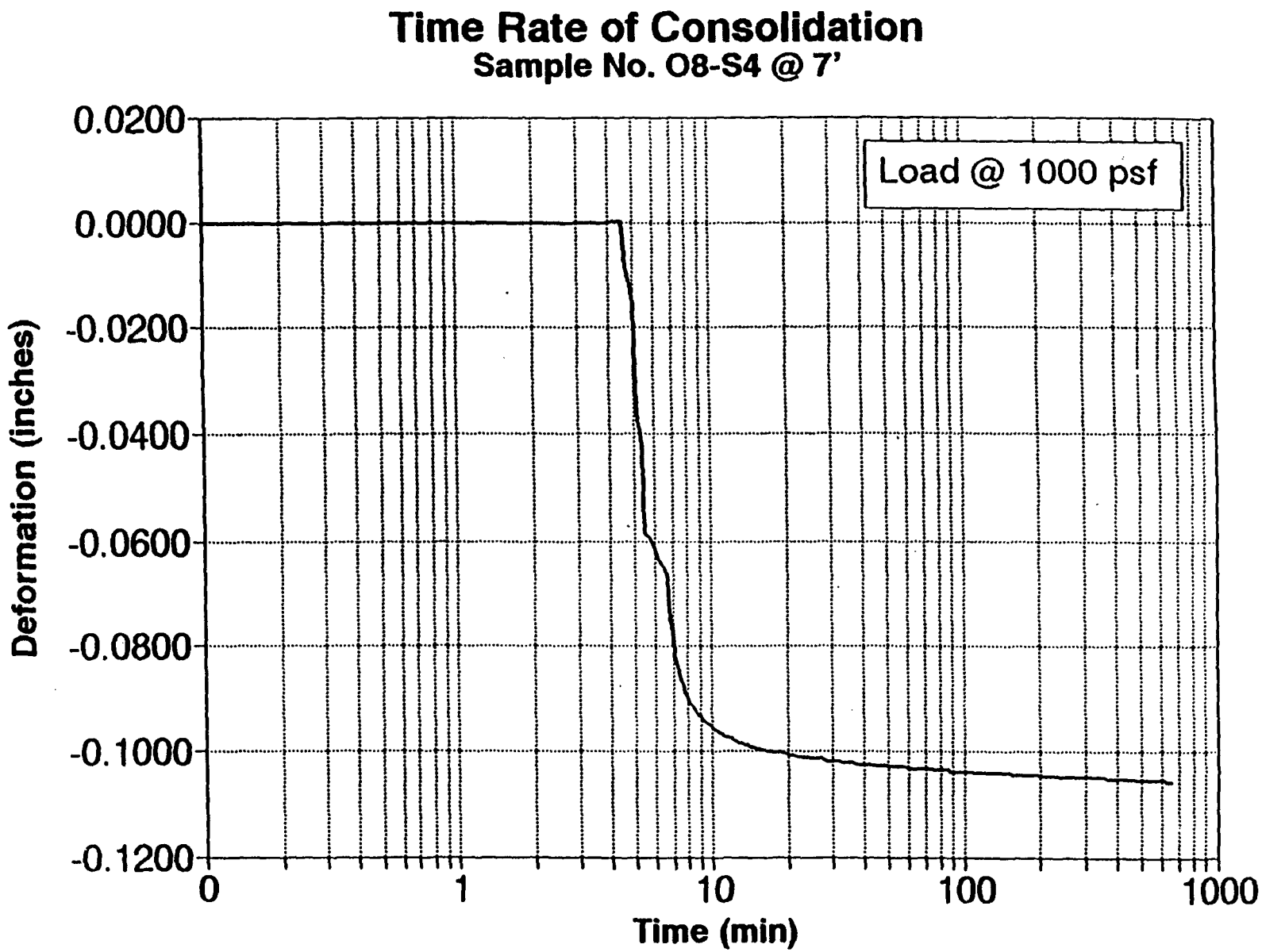
Project No. 41194

Figure 69



Project No. 41194

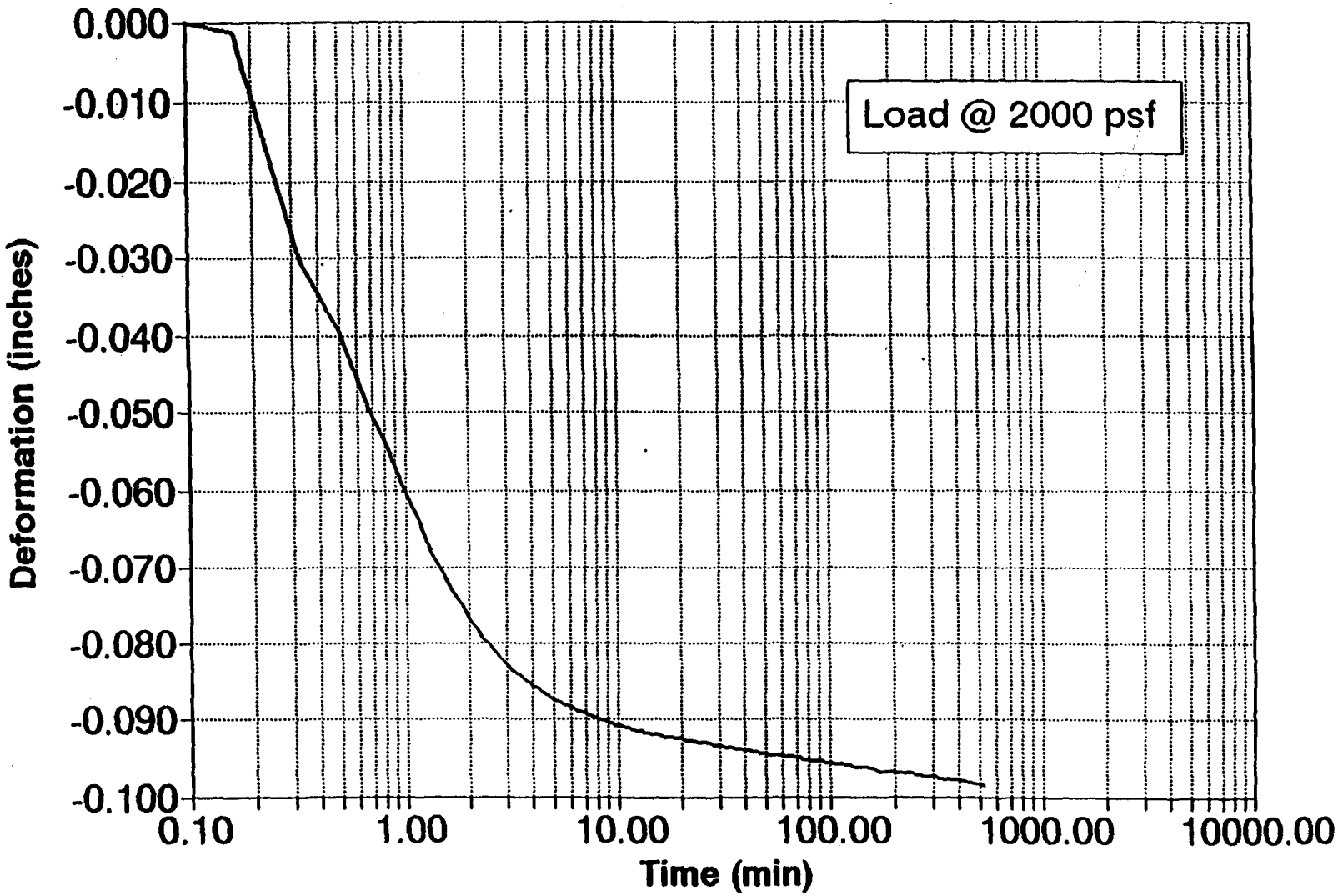
Figure 70



Project No. 41194

Figure 71

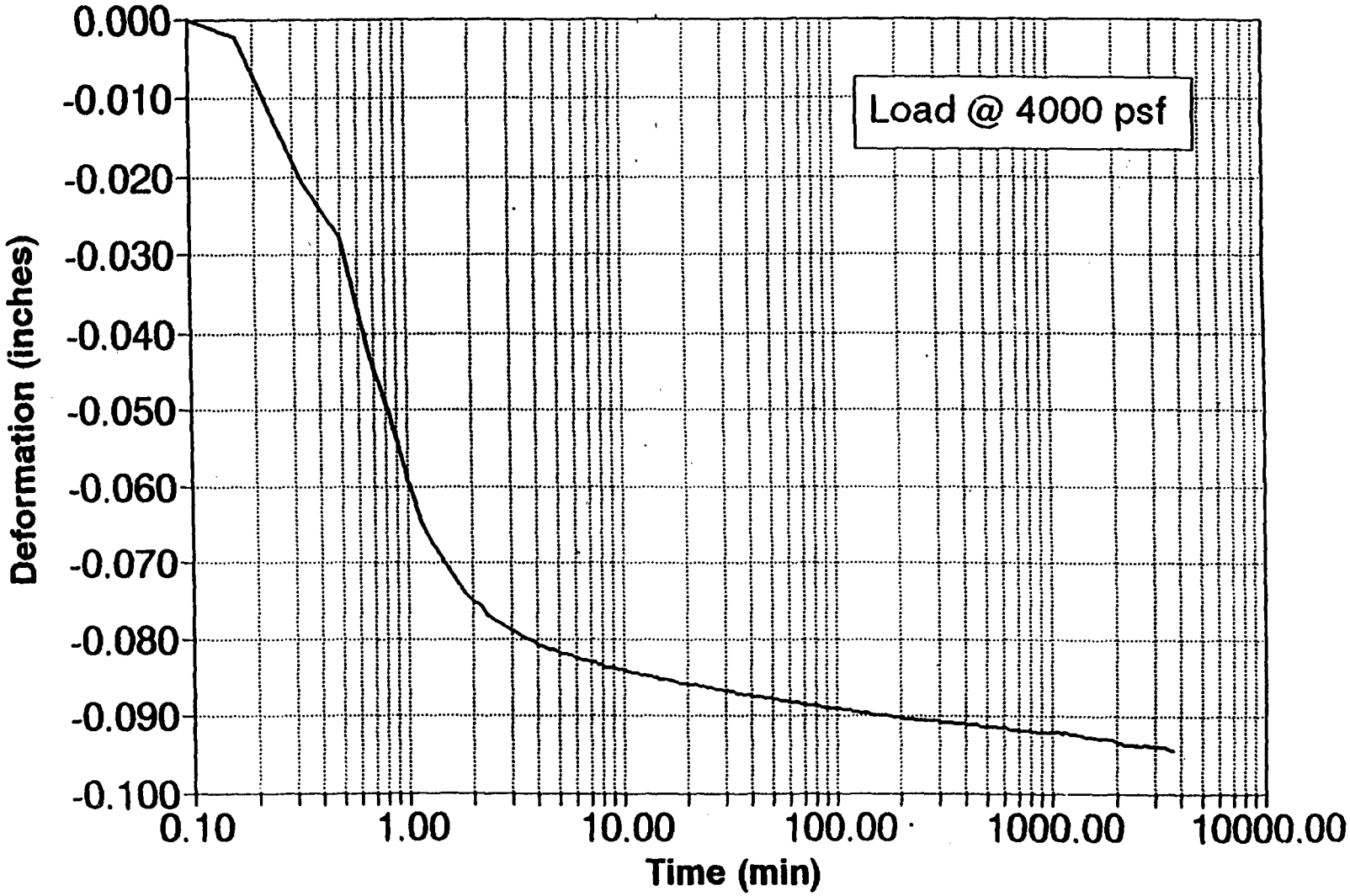
Time Rate of Consolidation
Sample No. O8-S4 @ 7'



Project No. 41194

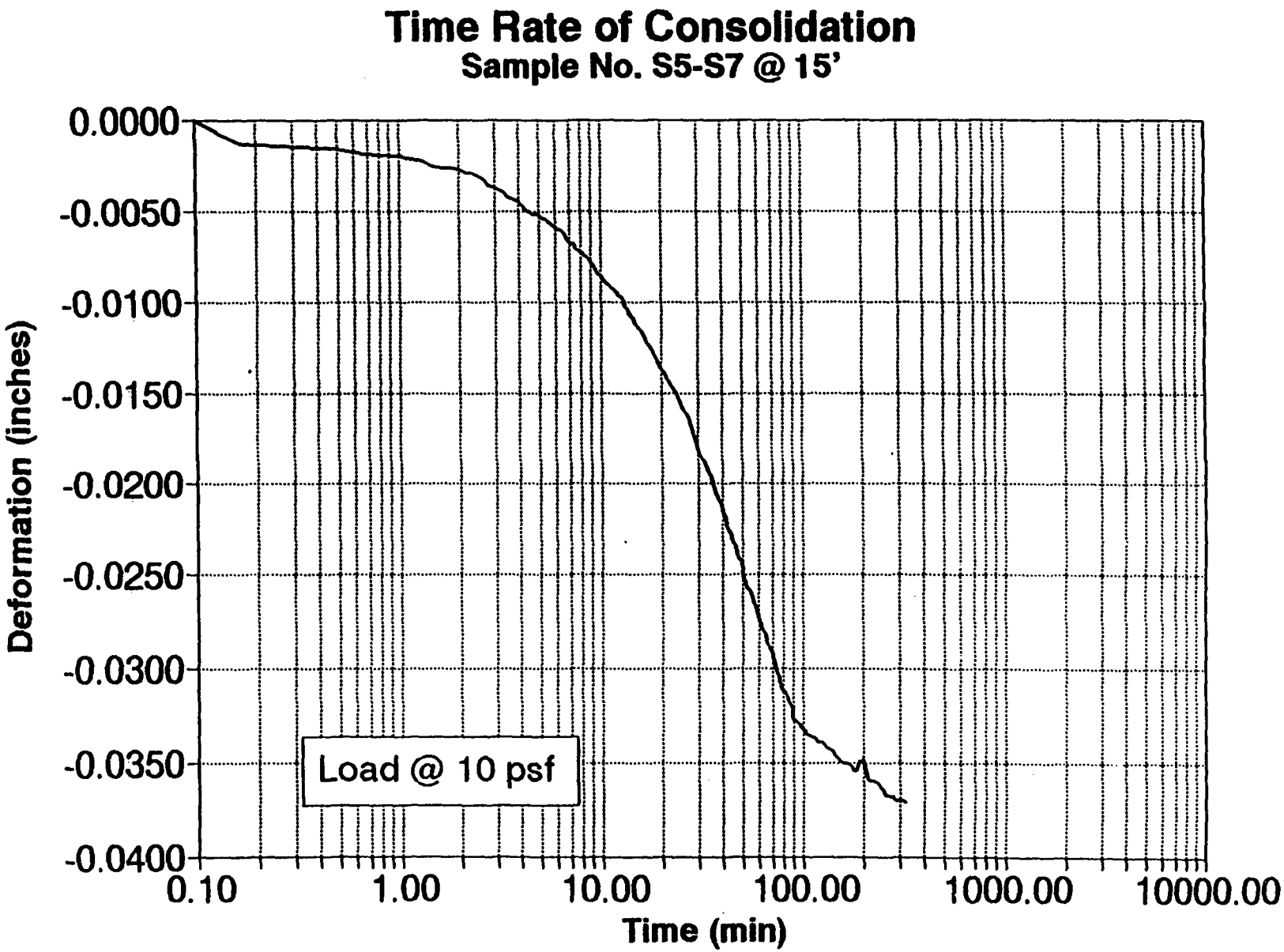
Figure 72

Time Rate of Consolidation
Sample No. O8-S4 @ 7'



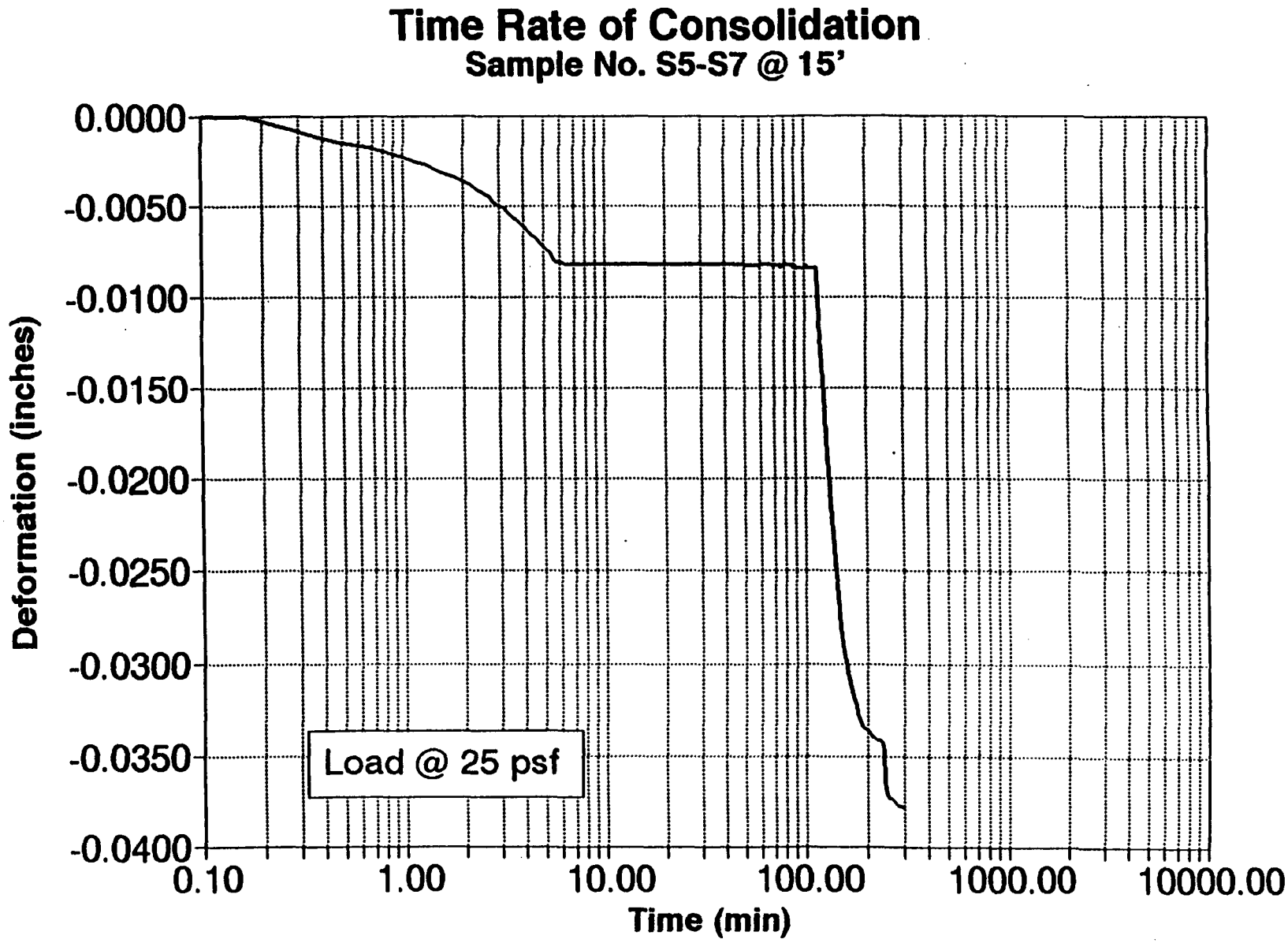
Project No. 41194

Figure 73



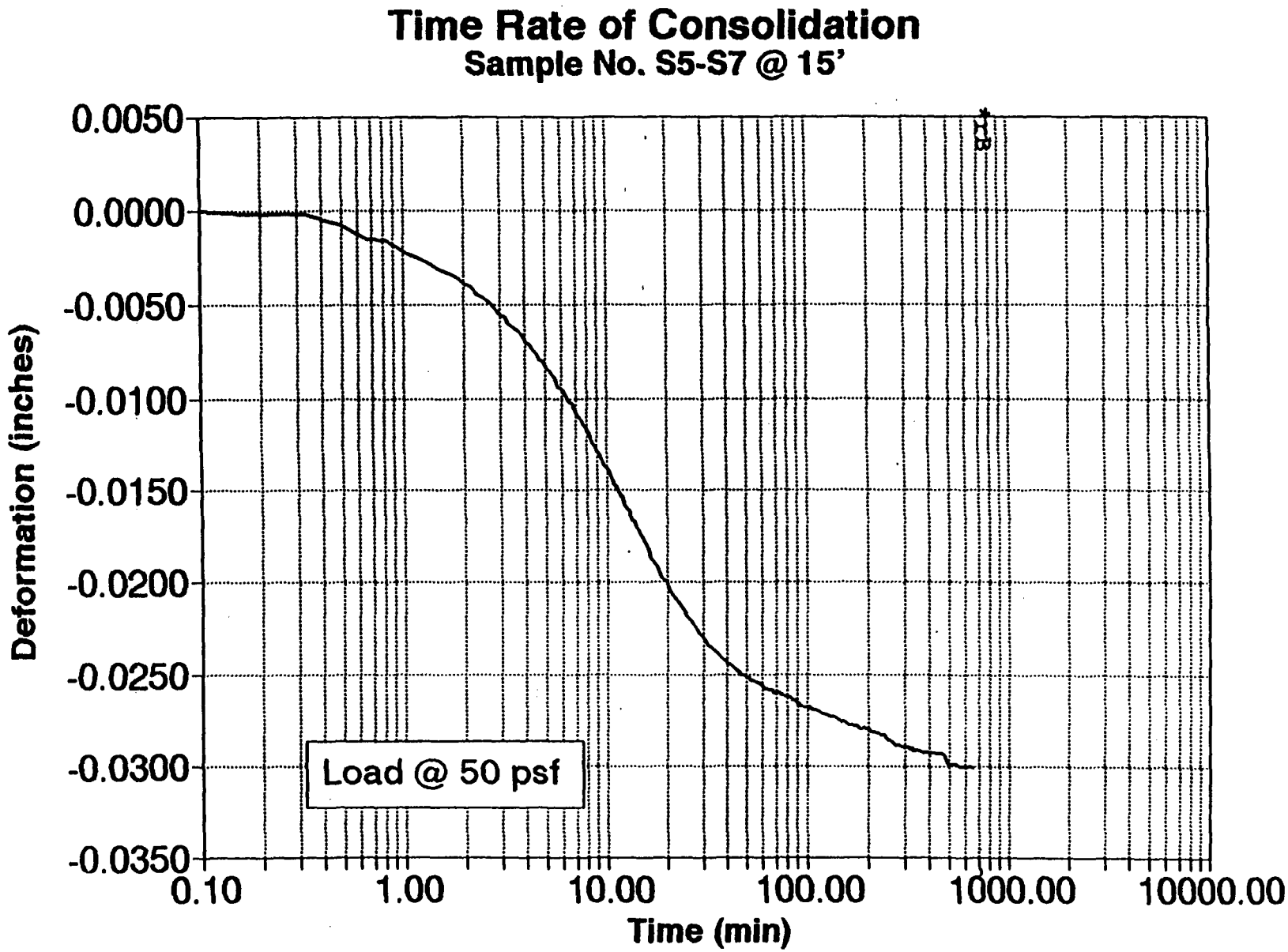
Project No. 41194

Figure 74



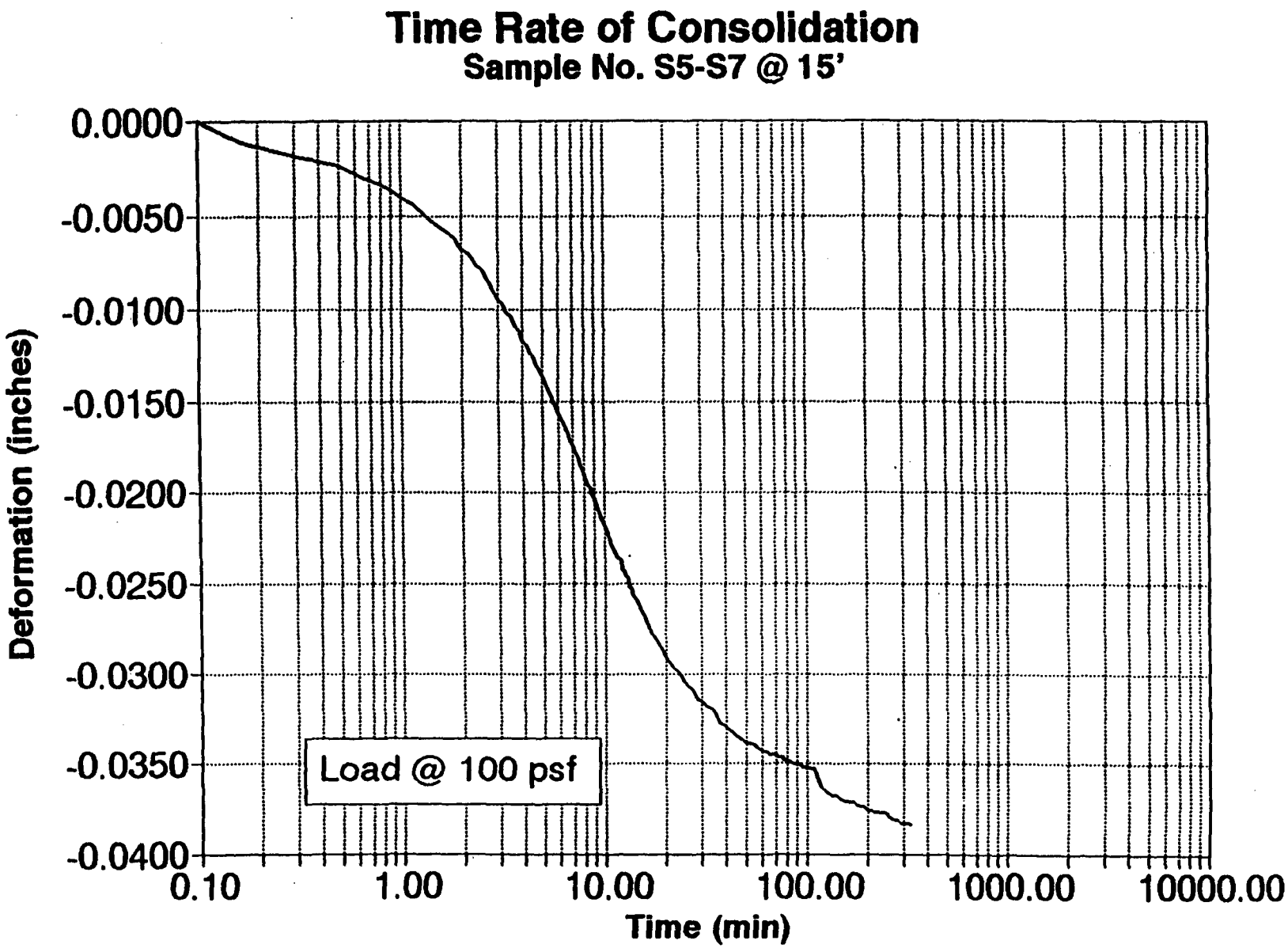
Project No. 41194

Figure 75



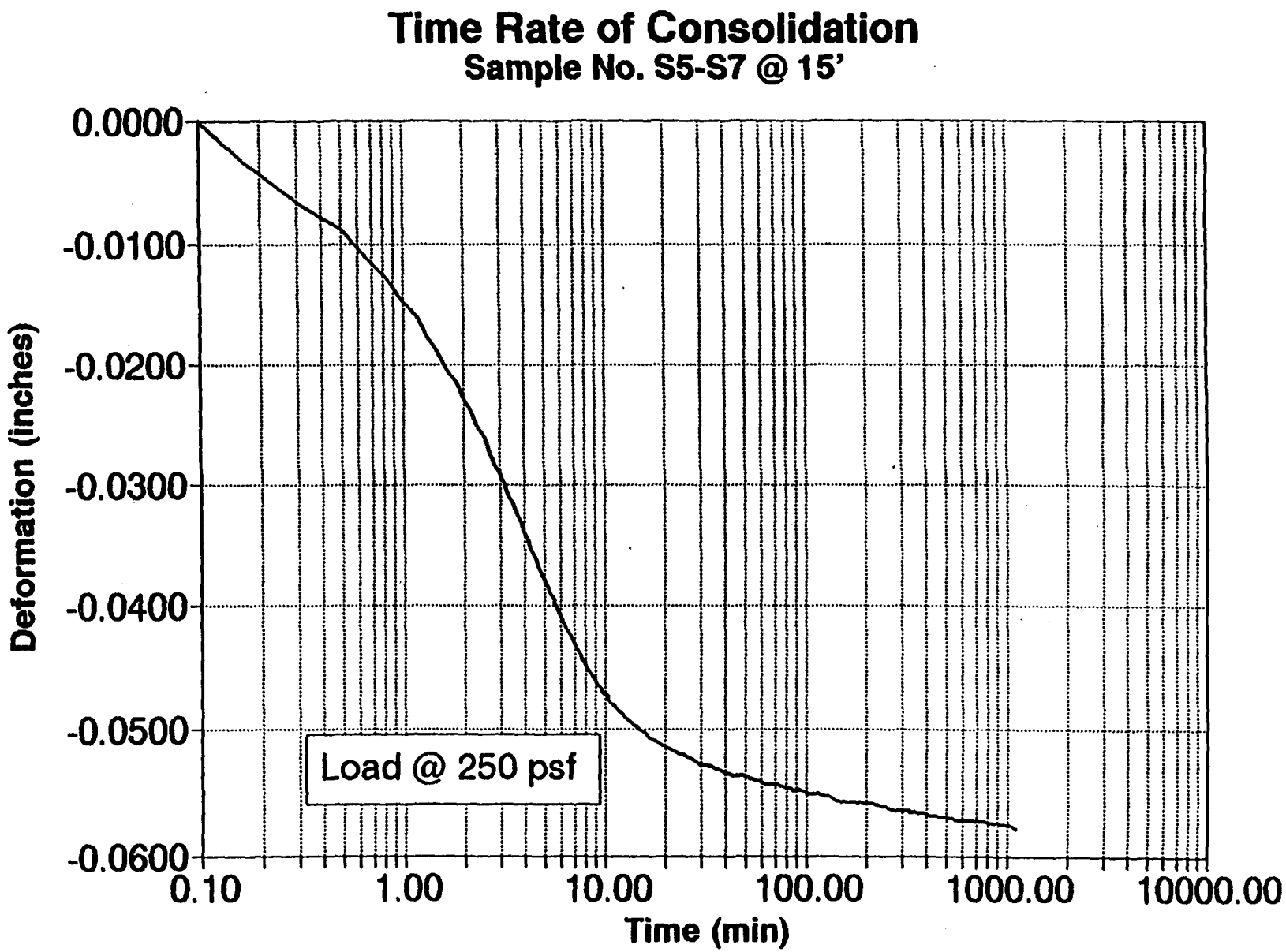
Project No. 41194

Figure 76



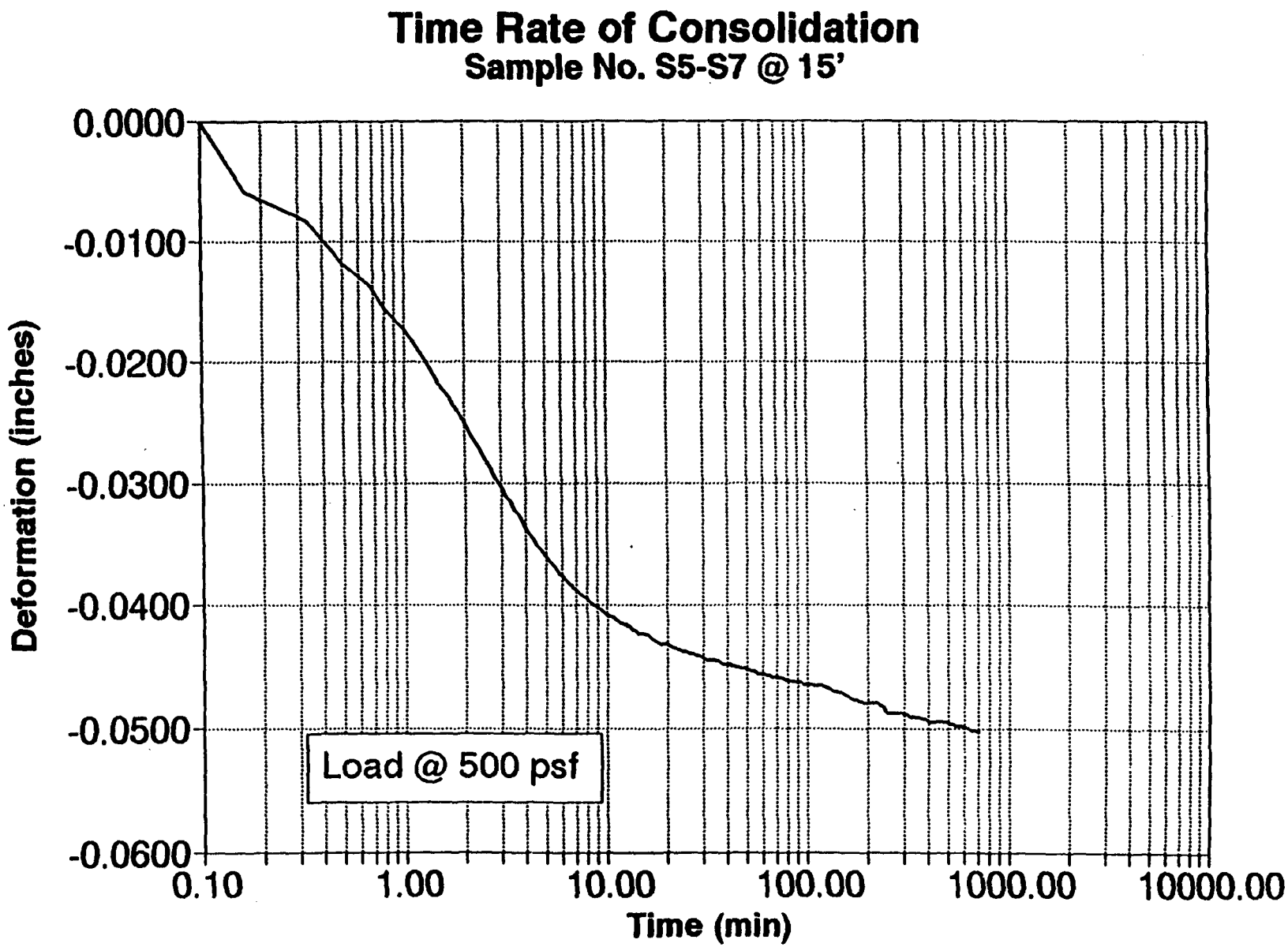
Project No. 41194

Figure 77



Project No. 41194

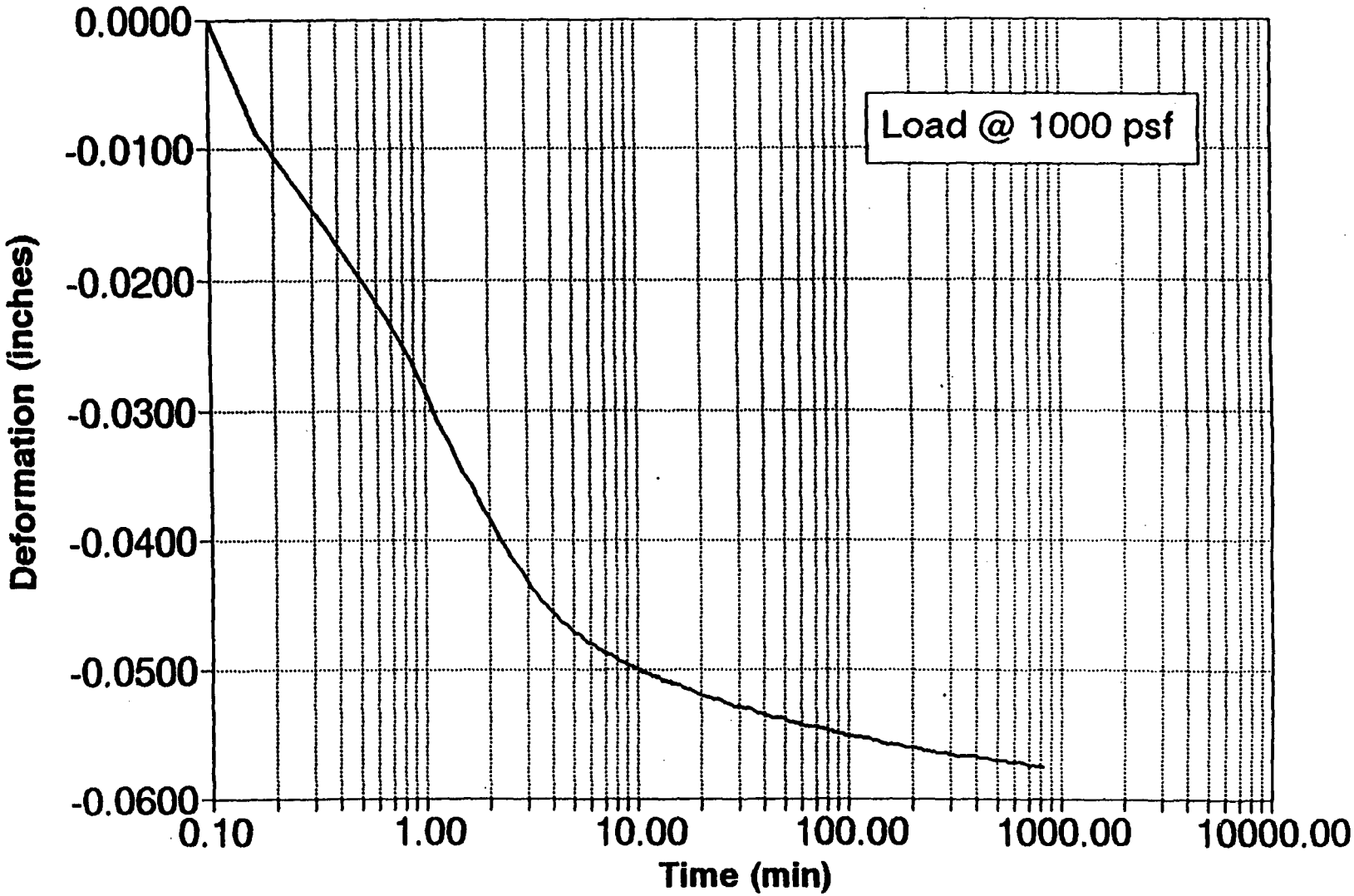
Figure 78



Project No. 41194

Figure 79

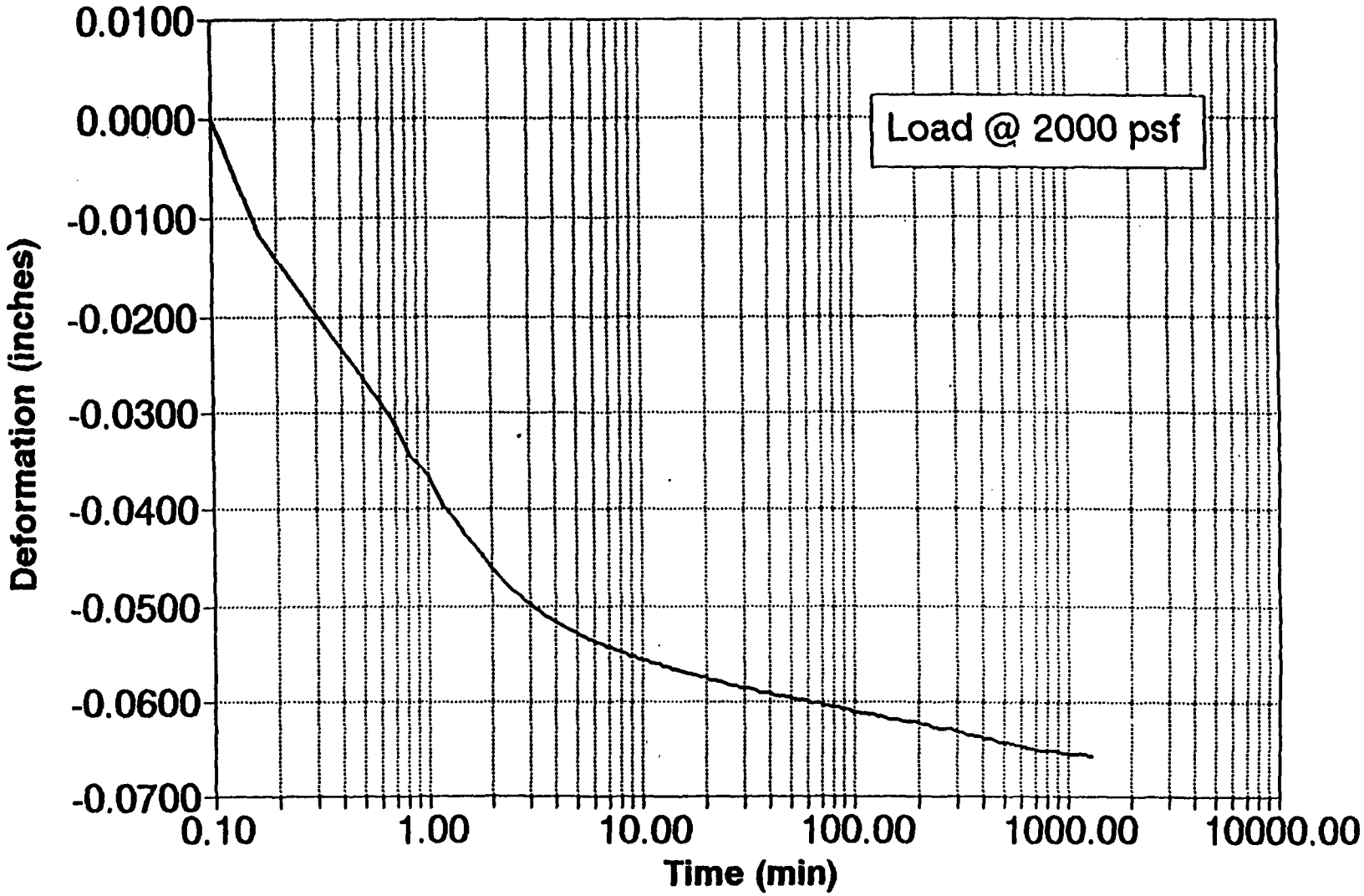
Time Rate of Consolidation
Sample No. S5-S7 @ 15'



Project No. 41194

Figure 80

Time Rate of Consolidation
Sample No. S5-S7 @ 15'

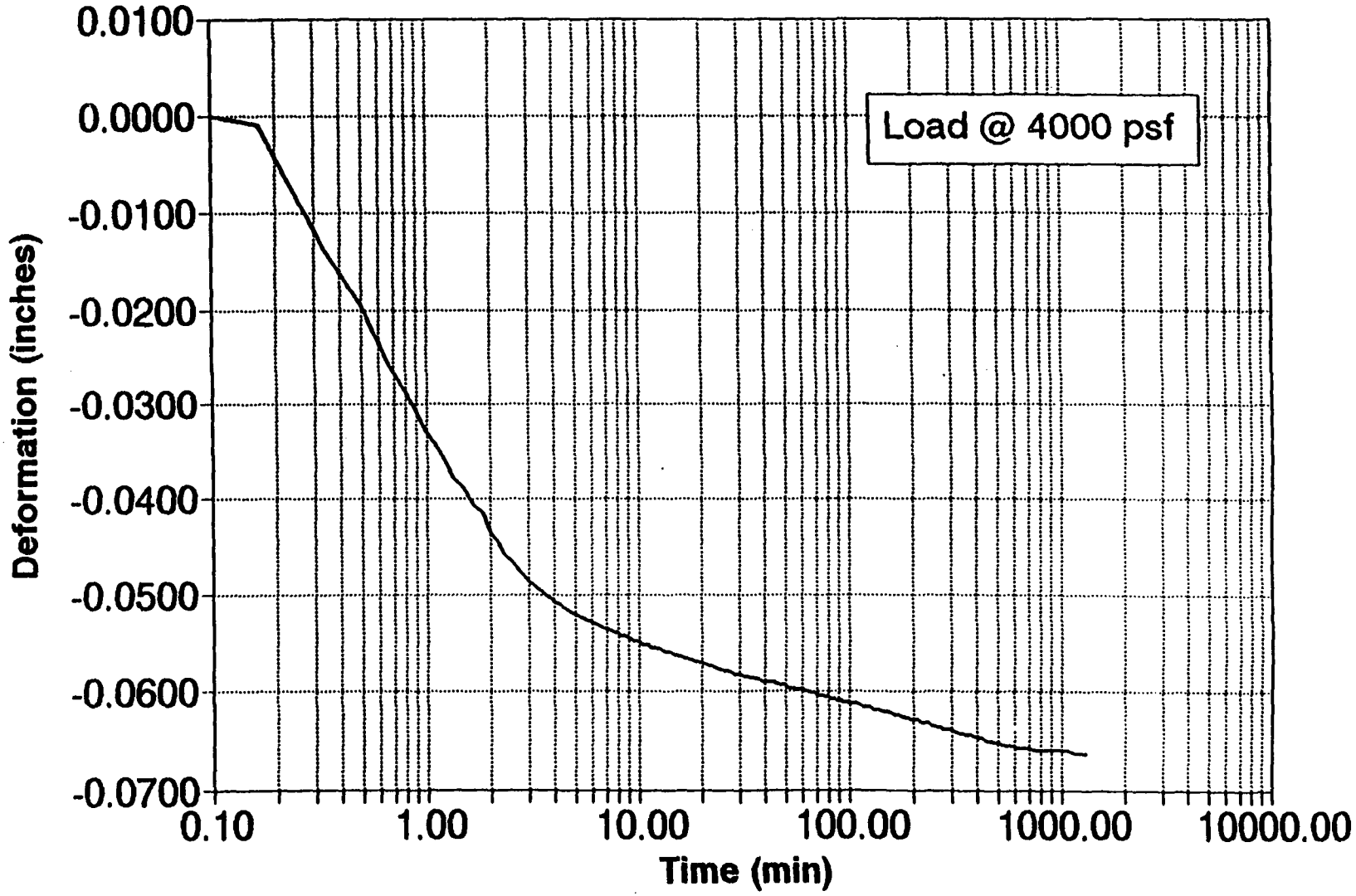


Project No. 41194

Figure 81

Time Rate of Consolidation

Sample No. S5-S7 @ 15'



Project No. 41194

Figure 82

Applied Geotechnical Engineering Consultants, Inc.

TABLE 1

FMC Pond 15S Closure

Summary of Laboratory Test Results

Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)	Phos. corr. Moisture Content (%)	Atterberg Limits			Specific Gravity
					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
D5	S1	1	167	141				
	S4	7	180	153				
	S7	15	167	145				
D7	S2	3	203	175				
	S5	10	168	141				2.77
	S8	15	167	149	92	72	20	
G4	S2	2	207	148	77	51	26	
	S3	5	196	144				
	S4	9	188	137				
	S5	11	185	135				
	S6	14	180	132				
G8	S1	1	219	175				
	S2	3	219	175				
	S3	5	203	150				2.74
	S4	7	194	155				
	S5	10	167	135				
	S6	12	169	136				
	S7	15	155	135				
	S8	15		132	85	64	21	
K4	S2	3	258	88	66	58	8	
	S4	7	265	92				
	S5	10	184	130				

Applied Geotechnical Engineering Consultants, Inc.

TABLE 1

FMC Pond 15S Closure

Summary of Laboratory Test Results

Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)	Phos. corr. Moisture Content (%)	Atterberg Limits			Specific Gravity
					Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	
K8	S3	5	196	130				
	S5	10	184	101	48	39	9	
	S6	12	215	95				
	S7	16	167	92				
O4	S1	1	204	144				
	S2	3	196	139				
	S3	5	187	132	81	56	26	
	S4	7	207	146				
	S5	10	324	216				
	S6	12	183	130				
	S7	15	164	118				
O8	S2	3	222	184				
	S3	5	228	189				
	S4	7	170	137				2.62
	S5	10	155	137	67	54	13	
S5	S3	5	193	159				
	S6	12	182	212	83	60	23	
	S7	15	155	111	53	56	-3	
S7	S1	1	237	186				
	S3	5	195	155	74	54	20	
	S5	10	162	130				
	S7	15	159	124				

Applied Geotechnical Engineering Consultants, Inc.

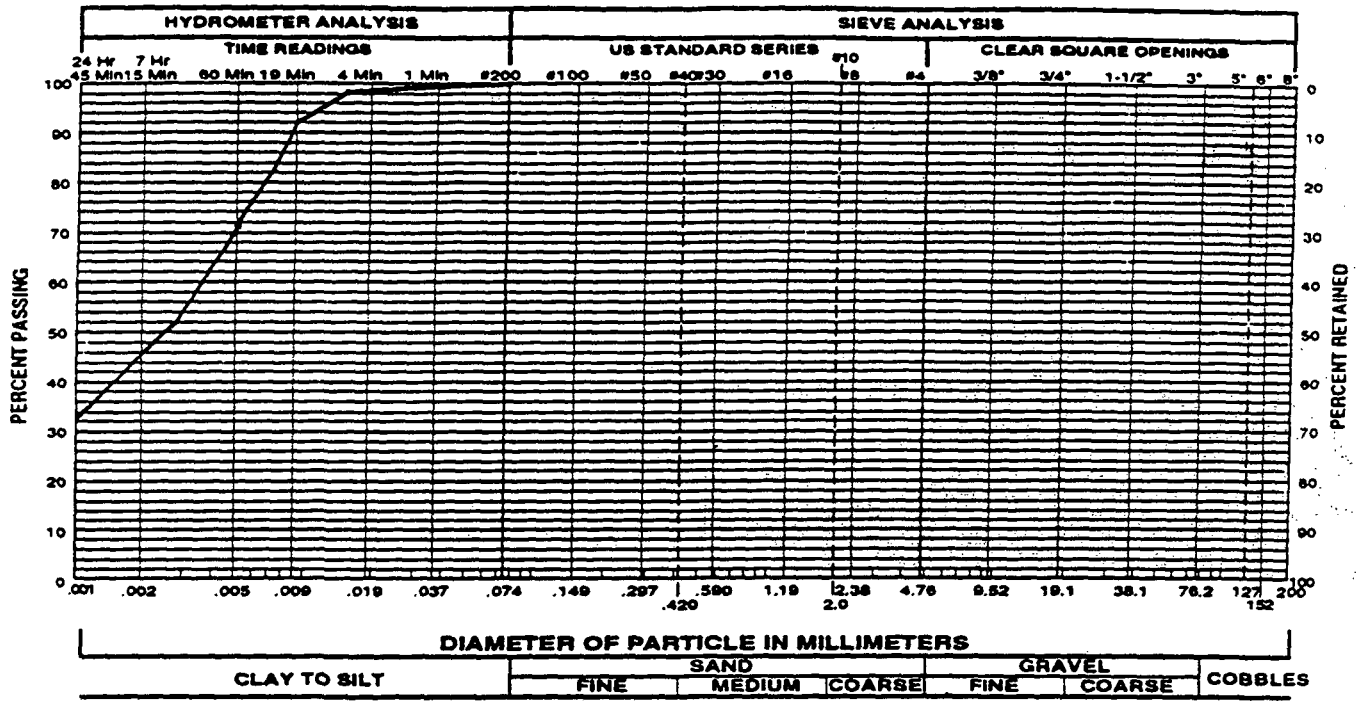
TABLE 2

FMC Pond 15S Closure

Summary of Permeability and Gradient Ratio Test Results

Boring No.	Sample No.	Depth (ft.)	Head (feet)	Gradient Ratio	Permeability
D5	composite	0-10	3.1	0.44	2.5×10^{-5}
			5.9	0.33	3.3×10^{-5}
			9.7	0.45	4.0×10^{-5}
O4	S2,S3,S4	3,5,7	2.7		6.0×10^{-6}
			5		1.6×10^{-6}
			9		1.4×10^{-6}
			13.5		7.3×10^{-7}
G8	S6,S7	12,15	2.7		1.2×10^{-5}
			5		3.2×10^{-5}
			9		3.9×10^{-6}
			11.5		9.2×10^{-6}

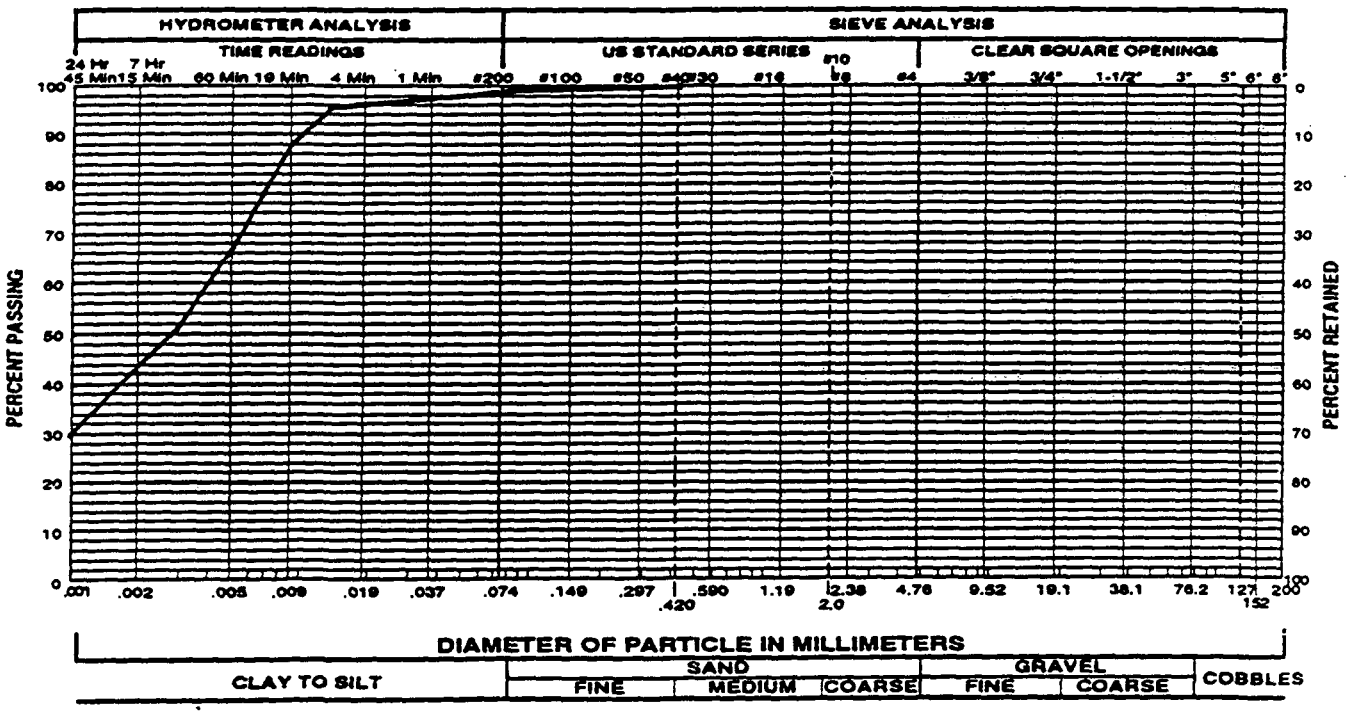
Applied Geotechnical Engineering Consultants, Inc.



Gravel 0 % Sand 0 % Silt and Clay 100 %

Liquid Limit - % Plasticity Index - %

Sample of Pond 15S Sludge From D5 - S7 @ 15'



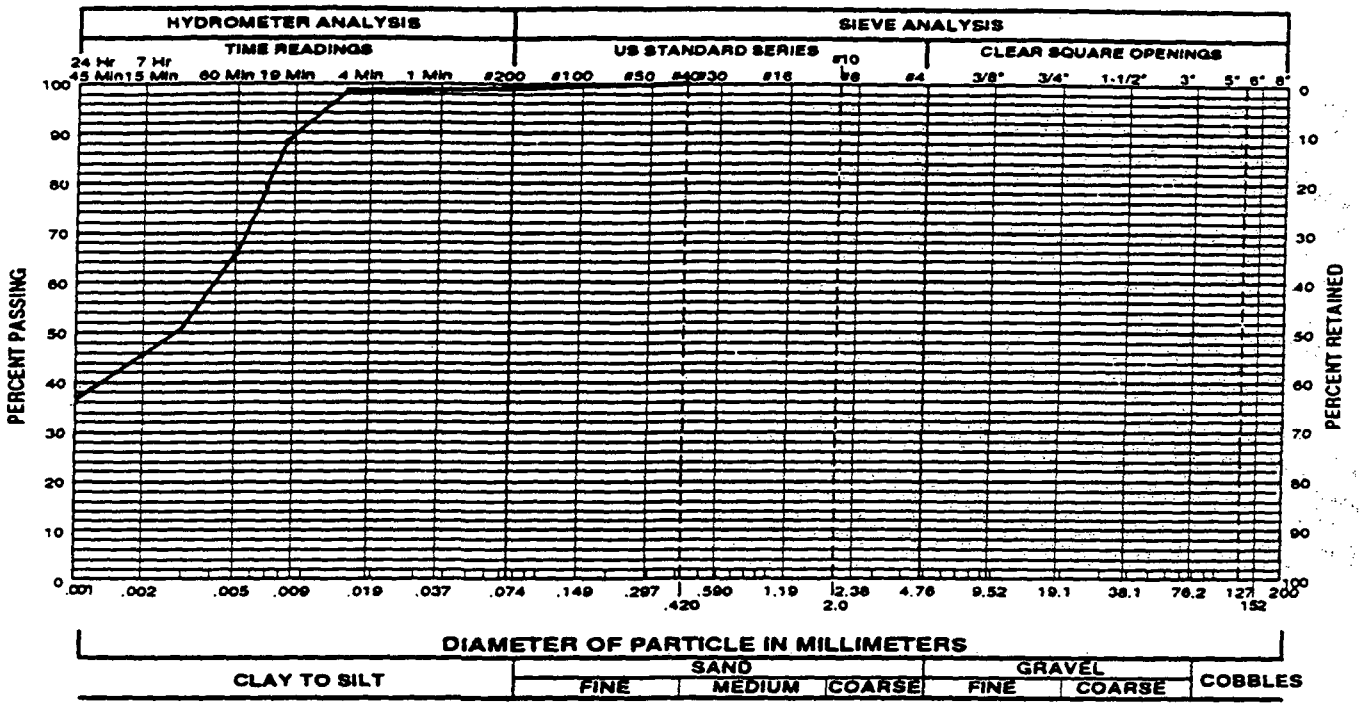
Gravel 0 % Sand 1 % Silt and Clay 99 %

Liquid Limit - % Plasticity Index - %

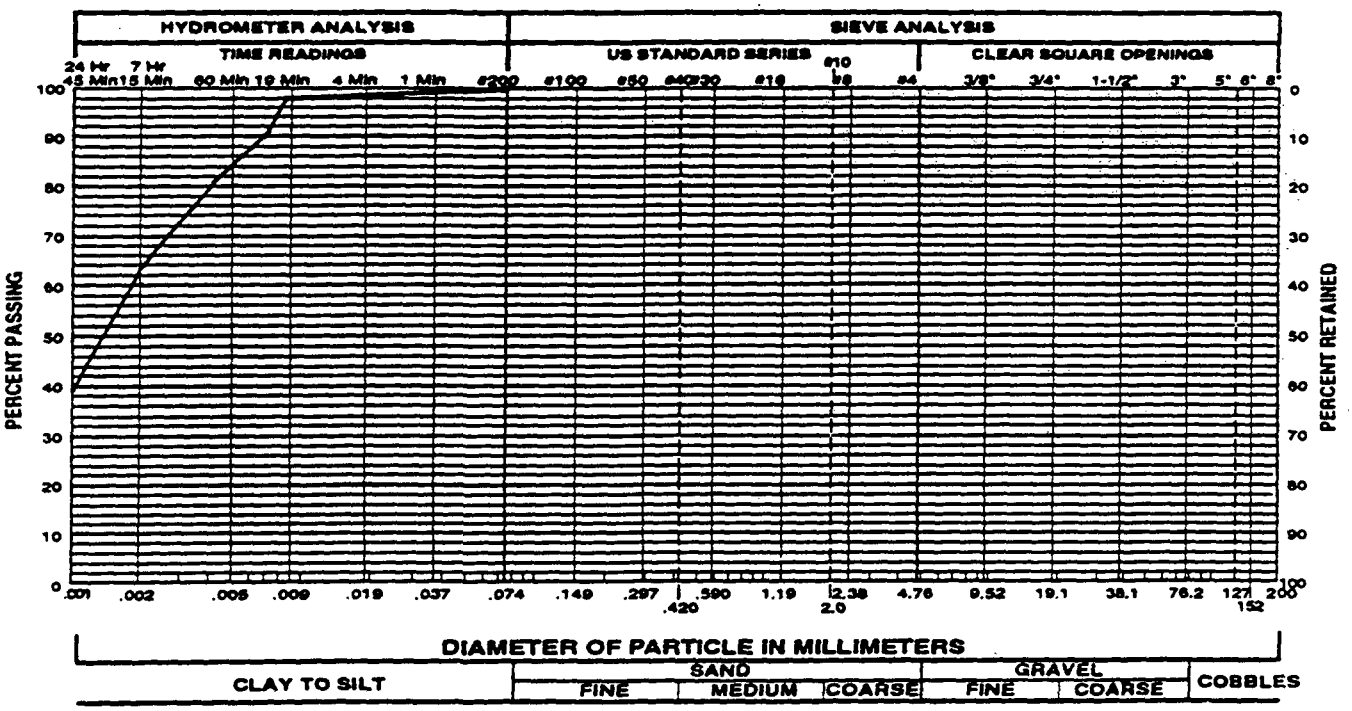
Sample of Pond 15S Sludge From D7 - S2 @ 3'

Project No. 41194 **GRADATION TEST RESULTS** Figure 1

Applied Geotechnical Engineering Consultants, Inc.



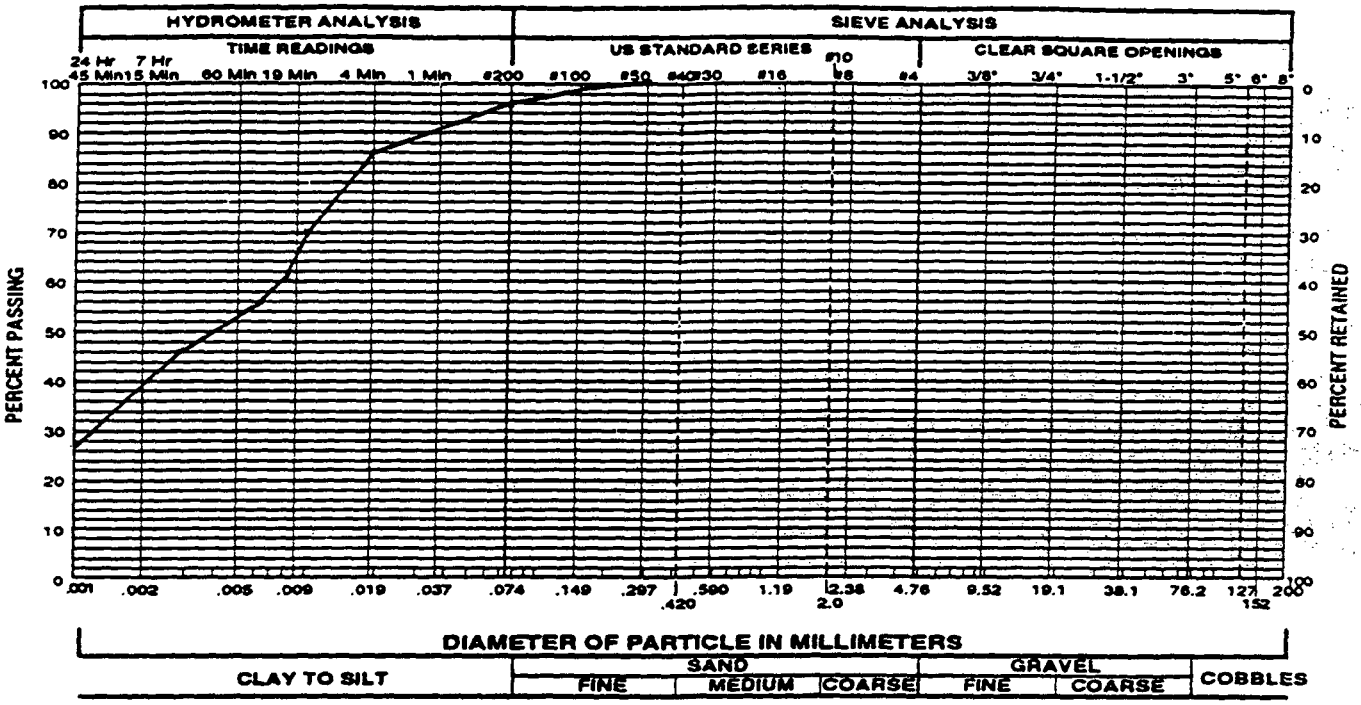
Gravel 0 % Sand 1 % Silt and Clay 99 %
Liquid Limit – % Plasticity Index – %
Sample of Pond 15S Sludge From G4 - S5 @ 11'



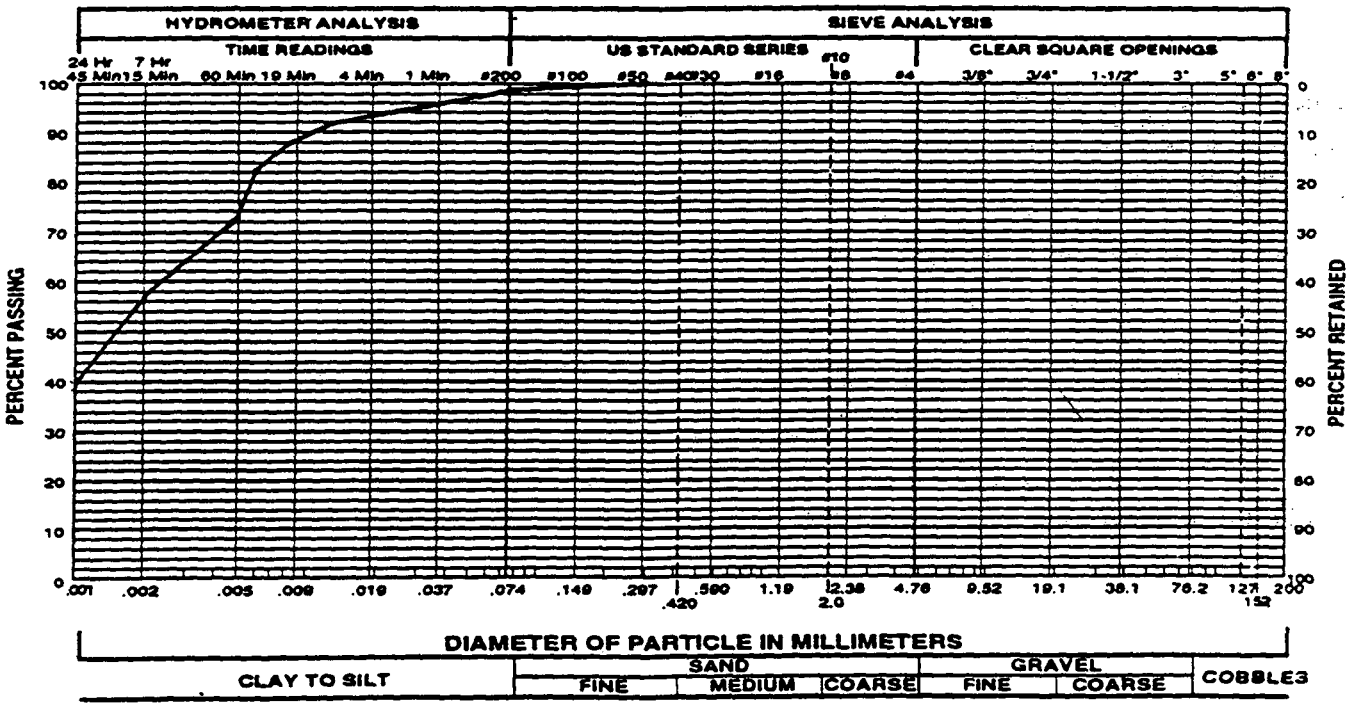
Gravel 0 % Sand 0 % Silt and Clay 100 %
Liquid Limit 97 % Plasticity Index 23 %
Sample of Pond 15S Sludge From G8 - S8 @ 15'

Project No. 41194 **GRADATION TEST RESULTS** Figure 2

Applied Geotechnical Engineering Consultants, Inc.



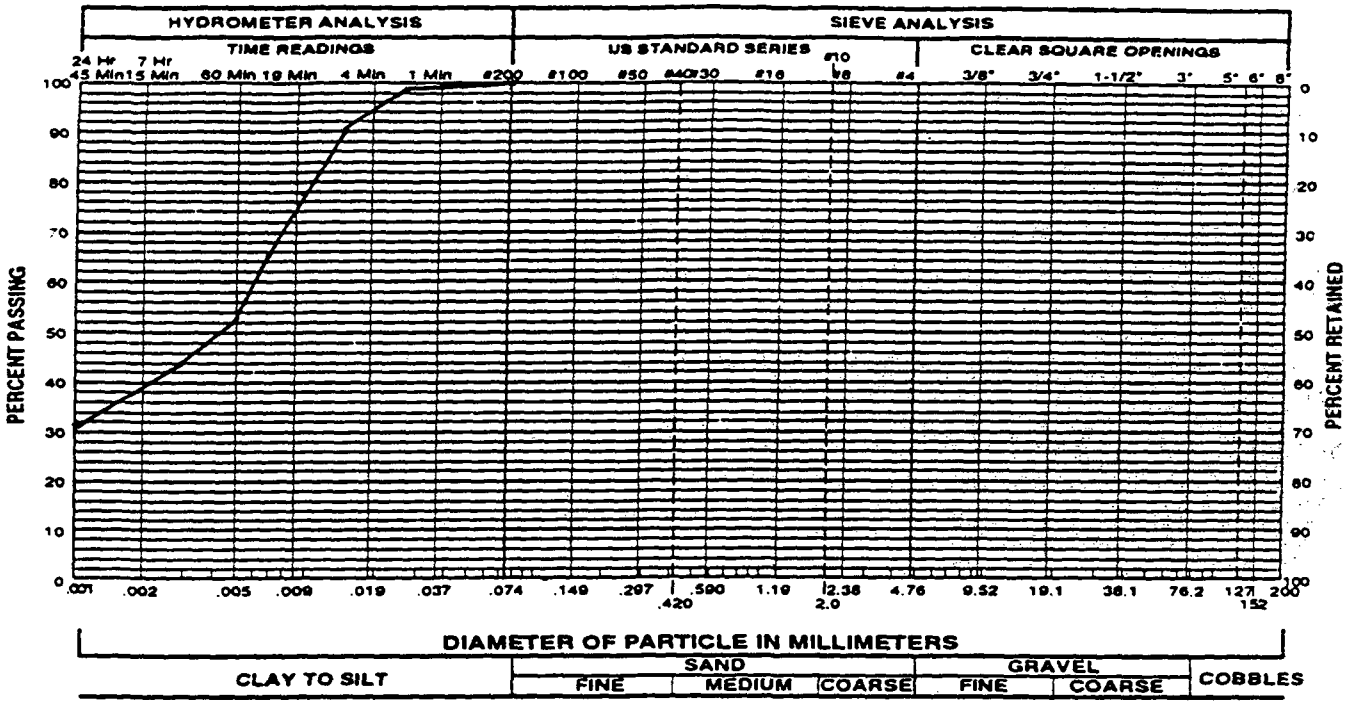
Gravel 0 % Sand 4 % Silt and Clay 96 %
Liquid Limit - % Plasticity Index - %
Sample of Pond 15S Sludge From K4 - S5 @ 10'



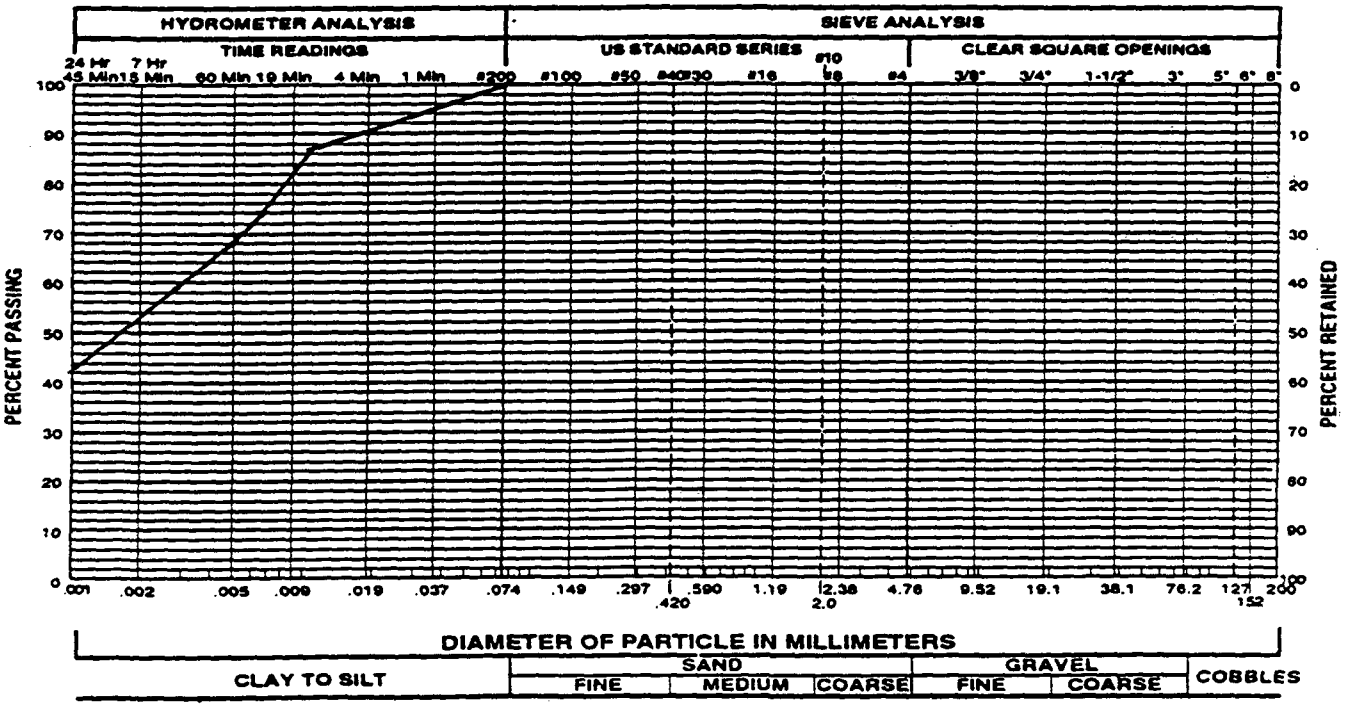
Gravel 0 % Sand 1 % Silt and Clay 99 %
Liquid Limit - % Plasticity Index - %
Sample of Pond 15S Sludge From K8 - S3 @ 5'

Project No. 41194 **GRADATION TEST RESULTS** Figure 3

Applied Geotechnical Engineering Consultants, Inc.



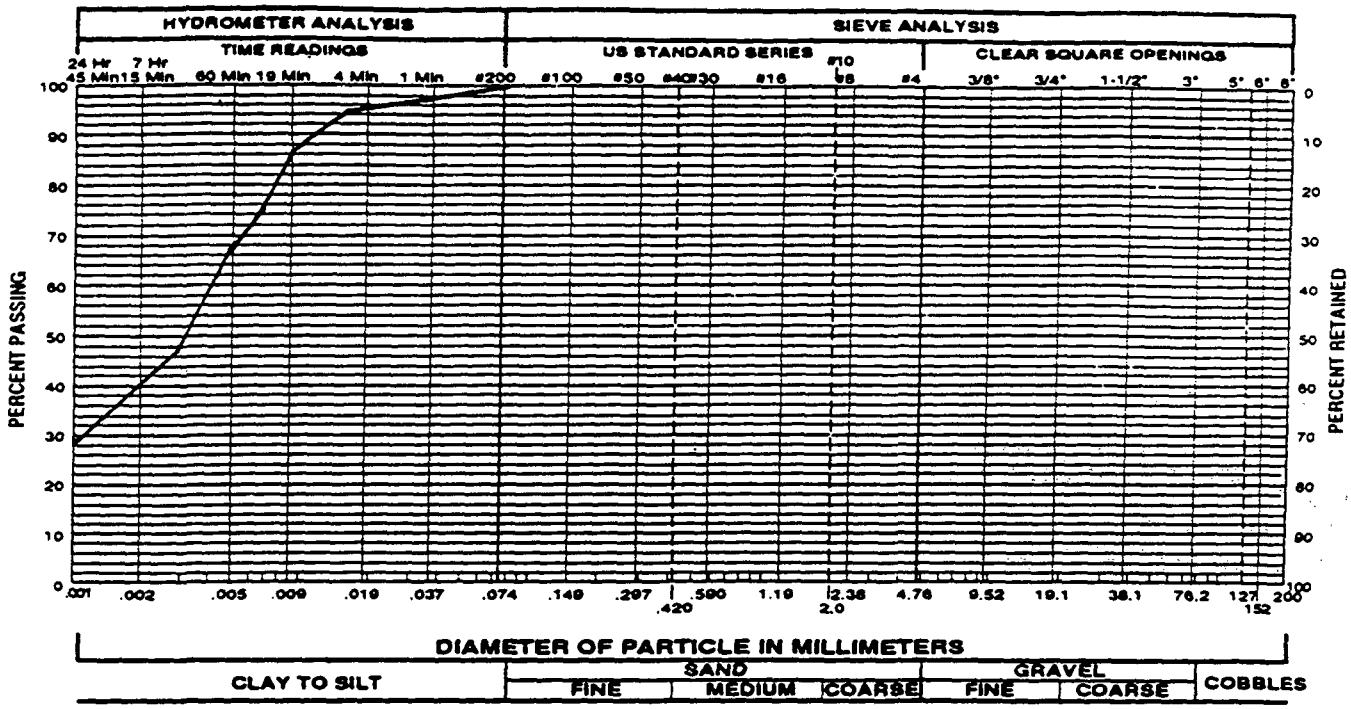
Gravel 0 % Sand 0 % Silt and Clay 100 %
Liquid Limit – % Plasticity Index – %
Sample of Pond 15S Sludge From 04 - S4 @ 7'



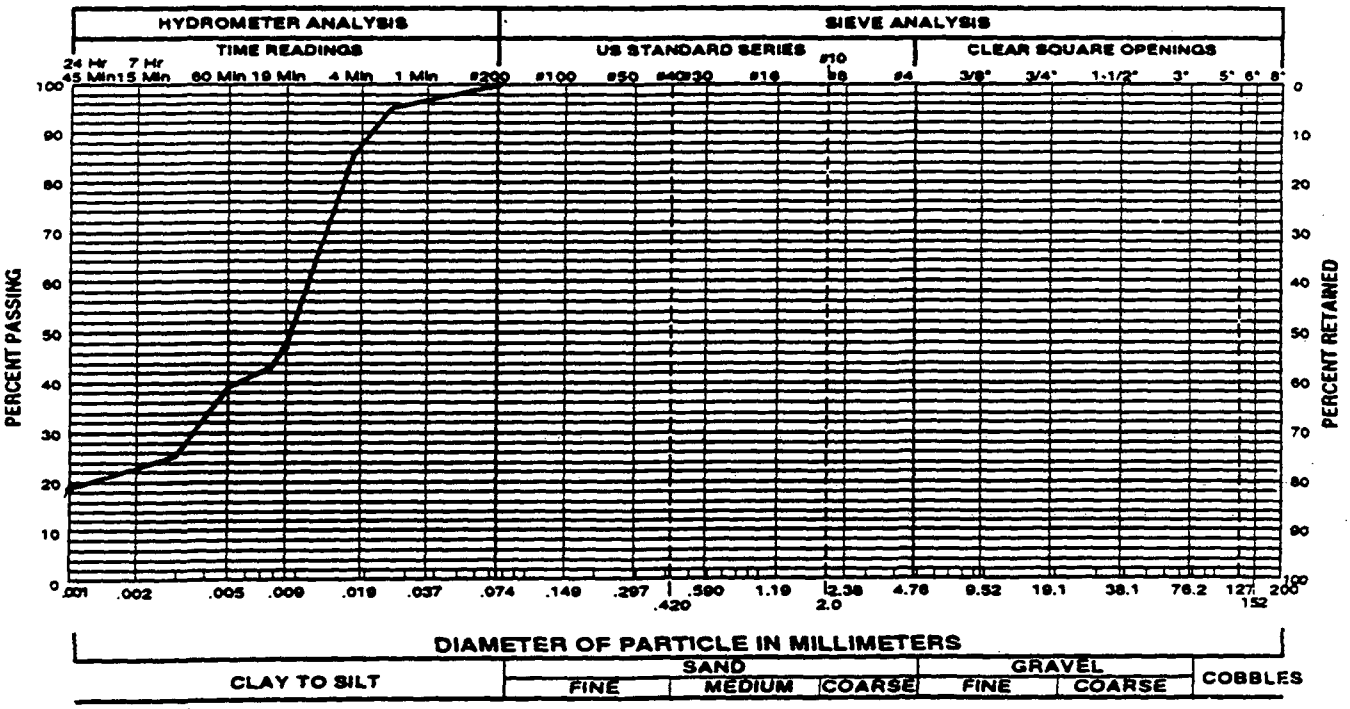
Gravel 0 % Sand 0 % Silt and Clay 100 %
Liquid Limit – % Plasticity Index – %
Sample of Pond 15S Sludge From 08 - S3 @ 5'

Project No. 41194 **GRADATION TEST RESULTS** Figure 4

Applied Geotechnical Engineering Consultants, Inc.



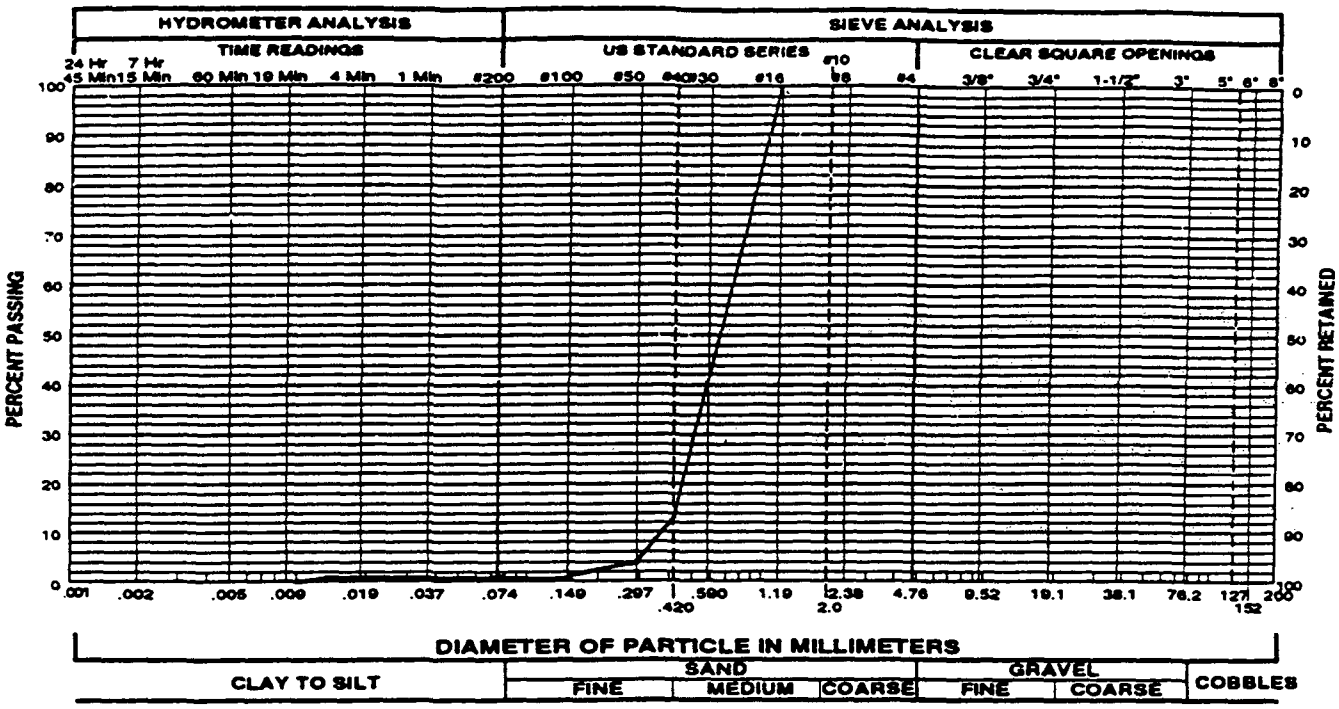
Gravel 0 % Sand 0 % Silt and Clay 100 %
Liquid Limit 95 % Plasticity Index 27 %
Sample of Pond 15S Sludge From S5 - S6 @ 12'



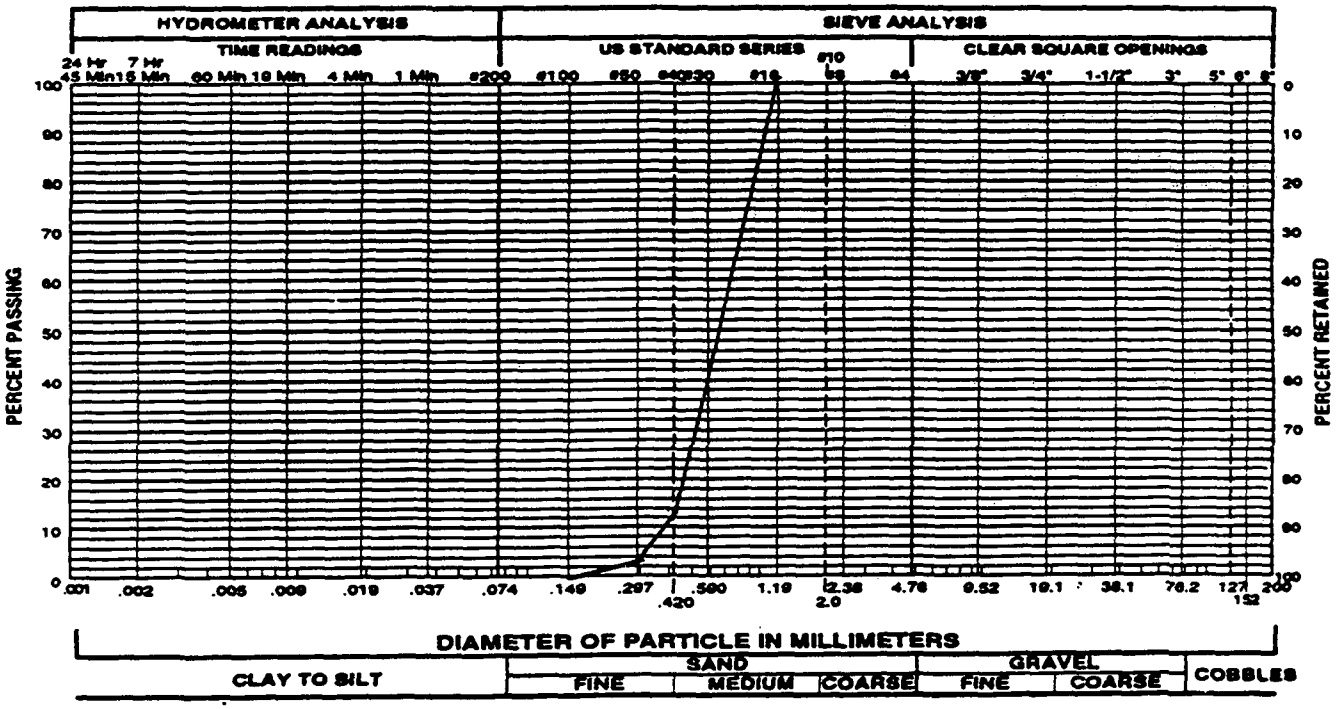
Gravel 0 % Sand 0 % Silt and Clay 100 %
Liquid Limit - % Plasticity Index - %
Sample of Pond 15S Sludge From S7 - S1 @1'

Project No. 41194 **GRADATION TEST RESULTS** Figure 5

Applied Geotechnical Engineering Consultants, Inc.



Gravel 0 % Sand 99 % Silt and Clay 1 %
Liquid Limit - % Plasticity Index - %
Sample of Silica Sand w/Trace of Sludge From Below Fabric
(Gradient Ratio Test)

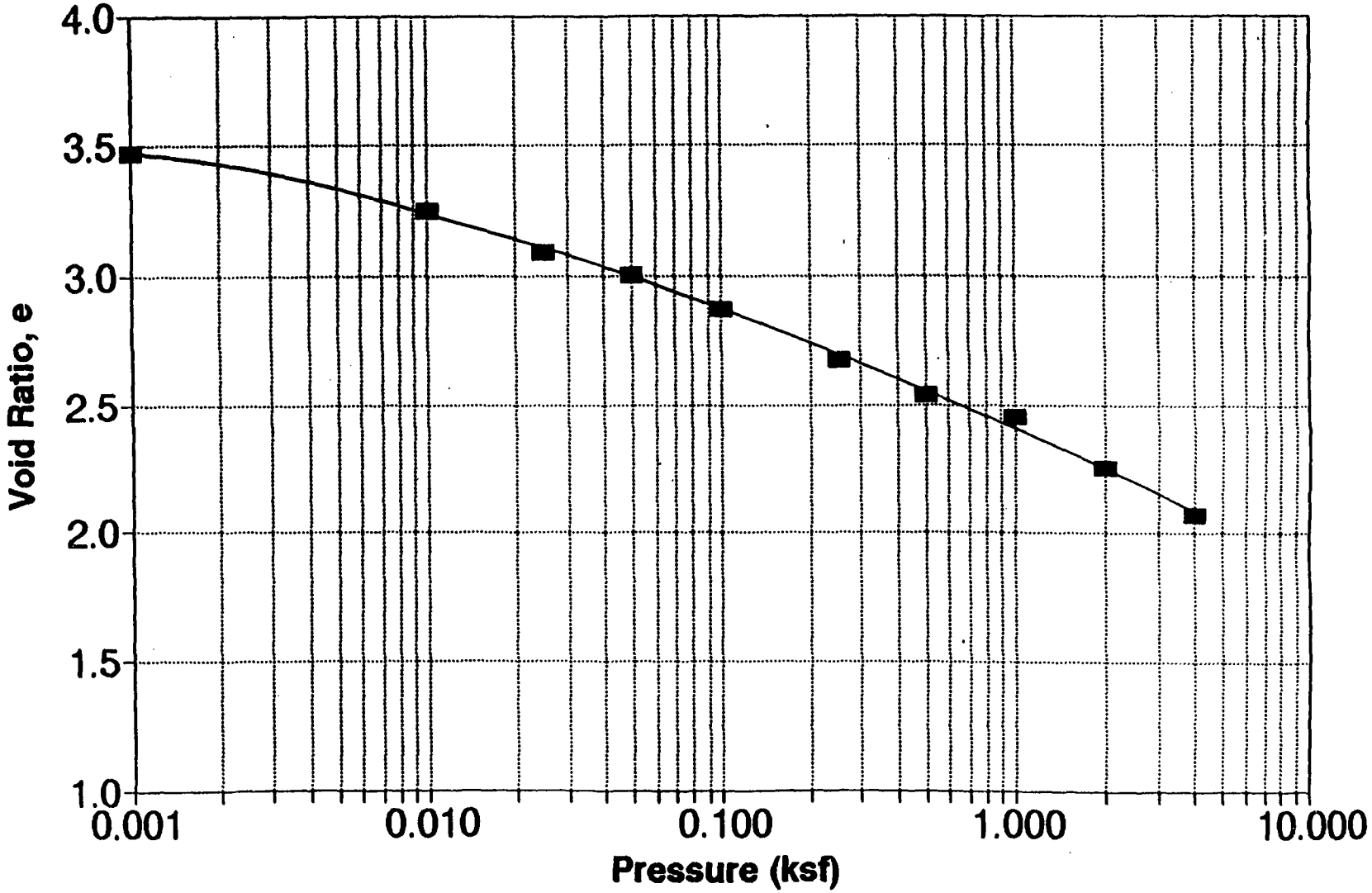


Gravel 0 % Sand 100 % Silt and Clay 0 %
Liquid Limit - % Plasticity Index - %
Sample of Sand From Original Product

Project No. 41194 **GRADATION TEST RESULTS** Figure 6

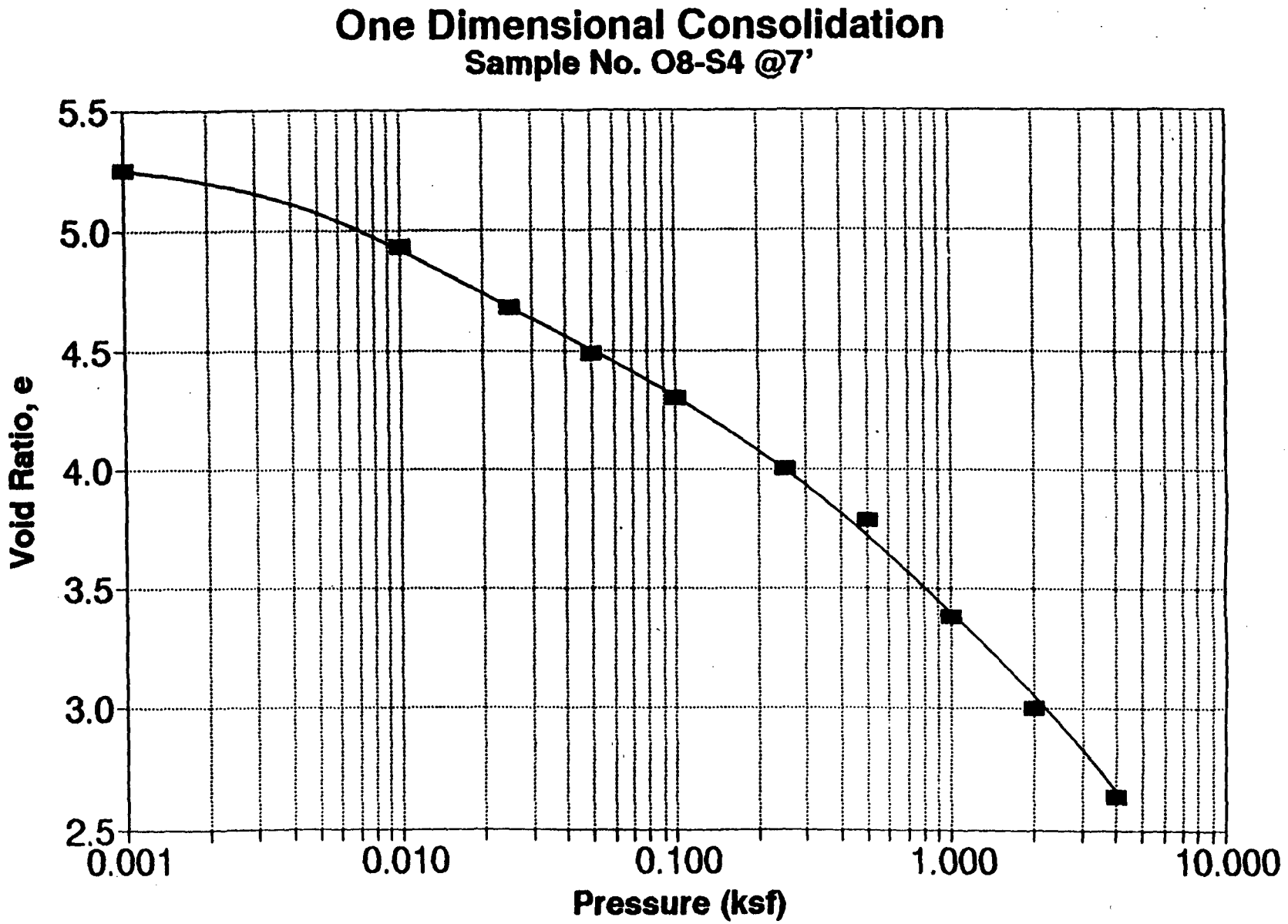
One Dimensional Consolidation

Sample No. G8-S3 @ 5'



Project No. 41194

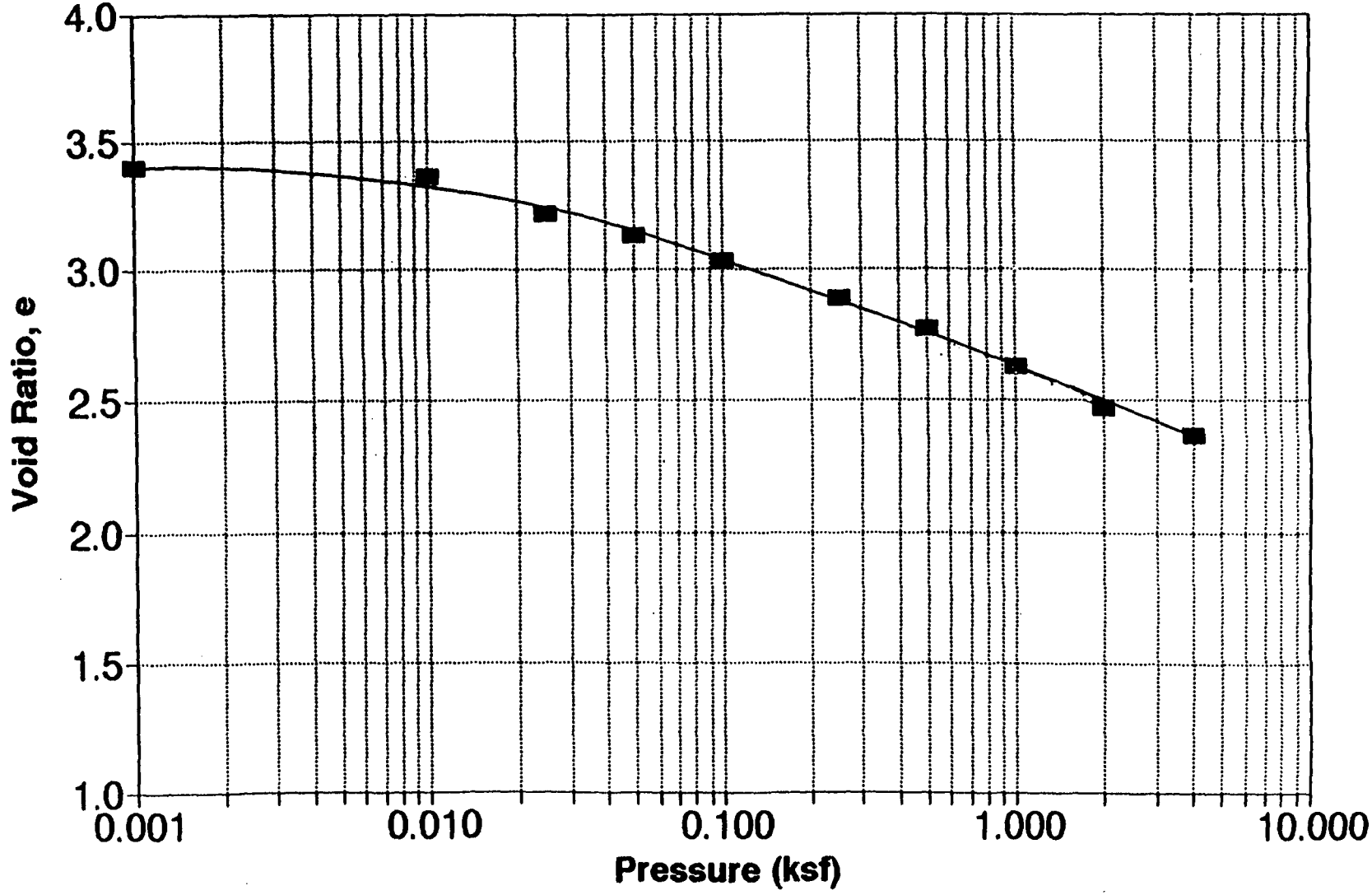
Figure 7



Project No. 41194

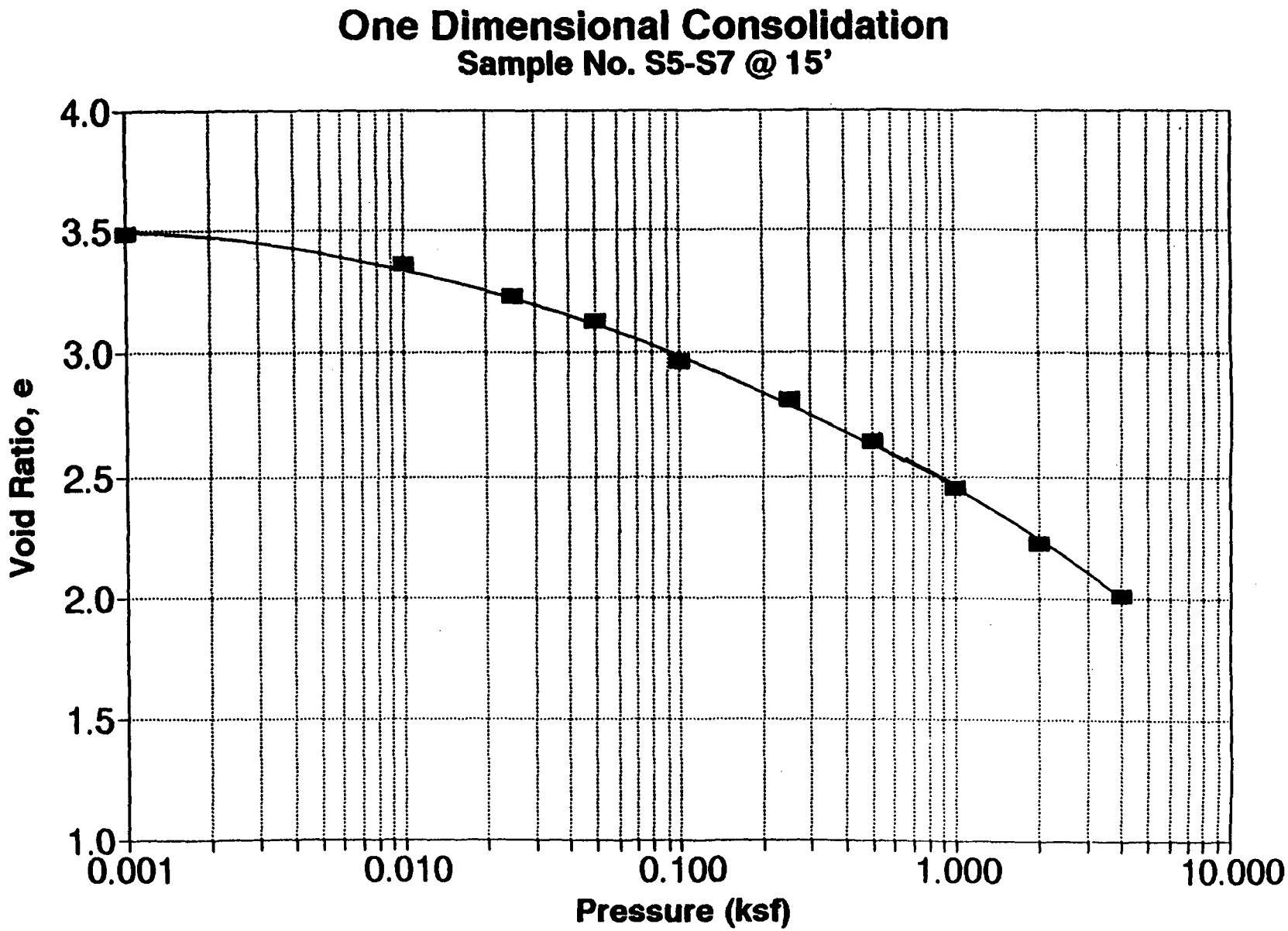
Figure 8

One Dimensional Consolidation
Sample No. D7-S5 @ 10'



Project No. 41194

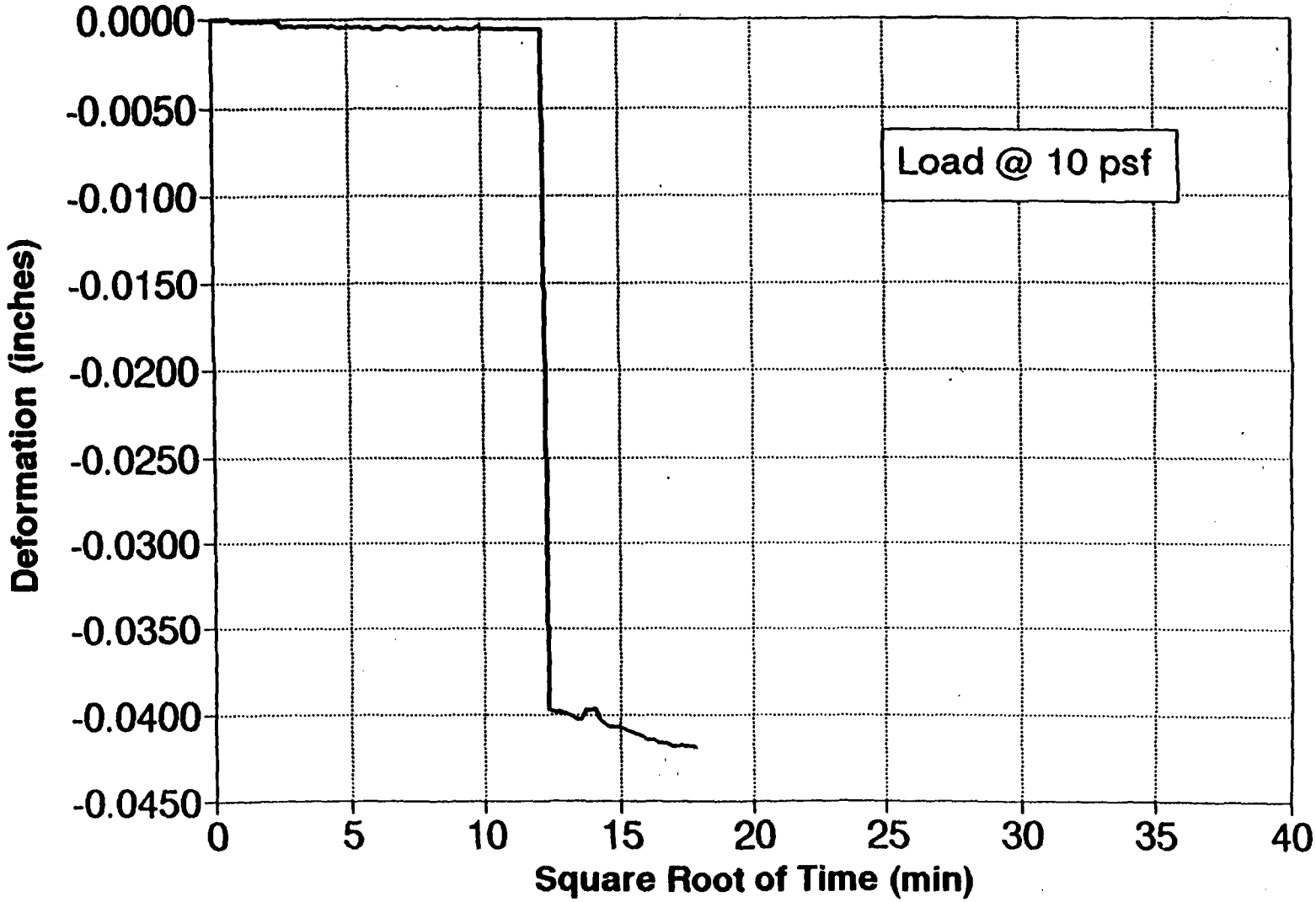
Figure 9



Project No. 41194

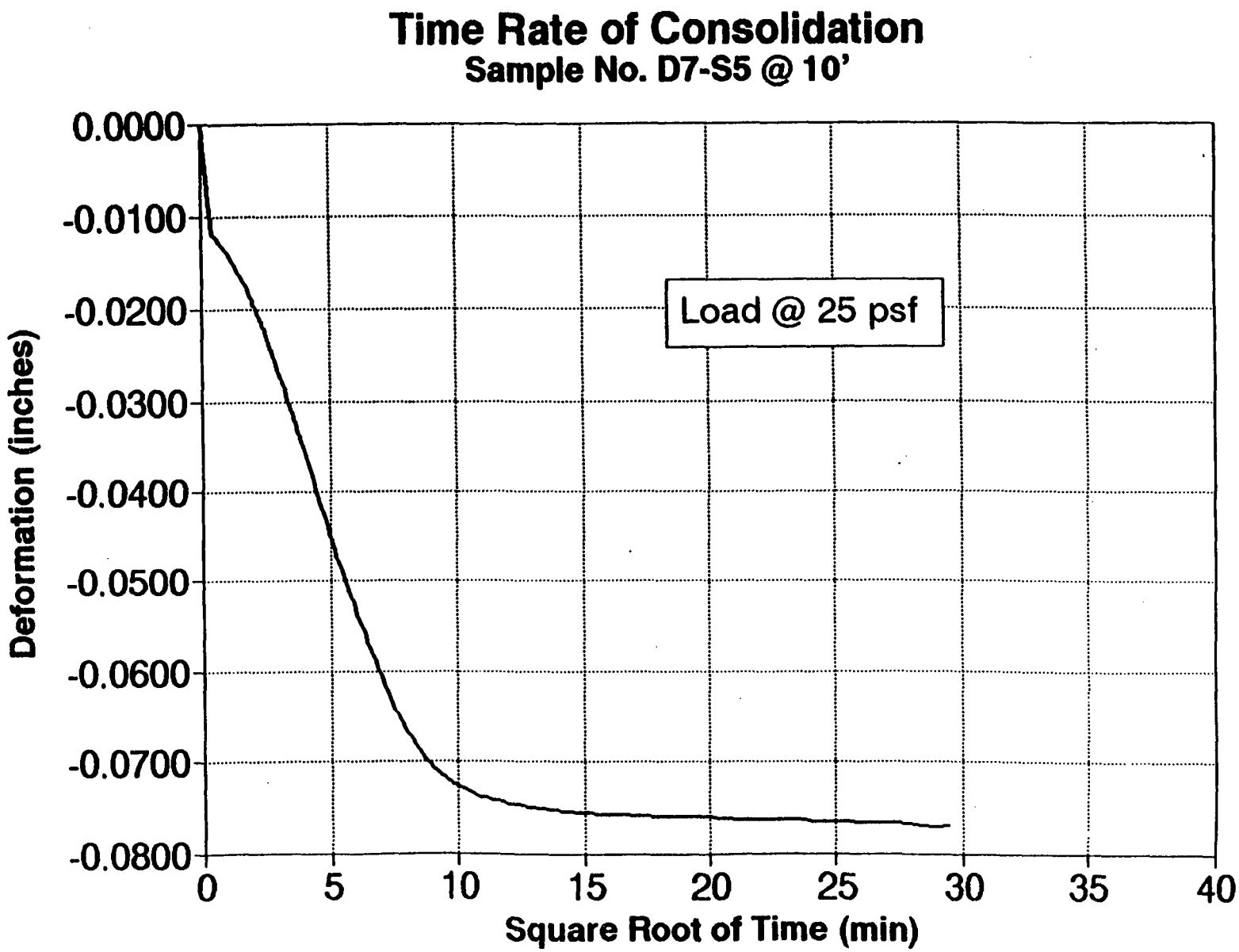
Figure 10

Time Rate of Consolidation
Sample No. D7-S5 @ 10'



Project No. 41194

Figure 11



Project No. 41194

Figure 12

APPENDIX A

MOISTURE CONTENT TESTS
DATA - CALCULATIONS

Moisture Contents

Pond 15S- Laboratory Data

Boring No.	Sample No.	Depth (feet)	Phos. content (measure	Phos. content (assumed	Uncorrected Weights (grams) Flask	Wet Sample + Flask	Wet Sample	Dry Sample + Flask	Dry Sample	Water	Phos. Wt. (g)	Corrected Weights (grams) Dry Sample	Water	MC (uncorr) (%)	MC (corr) (%)
D5	S1	1	4.09		92.09	112.70	20.61	99.80	7.71	12.90	0.84	8.55	12.06	167.32	140.97
	S4	7		3.76	94.79	115.07	20.28	102.04	7.25	13.03	0.76	8.01	12.27	179.72	153.10
	S7	15	3.43		92.09	112.70	20.61	99.80	7.71	12.90	0.71	8.42	12.19	167.32	144.86
D7	S2	3		3.38	89.77	111.03	21.26	96.79	7.02	14.24	0.72	7.74	13.52	202.85	174.73
	S5	10	4.08		87.21	107.63	20.42	94.84	7.63	12.79	0.83	8.46	11.96	167.63	141.28
	S8	15	2.69		89.31	110.87	21.56	97.38	8.07	13.49	0.58	8.65	12.91	167.16	149.25
G4	S2	2	7.68		92.40	114.77	22.37	99.69	7.29	15.08	1.72	9.01	13.36	206.86	148.33
	S3	5	7.16		88.97	109.28	20.31	95.63	6.66	13.45	1.45	8.31	12.00	196.06	144.28
	S4	9		7.42	92.18	112.67	20.49	99.29	7.11	13.38	1.52	8.63	11.86	188.19	137.42
	S5	11		7.42	88.70	109.79	21.09	96.11	7.41	13.68	1.56	8.97	12.12	184.62	134.99
	S6	14		7.42	88.75	108.99	20.24	95.97	7.22	13.02	1.50	8.72	11.52	180.33	132.06
G8	S1	1		5.09	93.48	113.72	20.24	99.82	6.34	13.90	1.03	7.37	12.87	219.24	174.62
	S2	3		5.09	87.36	108.33	20.97	93.93	6.57	14.40	1.07	7.64	13.33	219.18	174.57
	S3	5	6.87		88.10	112.21	24.11	96.09	7.99	16.12	1.66	9.65	14.46	201.75	149.94
	S4	7		5.09	93.01	113.13	20.12	99.86	6.85	13.27	1.02	7.87	12.25	193.72	155.52
	S5	10		5.09	88.42	108.77	20.35	96.03	7.61	12.74	1.04	8.65	11.70	167.41	135.37
	S6	12		5.09	92.06	112.74	20.66	99.77	7.69	12.97	1.05	8.74	11.92	168.66	136.34
	S7	15	3.31		87.89	108.90	21.01	96.13	8.24	12.77	0.70	8.94	12.07	154.98	135.13
K4	S2	3	15.12		93.17	113.25	20.08	96.76	5.61	14.47	3.04	8.65	11.43	257.93	132.24
	S4	7	25.86		95.34	117.00	21.66	101.26	5.94	15.72	5.60	11.54	10.12	264.65	87.67
	S5	10	16.77		89.52	109.79	20.27	96.67	7.15	13.12	3.40	10.55	9.72	183.50	92.15
K8	S3	5	9.78		94.96	115.95	20.99	102.04	7.08	13.91	2.05	9.13	11.86	196.47	129.83
	S5	10		14.68	88.54	108.64	20.10	95.61	7.07	13.03	2.95	10.02	10.08	184.30	100.59
	S6	12	19.58		92.19	113.06	20.87	98.82	6.63	14.24	4.09	10.72	10.15	214.78	94.75
	S7	16		14.68	87.96	109.06	21.10	95.87	7.91	13.19	3.10	11.01	10.09	166.75	91.69
O4	S1	1		8.08	88.58	108.66	20.08	95.19	6.61	13.47	1.62	8.23	11.85	203.78	143.91
	S2	3		8.08	92.32	112.85	20.53	99.26	6.94	13.59	1.66	8.60	11.93	195.82	138.75
	S3	5	8.21		92.18	114.36	22.18	99.92	7.74	14.44	1.82	9.56	12.62	186.56	131.98
	S4	7		8.08	92.09	113.86	21.77	99.19	7.10	14.67	1.76	8.86	12.91	206.62	145.74
	S5	10		8.08	89.41	110.58	21.17	94.40	4.99	16.18	1.71	6.70	14.47	324.25	215.94
	S6	12		8.08	87.27	107.42	20.15	94.40	7.13	13.02	1.63	8.76	11.39	162.61	130.07
	S7	15	7.95		92.15	112.96	20.81	100.03	7.88	12.93	1.65	9.53	11.28	164.09	118.26
O8	S2	3		4.13	87.22	109.51	22.29	94.15	6.93	15.36	0.92	7.85	14.44	221.65	183.93
	S3	5		4.13	89.52	110.58	21.06	95.94	6.42	14.64	0.87	7.29	13.77	228.04	188.90
	S4	7	5.17		93.00	113.25	20.25	100.49	7.49	12.76	1.05	8.54	11.71	170.36	137.20
	S5	10	3.09		94.84	117.07	22.23	103.55	8.71	13.52	0.69	9.40	12.83	155.22	136.57
S5	S3	5	4.42		92.08	113.26	21.18	99.31	7.23	13.95	0.94	8.17	13.01	192.95	159.36
	S6	12	3.21		89.89	109.40	19.51	95.52	5.63	13.88	0.63	6.26	13.25	246.54	211.85
	S7	15	8.02		88.43	110.42	21.99	97.07	8.64	13.35	1.76	10.40	11.59	154.51	111.37
S7	S1	1		5.31	94.79	117.59	22.80	101.55	6.76	16.04	1.21	7.97	14.83	237.28	186.05
	S2	3	4.70									0.00			
	S3	5		5.31	88.76	110.03	21.27	95.96	7.20	14.07	1.13	8.33	12.94	195.42	155.36
	S5	10		5.31	88.84	109.18	20.34	96.59	7.75	12.59	1.08	8.83	11.51	162.45	130.35
	S7	15	5.92		92.27	114.26	21.99	100.77	8.50	13.49	1.30	9.80	12.19	158.71	124.35

Moisture Contents

Permeability/Gradient Ratio Tests

Pond 15S- Laboratory Data

Boring No.	Sample No.	Depth (feet)	Phos. content (measure	Phos. content (assumed)	Uncorrected Weights (grams)						Phos. Wt. (g)	Corrected Weights (grams)		MC (uncorr) (%)	MC (corr) (%)
					Flask	Wet Sample + Flask	Wet Sample	Dry Sample + Flask	Dry Sample	Water		Dry Sample	Water		
D7	composite	0-10		3.38	92.08	126.65	34.57	107.21	15.13	19.44	1.17	16.30	18.27	128.49	112.11
G8	S6 & S7	12,15	3.31		94.79	141.60	46.81	115.30	20.51	26.30	1.55	22.06	24.75	128.23	112.20
O4 (1)	S2,S3,S4	3,5,7	8.21		87.97	111.88	23.91	97.14	9.17	14.74	1.96	11.13	12.78	160.74	114.77
O4 (2)	S2,S3,S4	3,5,7	8.21		91.51	104.15	12.64	96.84	5.33	7.31	1.04	6.37	6.27	137.15	98.50
O4 (3)	S2,S3,S4	3,5,7	8.21		89.00	113.78	24.78	102.10	13.10	11.68	2.03	15.13	9.65	89.16	63.73

Note: Sample D7 Composite was obtained from soil directly above fabric after gradient ratio test was complete
Sample G8- S6 & S7 was obtained from lower portion of permeability test after test was complete
Sample O4 (1)- S1,S2,S3 was obtained from lower portion of permeability test after test stage at head of 5' was complete
Sample O4 (2)- S1,S2,S3 was obtained from lower portion of permeability test after test stage at head of 9' was complete
Sample O4 (3)- S1,S2,S3 was obtained from lower portion of permeability test after test stage at head of 13.5' was complete

APPENDIX B

ATTERBERG LIMIT TESTS
DATA - CALCULATIONS

Atterberg Limits

Pond 15S- Laboratory Data

LIQUID LIMIT

Boring No.	Sample No.	Depth (feet)	Phos. content (measure	Uncorrected Weights (grams) Flask	Wet Sample + Flask	Wet Sample	Dry Sample + Flask	Dry Sample	Water	Phos. Wt. (g)	Corrected Weights (grams) Dry Sample	Water	NO. DROPS	DROPS CORR. VALUE	LL (uncorr) (%)	LL (corr) (%)
D7	S8	15	2.69	88.86	98.57	9.71	93.67	4.81	4.90	0.26	5.07	4.64	25	1.000	101.87	91.47
G4	S2	2	7.68	92.51	100.97	8.46	96.71	4.20	4.26	0.65	4.85	3.61	32	1.030	104.50	76.70
G8	S8	15	3.31	103.94	114.55	10.61	109.35	5.41	5.20	0.35	5.76	4.65	26	1.005	96.58	84.56
K4	S2	3	15.12	92.74	103.45	10.71	97.63	4.89	5.82	1.62	6.51	4.20	32	1.030	122.63	66.49
K8	S5	10	19.58	89.74	102.01	12.27	95.67	5.93	6.34	2.40	8.33	3.94	30	1.022	109.30	48.31
O4	S3	5	8.21	87.09	100.96	13.87	93.61	6.52	7.35	1.14	7.66	6.21	26	1.005	113.27	81.49
O8	S5	10	3.09	89.53	98.98	9.45	94.90	5.37	4.08	0.29	5.66	3.79	25	1.000	75.98	66.90
S5	S6	12	3.21	89.51	98.74	9.23	94.25	4.74	4.49	0.30	5.04	4.19	25	1.000	94.73	83.27
S5	S7	15	8.02	89.75	100.47	10.72	95.95	6.20	4.52	0.86	7.06	3.66	31	1.028	74.83	53.21
S7	S3	5	5.31	92.44	101.37	8.93	97.12	4.68	4.25	0.47	5.15	3.78	26	1.005	91.24	73.81

PLASTIC LIMIT/PLASTICITY INDEX

Boring No.	Sample No.	Depth (feet)	Phos. content (measure	Uncorrected Weights (grams) Flask	Wet Sample + Flask	Wet Sample	Dry Sample + Flask	Dry Sample	Water	Phos. Wt. (g)	Corrected Weights (grams) Dry Sample	Water	PL (uncorr) (%)	PL (corr) (%)	PI (uncorr) (%)	PI (corr) (%)
D7	S8	15	2.69	89.87	91.83	1.96	90.96	1.09	0.87	0.05	1.14	0.82	79.82	71.52	22.05	19.95
G4	S2	2	7.68	91.40	95.97	4.57	94.07	2.67	1.90	0.35	3.02	1.55	71.16	51.28	33.34	25.42
G8	S8	15	3.31	103.29	108.01	4.72	106.01	2.72	2.00	0.16	2.88	1.84	73.53	64.10	23.05	20.46
K4	S2	3	15.12	90.09	98.68	8.59	94.22	4.13	4.46	1.30	5.43	3.16	107.99	58.23	14.64	8.26
K8	S5	10	19.58	91.59	95.83	4.24	93.81	2.22	2.02	0.83	3.05	1.19	90.99	39.01	18.31	9.30
O4	S3	5	8.21	89.00	99.28	10.28	94.76	5.76	4.52	0.84	6.60	3.68	78.47	55.66	34.79	25.82
O8	S5	10	3.09	87.07	93.04	5.97	90.76	3.69	2.28	0.18	3.87	2.10	61.79	54.09	14.19	12.82
S5	S6	12	3.21	89.04	93.28	4.24	91.56	2.52	1.72	0.14	2.66	1.58	68.25	59.63	26.47	23.64
S5	S7	15	8.02	88.86	95.29	6.43	92.47	3.61	2.82	0.52	4.13	2.30	78.12	55.85	-3.29	-2.64
S7	S3	5	5.31	88.55	92.34	3.79	90.81	2.26	1.53	0.20	2.46	1.33	67.70	53.99	23.54	19.62

APPENDIX C

SPECIFIC GRAVITY TESTS
DATA - CALCULATIONS

Specific Gravity

Pond 15S- Laboratory Data

Boring No.	Sample No.	Depth (feet)	Cal. Flask Volume	Dry Sample	Dry Sample +Flask Vol	Flask+Soil +Water	Displaced Water	Temp. of Water & Soil	Temp. Corr. Factor	Specific Gravity	Average Specific Gravity
D7	S5	10	362.30	23.25	385.55	377.20	8.35	22	0.9996	2.783	
			338.21	25.00	363.21	354.13	9.08	19	1.0002	2.754	2.769
G8	S3	5	362.30	20.22	382.52	375.10	7.42	20	1.0000	2.725	
			360.04	23.47	383.51	375.00	8.51	19	1.0002	2.758	2.742
O8	S4	7	359.68	16.23	375.91	369.71	6.20	19	1.0002	2.618	2.618

APPENDIX D

GRADATION/HYDROMETER TESTS
DATA - CALCULATIONS

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 54.30 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		54.30	100.0
NO. 40		54.28	100.0
NO. 50		54.28	100.0
NO. 100		54.25	99.9
NO. 200		54.20	99.8

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	20.61
DRY	7.71
MC%	167.32

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	20.61
DRY	7.71
MC%	167.3%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 54.68

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.6

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				55	99	62	0.01312	6.1	0.023
5				54	98	61	0.01312	6.3	0.015
15				51	92	58	0.01312	6.8	0.009
30				46	83	53	0.01312	7.6	0.007
60				40	72	47	0.01312	8.6	0.005
250				29	52	36	0.01328	10.4	0.003
1440				18	33	25	0.01361	12.2	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 58.41 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		58.41	100.0
NO. 40		58.39	100.0
NO. 50		58.11	99.5
NO. 100		58.01	99.3
NO. 200		57.71	98.8

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	21.26
DRY	7.02
MC%	202.85

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	21.26
DRY	7.02
MC%	202.8%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 58.41

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				60		66	0.01312	5.5	0.022
5				57	96	63	0.01312	6.0	0.014
15				52	88	58	0.01312	6.8	0.009
30				46	78	52	0.01312	7.8	0.007
60				40	68	46	0.01312	8.8	0.005
250				30	51	36	0.01328	10.4	0.003
1440				18	30	25	0.01361	12.2	0.001

SIEVE/HYDROMETER WORKSHEET

Loc.

SAMPLE WEIGHT (dry)

ON + NO. 4

SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 53.97 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		53.97	100.0
NO. 40		53.93	99.9
NO. 50		53.93	99.9
NO. 100		53.87	99.8
NO. 200		53.78	99.6

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	21.09
DRY	7.41
MC%	184.62

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	21.09
DRY	7.41
MC%	184.6%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 53.97

SPECIFIC GRAVITY 6

MENISCUS CORR.

CYLINDER NO.

CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				58	106	65	0.01328	5.6	0.022
5				54	99	61	0.01328	6.3	0.015
22				48	88	55	0.01328	7.3	0.008
30				43	79	50	0.01328	8.1	0.007
68				36	66	43	0.01328	9.2	0.005
278				28	51	35	0.01328	10.6	0.003
1440				20	37	27	0.01396	11.9	0.001

SIEVE/HYDROMETER WORKSHEET

roject #
roject
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 50.20 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING	MOISTURE CORRECTIO		NATURAL M.C.	
NO .10			100.0	WET+DISH		WET+DISH	
NO. 16		50.20	100.0	DRY+DISH		DRY+DISH	
NO. 40		50.18	100.0	DISH		DISH	
NO. 50		50.20	100.0	WET	21.01	WET	21.01
NO. 100		50.17	99.9	DRY	8.24	DRY	8.24
NO. 200		50.17	99.9	MC%	154.98	MC%	155.0%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 50.20

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				54	108	61	0.01328	6.3	0.024
5				53	104	60	0.01328	6.5	0.015
15				50	98	57	0.01328	6.9	0.009
30				46	91	53	0.01328	7.6	0.007
76				41	81	48	0.01328	8.4	0.004
288				32	63	39	0.01328	9.9	0.002
1440				20	39	27	0.01396	11.9	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 52.00 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING	MOISTURE CORRECTIO		NATURAL M.C.	
NO .10			100.0	WET+DISH		WET+DISH	
NO. 16		52.00	100.0	DRY+DISH		DRY+DISH	
NO. 40		51.94	99.9	DISH		DISH	
NO. 50		52.00	100.0	WET	20.27	WET	20.27
NO. 100		51.35	98.8	DRY	7.15	DRY	7.15
NO. 200		50.06	96.3	MC%	183.50	MC%	183.5%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 52.00

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				53	101	59	0.01312	6.6	0.024
5				45	86	51	0.01312	7.9	0.017
15				37	70	43	0.01312	9.2	0.010
30				32	61	38	0.01312	10.1	0.008
60				29	55	35	0.01312	10.6	0.006
257				24	46	30	0.01328	11.4	0.003
1451				14	27	21	0.01361	12.9	0.001

SIEVE/HYDROMETER WORKSHEET

roject #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 67.58 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		67.58	100.0
NO. 40		67.57	100.0
NO. 50		67.42	99.8
NO. 100		67.42	99.8
NO. 200		67.11	99.3

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	20.99
DRY	7.08
MC%	196.47

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	20.99
DRY	7.08
MC%	196.5%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 67.58

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				65	95	71	0.01312	4.7	0.020
5				63	92	69	0.01312	5.0	0.013
15				60	88	66	0.01312	5.5	0.008
30				56	82	62	0.01312	6.1	0.006
60				50	73	56	0.01312	7.1	0.005
293				39	57	45	0.01328	8.9	0.002
1440				27	40	34	0.01361	10.7	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 53.81 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		53.81	100.0
NO. 40		53.79	100.0
NO. 50		53.81	100.0
NO. 100		53.77	99.9
NO. 200		53.73	99.9

MOISTURE CORRECTIO		NATURAL M.C.	
WET+DISH		WET+DISH	
DRY+DISH		DRY+DISH	
DISH		DISH	
WET	21.77	WET	21.77
DRY	7.1	DRY	7.1
MC%	206.62	MC%	206.6%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 53.61

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				54	99	61	0.01328	6.3	0.024
5				49	90	56	0.01328	7.1	0.016
15				42	77	49	0.01328	8.3	0.010
31				36	66	43	0.01328	9.2	0.007
84				29	53	36	0.01328	10.4	0.005
265				24	44	31	0.01328	11.2	0.003
1440				17	31	24	0.01396	12.4	0.001

SIEVE/HYDROMETER WORKSHEET

[redacted]

[redacted]

a Loc. [redacted]

AL SAMPLE WEIGHT (dry) [redacted]

TION + NO. 4

SIZE	WEIGHT RETAINED	PERCENT PASSING
5"	[redacted]	100
3"	[redacted]	100
1-1/2"	[redacted]	100
3/4"	[redacted]	100
3/8"	[redacted]	100
NO. 4	[redacted]	100

ON -NO. 4

SAMPLE WEIGHT (DRY) 47.89 Sample Wet Weight [redacted]

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10	[redacted]		100.0
NO. 16	[redacted]	47.89	100.0
NO. 40	[redacted]	47.87	100.0
NO. 50	[redacted]	47.89	100.0
NO. 100	[redacted]	47.86	99.9
NO. 200	[redacted]	47.84	99.9

MOISTURE CORRECTIO	
WET+DISH	[redacted]
DRY+DISH	[redacted]
DISH	[redacted]
WET	21.06
DRY	6.42
MC%	228.04

NATURAL M.C.	
WET+DISH	[redacted]
DRY+DISH	[redacted]
DISH	[redacted]
WET	21.06
DRY	6.42
MC%	228.0%

HYDROMETER

SAMPLE WEIGHT (WET) [redacted]

Wc 47.89

SPECIFIC GRAVITY [redacted] 6

MENISCUS CORR. [redacted]

CYLINDER NO. [redacted]

CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2	[redacted]	[redacted]	[redacted]	56	116	63	0.01328	6.0	0.023
5	[redacted]	[redacted]	[redacted]	51	105	58	0.01328	6.8	0.015
15	[redacted]	[redacted]	[redacted]	42	87	49	0.01328	8.3	0.010
31	[redacted]	[redacted]	[redacted]	36	74	43	0.01328	9.2	0.007
84	[redacted]	[redacted]	[redacted]	33	68	40	0.01328	9.7	0.005
265	[redacted]	[redacted]	[redacted]	28	58	35	0.01328	10.6	0.003
1440	[redacted]	[redacted]	[redacted]	21	43	28	0.01396	11.7	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 54.27 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO. 10			100.0
NO. 16		54.27	100.0
NO. 40		54.26	100.0
NO. 50		54.27	100.0
NO. 100		54.23	99.9
NO. 200		54.22	99.9

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	21.51
DRY	7.63
MC%	181.91

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	21.51
DRY	7.63
MC%	181.9%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 54.27

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				53	97	60	0.01328	6.5	0.024
5				52	95	59	0.01328	6.6	0.015
15				47	86	54	0.01328	7.4	0.009
31				41	75	48	0.01328	8.4	0.007
60				37	67	44	0.01328	9.1	0.005
254				26	47	33	0.01328	10.9	0.003
1405				16	29	23	0.01328	12.5	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry)

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY) 50.79 Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO .10			100.0
NO. 16		50.79	100.0
NO. 40		50.79	100.0
NO. 50		50.79	100.0
NO. 100		50.79	100.0
NO. 200		50.78	100.0

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	23.3
DRY	7.26
MC%	220.94

NATURAL M.C.	
WET+DISH	
DRY+DISH	
DISH	
WET	23.3
DRY	7.26
MC%	220.9%

HYDROMETER

SAMPLE WEIGHT (WET) Wc 50.79

SPECIFIC GRAVITY 6
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				49	95	56	0.01328	7.1	0.025
5				44	86	51	0.01328	7.9	0.017
22				24	47	31	0.01328	11.2	0.009
30				22	43	29	0.01328	11.5	0.008
84				20	39	27	0.01328	11.9	0.005
265				13	25	20	0.01328	13.0	0.003
1402				10	19	16	0.01396	13.7	0.001

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry) 312.48

PORTION + NO. 4

SIEVE SIZE	WEIGHT RETAINED	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

PORTION -NO. 4

SAMPLE WEIGHT (DRY)

Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO. 8(10)			100
NO. 16		99.806576	100
NO. 30(40)		12.856576	13
NO. 50		3.2565764	3
NO. 100		0.2265764	0
NO. 200		0.1165764	0

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	56.87
DRY	56.76
MC%	0.19

HYDROMETER

SAMPLE WEIGHT (WET)

Wc 99.81

SPECIFIC GRAVITY 5
MENISCUS CORR.

CYLINDER NO.
CYLINDER ARE 27.8

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				0	0	6	0.01382	15.3	0.038
5				0	0	6	0.01382	15.3	0.024
15				0	0	6	0.01382	15.3	0.014
30				0	0	6	0.01382	15.3	0.010
60				0	0	6	0.01382	15.3	0.007
250				0	0	6	0.01417	15.3	0.004
1440				0	0	6	ERR	15.3	ERR

SIEVE/HYDROMETER WORKSHEET

Project #
Project
Sample Loc.

TOTAL SAMPLE WEIGHT (dry) 113.56

PORTION + NO. 4

SIEVE SIZE	WEIGHT R •	PERCENT PASSING
5"		100
3"		100
1-1/2"		100
3/4"		100
3/8"		100
NO. 4		100

8

PORTION -NO. 4

SAMPLE WEIGHT (DRY) Sample Wet Weight

SIEVE SIZE	Weight Retained	Weight Passing	% PASSING
NO. 8(10)			100
NO. 16		99.483696	100
NO. 30(40)		12.673696	13
NO. 50		3.6336979	4
NO. 100		0.5738979	1
NO. 200		0.7738979	1

MOISTURE CORRECTIO	
WET+DISH	
DRY+DISH	
DISH	
WET	14.11
DRY	14.04
MC%	0.50

HYDROMETER

SAMPLE WEIGHT (WET)
Wc 99.50
SPECIFIC GRAVITY 5
MENISCUS CORR.
CYLINDER NO. •
CYLINDER ARE 27.6

ELAPSED TIME (MINUTES)	HYDROMETER READING	TEMP.	STD HYD READING	CORR. HYD READING	PERCENT FINER	MENISCUS CORR. HYD	K	L	DIAMETER (mm)
2				1	1	7	0.01382	15.1	0.038
5				1	1	7	0.01382	15.1	0.024
15				1	1	7	0.01382	15.1	0.014
30				0	0	6	0.01382	15.3	0.010
60				0	0	6	0.01382	15.3	0.007
250				0	0	6	0.01417	15.3	0.004
1440				0	0	6	ERR	15.3	ERR

APPENDIX E

CONSOLIDATION TESTS DATA - CALCULATIONS

One Dimensional Consolidation

Project No.	41194	
Project	FMC Pond 15S	
Sample ID	D7-S5 @ 10'	
Sample Ht.	1.878	(in)
Sample Dia.	4.000	(in)
Sample Area	0.087	(sq-ft)
Sample Vol.	0.014	(cu-ft)
Phos Cont.	4.08	(%)
Init. M.C.	167.63	(%)
Init. M.C. (corr)	141.28	(%)
Final M.C.	103.14	(%)
Final M.C. (corr	87.59	(%)
Dry Wt. of Soil/f	237.25	(g)
Dry Wt. of Soil/i	216.97	(g)
Spec. Grav.	2.7	
Pocket Pen.	0.55	(tsf)
Dial Reset	0.4362	2000 psf

Moisture Content Weights	
(initial)	
Total Wet Wt. (g)	20.42
Phos. Wt. (g)	0.83
Dry Wt. (g)	7.63
Dry Wt. + Phos Wt. (g)	8.46
Water Wt. + Phos (g)	12.79
Water Wt. (g)	11.96
(final)	
Total Wet Wt. (g)	64.11
Phos. Wt. (g)	2.62
Dry Wt. (g)	31.56
Dry Wt. + Phos Wt. (g)	34.18
Water Wt. + Phos (g)	32.55
Water Wt. (g)	29.93

Pressure (psf)	Final Dial Reading (inches)	Deformation (inches)	Sample Ht. (inches)	Strain (%)	Void Ratio e	Dry Density (pcf)	Void Ratio e	Dry Density (pcf)
					Calc. from final MC		Calc. from initial MC	
0.001	0.4363	0.0000	1.8780	0	3.403	38.26	3.815	34.99
0.0100	0.4225	0.0138	1.8642	0.73	3.371	38.55	3.779	35.25
0.0250	0.3586	0.0777	1.8003	4.14	3.221	39.92	3.615	36.50
0.0500	0.3209	0.1154	1.7626	6.14	3.133	40.77	3.519	37.28
0.1000	0.2785	0.1578	1.7202	8.40	3.033	41.77	3.410	38.20
0.2500	0.2190	0.2173	1.6607	11.57	2.894	43.27	3.258	39.57
0.5000	0.1657	0.2706	1.6074	14.41	2.769	44.71	3.121	40.88
1.0000	0.1058	0.3305	1.5475	17.60	2.628	46.44	2.967	42.47
2.0000	0.0377	0.3986	1.4794	21.22	2.469	48.57	2.793	44.42
4.0000	0.3920	0.4428	1.4352	23.58	2.365	50.07	2.679	45.79

Note: Initial MC not taken from actual sample testd, but fro same sample jar.
Final MC taken from actual sample tested.
Void Ratio (e), calculated from final MC likely to be most accurate.

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4363	0	0.4357	0	0.3586	0
0.17	0.41	0.4363	0	0.4238	-0.0119	0.3574	-0.0012
0.33	0.58	0.4363	0	0.4233	-0.0124	0.3569	-0.0017
0.50	0.71	0.4363	0	0.4229	-0.0128	0.3565	-0.0021
0.67	0.82	0.4362	-0.0001	0.4225	-0.0132	0.3561	-0.0025
0.83	0.91	0.4362	-0.0001	0.4221	-0.0136	0.3559	-0.0027
1.00	1.00	0.4363	0	0.4219	-0.0138	0.3555	-0.0031
1.17	1.08	0.4362	-0.0001	0.4215	-0.0142	0.3553	-0.0033
1.33	1.15	0.4362	-0.0001	0.4212	-0.0145	0.3549	-0.0037
1.50	1.22	0.4362	-0.0001	0.4208	-0.0149	0.3547	-0.0039
1.67	1.29	0.4362	-0.0001	0.4206	-0.0151	0.3544	-0.0042
1.83	1.35	0.4363	0	0.4202	-0.0155	0.3541	-0.0045
2.00	1.41	0.4362	-0.0001	0.42	-0.0157	0.3539	-0.0047
2.17	1.47	0.4362	-0.0001	0.4196	-0.0161	0.3537	-0.0049
2.33	1.53	0.4362	-0.0001	0.4194	-0.0163	0.3533	-0.0053
2.50	1.58	0.4362	-0.0001	0.4192	-0.0165	0.3531	-0.0055
2.67	1.63	0.4362	-0.0001	0.4188	-0.0169	0.3528	-0.0058
2.83	1.68	0.4362	-0.0001	0.4185	-0.0172	0.3526	-0.006
3.00	1.73	0.4362	-0.0001	0.4183	-0.0174	0.3523	-0.0063
3.17	1.78	0.4362	-0.0001	0.418	-0.0177	0.3522	-0.0064
3.33	1.83	0.4362	-0.0001	0.4176	-0.0181	0.3519	-0.0067
3.50	1.87	0.4362	-0.0001	0.4174	-0.0183	0.3516	-0.007
3.67	1.91	0.4361	-0.0002	0.4171	-0.0186	0.3515	-0.0071
3.83	1.96	0.4362	-0.0001	0.4168	-0.0189	0.3512	-0.0074
4.00	2.00	0.4362	-0.0001	0.4166	-0.0191	0.3509	-0.0077
4.17	2.04	0.4363	0	0.4162	-0.0195	0.3507	-0.0079
4.33	2.08	0.4362	-0.0001	0.416	-0.0197	0.3505	-0.0081
4.50	2.12	0.4362	-0.0001	0.4158	-0.0199	0.3503	-0.0083
4.67	2.16	0.4362	-0.0001	0.4155	-0.0202	0.35	-0.0086
4.83	2.20	0.4362	-0.0001	0.4153	-0.0204	0.3499	-0.0087
5.00	2.24	0.4362	-0.0001	0.415	-0.0207	0.3496	-0.009
5.17	2.27	0.4362	-0.0001	0.4148	-0.0209	0.3494	-0.0092
5.33	2.31	0.4362	-0.0001	0.4145	-0.0212	0.3492	-0.0094
5.50	2.35	0.4362	-0.0001	0.4144	-0.0213	0.3491	-0.0095
5.67	2.38	0.4361	-0.0002	0.414	-0.0217	0.3488	-0.0098
5.83	2.42	0.4361	-0.0002	0.4137	-0.022	0.3486	-0.01
6.00	2.45	0.4361	-0.0002	0.4135	-0.0222	0.3484	-0.0102
6.17	2.48	0.4361	-0.0002	0.4133	-0.0224	0.3482	-0.0104

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.4361	-0.0002	0.4129	-0.0228	0.348	-0.0106
6.50	2.55	0.4359	-0.0004	0.4128	-0.0229	0.3478	-0.0108
6.67	2.58	0.4359	-0.0004	0.4124	-0.0233	0.3476	-0.011
6.83	2.61	0.4358	-0.0005	0.4121	-0.0236	0.3475	-0.0111
7.00	2.65	0.4359	-0.0004	0.412	-0.0237	0.3472	-0.0114
7.17	2.68	0.436	-0.0003	0.4116	-0.0241	0.3471	-0.0115
7.33	2.71	0.4359	-0.0004	0.4114	-0.0243	0.3468	-0.0118
7.50	2.74	0.4359	-0.0004	0.4112	-0.0245	0.3467	-0.0119
7.67	2.77	0.4359	-0.0004	0.4109	-0.0248	0.3465	-0.0121
7.83	2.80	0.4359	-0.0004	0.4108	-0.0249	0.3463	-0.0123
8.00	2.83	0.4359	-0.0004	0.4105	-0.0252	0.3461	-0.0125
8.17	2.86	0.4359	-0.0004	0.4103	-0.0254	0.346	-0.0126
8.33	2.89	0.4359	-0.0004	0.41	-0.0257	0.3458	-0.0128
8.50	2.92	0.4359	-0.0004	0.4097	-0.026	0.3457	-0.0129
8.67	2.94	0.4359	-0.0004	0.4096	-0.0261	0.3454	-0.0132
8.83	2.97	0.4359	-0.0004	0.4093	-0.0264	0.3453	-0.0133
9.00	3.00	0.4359	-0.0004	0.409	-0.0267	0.3451	-0.0135
9.17	3.03	0.4359	-0.0004	0.4088	-0.0269	0.3449	-0.0137
9.33	3.06	0.4359	-0.0004	0.4086	-0.0271	0.3447	-0.0139
9.50	3.08	0.4358	-0.0005	0.4083	-0.0274	0.3446	-0.014
9.67	3.11	0.4358	-0.0005	0.4082	-0.0275	0.3444	-0.0142
9.83	3.14	0.4358	-0.0005	0.4079	-0.0278	0.3443	-0.0143
10.00	3.16	0.4359	-0.0004	0.4077	-0.028	0.3441	-0.0145
10.17	3.19	0.4358	-0.0005	0.4075	-0.0282	0.3439	-0.0147
10.33	3.21	0.4359	-0.0004	0.4073	-0.0284	0.3437	-0.0149
10.50	3.24	0.4359	-0.0004	0.4071	-0.0286	0.3436	-0.015
10.67	3.27	0.4359	-0.0004	0.4068	-0.0289	0.3434	-0.0152
10.83	3.29	0.4359	-0.0004	0.4066	-0.0291	0.3433	-0.0153
11.00	3.32	0.4359	-0.0004	0.4064	-0.0293	0.3431	-0.0155
11.17	3.34	0.4359	-0.0004	0.4062	-0.0295	0.343	-0.0156
11.33	3.37	0.4359	-0.0004	0.4059	-0.0298	0.3429	-0.0157
11.50	3.39	0.4359	-0.0004	0.4057	-0.03	0.3427	-0.0159
11.67	3.42	0.4359	-0.0004	0.4055	-0.0302	0.3426	-0.016
11.83	3.44	0.4359	-0.0004	0.4052	-0.0305	0.3424	-0.0162
12.00	3.46	0.4359	-0.0004	0.405	-0.0307	0.3422	-0.0164
12.17	3.49	0.4359	-0.0004	0.4048	-0.0309	0.3421	-0.0165
12.33	3.51	0.4359	-0.0004	0.4047	-0.031	0.342	-0.0166
12.50	3.54	0.4358	-0.0005	0.4045	-0.0312	0.3419	-0.0167

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.4358	-0.0005	0.4042	-0.0315	0.3417	-0.0169
12.83	3.58	0.4358	-0.0005	0.4041	-0.0316	0.3416	-0.017
13.00	3.61	0.4359	-0.0004	0.4039	-0.0318	0.3414	-0.0172
13.17	3.63	0.4359	-0.0004	0.4036	-0.0321	0.3413	-0.0173
13.33	3.65	0.4359	-0.0004	0.4034	-0.0323	0.3412	-0.0174
13.50	3.67	0.4359	-0.0004	0.4033	-0.0324	0.341	-0.0176
13.67	3.70	0.4359	-0.0004	0.403	-0.0327	0.3408	-0.0178
13.83	3.72	0.4359	-0.0004	0.4028	-0.0329	0.3407	-0.0179
14.00	3.74	0.4359	-0.0004	0.4026	-0.0331	0.3406	-0.018
14.17	3.76	0.4359	-0.0004	0.4025	-0.0332	0.3405	-0.0181
14.33	3.79	0.4359	-0.0004	0.4022	-0.0335	0.3403	-0.0183
14.50	3.81	0.4359	-0.0004	0.4019	-0.0338	0.3402	-0.0184
14.67	3.83	0.4359	-0.0004	0.4018	-0.0339	0.3401	-0.0185
14.83	3.85	0.4359	-0.0004	0.4016	-0.0341	0.3399	-0.0187
15.83	3.98	0.4359	-0.0004	0.4004	-0.0353	0.3392	-0.0194
16.83	4.10	0.4359	-0.0004	0.3993	-0.0364	0.3385	-0.0201
17.83	4.22	0.4359	-0.0004	0.3982	-0.0375	0.3378	-0.0208
18.83	4.34	0.4358	-0.0005	0.3971	-0.0386	0.3372	-0.0214
19.83	4.45	0.4359	-0.0004	0.3959	-0.0398	0.3365	-0.0221
20.83	4.56	0.4359	-0.0004	0.395	-0.0407	0.3359	-0.0227
21.83	4.67	0.4358	-0.0005	0.394	-0.0417	0.3353	-0.0233
22.83	4.78	0.4358	-0.0005	0.393	-0.0427	0.3348	-0.0238
23.83	4.88	0.4358	-0.0005	0.392	-0.0437	0.3342	-0.0244
24.83	4.98	0.4358	-0.0005	0.3911	-0.0446	0.3337	-0.0249
25.83	5.08	0.4359	-0.0004	0.3902	-0.0455	0.3333	-0.0253
26.83	5.18	0.4358	-0.0005	0.3893	-0.0464	0.3328	-0.0258
27.83	5.28	0.4358	-0.0005	0.3885	-0.0472	0.3323	-0.0263
28.83	5.37	0.4358	-0.0005	0.3877	-0.048	0.3319	-0.0267
29.83	5.46	0.4358	-0.0005	0.3868	-0.0489	0.3315	-0.0271
30.83	5.55	0.4358	-0.0005	0.3861	-0.0496	0.3311	-0.0275
31.83	5.64	0.4357	-0.0006	0.3853	-0.0504	0.3308	-0.0278
32.83	5.73	0.4358	-0.0005	0.3846	-0.0511	0.3304	-0.0282
33.83	5.82	0.4358	-0.0005	0.3838	-0.0519	0.3301	-0.0285
34.83	5.90	0.4358	-0.0005	0.3832	-0.0525	0.3298	-0.0288
35.83	5.99	0.4357	-0.0006	0.3825	-0.0532	0.3295	-0.0291
36.83	6.07	0.4357	-0.0006	0.3819	-0.0538	0.3292	-0.0294
37.83	6.15	0.4357	-0.0006	0.3812	-0.0545	0.3289	-0.0297
38.83	6.23	0.4357	-0.0006	0.3806	-0.0551	0.3287	-0.0299

nple D7-S5 @ 10'

ime (inutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.4357	-0.0006	0.38	-0.0557	0.3284	-0.0302
0.83	6.39	0.4358	-0.0005	0.3795	-0.0562	0.3282	-0.0304
41.83	6.47	0.4358	-0.0005	0.3789	-0.0568	0.328	-0.0306
42.83	6.54	0.4358	-0.0005	0.3783	-0.0574	0.3278	-0.0308
43.83	6.62	0.4358	-0.0005	0.3777	-0.058	0.3276	-0.031
44.83	6.70	0.4358	-0.0005	0.3772	-0.0585	0.3273	-0.0313
45.83	6.77	0.4358	-0.0005	0.3767	-0.059	0.3271	-0.0315
46.83	6.84	0.4358	-0.0005	0.3761	-0.0596	0.327	-0.0316
47.83	6.92	0.4358	-0.0005	0.3756	-0.0601	0.3269	-0.0317
48.83	6.99	0.4357	-0.0006	0.3751	-0.0606	0.3267	-0.0319
49.83	7.06	0.4357	-0.0006	0.3746	-0.0611	0.3265	-0.0321
50.83	7.13	0.4357	-0.0006	0.3741	-0.0616	0.3264	-0.0322
51.83	7.20	0.4357	-0.0006	0.3736	-0.0621	0.3263	-0.0323
52.83	7.27	0.4358	-0.0005	0.3731	-0.0626	0.3261	-0.0325
53.83	7.34	0.4358	-0.0005	0.3727	-0.063	0.326	-0.0326
54.83	7.40	0.4358	-0.0005	0.3723	-0.0634	0.3258	-0.0328
55.83	7.47	0.4358	-0.0005	0.372	-0.0637	0.3256	-0.033
56.83	7.54	0.4358	-0.0005	0.3715	-0.0642	0.3256	-0.033
57.83	7.60	0.4358	-0.0005	0.3712	-0.0645	0.3255	-0.0331
58.83	7.67	0.4358	-0.0005	0.3708	-0.0649	0.3254	-0.0332
59.83	7.74	0.4358	-0.0005	0.3704	-0.0653	0.3253	-0.0333
60.83	7.80	0.4358	-0.0005	0.3701	-0.0656	0.3252	-0.0334
61.83	7.86	0.4358	-0.0005	0.3698	-0.0659	0.325	-0.0336
62.83	7.93	0.4358	-0.0005	0.3695	-0.0662	0.3249	-0.0337
63.83	7.99	0.4358	-0.0005	0.3691	-0.0666	0.3248	-0.0338
64.83	8.05	0.4358	-0.0005	0.3688	-0.0669	0.3248	-0.0338
65.83	8.11	0.4358	-0.0005	0.3685	-0.0672	0.3247	-0.0339
66.83	8.18	0.4358	-0.0005	0.3682	-0.0675	0.3247	-0.0339
67.83	8.24	0.4357	-0.0006	0.368	-0.0677	0.3246	-0.034
68.83	8.30	0.4357	-0.0006	0.3677	-0.068	0.3245	-0.0341
69.83	8.36	0.4357	-0.0006	0.3674	-0.0683	0.3244	-0.0342
70.83	8.42	0.4357	-0.0006	0.3673	-0.0684	0.3243	-0.0343
71.83	8.48	0.4358	-0.0005	0.367	-0.0687	0.3243	-0.0343
72.83	8.53	0.4358	-0.0005	0.3668	-0.0689	0.3241	-0.0345
73.83	8.59	0.4358	-0.0005	0.3665	-0.0692	0.3241	-0.0345
74.83	8.65	0.4357	-0.0006	0.3663	-0.0694	0.324	-0.0346
75.83	8.71	0.4357	-0.0006	0.3661	-0.0696	0.324	-0.0346
76.83	8.77	0.4357	-0.0006	0.3659	-0.0698	0.324	-0.0346

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.4357	-0.0006	0.3657	-0.07	0.324	-0.0346
78.83	8.88	0.4357	-0.0006	0.3656	-0.0701	0.3239	-0.0347
79.83	8.93	0.4357	-0.0006	0.3654	-0.0703	0.3239	-0.0347
80.83	8.99	0.4357	-0.0006	0.3652	-0.0705	0.3238	-0.0348
81.83	9.05	0.4357	-0.0006	0.365	-0.0707	0.3237	-0.0349
82.83	9.10	0.4357	-0.0006	0.3649	-0.0708	0.3237	-0.0349
83.83	9.16	0.4358	-0.0005	0.3648	-0.0709	0.3237	-0.0349
84.83	9.21	0.4357	-0.0006	0.3646	-0.0711	0.3236	-0.035
85.83	9.26	0.4357	-0.0006	0.3645	-0.0712	0.3236	-0.035
86.83	9.32	0.4357	-0.0006	0.3643	-0.0714	0.3235	-0.0351
87.83	9.37	0.4357	-0.0006	0.3642	-0.0715	0.3235	-0.0351
88.83	9.43	0.4357	-0.0006	0.3641	-0.0716	0.3234	-0.0352
89.83	9.48	0.4357	-0.0006	0.3641	-0.0716	0.3234	-0.0352
90.83	9.53	0.4357	-0.0006	0.364	-0.0717	0.3233	-0.0353
91.83	9.58	0.4357	-0.0006	0.3638	-0.0719	0.3233	-0.0353
92.83	9.64	0.4357	-0.0006	0.3637	-0.072	0.3233	-0.0353
93.83	9.69	0.4357	-0.0006	0.3636	-0.0721	0.3232	-0.0354
94.83	9.74	0.4357	-0.0006	0.3635	-0.0722	0.3232	-0.0354
95.83	9.79	0.4357	-0.0006	0.3634	-0.0723	0.3232	-0.0354
96.83	9.84	0.4358	-0.0005	0.3633	-0.0724	0.3232	-0.0354
97.83	9.89	0.4358	-0.0005	0.3633	-0.0724	0.3232	-0.0354
98.83	9.94	0.4358	-0.0005	0.3632	-0.0725	0.3231	-0.0355
99.83	9.99	0.4357	-0.0006	0.3631	-0.0726	0.3231	-0.0355
100.83	10.04	0.4357	-0.0006	0.363	-0.0727	0.3231	-0.0355
101.83	10.09	0.4357	-0.0006	0.363	-0.0727	0.323	-0.0356
102.83	10.14	0.4357	-0.0006	0.3629	-0.0728	0.323	-0.0356
103.83	10.19	0.4357	-0.0006	0.3628	-0.0729	0.323	-0.0356
104.83	10.24	0.4357	-0.0006	0.3627	-0.073	0.323	-0.0356
109.33	10.46	0.4357	-0.0006	0.3625	-0.0732	0.3228	-0.0358
114.33	10.69	0.4357	-0.0006	0.3622	-0.0735	0.3227	-0.0359
119.33	10.92	0.4357	-0.0006	0.3619	-0.0738	0.3225	-0.0361
124.33	11.15	0.4357	-0.0006	0.3618	-0.0739	0.3225	-0.0361
129.33	11.37	0.4357	-0.0006	0.3616	-0.0741	0.3224	-0.0362
134.33	11.59	0.4357	-0.0006	0.3615	-0.0742	0.3224	-0.0362
139.33	11.80	0.4357	-0.0006	0.3613	-0.0744	0.3224	-0.0362
144.33	12.01	0.4357	-0.0006	0.3611	-0.0746	0.3223	-0.0363
149.33	12.22	0.4357	-0.0006	0.361	-0.0747	0.3222	-0.0364
154.33	12.42	0.3966	-0.0397	0.361	-0.0747	0.3222	-0.0364

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3965	-0.0398	0.3609	-0.0748	0.3221	-0.0365
164.33	12.82	0.3965	-0.0398	0.3607	-0.075	0.322	-0.0366
169.33	13.01	0.3964	-0.0399	0.3607	-0.075	0.322	-0.0366
174.33	13.20	0.3963	-0.04	0.3606	-0.0751	0.3219	-0.0367
179.33	13.39	0.3961	-0.0402	0.3606	-0.0751	0.3219	-0.0367
184.33	13.58	0.3961	-0.0402	0.3605	-0.0752	0.3218	-0.0368
189.33	13.76	0.3966	-0.0397	0.3604	-0.0753	0.3217	-0.0369
194.33	13.94	0.3966	-0.0397	0.3604	-0.0753	0.3217	-0.0369
199.33	14.12	0.3967	-0.0396	0.3603	-0.0754	0.3218	-0.0368
204.33	14.29	0.3961	-0.0402	0.3603	-0.0754	0.3217	-0.0369
209.33	14.47	0.3957	-0.0406	0.3603	-0.0754	0.3216	-0.037
214.33	14.64	0.3956	-0.0407	0.3602	-0.0755	0.3215	-0.0371
219.33	14.81	0.3956	-0.0407	0.3602	-0.0755	0.3215	-0.0371
224.33	14.98	0.3956	-0.0407	0.3601	-0.0756	0.3214	-0.0372
229.33	15.14	0.3955	-0.0408	0.3601	-0.0756	0.3214	-0.0372
234.33	15.31	0.3954	-0.0409	0.3601	-0.0756	0.3213	-0.0373
239.33	15.47	0.3953	-0.041	0.36	-0.0757	0.3213	-0.0373
244.33	15.63	0.3952	-0.0411	0.36	-0.0757	0.3212	-0.0374
249.33	15.79	0.3951	-0.0412	0.36	-0.0757	0.3212	-0.0374
254.33	15.95	0.3948	-0.0415	0.36	-0.0757	0.3211	-0.0375
259.33	16.10	0.3948	-0.0415	0.3599	-0.0758	0.3211	-0.0375
264.33	16.26	0.3948	-0.0415	0.3599	-0.0758	0.3211	-0.0375
269.33	16.41	0.3947	-0.0416	0.3599	-0.0758	0.3211	-0.0375
274.33	16.56	0.3947	-0.0416	0.3599	-0.0758	0.321	-0.0376
279.33	16.71	0.3947	-0.0416	0.3599	-0.0758	0.321	-0.0376
284.33	16.86	0.3946	-0.0417	0.3598	-0.0759	0.321	-0.0376
289.33	17.01	0.3945	-0.0418	0.3598	-0.0759	0.321	-0.0376
294.33	17.16	0.3945	-0.0418	0.3598	-0.0759	0.3209	-0.0377
299.33	17.30	0.3946	-0.0417	0.3598	-0.0759	0.3209	-0.0377
304.33	17.45	0.3945	-0.0418	0.3598	-0.0759		
309.33	17.59	0.3945	-0.0418	0.3598	-0.0759		
314.33	17.73	0.3945	-0.0418	0.3597	-0.076		
319.33	17.87	0.3944	-0.0419	0.3597	-0.076		
324.33	18.01			0.3597	-0.076		
329.33	18.15			0.3597	-0.076		
334.33	18.28			0.3597	-0.076		
339.33	18.42			0.3597	-0.076		
344.33	18.56			0.3596	-0.0761		

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69			0.3597	-0.076		
354.33	18.82			0.3596	-0.0761		
369.33	19.22			0.3596	-0.0761		
384.33	19.60			0.3596	-0.0761		
399.33	19.98			0.3596	-0.0761		
414.33	20.36			0.3595	-0.0762		
429.33	20.72			0.3595	-0.0762		
444.33	21.08			0.3594	-0.0763		
459.33	21.43			0.3594	-0.0763		
474.33	21.78			0.3594	-0.0763		
489.33	22.12			0.3594	-0.0763		
504.33	22.46			0.3594	-0.0763		
519.33	22.79			0.3594	-0.0763		
534.33	23.12			0.3594	-0.0763		
549.33	23.44			0.3593	-0.0764		
564.33	23.76			0.3593	-0.0764		
579.33	24.07			0.3592	-0.0765		
594.33	24.38			0.3592	-0.0765		
609.33	24.68			0.3592	-0.0765		
624.33	24.99			0.3592	-0.0765		
639.33	25.29			0.3592	-0.0765		
654.33	25.58			0.3592	-0.0765		
669.33	25.87			0.3591	-0.0766		
684.33	26.16			0.3591	-0.0766		
699.33	26.44			0.3591	-0.0766		
714.33	26.73			0.359	-0.0767		
744.33	27.28			0.359	-0.0767		
774.33	27.83			0.3589	-0.0768		
804.33	28.36			0.3588	-0.0769		
834.33	28.88			0.3586	-0.0771		
864.33	29.40			0.3588	-0.0769		

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.3209	0	0.2785	0	0.219	0
0.17	0.41	0.3195	-0.0014	0.274	-0.0045	0.2147	-0.0043
0.33	0.58	0.3182	-0.0027	0.2703	-0.0082	0.2109	-0.0081
0.50	0.71	0.3175	-0.0034	0.2683	-0.0102	0.2088	-0.0102
0.67	0.82	0.3165	-0.0044	0.266	-0.0125	0.2063	-0.0127
0.83	0.91	0.316	-0.0049	0.2648	-0.0137	0.2048	-0.0142
1.00	1.00	0.3151	-0.0058	0.2627	-0.0158	0.2029	-0.0161
1.17	1.08	0.3146	-0.0063	0.2614	-0.0171	0.2017	-0.0173
1.33	1.15	0.3138	-0.0071	0.2599	-0.0186	0.1997	-0.0193
1.50	1.22	0.3133	-0.0076	0.2589	-0.0196	0.1988	-0.0202
1.67	1.29	0.3126	-0.0083	0.2573	-0.0212	0.1973	-0.0217
1.83	1.35	0.3122	-0.0087	0.2564	-0.0221	0.1963	-0.0227
2.00	1.41	0.3114	-0.0095	0.255	-0.0235	0.195	-0.024
2.17	1.47	0.3111	-0.0098	0.2541	-0.0244	0.1941	-0.0249
2.33	1.53	0.3105	-0.0104	0.253	-0.0255	0.1929	-0.0261
2.50	1.58	0.31	-0.0109	0.2521	-0.0264	0.1921	-0.0269
2.67	1.63	0.3095	-0.0114	0.2509	-0.0276	0.1911	-0.0279
2.83	1.68	0.3091	-0.0118	0.2502	-0.0283	0.1903	-0.0287
3.00	1.73	0.3085	-0.0124	0.2492	-0.0293	0.1889	-0.0301
3.17	1.78	0.3082	-0.0127	0.2485	-0.03	0.1883	-0.0307
3.33	1.83	0.3076	-0.0133	0.2476	-0.0309	0.1874	-0.0316
3.50	1.87	0.3073	-0.0136	0.2469	-0.0316	0.1869	-0.0321
3.67	1.91	0.3067	-0.0142	0.246	-0.0325	0.186	-0.033
3.83	1.96	0.3065	-0.0144	0.2454	-0.0331	0.1856	-0.0334
4.00	2.00	0.3059	-0.015	0.2445	-0.034	0.1848	-0.0342
4.17	2.04	0.3057	-0.0152	0.2439	-0.0346	0.1845	-0.0345
4.33	2.08	0.3051	-0.0158	0.2431	-0.0354	0.1838	-0.0352
4.50	2.12	0.3048	-0.0161	0.2427	-0.0358	0.1833	-0.0357
4.67	2.16	0.3043	-0.0166	0.2419	-0.0366	0.1829	-0.0361
4.83	2.20	0.3041	-0.0168	0.2414	-0.0371	0.1826	-0.0364
5.00	2.24	0.3036	-0.0173	0.2407	-0.0378	0.1821	-0.0369
5.17	2.27	0.3034	-0.0175	0.2403	-0.0382	0.1817	-0.0373
5.33	2.31	0.3029	-0.018	0.2396	-0.0389	0.1814	-0.0376
5.50	2.35	0.3027	-0.0182	0.2391	-0.0394	0.181	-0.038
5.67	2.38	0.3023	-0.0186	0.2386	-0.0399	0.1808	-0.0382
5.83	2.42	0.302	-0.0189	0.2382	-0.0403	0.1804	-0.0386
6.00	2.45	0.3016	-0.0193	0.2376	-0.0409	0.1801	-0.0389
6.17	2.48	0.3013	-0.0196	0.2373	-0.0412	0.1799	-0.0391

ıple D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.3009	-0.02	0.2367	-0.0418	0.1795	-0.0395
6.50	2.55	0.3007	-0.0202	0.2364	-0.0421	0.1793	-0.0397
6.67	2.58	0.3003	-0.0206	0.2359	-0.0426	0.1791	-0.0399
6.83	2.61	0.3001	-0.0208	0.2356	-0.0429	0.1789	-0.0401
7.00	2.65	0.2996	-0.0213	0.2352	-0.0433	0.1786	-0.0404
7.17	2.68	0.2995	-0.0214	0.235	-0.0435	0.1785	-0.0405
7.33	2.71	0.2991	-0.0218	0.2345	-0.044	0.1783	-0.0407
7.50	2.74	0.2989	-0.022	0.2342	-0.0443	0.1781	-0.0409
7.67	2.77	0.2986	-0.0223	0.2338	-0.0447	0.1779	-0.0411
7.83	2.80	0.2983	-0.0226	0.2336	-0.0449	0.1777	-0.0413
8.00	2.83	0.298	-0.0229	0.2333	-0.0452	0.1776	-0.0414
8.17	2.86	0.2978	-0.0231	0.233	-0.0455	0.1775	-0.0415
8.33	2.89	0.2974	-0.0235	0.2328	-0.0457	0.1773	-0.0417
8.50	2.92	0.2973	-0.0236	0.2325	-0.046	0.1772	-0.0418
8.67	2.94	0.297	-0.0239	0.2322	-0.0463	0.177	-0.042
8.83	2.97	0.2967	-0.0242	0.232	-0.0465	0.1769	-0.0421
9.00	3.00	0.2965	-0.0244	0.2317	-0.0468	0.1768	-0.0422
9.17	3.03	0.2963	-0.0246	0.2315	-0.047	0.1767	-0.0423
9.33	3.06	0.296	-0.0249	0.2312	-0.0473	0.1765	-0.0425
9.50	3.08	0.2957	-0.0252	0.2312	-0.0473	0.1764	-0.0426
9.67	3.11	0.2955	-0.0254	0.2309	-0.0476	0.1763	-0.0427
9.83	3.14	0.2953	-0.0256	0.2308	-0.0477	0.1762	-0.0428
10.00	3.16	0.295	-0.0259	0.2305	-0.048	0.1761	-0.0429
10.17	3.19	0.2949	-0.026	0.2304	-0.0481	0.1761	-0.0429
10.33	3.21	0.2947	-0.0262	0.2302	-0.0483	0.1759	-0.0431
10.50	3.24	0.2945	-0.0264	0.23	-0.0485	0.1758	-0.0432
10.67	3.27	0.2942	-0.0267	0.2298	-0.0487	0.1757	-0.0433
10.83	3.29	0.2941	-0.0268	0.2296	-0.0489	0.1756	-0.0434
11.00	3.32	0.2939	-0.027	0.2296	-0.0489	0.1755	-0.0435
11.17	3.34	0.2937	-0.0272	0.2294	-0.0491	0.1754	-0.0436
11.33	3.37	0.2934	-0.0275	0.2292	-0.0493	0.1754	-0.0436
11.50	3.39	0.2933	-0.0276	0.2291	-0.0494	0.1753	-0.0437
11.67	3.42	0.2931	-0.0278	0.2289	-0.0496	0.1753	-0.0437
11.83	3.44	0.2929	-0.028	0.2288	-0.0497	0.1752	-0.0438
12.00	3.46	0.2926	-0.0283	0.2287	-0.0498	0.1751	-0.0439
12.17	3.49	0.2925	-0.0284	0.2286	-0.0499	0.1751	-0.0439
12.33	3.51	0.2924	-0.0285	0.2284	-0.0501	0.175	-0.044
12.50	3.54	0.2922	-0.0287	0.2283	-0.0502	0.1749	-0.0441

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.292	-0.0289	0.2282	-0.0503	0.1748	-0.0442
12.83	3.58	0.2918	-0.0291	0.2281	-0.0504	0.1748	-0.0442
13.00	3.61	0.2917	-0.0292	0.228	-0.0505	0.1747	-0.0443
13.17	3.63	0.2915	-0.0294	0.228	-0.0505	0.1747	-0.0443
13.33	3.65	0.2913	-0.0296	0.2278	-0.0507	0.1746	-0.0444
13.50	3.67	0.2911	-0.0298	0.2278	-0.0507	0.1746	-0.0444
13.67	3.70	0.291	-0.0299	0.2276	-0.0509	0.1745	-0.0445
13.83	3.72	0.2909	-0.03	0.2275	-0.051	0.1745	-0.0445
14.00	3.74	0.2907	-0.0302	0.2274	-0.0511	0.1744	-0.0446
14.17	3.76	0.2906	-0.0303	0.2273	-0.0512	0.1744	-0.0446
14.33	3.79	0.2904	-0.0305	0.2273	-0.0512	0.1743	-0.0447
14.50	3.81	0.2903	-0.0306	0.2273	-0.0512	0.1743	-0.0447
14.67	3.83	0.2902	-0.0307	0.2272	-0.0513	0.1742	-0.0448
14.83	3.85	0.2901	-0.0308	0.2271	-0.0514	0.1742	-0.0448
15.83	3.98	0.2893	-0.0316	0.2266	-0.0519	0.1739	-0.0451
16.83	4.10	0.2886	-0.0323	0.2263	-0.0522	0.1737	-0.0453
17.83	4.22	0.288	-0.0329	0.2259	-0.0526	0.1734	-0.0456
18.83	4.34	0.2875	-0.0334	0.2257	-0.0528	0.1732	-0.0458
19.83	4.45	0.287	-0.0339	0.2255	-0.053	0.173	-0.046
20.83	4.56	0.2865	-0.0344	0.2252	-0.0533	0.1729	-0.0461
21.83	4.67	0.2862	-0.0347	0.225	-0.0535	0.1728	-0.0462
22.83	4.78	0.2859	-0.035	0.2249	-0.0536	0.1726	-0.0464
23.83	4.88	0.2855	-0.0354	0.2247	-0.0538	0.1725	-0.0465
24.83	4.98	0.2853	-0.0356	0.2245	-0.054	0.1723	-0.0467
25.83	5.08	0.285	-0.0359	0.2244	-0.0541	0.1722	-0.0468
26.83	5.18	0.2847	-0.0362	0.2242	-0.0543	0.1721	-0.0469
27.83	5.28	0.2845	-0.0364	0.2241	-0.0544	0.172	-0.047
28.83	5.37	0.2843	-0.0366	0.2241	-0.0544	0.1719	-0.0471
29.83	5.46	0.284	-0.0369	0.224	-0.0545	0.1718	-0.0472
30.83	5.55	0.2839	-0.037	0.2239	-0.0546	0.1717	-0.0473
31.83	5.64	0.2838	-0.0371	0.2238	-0.0547	0.1716	-0.0474
32.83	5.73	0.2835	-0.0374	0.2237	-0.0548	0.1715	-0.0475
33.83	5.82	0.2833	-0.0376	0.2235	-0.055	0.1714	-0.0476
34.83	5.90	0.2832	-0.0377	0.2235	-0.055	0.1714	-0.0476
35.83	5.99	0.2831	-0.0378	0.2234	-0.0551	0.1713	-0.0477
36.83	6.07	0.283	-0.0379	0.2233	-0.0552	0.1713	-0.0477
37.83	6.15	0.2829	-0.038	0.2233	-0.0552	0.1712	-0.0478
38.83	6.23	0.2828	-0.0381	0.2233	-0.0552	0.1711	-0.0479

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.2827	-0.0382	0.2231	-0.0554	0.171	-0.048
40.83	6.39	0.2826	-0.0383	0.2231	-0.0554	0.171	-0.048
41.83	6.47	0.2825	-0.0384	0.223	-0.0555	0.1709	-0.0481
42.83	6.54	0.2824	-0.0385	0.2229	-0.0556	0.1709	-0.0481
43.83	6.62	0.2823	-0.0386	0.2229	-0.0556	0.1708	-0.0482
44.83	6.70	0.2823	-0.0386	0.2228	-0.0557	0.1708	-0.0482
45.83	6.77	0.2822	-0.0387	0.2228	-0.0557	0.1707	-0.0483
46.83	6.84	0.2821	-0.0388	0.2226	-0.0559	0.1707	-0.0483
47.83	6.92	0.2819	-0.039	0.2225	-0.056	0.1706	-0.0484
48.83	6.99	0.2818	-0.0391	0.2225	-0.056	0.1706	-0.0484
49.83	7.06	0.2817	-0.0392	0.2225	-0.056	0.1706	-0.0484
50.83	7.13	0.2816	-0.0393	0.2225	-0.056	0.1706	-0.0484
51.83	7.20	0.2816	-0.0393	0.2225	-0.056	0.1705	-0.0485
52.83	7.27	0.2815	-0.0394	0.2224	-0.0561	0.1705	-0.0485
53.83	7.34	0.2815	-0.0394	0.2224	-0.0561	0.1704	-0.0486
54.83	7.40	0.2815	-0.0394	0.2224	-0.0561	0.1704	-0.0486
55.83	7.47	0.2814	-0.0395	0.2223	-0.0562	0.1703	-0.0487
56.83	7.54	0.2814	-0.0395	0.2223	-0.0562	0.1703	-0.0487
57.83	7.60	0.2813	-0.0396	0.2223	-0.0562	0.1703	-0.0487
58.83	7.67	0.2813	-0.0396	0.2222	-0.0563	0.1702	-0.0488
59.83	7.74	0.2813	-0.0396	0.2222	-0.0563	0.1702	-0.0488
60.83	7.80	0.2812	-0.0397	0.2222	-0.0563	0.1701	-0.0489
61.83	7.86	0.2812	-0.0397	0.2221	-0.0564	0.1701	-0.0489
62.83	7.93	0.2811	-0.0398	0.2221	-0.0564	0.1701	-0.0489
63.83	7.99	0.2811	-0.0398	0.222	-0.0565	0.17	-0.049
64.83	8.05	0.2811	-0.0398	0.222	-0.0565	0.17	-0.049
65.83	8.11	0.281	-0.0399	0.2219	-0.0566	0.17	-0.049
66.83	8.18	0.2811	-0.0398	0.2219	-0.0566	0.1699	-0.0491
67.83	8.24	0.281	-0.0399	0.2219	-0.0566	0.1699	-0.0491
68.83	8.30	0.2809	-0.04	0.2218	-0.0567	0.1698	-0.0492
69.83	8.36	0.2809	-0.04	0.2218	-0.0567	0.1698	-0.0492
70.83	8.42	0.2809	-0.04	0.2218	-0.0567	0.1698	-0.0492
71.83	8.48	0.2809	-0.04	0.2218	-0.0567	0.1698	-0.0492
72.83	8.53	0.2809	-0.04	0.2218	-0.0567	0.1698	-0.0492
73.83	8.59	0.2808	-0.0401	0.2218	-0.0567	0.1698	-0.0492
74.83	8.65	0.2808	-0.0401	0.2218	-0.0567	0.1697	-0.0493
75.83	8.71	0.2807	-0.0402	0.2218	-0.0567	0.1697	-0.0493
76.83	8.77	0.2807	-0.0402	0.2217	-0.0568	0.1697	-0.0493

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.2807	-0.0402	0.2217	-0.0568	0.1695	-0.0495
78.83	8.88	0.2807	-0.0402	0.2217	-0.0568	0.1695	-0.0495
79.83	8.93	0.2807	-0.0402	0.2217	-0.0568	0.1695	-0.0495
80.83	8.99	0.2807	-0.0402	0.2217	-0.0568	0.1695	-0.0495
81.83	9.05	0.2807	-0.0402	0.2216	-0.0569	0.1694	-0.0496
82.83	9.10	0.2807	-0.0402	0.2216	-0.0569	0.1694	-0.0496
83.83	9.16	0.2806	-0.0403	0.2216	-0.0569	0.1694	-0.0496
84.83	9.21	0.2806	-0.0403	0.2216	-0.0569	0.1694	-0.0496
85.83	9.26	0.2806	-0.0403	0.2216	-0.0569	0.1693	-0.0497
86.83	9.32	0.2806	-0.0403	0.2215	-0.057	0.1693	-0.0497
87.83	9.37	0.2806	-0.0403	0.2215	-0.057	0.1693	-0.0497
88.83	9.43	0.2806	-0.0403	0.2215	-0.057	0.1693	-0.0497
89.83	9.48	0.2806	-0.0403	0.2215	-0.057	0.1692	-0.0498
90.83	9.53	0.2805	-0.0404	0.2215	-0.057	0.1692	-0.0498
91.83	9.58	0.2805	-0.0404	0.2215	-0.057	0.1692	-0.0498
92.83	9.64	0.2796	-0.0413	0.2214	-0.0571	0.1692	-0.0498
93.83	9.69	0.2795	-0.0414	0.2214	-0.0571	0.1691	-0.0499
94.83	9.74	0.2795	-0.0414	0.2214	-0.0571	0.1691	-0.0499
95.83	9.79	0.2795	-0.0414	0.2214	-0.0571	0.1691	-0.0499
96.83	9.84	0.2795	-0.0414	0.2213	-0.0572	0.1691	-0.0499
97.83	9.89	0.2795	-0.0414	0.2214	-0.0571	0.1691	-0.0499
98.83	9.94	0.2795	-0.0414	0.2213	-0.0572	0.1691	-0.0499
99.83	9.99	0.2795	-0.0414	0.2213	-0.0572	0.1691	-0.0499
100.83	10.04	0.2795	-0.0414	0.2212	-0.0573	0.1691	-0.0499
101.83	10.09	0.2795	-0.0414	0.2212	-0.0573	0.1691	-0.0499
102.83	10.14	0.2795	-0.0414	0.2212	-0.0573	0.169	-0.05
103.83	10.19	0.2795	-0.0414	0.2211	-0.0574	0.169	-0.05
104.83	10.24	0.2795	-0.0414	0.2211	-0.0574	0.169	-0.05
109.33	10.46	0.2795	-0.0414	0.2211	-0.0574	0.1689	-0.0501
114.33	10.69	0.2794	-0.0415	0.221	-0.0575	0.1688	-0.0502
119.33	10.92	0.2794	-0.0415	0.221	-0.0575	0.1687	-0.0503
124.33	11.15	0.2794	-0.0415	0.2209	-0.0576	0.1687	-0.0503
129.33	11.37	0.2793	-0.0416	0.2209	-0.0576	0.1686	-0.0504
134.33	11.59	0.2793	-0.0416	0.2208	-0.0577	0.1685	-0.0505
139.33	11.80	0.2794	-0.0415	0.2207	-0.0578	0.1684	-0.0506
144.33	12.01	0.2794	-0.0415	0.2207	-0.0578	0.1684	-0.0506
149.33	12.22	0.2793	-0.0416	0.2206	-0.0579	0.1683	-0.0507
154.33	12.42	0.2794	-0.0415	0.2206	-0.0579	0.1683	-0.0507

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.2793	-0.0416	0.2205	-0.058	0.1683	-0.0507
164.33	12.82	0.2793	-0.0416	0.2204	-0.0581	0.1682	-0.0508
169.33	13.01	0.2793	-0.0416	0.2204	-0.0581	0.1682	-0.0508
174.33	13.20	0.2793	-0.0416	0.2204	-0.0581	0.1681	-0.0509
179.33	13.39	0.2793	-0.0416	0.2203	-0.0582	0.1681	-0.0509
184.33	13.58	0.2793	-0.0416	0.2203	-0.0582	0.168	-0.051
189.33	13.76	0.2792	-0.0417	0.2202	-0.0583	0.1679	-0.0511
194.33	13.94	0.2792	-0.0417	0.2202	-0.0583	0.1679	-0.0511
199.33	14.12	0.2792	-0.0417	0.2202	-0.0583	0.1678	-0.0512
204.33	14.29	0.2792	-0.0417	0.2202	-0.0583	0.1678	-0.0512
209.33	14.47	0.2792	-0.0417	0.2202	-0.0583	0.1677	-0.0513
214.33	14.64	0.2792	-0.0417	0.2201	-0.0584	0.1677	-0.0513
219.33	14.81	0.2792	-0.0417	0.22	-0.0585	0.1676	-0.0514
224.33	14.98	0.2792	-0.0417	0.22	-0.0585	0.1676	-0.0514
229.33	15.14	0.2792	-0.0417	0.2199	-0.0586	0.1675	-0.0515
234.33	15.31	0.2792	-0.0417	0.2199	-0.0586	0.1675	-0.0515
239.33	15.47	0.2792	-0.0417	0.2199	-0.0586	0.1675	-0.0515
244.33	15.63	0.2792	-0.0417	0.2198	-0.0587	0.1675	-0.0515
249.33	15.79	0.2792	-0.0417	0.2198	-0.0587	0.1675	-0.0515
254.33	15.95	0.2792	-0.0417	0.2198	-0.0587	0.1674	-0.0516
259.33	16.10	0.2792	-0.0417	0.2197	-0.0588	0.1674	-0.0516
264.33	16.26	0.2792	-0.0417	0.2197	-0.0588	0.1673	-0.0517
269.33	16.41	0.2791	-0.0418	0.2197	-0.0588	0.1673	-0.0517
274.33	16.56	0.2791	-0.0418	0.2196	-0.0589	0.1673	-0.0517
279.33	16.71	0.2791	-0.0418	0.2196	-0.0589	0.1673	-0.0517
284.33	16.86	0.2791	-0.0418	0.2196	-0.0589	0.1673	-0.0517
289.33	17.01	0.2791	-0.0418	0.2195	-0.059	0.1673	-0.0517
294.33	17.16	0.2791	-0.0418	0.2195	-0.059	0.1673	-0.0517
299.33	17.30	0.2791	-0.0418	0.2195	-0.059	0.1673	-0.0517
304.33	17.45	0.2791	-0.0418	0.2194	-0.0591	0.1673	-0.0517
309.33	17.59	0.2791	-0.0418	0.2194	-0.0591	0.1673	-0.0517
314.33	17.73	0.2791	-0.0418	0.2194	-0.0591	0.1673	-0.0517
319.33	17.87	0.279	-0.0419	0.2194	-0.0591	0.1673	-0.0517
324.33	18.01	0.2791	-0.0418	0.2194	-0.0591	0.1672	-0.0518
329.33	18.15	0.279	-0.0419	0.2192	-0.0593	0.1672	-0.0518
334.33	18.28	0.279	-0.0419	0.2192	-0.0593	0.1672	-0.0518
339.33	18.42	0.279	-0.0419	0.2192	-0.0593	0.1671	-0.0519
344.33	18.56	0.279	-0.0419	0.2192	-0.0593	0.1671	-0.0519

ıple D7-S5 @ 10'

me (inutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.279	-0.0419	0.2192	-0.0593	0.167	-0.052
354.33	18.82	0.279	-0.0419	0.2191	-0.0594	0.167	-0.052
369.33	19.22	0.279	-0.0419	0.2191	-0.0594	0.167	-0.052
384.33	19.60	0.279	-0.0419	0.2191	-0.0594	0.1668	-0.0522
399.33	19.98	0.279	-0.0419			0.1668	-0.0522
414.33	20.36	0.279	-0.0419			0.1667	-0.0523
429.33	20.72	0.279	-0.0419			0.1667	-0.0523
444.33	21.08	0.2789	-0.042			0.1667	-0.0523
459.33	21.43	0.2789	-0.042			0.1666	-0.0524
474.33	21.78	0.2789	-0.042			0.1666	-0.0524
489.33	22.12	0.2789	-0.042			0.1665	-0.0525
504.33	22.46	0.2789	-0.042			0.1665	-0.0525
519.33	22.79	0.2789	-0.042			0.1664	-0.0526
534.33	23.12	0.2789	-0.042			0.1664	-0.0526
549.33	23.44	0.2789	-0.042			0.1663	-0.0527
564.33	23.76	0.2789	-0.042			0.1663	-0.0527
579.33	24.07	0.2789	-0.042			0.1663	-0.0527
594.33	24.38	0.2789	-0.042			0.1663	-0.0527
609.33	24.68	0.2789	-0.042			0.1662	-0.0528
624.33	24.99	0.2789	-0.042			0.1662	-0.0528
639.33	25.29	0.2788	-0.0421			0.1662	-0.0528
654.33	25.58	0.2789	-0.042			0.1661	-0.0529
669.33	25.87	0.2789	-0.042			0.1661	-0.0529
684.33	26.16	0.2789	-0.042			0.1661	-0.0529
699.33	26.44	0.2789	-0.042			0.1661	-0.0529
714.33	26.73	0.2788	-0.0421			0.166	-0.053
744.33	27.28	0.2788	-0.0421			0.166	-0.053
774.33	27.83	0.2788	-0.0421			0.1659	-0.0531
804.33	28.36	0.2788	-0.0421			0.1659	-0.0531
834.33	28.88	0.2788	-0.0421			0.1659	-0.0531
864.33	29.40	0.2788	-0.0421			0.1659	-0.0531
894.33	29.91	0.2785	-0.0424			0.1659	-0.0531
924.33	30.40	0.2785	-0.0424			0.1658	-0.0532
954.33	30.89					0.1658	-0.0532
984.33	31.37					0.1658	-0.0532
1014.33	31.85					0.1658	-0.0532
1044.33	32.32					0.1657	-0.0533

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.1656	0	0.1058	0	0.4362	0
0.17	0.41	0.1603	-0.0053	0.1054	-0.0004	0.4362	0
0.33	0.58	0.1541	-0.0115	0.0926	-0.0132	0.4361	-1E-04
0.50	0.71	0.151	-0.0146	0.0861	-0.0197	0.4316	-0.0046
0.67	0.82	0.1473	-0.0183	0.0818	-0.024	0.4287	-0.0075
0.83	0.91	0.1455	-0.0201	0.0785	-0.0273	0.4251	-0.0111
1.00	1.00	0.1428	-0.0228	0.0764	-0.0294	0.4231	-0.0131
1.17	1.08	0.1412	-0.0244	0.0731	-0.0327	0.4204	-0.0158
1.33	1.15	0.139	-0.0266	0.0707	-0.0351	0.4189	-0.0173
1.50	1.22	0.1376	-0.028	0.0687	-0.0371	0.4171	-0.0191
1.67	1.29	0.1359	-0.0297	0.0673	-0.0385	0.416	-0.0202
1.83	1.35	0.1347	-0.0309	0.0653	-0.0405	0.4149	-0.0213
2.00	1.41	0.1333	-0.0323	0.0642	-0.0416	0.4141	-0.0221
2.17	1.47	0.1323	-0.0333	0.0627	-0.0431	0.413	-0.0232
2.33	1.53	0.131	-0.0346	0.0617	-0.0441	0.4125	-0.0237
2.50	1.58	0.1302	-0.0354	0.0605	-0.0453	0.4119	-0.0243
2.67	1.63	0.1291	-0.0365	0.0596	-0.0462	0.4113	-0.0249
2.83	1.68	0.1284	-0.0372	0.0589	-0.0469	0.4108	-0.0254
3.00	1.73	0.1274	-0.0382	0.0584	-0.0474	0.4104	-0.0258
3.17	1.78	0.1269	-0.0387	0.0576	-0.0482	0.4099	-0.0263
3.33	1.83	0.1261	-0.0395	0.0572	-0.0486	0.4096	-0.0266
3.50	1.87	0.1257	-0.0399	0.0566	-0.0492	0.4092	-0.027
3.67	1.91	0.125	-0.0406	0.056	-0.0498	0.4089	-0.0273
3.83	1.96	0.1246	-0.041	0.0557	-0.0501	0.4086	-0.0276
4.00	2.00	0.1241	-0.0415	0.0551	-0.0507	0.4084	-0.0278
4.17	2.04	0.1237	-0.0419	0.0549	-0.0509	0.4081	-0.0281
4.33	2.08	0.1232	-0.0424	0.0545	-0.0513	0.4079	-0.0283
4.50	2.12	0.1228	-0.0428	0.0542	-0.0516	0.4076	-0.0286
4.67	2.16	0.1225	-0.0431	0.0541	-0.0517	0.4075	-0.0287
4.83	2.20	0.1222	-0.0434	0.0537	-0.0521	0.4073	-0.0289
5.00	2.24	0.1219	-0.0437	0.0534	-0.0524	0.4071	-0.0291
5.17	2.27	0.1216	-0.044	0.0532	-0.0526	0.4069	-0.0293
5.33	2.31	0.1212	-0.0444	0.053	-0.0528	0.4067	-0.0295
5.50	2.35	0.1211	-0.0445	0.0527	-0.0531	0.4066	-0.0296
5.67	2.38	0.1208	-0.0448	0.0526	-0.0532	0.4065	-0.0297
5.83	2.42	0.1206	-0.045	0.0524	-0.0534	0.4063	-0.0299
6.00	2.45	0.1203	-0.0453	0.0522	-0.0536	0.4062	-0.03
6.17	2.48	0.1202	-0.0454	0.052	-0.0538	0.406	-0.0302

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.1199	-0.0457	0.0519	-0.0539	0.4059	-0.0303
6.50	2.55	0.1198	-0.0458	0.0518	-0.054	0.4058	-0.0304
6.67	2.58	0.1195	-0.0461	0.0515	-0.0543	0.4057	-0.0305
6.83	2.61	0.1195	-0.0461	0.0514	-0.0544	0.4056	-0.0306
7.00	2.65	0.1193	-0.0463	0.0513	-0.0545	0.4055	-0.0307
7.17	2.68	0.1192	-0.0464	0.0511	-0.0547	0.4053	-0.0309
7.33	2.71	0.119	-0.0466	0.0511	-0.0547	0.4053	-0.0309
7.50	2.74	0.1188	-0.0468	0.0509	-0.0549	0.4051	-0.0311
7.67	2.77	0.1187	-0.0469	0.0508	-0.055	0.405	-0.0312
7.83	2.80	0.1186	-0.047	0.0507	-0.0551	0.405	-0.0312
8.00	2.83	0.1185	-0.0471	0.0506	-0.0552	0.4049	-0.0313
8.17	2.86	0.1184	-0.0472	0.0504	-0.0554	0.4048	-0.0314
8.33	2.89	0.1182	-0.0474	0.0503	-0.0555	0.4047	-0.0315
8.50	2.92	0.1181	-0.0475	0.0503	-0.0555	0.4046	-0.0316
8.67	2.94	0.118	-0.0476	0.0503	-0.0555	0.4045	-0.0317
8.83	2.97	0.1179	-0.0477	0.0501	-0.0557	0.4044	-0.0318
9.00	3.00	0.1179	-0.0477	0.05	-0.0558	0.4044	-0.0318
9.17	3.03	0.1178	-0.0478	0.0499	-0.0559	0.4043	-0.0319
9.33	3.06	0.1177	-0.0479	0.0498	-0.056	0.4042	-0.032
9.50	3.08	0.1176	-0.048	0.0497	-0.0561	0.4042	-0.032
9.67	3.11	0.1175	-0.0481	0.0497	-0.0561	0.4042	-0.032
9.83	3.14	0.1174	-0.0482	0.0496	-0.0562	0.4041	-0.0321
10.00	3.16	0.1173	-0.0483	0.0495	-0.0563	0.404	-0.0322
10.17	3.19	0.1172	-0.0484	0.0495	-0.0563	0.4039	-0.0323
10.33	3.21	0.1171	-0.0485	0.0494	-0.0564	0.4039	-0.0323
10:50	3.24	0.1171	-0.0485	0.0493	-0.0565	0.4038	-0.0324
10.67	3.27	0.1171	-0.0485	0.0493	-0.0565	0.4038	-0.0324
10.83	3.29	0.117	-0.0486	0.0492	-0.0566	0.4037	-0.0325
11.00	3.32	0.1169	-0.0487	0.0491	-0.0567	0.4036	-0.0326
11.17	3.34	0.1168	-0.0488	0.0491	-0.0567	0.4035	-0.0327
11.33	3.37	0.1167	-0.0489	0.049	-0.0568	0.4035	-0.0327
11.50	3.39	0.1167	-0.0489	0.0489	-0.0569	0.4034	-0.0328
11.67	3.42	0.1166	-0.049	0.0488	-0.057	0.4034	-0.0328
11.83	3.44	0.1165	-0.0491	0.0488	-0.057	0.4034	-0.0328
12.00	3.46	0.1165	-0.0491	0.0487	-0.0571	0.4034	-0.0328
12.17	3.49	0.1164	-0.0492	0.0487	-0.0571	0.4033	-0.0329
12.33	3.51	0.1164	-0.0492	0.0487	-0.0571	0.4033	-0.0329
12.50	3.54	0.1164	-0.0492	0.0486	-0.0572	0.4032	-0.033

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.1163	-0.0493	0.0486	-0.0572	0.4031	-0.0331
12.83	3.58	0.1163	-0.0493	0.0485	-0.0573	0.4031	-0.0331
13.00	3.61	0.1162	-0.0494	0.0485	-0.0573	0.4031	-0.0331
13.17	3.63	0.1162	-0.0494	0.0484	-0.0574	0.403	-0.0332
13.33	3.65	0.1161	-0.0495	0.0484	-0.0574	0.4029	-0.0333
13.50	3.67	0.1161	-0.0495	0.0483	-0.0575	0.4029	-0.0333
13.67	3.70	0.116	-0.0496	0.0483	-0.0575	0.4028	-0.0334
13.83	3.72	0.116	-0.0496	0.0482	-0.0576	0.4028	-0.0334
14.00	3.74	0.1159	-0.0497	0.0481	-0.0577	0.4027	-0.0335
14.17	3.76	0.1158	-0.0498	0.0481	-0.0577	0.4027	-0.0335
14.33	3.79	0.1158	-0.0498	0.048	-0.0578	0.4027	-0.0335
14.50	3.81	0.1157	-0.0499	0.048	-0.0578	0.4027	-0.0335
14.67	3.83	0.1157	-0.0499	0.048	-0.0578	0.4027	-0.0335
14.83	3.85	0.1156	-0.05	0.0479	-0.0579	0.4026	-0.0336
15.83	3.98	0.1155	-0.0501	0.0478	-0.058	0.4024	-0.0338
16.83	4.10	0.1152	-0.0504	0.0475	-0.0583	0.4022	-0.034
17.83	4.22	0.115	-0.0506	0.0473	-0.0585	0.4019	-0.0343
18.83	4.34	0.1148	-0.0508	0.0471	-0.0587	0.4019	-0.0343
19.83	4.45	0.1147	-0.0509	0.047	-0.0588	0.4017	-0.0345
20.83	4.56	0.1146	-0.051	0.0468	-0.059	0.4015	-0.0347
21.83	4.67	0.1144	-0.0512	0.0466	-0.0592	0.4013	-0.0349
22.83	4.78	0.1142	-0.0514	0.0465	-0.0593	0.4012	-0.035
23.83	4.88	0.1141	-0.0515	0.0464	-0.0594	0.4011	-0.0351
24.83	4.98	0.114	-0.0516	0.0463	-0.0595	0.401	-0.0352
25.83	5.08	0.1139	-0.0517	0.0461	-0.0597	0.4009	-0.0353
26.83	5.18	0.1138	-0.0518	0.046	-0.0598	0.4007	-0.0355
27.83	5.28	0.1137	-0.0519	0.0459	-0.0599	0.4006	-0.0356
28.83	5.37	0.1136	-0.052	0.0457	-0.0601	0.4005	-0.0357
29.83	5.46	0.1135	-0.0521	0.0456	-0.0602	0.4004	-0.0358
30.83	5.55	0.1134	-0.0522	0.0456	-0.0602	0.4003	-0.0359
31.83	5.64	0.1133	-0.0523	0.0455	-0.0603	0.4003	-0.0359
32.83	5.73	0.1132	-0.0524	0.0454	-0.0604	0.4002	-0.036
33.83	5.82	0.1132	-0.0524	0.0453	-0.0605	0.4001	-0.0361
34.83	5.90	0.1131	-0.0525	0.0452	-0.0606	0.4	-0.0362
35.83	5.99	0.113	-0.0526	0.0451	-0.0607	0.3999	-0.0363
36.83	6.07	0.113	-0.0526	0.045	-0.0608	0.3998	-0.0364
37.83	6.15	0.1129	-0.0527	0.0449	-0.0609	0.3997	-0.0365
38.83	6.23	0.1128	-0.0528	0.0448	-0.061	0.3997	-0.0365

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.1128	-0.0528	0.0448	-0.061	0.3996	-0.0366
40.83	6.39	0.1127	-0.0529	0.0448	-0.061	0.3995	-0.0367
41.83	6.47	0.1126	-0.053	0.0447	-0.0611	0.3995	-0.0367
42.83	6.54	0.1126	-0.053	0.0446	-0.0612	0.3995	-0.0367
43.83	6.62	0.1125	-0.0531	0.0446	-0.0612	0.3994	-0.0368
44.83	6.70	0.1124	-0.0532	0.0445	-0.0613	0.3993	-0.0369
45.83	6.77	0.1124	-0.0532	0.0444	-0.0614	0.3993	-0.0369
46.83	6.84	0.1124	-0.0532	0.0444	-0.0614	0.3992	-0.037
47.83	6.92	0.1123	-0.0533	0.0443	-0.0615	0.3991	-0.0371
48.83	6.99	0.1123	-0.0533	0.0442	-0.0616	0.3991	-0.0371
49.83	7.06	0.1122	-0.0534	0.0442	-0.0616	0.399	-0.0372
50.83	7.13	0.1122	-0.0534	0.0441	-0.0617	0.399	-0.0372
51.83	7.20	0.1121	-0.0535	0.0441	-0.0617	0.3989	-0.0373
52.83	7.27	0.1121	-0.0535	0.044	-0.0618	0.3988	-0.0374
53.83	7.34	0.112	-0.0536	0.044	-0.0618	0.3988	-0.0374
54.83	7.40	0.112	-0.0536	0.044	-0.0618	0.3988	-0.0374
55.83	7.47	0.1119	-0.0537	0.0439	-0.0619	0.3987	-0.0375
56.83	7.54	0.1119	-0.0537	0.0439	-0.0619	0.3987	-0.0375
57.83	7.60	0.1119	-0.0537	0.0438	-0.062	0.3987	-0.0375
58.83	7.67	0.1118	-0.0538	0.0438	-0.062	0.3986	-0.0376
59.83	7.74	0.1117	-0.0539	0.0438	-0.062	0.3986	-0.0376
60.83	7.80	0.1117	-0.0539	0.0437	-0.0621	0.3986	-0.0376
61.83	7.86	0.1117	-0.0539	0.0437	-0.0621	0.3985	-0.0377
62.83	7.93	0.1116	-0.054	0.0436	-0.0622	0.3985	-0.0377
63.83	7.99	0.1116	-0.054	0.0436	-0.0622	0.3984	-0.0378
64.83	8.05	0.1116	-0.054	0.0435	-0.0623	0.3984	-0.0378
65.83	8.11	0.1116	-0.054	0.0435	-0.0623	0.3983	-0.0379
66.83	8.18	0.1116	-0.054	0.0434	-0.0624	0.3983	-0.0379
67.83	8.24	0.1116	-0.054	0.0434	-0.0624	0.3982	-0.038
68.83	8.30	0.1115	-0.0541	0.0434	-0.0624	0.3982	-0.038
69.83	8.36	0.1115	-0.0541	0.0433	-0.0625	0.3982	-0.038
70.83	8.42	0.1114	-0.0542	0.0433	-0.0625	0.3981	-0.0381
71.83	8.48	0.1114	-0.0542	0.0432	-0.0626	0.3981	-0.0381
72.83	8.53	0.1114	-0.0542	0.0432	-0.0626	0.3981	-0.0381
73.83	8.59	0.1114	-0.0542	0.0432	-0.0626	0.398	-0.0382
74.83	8.65	0.1113	-0.0543	0.0432	-0.0626	0.398	-0.0382
75.83	8.71	0.1113	-0.0543	0.0432	-0.0626	0.3979	-0.0383
76.83	8.77	0.1113	-0.0543	0.0432	-0.0626	0.3979	-0.0383

mple D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.1113	-0.0543	0.0431	-0.0627	0.3979	-0.0383
78.83	8.88	0.1112	-0.0544	0.0431	-0.0627	0.3979	-0.0383
79.83	8.93	0.1112	-0.0544	0.043	-0.0628	0.3979	-0.0383
80.83	8.99	0.1112	-0.0544	0.043	-0.0628	0.3979	-0.0383
81.83	9.05	0.1111	-0.0545	0.043	-0.0628	0.3978	-0.0384
82.83	9.10	0.1111	-0.0545	0.043	-0.0628	0.3978	-0.0384
83.83	9.16	0.1111	-0.0545	0.0429	-0.0629	0.3978	-0.0384
84.83	9.21	0.1111	-0.0545	0.0429	-0.0629	0.3978	-0.0384
85.83	9.26	0.111	-0.0546	0.0429	-0.0629	0.3977	-0.0385
86.83	9.32	0.111	-0.0546	0.0428	-0.063	0.3977	-0.0385
87.83	9.37	0.111	-0.0546	0.0428	-0.063	0.3977	-0.0385
88.83	9.43	0.111	-0.0546	0.0428	-0.063	0.3976	-0.0386
89.83	9.48	0.1109	-0.0547	0.0427	-0.0631	0.3976	-0.0386
90.83	9.53	0.1109	-0.0547	0.0427	-0.0631	0.3976	-0.0386
91.83	9.58	0.1109	-0.0547	0.0427	-0.0631	0.3975	-0.0387
92.83	9.64	0.1109	-0.0547	0.0427	-0.0631	0.3975	-0.0387
93.83	9.69	0.1109	-0.0547	0.0426	-0.0632	0.3975	-0.0387
94.83	9.74	0.1109	-0.0547	0.0426	-0.0632	0.3975	-0.0387
95.83	9.79	0.1109	-0.0547	0.0426	-0.0632	0.3974	-0.0388
96.83	9.84	0.1109	-0.0547	0.0426	-0.0632	0.3974	-0.0388
97.83	9.89	0.1108	-0.0548	0.0425	-0.0633	0.3974	-0.0388
98.83	9.94	0.1108	-0.0548	0.0425	-0.0633	0.3973	-0.0389
99.83	9.99	0.1108	-0.0548	0.0424	-0.0634	0.3973	-0.0389
100.83	10.04	0.1108	-0.0548	0.0424	-0.0634	0.3973	-0.0389
101.83	10.09	0.1108	-0.0548	0.0424	-0.0634	0.3972	-0.039
102.83	10.14	0.1108	-0.0548	0.0424	-0.0634	0.3972	-0.039
103.83	10.19	0.1107	-0.0549	0.0424	-0.0634	0.3972	-0.039
104.83	10.24	0.1107	-0.0549	0.0424	-0.0634	0.3972	-0.039
109.33	10.46	0.1106	-0.055	0.0423	-0.0635	0.3971	-0.0391
114.33	10.69	0.1105	-0.0551	0.0422	-0.0636	0.3971	-0.0391
119.33	10.92	0.1104	-0.0552	0.0421	-0.0637	0.3969	-0.0393
124.33	11.15	0.1103	-0.0553	0.042	-0.0638	0.3968	-0.0394
129.33	11.37	0.1103	-0.0553	0.0419	-0.0639	0.3967	-0.0395
134.33	11.59	0.1102	-0.0554	0.0418	-0.064	0.3967	-0.0395
139.33	11.80	0.1101	-0.0555	0.0417	-0.0641	0.3965	-0.0397
144.33	12.01	0.1101	-0.0555	0.0416	-0.0642	0.3965	-0.0397
149.33	12.22	0.11	-0.0556	0.0416	-0.0642	0.3964	-0.0398
154.33	12.42	0.1099	-0.0557	0.0416	-0.0642	0.3964	-0.0398

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.1098	-0.0558	0.0415	-0.0643	0.3963	-0.0399
164.33	12.82	0.1097	-0.0559	0.0414	-0.0644	0.3962	-0.04
169.33	13.01	0.1097	-0.0559	0.0413	-0.0645	0.3962	-0.04
174.33	13.20	0.1096	-0.056	0.0412	-0.0646	0.3961	-0.0401
179.33	13.39	0.1095	-0.0561	0.0412	-0.0646	0.396	-0.0402
184.33	13.58	0.1095	-0.0561	0.0411	-0.0647	0.396	-0.0402
189.33	13.76	0.1094	-0.0562	0.041	-0.0648	0.3959	-0.0403
194.33	13.94	0.1094	-0.0562	0.0409	-0.0649	0.3958	-0.0404
199.33	14.12	0.1093	-0.0563	0.0409	-0.0649	0.3958	-0.0404
204.33	14.29	0.1093	-0.0563	0.0409	-0.0649	0.3957	-0.0405
209.33	14.47	0.1093	-0.0563	0.0408	-0.065	0.3956	-0.0406
214.33	14.64	0.1092	-0.0564	0.0407	-0.0651	0.3956	-0.0406
219.33	14.81	0.1092	-0.0564	0.0406	-0.0652	0.3956	-0.0406
224.33	14.98	0.1092	-0.0564	0.0406	-0.0652	0.3955	-0.0407
229.33	15.14	0.1091	-0.0565	0.0406	-0.0652	0.3955	-0.0407
234.33	15.31	0.1091	-0.0565	0.0405	-0.0653	0.3955	-0.0407
239.33	15.47	0.1091	-0.0565	0.0404	-0.0654	0.3954	-0.0408
244.33	15.63	0.109	-0.0566	0.0404	-0.0654	0.3954	-0.0408
249.33	15.79	0.1089	-0.0567	0.0403	-0.0655	0.3953	-0.0409
254.33	15.95	0.1089	-0.0567	0.0403	-0.0655	0.3953	-0.0409
259.33	16.10	0.1089	-0.0567	0.0402	-0.0656	0.3952	-0.041
264.33	16.26	0.1089	-0.0567	0.0402	-0.0656	0.3952	-0.041
269.33	16.41	0.1088	-0.0568	0.0401	-0.0657	0.3951	-0.0411
274.33	16.56	0.1088	-0.0568	0.0401	-0.0657	0.3951	-0.0411
279.33	16.71	0.1088	-0.0568	0.0401	-0.0657	0.395	-0.0412
284.33	16.86	0.1087	-0.0569	0.0401	-0.0657	0.395	-0.0412
289.33	17.01	0.1087	-0.0569	0.04	-0.0658	0.3949	-0.0413
294.33	17.16	0.1087	-0.0569	0.04	-0.0658	0.3949	-0.0413
299.33	17.30	0.1086	-0.057	0.04	-0.0658	0.3949	-0.0413
304.33	17.45	0.1086	-0.057	0.0399	-0.0659	0.3948	-0.0414
309.33	17.59	0.1086	-0.057	0.0399	-0.0659	0.3948	-0.0414
314.33	17.73	0.1085	-0.0571	0.0399	-0.0659	0.3948	-0.0414
319.33	17.87	0.1085	-0.0571	0.0398	-0.066	0.3948	-0.0414
324.33	18.01	0.1085	-0.0571	0.0398	-0.066	0.3948	-0.0414
329.33	18.15	0.1085	-0.0571	0.0398	-0.066	0.3947	-0.0415
334.33	18.28	0.1085	-0.0571	0.0397	-0.0661	0.3947	-0.0415
339.33	18.42	0.1085	-0.0571	0.0397	-0.0661	0.3946	-0.0416
344.33	18.56	0.1084	-0.0572	0.0396	-0.0662	0.3946	-0.0416

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.1084	-0.0572	0.0396	-0.0662	0.3946	-0.0416
354.33	18.82	0.1084	-0.0572	0.0396	-0.0662	0.3945	-0.0417
369.33	19.22	0.1083	-0.0573	0.0395	-0.0663	0.3945	-0.0417
384.33	19.60	0.1083	-0.0573	0.0395	-0.0663	0.3945	-0.0417
399.33	19.98	0.1082	-0.0574	0.0394	-0.0664	0.3944	-0.0418
414.33	20.36	0.1083	-0.0573	0.0393	-0.0665	0.3943	-0.0419
429.33	20.72	0.1083	-0.0573	0.0393	-0.0665	0.3942	-0.042
444.33	21.08	0.1082	-0.0574	0.0392	-0.0666	0.3941	-0.0421
459.33	21.43	0.1081	-0.0575	0.0392	-0.0666	0.3941	-0.0421
474.33	21.78	0.1081	-0.0575	0.0391	-0.0667	0.394	-0.0422
489.33	22.12	0.108	-0.0576	0.0391	-0.0667	0.394	-0.0422
504.33	22.46	0.1079	-0.0577	0.039	-0.0668	0.394	-0.0422
519.33	22.79	0.1079	-0.0577	0.0389	-0.0669	0.3939	-0.0423
534.33	23.12	0.1079	-0.0577	0.0389	-0.0669	0.3938	-0.0424
549.33	23.44	0.1078	-0.0578	0.0388	-0.067	0.3938	-0.0424
564.33	23.76	0.1078	-0.0578	0.0387	-0.0671	0.3937	-0.0425
579.33	24.07	0.1077	-0.0579	0.0387	-0.0671	0.3936	-0.0426
594.33	24.38	0.1077	-0.0579	0.0386	-0.0672	0.3936	-0.0426
609.33	24.68	0.1077	-0.0579	0.0386	-0.0672	0.3935	-0.0427
624.33	24.99	0.1076	-0.058	0.0386	-0.0672	0.3935	-0.0427
639.33	25.29	0.1075	-0.0581	0.0385	-0.0673	0.3934	-0.0428
654.33	25.58	0.1074	-0.0582	0.0385	-0.0673	0.3934	-0.0428
669.33	25.87	0.1073	-0.0583	0.0385	-0.0673	0.3934	-0.0428
684.33	26.16	0.1073	-0.0583	0.0385	-0.0673	0.3933	-0.0429
699.33	26.44	0.1072	-0.0584	0.0385	-0.0673	0.3933	-0.0429
714.33	26.73	0.1071	-0.0585	0.0384	-0.0674	0.3933	-0.0429
744.33	27.28	0.1071	-0.0585	0.0384	-0.0674	0.3932	-0.043
774.33	27.83	0.107	-0.0586	0.0383	-0.0675	0.3932	-0.043
804.33	28.36	0.107	-0.0586	0.0382	-0.0676	0.3932	-0.043
834.33	28.88	0.1069	-0.0587	0.0382	-0.0676	0.3931	-0.0431
864.33	29.40	0.1069	-0.0587	0.0381	-0.0677	0.393	-0.0432
894.33	29.91	0.1069	-0.0587	0.038	-0.0678	0.3929	-0.0433
924.33	30.40	0.1069	-0.0587	0.038	-0.0678	0.3929	-0.0433
954.33	30.89	0.1068	-0.0588	0.0379	-0.0679	0.3928	-0.0434
984.33	31.37	0.1067	-0.0589	0.0379	-0.0679	0.3927	-0.0435
1014.33	31.85	0.1067	-0.0589	0.0379	-0.0679	0.3927	-0.0435
1044.33	32.32	0.1067	-0.0589	0.0378	-0.068	0.3927	-0.0435
1074.33	32.78	0.1066	-0.059	0.0378	-0.068	0.3926	-0.0436

Sample D7-S5 @ 10'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23	0.1066	-0.059	0.0377	-0.0681	0.3926	-0.0436
1134.33	33.68	0.1066	-0.059	0.0377	-0.0681	0.3926	-0.0436
1164.33	34.12	0.1065	-0.0591	0.0377	-0.0681	0.3926	-0.0436
1194.33	34.56	0.1065	-0.0591	0.0377	-0.0681	0.3926	-0.0436
1224.33	34.99	0.1064	-0.0592			0.3925	-0.0437
1254.33	35.42	0.1064	-0.0592			0.3924	-0.0438
1284.33	35.84	0.1064	-0.0592			0.3924	-0.0438
1314.33	36.25	0.1063	-0.0593			0.3924	-0.0438
1344.33	36.67	0.1063	-0.0593			0.3924	-0.0438
1374.33	37.07	0.1063	-0.0593			0.3924	-0.0438
1404.33	37.47	0.1063	-0.0593			0.3924	-0.0438
1434.33	37.87	0.1062	-0.0594			0.3923	-0.0439
1464.33	38.27	0.1062	-0.0594			0.3923	-0.0439
1494.33	38.66	0.1062	-0.0594			0.3922	-0.044
1524.33	39.04	0.1062	-0.0594			0.3922	-0.044
1554.33	39.43	0.1062	-0.0594			0.3922	-0.044
1584.33	39.80	0.1061	-0.0595			0.3922	-0.044
1614.33	40.18	0.1061	-0.0595			0.3921	-0.0441
1644.33	40.55	0.1061	-0.0595			0.3921	-0.0441
1674.33	40.92	0.1061	-0.0595			0.3921	-0.0441
1704.33	41.28	0.1061	-0.0595			0.392	-0.0442
1734.33	41.65	0.106	-0.0596			0.392	-0.0442
1764.33	42.00	0.106	-0.0596			0.392	-0.0442
1794.33	42.36	0.1059	-0.0597			0.392	-0.0442
1824.33	42.71	0.1059	-0.0597				

One Dimensional Consolidation

Project No.	41194	
Project	FMC Pond 15S	
Sample ID	G8-S3 @ 5'	
Sample Ht.	1.724	(in)
Sample Dia.	4.000	(in)
Sample Area	0.087	(sq-ft)
Sample Vol.	0.013	(cu-ft)
Phos Cont.	6.87	(%)
Init. M.C.	201.75	(%)
Init. M.C. (corr)	149.94	(%)
Final M.C.	100.87	(%)
Final M.C. (corr	76.52	(%)
Dry Wt. of Soil/f	214.52	(g)
Dry Wt. of Soil/i	189.96	(g)
Spec. Grav.	2.7	
Pocket Pen.	0.4	(tsf)
Dial Reset	0.4284	500psf

Moisture Content Weights	
(Initial)	
Total Wet Wt. (g)	24.11
Phos. Wt. (g)	1.66
Dry Wt. (g)	7.99
Dry Wt. + Phos Wt. (g)	9.65
Water Wt. + Phos (g)	16.12
Water Wt. (g)	14.46
(final)	
Total Wet Wt. (g)	50.52
Phos. Wt. (g)	3.47
Dry Wt. (g)	25.15
Dry Wt. + Phos Wt. (g)	28.62
Water Wt. + Phos (g)	25.37
Water Wt. (g)	21.90

Pressure (psf)	Final Dial Reading (inches)	Deformation (inches)	Sample Ht. (inches)	Strain (%)	Void Ratio e	Dry Density (pcf)	Void Ratio e	Dry Density (pcf)
					Calc. from final MC		Calc. from initial MC	
0.001	0.4357	0.0000	1.7240	0	3.470	37.69	4.048	33.37
0.0100	0.3535	0.0822	1.6418	4.77	3.257	39.58	3.808	35.04
0.0250	0.2900	0.1457	1.5783	8.45	3.092	41.17	3.622	36.45
0.0500	0.2573	0.1784	1.5456	10.35	3.008	42.04	3.526	37.23
0.1000	0.2060	0.2297	1.4943	13.32	2.875	43.48	3.376	38.50
0.2500	0.1304	0.3053	1.4187	17.71	2.679	45.80	3.154	40.56
0.5000	0.0761	0.3596	1.3644	20.86	2.538	47.62	2.995	42.17
1.0000	0.3962	0.3926	1.3312	22.78	2.452	48.81	2.898	43.22
2.0000	0.3192	0.4688	1.2552	27.19	2.255	51.77	2.676	45.84
4.0000	0.2464	0.5416	1.1824	31.42	2.066	54.95	2.462	48.66

Note: Initial MC not taken from actual sample tested, but from same sample jar.
Final MC taken from actual sample tested.
Void Ratio (e), calculated from final MC likely to be most accurate.

ıple G8-S3 @ 5'

ime inutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4357	0	0.3534	0	0.29	0
0.17	0.41	0.4343	-0.0014	0.3529	-0.0005	0.2894	-0.0006
0.33	0.58	0.4338	-0.0019	0.3525	-0.0009	0.2892	-0.0008
0.50	0.71	0.4333	-0.0024	0.3522	-0.0012	0.2889	-0.0011
0.67	0.82	0.4327	-0.003	0.3519	-0.0015	0.2887	-0.0013
0.83	0.91	0.4323	-0.0034	0.3516	-0.0018	0.2886	-0.0014
1.00	1.00	0.4318	-0.0039	0.3514	-0.002	0.2885	-0.0015
1.17	1.08	0.4315	-0.0042	0.351	-0.0024	0.2883	-0.0017
1.33	1.15	0.4311	-0.0046	0.3508	-0.0026	0.2882	-0.0018
1.50	1.22	0.431	-0.0047	0.3505	-0.0029	0.288	-0.002
1.67	1.29	0.4307	-0.005	0.3501	-0.0033	0.288	-0.002
1.83	1.35	0.4303	-0.0054	0.3499	-0.0035	0.2878	-0.0022
2.00	1.41	0.4301	-0.0056	0.3496	-0.0038	0.2878	-0.0022
2.17	1.47	0.4298	-0.0059	0.3493	-0.0041	0.2877	-0.0023
2.33	1.53	0.4295	-0.0062	0.3491	-0.0043	0.2877	-0.0023
2.50	1.58	0.4293	-0.0064	0.3488	-0.0046	0.2876	-0.0024
2.67	1.63	0.429	-0.0067	0.3485	-0.0049	0.2875	-0.0025
2.83	1.68	0.4288	-0.0069	0.3482	-0.0052	0.2874	-0.0026
3.00	1.73	0.4286	-0.0071	0.3481	-0.0053	0.2873	-0.0027
3.17	1.78	0.4283	-0.0074	0.3478	-0.0056	0.2873	-0.0027
3.33	1.83	0.4279	-0.0078	0.3476	-0.0058	0.2872	-0.0028
3.50	1.87	0.4278	-0.0079	0.3474	-0.006	0.2871	-0.0029
3.67	1.91	0.4276	-0.0081	0.3472	-0.0062	0.2871	-0.0029
3.83	1.96	0.4274	-0.0083	0.347	-0.0064	0.287	-0.003
4.00	2.00	0.4271	-0.0086	0.3468	-0.0066	0.287	-0.003
4.17	2.04	0.4267	-0.009	0.3467	-0.0067	0.287	-0.003
4.33	2.08	0.4265	-0.0092	0.3465	-0.0069	0.2869	-0.0031
4.50	2.12	0.4263	-0.0094	0.3461	-0.0073	0.2868	-0.0032
4.67	2.16	0.4262	-0.0095	0.346	-0.0074	0.2868	-0.0032
4.83	2.20	0.4258	-0.0099	0.3457	-0.0077	0.2867	-0.0033
5.00	2.24	0.4252	-0.0105	0.3455	-0.0079	0.2867	-0.0033
5.17	2.27	0.4249	-0.0108	0.3453	-0.0081	0.2866	-0.0034
5.33	2.31	0.4247	-0.011	0.3452	-0.0082	0.2866	-0.0034
5.50	2.35	0.4242	-0.0115	0.345	-0.0084	0.2865	-0.0035
5.67	2.38	0.4239	-0.0118	0.3448	-0.0086	0.2865	-0.0035
5.83	2.42	0.4238	-0.0119	0.3445	-0.0089	0.2865	-0.0035
6.00	2.45	0.4236	-0.0121	0.3444	-0.009	0.2864	-0.0036
6.17	2.48	0.4235	-0.0122	0.3441	-0.0093	0.2864	-0.0036

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.4233	-0.0124	0.3439	-0.0095	0.2864	-0.0036
6.50	2.55	0.4232	-0.0125	0.3437	-0.0097	0.2863	-0.0037
6.67	2.58	0.4231	-0.0126	0.3435	-0.0099	0.2863	-0.0037
6.83	2.61	0.4231	-0.0126	0.3432	-0.0102	0.2862	-0.0038
7.00	2.65	0.4231	-0.0126	0.343	-0.0104	0.2862	-0.0038
7.17	2.68	0.423	-0.0127	0.3429	-0.0105	0.2862	-0.0038
7.33	2.71	0.4229	-0.0128	0.3427	-0.0107	0.2861	-0.0039
7.50	2.74	0.4228	-0.0129	0.3424	-0.011	0.2861	-0.0039
7.67	2.77	0.4227	-0.013	0.3422	-0.0112	0.286	-0.004
7.83	2.80	0.4227	-0.013	0.3421	-0.0113	0.2859	-0.0041
8.00	2.83	0.4226	-0.0131	0.3419	-0.0115	0.2859	-0.0041
8.17	2.86	0.4226	-0.0131	0.3416	-0.0118	0.2858	-0.0042
8.33	2.89	0.4219	-0.0138	0.3415	-0.0119	0.2858	-0.0042
8.50	2.92	0.4219	-0.0138	0.3413	-0.0121	0.2857	-0.0043
8.67	2.94	0.4218	-0.0139	0.3412	-0.0122	0.2857	-0.0043
8.83	2.97	0.4216	-0.0141	0.341	-0.0124	0.2856	-0.0044
9.00	3.00	0.4215	-0.0142	0.3407	-0.0127	0.2855	-0.0045
9.17	3.03	0.4215	-0.0142	0.3405	-0.0129	0.2855	-0.0045
9.33	3.06	0.4214	-0.0143	0.3403	-0.0131	0.2855	-0.0045
9.50	3.08	0.4212	-0.0145	0.3401	-0.0133	0.2855	-0.0045
9.67	3.11	0.421	-0.0147	0.34	-0.0134	0.2854	-0.0046
9.83	3.14	0.4207	-0.015	0.3397	-0.0137	0.2854	-0.0046
10.00	3.16	0.4207	-0.015	0.3397	-0.0137	0.2854	-0.0046
10.17	3.19	0.4206	-0.0151	0.3395	-0.0139	0.2853	-0.0047
10.33	3.21	0.4205	-0.0152	0.3393	-0.0141	0.2853	-0.0047
10.50	3.24	0.4205	-0.0152	0.3391	-0.0143	0.2852	-0.0048
10.67	3.27	0.4204	-0.0153	0.3389	-0.0145	0.2852	-0.0048
10.83	3.29	0.4204	-0.0153	0.3389	-0.0145	0.2851	-0.0049
11.00	3.32	0.4203	-0.0154	0.3387	-0.0147	0.2851	-0.0049
11.17	3.34	0.4202	-0.0155	0.3385	-0.0149	0.285	-0.005
11.33	3.37	0.4201	-0.0156	0.3384	-0.015	0.285	-0.005
11.50	3.39	0.42	-0.0157	0.3382	-0.0152	0.2849	-0.0051
11.67	3.42	0.42	-0.0157	0.3382	-0.0152	0.2849	-0.0051
11.83	3.44	0.4199	-0.0158	0.338	-0.0154	0.2849	-0.0051
12.00	3.46	0.4186	-0.0171	0.3379	-0.0155	0.2848	-0.0052
12.17	3.49	0.4186	-0.0171	0.3377	-0.0157	0.2848	-0.0052
12.33	3.51	0.4184	-0.0173	0.3376	-0.0158	0.2847	-0.0053
12.50	3.54	0.4184	-0.0173	0.3374	-0.016	0.2847	-0.0053

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.4183	-0.0174	0.3372	-0.0162	0.2847	-0.0053
12.83	3.58	0.4182	-0.0175	0.337	-0.0164	0.2847	-0.0053
13.00	3.61	0.4181	-0.0176	0.3369	-0.0165	0.2847	-0.0053
13.17	3.63	0.418	-0.0177	0.3366	-0.0168	0.2846	-0.0054
13.33	3.65	0.4178	-0.0179	0.3365	-0.0169	0.2846	-0.0054
13.50	3.67	0.4175	-0.0182	0.3363	-0.0171	0.2845	-0.0055
13.67	3.70	0.4172	-0.0185	0.3362	-0.0172	0.2845	-0.0055
13.83	3.72	0.417	-0.0187	0.3361	-0.0173	0.2845	-0.0055
14.00	3.74	0.4168	-0.0189	0.336	-0.0174	0.2844	-0.0056
14.17	3.76	0.4167	-0.019	0.3359	-0.0175	0.2844	-0.0056
14.33	3.79	0.4165	-0.0192	0.3359	-0.0175	0.2843	-0.0057
14.50	3.81	0.4164	-0.0193	0.3357	-0.0177	0.2843	-0.0057
14.67	3.83	0.4162	-0.0195	0.3356	-0.0178	0.2842	-0.0058
14.83	3.85	0.4161	-0.0196	0.3354	-0.018	0.2842	-0.0058
15.83	3.98	0.4154	-0.0203	0.3347	-0.0187	0.2839	-0.0061
16.83	4.10	0.4147	-0.021	0.334	-0.0194	0.2838	-0.0062
17.83	4.22	0.4137	-0.022	0.3332	-0.0202	0.2836	-0.0064
18.83	4.34	0.4122	-0.0235	0.3325	-0.0209	0.2832	-0.0068
19.83	4.45	0.4111	-0.0246	0.3318	-0.0216	0.283	-0.007
20.83	4.56	0.41	-0.0257	0.3311	-0.0223	0.2827	-0.0073
21.83	4.67	0.4094	-0.0263	0.3303	-0.0231	0.2823	-0.0077
22.83	4.78	0.4088	-0.0269	0.3296	-0.0238	0.2821	-0.0079
23.83	4.88	0.4082	-0.0275	0.3291	-0.0243	0.2818	-0.0082
24.83	4.98	0.4076	-0.0281	0.3287	-0.0247	0.2815	-0.0085
25.83	5.08	0.4069	-0.0288	0.3281	-0.0253	0.2813	-0.0087
26.83	5.18	0.4063	-0.0294	0.3277	-0.0257	0.2811	-0.0089
27.83	5.28	0.4058	-0.0299	0.3271	-0.0263	0.2808	-0.0092
28.83	5.37	0.4053	-0.0304	0.3265	-0.0269	0.2806	-0.0094
29.83	5.46	0.405	-0.0307	0.326	-0.0274	0.2803	-0.0097
30.83	5.55	0.4047	-0.031	0.3254	-0.028	0.28	-0.01
31.83	5.64	0.4042	-0.0315	0.3247	-0.0287	0.2799	-0.0101
32.83	5.73	0.4039	-0.0318	0.324	-0.0294	0.2796	-0.0104
33.83	5.82	0.4029	-0.0328	0.3234	-0.03	0.2793	-0.0107
34.83	5.90	0.4023	-0.0334	0.3228	-0.0306	0.2792	-0.0108
35.83	5.99	0.402	-0.0337	0.3222	-0.0312	0.2789	-0.0111
36.83	6.07	0.4013	-0.0344	0.3216	-0.0318	0.2786	-0.0114
37.83	6.15	0.4007	-0.035	0.3211	-0.0323	0.2781	-0.0119
38.83	6.23	0.4004	-0.0353	0.3207	-0.0327	0.2778	-0.0122

ple G8-S3 @ 5'

ne (nutes)	Square Root of Time (minutes)	Test 1 @ 10 psf Dial Reading (inches)	Test 1 @ 10 psf Deflection (inches)	Test 2 @ 25 psf Dial Reading (inches)	Test 2 @ 25 psf Deflection (inches)	Test 3 @ 50 psf Dial Reading (inches)	Test 3 @ 50 psf Deflection (inches)
39.83	6.31	0.3993	-0.0364	0.3201	-0.0333	0.2776	-0.0124
40.83	6.39	0.3988	-0.0369	0.3197	-0.0337	0.2773	-0.0127
41.83	6.47	0.3984	-0.0373	0.3193	-0.0341	0.277	-0.013
42.83	6.54	0.3979	-0.0378	0.319	-0.0344	0.2768	-0.0132
43.83	6.62	0.3975	-0.0382	0.3186	-0.0348	0.2764	-0.0136
44.83	6.70	0.3971	-0.0386	0.3183	-0.0351	0.2761	-0.0139
45.83	6.77	0.397	-0.0387	0.3178	-0.0356	0.2759	-0.0141
46.83	6.84	0.3964	-0.0393	0.3175	-0.0359	0.2756	-0.0144
47.83	6.92	0.3956	-0.0401	0.3172	-0.0362	0.2752	-0.0148
48.83	6.99	0.395	-0.0407	0.3169	-0.0365	0.2749	-0.0151
49.83	7.06	0.3943	-0.0414	0.3164	-0.037	0.2746	-0.0154
50.83	7.13	0.394	-0.0417	0.3161	-0.0373	0.2744	-0.0156
51.83	7.20	0.3935	-0.0422	0.3156	-0.0378	0.2741	-0.0159
52.83	7.27	0.3932	-0.0425	0.315	-0.0384	0.2738	-0.0162
53.83	7.34	0.3926	-0.0431	0.3143	-0.0391	0.2736	-0.0164
54.83	7.40	0.3922	-0.0435	0.3138	-0.0396	0.2734	-0.0166
55.83	7.47	0.3919	-0.0438	0.3132	-0.0402	0.2731	-0.0169
56.83	7.54	0.3916	-0.0441	0.3126	-0.0408	0.2729	-0.0171
57.83	7.60	0.3911	-0.0446	0.3119	-0.0415	0.2727	-0.0173
58.83	7.67	0.3906	-0.0451	0.3114	-0.042	0.2725	-0.0175
59.83	7.74	0.3901	-0.0456	0.3111	-0.0423	0.2724	-0.0176
60.83	7.80	0.3896	-0.0461	0.3106	-0.0428	0.2722	-0.0178
61.83	7.86	0.3893	-0.0464	0.3104	-0.043	0.272	-0.018
62.83	7.93	0.3891	-0.0466	0.3102	-0.0432	0.2719	-0.0181
63.83	7.99	0.3888	-0.0469	0.3099	-0.0435	0.2717	-0.0183
64.83	8.05	0.3885	-0.0472	0.3096	-0.0438	0.2715	-0.0185
65.83	8.11	0.3882	-0.0475	0.3093	-0.0441	0.2713	-0.0187
66.83	8.18	0.3881	-0.0476	0.3091	-0.0443	0.2713	-0.0187
67.83	8.24	0.3879	-0.0478	0.309	-0.0444	0.2711	-0.0189
68.83	8.30	0.3876	-0.0481	0.3088	-0.0446	0.2709	-0.0191
69.83	8.36	0.3874	-0.0483	0.3085	-0.0449	0.2708	-0.0192
70.83	8.42	0.3873	-0.0484	0.3083	-0.0451	0.2707	-0.0193
71.83	8.48	0.3872	-0.0485	0.3082	-0.0452	0.2706	-0.0194
72.83	8.53	0.3871	-0.0486	0.3081	-0.0453	0.2705	-0.0195
73.83	8.59	0.387	-0.0487	0.3078	-0.0456	0.2704	-0.0196
74.83	8.65	0.3869	-0.0488	0.3076	-0.0458	0.2703	-0.0197
75.83	8.71	0.3867	-0.049	0.3073	-0.0461	0.2701	-0.0199
76.83	8.77	0.3865	-0.0492	0.3068	-0.0466	0.27	-0.02

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.3864	-0.0493	0.3065	-0.0469	0.2698	-0.0202
78.83	8.88	0.3863	-0.0494	0.306	-0.0474	0.2697	-0.0203
79.83	8.93	0.3862	-0.0495	0.3057	-0.0477	0.2697	-0.0203
80.83	8.99	0.3859	-0.0498	0.3053	-0.0481	0.2695	-0.0205
81.83	9.05	0.3856	-0.0501	0.3049	-0.0485	0.2694	-0.0206
82.83	9.10	0.3855	-0.0502	0.3047	-0.0487	0.2693	-0.0207
83.83	9.16	0.3852	-0.0505	0.3044	-0.049	0.2691	-0.0209
84.83	9.21	0.3847	-0.051	0.3043	-0.0491	0.269	-0.021
85.83	9.26	0.3845	-0.0512	0.3041	-0.0493	0.2689	-0.0211
86.83	9.32	0.3842	-0.0515	0.3038	-0.0496	0.2689	-0.0211
87.83	9.37	0.384	-0.0517	0.3036	-0.0498	0.2688	-0.0212
88.83	9.43	0.3837	-0.052	0.3034	-0.05	0.2687	-0.0213
89.83	9.48	0.3835	-0.0522	0.3033	-0.0501	0.2686	-0.0214
90.83	9.53	0.3832	-0.0525	0.3032	-0.0502	0.2684	-0.0216
91.83	9.58	0.383	-0.0527	0.3031	-0.0503	0.2683	-0.0217
92.83	9.64	0.3829	-0.0528	0.3031	-0.0503	0.2683	-0.0217
93.83	9.69	0.3827	-0.053	0.303	-0.0504	0.2682	-0.0218
94.83	9.74	0.3824	-0.0533	0.3029	-0.0505	0.2681	-0.0219
95.83	9.79	0.3821	-0.0536	0.3029	-0.0505	0.268	-0.022
96.83	9.84	0.3819	-0.0538	0.3027	-0.0507	0.2679	-0.0221
97.83	9.89	0.3816	-0.0541	0.3025	-0.0509	0.2678	-0.0222
98.83	9.94	0.3814	-0.0543	0.3022	-0.0512	0.2676	-0.0224
99.83	9.99	0.3811	-0.0546	0.3021	-0.0513	0.2675	-0.0225
100.83	10.04	0.3808	-0.0549	0.302	-0.0514	0.2674	-0.0226
101.83	10.09	0.3806	-0.0551	0.3019	-0.0515	0.2673	-0.0227
102.83	10.14	0.3804	-0.0553	0.3018	-0.0516	0.2672	-0.0228
103.83	10.19	0.3801	-0.0556	0.3016	-0.0518	0.267	-0.023
104.83	10.24	0.3798	-0.0559	0.3014	-0.052	0.2669	-0.0231
109.33	10.46	0.3788	-0.0569	0.301	-0.0524	0.2666	-0.0234
114.33	10.69	0.3775	-0.0582	0.3008	-0.0526	0.2663	-0.0237
119.33	10.92	0.3754	-0.0603	0.3002	-0.0532	0.2659	-0.0241
124.33	11.15	0.3738	-0.0619	0.2993	-0.0541	0.2658	-0.0242
129.33	11.37	0.3724	-0.0633	0.2986	-0.0548	0.2656	-0.0244
134.33	11.59	0.3718	-0.0639	0.298	-0.0554	0.2654	-0.0246
139.33	11.80	0.3715	-0.0642	0.2972	-0.0562	0.2652	-0.0248
144.33	12.01	0.3712	-0.0645	0.2969	-0.0565	0.265	-0.025
149.33	12.22	0.3707	-0.065	0.2966	-0.0568	0.265	-0.025
154.33	12.42	0.3704	-0.0653	0.2964	-0.057	0.2649	-0.0251

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3693	-0.0664	0.2957	-0.0577	0.2648	-0.0252
164.33	12.82	0.3686	-0.0671	0.2955	-0.0579	0.2646	-0.0254
169.33	13.01	0.3679	-0.0678	0.2954	-0.058	0.2645	-0.0255
174.33	13.20	0.3674	-0.0683	0.2952	-0.0582	0.2644	-0.0256
179.33	13.39	0.3673	-0.0684	0.2949	-0.0585	0.2644	-0.0256
184.33	13.58	0.3663	-0.0694	0.2946	-0.0588	0.2643	-0.0257
189.33	13.76	0.3648	-0.0709	0.2945	-0.0589	0.2643	-0.0257
194.33	13.94	0.3635	-0.0722	0.2943	-0.0591	0.2642	-0.0258
199.33	14.12	0.3625	-0.0732	0.2942	-0.0592	0.2642	-0.0258
204.33	14.29	0.3616	-0.0741	0.2941	-0.0593	0.2642	-0.0258
209.33	14.47	0.361	-0.0747	0.2941	-0.0593	0.2641	-0.0259
214.33	14.64	0.3606	-0.0751	0.294	-0.0594	0.264	-0.026
219.33	14.81	0.3602	-0.0755	0.294	-0.0594	0.264	-0.026
224.33	14.98	0.3599	-0.0758	0.294	-0.0594	0.264	-0.026
229.33	15.14	0.3598	-0.0759	0.294	-0.0594	0.264	-0.026
234.33	15.31	0.3597	-0.076	0.294	-0.0594	0.2639	-0.0261
239.33	15.47	0.3596	-0.0761	0.294	-0.0594	0.2639	-0.0261
244.33	15.63	0.3595	-0.0762	0.294	-0.0594	0.2636	-0.0264
249.33	15.79	0.3594	-0.0763	0.294	-0.0594	0.2636	-0.0264
254.33	15.95	0.3594	-0.0763	0.294	-0.0594	0.2636	-0.0264
259.33	16.10	0.3594	-0.0763	0.294	-0.0594	0.2635	-0.0265
264.33	16.26	0.3594	-0.0763	0.2936	-0.0598	0.2635	-0.0265
269.33	16.41	0.3594	-0.0763	0.2936	-0.0598	0.2635	-0.0265
274.33	16.56	0.3593	-0.0764	0.2934	-0.06	0.2635	-0.0265
279.33	16.71	0.3591	-0.0766	0.2932	-0.0602	0.2635	-0.0265
284.33	16.86	0.359	-0.0767	0.2926	-0.0608	0.2635	-0.0265
289.33	17.01	0.359	-0.0767	0.2925	-0.0609	0.2635	-0.0265
294.33	17.16	0.359	-0.0767	0.2925	-0.0609	0.2634	-0.0266
299.33	17.30	0.359	-0.0767	0.2924	-0.061	0.2634	-0.0266
304.33	17.45	0.3589	-0.0768	0.2923	-0.0611	0.2634	-0.0266
309.33	17.59	0.3589	-0.0768	0.2921	-0.0613	0.2634	-0.0266
314.33	17.73	0.3589	-0.0768	0.2919	-0.0615	0.2634	-0.0266
319.33	17.87	0.3589	-0.0768	0.2919	-0.0615	0.2634	-0.0266
324.33	18.01	0.3588	-0.0769	0.2918	-0.0616	0.2627	-0.0273
329.33	18.15	0.3587	-0.077	0.2918	-0.0616	0.2625	-0.0275
334.33	18.28	0.3587	-0.077	0.2918	-0.0616	0.2624	-0.0276
339.33	18.42	0.3587	-0.077	0.2917	-0.0617	0.2623	-0.0277
344.33	18.56	0.3587	-0.077	0.2917	-0.0617	0.2619	-0.0281

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.3587	-0.077	0.2916	-0.0618	0.2614	-0.0286
354.33	18.82	0.3587	-0.077	0.2915	-0.0619	0.2611	-0.0289
369.33	19.22	0.3587	-0.077	0.2914	-0.062	0.261	-0.029
384.33	19.60	0.3587	-0.077	0.2914	-0.062	0.26	-0.03
399.33	19.98	0.3587	-0.077	0.2913	-0.0621	0.2597	-0.0303
414.33	20.36	0.3587	-0.077	0.2911	-0.0623	0.2595	-0.0305
429.33	20.72	0.3587	-0.077	0.291	-0.0624	0.259	-0.031
444.33	21.08	0.3587	-0.077	0.2908	-0.0626	0.2587	-0.0313
459.33	21.43	0.3587	-0.077	0.2907	-0.0627	0.2587	-0.0313
474.33	21.78	0.3587	-0.077	0.2905	-0.0629	0.2586	-0.0314
489.33	22.12	0.3587	-0.077	0.2904	-0.063	0.2586	-0.0314
504.33	22.46	0.3587	-0.077	0.2904	-0.063	0.2583	-0.0317
519.33	22.79	0.3587	-0.077	0.2903	-0.0631	0.2582	-0.0318
534.33	23.12	0.3587	-0.077	0.2903	-0.0631	0.258	-0.032
549.33	23.44	0.3587	-0.077	0.2902	-0.0632	0.2579	-0.0321
564.33	23.76	0.3587	-0.077	0.2901	-0.0633	0.2576	-0.0324
579.33	24.07	0.3588	-0.0769	0.29	-0.0634	0.2573	-0.0327
594.33	24.38	0.3587	-0.077	0.29	-0.0634	0.2573	-0.0327
609.33	24.68	0.3587	-0.077	0.29	-0.0634		
624.33	24.99	0.3587	-0.077	0.29	-0.0634		
639.33	25.29	0.3587	-0.077	0.29	-0.0634		
654.33	25.58	0.3587	-0.077	0.2899	-0.0635		
669.33	25.87	0.3587	-0.077	0.2899	-0.0635		
684.33	26.16	0.3587	-0.077	0.2899	-0.0635		
699.33	26.44	0.3587	-0.077	0.2899	-0.0635		
714.33	26.73	0.3587	-0.077	0.29	-0.0634		
744.33	27.28	0.3587	-0.077	0.2899	-0.0635		
774.33	27.83	0.3588	-0.0769	0.2899	-0.0635		
804.33	28.36	0.3587	-0.077	0.29	-0.0634		
834.33	28.88	0.3587	-0.077	0.2899	-0.0635		
864.33	29.40	0.3587	-0.077	0.2899	-0.0635		
894.33	29.91	0.3587	-0.077	0.29	-0.0634		
924.33	30.40	0.3582	-0.0775	0.29	-0.0634		
954.33	30.89	0.3548	-0.0809	0.2899	-0.0635		
984.33	31.37			0.29	-0.0634		
1014.33	31.85			0.29	-0.0634		
1044.33	32.32			0.29	-0.0634		
1074.33	32.78			0.29	-0.0634		

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23			0.29	-0.0634		
1134.33	33.68			0.29	-0.0634		
1164.33	34.12			0.29	-0.0634		
1194.33	34.56			0.29	-0.0634		
1224.33	34.99			0.29	-0.0634		
1254.33	35.42			0.29	-0.0634		
1284.33	35.84			0.29	-0.0634		
1314.33	36.25			0.29	-0.0634		
1344.33	36.67			0.29	-0.0634		
1374.33	37.07			0.29	-0.0634		
1404.33	37.47			0.29	-0.0634		

ole G8-S3 @ 5'

ne utes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.2572	0	0.206	0	0.1305	0
0.17	0.41	0.2562	-0.001	0.1974	-0.0086	0.1276	-0.0029
0.33	0.58	0.2549	-0.0023	0.193	-0.013	0.1252	-0.0053
0.50	0.71	0.2542	-0.003	0.1912	-0.0148	0.1228	-0.0077
0.67	0.82	0.2532	-0.004	0.1888	-0.0172	0.1215	-0.009
0.83	0.91	0.2527	-0.0045	0.1873	-0.0187	0.1199	-0.0106
1.00	1.00	0.252	-0.0052	0.1852	-0.0208	0.1188	-0.0117
1.17	1.08	0.2516	-0.0056	0.184	-0.022	0.1174	-0.0131
1.33	1.15	0.2509	-0.0063	0.1824	-0.0236	0.1164	-0.0141
1.50	1.22	0.2506	-0.0066	0.1813	-0.0247	0.1154	-0.0151
1.67	1.29	0.25	-0.0072	0.1799	-0.0261	0.1144	-0.0161
1.83	1.35	0.2496	-0.0076	0.179	-0.027	0.1133	-0.0172
2.00	1.41	0.2491	-0.0081	0.1775	-0.0285	0.1127	-0.0178
2.17	1.47	0.2487	-0.0085	0.1766	-0.0294	0.1116	-0.0189
2.33	1.53	0.2483	-0.0089	0.1753	-0.0307	0.111	-0.0195
2.50	1.58	0.2479	-0.0093	0.1746	-0.0314	0.1101	-0.0204
2.67	1.63	0.2476	-0.0096	0.1734	-0.0326	0.1094	-0.0211
2.83	1.68	0.2472	-0.01	0.1727	-0.0333	0.1085	-0.022
3.00	1.73	0.2469	-0.0103	0.1716	-0.0344	0.108	-0.0225
3.17	1.78	0.2466	-0.0106	0.1709	-0.0351	0.107	-0.0235
3.33	1.83	0.2461	-0.0111	0.17	-0.036	0.1065	-0.024
3.50	1.87	0.2459	-0.0113	0.1692	-0.0368	0.1058	-0.0247
3.67	1.91	0.2454	-0.0118	0.1682	-0.0378	0.1053	-0.0252
3.83	1.96	0.2452	-0.012	0.1676	-0.0384	0.1046	-0.0259
4.00	2.00	0.2447	-0.0125	0.1667	-0.0393	0.104	-0.0265
4.17	2.04	0.2446	-0.0126	0.166	-0.04	0.1034	-0.0271
4.33	2.08	0.2442	-0.013	0.1651	-0.0409	0.103	-0.0275
4.50	2.12	0.2438	-0.0134	0.1645	-0.0415	0.1023	-0.0282
4.67	2.16	0.2435	-0.0137	0.1637	-0.0423	0.1019	-0.0286
4.83	2.20	0.2433	-0.0139	0.1632	-0.0428	0.1013	-0.0292
5.00	2.24	0.243	-0.0142	0.1624	-0.0436	0.101	-0.0295
5.17	2.27	0.2427	-0.0145	0.162	-0.044	0.1004	-0.0301
5.33	2.31	0.2422	-0.015	0.1612	-0.0448	0.1	-0.0305
5.50	2.35	0.242	-0.0152	0.1607	-0.0453	0.0995	-0.031
5.67	2.38	0.2417	-0.0155	0.16	-0.046	0.0992	-0.0313
5.83	2.42	0.2414	-0.0158	0.1596	-0.0464	0.0987	-0.0318
6.00	2.45	0.241	-0.0162	0.1588	-0.0472	0.0984	-0.0321
6.17	2.48	0.2407	-0.0165	0.1584	-0.0476	0.098	-0.0325

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.2404	-0.0168	0.1577	-0.0483	0.0977	-0.0328
6.50	2.55	0.2401	-0.0171	0.1573	-0.0487	0.0974	-0.0331
6.67	2.58	0.2398	-0.0174	0.1567	-0.0493	0.097	-0.0335
6.83	2.61	0.2396	-0.0176	0.1563	-0.0497	0.0966	-0.0339
7.00	2.65	0.2392	-0.018	0.1558	-0.0502	0.0964	-0.0341
7.17	2.68	0.2391	-0.0181	0.1554	-0.0506	0.096	-0.0345
7.33	2.71	0.2387	-0.0185	0.1549	-0.0511	0.0958	-0.0347
7.50	2.74	0.2384	-0.0188	0.1546	-0.0514	0.0954	-0.0351
7.67	2.77	0.2381	-0.0191	0.1541	-0.0519	0.0952	-0.0353
7.83	2.80	0.2379	-0.0193	0.1537	-0.0523	0.0949	-0.0356
8.00	2.83	0.2375	-0.0197	0.1533	-0.0527	0.0947	-0.0358
8.17	2.86	0.2373	-0.0199	0.153	-0.053	0.0944	-0.0361
8.33	2.89	0.2369	-0.0203	0.1525	-0.0535	0.0943	-0.0362
8.50	2.92	0.2367	-0.0205	0.1521	-0.0539	0.094	-0.0365
8.67	2.94	0.2365	-0.0207	0.1517	-0.0543	0.0938	-0.0367
8.83	2.97	0.2362	-0.021	0.1514	-0.0546	0.0936	-0.0369
9.00	3.00	0.2359	-0.0213	0.1509	-0.0551	0.0934	-0.0371
9.17	3.03	0.2358	-0.0214	0.1505	-0.0555	0.0932	-0.0373
9.33	3.06	0.2355	-0.0217	0.1502	-0.0558	0.0931	-0.0374
9.50	3.08	0.2353	-0.0219	0.1498	-0.0562	0.0928	-0.0377
9.67	3.11	0.2351	-0.0221	0.1494	-0.0566	0.0928	-0.0377
9.83	3.14	0.2349	-0.0223	0.1492	-0.0568	0.0926	-0.0379
10.00	3.16	0.2346	-0.0226	0.1487	-0.0573	0.0925	-0.038
10.17	3.19	0.2344	-0.0228	0.1485	-0.0575	0.0922	-0.0383
10.33	3.21	0.2342	-0.023	0.1481	-0.0579	0.0921	-0.0384
10.50	3.24	0.234	-0.0232	0.1479	-0.0581	0.092	-0.0385
10.67	3.27	0.2337	-0.0235	0.1477	-0.0583	0.0919	-0.0386
10.83	3.29	0.2336	-0.0236	0.1474	-0.0586	0.0918	-0.0387
11.00	3.32	0.2333	-0.0239	0.1471	-0.0589	0.0916	-0.0389
11.17	3.34	0.2331	-0.0241	0.147	-0.059	0.0915	-0.039
11.33	3.37	0.2328	-0.0244	0.1467	-0.0593	0.0913	-0.0392
11.50	3.39	0.2326	-0.0246	0.1464	-0.0596	0.0912	-0.0393
11.67	3.42	0.2323	-0.0249	0.1462	-0.0598	0.0912	-0.0393
11.83	3.44	0.2321	-0.0251	0.146	-0.06	0.091	-0.0395
12.00	3.46	0.2319	-0.0253	0.1457	-0.0603	0.091	-0.0395
12.17	3.49	0.2317	-0.0255	0.1455	-0.0605	0.0908	-0.0397
12.33	3.51	0.2314	-0.0258	0.1453	-0.0607	0.0907	-0.0398
12.50	3.54	0.2312	-0.026	0.1451	-0.0609	0.0906	-0.0399

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.2311	-0.0261	0.1449	-0.0611	0.0905	-0.04
12.83	3.58	0.2309	-0.0263	0.1447	-0.0613	0.0904	-0.0401
13.00	3.61	0.2306	-0.0266	0.1445	-0.0615	0.0904	-0.0401
13.17	3.63	0.2305	-0.0267	0.1443	-0.0617	0.0903	-0.0402
13.33	3.65	0.2303	-0.0269	0.1441	-0.0619	0.0902	-0.0403
13.50	3.67	0.2302	-0.027	0.144	-0.062	0.0901	-0.0404
13.67	3.70	0.2299	-0.0273	0.1438	-0.0622	0.09	-0.0405
13.83	3.72	0.2298	-0.0274	0.1437	-0.0623	0.0899	-0.0406
14.00	3.74	0.2296	-0.0276	0.1435	-0.0625	0.0899	-0.0406
14.17	3.76	0.2295	-0.0277	0.1434	-0.0626	0.0897	-0.0408
14.33	3.79	0.2292	-0.028	0.1432	-0.0628	0.0896	-0.0409
14.50	3.81	0.2291	-0.0281	0.1431	-0.0629	0.0896	-0.0409
14.67	3.83	0.2289	-0.0283	0.1429	-0.0631	0.0896	-0.0409
14.83	3.85	0.2288	-0.0284	0.1428	-0.0632	0.0895	-0.041
15.83	3.98	0.2278	-0.0294	0.1421	-0.0639	0.089	-0.0415
16.83	4.10	0.2268	-0.0304	0.1414	-0.0646	0.0887	-0.0418
17.83	4.22	0.2258	-0.0314	0.1407	-0.0653	0.0883	-0.0422
18.83	4.34	0.2249	-0.0323	0.1402	-0.0658	0.088	-0.0425
19.83	4.45	0.2241	-0.0331	0.1398	-0.0662	0.0877	-0.0428
20.83	4.56	0.2233	-0.0339	0.1394	-0.0666	0.0874	-0.0431
21.83	4.67	0.2226	-0.0346	0.1391	-0.0669	0.0873	-0.0432
22.83	4.78	0.222	-0.0352	0.1387	-0.0673	0.087	-0.0435
23.83	4.88	0.2214	-0.0358	0.1384	-0.0676	0.0868	-0.0437
24.83	4.98	0.2208	-0.0364	0.1382	-0.0678	0.0866	-0.0439
25.83	5.08	0.2202	-0.037	0.1379	-0.0681	0.0865	-0.044
26.83	5.18	0.2198	-0.0374	0.1377	-0.0683	0.0863	-0.0442
27.83	5.28	0.2194	-0.0378	0.1375	-0.0685	0.0861	-0.0444
28.83	5.37	0.219	-0.0382	0.1373	-0.0687	0.086	-0.0445
29.83	5.46	0.2186	-0.0386	0.1371	-0.0689	0.0858	-0.0447
30.83	5.55	0.2183	-0.0389	0.137	-0.069	0.0857	-0.0448
31.83	5.64	0.2179	-0.0393	0.1368	-0.0692	0.0855	-0.045
32.83	5.73	0.2177	-0.0395	0.1367	-0.0693	0.0854	-0.0451
33.83	5.82	0.2174	-0.0398	0.1365	-0.0695	0.0853	-0.0452
34.83	5.90	0.2171	-0.0401	0.1364	-0.0696	0.0851	-0.0454
35.83	5.99	0.2169	-0.0403	0.1363	-0.0697	0.085	-0.0455
36.83	6.07	0.2165	-0.0407	0.1362	-0.0698	0.0849	-0.0456
37.83	6.15	0.2164	-0.0408	0.1361	-0.0699	0.0849	-0.0456
38.83	6.23	0.2162	-0.041	0.136	-0.07	0.0848	-0.0457

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.216	-0.0412	0.136	-0.07	0.0847	-0.0458
40.83	6.39	0.2158	-0.0414	0.1359	-0.0701	0.0846	-0.0459
41.83	6.47	0.2156	-0.0416	0.1358	-0.0702	0.0844	-0.0461
42.83	6.54	0.2155	-0.0417	0.1357	-0.0703	0.0843	-0.0462
43.83	6.62	0.2154	-0.0418	0.1356	-0.0704	0.0842	-0.0463
44.83	6.70	0.2152	-0.042	0.1355	-0.0705	0.0841	-0.0464
45.83	6.77	0.215	-0.0422	0.1355	-0.0705	0.0841	-0.0464
46.83	6.84	0.2148	-0.0424	0.1354	-0.0706	0.0841	-0.0464
47.83	6.92	0.2147	-0.0425	0.1353	-0.0707	0.084	-0.0465
48.83	6.99	0.2146	-0.0426	0.1353	-0.0707	0.0839	-0.0466
49.83	7.06	0.2145	-0.0427	0.1352	-0.0708	0.0839	-0.0466
50.83	7.13	0.2144	-0.0428	0.1352	-0.0708	0.0838	-0.0467
51.83	7.20	0.2142	-0.043	0.1352	-0.0708	0.0838	-0.0467
52.83	7.27	0.2142	-0.043	0.1352	-0.0708	0.0837	-0.0468
53.83	7.34	0.2141	-0.0431	0.1351	-0.0709	0.0837	-0.0468
54.83	7.40	0.214	-0.0432	0.1351	-0.0709	0.0836	-0.0469
55.83	7.47	0.2139	-0.0433	0.135	-0.071	0.0836	-0.0469
56.83	7.54	0.2139	-0.0433	0.1349	-0.0711	0.0835	-0.047
57.83	7.60	0.2138	-0.0434	0.1349	-0.0711	0.0834	-0.0471
58.83	7.67	0.2138	-0.0434	0.1349	-0.0711	0.0833	-0.0472
59.83	7.74	0.2137	-0.0435	0.1348	-0.0712	0.0833	-0.0472
60.83	7.80	0.2136	-0.0436	0.1348	-0.0712	0.0833	-0.0472
61.83	7.86	0.2135	-0.0437	0.1347	-0.0713	0.0832	-0.0473
62.83	7.93	0.2134	-0.0438	0.1347	-0.0713	0.0832	-0.0473
63.83	7.99	0.2134	-0.0438	0.1346	-0.0714	0.0832	-0.0473
64.83	8.05	0.2133	-0.0439	0.1346	-0.0714	0.0831	-0.0474
65.83	8.11	0.2133	-0.0439	0.1346	-0.0714	0.0831	-0.0474
66.83	8.18	0.2132	-0.044	0.1345	-0.0715	0.083	-0.0475
67.83	8.24	0.2131	-0.0441	0.1345	-0.0715	0.083	-0.0475
68.83	8.30	0.2131	-0.0441	0.1345	-0.0715	0.083	-0.0475
69.83	8.36	0.2131	-0.0441	0.1345	-0.0715	0.0829	-0.0476
70.83	8.42	0.213	-0.0442	0.1345	-0.0715	0.0829	-0.0476
71.83	8.48	0.213	-0.0442	0.1345	-0.0715	0.0828	-0.0477
72.83	8.53	0.2129	-0.0443	0.1344	-0.0716	0.0828	-0.0477
73.83	8.59	0.2129	-0.0443	0.1344	-0.0716	0.0828	-0.0477
74.83	8.65	0.2128	-0.0444	0.1344	-0.0716	0.0827	-0.0478
75.83	8.71	0.2127	-0.0445	0.1344	-0.0716	0.0827	-0.0478
76.83	8.77	0.2127	-0.0445	0.1343	-0.0717	0.0826	-0.0479

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.2126	-0.0446	0.1343	-0.0717	0.0826	-0.0479
78.83	8.88	0.2125	-0.0447	0.1343	-0.0717	0.0825	-0.048
79.83	8.93	0.2124	-0.0448	0.1342	-0.0718	0.0825	-0.048
80.83	8.99	0.2124	-0.0448	0.1342	-0.0718	0.0825	-0.048
81.83	9.05	0.2124	-0.0448	0.1342	-0.0718	0.0825	-0.048
82.83	9.10	0.2123	-0.0449	0.1341	-0.0719	0.0824	-0.0481
83.83	9.16	0.2123	-0.0449	0.1341	-0.0719	0.0824	-0.0481
84.83	9.21	0.2123	-0.0449	0.134	-0.072	0.0823	-0.0482
85.83	9.26	0.2123	-0.0449	0.134	-0.072	0.0823	-0.0482
86.83	9.32	0.2122	-0.045	0.134	-0.072	0.0823	-0.0482
87.83	9.37	0.2121	-0.0451	0.134	-0.072	0.0822	-0.0483
88.83	9.43	0.2121	-0.0451	0.1339	-0.0721	0.0822	-0.0483
89.83	9.48	0.2121	-0.0451	0.1339	-0.0721	0.0821	-0.0484
90.83	9.53	0.212	-0.0452	0.1339	-0.0721	0.0821	-0.0484
91.83	9.58	0.212	-0.0452	0.1339	-0.0721	0.0821	-0.0484
92.83	9.64	0.212	-0.0452	0.1338	-0.0722	0.082	-0.0485
93.83	9.69	0.2119	-0.0453	0.1338	-0.0722	0.0819	-0.0486
94.83	9.74	0.2118	-0.0454	0.1338	-0.0722	0.0819	-0.0486
95.83	9.79	0.2118	-0.0454	0.1338	-0.0722	0.0819	-0.0486
96.83	9.84	0.2118	-0.0454	0.1338	-0.0722	0.0818	-0.0487
97.83	9.89	0.2117	-0.0455	0.1338	-0.0722	0.0818	-0.0487
98.83	9.94	0.2117	-0.0455	0.1338	-0.0722	0.0818	-0.0487
99.83	9.99	0.2116	-0.0456	0.1337	-0.0723	0.0818	-0.0487
100.83	10.04	0.2116	-0.0456	0.1337	-0.0723	0.0818	-0.0487
101.83	10.09	0.2116	-0.0456	0.1337	-0.0723	0.0818	-0.0487
102.83	10.14	0.2116	-0.0456	0.1337	-0.0723	0.0817	-0.0488
103.83	10.19	0.2116	-0.0456	0.1337	-0.0723	0.0816	-0.0489
104.83	10.24	0.2115	-0.0457	0.1337	-0.0723	0.0816	-0.0489
109.33	10.46	0.2115	-0.0457	0.1337	-0.0723	0.0814	-0.0491
114.33	10.69	0.2114	-0.0458	0.1336	-0.0724	0.0813	-0.0492
119.33	10.92	0.2112	-0.046	0.1336	-0.0724	0.0812	-0.0493
124.33	11.15	0.2111	-0.0461	0.1335	-0.0725	0.0811	-0.0494
129.33	11.37	0.211	-0.0462	0.1335	-0.0725	0.081	-0.0495
134.33	11.59	0.2109	-0.0463	0.1334	-0.0726	0.081	-0.0495
139.33	11.80	0.2108	-0.0464	0.1334	-0.0726	0.0809	-0.0496
144.33	12.01	0.2108	-0.0464	0.1333	-0.0727	0.0808	-0.0497
149.33	12.22	0.2107	-0.0465	0.1333	-0.0727	0.0807	-0.0498
154.33	12.42	0.2107	-0.0465	0.1333	-0.0727	0.0806	-0.0499

ple G8-S3 @ 5'

me (inutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.2106	-0.0466	0.1332	-0.0728	0.0806	-0.0499
164.33	12.82	0.2105	-0.0467	0.1332	-0.0728	0.0805	-0.05
169.33	13.01	0.2105	-0.0467	0.1332	-0.0728	0.0804	-0.0501
174.33	13.20	0.2104	-0.0468	0.1331	-0.0729	0.0804	-0.0501
179.33	13.39	0.2104	-0.0468	0.1331	-0.0729	0.0803	-0.0502
184.33	13.58	0.2103	-0.0469	0.133	-0.073	0.0803	-0.0502
189.33	13.76	0.2103	-0.0469	0.1329	-0.0731	0.0802	-0.0503
194.33	13.94	0.2102	-0.047	0.1329	-0.0731	0.0802	-0.0503
199.33	14.12	0.2102	-0.047	0.1329	-0.0731	0.0801	-0.0504
204.33	14.29	0.2101	-0.0471	0.1329	-0.0731	0.0799	-0.0506
209.33	14.47	0.2101	-0.0471	0.1329	-0.0731	0.0798	-0.0507
214.33	14.64	0.2101	-0.0471	0.1329	-0.0731	0.0797	-0.0508
219.33	14.81	0.21	-0.0472	0.1328	-0.0732	0.0797	-0.0508
224.33	14.98	0.21	-0.0472	0.1328	-0.0732	0.0796	-0.0509
229.33	15.14	0.21	-0.0472	0.1327	-0.0733	0.0795	-0.051
234.33	15.31	0.21	-0.0472	0.1327	-0.0733	0.0795	-0.051
239.33	15.47	0.21	-0.0472	0.1327	-0.0733	0.0794	-0.0511
244.33	15.63	0.21	-0.0472	0.1327	-0.0733	0.0794	-0.0511
249.33	15.79	0.2099	-0.0473	0.1326	-0.0734	0.0794	-0.0511
254.33	15.95	0.2099	-0.0473	0.1326	-0.0734	0.0793	-0.0512
259.33	16.10	0.2099	-0.0473	0.1326	-0.0734	0.0793	-0.0512
264.33	16.26	0.2099	-0.0473	0.1326	-0.0734	0.0792	-0.0513
269.33	16.41	0.2098	-0.0474	0.1325	-0.0735	0.0792	-0.0513
274.33	16.56	0.2098	-0.0474	0.1325	-0.0735	0.0792	-0.0513
279.33	16.71	0.2098	-0.0474	0.1325	-0.0735	0.0791	-0.0514
284.33	16.86	0.2098	-0.0474	0.1324	-0.0736	0.0791	-0.0514
289.33	17.01	0.2098	-0.0474	0.1324	-0.0736	0.079	-0.0515
294.33	17.16	0.2098	-0.0474	0.1324	-0.0736	0.079	-0.0515
299.33	17.30	0.2098	-0.0474	0.1324	-0.0736	0.079	-0.0515
304.33	17.45	0.2097	-0.0475	0.1324	-0.0736	0.0789	-0.0516
309.33	17.59	0.2097	-0.0475	0.1323	-0.0737	0.0789	-0.0516
314.33	17.73	0.2097	-0.0475	0.1323	-0.0737	0.0788	-0.0517
319.33	17.87	0.2097	-0.0475	0.1323	-0.0737	0.0789	-0.0516
324.33	18.01	0.2096	-0.0476	0.1322	-0.0738	0.0788	-0.0517
329.33	18.15	0.2096	-0.0476	0.1322	-0.0738	0.0788	-0.0517
334.33	18.28	0.2096	-0.0476	0.1322	-0.0738	0.0787	-0.0518
339.33	18.42	0.2096	-0.0476	0.1322	-0.0738	0.0786	-0.0519
344.33	18.56	0.2096	-0.0476	0.1322	-0.0738	0.0786	-0.0519

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.2096	-0.0476	0.1321	-0.0739	0.0786	-0.0519
354.33	18.82	0.2096	-0.0476	0.1321	-0.0739	0.0786	-0.0519
369.33	19.22	0.2095	-0.0477	0.1321	-0.0739	0.0786	-0.0519
384.33	19.60	0.2095	-0.0477	0.1321	-0.0739	0.0784	-0.0521
399.33	19.98	0.2095	-0.0477	0.1321	-0.0739	0.0783	-0.0522
414.33	20.36	0.2094	-0.0478	0.132	-0.074	0.0783	-0.0522
429.33	20.72	0.2094	-0.0478	0.132	-0.074	0.0782	-0.0523
444.33	21.08	0.2093	-0.0479	0.1319	-0.0741	0.0782	-0.0523
459.33	21.43	0.2093	-0.0479	0.1319	-0.0741	0.0781	-0.0524
474.33	21.78	0.2093	-0.0479	0.1319	-0.0741	0.078	-0.0525
489.33	22.12	0.2092	-0.048	0.1318	-0.0742	0.078	-0.0525
504.33	22.46	0.2092	-0.048	0.1318	-0.0742	0.0779	-0.0526
519.33	22.79	0.2092	-0.048	0.1317	-0.0743	0.0779	-0.0526
534.33	23.12	0.2091	-0.0481	0.1317	-0.0743	0.0778	-0.0527
549.33	23.44	0.2091	-0.0481	0.1317	-0.0743	0.0778	-0.0527
564.33	23.76	0.209	-0.0482	0.1316	-0.0744	0.0778	-0.0527
579.33	24.07	0.209	-0.0482	0.1316	-0.0744	0.0778	-0.0527
594.33	24.38	0.209	-0.0482	0.1316	-0.0744	0.0777	-0.0528
609.33	24.68	0.209	-0.0482	0.1315	-0.0745	0.0777	-0.0528
624.33	24.99	0.2089	-0.0483	0.1315	-0.0745	0.0777	-0.0528
639.33	25.29	0.2088	-0.0484	0.1315	-0.0745	0.0777	-0.0528
654.33	25.58	0.2088	-0.0484	0.1314	-0.0746	0.0776	-0.0529
669.33	25.87	0.2088	-0.0484	0.1314	-0.0746	0.0776	-0.0529
684.33	26.16	0.2088	-0.0484	0.1314	-0.0746	0.0775	-0.053
699.33	26.44	0.2087	-0.0485	0.1314	-0.0746	0.0775	-0.053
714.33	26.73	0.2087	-0.0485	0.1313	-0.0747	0.0775	-0.053
744.33	27.28	0.2087	-0.0485	0.1313	-0.0747	0.0775	-0.053
774.33	27.83	0.2086	-0.0486	0.1313	-0.0747	0.0774	-0.0531
804.33	28.36	0.2086	-0.0486	0.1313	-0.0747	0.0773	-0.0532
834.33	28.88	0.2085	-0.0487	0.1313	-0.0747	0.0773	-0.0532
864.33	29.40	0.2084	-0.0488	0.1313	-0.0747	0.0772	-0.0533
894.33	29.91	0.2084	-0.0488	0.1312	-0.0748	0.0772	-0.0533
924.33	30.40	0.2083	-0.0489	0.1312	-0.0748	0.0771	-0.0534
954.33	30.89	0.2078	-0.0494	0.1311	-0.0749	0.0771	-0.0534
984.33	31.37	0.2076	-0.0496	0.1311	-0.0749	0.0771	-0.0534
1014.33	31.85	0.2075	-0.0497	0.131	-0.075	0.077	-0.0535
1044.33	32.32	0.2074	-0.0498	0.1309	-0.0751	0.077	-0.0535
1074.33	32.78	0.2069	-0.0503	0.1311	-0.0749	0.077	-0.0535

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23	0.2068	-0.0504	0.131	-0.075	0.077	-0.0535
1134.33	33.68	0.2067	-0.0505	0.1308	-0.0752	0.0769	-0.0536
1164.33	34.12	0.2065	-0.0507	0.1307	-0.0753	0.0769	-0.0536
1194.33	34.56	0.2064	-0.0508	0.1305	-0.0755	0.0768	-0.0537
1224.33	34.99	0.2064	-0.0508	0.1305	-0.0755	0.0768	-0.0537
1254.33	35.42	0.2063	-0.0509			0.0768	-0.0537
1284.33	35.84	0.2063	-0.0509			0.0767	-0.0538
1314.33	36.25	0.2063	-0.0509			0.0766	-0.0539
1344.33	36.67	0.2061	-0.0511			0.0764	-0.0541
1374.33	37.07					0.0763	-0.0542
1404.33	37.47					0.0764	-0.0541
1434.33	37.87					0.0764	-0.0541
1464.33	38.27					0.0764	-0.0541
1494.33	38.66					0.0763	-0.0542
1524.33	39.04					0.0762	-0.0543
1554.33	39.43					0.0762	-0.0543
1584.33	39.80					0.0762	-0.0543
1614.33	40.18					0.0761	-0.0544

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4278	0	0.3822	0	0.3192	0
0.17	0.41	0.4245	-0.0033	0.3768	-0.0054	0.3088	-0.0104
0.33	0.58	0.4212	-0.0066	0.371	-0.0112	0.3023	-0.0169
0.50	0.71	0.4196	-0.0082	0.3668	-0.0154	0.2957	-0.0235
0.67	0.82	0.4181	-0.0097	0.3635	-0.0187	0.2922	-0.027
0.83	0.91	0.417	-0.0108	0.36	-0.0222	0.2879	-0.0313
1.00	1.00	0.4159	-0.0119	0.3576	-0.0246	0.2854	-0.0338
1.17	1.08	0.4152	-0.0126	0.3546	-0.0276	0.2819	-0.0373
1.33	1.15	0.4145	-0.0133	0.3527	-0.0295	0.28	-0.0392
1.50	1.22	0.4137	-0.0141	0.3504	-0.0318	0.2773	-0.0419
1.67	1.29	0.4129	-0.0149	0.3492	-0.033	0.2758	-0.0434
1.83	1.35	0.4124	-0.0154	0.3472	-0.035	0.2735	-0.0457
2.00	1.41	0.4118	-0.016	0.3462	-0.036	0.2726	-0.0466
2.17	1.47	0.4113	-0.0165	0.3447	-0.0375	0.2711	-0.0481
2.33	1.53	0.4108	-0.017	0.3438	-0.0384	0.2705	-0.0487
2.50	1.58	0.4105	-0.0173	0.3425	-0.0397	0.2695	-0.0497
2.67	1.63	0.4099	-0.0179	0.3416	-0.0406	0.2688	-0.0504
2.83	1.68	0.4097	-0.0181	0.3406	-0.0416	0.268	-0.0512
3.00	1.73	0.4092	-0.0186	0.3399	-0.0423	0.2674	-0.0518
3.17	1.78	0.409	-0.0188	0.339	-0.0432	0.2666	-0.0526
3.33	1.83	0.4086	-0.0192	0.3386	-0.0436	0.2663	-0.0529
3.50	1.87	0.4084	-0.0194	0.3379	-0.0443	0.2657	-0.0535
3.67	1.91	0.4081	-0.0197	0.3376	-0.0446	0.2654	-0.0538
3.83	1.96	0.4078	-0.02	0.337	-0.0452	0.265	-0.0542
4.00	2.00	0.4075	-0.0203	0.3366	-0.0456	0.2647	-0.0545
4.17	2.04	0.4074	-0.0204	0.3362	-0.046	0.2643	-0.0549
4.33	2.08	0.4071	-0.0207	0.3358	-0.0464	0.2641	-0.0551
4.50	2.12	0.4069	-0.0209	0.3354	-0.0468	0.2637	-0.0555
4.67	2.16	0.4067	-0.0211	0.3351	-0.0471	0.2635	-0.0557
4.83	2.20	0.4066	-0.0212	0.3348	-0.0474	0.2633	-0.0559
5.00	2.24	0.4063	-0.0215	0.3346	-0.0476	0.2631	-0.0561
5.17	2.27	0.4061	-0.0217	0.3342	-0.048	0.2628	-0.0564
5.33	2.31	0.4059	-0.0219	0.3341	-0.0481	0.2627	-0.0565
5.50	2.35	0.4058	-0.022	0.3338	-0.0484	0.2625	-0.0567
5.67	2.38	0.4057	-0.0221	0.3336	-0.0486	0.2623	-0.0569
5.83	2.42	0.4055	-0.0223	0.3334	-0.0488	0.2621	-0.0571
6.00	2.45	0.4053	-0.0225	0.3332	-0.049	0.2619	-0.0573
6.17	2.48	0.4052	-0.0226	0.333	-0.0492	0.2618	-0.0574

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.405	-0.0228	0.3328	-0.0494	0.2617	-0.0575
6.50	2.55	0.4049	-0.0229	0.3327	-0.0495	0.2615	-0.0577
6.67	2.58	0.4047	-0.0231	0.3326	-0.0496	0.2614	-0.0578
6.83	2.61	0.4046	-0.0232	0.3324	-0.0498	0.2612	-0.058
7.00	2.65	0.4045	-0.0233	0.3323	-0.0499	0.2611	-0.0581
7.17	2.68	0.4043	-0.0235	0.3321	-0.0501	0.261	-0.0582
7.33	2.71	0.4042	-0.0236	0.332	-0.0502	0.2609	-0.0583
7.50	2.74	0.4042	-0.0236	0.3319	-0.0503	0.2608	-0.0584
7.67	2.77	0.4041	-0.0237	0.3319	-0.0503	0.2607	-0.0585
7.83	2.80	0.404	-0.0238	0.3317	-0.0505	0.2606	-0.0586
8.00	2.83	0.4038	-0.024	0.3316	-0.0506	0.2605	-0.0587
8.17	2.86	0.4038	-0.024	0.3315	-0.0507	0.2603	-0.0589
8.33	2.89	0.4037	-0.0241	0.3314	-0.0508	0.2603	-0.0589
8.50	2.92	0.4036	-0.0242	0.3313	-0.0509	0.2602	-0.059
8.67	2.94	0.4035	-0.0243	0.3312	-0.051	0.2602	-0.059
8.83	2.97	0.4034	-0.0244	0.3311	-0.0511	0.26	-0.0592
9.00	3.00	0.4034	-0.0244	0.3311	-0.0511	0.2599	-0.0593
9.17	3.03	0.4033	-0.0245	0.331	-0.0512	0.2598	-0.0594
9.33	3.06	0.4032	-0.0246	0.3309	-0.0513	0.2597	-0.0595
9.50	3.08	0.4032	-0.0246	0.3308	-0.0514	0.2597	-0.0595
9.67	3.11	0.4031	-0.0247	0.3307	-0.0515	0.2596	-0.0596
9.83	3.14	0.403	-0.0248	0.3305	-0.0517	0.2595	-0.0597
10.00	3.16	0.4029	-0.0249	0.3305	-0.0517	0.2595	-0.0597
10.17	3.19	0.4029	-0.0249	0.3303	-0.0519	0.2594	-0.0598
10.33	3.21	0.4028	-0.025	0.3303	-0.0519	0.2593	-0.0599
10.50	3.24	0.4027	-0.0251	0.3303	-0.0519	0.2592	-0.06
10.67	3.27	0.4027	-0.0251	0.3302	-0.052	0.2592	-0.06
10.83	3.29	0.4027	-0.0251	0.3301	-0.0521	0.2591	-0.0601
11.00	3.32	0.4026	-0.0252	0.33	-0.0522	0.259	-0.0602
11.17	3.34	0.4026	-0.0252	0.3299	-0.0523	0.2589	-0.0603
11.33	3.37	0.4025	-0.0253	0.3299	-0.0523	0.2589	-0.0603
11.50	3.39	0.4025	-0.0253	0.3298	-0.0524	0.2588	-0.0604
11.67	3.42	0.4024	-0.0254	0.3297	-0.0525	0.2588	-0.0604
11.83	3.44	0.4024	-0.0254	0.3296	-0.0526	0.2587	-0.0605
12.00	3.46	0.4023	-0.0255	0.3296	-0.0526	0.2587	-0.0605
12.17	3.49	0.4023	-0.0255	0.3295	-0.0527	0.2587	-0.0605
12.33	3.51	0.4022	-0.0256	0.3295	-0.0527	0.2586	-0.0606
12.50	3.54	0.4022	-0.0256	0.3295	-0.0527	0.2586	-0.0606

ple G8-S3 @ 5'

me nutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.4021	-0.0257	0.3295	-0.0527	0.2585	-0.0607
12.83	3.58	0.4021	-0.0257	0.3294	-0.0528	0.2585	-0.0607
13.00	3.61	0.402	-0.0258	0.3293	-0.0529	0.2584	-0.0608
13.17	3.63	0.402	-0.0258	0.3293	-0.0529	0.2584	-0.0608
13.33	3.65	0.402	-0.0258	0.3292	-0.053	0.2583	-0.0609
13.50	3.67	0.4019	-0.0259	0.3292	-0.053	0.2583	-0.0609
13.67	3.70	0.4019	-0.0259	0.3291	-0.0531	0.2582	-0.061
13.83	3.72	0.4019	-0.0259	0.3291	-0.0531	0.2582	-0.061
14.00	3.74	0.4019	-0.0259	0.3291	-0.0531	0.2581	-0.0611
14.17	3.76	0.4019	-0.0259	0.329	-0.0532	0.2581	-0.0611
14.33	3.79	0.4018	-0.026	0.329	-0.0532	0.2581	-0.0611
14.50	3.81	0.4018	-0.026	0.3289	-0.0533	0.258	-0.0612
14.67	3.83	0.4017	-0.0261	0.3289	-0.0533	0.258	-0.0612
14.83	3.85	0.4017	-0.0261	0.3288	-0.0534	0.2579	-0.0613
15.83	3.98	0.4015	-0.0263	0.3287	-0.0535	0.2578	-0.0614
16.83	4.10	0.4013	-0.0265	0.3285	-0.0537	0.2575	-0.0617
17.83	4.22	0.4011	-0.0267	0.3283	-0.0539	0.2574	-0.0618
18.83	4.34	0.401	-0.0268	0.3281	-0.0541	0.2572	-0.062
19.83	4.45	0.4008	-0.027	0.3279	-0.0543	0.2571	-0.0621
20.83	4.56	0.4007	-0.0271	0.3279	-0.0543	0.2569	-0.0623
21.83	4.67	0.4006	-0.0272	0.3277	-0.0545	0.2567	-0.0625
22.83	4.78	0.4004	-0.0274	0.3276	-0.0546	0.2565	-0.0627
23.83	4.88	0.4003	-0.0275	0.3274	-0.0548	0.2564	-0.0628
24.83	4.98	0.4003	-0.0275	0.3273	-0.0549	0.2563	-0.0629
25.83	5.08	0.4002	-0.0276	0.3272	-0.055	0.2562	-0.063
26.83	5.18	0.4001	-0.0277	0.3271	-0.0551	0.256	-0.0632
27.83	5.28	0.4	-0.0278	0.327	-0.0552	0.2559	-0.0633
28.83	5.37	0.3999	-0.0279	0.3269	-0.0553	0.2558	-0.0634
29.83	5.46	0.3998	-0.028	0.3268	-0.0554	0.2556	-0.0636
30.83	5.55	0.3997	-0.0281	0.3267	-0.0555	0.2556	-0.0636
31.83	5.64	0.3996	-0.0282	0.3266	-0.0556	0.2555	-0.0637
32.83	5.73	0.3995	-0.0283	0.3265	-0.0557	0.2554	-0.0638
33.83	5.82	0.3995	-0.0283	0.3264	-0.0558	0.2553	-0.0639
34.83	5.90	0.3995	-0.0283	0.3264	-0.0558	0.2552	-0.064
35.83	5.99	0.3994	-0.0284	0.3264	-0.0558	0.2551	-0.0641
36.83	6.07	0.3994	-0.0284	0.3263	-0.0559	0.255	-0.0642
37.83	6.15	0.3993	-0.0285	0.3262	-0.056	0.2549	-0.0643
38.83	6.23	0.3993	-0.0285	0.3262	-0.056	0.2548	-0.0644

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.3992	-0.0286	0.3261	-0.0561	0.2548	-0.0644
40.83	6.39	0.3992	-0.0286	0.3261	-0.0561	0.2547	-0.0645
41.83	6.47	0.3991	-0.0287	0.326	-0.0562	0.2546	-0.0646
42.83	6.54	0.3991	-0.0287	0.3259	-0.0563	0.2546	-0.0646
43.83	6.62	0.399	-0.0288	0.3259	-0.0563	0.2545	-0.0647
44.83	6.70	0.3989	-0.0289	0.3258	-0.0564	0.2544	-0.0648
45.83	6.77	0.3989	-0.0289	0.3258	-0.0564	0.2543	-0.0649
46.83	6.84	0.3989	-0.0289	0.3257	-0.0565	0.2542	-0.065
47.83	6.92	0.3988	-0.029	0.3257	-0.0565	0.2542	-0.065
48.83	6.99	0.3988	-0.029	0.3256	-0.0566	0.2541	-0.0651
49.83	7.06	0.3987	-0.0291	0.3256	-0.0566	0.254	-0.0652
50.83	7.13	0.3987	-0.0291	0.3256	-0.0566	0.254	-0.0652
51.83	7.20	0.3987	-0.0291	0.3255	-0.0567	0.254	-0.0652
52.83	7.27	0.3987	-0.0291	0.3255	-0.0567	0.254	-0.0652
53.83	7.34	0.3987	-0.0291	0.3255	-0.0567	0.2539	-0.0653
54.83	7.40	0.3987	-0.0291	0.3254	-0.0568	0.2539	-0.0653
55.83	7.47	0.3986	-0.0292	0.3254	-0.0568	0.2538	-0.0654
56.83	7.54	0.3986	-0.0292	0.3254	-0.0568	0.2538	-0.0654
57.83	7.60	0.3986	-0.0292	0.3253	-0.0569	0.2537	-0.0655
58.83	7.67	0.3985	-0.0293	0.3253	-0.0569	0.2537	-0.0655
59.83	7.74	0.3985	-0.0293	0.3252	-0.057	0.2536	-0.0656
60.83	7.80	0.3985	-0.0293	0.3252	-0.057	0.2536	-0.0656
61.83	7.86	0.3984	-0.0294	0.3252	-0.057	0.2535	-0.0657
62.83	7.93	0.3984	-0.0294	0.3251	-0.0571	0.2535	-0.0657
63.83	7.99	0.3984	-0.0294	0.3251	-0.0571	0.2534	-0.0658
64.83	8.05	0.3984	-0.0294	0.3251	-0.0571	0.2534	-0.0658
65.83	8.11	0.3984	-0.0294	0.3251	-0.0571	0.2533	-0.0659
66.83	8.18	0.3983	-0.0295	0.325	-0.0572	0.2533	-0.0659
67.83	8.24	0.3983	-0.0295	0.325	-0.0572	0.2532	-0.066
68.83	8.30	0.3983	-0.0295	0.3249	-0.0573	0.2532	-0.066
69.83	8.36	0.3983	-0.0295	0.3249	-0.0573	0.2532	-0.066
70.83	8.42	0.3982	-0.0296	0.3249	-0.0573	0.2532	-0.066
71.83	8.48	0.3982	-0.0296	0.3249	-0.0573	0.2532	-0.066
72.83	8.53	0.3982	-0.0296	0.3248	-0.0574	0.2531	-0.0661
73.83	8.59	0.3982	-0.0296	0.3248	-0.0574	0.2531	-0.0661
74.83	8.65	0.3981	-0.0297	0.3248	-0.0574	0.2531	-0.0661
75.83	8.71	0.3981	-0.0297	0.3248	-0.0574	0.253	-0.0662
76.83	8.77	0.3981	-0.0297	0.3248	-0.0574	0.253	-0.0662

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.3981	-0.0297	0.3248	-0.0574	0.2529	-0.0663
78.83	8.88	0.398	-0.0298	0.3248	-0.0574	0.2529	-0.0663
79.83	8.93	0.398	-0.0298	0.3247	-0.0575	0.2529	-0.0663
80.83	8.99	0.398	-0.0298	0.3247	-0.0575	0.2528	-0.0664
81.83	9.05	0.398	-0.0298	0.3247	-0.0575	0.2528	-0.0664
82.83	9.10	0.398	-0.0298	0.3247	-0.0575	0.2528	-0.0664
83.83	9.16	0.3979	-0.0299	0.3246	-0.0576	0.2527	-0.0665
84.83	9.21	0.3979	-0.0299	0.3246	-0.0576	0.2527	-0.0665
85.83	9.26	0.3979	-0.0299	0.3246	-0.0576	0.2526	-0.0666
86.83	9.32	0.3979	-0.0299	0.3246	-0.0576	0.2526	-0.0666
87.83	9.37	0.3979	-0.0299	0.3246	-0.0576	0.2526	-0.0666
88.83	9.43	0.3979	-0.0299	0.3245	-0.0577	0.2525	-0.0667
89.83	9.48	0.3979	-0.0299	0.3245	-0.0577	0.2525	-0.0667
90.83	9.53	0.3979	-0.0299	0.3245	-0.0577	0.2524	-0.0668
91.83	9.58	0.3979	-0.0299	0.3245	-0.0577	0.2524	-0.0668
92.83	9.64	0.3979	-0.0299	0.3244	-0.0578	0.2524	-0.0668
93.83	9.69	0.3979	-0.0299	0.3244	-0.0578	0.2524	-0.0668
94.83	9.74	0.3979	-0.0299	0.3244	-0.0578	0.2524	-0.0668
95.83	9.79	0.3979	-0.0299	0.3243	-0.0579	0.2524	-0.0668
96.83	9.84	0.3979	-0.0299	0.3243	-0.0579	0.2524	-0.0668
97.83	9.89	0.3979	-0.0299	0.3243	-0.0579	0.2523	-0.0669
98.83	9.94	0.3979	-0.0299	0.3243	-0.0579	0.2523	-0.0669
99.83	9.99	0.3979	-0.0299	0.3243	-0.0579	0.2523	-0.0669
100.83	10.04	0.3978	-0.03	0.3242	-0.058	0.2523	-0.0669
101.83	10.09	0.3978	-0.03	0.3242	-0.058	0.2522	-0.067
102.83	10.14	0.3978	-0.03	0.3242	-0.058	0.2522	-0.067
103.83	10.19	0.3978	-0.03	0.3242	-0.058	0.2522	-0.067
104.83	10.24	0.3978	-0.03	0.3242	-0.058	0.2521	-0.0671
109.33	10.46	0.3977	-0.0301	0.3241	-0.0581	0.252	-0.0672
114.33	10.69	0.3977	-0.0301	0.324	-0.0582	0.2519	-0.0673
119.33	10.92	0.3976	-0.0302	0.324	-0.0582	0.2518	-0.0674
124.33	11.15	0.3975	-0.0303	0.3239	-0.0583	0.2517	-0.0675
129.33	11.37	0.3975	-0.0303	0.3237	-0.0585	0.2516	-0.0676
134.33	11.59	0.3974	-0.0304	0.3237	-0.0585	0.2516	-0.0676
139.33	11.80	0.3974	-0.0304	0.3236	-0.0586	0.2515	-0.0677
144.33	12.01	0.3974	-0.0304	0.3235	-0.0587	0.2514	-0.0678
149.33	12.22	0.3973	-0.0305	0.3234	-0.0588	0.2514	-0.0678
154.33	12.42	0.3972	-0.0306	0.3233	-0.0589	0.2512	-0.068

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3972	-0.0306	0.3233	-0.0589	0.2512	-0.068
164.33	12.82	0.3972	-0.0306	0.3232	-0.059	0.2511	-0.0681
169.33	13.01	0.3971	-0.0307	0.3232	-0.059	0.251	-0.0682
174.33	13.20	0.3971	-0.0307	0.3232	-0.059	0.2509	-0.0683
179.33	13.39	0.3971	-0.0307	0.3231	-0.0591	0.2509	-0.0683
184.33	13.58	0.3971	-0.0307	0.323	-0.0592	0.2509	-0.0683
189.33	13.76	0.3971	-0.0307	0.323	-0.0592	0.2508	-0.0684
194.33	13.94	0.397	-0.0308	0.3229	-0.0593	0.2507	-0.0685
199.33	14.12	0.397	-0.0308	0.3228	-0.0594	0.2506	-0.0686
204.33	14.29	0.397	-0.0308	0.3228	-0.0594	0.2505	-0.0687
209.33	14.47	0.3969	-0.0309	0.3227	-0.0595	0.2505	-0.0687
214.33	14.64	0.3969	-0.0309	0.3226	-0.0596	0.2504	-0.0688
219.33	14.81	0.3969	-0.0309	0.3226	-0.0596	0.2503	-0.0689
224.33	14.98	0.3969	-0.0309	0.3225	-0.0597	0.2503	-0.0689
229.33	15.14	0.3968	-0.031	0.3225	-0.0597	0.2502	-0.069
234.33	15.31	0.3968	-0.031	0.3224	-0.0598	0.2502	-0.069
239.33	15.47	0.3968	-0.031	0.3224	-0.0598	0.2501	-0.0691
244.33	15.63	0.3968	-0.031	0.3224	-0.0598	0.2501	-0.0691
249.33	15.79	0.3967	-0.0311	0.3224	-0.0598	0.2501	-0.0691
254.33	15.95	0.3967	-0.0311	0.3223	-0.0599	0.25	-0.0692
259.33	16.10	0.3967	-0.0311	0.3223	-0.0599	0.25	-0.0692
264.33	16.26	0.3967	-0.0311	0.3222	-0.06	0.2499	-0.0693
269.33	16.41	0.3966	-0.0312	0.3222	-0.06	0.2499	-0.0693
274.33	16.56	0.3966	-0.0312	0.3221	-0.0601	0.2498	-0.0694
279.33	16.71	0.3966	-0.0312	0.3221	-0.0601	0.2498	-0.0694
284.33	16.86	0.3966	-0.0312	0.3221	-0.0601	0.2497	-0.0695
289.33	17.01	0.3966	-0.0312	0.322	-0.0602	0.2497	-0.0695
294.33	17.16	0.3966	-0.0312	0.322	-0.0602	0.2497	-0.0695
299.33	17.30	0.3965	-0.0313	0.3219	-0.0603	0.2496	-0.0696
304.33	17.45	0.3965	-0.0313	0.3219	-0.0603	0.2495	-0.0697
309.33	17.59	0.3965	-0.0313	0.3219	-0.0603	0.2495	-0.0697
314.33	17.73	0.3965	-0.0313	0.3218	-0.0604	0.2494	-0.0698
319.33	17.87	0.3965	-0.0313	0.3218	-0.0604	0.2494	-0.0698
324.33	18.01	0.3965	-0.0313	0.3218	-0.0604	0.2493	-0.0699
329.33	18.15	0.3965	-0.0313	0.3217	-0.0605	0.2493	-0.0699
334.33	18.28	0.3964	-0.0314	0.3217	-0.0605	0.2493	-0.0699
339.33	18.42	0.3964	-0.0314	0.3218	-0.0604	0.2493	-0.0699
344.33	18.56	0.3964	-0.0314	0.3217	-0.0605	0.2493	-0.0699

Sample G8-S3 @ 5'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.3964	-0.0314	0.3217	-0.0605	0.2492	-0.07
354.33	18.82	0.3964	-0.0314	0.3217	-0.0605	0.2492	-0.07
369.33	19.22	0.3964	-0.0314	0.3216	-0.0606	0.2491	-0.0701
384.33	19.60	0.3964	-0.0314	0.3216	-0.0606	0.2491	-0.0701
399.33	19.98	0.3964	-0.0314	0.3215	-0.0607	0.2489	-0.0703
414.33	20.36	0.3963	-0.0315	0.3215	-0.0607	0.2488	-0.0704
429.33	20.72	0.3963	-0.0315	0.3214	-0.0608	0.2487	-0.0705
444.33	21.08	0.3962	-0.0316	0.3213	-0.0609	0.2486	-0.0706
459.33	21.43	0.3962	-0.0316	0.3212	-0.061	0.2485	-0.0707
474.33	21.78	0.3962	-0.0316	0.3211	-0.0611	0.2484	-0.0708
489.33	22.12	0.3962	-0.0316	0.3211	-0.0611	0.2483	-0.0709
504.33	22.46	0.3961	-0.0317	0.321	-0.0612	0.2483	-0.0709
519.33	22.79	0.3961	-0.0317	0.3209	-0.0613	0.2482	-0.071
534.33	23.12	0.3961	-0.0317	0.3209	-0.0613	0.2481	-0.0711
549.33	23.44	0.396	-0.0318	0.3209	-0.0613	0.248	-0.0712
564.33	23.76	0.396	-0.0318	0.3208	-0.0614	0.2479	-0.0713
579.33	24.07	0.396	-0.0318	0.3208	-0.0614	0.2479	-0.0713
594.33	24.38	0.3959	-0.0319	0.3207	-0.0615	0.2479	-0.0713
609.33	24.68	0.3959	-0.0319	0.3207	-0.0615	0.2479	-0.0713
624.33	24.99	0.3959	-0.0319	0.3207	-0.0615	0.2478	-0.0714
639.33	25.29	0.3958	-0.032	0.3206	-0.0616	0.2477	-0.0715
654.33	25.58	0.3958	-0.032	0.3206	-0.0616	0.2477	-0.0715
669.33	25.87	0.3958	-0.032	0.3205	-0.0617	0.2477	-0.0715
684.33	26.16	0.3958	-0.032	0.3205	-0.0617	0.2477	-0.0715
699.33	26.44	0.3956	-0.0322	0.3204	-0.0618	0.2476	-0.0716
714.33	26.73	0.3956	-0.0322	0.3204	-0.0618	0.2475	-0.0717
744.33	27.28	0.3956	-0.0322	0.3204	-0.0618	0.2474	-0.0718
774.33	27.83	0.3956	-0.0322	0.3203	-0.0619	0.2474	-0.0718
804.33	28.36	0.3956	-0.0322	0.3202	-0.062	0.2473	-0.0719
834.33	28.88	0.3955	-0.0323	0.3202	-0.062	0.2472	-0.072
864.33	29.40	0.3955	-0.0323	0.3201	-0.0621	0.2471	-0.0721
894.33	29.91	0.3955	-0.0323	0.3201	-0.0621	0.2471	-0.0721
924.33	30.40	0.3954	-0.0324	0.32	-0.0622	0.247	-0.0722
954.33	30.89	0.3954	-0.0324	0.32	-0.0622	0.2469	-0.0723
984.33	31.37	0.3953	-0.0325	0.3199	-0.0623	0.2469	-0.0723
1014.33	31.85	0.3953	-0.0325	0.3198	-0.0624	0.2469	-0.0723
1044.33	32.32	0.3952	-0.0326	0.3198	-0.0624	0.2469	-0.0723
1074.33	32.78	0.3952	-0.0326	0.3197	-0.0625	0.2468	-0.0724

ple G8-S3 @ 5'

ne utes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
4.33	33.23	0.3952	-0.0326	0.3197	-0.0625	0.2468	-0.0724
4.33	33.68	0.3952	-0.0326	0.3196	-0.0626	0.2467	-0.0725
54.33	34.12	0.3952	-0.0326	0.3196	-0.0626	0.2466	-0.0726
94.33	34.56			0.3195	-0.0627	0.2466	-0.0726
224.33	34.99			0.3195	-0.0627	0.2466	-0.0726
254.33	35.42			0.3194	-0.0628	0.2465	-0.0727
284.33	35.84			0.3194	-0.0628	0.2465	-0.0727
314.33	36.25			0.3193	-0.0629	0.2465	-0.0727
1344.33	36.67			0.3193	-0.0629	0.2464	-0.0728
1374.33	37.07			0.3193	-0.0629	0.2464	-0.0728
1404.33	37.47			0.3193	-0.0629	0.2464	-0.0728
1434.33	37.87			0.3193	-0.0629		

One Dimensional Consolidation

Project No.	41194	
Project	FMC Pond 15S	
Sample ID	O8-S4 @ 7'	
Sample Ht.	1.623	(in)
Sample Dia.	4.000	(in)
Sample Area	0.087	(sq-ft)
Sample Vol.	0.012	(cu-ft)
Phos Cont.	5.17	(%)
Init. M.C.	170.36	(%)
Init. M.C. (corr)	137.20	(%)
Final M.C.	120.13	(%)
Final M.C. (corr	97.64	(%)
Dry Wt. of Soil/f	144.38	(g)
Dry Wt. of Soil/i	191.90	(g)
Spec. Grav.	2.7	
Pocket Pen.	n/a	(tsf)
Dial Reset	0.4361	500psf

Moisture Content Weights	
(initial)	
Total Wet Wt. (g)	20.25
Phos. Wt. (g)	1.05
Dry Wt. (g)	7.49
Dry Wt. + Phos Wt. (g)	8.54
Water Wt. + Phos (g)	12.76
Water Wt. (g)	11.71
(final)	
Total Wet Wt. (g)	16.84
Phos. Wt. (g)	0.87
Dry Wt. (g)	7.65
Dry Wt. + Phos Wt. (g)	8.52
Water Wt. + Phos (g)	9.19
Water Wt. (g)	8.32

Pressure (psf)	Final Dial Reading (inches)	Deformation (inches)	Sample Ht. (inches)	Strain (%)	Void Ratio e	Dry Density (pcf)	Void Ratio e	Dry Density (pcf)
					Calc. from final MC		Calc. from initial MC	
0.001	0.4362	0.0000	1.6230	0	5.253	26.94	3.705	35.81
0.0100	0.3552	0.0810	1.5420	4.99	4.941	28.36	3.470	37.69
0.0250	0.2895	0.1467	1.4763	9.04	4.688	29.62	3.279	39.37
0.0500	0.2377	0.1985	1.4245	12.23	4.488	30.70	3.129	40.80
0.1000	0.1904	0.2458	1.3772	15.14	4.306	31.75	2.992	42.20
0.2500	0.1123	0.3239	1.2991	19.96	4.005	33.66	2.766	44.74
0.5000	0.0555	0.3807	1.2423	23.46	3.786	35.20	2.601	46.79
1.0000	0.3305	0.4863	1.1367	29.96	3.379	38.47	2.295	51.13
2.0000	0.2321	0.5847	1.0383	36.03	3.000	42.12	2.010	55.98
4.0000	0.1376	0.6792	0.9438	41.85	2.636	46.33	1.736	61.58

Note: Initial MC not taken from actual sample tested, but from same sample jar.
Final MC taken from actual sample tested.
Void Ratio (e), calculated from final MC likely to be most accurate.

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4361	0	0.3552	0	0.2895	0
0.17	0.41	0.436	-1E-04	0.3547	-0.0005	0.2893	-0.0002
0.33	0.58	0.4357	-0.0004	0.3546	-0.0006	0.2889	-0.0006
0.50	0.71	0.4357	-0.0004	0.3543	-0.0009	0.2886	-0.0009
0.67	0.82	0.4356	-0.0005	0.3541	-0.0011	0.2884	-0.0011
0.83	0.91	0.4354	-0.0007	0.3539	-0.0013	0.2881	-0.0014
1.00	1.00	0.4352	-0.0009	0.3537	-0.0015	0.2879	-0.0016
1.17	1.08	0.4351	-0.001	0.3534	-0.0018	0.2877	-0.0018
1.33	1.15	0.435	-0.0011	0.3532	-0.002	0.2876	-0.0019
1.50	1.22	0.4349	-0.0012	0.353	-0.0022	0.2872	-0.0023
1.67	1.29	0.4348	-0.0013	0.3529	-0.0023	0.2871	-0.0024
1.83	1.35	0.4347	-0.0014	0.3526	-0.0026	0.2869	-0.0026
2.00	1.41	0.4345	-0.0016	0.3524	-0.0028	0.2867	-0.0028
2.17	1.47	0.4344	-0.0017	0.3523	-0.0029	0.2865	-0.003
2.33	1.53	0.4342	-0.0019	0.3521	-0.0031	0.2863	-0.0032
2.50	1.58	0.4341	-0.002	0.3519	-0.0033	0.2862	-0.0033
2.67	1.63	0.4341	-0.002	0.3517	-0.0035	0.286	-0.0035
2.83	1.68	0.434	-0.0021	0.3515	-0.0037	0.2857	-0.0038
3.00	1.73	0.4338	-0.0023	0.3514	-0.0038	0.2856	-0.0039
3.17	1.78	0.4337	-0.0024	0.3512	-0.004	0.2854	-0.0041
3.33	1.83	0.4336	-0.0025	0.351	-0.0042	0.2853	-0.0042
3.50	1.87	0.4335	-0.0026	0.3507	-0.0045	0.285	-0.0045
3.67	1.91	0.4333	-0.0028	0.3506	-0.0046	0.2849	-0.0046
3.83	1.96	0.4333	-0.0028	0.3504	-0.0048	0.2847	-0.0048
4.00	2.00	0.4332	-0.0029	0.3502	-0.005	0.2846	-0.0049
4.17	2.04	0.4331	-0.003	0.35	-0.0052	0.2843	-0.0052
4.33	2.08	0.4329	-0.0032	0.3499	-0.0053	0.2842	-0.0053
4.50	2.12	0.4328	-0.0033	0.3497	-0.0055	0.2839	-0.0056
4.67	2.16	0.4326	-0.0035	0.3495	-0.0057	0.2839	-0.0056
4.83	2.20	0.4325	-0.0036	0.3493	-0.0059	0.2836	-0.0059
5.00	2.24	0.4325	-0.0036	0.3492	-0.006	0.2835	-0.006
5.17	2.27	0.4324	-0.0037	0.349	-0.0062	0.2832	-0.0063
5.33	2.31	0.4323	-0.0038	0.3488	-0.0064	0.2831	-0.0064
5.50	2.35	0.4322	-0.0039	0.3486	-0.0066	0.2829	-0.0066
5.67	2.38	0.432	-0.0041	0.3484	-0.0068	0.2827	-0.0068
5.83	2.42	0.4319	-0.0042	0.3483	-0.0069	0.2825	-0.007
6.00	2.45	0.4318	-0.0043	0.3481	-0.0071	0.2823	-0.0072
6.17	2.48	0.4318	-0.0043	0.3479	-0.0073	0.2822	-0.0073

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.4316	-0.0045	0.3477	-0.0075	0.282	-0.0075
6.50	2.55	0.4315	-0.0046	0.3476	-0.0076	0.2818	-0.0077
6.67	2.58	0.4314	-0.0047	0.3474	-0.0078	0.2817	-0.0078
6.83	2.61	0.4313	-0.0048	0.3472	-0.008	0.2815	-0.008
7.00	2.65	0.4311	-0.005	0.347	-0.0082	0.2813	-0.0082
7.17	2.68	0.431	-0.0051	0.3468	-0.0084	0.2811	-0.0084
7.33	2.71	0.431	-0.0051	0.3468	-0.0084	0.2809	-0.0086
7.50	2.74	0.4309	-0.0052	0.3465	-0.0087	0.2807	-0.0088
7.67	2.77	0.4308	-0.0053	0.3464	-0.0088	0.2806	-0.0089
7.83	2.80	0.4307	-0.0054	0.3462	-0.009	0.2804	-0.0091
8.00	2.83	0.4306	-0.0055	0.346	-0.0092	0.2803	-0.0092
8.17	2.86	0.4305	-0.0056	0.3459	-0.0093	0.28	-0.0095
8.33	2.89	0.4304	-0.0057	0.3457	-0.0095	0.28	-0.0095
8.50	2.92	0.4302	-0.0059	0.3455	-0.0097	0.2798	-0.0097
8.67	2.94	0.4302	-0.0059	0.3454	-0.0098	0.2796	-0.0099
8.83	2.97	0.4301	-0.006	0.3452	-0.01	0.2794	-0.0101
9.00	3.00	0.43	-0.0061	0.3451	-0.0101	0.2792	-0.0103
9.17	3.03	0.4299	-0.0062	0.3449	-0.0103	0.2791	-0.0104
9.33	3.06	0.4298	-0.0063	0.3447	-0.0105	0.2789	-0.0106
9.50	3.08	0.4297	-0.0064	0.3445	-0.0107	0.2787	-0.0108
9.67	3.11	0.4295	-0.0066	0.3444	-0.0108	0.2786	-0.0109
9.83	3.14	0.4294	-0.0067	0.3443	-0.0109	0.2784	-0.0111
10.00	3.16	0.4294	-0.0067	0.3441	-0.0111	0.2783	-0.0112
10.17	3.19	0.4293	-0.0068	0.3439	-0.0113	0.2781	-0.0114
10.33	3.21	0.4292	-0.0069	0.3437	-0.0115	0.278	-0.0115
10.50	3.24	0.4291	-0.007	0.3437	-0.0115	0.2777	-0.0118
10.67	3.27	0.429	-0.0071	0.3435	-0.0117	0.2776	-0.0119
10.83	3.29	0.4289	-0.0072	0.3433	-0.0119	0.2775	-0.012
11.00	3.32	0.4288	-0.0073	0.3432	-0.012	0.2773	-0.0122
11.17	3.34	0.4287	-0.0074	0.343	-0.0122	0.2771	-0.0124
11.33	3.37	0.4286	-0.0075	0.3429	-0.0123	0.277	-0.0125
11.50	3.39	0.4285	-0.0076	0.3427	-0.0125	0.2768	-0.0127
11.67	3.42	0.4284	-0.0077	0.3426	-0.0126	0.2768	-0.0127
11.83	3.44	0.4283	-0.0078	0.3424	-0.0128	0.2765	-0.013
12.00	3.46	0.4282	-0.0079	0.3422	-0.013	0.2764	-0.0131
12.17	3.49	0.4281	-0.008	0.3421	-0.0131	0.2762	-0.0133
12.33	3.51	0.428	-0.0081	0.342	-0.0132	0.276	-0.0135
12.50	3.54	0.4279	-0.0082	0.3418	-0.0134	0.2759	-0.0136

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.4278	-0.0083	0.3417	-0.0135	0.2757	-0.0138
12.83	3.58	0.4278	-0.0083	0.3414	-0.0138	0.2755	-0.014
13.00	3.61	0.4276	-0.0085	0.3413	-0.0139	0.2754	-0.0141
13.17	3.63	0.4276	-0.0085	0.3412	-0.014	0.2752	-0.0143
13.33	3.65	0.4275	-0.0086	0.3411	-0.0141	0.2752	-0.0143
13.50	3.67	0.4274	-0.0087	0.3409	-0.0143	0.2749	-0.0146
13.67	3.70	0.4272	-0.0089	0.3407	-0.0145	0.2748	-0.0147
13.83	3.72	0.4272	-0.0089	0.3405	-0.0147	0.2746	-0.0149
14.00	3.74	0.427	-0.0091	0.3405	-0.0147	0.2745	-0.015
14.17	3.76	0.427	-0.0091	0.3403	-0.0149	0.2743	-0.0152
14.33	3.79	0.427	-0.0091	0.3402	-0.015	0.2742	-0.0153
14.50	3.81	0.4269	-0.0092	0.34	-0.0152	0.274	-0.0155
14.67	3.83	0.4267	-0.0094	0.3398	-0.0154	0.2739	-0.0156
14.83	3.85	0.4267	-0.0094	0.3397	-0.0155	0.2737	-0.0158
15.83	3.98	0.4261	-0.01	0.3389	-0.0163	0.2729	-0.0166
16.83	4.10	0.4256	-0.0105	0.3379	-0.0173	0.2721	-0.0174
17.83	4.22	0.4251	-0.011	0.3371	-0.0181	0.2713	-0.0182
18.83	4.34	0.4246	-0.0115	0.3362	-0.019	0.2704	-0.0191
19.83	4.45	0.4241	-0.012	0.3354	-0.0198	0.2697	-0.0198
20.83	4.56	0.4237	-0.0124	0.3346	-0.0206	0.2689	-0.0206
21.83	4.67	0.4231	-0.013	0.3338	-0.0214	0.2682	-0.0213
22.83	4.78	0.4227	-0.0134	0.333	-0.0222	0.2674	-0.0221
23.83	4.88	0.4222	-0.0139	0.3323	-0.0229	0.2666	-0.0229
24.83	4.98	0.4217	-0.0144	0.3315	-0.0237	0.2659	-0.0236
25.83	5.08	0.4212	-0.0149	0.3308	-0.0244	0.2652	-0.0243
26.83	5.18	0.4207	-0.0154	0.3301	-0.0251	0.2646	-0.0249
27.83	5.28	0.4203	-0.0158	0.3294	-0.0258	0.2639	-0.0256
28.83	5.37	0.4199	-0.0162	0.3287	-0.0265	0.2633	-0.0262
29.83	5.46	0.4194	-0.0167	0.3279	-0.0273	0.2627	-0.0268
30.83	5.55	0.419	-0.0171	0.3273	-0.0279	0.262	-0.0275
31.83	5.64	0.4185	-0.0176	0.3266	-0.0286	0.2614	-0.0281
32.83	5.73	0.4181	-0.018	0.326	-0.0292	0.2609	-0.0286
33.83	5.82	0.4177	-0.0184	0.3253	-0.0299	0.2603	-0.0292
34.83	5.90	0.4173	-0.0188	0.3247	-0.0305	0.2597	-0.0298
35.83	5.99	0.4168	-0.0193	0.324	-0.0312	0.2591	-0.0304
36.83	6.07	0.4164	-0.0197	0.3233	-0.0319	0.2586	-0.0309
37.83	6.15	0.4159	-0.0202	0.3227	-0.0325	0.258	-0.0315
38.83	6.23	0.4154	-0.0207	0.3221	-0.0331	0.2575	-0.032

ple O8-S4 @ 7'

ne utes)	Square Root of Time (minutes)	Test 1 @ 10 psf Dial Reading (inches)	Test 1 @ 10 psf Deflection (inches)	Test 2 @ 25 psf Dial Reading (inches)	Test 2 @ 25 psf Deflection (inches)	Test 3 @ 50 psf Dial Reading (inches)	Test 3 @ 50 psf Deflection (inches)
39.83	6.31	0.4151	-0.021	0.3216	-0.0336	0.2571	-0.0324
40.83	6.39	0.4146	-0.0215	0.3209	-0.0343	0.2565	-0.033
41.83	6.47	0.4142	-0.0219	0.3203	-0.0349	0.2561	-0.0334
42.83	6.54	0.4138	-0.0223	0.3198	-0.0354	0.2556	-0.0339
43.83	6.62	0.4134	-0.0227	0.3193	-0.0359	0.2551	-0.0344
44.83	6.70	0.413	-0.0231	0.3186	-0.0366	0.2547	-0.0348
45.83	6.77	0.4126	-0.0235	0.3181	-0.0371	0.2542	-0.0353
46.83	6.84	0.4122	-0.0239	0.3176	-0.0376	0.2538	-0.0357
47.83	6.92	0.4118	-0.0243	0.317	-0.0382	0.2534	-0.0361
48.83	6.99	0.4114	-0.0247	0.3165	-0.0387	0.253	-0.0365
49.83	7.06	0.4112	-0.0249	0.316	-0.0392	0.2526	-0.0369
50.83	7.13	0.4108	-0.0253	0.3155	-0.0397	0.2522	-0.0373
51.83	7.20	0.4104	-0.0257	0.315	-0.0402	0.2518	-0.0377
52.83	7.27	0.4101	-0.026	0.3146	-0.0406	0.2515	-0.038
53.83	7.34	0.4097	-0.0264	0.314	-0.0412	0.2511	-0.0384
54.83	7.40	0.4093	-0.0268	0.3135	-0.0417	0.2508	-0.0387
55.83	7.47	0.4089	-0.0272	0.313	-0.0422	0.2505	-0.039
56.83	7.54	0.4086	-0.0275	0.3126	-0.0426	0.2501	-0.0394
57.83	7.60	0.4082	-0.0279	0.3122	-0.043	0.2499	-0.0396
58.83	7.67	0.4079	-0.0282	0.3117	-0.0435	0.2495	-0.04
59.83	7.74	0.4075	-0.0286	0.3113	-0.0439	0.2493	-0.0402
60.83	7.80	0.4073	-0.0288	0.3108	-0.0444	0.249	-0.0405
61.83	7.86	0.4069	-0.0292	0.3104	-0.0448	0.2488	-0.0407
62.83	7.93	0.4066	-0.0295	0.31	-0.0452	0.2485	-0.041
63.83	7.99	0.4062	-0.0299	0.3096	-0.0456	0.2483	-0.0412
64.83	8.05	0.4058	-0.0303	0.3091	-0.0461	0.2481	-0.0414
65.83	8.11	0.4055	-0.0306	0.3088	-0.0464	0.2478	-0.0417
66.83	8.18	0.4051	-0.031	0.3083	-0.0469	0.2476	-0.0419
67.83	8.24	0.4048	-0.0313	0.308	-0.0472	0.2474	-0.0421
68.83	8.30	0.4045	-0.0316	0.3076	-0.0476	0.2472	-0.0423
69.83	8.36	0.4042	-0.0319	0.3073	-0.0479	0.247	-0.0425
70.83	8.42	0.4038	-0.0323	0.3069	-0.0483	0.2469	-0.0426
71.83	8.48	0.4035	-0.0326	0.3066	-0.0486	0.2467	-0.0428
72.83	8.53	0.4032	-0.0329	0.3062	-0.049	0.2465	-0.043
73.83	8.59	0.4029	-0.0332	0.3059	-0.0493	0.2463	-0.0432
74.83	8.65	0.4027	-0.0334	0.3055	-0.0497	0.2461	-0.0434
75.83	8.71	0.4023	-0.0338	0.3052	-0.05	0.246	-0.0435
76.83	8.77	0.4019	-0.0342	0.3049	-0.0503	0.2459	-0.0436

Sample 08-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.63	8.82	0.4017	-0.0344	0.3045	-0.0507	0.2457	-0.0438
78.83	8.88	0.4013	-0.0348	0.3043	-0.0509	0.2456	-0.0439
79.83	8.93	0.4011	-0.035	0.3039	-0.0513	0.2454	-0.0441
80.83	8.99	0.4007	-0.0354	0.3036	-0.0516	0.2454	-0.0441
81.83	9.05	0.4004	-0.0357	0.3034	-0.0518	0.2452	-0.0443
82.83	9.10	0.4002	-0.0359	0.3031	-0.0521	0.2451	-0.0444
83.83	9.16	0.4	-0.0361	0.3028	-0.0524	0.245	-0.0445
84.83	9.21	0.3996	-0.0365	0.3026	-0.0526	0.2448	-0.0447
85.83	9.26	0.3994	-0.0367	0.3023	-0.0529	0.2447	-0.0448
86.83	9.32	0.3991	-0.037	0.302	-0.0532	0.2446	-0.0449
87.83	9.37	0.3987	-0.0374	0.3018	-0.0534	0.2446	-0.0449
88.83	9.43	0.3985	-0.0376	0.3015	-0.0537	0.2445	-0.045
89.83	9.48	0.3981	-0.038	0.3012	-0.054	0.2444	-0.0451
90.83	9.53	0.3979	-0.0382	0.3011	-0.0541	0.2442	-0.0453
91.83	9.58	0.3976	-0.0385	0.3008	-0.0544	0.2441	-0.0454
92.83	9.64	0.3973	-0.0388	0.3005	-0.0547	0.244	-0.0455
93.83	9.69	0.3971	-0.039	0.3004	-0.0548	0.2439	-0.0456
94.83	9.74	0.3968	-0.0393	0.3002	-0.055	0.2438	-0.0457
95.83	9.79	0.3965	-0.0396	0.2999	-0.0553	0.2438	-0.0457
96.83	9.84	0.3962	-0.0399	0.2997	-0.0555	0.2437	-0.0458
97.83	9.89	0.398	-0.0401	0.2995	-0.0557	0.2436	-0.0459
98.83	9.94	0.3957	-0.0404	0.2993	-0.0559	0.2435	-0.046
99.83	9.99	0.3954	-0.0407	0.2991	-0.0561	0.2435	-0.046
100.83	10.04	0.3951	-0.041	0.2989	-0.0563	0.2434	-0.0461
101.83	10.09	0.3948	-0.0413	0.2988	-0.0564	0.2433	-0.0462
102.83	10.14	0.3946	-0.0415	0.2985	-0.0567	0.2432	-0.0463
103.83	10.19	0.3943	-0.0418	0.2983	-0.0569	0.2431	-0.0464
104.83	10.24	0.3941	-0.042	0.2981	-0.0571	0.2431	-0.0464
109.33	10.46	0.3929	-0.0432	0.2973	-0.0579	0.2428	-0.0467
114.33	10.69	0.3916	-0.0445	0.2966	-0.0586	0.2425	-0.047
119.33	10.92	0.3906	-0.0455	0.2959	-0.0593	0.2422	-0.0473
124.33	11.15	0.3894	-0.0467	0.2953	-0.0599	0.2421	-0.0474
129.33	11.37	0.3883	-0.0478	0.2949	-0.0603	0.2419	-0.0476
134.33	11.59	0.3872	-0.0489	0.2944	-0.0608	0.2417	-0.0478
139.33	11.80	0.3862	-0.0499	0.294	-0.0612	0.2416	-0.0479
144.33	12.01	0.3851	-0.051	0.2936	-0.0616	0.2414	-0.0481
149.33	12.22	0.3841	-0.052	0.2933	-0.0619	0.2414	-0.0481
154.33	12.42	0.383	-0.0531	0.2931	-0.0621	0.2412	-0.0483

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3822	-0.0539	0.2929	-0.0623	0.2411	-0.0484
164.33	12.82	0.3812	-0.0549	0.2926	-0.0626	0.241	-0.0485
169.33	13.01	0.3802	-0.0559	0.2925	-0.0627	0.2408	-0.0487
174.33	13.20	0.3794	-0.0567	0.2923	-0.0629	0.2406	-0.0489
179.33	13.39	0.3785	-0.0576	0.2922	-0.063	0.2404	-0.0491
184.33	13.58	0.3776	-0.0585	0.2919	-0.0633	0.2401	-0.0494
189.33	13.76	0.3769	-0.0592	0.2918	-0.0634	0.2399	-0.0496
194.33	13.94	0.3762	-0.0599	0.2918	-0.0634	0.2397	-0.0498
199.33	14.12	0.3753	-0.0608	0.2917	-0.0635	0.2396	-0.0499
204.33	14.29	0.3745	-0.0616	0.2915	-0.0637	0.2395	-0.05
209.33	14.47	0.3738	-0.0623	0.2915	-0.0637	0.2394	-0.0501
214.33	14.64	0.373	-0.0631	0.2914	-0.0638	0.2392	-0.0503
219.33	14.81	0.3724	-0.0637	0.2913	-0.0639	0.2392	-0.0503
224.33	14.98	0.3716	-0.0645	0.2912	-0.064	0.2391	-0.0504
229.33	15.14	0.3707	-0.0654	0.2911	-0.0641	0.239	-0.0505
234.33	15.31	0.3699	-0.0662	0.291	-0.0642	0.2389	-0.0506
239.33	15.47	0.369	-0.0671	0.291	-0.0642	0.2389	-0.0506
244.33	15.63	0.3683	-0.0678	0.291	-0.0642	0.2389	-0.0506
249.33	15.79	0.3677	-0.0684	0.2909	-0.0643	0.2387	-0.0508
254.33	15.95	0.3671	-0.069	0.2909	-0.0643	0.2387	-0.0508
259.33	16.10	0.3665	-0.0696	0.2908	-0.0644	0.2386	-0.0509
264.33	16.26	0.366	-0.0701	0.2908	-0.0644	0.2386	-0.0509
269.33	16.41	0.3655	-0.0706	0.2908	-0.0644	0.2385	-0.051
274.33	16.56	0.365	-0.0711	0.2906	-0.0646	0.2385	-0.051
279.33	16.71	0.3644	-0.0717	0.2906	-0.0646	0.2386	-0.0509
284.33	16.86	0.3639	-0.0722	0.2906	-0.0646	0.2385	-0.051
289.33	17.01	0.3635	-0.0726	0.2906	-0.0646	0.2385	-0.051
294.33	17.16	0.3631	-0.073	0.2906	-0.0646	0.2384	-0.0511
299.33	17.30	0.3628	-0.0733	0.2905	-0.0647	0.2383	-0.0512
304.33	17.45	0.3624	-0.0737	0.2905	-0.0647	0.2383	-0.0512
309.33	17.59	0.362	-0.0741	0.2905	-0.0647	0.2383	-0.0512
314.33	17.73	0.3617	-0.0744	0.2903	-0.0649	0.2383	-0.0512
319.33	17.87	0.3613	-0.0748	0.2903	-0.0649	0.2383	-0.0512
324.33	18.01	0.361	-0.0751	0.2903	-0.0649	0.2383	-0.0512
329.33	18.15	0.3609	-0.0752	0.2903	-0.0649	0.2383	-0.0512
334.33	18.28	0.3606	-0.0755	0.2902	-0.065	0.2383	-0.0512
339.33	18.42	0.3603	-0.0758	0.2902	-0.065	0.2383	-0.0512
344.33	18.56	0.3602	-0.0759	0.2902	-0.065	0.2382	-0.0513

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.36	-0.0761	0.2902	-0.065	0.2382	-0.0513
354.33	18.82	0.3597	-0.0764	0.2902	-0.065	0.2382	-0.0513
369.33	19.22	0.3595	-0.0766	0.2902	-0.065	0.2382	-0.0513
384.33	19.60	0.359	-0.0771	0.2902	-0.065	0.2381	-0.0514
399.33	19.98	0.3586	-0.0775	0.2902	-0.065	0.238	-0.0515
414.33	20.36	0.3581	-0.078	0.2901	-0.0651	0.2378	-0.0517
429.33	20.72	0.3578	-0.0783	0.29	-0.0652	0.2378	-0.0517
444.33	21.08	0.3575	-0.0786	0.2899	-0.0653	0.2377	-0.0518
459.33	21.43	0.357	-0.0791	0.2898	-0.0654	0.2378	-0.0517
474.33	21.78	0.3566	-0.0795	0.2898	-0.0654		
489.33	22.12	0.3564	-0.0797	0.2898	-0.0654		
504.33	22.46	0.3563	-0.0798	0.2897	-0.0655		
519.33	22.79	0.3561	-0.08	0.2897	-0.0655		
534.33	23.12	0.3559	-0.0802	0.2897	-0.0655		
549.33	23.44	0.3557	-0.0804	0.2897	-0.0655		
564.33	23.76	0.3555	-0.0806	0.2897	-0.0655		
579.33	24.07	0.3554	-0.0807	0.2897	-0.0655		
594.33	24.38	0.3554	-0.0807	0.2897	-0.0655		
609.33	24.68	0.3553	-0.0808	0.2895	-0.0657		
624.33	24.99	0.3552	-0.0809	0.2895	-0.0657		
639.33	25.29			0.2895	-0.0657		
654.33	25.58			0.2895	-0.0657		
669.33	25.87						

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.2377	0	0.1904	0	0.1123	0
0.17	0.41	0.2371	-0.0006	0.1887	-0.0017	0.1115	-0.0008
0.33	0.58	0.2363	-0.0014	0.1867	-0.0037	0.1091	-0.0032
0.50	0.71	0.2359	-0.0018	0.1829	-0.0075	0.1056	-0.0067
0.67	0.82	0.2353	-0.0024	0.1793	-0.0111	0.1035	-0.0088
0.83	0.91	0.235	-0.0027	0.1746	-0.0158	0.1008	-0.0115
1.00	1.00	0.2344	-0.0033	0.1723	-0.0181	0.0987	-0.0136
1.17	1.08	0.2341	-0.0036	0.1691	-0.0213	0.0963	-0.016
1.33	1.15	0.2336	-0.0041	0.1671	-0.0233	0.0946	-0.0177
1.50	1.22	0.2332	-0.0045	0.1647	-0.0257	0.0927	-0.0196
1.67	1.29	0.2328	-0.0049	0.1632	-0.0272	0.0914	-0.0209
1.83	1.35	0.2325	-0.0052	0.1613	-0.0291	0.0896	-0.0227
2.00	1.41	0.232	-0.0057	0.1601	-0.0303	0.0886	-0.0237
2.17	1.47	0.2317	-0.006	0.1585	-0.0319	0.087	-0.0253
2.33	1.53	0.2312	-0.0065	0.1575	-0.0329	0.086	-0.0263
2.50	1.58	0.2309	-0.0068	0.1563	-0.0341	0.0846	-0.0277
2.67	1.63	0.2304	-0.0073	0.1554	-0.035	0.0837	-0.0286
2.83	1.68	0.2302	-0.0075	0.1541	-0.0363	0.0825	-0.0298
3.00	1.73	0.2297	-0.008	0.1533	-0.0371	0.0818	-0.0305
3.17	1.78	0.2295	-0.0082	0.1523	-0.0381	0.0808	-0.0315
3.33	1.83	0.229	-0.0087	0.1515	-0.0389	0.0801	-0.0322
3.50	1.87	0.2288	-0.0089	0.1505	-0.0399	0.0791	-0.0332
3.67	1.91	0.2284	-0.0093	0.15	-0.0404	0.0785	-0.0338
3.83	1.96	0.2281	-0.0096	0.1489	-0.0415	0.0777	-0.0346
4.00	2.00	0.2278	-0.0099	0.1483	-0.0421	0.0771	-0.0352
4.17	2.04	0.2275	-0.0102	0.1475	-0.0429	0.0763	-0.036
4.33	2.08	0.2272	-0.0105	0.147	-0.0434	0.0758	-0.0365
4.50	2.12	0.2269	-0.0108	0.1461	-0.0443	0.0754	-0.0369
4.67	2.16	0.2265	-0.0112	0.1455	-0.0449	0.0747	-0.0376
4.83	2.20	0.2263	-0.0114	0.1447	-0.0457	0.0741	-0.0382
5.00	2.24	0.2259	-0.0118	0.1442	-0.0462	0.0738	-0.0385
5.17	2.27	0.2257	-0.012	0.1435	-0.0469	0.0731	-0.0392
5.33	2.31	0.2253	-0.0124	0.1431	-0.0473	0.0728	-0.0395
5.50	2.35	0.225	-0.0127	0.1423	-0.0481	0.0723	-0.04
5.67	2.38	0.2248	-0.0129	0.1418	-0.0486	0.0721	-0.0402
5.83	2.42	0.2245	-0.0132	0.1413	-0.0491	0.0715	-0.0408
6.00	2.45	0.2241	-0.0136	0.1407	-0.0497	0.0713	-0.041
6.17	2.48	0.2239	-0.0138	0.1401	-0.0503	0.0708	-0.0415

ple O8-S4 @ 7'

ne utes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.2236	-0.0141	0.1397	-0.0507	0.0706	-0.0417
6.50	2.55	0.2233	-0.0144	0.1392	-0.0512	0.0703	-0.042
6.67	2.58	0.2231	-0.0146	0.1387	-0.0517	0.07	-0.0423
6.83	2.61	0.2228	-0.0149	0.1382	-0.0522	0.0697	-0.0426
7.00	2.65	0.2225	-0.0152	0.1378	-0.0526	0.0695	-0.0428
7.17	2.68	0.2223	-0.0154	0.1372	-0.0532	0.0692	-0.0431
7.33	2.71	0.222	-0.0157	0.1369	-0.0535	0.069	-0.0433
7.50	2.74	0.2218	-0.0159	0.1364	-0.054	0.0686	-0.0437
7.67	2.77	0.2215	-0.0162	0.136	-0.0544	0.0684	-0.0439
7.83	2.80	0.2212	-0.0165	0.1355	-0.0549	0.0682	-0.0441
8.00	2.83	0.221	-0.0167	0.1352	-0.0552	0.068	-0.0443
8.17	2.86	0.2208	-0.0169	0.1347	-0.0557	0.0677	-0.0446
8.33	2.89	0.2204	-0.0173	0.1345	-0.0559	0.0676	-0.0447
8.50	2.92	0.2203	-0.0174	0.1339	-0.0565	0.0674	-0.0449
8.67	2.94	0.22	-0.0177	0.1337	-0.0567	0.0673	-0.045
8.83	2.97	0.2198	-0.0179	0.1332	-0.0572	0.067	-0.0453
9.00	3.00	0.2195	-0.0182	0.1329	-0.0575	0.0669	-0.0454
9.17	3.03	0.2193	-0.0184	0.1326	-0.0578	0.0668	-0.0455
9.33	3.06	0.219	-0.0187	0.1323	-0.0581	0.0666	-0.0457
9.50	3.08	0.2188	-0.0189	0.1319	-0.0585	0.0664	-0.0459
9.67	3.11	0.2186	-0.0191	0.1316	-0.0588	0.0663	-0.046
9.83	3.14	0.2184	-0.0193	0.1313	-0.0591	0.0661	-0.0462
10.00	3.16	0.218	-0.0197	0.131	-0.0594	0.066	-0.0463
10.17	3.19	0.2178	-0.0199	0.1306	-0.0598	0.0659	-0.0464
10.33	3.21	0.2176	-0.0201	0.1304	-0.06	0.0658	-0.0465
10.50	3.24	0.2175	-0.0202	0.13	-0.0604	0.0656	-0.0467
10.67	3.27	0.2172	-0.0205	0.1299	-0.0605	0.0655	-0.0468
10.83	3.29	0.217	-0.0207	0.1296	-0.0608	0.0653	-0.047
11.00	3.32	0.2167	-0.021	0.1293	-0.0611	0.0652	-0.0471
11.17	3.34	0.2165	-0.0212	0.129	-0.0614	0.0652	-0.0471
11.33	3.37	0.2163	-0.0214	0.1288	-0.0616	0.0651	-0.0472
11.50	3.39	0.2162	-0.0215	0.1285	-0.0619	0.065	-0.0473
11.67	3.42	0.2159	-0.0218	0.1283	-0.0621	0.0649	-0.0474
11.83	3.44	0.2157	-0.022	0.1281	-0.0623	0.0647	-0.0476
12.00	3.46	0.2155	-0.0222	0.1278	-0.0626	0.0646	-0.0477
12.17	3.49	0.2153	-0.0224	0.1276	-0.0628	0.0645	-0.0478
12.33	3.51	0.2151	-0.0226	0.1274	-0.063	0.0645	-0.0478
12.50	3.54	0.2148	-0.0229	0.1272	-0.0632	0.0644	-0.0479

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.2147	-0.023	0.127	-0.0634	0.0644	-0.0479
12.83	3.58	0.2144	-0.0233	0.1267	-0.0637	0.0642	-0.0481
13.00	3.61	0.2142	-0.0235	0.1266	-0.0638	0.0642	-0.0481
13.17	3.63	0.214	-0.0237	0.1264	-0.064	0.0641	-0.0482
13.33	3.65	0.2138	-0.0239	0.1262	-0.0642	0.064	-0.0483
13.50	3.67	0.2137	-0.024	0.126	-0.0644	0.0639	-0.0484
13.67	3.70	0.2134	-0.0243	0.1258	-0.0646	0.0638	-0.0485
13.83	3.72	0.2132	-0.0245	0.1256	-0.0648	0.0638	-0.0485
14.00	3.74	0.213	-0.0247	0.1255	-0.0649	0.0637	-0.0486
14.17	3.76	0.2128	-0.0249	0.1253	-0.0651	0.0637	-0.0486
14.33	3.79	0.2126	-0.0251	0.1251	-0.0653	0.0636	-0.0487
14.50	3.81	0.2124	-0.0253	0.125	-0.0654	0.0636	-0.0487
14.67	3.83	0.2122	-0.0255	0.1249	-0.0655	0.0635	-0.0488
14.83	3.85	0.212	-0.0257	0.1247	-0.0657	0.0634	-0.0489
15.83	3.98	0.2109	-0.0268	0.1238	-0.0666	0.063	-0.0493
16.83	4.10	0.2099	-0.0278	0.1231	-0.0673	0.0629	-0.0494
17.83	4.22	0.2089	-0.0288	0.1225	-0.0679	0.0626	-0.0497
18.83	4.34	0.2079	-0.0298	0.1219	-0.0685	0.0624	-0.0499
19.83	4.45	0.2071	-0.0306	0.1215	-0.0689	0.0621	-0.0502
20.83	4.56	0.2063	-0.0314	0.1211	-0.0693	0.062	-0.0503
21.83	4.67	0.2055	-0.0322	0.1207	-0.0697	0.0618	-0.0505
22.83	4.78	0.2049	-0.0328	0.1203	-0.0701	0.0616	-0.0507
23.83	4.88	0.2042	-0.0335	0.1201	-0.0703	0.0614	-0.0509
24.83	4.98	0.2036	-0.0341	0.1197	-0.0707	0.0613	-0.051
25.83	5.08	0.203	-0.0347	0.1195	-0.0709	0.0613	-0.051
26.83	5.18	0.2024	-0.0353	0.1193	-0.0711	0.0611	-0.0512
27.83	5.28	0.2019	-0.0358	0.1191	-0.0713	0.061	-0.0513
28.83	5.37	0.2014	-0.0363	0.1188	-0.0716	0.0609	-0.0514
29.83	5.46	0.201	-0.0367	0.1187	-0.0717	0.0608	-0.0515
30.83	5.55	0.2005	-0.0372	0.1185	-0.0719	0.0606	-0.0517
31.83	5.64	0.2002	-0.0375	0.1184	-0.072	0.0605	-0.0518
32.83	5.73	0.1998	-0.0379	0.1181	-0.0723	0.0605	-0.0518
33.83	5.82	0.1995	-0.0382	0.118	-0.0724	0.0604	-0.0519
34.83	5.90	0.1992	-0.0385	0.1179	-0.0725	0.0604	-0.0519
35.83	5.99	0.1989	-0.0388	0.1178	-0.0726	0.0602	-0.0521
36.83	6.07	0.1986	-0.0391	0.1177	-0.0727	0.0602	-0.0521
37.83	6.15	0.1984	-0.0393	0.1176	-0.0728	0.0601	-0.0522
38.83	6.23	0.1982	-0.0395	0.1175	-0.0729	0.06	-0.0523

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.1979	-0.0398	0.1174	-0.073	0.0599	-0.0524
40.83	6.39	0.1977	-0.04	0.1173	-0.0731	0.0599	-0.0524
41.83	6.47	0.1975	-0.0402	0.1172	-0.0732	0.0598	-0.0525
42.83	6.54	0.1974	-0.0403	0.1171	-0.0733	0.0597	-0.0526
43.83	6.62	0.1972	-0.0405	0.1171	-0.0733	0.0597	-0.0526
44.83	6.70	0.197	-0.0407	0.117	-0.0734	0.0597	-0.0526
45.83	6.77	0.1968	-0.0409	0.1169	-0.0735	0.0596	-0.0527
46.83	6.84	0.1967	-0.041	0.1169	-0.0735	0.0596	-0.0527
47.83	6.92	0.1966	-0.0411	0.1168	-0.0736	0.0596	-0.0527
48.83	6.99	0.1965	-0.0412	0.1167	-0.0737	0.0595	-0.0528
49.83	7.06	0.1963	-0.0414	0.1166	-0.0738	0.0594	-0.0529
50.83	7.13	0.1962	-0.0415	0.1166	-0.0738	0.0594	-0.0529
51.83	7.20	0.1961	-0.0416	0.1165	-0.0739	0.0593	-0.053
52.83	7.27	0.1959	-0.0418	0.1165	-0.0739	0.0593	-0.053
53.83	7.34	0.1958	-0.0419	0.1164	-0.074	0.0592	-0.0531
54.83	7.40	0.1957	-0.042	0.1164	-0.074	0.0592	-0.0531
55.83	7.47	0.1956	-0.0421	0.1164	-0.074	0.0591	-0.0532
56.83	7.54	0.1956	-0.0421	0.1164	-0.074	0.0591	-0.0532
57.83	7.60	0.1954	-0.0423	0.1163	-0.0741	0.059	-0.0533
58.83	7.67	0.1954	-0.0423	0.1163	-0.0741	0.059	-0.0533
59.83	7.74	0.1953	-0.0424	0.1162	-0.0742	0.059	-0.0533
60.83	7.80	0.1952	-0.0425	0.1161	-0.0743	0.0589	-0.0534
61.83	7.86	0.1951	-0.0426	0.1161	-0.0743	0.0589	-0.0534
62.83	7.93	0.195	-0.0427	0.1161	-0.0743	0.0589	-0.0534
63.83	7.99	0.195	-0.0427	0.116	-0.0744	0.0589	-0.0534
64.83	8.05	0.195	-0.0427	0.116	-0.0744	0.0589	-0.0534
65.83	8.11	0.1949	-0.0428	0.116	-0.0744	0.0588	-0.0535
66.83	8.18	0.1948	-0.0429	0.1159	-0.0745	0.0588	-0.0535
67.83	8.24	0.1947	-0.043	0.1159	-0.0745	0.0587	-0.0536
68.83	8.30	0.1947	-0.043	0.1158	-0.0746	0.0587	-0.0536
69.83	8.36	0.1946	-0.0431	0.1158	-0.0746	0.0587	-0.0536
70.83	8.42	0.1945	-0.0432	0.1157	-0.0747	0.0586	-0.0537
71.83	8.48	0.1945	-0.0432	0.1157	-0.0747	0.0586	-0.0537
72.83	8.53	0.1945	-0.0432	0.1157	-0.0747	0.0586	-0.0537
73.83	8.59	0.1944	-0.0433	0.1157	-0.0747	0.0585	-0.0538
74.83	8.65	0.1944	-0.0433	0.1156	-0.0748	0.0585	-0.0538
75.83	8.71	0.1943	-0.0434	0.1156	-0.0748	0.0585	-0.0538
76.83	8.77	0.1943	-0.0434	0.1156	-0.0748	0.0585	-0.0538

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.1942	-0.0435	0.1156	-0.0748	0.0584	-0.0539
78.83	8.88	0.1942	-0.0435	0.1156	-0.0748	0.0584	-0.0539
79.83	8.93	0.1942	-0.0435	0.1156	-0.0748	0.0584	-0.0539
80.83	8.99	0.1942	-0.0435	0.1155	-0.0749	0.0583	-0.054
81.83	9.05	0.1941	-0.0436	0.1155	-0.0749	0.0583	-0.054
82.83	9.10	0.1941	-0.0436	0.1155	-0.0749	0.0583	-0.054
83.83	9.16	0.194	-0.0437	0.1155	-0.0749	0.0582	-0.0541
84.83	9.21	0.194	-0.0437	0.1154	-0.075	0.0582	-0.0541
85.83	9.26	0.1939	-0.0438	0.1154	-0.075	0.0582	-0.0541
86.83	9.32	0.1939	-0.0438	0.1153	-0.0751	0.0582	-0.0541
87.83	9.37	0.1939	-0.0438	0.1153	-0.0751	0.0581	-0.0542
88.83	9.43	0.1939	-0.0438	0.1153	-0.0751	0.0581	-0.0542
89.83	9.48	0.1938	-0.0439	0.1152	-0.0752	0.0581	-0.0542
90.83	9.53	0.1938	-0.0439	0.1152	-0.0752	0.0581	-0.0542
91.83	9.58	0.1937	-0.044	0.1152	-0.0752	0.058	-0.0543
92.83	9.64	0.1937	-0.044	0.1152	-0.0752	0.058	-0.0543
93.83	9.69	0.1937	-0.044	0.1151	-0.0753	0.058	-0.0543
94.83	9.74	0.1936	-0.0441	0.1151	-0.0753	0.058	-0.0543
95.83	9.79	0.1936	-0.0441	0.1151	-0.0753	0.058	-0.0543
96.83	9.84	0.1936	-0.0441	0.1151	-0.0753	0.0579	-0.0544
97.83	9.89	0.1935	-0.0442	0.1151	-0.0753	0.0579	-0.0544
98.83	9.94	0.1935	-0.0442	0.115	-0.0754	0.0579	-0.0544
99.83	9.99	0.1935	-0.0442	0.115	-0.0754	0.0579	-0.0544
100.83	10.04	0.1935	-0.0442	0.115	-0.0754	0.0578	-0.0545
101.83	10.09	0.1934	-0.0443	0.115	-0.0754	0.0578	-0.0545
102.83	10.14	0.1934	-0.0443	0.115	-0.0754	0.0578	-0.0545
103.83	10.19	0.1934	-0.0443	0.1149	-0.0755	0.0578	-0.0545
104.83	10.24	0.1934	-0.0443	0.1149	-0.0755	0.0578	-0.0545
109.33	10.46	0.1934	-0.0443	0.1149	-0.0755	0.0576	-0.0547
114.33	10.69	0.1933	-0.0444	0.1148	-0.0756	0.0576	-0.0547
119.33	10.92	0.1932	-0.0445	0.1148	-0.0756	0.0575	-0.0548
124.33	11.15	0.193	-0.0447	0.1147	-0.0757	0.0574	-0.0549
129.33	11.37	0.1929	-0.0448	0.1146	-0.0758	0.0574	-0.0549
134.33	11.59	0.1929	-0.0448	0.1146	-0.0758	0.0574	-0.0549
139.33	11.80	0.1928	-0.0449	0.1145	-0.0759	0.0573	-0.055
144.33	12.01	0.1927	-0.045	0.1144	-0.076	0.0573	-0.055
149.33	12.22	0.1927	-0.045	0.1144	-0.076	0.0572	-0.0551
154.33	12.42	0.1926	-0.0451	0.1143	-0.0761	0.0571	-0.0552

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.1926	-0.0451	0.1143	-0.0761	0.0571	-0.0552
164.33	12.82	0.1925	-0.0452	0.1142	-0.0762	0.057	-0.0553
169.33	13.01	0.1925	-0.0452	0.1142	-0.0762	0.0569	-0.0554
174.33	13.20	0.1924	-0.0453	0.1141	-0.0763	0.0568	-0.0555
179.33	13.39	0.1924	-0.0453	0.114	-0.0764	0.0568	-0.0555
184.33	13.58	0.1923	-0.0454	0.114	-0.0764	0.0568	-0.0555
189.33	13.76	0.1923	-0.0454	0.114	-0.0764	0.0566	-0.0557
194.33	13.94	0.1923	-0.0454	0.114	-0.0764	0.0566	-0.0557
199.33	14.12	0.1922	-0.0455	0.1139	-0.0765	0.0566	-0.0557
204.33	14.29	0.1922	-0.0455	0.1139	-0.0765	0.0566	-0.0557
209.33	14.47	0.1922	-0.0455	0.1139	-0.0765	0.0565	-0.0558
214.33	14.64	0.1922	-0.0455	0.1138	-0.0766	0.0565	-0.0558
219.33	14.81	0.1921	-0.0456	0.1137	-0.0767	0.0564	-0.0559
224.33	14.98	0.1919	-0.0458	0.1137	-0.0767	0.0565	-0.0558
229.33	15.14	0.1918	-0.0459	0.1136	-0.0768	0.0564	-0.0559
234.33	15.31	0.1918	-0.0459	0.1136	-0.0768	0.0564	-0.0559
239.33	15.47	0.1916	-0.0461	0.1135	-0.0769	0.0563	-0.056
244.33	15.63	0.1916	-0.0461	0.1135	-0.0769	0.0563	-0.056
249.33	15.79	0.1915	-0.0462	0.1134	-0.077	0.0563	-0.056
254.33	15.95	0.1915	-0.0462	0.1134	-0.077	0.0562	-0.0561
259.33	16.10	0.1915	-0.0462	0.1133	-0.0771	0.0562	-0.0561
264.33	16.26	0.1914	-0.0463	0.1133	-0.0771	0.0561	-0.0562
269.33	16.41	0.1914	-0.0463	0.1132	-0.0772	0.0561	-0.0562
274.33	16.56	0.1914	-0.0463	0.1132	-0.0772	0.0561	-0.0562
279.33	16.71	0.1913	-0.0464	0.1131	-0.0773	0.0561	-0.0562
284.33	16.86	0.1913	-0.0464	0.113	-0.0774	0.056	-0.0563
289.33	17.01	0.1913	-0.0464	0.113	-0.0774	0.056	-0.0563
294.33	17.16	0.1912	-0.0465	0.1129	-0.0775	0.056	-0.0563
299.33	17.30	0.1912	-0.0465	0.1129	-0.0775	0.0559	-0.0564
304.33	17.45	0.1912	-0.0465	0.1129	-0.0775	0.0559	-0.0564
309.33	17.59	0.1912	-0.0465	0.1128	-0.0776	0.0559	-0.0564
314.33	17.73	0.1912	-0.0465	0.1128	-0.0776	0.0559	-0.0564
319.33	17.87	0.1911	-0.0466	0.1127	-0.0777	0.0558	-0.0565
324.33	18.01	0.1911	-0.0466	0.1127	-0.0777	0.0558	-0.0565
329.33	18.15	0.1911	-0.0466	0.1128	-0.0776	0.0558	-0.0565
334.33	18.28	0.1911	-0.0466	0.1127	-0.0777	0.0558	-0.0565
339.33	18.42	0.1911	-0.0466	0.1127	-0.0777	0.0558	-0.0565
344.33	18.56	0.1911	-0.0466	0.1127	-0.0777	0.0558	-0.0565

ple O8-S4 @ 7'

me nutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.1911	-0.0466	0.1126	-0.0778	0.0558	-0.0565
354.33	18.82	0.1911	-0.0466	0.1126	-0.0778	0.0558	-0.0565
369.33	19.22	0.1911	-0.0466	0.1125	-0.0779	0.0558	-0.0565
384.33	19.60	0.1911	-0.0466	0.1124	-0.078	0.0557	-0.0566
399.33	19.98	0.191	-0.0467	0.1124	-0.078	0.0557	-0.0566
414.33	20.36	0.191	-0.0467	0.1123	-0.0781	0.0556	-0.0567
429.33	20.72	0.191	-0.0467			0.0556	-0.0567
444.33	21.08	0.1909	-0.0468			0.0555	-0.0568
459.33	21.43	0.1909	-0.0468				
474.33	21.78	0.1909	-0.0468				
489.33	22.12	0.1909	-0.0468				
504.33	22.46	0.1909	-0.0468				
519.33	22.79	0.1909	-0.0468				
534.33	23.12	0.1909	-0.0468				
549.33	23.44	0.1909	-0.0468				
564.33	23.76	0.1908	-0.0469				
579.33	24.07	0.1908	-0.0469				
594.33	24.38	0.1908	-0.0469				
609.33	24.68	0.1908	-0.0469				
624.33	24.99	0.1908	-0.0469				
639.33	25.29	0.1908	-0.0469				
654.33	25.58	0.1907	-0.047				
669.33	25.87	0.1907	-0.047				
684.33	26.16	0.1907	-0.047				
699.33	26.44	0.1906	-0.0471				
714.33	26.73	0.1906	-0.0471				
744.33	27.28	0.1906	-0.0471				
774.33	27.83	0.1906	-0.0471				
804.33	28.36	0.1906	-0.0471				
834.33	28.88	0.1905	-0.0472				
864.33	29.40	0.1905	-0.0472				
894.33	29.91	0.1905	-0.0472				
924.33	30.40	0.1905	-0.0472				
954.33	30.89	0.1904	-0.0473				
984.33	31.37						
1014.33	31.85						
1044.33	32.32						
1074.33	32.78						

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4361	0	0.3306	0	0.2321	0
0.17	0.41	0.4361	0	0.3294	-0.0012	0.2298	-0.0023
0.33	0.58	0.4361	0	0.3001	-0.0305	0.2116	-0.0205
0.50	0.71	0.4361	0	0.2911	-0.0395	0.2043	-0.0278
0.67	0.82	0.4361	0	0.2812	-0.0494	0.1893	-0.0428
0.83	0.91	0.4361	0	0.2759	-0.0547	0.1818	-0.0503
1.00	1.00	0.4361	0	0.2701	-0.0605	0.173	-0.0591
1.17	1.08	0.4361	0	0.2665	-0.0641	0.1672	-0.0649
1.33	1.15	0.4361	0	0.2624	-0.0682	0.1643	-0.0678
1.50	1.22	0.4361	0	0.26	-0.0706	0.1621	-0.07
1.67	1.29	0.4361	0	0.2573	-0.0733	0.1597	-0.0724
1.83	1.35	0.4361	0	0.2556	-0.075	0.158	-0.0741
2.00	1.41	0.4361	0	0.2537	-0.0769	0.1571	-0.075
2.17	1.47	0.4362	1E-04	0.2527	-0.0779	0.1564	-0.0757
2.33	1.53	0.4361	0	0.2511	-0.0795	0.1553	-0.0768
2.50	1.58	0.4362	1E-04	0.2503	-0.0803	0.1546	-0.0775
2.67	1.63	0.4361	0	0.2493	-0.0813	0.1541	-0.078
2.83	1.68	0.4362	1E-04	0.2485	-0.0821	0.1538	-0.0783
3.00	1.73	0.4362	1E-04	0.2476	-0.083	0.1532	-0.0789
3.17	1.78	0.4362	1E-04	0.2471	-0.0835	0.1529	-0.0792
3.33	1.83	0.4362	1E-04	0.2466	-0.084	0.1525	-0.0796
3.50	1.87	0.4362	1E-04	0.2462	-0.0844	0.1522	-0.0799
3.67	1.91	0.4362	1E-04	0.2457	-0.0849	0.152	-0.0801
3.83	1.96	0.4362	1E-04	0.2454	-0.0852	0.1518	-0.0803
4.00	2.00	0.4362	1E-04	0.2449	-0.0857	0.1515	-0.0806
4.17	2.04	0.4364	0.0003	0.2446	-0.086	0.1512	-0.0809
4.33	2.08	0.4363	0.0002	0.2443	-0.0863	0.1511	-0.081
4.50	2.12	0.4365	0.0004	0.2439	-0.0867	0.1509	-0.0812
4.67	2.16	0.4275	-0.0086	0.2437	-0.0869	0.1508	-0.0813
4.83	2.20	0.425	-0.0111	0.2434	-0.0872	0.1506	-0.0815
5.00	2.24	0.4207	-0.0154	0.2431	-0.0875	0.1504	-0.0817
5.17	2.27	0.4	-0.0361	0.243	-0.0876	0.1503	-0.0818
5.33	2.31	0.3938	-0.0423	0.2428	-0.0878	0.1502	-0.0819
5.50	2.35	0.3778	-0.0583	0.2426	-0.088	0.1501	-0.082
5.67	2.38	0.3769	-0.0592	0.2424	-0.0882	0.15	-0.0821
5.83	2.42	0.3756	-0.0605	0.2423	-0.0883	0.1498	-0.0823
6.00	2.45	0.3748	-0.0613	0.2422	-0.0884	0.1497	-0.0824
6.17	2.48	0.3728	-0.0633	0.2421	-0.0885	0.1496	-0.0825

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.3721	-0.064	0.2418	-0.0888	0.1495	-0.0826
6.50	2.55	0.3713	-0.0648	0.2416	-0.089	0.1494	-0.0827
6.67	2.58	0.3696	-0.0665	0.2415	-0.0891	0.1494	-0.0827
6.83	2.61	0.3612	-0.0749	0.2414	-0.0892	0.1493	-0.0828
7.00	2.65	0.3578	-0.0783	0.2413	-0.0893	0.1492	-0.0829
7.17	2.68	0.3544	-0.0817	0.2412	-0.0894	0.1491	-0.083
7.33	2.71	0.3525	-0.0836	0.2411	-0.0895	0.149	-0.0831
7.50	2.74	0.35	-0.0861	0.241	-0.0896	0.1489	-0.0832
7.67	2.77	0.3487	-0.0874	0.2409	-0.0897	0.1489	-0.0832
7.83	2.80	0.3473	-0.0888	0.2408	-0.0898	0.1488	-0.0833
8.00	2.83	0.3464	-0.0897	0.2406	-0.09	0.1487	-0.0834
8.17	2.86	0.3453	-0.0908	0.2406	-0.09	0.1486	-0.0835
8.33	2.89	0.3447	-0.0914	0.2405	-0.0901	0.1486	-0.0835
8.50	2.92	0.3441	-0.092	0.2405	-0.0901	0.1486	-0.0835
8.67	2.94	0.3437	-0.0924	0.2404	-0.0902	0.1485	-0.0836
8.83	2.97	0.343	-0.0931	0.2403	-0.0903	0.1485	-0.0836
9.00	3.00	0.3428	-0.0933	0.2402	-0.0904	0.1484	-0.0837
9.17	3.03	0.3421	-0.094	0.2401	-0.0905	0.1484	-0.0837
9.33	3.06	0.3419	-0.0942	0.24	-0.0906	0.1483	-0.0838
9.50	3.08	0.3415	-0.0946	0.24	-0.0906	0.1482	-0.0839
9.67	3.11	0.3413	-0.0948	0.2399	-0.0907	0.1482	-0.0839
9.83	3.14	0.3409	-0.0952	0.2398	-0.0908	0.1481	-0.084
10.00	3.16	0.3406	-0.0955	0.2398	-0.0908	0.1481	-0.084
10.17	3.19	0.3404	-0.0957	0.2398	-0.0908	0.1481	-0.084
10.33	3.21	0.3402	-0.0959	0.2397	-0.0909	0.148	-0.0841
10.50	3.24	0.3399	-0.0962	0.2396	-0.091	0.1479	-0.0842
10.67	3.27	0.3397	-0.0964	0.2396	-0.091	0.1479	-0.0842
10.83	3.29	0.3395	-0.0966	0.2395	-0.0911	0.1479	-0.0842
11.00	3.32	0.3393	-0.0968	0.2395	-0.0911	0.1478	-0.0843
11.17	3.34	0.3391	-0.097	0.2394	-0.0912	0.1478	-0.0843
11.33	3.37	0.3389	-0.0972	0.2394	-0.0912	0.1478	-0.0843
11.50	3.39	0.3388	-0.0973	0.2393	-0.0913	0.1478	-0.0843
11.67	3.42	0.3386	-0.0975	0.2392	-0.0914	0.1477	-0.0844
11.83	3.44	0.3384	-0.0977	0.2392	-0.0914	0.1476	-0.0845
12.00	3.46	0.3383	-0.0978	0.2391	-0.0915	0.1476	-0.0845
12.17	3.49	0.3382	-0.0979	0.2391	-0.0915	0.1476	-0.0845
12.33	3.51	0.3381	-0.098	0.2391	-0.0915	0.1475	-0.0846
12.50	3.54	0.3379	-0.0982	0.2391	-0.0915	0.1475	-0.0846

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.3378	-0.0983	0.2391	-0.0915	0.1475	-0.0846
12.83	3.58	0.3377	-0.0984	0.239	-0.0916	0.1474	-0.0847
13.00	3.61	0.3376	-0.0985	0.239	-0.0916	0.1474	-0.0847
13.17	3.63	0.3374	-0.0987	0.2389	-0.0917	0.1473	-0.0848
13.33	3.65	0.3374	-0.0987	0.2389	-0.0917	0.1473	-0.0848
13.50	3.67	0.3373	-0.0988	0.2389	-0.0917	0.1473	-0.0848
13.67	3.70	0.3372	-0.0989	0.2388	-0.0918	0.1472	-0.0849
13.83	3.72	0.3371	-0.099	0.2388	-0.0918	0.1472	-0.0849
14.00	3.74	0.337	-0.0991	0.2388	-0.0918	0.1472	-0.0849
14.17	3.76	0.337	-0.0991	0.2387	-0.0919	0.1471	-0.085
14.33	3.79	0.3369	-0.0992	0.2387	-0.0919	0.1471	-0.085
14.50	3.81	0.3368	-0.0993	0.2387	-0.0919	0.147	-0.0851
14.67	3.83	0.3368	-0.0993	0.2386	-0.092	0.147	-0.0851
14.83	3.85	0.3367	-0.0994	0.2386	-0.092	0.147	-0.0851
15.83	3.98	0.3364	-0.0997	0.2384	-0.0922	0.1469	-0.0852
16.83	4.10	0.3361	-0.1	0.2383	-0.0923	0.1467	-0.0854
17.83	4.22	0.3359	-0.1002	0.2383	-0.0923	0.1466	-0.0855
18.83	4.34	0.3357	-0.1004	0.2381	-0.0925	0.1464	-0.0857
19.83	4.45	0.3355	-0.1006	0.238	-0.0926	0.1463	-0.0858
20.83	4.56	0.3353	-0.1008	0.2379	-0.0927	0.1462	-0.0859
21.83	4.67	0.3351	-0.101	0.2378	-0.0928	0.1461	-0.086
22.83	4.78	0.335	-0.1011	0.2376	-0.093	0.146	-0.0861
23.83	4.88	0.3349	-0.1012	0.2375	-0.0931	0.1459	-0.0862
24.83	4.98	0.3348	-0.1013	0.2375	-0.0931	0.1458	-0.0863
25.83	5.08	0.3347	-0.1014	0.2375	-0.0931	0.1457	-0.0864
26.83	5.18	0.3346	-0.1015	0.2374	-0.0932	0.1456	-0.0865
27.83	5.28	0.3345	-0.1016	0.2373	-0.0933	0.1455	-0.0866
28.83	5.37	0.3343	-0.1018	0.2372	-0.0934	0.1455	-0.0866
29.83	5.46	0.3342	-0.1019	0.2372	-0.0934	0.1454	-0.0867
30.83	5.55	0.3342	-0.1019	0.2371	-0.0935	0.1454	-0.0867
31.83	5.64	0.3341	-0.102	0.237	-0.0936	0.1452	-0.0869
32.83	5.73	0.334	-0.1021	0.237	-0.0936	0.1452	-0.0869
33.83	5.82	0.3339	-0.1022	0.2369	-0.0937	0.1451	-0.087
34.83	5.90	0.3339	-0.1022	0.2369	-0.0937	0.145	-0.0871
35.83	5.99	0.3338	-0.1023	0.2367	-0.0939	0.145	-0.0871
36.83	6.07	0.3337	-0.1024	0.2367	-0.0939	0.1449	-0.0872
37.83	6.15	0.3337	-0.1024	0.2367	-0.0939	0.1448	-0.0873
38.83	6.23	0.3336	-0.1025	0.2366	-0.094	0.1448	-0.0873

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.3336	-0.1025	0.2366	-0.094	0.1447	-0.0874
40.83	6.39	0.3335	-0.1026	0.2365	-0.0941	0.1447	-0.0874
41.83	6.47	0.3335	-0.1026	0.2365	-0.0941	0.1447	-0.0874
42.83	6.54	0.3334	-0.1027	0.2364	-0.0942	0.1447	-0.0874
43.83	6.62	0.3334	-0.1027	0.2364	-0.0942	0.1446	-0.0875
44.83	6.70	0.3334	-0.1027	0.2363	-0.0943	0.1446	-0.0875
45.83	6.77	0.3334	-0.1027	0.2363	-0.0943	0.1445	-0.0876
46.83	6.84	0.3334	-0.1027	0.2362	-0.0944	0.1444	-0.0877
47.83	6.92	0.3333	-0.1028	0.2362	-0.0944	0.1444	-0.0877
48.83	6.99	0.3333	-0.1028	0.2362	-0.0944	0.1444	-0.0877
49.83	7.06	0.3332	-0.1029	0.2361	-0.0945	0.1443	-0.0878
50.83	7.13	0.3332	-0.1029	0.2361	-0.0945	0.1443	-0.0878
51.83	7.20	0.3332	-0.1029	0.236	-0.0946	0.1442	-0.0879
52.83	7.27	0.3332	-0.1029	0.236	-0.0946	0.1442	-0.0879
53.83	7.34	0.3331	-0.103	0.236	-0.0946	0.1441	-0.088
54.83	7.40	0.3331	-0.103	0.2359	-0.0947	0.1441	-0.088
55.83	7.47	0.333	-0.1031	0.2359	-0.0947	0.1441	-0.088
56.83	7.54	0.333	-0.1031	0.2359	-0.0947	0.144	-0.0881
57.83	7.60	0.333	-0.1031	0.2359	-0.0947	0.144	-0.0881
58.83	7.67	0.3329	-0.1032	0.2359	-0.0947	0.1439	-0.0882
59.83	7.74	0.3329	-0.1032	0.2359	-0.0947	0.1439	-0.0882
60.83	7.80	0.3329	-0.1032	0.2358	-0.0948	0.1439	-0.0882
61.83	7.86	0.3329	-0.1032	0.2358	-0.0948	0.1439	-0.0882
62.83	7.93	0.3329	-0.1032	0.2358	-0.0948	0.1439	-0.0882
63.83	7.99	0.3328	-0.1033	0.2358	-0.0948	0.1439	-0.0882
64.83	8.05	0.3328	-0.1033	0.2357	-0.0949	0.1438	-0.0883
65.83	8.11	0.3328	-0.1033	0.2357	-0.0949	0.1438	-0.0883
66.83	8.18	0.3327	-0.1034	0.2357	-0.0949	0.1437	-0.0884
67.83	8.24	0.3327	-0.1034	0.2356	-0.095	0.1437	-0.0884
68.83	8.30	0.3327	-0.1034	0.2356	-0.095	0.1437	-0.0884
69.83	8.36	0.3327	-0.1034	0.2355	-0.0951	0.1436	-0.0885
70.83	8.42	0.3327	-0.1034	0.2355	-0.0951	0.1436	-0.0885
71.83	8.48	0.3327	-0.1034	0.2355	-0.0951	0.1436	-0.0885
72.83	8.53	0.3327	-0.1034	0.2355	-0.0951	0.1435	-0.0886
73.83	8.59	0.3327	-0.1034	0.2354	-0.0952	0.1435	-0.0886
74.83	8.65	0.3326	-0.1035	0.2354	-0.0952	0.1435	-0.0886
75.83	8.71	0.3326	-0.1035	0.2354	-0.0952	0.1434	-0.0887
76.83	8.77	0.3326	-0.1035	0.2354	-0.0952	0.1434	-0.0887

mple 08-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.3326	-0.1035	0.2353	-0.0953	0.1434	-0.0887
78.83	8.88	0.3326	-0.1035	0.2353	-0.0953	0.1434	-0.0887
79.83	8.93	0.3326	-0.1035	0.2353	-0.0953	0.1434	-0.0887
80.83	8.99	0.3325	-0.1036	0.2352	-0.0954	0.1433	-0.0888
81.83	9.05	0.3325	-0.1036	0.2352	-0.0954	0.1434	-0.0887
82.83	9.10	0.3325	-0.1036	0.2352	-0.0954	0.1434	-0.0887
83.83	9.16	0.3325	-0.1036	0.2352	-0.0954	0.1433	-0.0888
84.83	9.21	0.3325	-0.1036	0.2351	-0.0955	0.1433	-0.0888
85.83	9.26	0.3325	-0.1036	0.2351	-0.0955	0.1433	-0.0888
86.83	9.32	0.3324	-0.1037	0.2351	-0.0955	0.1433	-0.0888
87.83	9.37	0.3324	-0.1037	0.2351	-0.0955	0.1432	-0.0889
88.83	9.43	0.3324	-0.1037	0.2351	-0.0955	0.1432	-0.0889
89.83	9.48	0.3324	-0.1037	0.2351	-0.0955	0.1432	-0.0889
90.83	9.53	0.3324	-0.1037	0.2351	-0.0955	0.1432	-0.0889
91.83	9.58	0.3324	-0.1037	0.2351	-0.0955	0.1431	-0.089
92.83	9.64	0.3324	-0.1037	0.2351	-0.0955	0.1431	-0.089
93.83	9.69	0.3323	-0.1038	0.235	-0.0956	0.1431	-0.089
94.83	9.74	0.3323	-0.1038	0.235	-0.0956	0.1431	-0.089
95.83	9.79	0.3323	-0.1038	0.235	-0.0956	0.1431	-0.089
96.83	9.84	0.3323	-0.1038	0.235	-0.0956	0.1431	-0.089
97.83	9.89	0.3323	-0.1038	0.2349	-0.0957	0.1431	-0.089
98.83	9.94	0.3322	-0.1039	0.2349	-0.0957	0.143	-0.0891
99.83	9.99	0.3322	-0.1039	0.2349	-0.0957	0.143	-0.0891
100.83	10.04	0.3322	-0.1039	0.2349	-0.0957	0.143	-0.0891
101.83	10.09	0.3322	-0.1039	0.2349	-0.0957	0.143	-0.0891
102.83	10.14	0.3322	-0.1039	0.2349	-0.0957	0.143	-0.0891
103.83	10.19	0.3322	-0.1039	0.2348	-0.0958	0.143	-0.0891
104.83	10.24	0.3322	-0.1039	0.2348	-0.0958	0.1429	-0.0892
109.33	10.46	0.3321	-0.104	0.2348	-0.0958	0.1429	-0.0892
114.33	10.69	0.3321	-0.104	0.2347	-0.0959	0.1428	-0.0893
119.33	10.92	0.332	-0.1041	0.2346	-0.096	0.1427	-0.0894
124.33	11.15	0.332	-0.1041	0.2345	-0.0961	0.1426	-0.0895
129.33	11.37	0.3319	-0.1042	0.2344	-0.0962	0.1425	-0.0896
134.33	11.59	0.3319	-0.1042	0.2344	-0.0962	0.1425	-0.0896
139.33	11.80	0.3319	-0.1042	0.2343	-0.0963	0.1424	-0.0897
144.33	12.01	0.3319	-0.1042	0.2343	-0.0963	0.1423	-0.0898
149.33	12.22	0.3319	-0.1042	0.2343	-0.0963	0.1423	-0.0898
154.33	12.42	0.3318	-0.1043	0.2342	-0.0964	0.1423	-0.0898

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3318	-0.1043	0.2341	-0.0965	0.1423	-0.0898
164.33	12.82	0.3317	-0.1044	0.234	-0.0966	0.1422	-0.0899
169.33	13.01	0.3317	-0.1044	0.2339	-0.0967	0.1422	-0.0899
174.33	13.20	0.3317	-0.1044	0.2339	-0.0967	0.1421	-0.09
179.33	13.39	0.3317	-0.1044	0.2339	-0.0967	0.1421	-0.09
184.33	13.58	0.3316	-0.1045	0.2339	-0.0967	0.142	-0.0901
189.33	13.76	0.3316	-0.1045	0.2338	-0.0968	0.142	-0.0901
194.33	13.94	0.3316	-0.1045	0.2338	-0.0968	0.1419	-0.0902
199.33	14.12	0.3316	-0.1045	0.2337	-0.0969	0.1419	-0.0902
204.33	14.29	0.3315	-0.1046	0.2337	-0.0969	0.1418	-0.0903
209.33	14.47	0.3315	-0.1046	0.2337	-0.0969	0.1418	-0.0903
214.33	14.64	0.3315	-0.1046	0.2336	-0.097	0.1418	-0.0903
219.33	14.81	0.3315	-0.1046	0.2337	-0.0969	0.1418	-0.0903
224.33	14.98	0.3315	-0.1046	0.2336	-0.097	0.1417	-0.0904
229.33	15.14	0.3314	-0.1047	0.2336	-0.097	0.1417	-0.0904
234.33	15.31	0.3314	-0.1047	0.2336	-0.097	0.1416	-0.0905
239.33	15.47	0.3313	-0.1048	0.2336	-0.097	0.1416	-0.0905
244.33	15.63	0.3313	-0.1048	0.2336	-0.097	0.1416	-0.0905
249.33	15.79	0.3313	-0.1048	0.2335	-0.0971	0.1416	-0.0905
254.33	15.95	0.3313	-0.1048	0.2335	-0.0971	0.1415	-0.0906
259.33	16.10	0.3312	-0.1049	0.2335	-0.0971	0.1415	-0.0906
264.33	16.26	0.3312	-0.1049	0.2334	-0.0972	0.1415	-0.0906
269.33	16.41	0.3312	-0.1049	0.2333	-0.0973	0.1415	-0.0906
274.33	16.56	0.3312	-0.1049	0.2333	-0.0973	0.1415	-0.0906
279.33	16.71	0.3312	-0.1049	0.2333	-0.0973	0.1415	-0.0906
284.33	16.86	0.3312	-0.1049	0.2332	-0.0974	0.1415	-0.0906
289.33	17.01	0.3312	-0.1049	0.2332	-0.0974	0.1415	-0.0906
294.33	17.16	0.3312	-0.1049	0.2333	-0.0973	0.1415	-0.0906
299.33	17.30	0.3311	-0.105	0.2332	-0.0974	0.1414	-0.0907
304.33	17.45	0.3311	-0.105	0.2332	-0.0974	0.1414	-0.0907
309.33	17.59	0.3311	-0.105	0.2332	-0.0974	0.1414	-0.0907
314.33	17.73	0.3311	-0.105	0.2331	-0.0975	0.1414	-0.0907
319.33	17.87	0.3311	-0.105	0.2331	-0.0975	0.1413	-0.0908
324.33	18.01	0.3311	-0.105	0.2331	-0.0975	0.1413	-0.0908
329.33	18.15	0.3311	-0.105	0.233	-0.0976	0.1413	-0.0908
334.33	18.28	0.3311	-0.105	0.233	-0.0976	0.1413	-0.0908
339.33	18.42	0.3311	-0.105	0.2329	-0.0977	0.1413	-0.0908
344.33	18.56	0.3311	-0.105	0.2329	-0.0977	0.1413	-0.0908

Sample 08-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.3311	-0.105	0.2329	-0.0977	0.1412	-0.0909
354.33	18.82	0.3311	-0.105	0.2328	-0.0978	0.1412	-0.0909
369.33	19.22	0.331	-0.1051	0.2328	-0.0978	0.1412	-0.0909
384.33	19.60	0.331	-0.1051	0.2328	-0.0978	0.1412	-0.0909
399.33	19.98	0.3309	-0.1052	0.2328	-0.0978	0.1411	-0.091
414.33	20.36	0.3309	-0.1052	0.2327	-0.0979	0.141	-0.0911
429.33	20.72	0.3308	-0.1053	0.2326	-0.098	0.141	-0.0911
444.33	21.08	0.3308	-0.1053	0.2325	-0.0981	0.141	-0.0911
459.33	21.43	0.3308	-0.1053	0.2325	-0.0981	0.1409	-0.0912
474.33	21.78	0.3307	-0.1054	0.2323	-0.0983	0.1408	-0.0913
489.33	22.12	0.3307	-0.1054	0.2323	-0.0983	0.1408	-0.0913
504.33	22.46	0.3307	-0.1054	0.2322	-0.0984	0.1408	-0.0913
519.33	22.79	0.3307	-0.1054	0.2322	-0.0984	0.1408	-0.0913
534.33	23.12	0.3307	-0.1054	0.2321	-0.0985	0.1407	-0.0914
549.33	23.44	0.3307	-0.1054			0.1407	-0.0914
564.33	23.76	0.3307	-0.1054			0.1407	-0.0914
579.33	24.07	0.3306	-0.1055			0.1406	-0.0915
594.33	24.38	0.3306	-0.1055			0.1406	-0.0915
609.33	24.68	0.3306	-0.1055			0.1406	-0.0915
624.33	24.99	0.3305	-0.1056			0.1405	-0.0916
639.33	25.29	0.3305	-0.1056			0.1404	-0.0917
654.33	25.58	0.3305	-0.1056			0.1404	-0.0917
669.33	25.87					0.1404	-0.0917
684.33	26.16					0.1404	-0.0917
699.33	26.44					0.1404	-0.0917
714.33	26.73					0.1402	-0.0919
744.33	27.28					0.1402	-0.0919
774.33	27.83					0.1402	-0.0919
804.33	28.36					0.1402	-0.0919
834.33	28.88					0.14	-0.0921
864.33	29.40					0.14	-0.0921
894.33	29.91					0.14	-0.0921
924.33	30.40					0.14	-0.0921
954.33	30.89					0.14	-0.0921
984.33	31.37					0.14	-0.0921
1014.33	31.85					0.14	-0.0921
1044.33	32.32					0.1399	-0.0922
1074.33	32.78					0.1399	-0.0922

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23					0.1399	-0.0922
1134.33	33.68					0.1398	-0.0923
1164.33	34.12					0.1399	-0.0922
1194.33	34.56					0.1399	-0.0922
1224.33	34.99					0.1398	-0.0923
1254.33	35.42					0.1398	-0.0923
1284.33	35.84					0.1398	-0.0923
1314.33	36.25					0.1397	-0.0924
1344.33	36.67					0.1396	-0.0925
1374.33	37.07					0.1396	-0.0925
1404.33	37.47					0.1395	-0.0926
1434.33	37.87					0.1394	-0.0927
1464.33	38.27					0.1393	-0.0928
1494.33	38.66					0.1392	-0.0929
1524.33	39.04					0.1393	-0.0928
1554.33	39.43					0.1393	-0.0928
1584.33	39.80					0.1393	-0.0928
1614.33	40.18					0.1393	-0.0928
1644.33	40.55					0.1392	-0.0929
1674.33	40.92					0.1392	-0.0929
1704.33	41.28					0.1392	-0.0929
1734.33	41.65					0.1392	-0.0929
1764.33	42.00					0.1391	-0.093
1794.33	42.36					0.1391	-0.093
1824.33	42.71					0.1391	-0.093
1854.33	43.06					0.139	-0.0931
1884.33	43.41					0.139	-0.0931
1914.33	43.75					0.1389	-0.0932
1944.33	44.09					0.1389	-0.0932
1974.33	44.43					0.1388	-0.0933
2004.33	44.77					0.1388	-0.0933
2034.33	45.10					0.1387	-0.0934
2064.33	45.43					0.1386	-0.0935
2094.33	45.76					0.1386	-0.0935
2124.33	46.09					0.1386	-0.0935
2154.33	46.41					0.1385	-0.0936
2184.33	46.74					0.1385	-0.0936
2214.33	47.06					0.1384	-0.0937

Sample O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
2244.33	47.37					0.1384	-0.0937
2274.33	47.69					0.1384	-0.0937
2304.33	48.00					0.1384	-0.0937
2334.33	48.31					0.1384	-0.0937
2364.33	48.62					0.1384	-0.0937
2394.33	48.93					0.1384	-0.0937
2424.33	49.24					0.1384	-0.0937
2454.33	49.54					0.1383	-0.0938
2484.33	49.84					0.1384	-0.0937
2514.33	50.14					0.1383	-0.0938
2544.33	50.44					0.1383	-0.0938
2574.33	50.74					0.1383	-0.0938
2604.33	51.03					0.1383	-0.0938
2634.33	51.33					0.1383	-0.0938
2664.33	51.62					0.1383	-0.0938
2694.33	51.91					0.1384	-0.0937
2724.33	52.20					0.1384	-0.0937
2754.33	52.48					0.1384	-0.0937
2784.33	52.77					0.1383	-0.0938
2814.33	53.05					0.1384	-0.0937
2844.33	53.33					0.1384	-0.0937
2874.33	53.61					0.1383	-0.0938
2904.33	53.89					0.1383	-0.0938
2934.33	54.17					0.1383	-0.0938
2964.33	54.45					0.1383	-0.0938
2994.33	54.72					0.1382	-0.0939
3024.33	54.99					0.1382	-0.0939
3054.33	55.27					0.1382	-0.0939
3084.33	55.54					0.1382	-0.0939
3114.33	55.81					0.1382	-0.0939
3144.33	56.07					0.1381	-0.094
3174.33	56.34					0.1381	-0.094
3204.33	56.61					0.1381	-0.094
3234.33	56.87					0.1382	-0.0939
3264.33	57.13					0.1381	-0.094
3294.33	57.40					0.1381	-0.094
3324.33	57.66					0.138	-0.0941
3354.33	57.92					0.1381	-0.094

mple O8-S4 @ 7'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
3384.33	58.18					0.138	-0.0941
3414.33	58.43					0.138	-0.0941
3444.33	58.69					0.1379	-0.0942
3474.33	58.94					0.1378	-0.0943
3504.33	59.20					0.1378	-0.0943
3534.33	59.45					0.1379	-0.0942
3564.33	59.70					0.1377	-0.0944
3594.33	59.95					0.1377	-0.0944
3624.33	60.20					0.1376	-0.0945
3654.33	60.45					0.1376	-0.0945
3684.33	60.70					0.1376	-0.0945
3714.33	60.95					0.1376	-0.0945

One Dimensional Consolidation

Project No.	41194
Project	FMC Pond 15S
Sample ID	S5-S7 @ 15'
Sample Ht.	1.350 (in)
Sample Dia.	4.000 (in)
Sample Area	0.087 (sq-ft)
Sample Vol.	0.010 (cu-ft)
Phos Cont.	3.02 (%)
Init. M.C.	154.51 (%)
Init. M.C. (corr)	111.37 (%)
Final M.C.	102.87 (%)
Final M.C. (corr	74.48 (%)
Dry Wt. of Soil/f	167.17 (g)
Dry Wt. of Soil/i	187.41 (g)
Spec. Grav.	2.7
Pocket Pen.	0.3 (tsf)
Dial Reset	0.4278 250 psf

Moisture Content Weights	
(initial)	
Total Wet Wt. (g)	21.99
Phos. Wt. (g)	1.76
Dry Wt. (g)	8.64
Dry Wt. + Phos Wt. (g)	10.40
Water Wt. + Phos (g)	13.35
Water Wt. (g)	11.59
(final)	
Total Wet Wt. (g)	19.8
Phos. Wt. (g)	1.59
Dry Wt. (g)	9.76
Dry Wt. + Phos Wt. (g)	11.35
Water Wt. + Phos (g)	10.04
Water Wt. (g)	8.45

Pressure (psf)	Final Dial Reading (inches)	Deformation (inches)	Sample Ht. (inches)	Strain (%)	Void Ratio e	Dry Density (pcf)	Void Ratio e	Dry Density (pcf)
					Calc. from final MC		Calc. from initial MC	
0.001	0.4351	0.0000	1.3500	0	3.492	37.51	3.007	42.05
0.0100	0.3964	0.0387	1.3113	2.87	3.363	38.61	2.892	43.29
0.0250	0.3573	0.0778	1.2722	5.76	3.233	39.80	2.776	44.62
0.0500	0.3262	0.1089	1.2411	8.07	3.130	40.80	2.684	45.74
0.1000	0.2779	0.1572	1.1928	11.64	2.969	42.45	2.540	47.59
0.2500	0.2301	0.2050	1.1450	15.19	2.810	44.22	2.399	49.57
0.5000	0.3777	0.2551	1.0949	18.90	2.643	46.25	2.250	51.84
1.0000	0.3201	0.3127	1.0373	23.16	2.452	48.81	2.079	54.72
2.0000	0.2540	0.3788	0.9712	28.06	2.232	52.14	1.883	58.45
4.0000	0.1877	0.4451	0.9049	32.97	2.011	55.96	1.686	62.73

Note: Initial MC not tken from actual sample testd, but from same sample jar.
Final MC taken from actual sample tested.
Void Ratio (e), calculated from final MC likely to be most accurate.

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.4315	0	0.3943	0	0.3563	0
0.17	0.41	0.4302	-0.0013	0.3943	0	0.3561	-0.0002
0.33	0.58	0.4301	-0.0014	0.3933	-0.001	0.3561	-0.0002
0.50	0.71	0.4299	-0.0016	0.3929	-0.0014	0.3555	-0.0008
0.67	0.82	0.4297	-0.0018	0.3926	-0.0017	0.3548	-0.0015
0.83	0.91	0.4296	-0.0019	0.3923	-0.002	0.3547	-0.0016
1.00	1.00	0.4295	-0.002	0.3921	-0.0022	0.3541	-0.0022
1.17	1.08	0.4294	-0.0021	0.3918	-0.0025	0.3539	-0.0024
1.33	1.15	0.4293	-0.0022	0.3916	-0.0027	0.3536	-0.0027
1.50	1.22	0.429	-0.0025	0.3913	-0.003	0.3533	-0.003
1.67	1.29	0.4289	-0.0026	0.3911	-0.0032	0.353	-0.0033
1.83	1.35	0.4289	-0.0026	0.3909	-0.0034	0.3528	-0.0035
2.00	1.41	0.4288	-0.0027	0.3907	-0.0036	0.3524	-0.0039
2.17	1.47	0.4286	-0.0029	0.3905	-0.0038	0.3523	-0.004
2.33	1.53	0.4286	-0.0029	0.3902	-0.0041	0.3519	-0.0044
2.50	1.58	0.4284	-0.0031	0.39	-0.0043	0.3517	-0.0046
2.67	1.63	0.4282	-0.0033	0.3898	-0.0045	0.3514	-0.0049
2.83	1.68	0.4279	-0.0036	0.3895	-0.0048	0.3512	-0.0051
3.00	1.73	0.4278	-0.0037	0.3893	-0.005	0.3508	-0.0055
3.17	1.78	0.4277	-0.0038	0.3892	-0.0051	0.3507	-0.0056
3.33	1.83	0.4276	-0.0039	0.389	-0.0053	0.3503	-0.006
3.50	1.87	0.4273	-0.0042	0.3887	-0.0056	0.3501	-0.0062
3.67	1.91	0.4272	-0.0043	0.3885	-0.0058	0.3499	-0.0064
3.83	1.96	0.4271	-0.0044	0.3883	-0.006	0.3497	-0.0066
4.00	2.00	0.427	-0.0045	0.3882	-0.0061	0.3493	-0.007
4.17	2.04	0.4268	-0.0047	0.3879	-0.0064	0.3492	-0.0071
4.33	2.08	0.4266	-0.0049	0.3877	-0.0066	0.3489	-0.0074
4.50	2.12	0.4265	-0.005	0.3876	-0.0067	0.3487	-0.0076
4.67	2.16	0.4263	-0.0052	0.3874	-0.0069	0.3484	-0.0079
4.83	2.20	0.4263	-0.0052	0.3872	-0.0071	0.3483	-0.008
5.00	2.24	0.4263	-0.0052	0.387	-0.0073	0.348	-0.0083
5.17	2.27	0.4261	-0.0054	0.3869	-0.0074	0.3478	-0.0085
5.33	2.31	0.4261	-0.0054	0.3867	-0.0076	0.3476	-0.0087
5.50	2.35	0.4259	-0.0056	0.3864	-0.0079	0.3474	-0.0089
5.67	2.38	0.4259	-0.0056	0.3863	-0.008	0.3471	-0.0092
5.83	2.42	0.4257	-0.0058	0.3862	-0.0081	0.3469	-0.0094
6.00	2.45	0.4256	-0.0059	0.3862	-0.0081	0.3468	-0.0095
6.17	2.48	0.4255	-0.006	0.3862	-0.0081	0.3466	-0.0097

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.4255	-0.006	0.3861	-0.0082	0.3463	-0.01
6.50	2.55	0.4254	-0.0061	0.3861	-0.0082	0.3461	-0.0102
6.67	2.58	0.4252	-0.0063	0.3861	-0.0082	0.346	-0.0103
6.83	2.61	0.4249	-0.0066	0.3861	-0.0082	0.3458	-0.0105
7.00	2.65	0.4248	-0.0067	0.3861	-0.0082	0.3456	-0.0107
7.17	2.68	0.4247	-0.0068	0.3861	-0.0082	0.3454	-0.0109
7.33	2.71	0.4247	-0.0068	0.3861	-0.0082	0.3452	-0.0111
7.50	2.74	0.4245	-0.007	0.3861	-0.0082	0.3451	-0.0112
7.67	2.77	0.4244	-0.0071	0.3861	-0.0082	0.3449	-0.0114
7.83	2.80	0.4243	-0.0072	0.3861	-0.0082	0.3447	-0.0116
8.00	2.83	0.4242	-0.0073	0.3861	-0.0082	0.3445	-0.0118
8.17	2.86	0.4242	-0.0073	0.3861	-0.0082	0.3444	-0.0119
8.33	2.89	0.4241	-0.0074	0.3861	-0.0082	0.3442	-0.0121
8.50	2.92	0.424	-0.0075	0.3861	-0.0082	0.3439	-0.0124
8.67	2.94	0.4239	-0.0076	0.3861	-0.0082	0.3437	-0.0126
8.83	2.97	0.4238	-0.0077	0.3861	-0.0082	0.3436	-0.0127
9.00	3.00	0.4237	-0.0078	0.3861	-0.0082	0.3434	-0.0129
9.17	3.03	0.4236	-0.0079	0.3861	-0.0082	0.3433	-0.013
9.33	3.06	0.4235	-0.008	0.3861	-0.0082	0.3431	-0.0132
9.50	3.08	0.4233	-0.0082	0.3861	-0.0082	0.3429	-0.0134
9.67	3.11	0.4232	-0.0083	0.3861	-0.0082	0.3428	-0.0135
9.83	3.14	0.4231	-0.0084	0.3861	-0.0082	0.3426	-0.0137
10.00	3.16	0.423	-0.0085	0.3861	-0.0082	0.3425	-0.0138
10.17	3.19	0.4228	-0.0087	0.3861	-0.0082	0.3423	-0.014
10.33	3.21	0.4227	-0.0088	0.3861	-0.0082	0.3421	-0.0142
10.50	3.24	0.4227	-0.0088	0.3861	-0.0082	0.3421	-0.0142
10.67	3.27	0.4226	-0.0089	0.3861	-0.0082	0.3419	-0.0144
10.83	3.29	0.4225	-0.009	0.3861	-0.0082	0.3418	-0.0145
11.00	3.32	0.4225	-0.009	0.3861	-0.0082	0.3416	-0.0147
11.17	3.34	0.4224	-0.0091	0.3861	-0.0082	0.3415	-0.0148
11.33	3.37	0.4223	-0.0092	0.3861	-0.0082	0.3413	-0.015
11.50	3.39	0.4223	-0.0092	0.3861	-0.0082	0.3412	-0.0151
11.67	3.42	0.4222	-0.0093	0.3861	-0.0082	0.341	-0.0153
11.83	3.44	0.4221	-0.0094	0.3861	-0.0082	0.341	-0.0153
12.00	3.46	0.4221	-0.0094	0.3861	-0.0082	0.3408	-0.0155
12.17	3.49	0.422	-0.0095	0.3861	-0.0082	0.3407	-0.0156
12.33	3.51	0.4219	-0.0096	0.3861	-0.0082	0.3405	-0.0158
12.50	3.54	0.4218	-0.0097	0.3861	-0.0082	0.3404	-0.0159

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.4218	-0.0097	0.3861	-0.0082	0.3403	-0.016
12.83	3.58	0.4216	-0.0099	0.3861	-0.0082	0.3402	-0.0161
13.00	3.61	0.4215	-0.01	0.3861	-0.0082	0.34	-0.0163
13.17	3.63	0.4213	-0.0102	0.3861	-0.0082	0.3399	-0.0164
13.33	3.65	0.4212	-0.0103	0.3861	-0.0082	0.3397	-0.0166
13.50	3.67	0.4211	-0.0104	0.3861	-0.0082	0.3397	-0.0166
13.67	3.70	0.421	-0.0105	0.3861	-0.0082	0.3396	-0.0167
13.83	3.72	0.4208	-0.0107	0.3861	-0.0082	0.3395	-0.0168
14.00	3.74	0.4208	-0.0107	0.3861	-0.0082	0.3393	-0.017
14.17	3.76	0.4207	-0.0108	0.3861	-0.0082	0.3392	-0.0171
14.33	3.79	0.4207	-0.0108	0.3861	-0.0082	0.3391	-0.0172
14.50	3.81	0.4206	-0.0109	0.3861	-0.0082	0.339	-0.0173
14.67	3.83	0.4204	-0.0111	0.3861	-0.0082	0.3389	-0.0174
14.83	3.85	0.4203	-0.0112	0.3861	-0.0082	0.3388	-0.0175
15.83	3.98	0.4199	-0.0116	0.3861	-0.0082	0.3382	-0.0181
16.83	4.10	0.4194	-0.0121	0.3861	-0.0082	0.3376	-0.0187
17.83	4.22	0.4189	-0.0126	0.3861	-0.0082	0.3372	-0.0191
18.83	4.34	0.4184	-0.0131	0.3861	-0.0082	0.3366	-0.0197
19.83	4.45	0.4179	-0.0136	0.3861	-0.0082	0.3363	-0.02
20.83	4.56	0.4176	-0.0139	0.3861	-0.0082	0.3358	-0.0205
21.83	4.67	0.4171	-0.0144	0.3861	-0.0082	0.3355	-0.0208
22.83	4.78	0.4167	-0.0148	0.3861	-0.0082	0.3351	-0.0212
23.83	4.88	0.4162	-0.0153	0.3861	-0.0082	0.3348	-0.0215
24.83	4.98	0.4158	-0.0157	0.3861	-0.0082	0.3345	-0.0218
25.83	5.08	0.4155	-0.016	0.3861	-0.0082	0.3342	-0.0221
26.83	5.18	0.4152	-0.0163	0.3861	-0.0082	0.334	-0.0223
27.83	5.28	0.4147	-0.0168	0.3861	-0.0082	0.3338	-0.0225
28.83	5.37	0.4144	-0.0171	0.3861	-0.0082	0.3335	-0.0228
29.83	5.46	0.4138	-0.0177	0.3861	-0.0082	0.3334	-0.0229
30.83	5.55	0.4132	-0.0183	0.3861	-0.0082	0.3332	-0.0231
31.83	5.64	0.4129	-0.0186	0.3861	-0.0082	0.3329	-0.0234
32.83	5.73	0.4126	-0.0189	0.3861	-0.0082	0.3328	-0.0235
33.83	5.82	0.4121	-0.0194	0.3861	-0.0082	0.3327	-0.0236
34.83	5.90	0.4118	-0.0197	0.3861	-0.0082	0.3325	-0.0238
35.83	5.99	0.4114	-0.0201	0.3861	-0.0082	0.3324	-0.0239
36.83	6.07	0.411	-0.0205	0.3861	-0.0082	0.3323	-0.024
37.83	6.15	0.4106	-0.0209	0.3861	-0.0082	0.3321	-0.0242
38.83	6.23	0.4103	-0.0212	0.3861	-0.0082	0.332	-0.0243

ample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.41	-0.0215	0.3861	-0.0082	0.3319	-0.0244
40.83	6.39	0.4096	-0.0219	0.3861	-0.0082	0.3319	-0.0244
41.83	6.47	0.4092	-0.0223	0.3861	-0.0082	0.3318	-0.0245
42.83	6.54	0.4089	-0.0226	0.3861	-0.0082	0.3317	-0.0246
43.83	6.62	0.4086	-0.0229	0.3861	-0.0082	0.3316	-0.0247
44.83	6.70	0.4082	-0.0233	0.3861	-0.0082	0.3315	-0.0248
45.83	6.77	0.408	-0.0235	0.3861	-0.0082	0.3314	-0.0249
46.83	6.84	0.4077	-0.0238	0.3861	-0.0082	0.3313	-0.025
47.83	6.92	0.4074	-0.0241	0.3861	-0.0082	0.3313	-0.025
48.83	6.99	0.4072	-0.0243	0.3861	-0.0082	0.3312	-0.0251
49.83	7.06	0.4066	-0.0249	0.3861	-0.0082	0.3311	-0.0252
50.83	7.13	0.4064	-0.0251	0.386	-0.0083	0.3311	-0.0252
51.83	7.20	0.4061	-0.0254	0.386	-0.0083	0.3311	-0.0252
52.83	7.27	0.4058	-0.0257	0.386	-0.0083	0.331	-0.0253
53.83	7.34	0.4057	-0.0258	0.386	-0.0083	0.331	-0.0253
54.83	7.40	0.4055	-0.026	0.386	-0.0083	0.3309	-0.0254
55.83	7.47	0.4053	-0.0262	0.386	-0.0083	0.3309	-0.0254
56.83	7.54	0.405	-0.0265	0.386	-0.0083	0.3308	-0.0255
57.83	7.60	0.4048	-0.0267	0.386	-0.0083	0.3308	-0.0255
58.83	7.67	0.4045	-0.027	0.386	-0.0083	0.3307	-0.0256
59.83	7.74	0.4042	-0.0273	0.386	-0.0083	0.3307	-0.0256
60.83	7.80	0.4041	-0.0274	0.3861	-0.0082	0.3306	-0.0257
61.83	7.86	0.4037	-0.0278	0.3861	-0.0082	0.3305	-0.0258
62.83	7.93	0.4035	-0.028	0.3861	-0.0082	0.3305	-0.0258
63.83	7.99	0.4034	-0.0281	0.3861	-0.0082	0.3305	-0.0258
64.83	8.05	0.4032	-0.0283	0.3861	-0.0082	0.3304	-0.0259
65.83	8.11	0.4029	-0.0286	0.3861	-0.0082	0.3304	-0.0259
66.83	8.18	0.4027	-0.0288	0.3861	-0.0082	0.3304	-0.0259
67.83	8.24	0.4026	-0.0289	0.3861	-0.0082	0.3303	-0.026
68.83	8.30	0.4024	-0.0291	0.386	-0.0083	0.3303	-0.026
69.83	8.36	0.4022	-0.0293	0.386	-0.0083	0.3303	-0.026
70.83	8.42	0.4021	-0.0294	0.3861	-0.0082	0.3303	-0.026
71.83	8.48	0.4019	-0.0296	0.386	-0.0083	0.3303	-0.026
72.83	8.53	0.4017	-0.0298	0.386	-0.0083	0.3303	-0.026
73.83	8.59	0.4013	-0.0302	0.386	-0.0083	0.3302	-0.0261
74.83	8.65	0.4011	-0.0304	0.386	-0.0083	0.3302	-0.0261
75.83	8.71	0.4011	-0.0304	0.386	-0.0083	0.3302	-0.0261
76.83	8.77	0.4008	-0.0307	0.3859	-0.0084	0.3302	-0.0261

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.4007	-0.0308	0.386	-0.0083	0.3301	-0.0262
78.83	8.88	0.4004	-0.0311	0.386	-0.0083	0.3301	-0.0262
79.83	8.93	0.4004	-0.0311	0.386	-0.0083	0.3301	-0.0262
80.83	8.99	0.4003	-0.0312	0.3861	-0.0082	0.33	-0.0263
81.83	9.05	0.4002	-0.0313	0.3861	-0.0082	0.33	-0.0263
82.83	9.10	0.4001	-0.0314	0.386	-0.0083	0.33	-0.0263
83.83	9.16	0.3999	-0.0316	0.386	-0.0083	0.3299	-0.0264
84.83	9.21	0.3998	-0.0317	0.3861	-0.0082	0.3299	-0.0264
85.83	9.26	0.3997	-0.0318	0.386	-0.0083	0.3299	-0.0264
86.83	9.32	0.3995	-0.032	0.386	-0.0083	0.3299	-0.0264
87.83	9.37	0.3993	-0.0322	0.386	-0.0083	0.3299	-0.0264
88.83	9.43	0.3989	-0.0326	0.3859	-0.0084	0.3298	-0.0265
89.83	9.48	0.3988	-0.0327	0.386	-0.0083	0.3297	-0.0266
90.83	9.53	0.3988	-0.0327	0.3859	-0.0084	0.3297	-0.0266
91.83	9.58	0.3987	-0.0328	0.3859	-0.0084	0.3296	-0.0267
92.83	9.64	0.3987	-0.0328	0.3859	-0.0084	0.3296	-0.0267
93.83	9.69	0.3986	-0.0329	0.3859	-0.0084	0.3296	-0.0267
94.83	9.74	0.3986	-0.0329	0.3859	-0.0084	0.3296	-0.0267
95.83	9.79	0.3985	-0.033	0.3859	-0.0084	0.3295	-0.0268
96.83	9.84	0.3985	-0.033	0.3859	-0.0084	0.3295	-0.0268
97.83	9.89	0.3984	-0.0331	0.3859	-0.0084	0.3295	-0.0268
98.83	9.94	0.3984	-0.0331	0.3859	-0.0084	0.3295	-0.0268
99.83	9.99	0.3983	-0.0332	0.3859	-0.0084	0.3295	-0.0268
100.83	10.04	0.3982	-0.0333	0.3858	-0.0085	0.3295	-0.0268
101.83	10.09	0.3982	-0.0333	0.386	-0.0083	0.3295	-0.0268
102.83	10.14	0.3981	-0.0334	0.3859	-0.0084	0.3295	-0.0268
103.83	10.19	0.3981	-0.0334	0.3859	-0.0084	0.3295	-0.0268
104.83	10.24	0.3981	-0.0334	0.3859	-0.0084	0.3294	-0.0269
109.33	10.46	0.3979	-0.0336	0.3859	-0.0084	0.3294	-0.0269
114.33	10.69	0.3978	-0.0337	0.3859	-0.0084	0.3293	-0.027
119.33	10.92	0.3976	-0.0339	0.3829	-0.0114	0.3292	-0.0271
124.33	11.15	0.3976	-0.0339	0.3788	-0.0155	0.3291	-0.0272
129.33	11.37	0.3974	-0.0341	0.3755	-0.0188	0.329	-0.0273
134.33	11.59	0.3972	-0.0343	0.3721	-0.0222	0.329	-0.0273
139.33	11.80	0.3971	-0.0344	0.3698	-0.0245	0.3289	-0.0274
144.33	12.01	0.3969	-0.0346	0.3679	-0.0264	0.3288	-0.0275
149.33	12.22	0.3968	-0.0347	0.3663	-0.028	0.3287	-0.0276
154.33	12.42	0.3966	-0.0349	0.365	-0.0293	0.3287	-0.0276

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3965	-0.035	0.3641	-0.0302	0.3286	-0.0277
164.33	12.82	0.3965	-0.035	0.3633	-0.031	0.3286	-0.0277
169.33	13.01	0.3964	-0.0351	0.3625	-0.0318	0.3285	-0.0278
174.33	13.20	0.3963	-0.0352	0.362	-0.0323	0.3285	-0.0278
179.33	13.39	0.3961	-0.0354	0.3616	-0.0327	0.3284	-0.0279
184.33	13.58	0.3961	-0.0354	0.3611	-0.0332	0.3283	-0.028
189.33	13.76	0.3966	-0.0349	0.3609	-0.0334	0.3284	-0.0279
194.33	13.94	0.3966	-0.0349	0.3608	-0.0335	0.3283	-0.028
199.33	14.12	0.3967	-0.0348	0.3607	-0.0336	0.3283	-0.028
204.33	14.29	0.3961	-0.0354	0.3606	-0.0337	0.3282	-0.0281
209.33	14.47	0.3957	-0.0358	0.3603	-0.034	0.3282	-0.0281
214.33	14.64	0.3956	-0.0359	0.3603	-0.034	0.3282	-0.0281
219.33	14.81	0.3956	-0.0359	0.3602	-0.0341	0.3281	-0.0282
224.33	14.98	0.3956	-0.0359	0.3602	-0.0341	0.3281	-0.0282
229.33	15.14	0.3955	-0.036	0.3602	-0.0341	0.328	-0.0283
234.33	15.31	0.3954	-0.0361	0.3601	-0.0342	0.328	-0.0283
239.33	15.47	0.3953	-0.0362	0.3596	-0.0347	0.328	-0.0283
244.33	15.63	0.3952	-0.0363	0.3579	-0.0364	0.3279	-0.0284
249.33	15.79	0.3951	-0.0364	0.3572	-0.0371	0.3277	-0.0286
254.33	15.95	0.3948	-0.0367	0.357	-0.0373	0.3277	-0.0286
259.33	16.10	0.3948	-0.0367	0.357	-0.0373	0.3276	-0.0287
264.33	16.26	0.3948	-0.0367	0.3569	-0.0374	0.3276	-0.0287
269.33	16.41	0.3947	-0.0368	0.3568	-0.0375	0.3275	-0.0288
274.33	16.56	0.3947	-0.0368	0.3567	-0.0376	0.3275	-0.0288
279.33	16.71	0.3947	-0.0368	0.3566	-0.0377	0.3275	-0.0288
284.33	16.86	0.3946	-0.0369	0.3565	-0.0378	0.3275	-0.0288
289.33	17.01	0.3945	-0.037	0.3565	-0.0378	0.3274	-0.0289
294.33	17.16	0.3945	-0.037	0.3564	-0.0379	0.3274	-0.0289
299.33	17.30	0.3946	-0.0369			0.3273	-0.029
304.33	17.45	0.3945	-0.037			0.3273	-0.029
309.33	17.59	0.3945	-0.037			0.3273	-0.029
314.33	17.73	0.3945	-0.037			0.3273	-0.029
319.33	17.87	0.3944	-0.0371			0.3272	-0.0291
324.33	18.01					0.3273	-0.029
329.33	18.15					0.3272	-0.0291
334.33	18.28					0.3272	-0.0291
339.33	18.42					0.3272	-0.0291
344.33	18.56					0.3272	-0.0291

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 1 @ 10 psf		Test 2 @ 25 psf		Test 3 @ 50 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69					0.3272	-0.0291
354.33	18.82					0.3272	-0.0291
369.33	19.22					0.3271	-0.0292
384.33	19.60					0.3271	-0.0292
399.33	19.98					0.3271	-0.0292
414.33	20.36					0.3271	-0.0292
429.33	20.72					0.327	-0.0293
444.33	21.08					0.327	-0.0293
459.33	21.43					0.327	-0.0293
474.33	21.78					0.3268	-0.0295
489.33	22.12					0.3265	-0.0298
504.33	22.46					0.3264	-0.0299
519.33	22.79					0.3264	-0.0299
534.33	23.12					0.3264	-0.0299
549.33	23.44					0.3264	-0.0299
564.33	23.76					0.3263	-0.03
579.33	24.07					0.3263	-0.03
594.33	24.38					0.3263	-0.03
609.33	24.68					0.3263	-0.03
624.33	24.99					0.3263	-0.03
639.33	25.29					0.3263	-0.03
654.33	25.58					0.3262	-0.0301
669.33	25.87						
684.33	26.16						
699.33	26.44						
714.33	26.73						
744.33	27.28						
774.33	27.83						
804.33	28.36						
834.33	28.88						
864.33	29.40						
894.33	29.91						
924.33	30.40						
954.33	30.89						
984.33	31.37						
1014.33	31.85						
1044.33	32.32						
1074.33	32.78						

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.3263	0	0.2879	0	0.4278	0
0.17	0.41	0.3252	-0.0011	0.2846	-0.0033	0.4219	-0.0059
0.33	0.58	0.3244	-0.0019	0.2809	-0.007	0.4196	-0.0082
0.50	0.71	0.3239	-0.0024	0.2791	-0.0088	0.416	-0.0118
0.67	0.82	0.3233	-0.003	0.2767	-0.0112	0.4142	-0.0136
0.83	0.91	0.3229	-0.0034	0.2752	-0.0127	0.4119	-0.0159
1.00	1.00	0.3223	-0.004	0.2732	-0.0147	0.4105	-0.0173
1.17	1.08	0.3219	-0.0044	0.272	-0.0159	0.4089	-0.0189
1.33	1.15	0.3214	-0.0049	0.2702	-0.0177	0.4075	-0.0203
1.50	1.22	0.3209	-0.0054	0.269	-0.0189	0.4059	-0.0219
1.67	1.29	0.3205	-0.0058	0.2674	-0.0205	0.405	-0.0228
1.83	1.35	0.3201	-0.0062	0.2665	-0.0214	0.4038	-0.024
2.00	1.41	0.3195	-0.0068	0.265	-0.0229	0.4028	-0.025
2.17	1.47	0.3193	-0.007	0.2641	-0.0238	0.4016	-0.0262
2.33	1.53	0.3187	-0.0076	0.2628	-0.0251	0.4009	-0.0269
2.50	1.58	0.3184	-0.0079	0.262	-0.0259	0.3998	-0.028
2.67	1.63	0.3178	-0.0085	0.2607	-0.0272	0.3991	-0.0287
2.83	1.68	0.3174	-0.0089	0.2598	-0.0281	0.3982	-0.0296
3.00	1.73	0.3169	-0.0094	0.2587	-0.0292	0.3976	-0.0302
3.17	1.78	0.3166	-0.0097	0.2579	-0.03	0.3968	-0.031
3.33	1.83	0.3162	-0.0101	0.257	-0.0309	0.3964	-0.0314
3.50	1.87	0.3159	-0.0104	0.2563	-0.0316	0.3956	-0.0322
3.67	1.91	0.3154	-0.0109	0.2553	-0.0326	0.3952	-0.0326
3.83	1.96	0.3151	-0.0112	0.2547	-0.0332	0.3946	-0.0332
4.00	2.00	0.3146	-0.0117	0.2539	-0.034	0.3941	-0.0337
4.17	2.04	0.3144	-0.0119	0.2532	-0.0347	0.3936	-0.0342
4.33	2.08	0.3139	-0.0124	0.2524	-0.0355	0.3933	-0.0345
4.50	2.12	0.3137	-0.0126	0.2518	-0.0361	0.3927	-0.0351
4.67	2.16	0.3132	-0.0131	0.2511	-0.0368	0.3924	-0.0354
4.83	2.20	0.313	-0.0133	0.2506	-0.0373	0.3921	-0.0357
5.00	2.24	0.3126	-0.0137	0.25	-0.0379	0.3917	-0.0361
5.17	2.27	0.3123	-0.014	0.2495	-0.0384	0.3914	-0.0364
5.33	2.31	0.3119	-0.0144	0.2488	-0.0391	0.3912	-0.0366
5.50	2.35	0.3116	-0.0147	0.2485	-0.0394	0.3909	-0.0369
5.67	2.38	0.3113	-0.015	0.2479	-0.04	0.3907	-0.0371
5.83	2.42	0.311	-0.0153	0.2475	-0.0404	0.3904	-0.0374
6.00	2.45	0.3106	-0.0157	0.2469	-0.041	0.3902	-0.0376
6.17	2.48	0.3104	-0.0159	0.2467	-0.0412	0.39	-0.0378

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.31	-0.0163	0.2461	-0.0418	0.3898	-0.036
6.50	2.55	0.3098	-0.0165	0.2458	-0.0421	0.3895	-0.0383
6.67	2.58	0.3094	-0.0169	0.2454	-0.0425	0.3894	-0.0384
6.83	2.61	0.3091	-0.0172	0.2452	-0.0427	0.3892	-0.0386
7.00	2.65	0.3089	-0.0174	0.2447	-0.0432	0.3891	-0.0387
7.17	2.68	0.3086	-0.0177	0.2445	-0.0434	0.3889	-0.0389
7.33	2.71	0.3083	-0.018	0.2441	-0.0438	0.3887	-0.0391
7.50	2.74	0.3081	-0.0182	0.2438	-0.0441	0.3886	-0.0392
7.67	2.77	0.3078	-0.0185	0.2435	-0.0444	0.3885	-0.0393
7.83	2.80	0.3075	-0.0188	0.2433	-0.0446	0.3884	-0.0394
8.00	2.83	0.3073	-0.019	0.243	-0.0449	0.3882	-0.0396
8.17	2.86	0.307	-0.0193	0.2428	-0.0451	0.3881	-0.0397
8.33	2.89	0.3067	-0.0196	0.2425	-0.0454	0.388	-0.0398
8.50	2.92	0.3066	-0.0197	0.2423	-0.0456	0.3878	-0.04
8.67	2.94	0.3063	-0.02	0.2421	-0.0458	0.3877	-0.0401
8.83	2.97	0.3061	-0.0202	0.242	-0.0459	0.3877	-0.0401
9.00	3.00	0.3059	-0.0204	0.2417	-0.0462	0.3876	-0.0402
9.17	3.03	0.3057	-0.0206	0.2415	-0.0464	0.3875	-0.0403
9.33	3.06	0.3054	-0.0209	0.2413	-0.0466	0.3874	-0.0404
9.50	3.08	0.3051	-0.0212	0.2412	-0.0467	0.3873	-0.0405
9.67	3.11	0.305	-0.0213	0.241	-0.0469	0.3872	-0.0406
9.83	3.14	0.3048	-0.0215	0.2408	-0.0471	0.3871	-0.0407
10.00	3.16	0.3045	-0.0218	0.2406	-0.0473	0.387	-0.0408
10.17	3.19	0.3043	-0.022	0.2406	-0.0473	0.3869	-0.0409
10.33	3.21	0.3042	-0.0221	0.2404	-0.0475	0.3869	-0.0409
10.50	3.24	0.304	-0.0223	0.2402	-0.0477	0.3868	-0.041
10.67	3.27	0.3038	-0.0225	0.2401	-0.0478	0.3867	-0.0411
10.83	3.29	0.3036	-0.0227	0.2399	-0.048	0.3867	-0.0411
11.00	3.32	0.3034	-0.0229	0.2398	-0.0481	0.3866	-0.0412
11.17	3.34	0.3033	-0.023	0.2398	-0.0481	0.3865	-0.0413
11.33	3.37	0.303	-0.0233	0.2396	-0.0483	0.3865	-0.0413
11.50	3.39	0.3029	-0.0234	0.2395	-0.0484	0.3864	-0.0414
11.67	3.42	0.3027	-0.0236	0.2393	-0.0486	0.3863	-0.0415
11.83	3.44	0.3027	-0.0236	0.2393	-0.0486	0.3863	-0.0415
12.00	3.46	0.3025	-0.0238	0.2391	-0.0488	0.3862	-0.0416
12.17	3.49	0.3023	-0.024	0.2391	-0.0488	0.3861	-0.0417
12.33	3.51	0.3021	-0.0242	0.239	-0.0489	0.3861	-0.0417
12.50	3.54	0.302	-0.0243	0.2389	-0.049	0.3861	-0.0417

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.3018	-0.0245	0.2388	-0.0491	0.386	-0.0418
12.83	3.58	0.3017	-0.0246	0.2387	-0.0492	0.386	-0.0418
13.00	3.61	0.3015	-0.0248	0.2386	-0.0493	0.3859	-0.0419
13.17	3.63	0.3014	-0.0249	0.2386	-0.0493	0.3859	-0.0419
13.33	3.65	0.3012	-0.0251	0.2384	-0.0495	0.3858	-0.042
13.50	3.67	0.3011	-0.0252	0.2384	-0.0495	0.3857	-0.0421
13.67	3.70	0.3009	-0.0254	0.2383	-0.0496	0.3857	-0.0421
13.83	3.72	0.3008	-0.0255	0.2383	-0.0496	0.3857	-0.0421
14.00	3.74	0.3006	-0.0257	0.2382	-0.0497	0.3856	-0.0422
14.17	3.76	0.3005	-0.0258	0.2381	-0.0498	0.3855	-0.0423
14.33	3.79	0.3004	-0.0259	0.2381	-0.0498	0.3855	-0.0423
14.50	3.81	0.3003	-0.026	0.238	-0.0499	0.3855	-0.0423
14.67	3.83	0.3002	-0.0261	0.2379	-0.05	0.3854	-0.0424
14.83	3.85	0.3001	-0.0262	0.2379	-0.05	0.3854	-0.0424
15.83	3.98	0.2994	-0.0269	0.2375	-0.0504	0.3853	-0.0425
16.83	4.10	0.2988	-0.0275	0.2372	-0.0507	0.385	-0.0428
17.83	4.22	0.2982	-0.0281	0.2369	-0.051	0.3848	-0.043
18.83	4.34	0.2978	-0.0285	0.2367	-0.0512	0.3846	-0.0432
19.83	4.45	0.2973	-0.029	0.2365	-0.0514	0.3846	-0.0432
20.83	4.56	0.297	-0.0293	0.2363	-0.0516	0.3844	-0.0434
21.83	4.67	0.2967	-0.0296	0.2362	-0.0517	0.3843	-0.0435
22.83	4.78	0.2964	-0.0299	0.236	-0.0519	0.3842	-0.0436
23.83	4.88	0.2961	-0.0302	0.2359	-0.052	0.3841	-0.0437
24.83	4.98	0.2958	-0.0305	0.2358	-0.0521	0.384	-0.0438
25.83	5.08	0.2956	-0.0307	0.2357	-0.0522	0.3838	-0.044
26.83	5.18	0.2954	-0.0309	0.2355	-0.0524	0.3838	-0.044
27.83	5.28	0.2951	-0.0312	0.2354	-0.0525	0.3837	-0.0441
28.83	5.37	0.2949	-0.0314	0.2353	-0.0526	0.3837	-0.0441
29.83	5.46	0.2948	-0.0315	0.2351	-0.0528	0.3836	-0.0442
30.83	5.55	0.2947	-0.0316	0.2351	-0.0528	0.3835	-0.0443
31.83	5.64	0.2945	-0.0318	0.2351	-0.0528	0.3834	-0.0444
32.83	5.73	0.2944	-0.0319	0.235	-0.0529	0.3834	-0.0444
33.83	5.82	0.2943	-0.032	0.2349	-0.053	0.3833	-0.0445
34.83	5.90	0.2941	-0.0322	0.2348	-0.0531	0.3832	-0.0446
35.83	5.99	0.2938	-0.0325	0.2347	-0.0532	0.3832	-0.0446
36.83	6.07	0.2936	-0.0327	0.2347	-0.0532	0.3831	-0.0447
37.83	6.15	0.2935	-0.0328	0.2346	-0.0533	0.383	-0.0448
38.83	6.23	0.2934	-0.0329	0.2345	-0.0534	0.383	-0.0448

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.2933	-0.033	0.2344	-0.0535	0.383	-0.0448
40.83	6.39	0.2932	-0.0331	0.2344	-0.0535	0.383	-0.0448
41.83	6.47	0.2931	-0.0332	0.2344	-0.0535	0.3829	-0.0449
42.83	6.54	0.293	-0.0333	0.2343	-0.0536	0.3829	-0.0449
43.83	6.62	0.2929	-0.0334	0.2343	-0.0536	0.3828	-0.045
44.83	6.70	0.2928	-0.0335	0.2343	-0.0536	0.3828	-0.045
45.83	6.77	0.2927	-0.0336	0.2343	-0.0536	0.3827	-0.0451
46.83	6.84	0.2926	-0.0337	0.2343	-0.0536	0.3827	-0.0451
47.83	6.92	0.2926	-0.0337	0.2342	-0.0537	0.3826	-0.0452
48.83	6.99	0.2925	-0.0338	0.2342	-0.0537	0.3826	-0.0452
49.83	7.06	0.2925	-0.0338	0.2341	-0.0538	0.3825	-0.0453
50.83	7.13	0.2925	-0.0338	0.2341	-0.0538	0.3825	-0.0453
51.83	7.20	0.2924	-0.0339	0.2341	-0.0538	0.3825	-0.0453
52.83	7.27	0.2924	-0.0339	0.234	-0.0539	0.3824	-0.0454
53.83	7.34	0.2923	-0.034	0.234	-0.0539	0.3824	-0.0454
54.83	7.40	0.2923	-0.034	0.2339	-0.054	0.3824	-0.0454
55.83	7.47	0.2922	-0.0341	0.2339	-0.054	0.3822	-0.0456
56.83	7.54	0.2922	-0.0341	0.2338	-0.0541	0.3822	-0.0456
57.83	7.60	0.2921	-0.0342	0.2338	-0.0541	0.3822	-0.0456
58.83	7.67	0.2921	-0.0342	0.2338	-0.0541	0.3822	-0.0456
59.83	7.74	0.292	-0.0343	0.2337	-0.0542	0.3822	-0.0456
60.83	7.80	0.292	-0.0343	0.2337	-0.0542	0.3822	-0.0456
61.83	7.86	0.2919	-0.0344	0.2337	-0.0542	0.3822	-0.0456
62.83	7.93	0.2919	-0.0344	0.2336	-0.0543	0.3821	-0.0457
63.83	7.99	0.2919	-0.0344	0.2336	-0.0543	0.3821	-0.0457
64.83	8.05	0.2918	-0.0345	0.2336	-0.0543	0.3821	-0.0457
65.83	8.11	0.2918	-0.0345	0.2336	-0.0543	0.382	-0.0458
66.83	8.18	0.2918	-0.0345	0.2336	-0.0543	0.382	-0.0458
67.83	8.24	0.2918	-0.0345	0.2336	-0.0543	0.382	-0.0458
68.83	8.30	0.2918	-0.0345	0.2335	-0.0544	0.382	-0.0458
69.83	8.36	0.2918	-0.0345	0.2335	-0.0544	0.3819	-0.0459
70.83	8.42	0.2917	-0.0346	0.2335	-0.0544	0.3819	-0.0459
71.83	8.48	0.2917	-0.0346	0.2335	-0.0544	0.3819	-0.0459
72.83	8.53	0.2916	-0.0347	0.2335	-0.0544	0.3818	-0.046
73.83	8.59	0.2916	-0.0347	0.2334	-0.0545	0.3818	-0.046
74.83	8.65	0.2916	-0.0347	0.2334	-0.0545	0.3818	-0.046
75.83	8.71	0.2916	-0.0347	0.2334	-0.0545	0.3818	-0.046
76.83	8.77	0.2915	-0.0348	0.2334	-0.0545	0.3818	-0.046

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.2915	-0.0348	0.2333	-0.0546	0.3817	-0.0461
78.83	8.88	0.2915	-0.0348	0.2333	-0.0546	0.3817	-0.0461
79.83	8.93	0.2915	-0.0348	0.2333	-0.0546	0.3817	-0.0461
80.83	8.99	0.2914	-0.0349	0.2333	-0.0546	0.3817	-0.0461
81.83	9.05	0.2914	-0.0349	0.2332	-0.0547	0.3817	-0.0461
82.83	9.10	0.2914	-0.0349	0.2332	-0.0547	0.3816	-0.0462
83.83	9.16	0.2913	-0.035	0.2332	-0.0547	0.3816	-0.0462
84.83	9.21	0.2913	-0.035	0.2331	-0.0548	0.3816	-0.0462
85.83	9.26	0.2913	-0.035	0.2331	-0.0548	0.3816	-0.0462
86.83	9.32	0.2913	-0.035	0.2331	-0.0548	0.3816	-0.0462
87.83	9.37	0.2912	-0.0351	0.2331	-0.0548	0.3815	-0.0463
88.83	9.43	0.2912	-0.0351	0.2331	-0.0548	0.3815	-0.0463
89.83	9.48	0.2912	-0.0351	0.2331	-0.0548	0.3815	-0.0463
90.83	9.53	0.2912	-0.0351	0.2332	-0.0547	0.3815	-0.0463
91.83	9.58	0.2912	-0.0351	0.2331	-0.0548	0.3815	-0.0463
92.83	9.64	0.2912	-0.0351	0.2331	-0.0548	0.3815	-0.0463
93.83	9.69	0.2911	-0.0352	0.2331	-0.0548	0.3814	-0.0464
94.83	9.74	0.2911	-0.0352	0.2331	-0.0548	0.3814	-0.0464
95.83	9.79	0.2911	-0.0352	0.233	-0.0549	0.3814	-0.0464
96.83	9.84	0.2911	-0.0352	0.233	-0.0549	0.3814	-0.0464
97.83	9.89	0.2911	-0.0352	0.233	-0.0549	0.3814	-0.0464
98.83	9.94	0.2911	-0.0352	0.233	-0.0549	0.3814	-0.0464
99.83	9.99	0.291	-0.0353	0.233	-0.0549	0.3814	-0.0464
100.83	10.04	0.291	-0.0353	0.2329	-0.055	0.3814	-0.0464
101.83	10.09	0.291	-0.0353	0.2329	-0.055	0.3814	-0.0464
102.83	10.14	0.291	-0.0353	0.2329	-0.055	0.3814	-0.0464
103.83	10.19	0.291	-0.0353	0.2329	-0.055	0.3814	-0.0464
104.83	10.24	0.291	-0.0353	0.2329	-0.055	0.3814	-0.0464
109.33	10.46	0.291	-0.0353	0.2328	-0.0551	0.3813	-0.0465
114.33	10.69	0.2903	-0.036	0.2328	-0.0551	0.3812	-0.0466
119.33	10.92	0.29	-0.0363	0.2327	-0.0552	0.3812	-0.0466
124.33	11.15	0.2897	-0.0366	0.2326	-0.0553	0.3811	-0.0467
129.33	11.37	0.2896	-0.0367	0.2326	-0.0553	0.381	-0.0468
134.33	11.59	0.2895	-0.0368	0.2325	-0.0554	0.3808	-0.047
139.33	11.80	0.2895	-0.0368	0.2323	-0.0556	0.3808	-0.047
144.33	12.01	0.2894	-0.0369	0.2323	-0.0556	0.3807	-0.0471
149.33	12.22	0.2893	-0.037	0.2322	-0.0557	0.3807	-0.0471
154.33	12.42	0.2892	-0.0371	0.2323	-0.0556	0.3806	-0.0472

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.2892	-0.0371	0.2322	-0.0557	0.3804	-0.0474
164.33	12.82	0.2891	-0.0372	0.2321	-0.0558	0.3802	-0.0476
169.33	13.01	0.2891	-0.0372	0.2321	-0.0558	0.3801	-0.0477
174.33	13.20	0.289	-0.0373	0.2321	-0.0558	0.3801	-0.0477
179.33	13.39	0.289	-0.0373	0.232	-0.0559	0.38	-0.0478
184.33	13.58	0.2889	-0.0374	0.2321	-0.0558	0.38	-0.0478
189.33	13.76	0.2889	-0.0374	0.2321	-0.0558	0.3799	-0.0479
194.33	13.94	0.2888	-0.0375	0.232	-0.0559	0.3799	-0.0479
199.33	14.12	0.2887	-0.0376	0.232	-0.0559	0.3798	-0.048
204.33	14.29	0.2887	-0.0376	0.232	-0.0559	0.3798	-0.048
209.33	14.47	0.2887	-0.0376	0.232	-0.0559	0.3798	-0.048
214.33	14.64	0.2886	-0.0377	0.232	-0.0559	0.3798	-0.048
219.33	14.81	0.2886	-0.0377	0.2319	-0.056	0.3798	-0.048
224.33	14.98	0.2886	-0.0377	0.2319	-0.056	0.3797	-0.0481
229.33	15.14	0.2886	-0.0377	0.2319	-0.056	0.3796	-0.0482
234.33	15.31	0.2886	-0.0377	0.2318	-0.0561	0.3796	-0.0482
239.33	15.47	0.2886	-0.0377	0.2318	-0.0561	0.3795	-0.0483
244.33	15.63	0.2886	-0.0377	0.2318	-0.0561	0.3792	-0.0486
249.33	15.79	0.2885	-0.0378	0.2318	-0.0561	0.3791	-0.0487
254.33	15.95	0.2883	-0.038	0.2317	-0.0562	0.3791	-0.0487
259.33	16.10	0.2883	-0.038	0.2317	-0.0562	0.3791	-0.0487
264.33	16.26	0.2882	-0.0381	0.2316	-0.0563	0.3791	-0.0487
269.33	16.41	0.2882	-0.0381	0.2316	-0.0563	0.3791	-0.0487
274.33	16.56	0.2881	-0.0382	0.2315	-0.0564	0.379	-0.0488
279.33	16.71	0.2881	-0.0382	0.2315	-0.0564	0.379	-0.0488
284.33	16.86	0.2881	-0.0382	0.2315	-0.0564	0.379	-0.0488
289.33	17.01	0.288	-0.0383	0.2315	-0.0564	0.379	-0.0488
294.33	17.16	0.288	-0.0383	0.2315	-0.0564	0.379	-0.0488
299.33	17.30	0.288	-0.0383	0.2315	-0.0564	0.3789	-0.0489
304.33	17.45	0.288	-0.0383	0.2314	-0.0565	0.3789	-0.0489
309.33	17.59	0.288	-0.0383	0.2314	-0.0565	0.3789	-0.0489
314.33	17.73	0.288	-0.0383	0.2314	-0.0565	0.3788	-0.049
319.33	17.87	0.288	-0.0383	0.2314	-0.0565	0.3788	-0.049
324.33	18.01	0.2879	-0.0384	0.2314	-0.0565	0.3787	-0.0491
329.33	18.15	0.2879	-0.0384	0.2313	-0.0566	0.3787	-0.0491
334.33	18.28			0.2313	-0.0566	0.3788	-0.049
339.33	18.42			0.2313	-0.0566	0.3787	-0.0491
344.33	18.56			0.2314	-0.0565	0.3787	-0.0491

ample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69			0.2313	-0.0566	0.3787	-0.0491
354.33	18.82			0.2313	-0.0566	0.3787	-0.0491
369.33	19.22			0.2313	-0.0566	0.3786	-0.0492
384.33	19.60			0.2313	-0.0566	0.3786	-0.0492
399.33	19.98			0.2312	-0.0567	0.3784	-0.0494
414.33	20.36			0.2311	-0.0568	0.3784	-0.0494
429.33	20.72			0.2311	-0.0568	0.3783	-0.0495
444.33	21.08			0.2311	-0.0568	0.3783	-0.0495
459.33	21.43			0.231	-0.0569	0.3783	-0.0495
474.33	21.78			0.231	-0.0569	0.3783	-0.0495
489.33	22.12			0.231	-0.0569	0.3783	-0.0495
504.33	22.46			0.2309	-0.057	0.3782	-0.0496
519.33	22.79			0.2309	-0.057	0.3782	-0.0496
534.33	23.12			0.2309	-0.057	0.3781	-0.0497
549.33	23.44			0.2308	-0.0571	0.378	-0.0498
564.33	23.76			0.2308	-0.0571	0.378	-0.0498
579.33	24.07			0.2308	-0.0571	0.378	-0.0498
594.33	24.38			0.2308	-0.0571	0.3779	-0.0499
609.33	24.68			0.2307	-0.0572	0.3779	-0.0499
624.33	24.99			0.2307	-0.0572	0.3779	-0.0499
639.33	25.29			0.2307	-0.0572	0.3778	-0.05
654.33	25.58			0.2307	-0.0572	0.3777	-0.0501
669.33	25.87			0.2307	-0.0572	0.3778	-0.05
684.33	26.16			0.2306	-0.0573	0.3777	-0.0501
699.33	26.44			0.2306	-0.0573	0.3777	-0.0501
714.33	26.73			0.2306	-0.0573	0.3777	-0.0501
744.33	27.28			0.2306	-0.0573		
774.33	27.83			0.2306	-0.0573		
804.33	28.36			0.2305	-0.0574		
834.33	28.88			0.2305	-0.0574		
864.33	29.40			0.2305	-0.0574		
894.33	29.91			0.2304	-0.0575		
924.33	30.40			0.2304	-0.0575		
954.33	30.89			0.2304	-0.0575		
984.33	31.37			0.2303	-0.0576		
1014.33	31.85			0.2303	-0.0576		
1044.33	32.32			0.2303	-0.0576		
1074.33	32.78			0.2302	-0.0577		

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 4 @ 100 psf		Test 5 @ 250 psf		Test 6 @ 500 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23			0.2301	-0.0578		
1134.33	33.68						
1164.33	34.12						
1194.33	34.56						
1224.33	34.99						
1254.33	35.42						
1284.33	35.84						
1314.33	36.25						

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
0.1	0	0.3776	0	0.3201	0	0.254	0
0.17	0.41	0.3688	-0.0088	0.3085	-0.0116	0.253	-0.001
0.33	0.58	0.3621	-0.0155	0.2992	-0.0209	0.2406	-0.0134
0.50	0.71	0.3578	-0.0198	0.2936	-0.0265	0.2344	-0.0196
0.67	0.82	0.3546	-0.023	0.2897	-0.0304	0.2281	-0.0259
0.83	0.91	0.3521	-0.0255	0.2858	-0.0343	0.2246	-0.0294
1.00	1.00	0.3491	-0.0285	0.2836	-0.0365	0.2209	-0.0331
1.17	1.08	0.3465	-0.0311	0.2807	-0.0394	0.2189	-0.0351
1.33	1.15	0.3449	-0.0327	0.2792	-0.0409	0.2163	-0.0377
1.50	1.22	0.3429	-0.0347	0.2775	-0.0426	0.2152	-0.0388
1.67	1.29	0.3418	-0.0358	0.2763	-0.0438	0.2135	-0.0405
1.83	1.35	0.34	-0.0376	0.275	-0.0451	0.2125	-0.0415
2.00	1.41	0.3392	-0.0384	0.2741	-0.046	0.2106	-0.0434
2.17	1.47	0.3382	-0.0394	0.2731	-0.047	0.2095	-0.0445
2.33	1.53	0.3373	-0.0403	0.2725	-0.0476	0.2083	-0.0457
2.50	1.58	0.3363	-0.0413	0.2718	-0.0483	0.2075	-0.0465
2.67	1.63	0.3357	-0.0419	0.2713	-0.0488	0.2066	-0.0474
2.83	1.68	0.3352	-0.0424	0.2707	-0.0494	0.2061	-0.0479
3.00	1.73	0.3344	-0.0432	0.2704	-0.0497	0.2054	-0.0486
3.17	1.78	0.3338	-0.0438	0.2699	-0.0502	0.2051	-0.0489
3.33	1.83	0.3335	-0.0441	0.2697	-0.0504	0.2046	-0.0494
3.50	1.87	0.3329	-0.0447	0.2692	-0.0509	0.2043	-0.0497
3.67	1.91	0.3327	-0.0449	0.2689	-0.0512	0.2038	-0.0502
3.83	1.96	0.3322	-0.0454	0.2687	-0.0514	0.2037	-0.0503
4.00	2.00	0.332	-0.0456	0.2685	-0.0516	0.2032	-0.0508
4.17	2.04	0.3317	-0.0459	0.2682	-0.0519	0.203	-0.051
4.33	2.08	0.3314	-0.0462	0.2681	-0.052	0.2028	-0.0512
4.50	2.12	0.3312	-0.0464	0.2678	-0.0523	0.2026	-0.0514
4.67	2.16	0.331	-0.0466	0.2676	-0.0525	0.2023	-0.0517
4.83	2.20	0.3307	-0.0469	0.2674	-0.0527	0.2021	-0.0519
5.00	2.24	0.3305	-0.0471	0.2674	-0.0527	0.202	-0.052
5.17	2.27	0.3304	-0.0472	0.2671	-0.053	0.2018	-0.0522
5.33	2.31	0.3303	-0.0473	0.267	-0.0531	0.2016	-0.0524
5.50	2.35	0.33	-0.0476	0.2668	-0.0533	0.2015	-0.0525
5.67	2.38	0.3299	-0.0477	0.2667	-0.0534	0.2013	-0.0527
5.83	2.42	0.3297	-0.0479	0.2666	-0.0535	0.2013	-0.0527
6.00	2.45	0.3296	-0.048	0.2665	-0.0536	0.2011	-0.0529
6.17	2.48	0.3295	-0.0481	0.2664	-0.0537	0.201	-0.053

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
6.33	2.52	0.3294	-0.0482	0.2663	-0.0538	0.2008	-0.0532
6.50	2.55	0.3292	-0.0484	0.2661	-0.054	0.2007	-0.0533
6.67	2.58	0.3292	-0.0484	0.266	-0.0541	0.2006	-0.0534
6.83	2.61	0.329	-0.0486	0.2659	-0.0542	0.2005	-0.0535
7.00	2.65	0.3289	-0.0487	0.2658	-0.0543	0.2004	-0.0536
7.17	2.68	0.3288	-0.0488	0.2658	-0.0543	0.2004	-0.0536
7.33	2.71	0.3287	-0.0489	0.2657	-0.0544	0.2002	-0.0538
7.50	2.74	0.3287	-0.0489	0.2656	-0.0545	0.2002	-0.0538
7.67	2.77	0.3286	-0.049	0.2655	-0.0546	0.2001	-0.0539
7.83	2.80	0.3285	-0.0491	0.2654	-0.0547	0.2	-0.054
8.00	2.83	0.3284	-0.0492	0.2653	-0.0548	0.1999	-0.0541
8.17	2.86	0.3283	-0.0493	0.2652	-0.0549	0.1998	-0.0542
8.33	2.89	0.3283	-0.0493	0.2652	-0.0549	0.1997	-0.0543
8.50	2.92	0.3282	-0.0494	0.2651	-0.055	0.1997	-0.0543
8.67	2.94	0.3281	-0.0495	0.265	-0.0551	0.1996	-0.0544
8.83	2.97	0.328	-0.0496	0.265	-0.0551	0.1996	-0.0544
9.00	3.00	0.328	-0.0496	0.265	-0.0551	0.1995	-0.0545
9.17	3.03	0.3279	-0.0497	0.2649	-0.0552	0.1994	-0.0546
9.33	3.06	0.3279	-0.0497	0.2649	-0.0552	0.1993	-0.0547
9.50	3.08	0.3278	-0.0498	0.2648	-0.0553	0.1992	-0.0548
9.67	3.11	0.3278	-0.0498	0.2647	-0.0554	0.1992	-0.0548
9.83	3.14	0.3277	-0.0499	0.2646	-0.0555	0.1991	-0.0549
10.00	3.16	0.3277	-0.0499	0.2646	-0.0555	0.1991	-0.0549
10.17	3.19	0.3276	-0.05	0.2645	-0.0556	0.199	-0.055
10.33	3.21	0.3276	-0.05	0.2645	-0.0556	0.1989	-0.0551
10.50	3.24	0.3275	-0.0501	0.2644	-0.0557	0.1989	-0.0551
10.67	3.27	0.3275	-0.0501	0.2644	-0.0557	0.1989	-0.0551
10.83	3.29	0.3274	-0.0502	0.2643	-0.0558	0.1989	-0.0551
11.00	3.32	0.3273	-0.0503	0.2643	-0.0558	0.1988	-0.0552
11.17	3.34	0.3273	-0.0503	0.2642	-0.0559	0.1988	-0.0552
11.33	3.37	0.3272	-0.0504	0.2642	-0.0559	0.1987	-0.0553
11.50	3.39	0.3272	-0.0504	0.2642	-0.0559	0.1986	-0.0554
11.67	3.42	0.3271	-0.0505	0.2642	-0.0559	0.1986	-0.0554
11.83	3.44	0.3271	-0.0505	0.2641	-0.056	0.1985	-0.0555
12.00	3.46	0.3271	-0.0505	0.2641	-0.056	0.1985	-0.0555
12.17	3.49	0.3271	-0.0505	0.264	-0.0561	0.1984	-0.0556
12.33	3.51	0.327	-0.0506	0.264	-0.0561	0.1984	-0.0556
12.50	3.54	0.327	-0.0506	0.2639	-0.0562	0.1983	-0.0557

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
12.67	3.56	0.327	-0.0506	0.2639	-0.0562	0.1983	-0.0557
12.83	3.58	0.3269	-0.0507	0.2638	-0.0563	0.1982	-0.0558
13.00	3.61	0.3269	-0.0507	0.2638	-0.0563	0.1982	-0.0558
13.17	3.63	0.3268	-0.0508	0.2638	-0.0563	0.1982	-0.0558
13.33	3.65	0.3268	-0.0508	0.2637	-0.0564	0.1982	-0.0558
13.50	3.67	0.3268	-0.0508	0.2637	-0.0564	0.1981	-0.0559
13.67	3.70	0.3267	-0.0509	0.2636	-0.0565	0.1981	-0.0559
13.83	3.72	0.3267	-0.0509	0.2636	-0.0565	0.1981	-0.0559
14.00	3.74	0.3266	-0.051	0.2636	-0.0565	0.198	-0.056
14.17	3.76	0.3266	-0.051	0.2635	-0.0566	0.198	-0.056
14.33	3.79	0.3266	-0.051	0.2635	-0.0566	0.1979	-0.0561
14.50	3.81	0.3265	-0.0511	0.2634	-0.0567	0.1979	-0.0561
14.67	3.83	0.3265	-0.0511	0.2634	-0.0567	0.1979	-0.0561
14.83	3.85	0.3265	-0.0511	0.2634	-0.0567	0.1978	-0.0562
15.83	3.98	0.3264	-0.0512	0.2633	-0.0568	0.1976	-0.0564
16.83	4.10	0.3262	-0.0514	0.2631	-0.057	0.1974	-0.0566
17.83	4.22	0.326	-0.0516	0.2629	-0.0572	0.1973	-0.0567
18.83	4.34	0.3258	-0.0518	0.2628	-0.0573	0.1971	-0.0569
19.83	4.45	0.3257	-0.0519	0.2627	-0.0574	0.197	-0.057
20.83	4.56	0.3256	-0.052	0.2625	-0.0576	0.1968	-0.0572
21.83	4.67	0.3255	-0.0521	0.2624	-0.0577	0.1966	-0.0574
22.83	4.78	0.3254	-0.0522	0.2623	-0.0578	0.1965	-0.0575
23.83	4.88	0.3253	-0.0523	0.2621	-0.058	0.1964	-0.0576
24.83	4.98	0.3252	-0.0524	0.262	-0.0581	0.1962	-0.0578
25.83	5.08	0.3251	-0.0525	0.2619	-0.0582	0.1961	-0.0579
26.83	5.18	0.325	-0.0526	0.2619	-0.0582	0.196	-0.058
27.83	5.28	0.3249	-0.0527	0.2618	-0.0583	0.1959	-0.0581
28.83	5.37	0.3248	-0.0528	0.2617	-0.0584	0.1958	-0.0582
29.83	5.46	0.3248	-0.0528	0.2616	-0.0585	0.1958	-0.0582
30.83	5.55	0.3248	-0.0528	0.2616	-0.0585	0.1957	-0.0583
31.83	5.64	0.3247	-0.0529	0.2615	-0.0586	0.1956	-0.0584
32.83	5.73	0.3246	-0.053	0.2614	-0.0587	0.1955	-0.0585
33.83	5.82	0.3246	-0.053	0.2613	-0.0588	0.1954	-0.0586
34.83	5.90	0.3245	-0.0531	0.2612	-0.0589	0.1954	-0.0586
35.83	5.99	0.3244	-0.0532	0.2611	-0.059	0.1953	-0.0587
36.83	6.07	0.3243	-0.0533	0.2611	-0.059	0.1952	-0.0588
37.83	6.15	0.3243	-0.0533	0.2611	-0.059	0.1951	-0.0589
38.83	6.23	0.3242	-0.0534	0.261	-0.0591	0.195	-0.059

:mple S5-S7 @ 15'

Time minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
39.83	6.31	0.3242	-0.0534	0.261	-0.0591	0.1951	-0.0589
40.83	6.39	0.3241	-0.0535	0.2609	-0.0592	0.195	-0.059
41.83	6.47	0.3241	-0.0535	0.2608	-0.0593	0.195	-0.059
42.83	6.54	0.324	-0.0536	0.2608	-0.0593	0.195	-0.059
43.83	6.62	0.324	-0.0536	0.2607	-0.0594	0.1949	-0.0591
44.83	6.70	0.324	-0.0536	0.2608	-0.0593	0.1948	-0.0592
45.83	6.77	0.3239	-0.0537	0.2607	-0.0594	0.1948	-0.0592
46.83	6.84	0.3239	-0.0537	0.2607	-0.0594	0.1947	-0.0593
47.83	6.92	0.3239	-0.0537	0.2606	-0.0595	0.1946	-0.0594
48.83	6.99	0.3238	-0.0538	0.2606	-0.0595	0.1946	-0.0594
49.83	7.06	0.3238	-0.0538	0.2605	-0.0596	0.1945	-0.0595
50.83	7.13	0.3237	-0.0539	0.2605	-0.0596	0.1945	-0.0595
51.83	7.20	0.3237	-0.0539	0.2604	-0.0597	0.1944	-0.0596
52.83	7.27	0.3236	-0.054	0.2604	-0.0597	0.1943	-0.0597
53.83	7.34	0.3236	-0.054	0.2603	-0.0598	0.1943	-0.0597
54.83	7.40	0.3236	-0.054	0.2603	-0.0598	0.1943	-0.0597
55.83	7.47	0.3235	-0.0541	0.2603	-0.0598	0.1942	-0.0598
56.83	7.54	0.3235	-0.0541	0.2603	-0.0598	0.1942	-0.0598
57.83	7.60	0.3235	-0.0541	0.2603	-0.0598	0.1942	-0.0598
58.83	7.67	0.3234	-0.0542	0.2602	-0.0599	0.1942	-0.0598
59.83	7.74	0.3234	-0.0542	0.2602	-0.0599	0.1941	-0.0599
60.83	7.80	0.3234	-0.0542	0.2601	-0.06	0.1941	-0.0599
61.83	7.86	0.3234	-0.0542	0.2601	-0.06	0.194	-0.06
62.83	7.93	0.3233	-0.0543	0.26	-0.0601	0.194	-0.06
63.83	7.99	0.3233	-0.0543	0.26	-0.0601	0.194	-0.06
64.83	8.05	0.3232	-0.0544	0.26	-0.0601	0.1939	-0.0601
65.83	8.11	0.3232	-0.0544	0.26	-0.0601	0.1938	-0.0602
66.83	8.18	0.3232	-0.0544	0.2599	-0.0602	0.1938	-0.0602
67.83	8.24	0.3232	-0.0544	0.2599	-0.0602	0.1938	-0.0602
68.83	8.30	0.3232	-0.0544	0.2599	-0.0602	0.1938	-0.0602
69.83	8.36	0.3232	-0.0544	0.2598	-0.0603	0.1937	-0.0603
70.83	8.42	0.3232	-0.0544	0.2598	-0.0603	0.1937	-0.0603
71.83	8.48	0.3232	-0.0544	0.2597	-0.0604	0.1936	-0.0604
72.83	8.53	0.3231	-0.0545	0.2597	-0.0604	0.1936	-0.0604
73.83	8.59	0.3231	-0.0545	0.2597	-0.0604	0.1935	-0.0605
74.83	8.65	0.3231	-0.0545	0.2597	-0.0604	0.1935	-0.0605
75.83	8.71	0.3231	-0.0545	0.2596	-0.0605	0.1934	-0.0606
76.83	8.77	0.323	-0.0546	0.2596	-0.0605	0.1934	-0.0606

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
77.83	8.82	0.323	-0.0546	0.2596	-0.0605	0.1934	-0.0606
78.83	8.88	0.323	-0.0546	0.2595	-0.0606	0.1934	-0.0606
79.83	8.93	0.323	-0.0546	0.2595	-0.0606	0.1934	-0.0606
80.83	8.99	0.3229	-0.0547	0.2595	-0.0606	0.1934	-0.0606
81.83	9.05	0.3229	-0.0547	0.2595	-0.0606	0.1933	-0.0607
82.83	9.10	0.3229	-0.0547	0.2595	-0.0606	0.1933	-0.0607
83.83	9.16	0.3229	-0.0547	0.2595	-0.0606	0.1932	-0.0608
84.83	9.21	0.3228	-0.0548	0.2595	-0.0606	0.1932	-0.0608
85.83	9.26	0.3228	-0.0548	0.2595	-0.0606	0.1932	-0.0608
86.83	9.32	0.3228	-0.0548	0.2594	-0.0607	0.1931	-0.0609
87.83	9.37	0.3228	-0.0548	0.2594	-0.0607	0.1931	-0.0609
88.83	9.43	0.3227	-0.0549	0.2594	-0.0607	0.1931	-0.0609
89.83	9.48	0.3227	-0.0549	0.2593	-0.0608	0.1931	-0.0609
90.83	9.53	0.3227	-0.0549	0.2593	-0.0608	0.1931	-0.0609
91.83	9.58	0.3227	-0.0549	0.2593	-0.0608	0.1931	-0.0609
92.83	9.64	0.3227	-0.0549	0.2593	-0.0608	0.193	-0.061
93.83	9.69	0.3227	-0.0549	0.2592	-0.0609	0.193	-0.061
94.83	9.74	0.3227	-0.0549	0.2592	-0.0609	0.193	-0.061
95.83	9.79	0.3226	-0.055	0.2592	-0.0609	0.1929	-0.0611
96.83	9.84	0.3226	-0.055	0.2592	-0.0609	0.1929	-0.0611
97.83	9.89	0.3226	-0.055	0.2591	-0.061	0.1929	-0.0611
98.83	9.94	0.3226	-0.055	0.2591	-0.061	0.1929	-0.0611
99.83	9.99	0.3225	-0.0551	0.2591	-0.061	0.1928	-0.0612
100.83	10.04	0.3225	-0.0551	0.2591	-0.061	0.1928	-0.0612
101.83	10.09	0.3225	-0.0551	0.259	-0.0611	0.1928	-0.0612
102.83	10.14	0.3225	-0.0551	0.259	-0.0611	0.1928	-0.0612
103.83	10.19	0.3225	-0.0551	0.259	-0.0611	0.1927	-0.0613
104.83	10.24	0.3225	-0.0551	0.259	-0.0611	0.1927	-0.0613
109.33	10.46	0.3224	-0.0552	0.2589	-0.0612	0.1927	-0.0613
114.33	10.69	0.3224	-0.0552	0.2588	-0.0613	0.1925	-0.0615
119.33	10.92	0.3223	-0.0553	0.2587	-0.0614	0.1924	-0.0616
124.33	11.15	0.3223	-0.0553	0.2587	-0.0614	0.1924	-0.0616
129.33	11.37	0.3222	-0.0554	0.2586	-0.0615	0.1922	-0.0618
134.33	11.59	0.3222	-0.0554	0.2585	-0.0616	0.1921	-0.0619
139.33	11.80	0.3221	-0.0555	0.2584	-0.0617	0.192	-0.062
144.33	12.01	0.322	-0.0556	0.2583	-0.0618	0.1919	-0.0621
149.33	12.22	0.322	-0.0556	0.2583	-0.0618	0.1919	-0.0621
154.33	12.42	0.3219	-0.0557	0.2583	-0.0618	0.1918	-0.0622

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
159.33	12.62	0.3219	-0.0557	0.2582	-0.0619	0.1917	-0.0623
164.33	12.82	0.3218	-0.0558	0.2581	-0.062	0.1916	-0.0624
169.33	13.01	0.3218	-0.0558	0.258	-0.0621	0.1915	-0.0625
174.33	13.20	0.3217	-0.0559	0.258	-0.0621	0.1914	-0.0626
179.33	13.39	0.3217	-0.0559	0.2579	-0.0622	0.1914	-0.0626
184.33	13.58	0.3216	-0.056	0.2579	-0.0622	0.1913	-0.0627
189.33	13.76	0.3216	-0.056	0.2579	-0.0622	0.1912	-0.0628
194.33	13.94	0.3216	-0.056	0.2579	-0.0622	0.1911	-0.0629
199.33	14.12	0.3216	-0.056	0.2578	-0.0623	0.1911	-0.0629
204.33	14.29	0.3216	-0.056	0.2578	-0.0623	0.191	-0.063
209.33	14.47	0.3216	-0.056	0.2577	-0.0624	0.191	-0.063
214.33	14.64	0.3215	-0.0561	0.2577	-0.0624	0.1909	-0.0631
219.33	14.81	0.3215	-0.0561	0.2576	-0.0625	0.1908	-0.0632
224.33	14.98	0.3214	-0.0562	0.2575	-0.0626	0.1908	-0.0632
229.33	15.14	0.3214	-0.0562	0.2575	-0.0626	0.1907	-0.0633
234.33	15.31	0.3214	-0.0562	0.2574	-0.0627	0.1907	-0.0633
239.33	15.47	0.3214	-0.0562	0.2574	-0.0627	0.1906	-0.0634
244.33	15.63	0.3213	-0.0563	0.2573	-0.0628	0.1905	-0.0635
249.33	15.79	0.3213	-0.0563	0.2572	-0.0629	0.1904	-0.0636
254.33	15.95	0.3213	-0.0563	0.2572	-0.0629	0.1904	-0.0636
259.33	16.10	0.3212	-0.0564	0.2572	-0.0629	0.1903	-0.0637
264.33	16.26	0.3212	-0.0564	0.2571	-0.063	0.1903	-0.0637
269.33	16.41	0.3212	-0.0564	0.2571	-0.063	0.1903	-0.0637
274.33	16.56	0.3211	-0.0565	0.2571	-0.063	0.1902	-0.0638
279.33	16.71	0.3211	-0.0565	0.2571	-0.063	0.1901	-0.0639
284.33	16.86	0.3211	-0.0565	0.2571	-0.063	0.1901	-0.0639
289.33	17.01	0.3211	-0.0565	0.257	-0.0631	0.1901	-0.0639
294.33	17.16	0.321	-0.0566	0.257	-0.0631	0.1901	-0.0639
299.33	17.30	0.321	-0.0566	0.257	-0.0631	0.19	-0.064
304.33	17.45	0.321	-0.0566	0.2569	-0.0632	0.19	-0.064
309.33	17.59	0.321	-0.0566	0.2569	-0.0632	0.1899	-0.0641
314.33	17.73	0.3209	-0.0567	0.2568	-0.0633	0.1899	-0.0641
319.33	17.87	0.3209	-0.0567	0.2568	-0.0633	0.1898	-0.0642
324.33	18.01	0.3209	-0.0567	0.2567	-0.0634	0.1897	-0.0643
329.33	18.15	0.3209	-0.0567	0.2567	-0.0634	0.1897	-0.0643
334.33	18.28	0.3209	-0.0567	0.2567	-0.0634	0.1896	-0.0644
339.33	18.42	0.3209	-0.0567	0.2566	-0.0635	0.1896	-0.0644
344.33	18.56	0.3209	-0.0567	0.2566	-0.0635	0.1896	-0.0644

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
349.33	18.69	0.3209	-0.0567	0.2565	-0.0636	0.1895	-0.0645
354.33	18.82	0.3209	-0.0567	0.2565	-0.0636	0.1895	-0.0645
369.33	19.22	0.3209	-0.0567	0.2564	-0.0637	0.1895	-0.0645
384.33	19.60	0.3209	-0.0567	0.2564	-0.0637	0.1894	-0.0646
399.33	19.98	0.3209	-0.0567	0.2563	-0.0638	0.1893	-0.0647
414.33	20.36	0.3208	-0.0568	0.2563	-0.0638	0.1892	-0.0648
429.33	20.72	0.3208	-0.0568	0.2562	-0.0639	0.1891	-0.0649
444.33	21.08	0.3208	-0.0568	0.2561	-0.064	0.1889	-0.0651
459.33	21.43	0.3207	-0.0569	0.256	-0.0641	0.1889	-0.0651
474.33	21.78	0.3206	-0.057	0.2558	-0.0643	0.1888	-0.0652
489.33	22.12	0.3206	-0.057	0.2557	-0.0644	0.1887	-0.0653
504.33	22.46	0.3206	-0.057	0.2556	-0.0645	0.1887	-0.0653
519.33	22.79	0.3206	-0.057	0.2557	-0.0644	0.1886	-0.0654
534.33	23.12	0.3206	-0.057	0.2556	-0.0645	0.1886	-0.0654
549.33	23.44	0.3206	-0.057	0.2556	-0.0645	0.1885	-0.0655
564.33	23.76	0.3205	-0.0571	0.2555	-0.0646	0.1884	-0.0656
579.33	24.07	0.3204	-0.0572	0.2555	-0.0646	0.1884	-0.0656
594.33	24.38	0.3204	-0.0572	0.2554	-0.0647	0.1884	-0.0656
609.33	24.68	0.3204	-0.0572	0.2553	-0.0648	0.1883	-0.0657
624.33	24.99	0.3204	-0.0572	0.2553	-0.0648	0.1883	-0.0657
639.33	25.29	0.3204	-0.0572	0.2552	-0.0649	0.1883	-0.0657
654.33	25.58	0.3204	-0.0572	0.2551	-0.065	0.1882	-0.0658
669.33	25.87	0.3203	-0.0573	0.2551	-0.065	0.1882	-0.0658
684.33	26.16	0.3203	-0.0573	0.2551	-0.065	0.1882	-0.0658
699.33	26.44	0.3202	-0.0574	0.255	-0.0651	0.1881	-0.0659
714.33	26.73	0.3202	-0.0574	0.255	-0.0651	0.1881	-0.0659
744.33	27.28	0.3202	-0.0574	0.2549	-0.0652	0.188	-0.066
774.33	27.83	0.3201	-0.0575	0.2549	-0.0652	0.188	-0.066
804.33	28.36	0.3202	-0.0574	0.2548	-0.0653	0.188	-0.066
834.33	28.88	0.3201	-0.0575	0.2548	-0.0653	0.188	-0.066
864.33	29.40			0.2548	-0.0653	0.188	-0.066
894.33	29.91			0.2548	-0.0653	0.188	-0.066
924.33	30.40			0.2547	-0.0654	0.188	-0.066
954.33	30.89			0.2547	-0.0654	0.1879	-0.0661
984.33	31.37			0.2547	-0.0654	0.1879	-0.0661
1014.33	31.85			0.2546	-0.0655	0.1879	-0.0661
1044.33	32.32			0.2546	-0.0655	0.1879	-0.0661
1074.33	32.78			0.2546	-0.0655	0.1879	-0.0661

Sample S5-S7 @ 15'

Time (minutes)	Square Root of Time (minutes)	Test 7 @ 1000 psf		Test 8 @ 2000 psf		Test 9 @ 4000 psf	
		Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)	Dial Reading (inches)	Deflection (inches)
1104.33	33.23			0.2545	-0.0656	0.1878	-0.0662
1134.33	33.68			0.2545	-0.0656	0.1878	-0.0662
1164.33	34.12			0.2545	-0.0656	0.1877	-0.0663
1194.33	34.56			0.2545	-0.0656	0.1877	-0.0663
1224.33	34.99			0.2545	-0.0656	0.1877	-0.0663
1254.33	35.42			0.2544	-0.0657	0.1877	-0.0663
1284.33	35.84			0.2544	-0.0657	0.1877	-0.0663
1314.33	36.25			0.2543	-0.0658	0.1877	-0.0663
				0.2543	-0.0658	0.1878	-0.0662
				0.2543	-0.0658	0.1876	-0.0664
				0.2542	-0.0659		
				0.2543	-0.0658		
				0.2543	-0.0658		