DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

4390 McMENEMY ROAD
SAINT PAUL, MINNESOTA 55127

FINAL WORK PLAN
DRIP PAD DESIGN AND EXCAVATION

PENTA WOOD PRODUCTS, INC.
8682 STATE ROAD 70
SIREN, WISCONSIN
June 12, 1992
VEWI3180

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Wisconsin.

P.E.
Mark A. Johnson, P.E. Reg. No. E-26781

Date 6-12-92

ADDENDUM

Addendum #1

June 10, 1992
for
Work Plan: Drip Pad Design & Excavation
Penta Wood Products, Inc.

A report entitled "*Work Plan: Drip Pad Design and Excavation, Penta Wood Products, Inc., DAHL, May 14, 1992*" was issued to the WDNR for approval and review. On May 26, 1992, the WDNR addressed a letter to DAHL with comments and questions concerning the contents of the report. This final revision of the report addresses those comments in the order they were discussed in the WDNR letter. A copy of the WDNR letter is included in this Addendum.

1) Clean fill required to replace impacted soils to be excavated from beneath the presently existing drip tracks, will be brought from off site.

2) This comment is no longer applicable since analysis for metals in soils was to be performed on fill material taken from on site. As indicated above, soils will be brought in from off site.

3) The Federal drip pad design standards require provisions for run-on control, however, from discussion with Mr. Regie Chetham, EPA Federal Facility Enforcement [(202) 260-4641] and Mr. John Dombrowski, EPA Facility Enforcement [(202) 260-7834], the design standards do not include provisions for infiltration, and in their professional oppinion, they would not utilize infiltration to reduce run on. After discussion with the Wisconsin Department of Natural Resources and Penta Wood, the run-on prevention culvert designed to pass through the segregation membrane has been eliminated from the drip pad design. Instead, the area along the southern edge of the drip pad will be graded to direct drainage around the drip pad and to the west.

4) Section 4.0, Paragraph 3, Sentences 6 and 7 should read: Upon completion of excavation, the suspected clean soils stockpile will be sampled to confirm the absence of PCP and #2 fuel oil. One composite sample will be collected for every 100 cubic yards of stockpiled soils. Each composite sample will consist of 5 grab samples collected in a pre-determined grid pattern from a depth of 6 inches below the stockpile surface.

5) Section 4.0, Paragraph 7, Sentence 2 should read: Any soils containing detectable concentrations of PCP, or concentrations of volatile organic compounds above the background level of the field instrument, will be considered to be impacted, as per DNR guidelines.

6) Section 4.0, Paragraph 8, Sentence 2 should read: Samples will be collected for laboratory analysis every 10 feet along the basin floor and sidewalls.

7) Section 5.0, Paragraph 7, Sentence 2 should read: Soils will be analyzed for PCP by EPA Method 8250.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Northwest District Headquarters

P.O. Box 309
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Spooner, Wisconsin 54801
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May 26, 1992

File Ref: EPA ID# WID006176945
807050310

Linda R. Schorr - Project Manager
Dahl and Associates, Inc.
4390 McMenemy Road
Saint Paul, Minnesota 55127

Dear Ms. Schorr:

On behalf of the Wisconsin Department of Natural Resources - Northwest District I have had a chance to review the proposed "Work Plan - Drip Pad Design and Excavation" submittal for the pentachlorophenol drip track at Penta Wood Products, Inc. The proposed work plan was received by the Department on May 15, 1992 and was reviewed by district hydrogeologist Jamie Dunn and me.

The Department has a number of questions and comments regarding the submittal which are summarized below:

1). In section 3.1, paragraph 3, Dahl and Associates propose to locate clean fill on the Penta Wood Products property to backfill the drip track excavation. To ensure clean soil, it is proposed to collect 1 composite soil sample for every 100 by 100 foot area soil is removed. The one composite sample shall be made up from 10 soil core samples.
The Department feels the number of 100 by 100 foot areas that are "clean" at the Penta Wood Products site will be fairly limited. We recommend that at least two composite samples be collected for each 10,000 sq. ft. area. If the area is clean, then the compositing of samples shall be conducted for every 2.5 feet in depth that soil is removed. The submittal makes no mention on how the 10 soil core sample locations will be determined. Will they be determined on a random basis before excavation, or by a grid pattern?

2). Section 3.1, paragraph 3, final sentence states that excavation will commence upon laboratory confirmation that the metals concentrations are above background. We assume that you meant to mean at or below background concentrations for metals.

3). Dahl and Associates has designed a surface water drainage system to assist the drainage of the soils to the south of the drip track. The Department wonders why such a drainage plan is proposed considering the surface soils have high infiltration rates and puddling/ponding of precipitation is rare. We are also concerned about the plan to route the surface water drain through the excavation, and conceivably through the contaminated soil barrier membrane that may have to be installed. The Department understands the need to penetrate the barrier membrane with the roof structure support columns, but the surface drainage system is an added option that does not need to penetrate the membrane. Wisconsin Department of Natural Resources suggests eliminating the idea of the drainage system, or if absolutely needed, the drainage system shall be installed in a manner that does not impact the proposed drip track pad design.

4). In the discussion on excavated soils (section 4.0, paragraph 3) the plan is vague on sampling of the suspected clean soil stockpiles. It mentions that the samples will be collected at least 6 inches below the stockpile surface, but has no mention of sampling frequency or technique. We feel that one composite sample per 100 cubic yards of suspected clean soil is representative. The composite sample should be derived from 5 grab samples taken within the 100 cubic yards. The grab samples should be taken from a pre-determined grid pattern from within the stockpiles.

5). In section 4.0, paragraph 7, Dahl and Associates suggests that "any soils containing detectable concentrations of volatile compounds or PCP above background levels will be considered to be impacted". Since pentachlorophenol is not a naturally occurring compound, the Department considers any detect of pentachlorophenol in the soil to mean the soils are impacted and must be handled properly as a listed hazardous waste.

6). In the discussion on sampling at the extent of excavation (section 4.0, paragraph 8) the sampling frequency is suggested as once every 20 feet on the sides and at the bottom of excavation. As the native soils at Penta Wood Products are so permeable and no known contamination plumes are identified in previous investigations of the drip track area, the Department requests that one sample every 10 feet be collected at the extent of excavation.

7). Final comment relates to section 5.0, paragraph 7, where EPA Method 8040 is suggested as the appropriate sampling analysis technique for the soil samples. The Department requests that all soil samples collected for laboratory analysis be analyzed for pentachlorophenol using EPA Method 8250.

If you would like to discuss the comments or suggested changes as outlined above you can contact me at 715/635-4065. If the changes suggested above are approvable by Dahl and Associates and Penta Wood Products, Inc., please add the amendments to the proposed plan and send an additional 3 copies of this report to the Wisconsin Department of Natural Resources at the address at the top of this correspondence.

Sincerely,

Dave Kafura

Dave Kafura
Hazardous Waste Specialist
Solid Waste Program

cc: Jamie Dunn - Spooner
Hazardous Waste Section - SW/3
Mick Michaelsen - Spooner
Pete Flaherty - LC/5
Lorriane Stoltzfus - DOJ
Vern Lundequam - PWP

CONTENTS

SECTIONS

APPENDICES

1.0 INTRODUCTION

Dahl & Associates, Inc. (DAHL) was retained by Mr. Vern Lundequam, Penta Wood Products, Inc. (PWP), to provide the design, specifications and certification of a wood treatment drip pad, in accordance with Environmental Protection Agency (EPA) Regulation 40 CFR Part 264, Subpart W, as required by the Wisconsin Department of Natural Resources (WDNR). The implementation of this design is required to bring the PWP wood treatment facility into compliance with the EPA regulations for drip pads. In addition, this document provides a work plan for the excavation, and sampling of impacted soils beneath the presently-existing drip tracks at the PWP site, as required by the WDNR.

2.0 BACKGROUND

The PWP wood treating facility is located at 8682 State Road 70, Siren, Wisconsin. Since the mid-1950's, the PWP facility has pressure treated wooden posts and poles with a wood preservative solution containing pentachlorophenol (PCP) and #2 fuel oil. After the wood is treated in a pressure cylinder, the treated wood is rolled onto drip tracks prior to storage. Originally, treated wood was allowed to drip directly onto the ground surface. Presently, plastic liners are in place between the tracks to collect residual wood treating fluid.

The wood-treating solution used at the PWP facility has, throughout the site's history, contained PCP. Since 1975, Chemonite, a water-soluble arsenate and copper II oxide salt solution, has also been used at a separate treatment cylinder. Material Safety Data Sheets (MSDS) for PCP are provided in Appendix A.

Previous environmental investigations on the site have been conducted by Conestoga-Rovers Associates, Inc. (CRA). Documentation of these investigations can be found in the following reports:

1) Scope of Work, Penta Wood Products, Inc., Siren, Wisconsin, CRA, August 1987.

2) Site Evaluation, Penta Wood Products, Inc., Siren, Wisconsin, CRA, July 1988.

3) Site Evaluation - Phase II Penta Wood Products, Inc., Siren, Wisconsin, CRA, October 1989.

4) Remedial Investigation and Corrective Action Plan, Penta Wood Products, Inc., Siren, Wisconsin, CRA, March 10, 1992.

These investigations identified previous releases of PCP-containing wood treating solution, potential PCP source areas on site, and actual PCP soil and ground-water

impact. CRA proposed corrective action design options; these designs have not been implemented as of the time of this work plan.

EPA regulations required that new wood treating drip pads be in place at wood treating facilities by May 6, 1992. In response to the passage of that date without the certification of a new drip pad on site, the State of Wisconsin, Burnett County Circuit Court issued an interim stipulation and preliminary injunction against PWP, stating among other stipulations, that a work plan must be prepared and submitted to the WDNR for approval and that certification of the drip pad must be made within 60 days of the approval date or the date when the WDNR has been notified that all required permits have been obtained. This work plan has been prepared to address the state-issued stipulations to carry out the design, specifications, certification of installation as per 40 CFR Part 264 Subpart W, and the excavation of PCP-impacted soils directly under and adjacent to the area where the new drip pad is to be installed.

A copy of the final Interim Stipulation and Preliminary Injunction, Case No. 91-CV-79 is included in Appendix A. PWP will execute of this design and work plan within 10 days of WDNR approval or within 10 days after informing the WDNR in writing that all necessary local permits have been obtain, or have determined that none are required. PWP will complete the installation of the drip pad within 60 days after informing the WDNR in writing that all necessary local permits have been obtain, or have determined that none are required.

3.0 DESIGN AND SPECIFICATIONS OF DRIP PAD

The following drip pad design and specifications proposed by DAHL have been based on 40 CFR Part 264 Subpart W. Details of the drip pad design and material specifications, including design drawings, are submitted in Appendix B. Engineering calculations used in the drip pad design are provided in Appendix C. Manufacturer's literature is provide for some components in Appendix D.

All ordering of construction materials, permitting, equipment, surveying and labor required for the excavation, backfilling, manufacture and installation of the drip pad design will be provided by PWP.

3.1 Drip Pad Design and Installation

The present drip tracks leading from the treatment cylinder will be removed. Excavation of impacted soils beneath this area will follow the excavation work plan outlined in Section 4.0 of this document. As required, additional excavation beneath

the area of the proposed drip pad will be conducted for the installation of a secondary containment and leak detection liner which will underlay the entire drip pad area. Excavation, required for grading and impacted soil removal, will follow the work plan outlined in Section 4.0 of this document. The area will be excavated and sloped prior to liner installation at a grade of 1.0 percent.

If backfilling is required following the excavation of impacted soils to bring the excavated area up to the specified elevation for installation of the secondary containment liner, a separation membrane will be installed, if required, and the excavation will be backfilled as specified in Section 4.0.

Clean fill will be used for any backfilling related to this design and work plan. If clean fill is taken from any developed area of the PWP property, the fill material must be shown to contain non-detectable concentrations of any of the potential hazardous materials used on site. To ensure the cleanliness of the soils, one composite soil sample will be collected of every 100 by 100 foot area from which fill is to be taken and analyzed for PCP, diesel range organics (DRO), arsenic, copper and zinc. Each composite sample will consist of 10 soil cores collected at a depth of 0.5 to 1.5 feet below the ground surface within the 100 by 100 foot area. Soil cores will be field-screened for the presence of volatile organic compounds using a flame ionization detector (FID). If no volatile organic compounds are detected by field-screening, individual core samples will be combined and mixed in the field and a representative sample of the composite will be submitted to an analytical laboratory. Upon receiving confirmation from the laboratory that the parameters tested for are non-detectable for PCP and DRO, or above background concentrations for metals, excavation of the clean fill material will commence.

The secondary containment liner will consist of Permalon X-210, or equivalent synthetic, multi-layered, alloyed high-density polyethylene membrane (see Appendix B for specifications and Appendix D for manufacturer's literature). The secondary containment liner will underlay the entire primary collection system. The surface on which the liner will rest will not contain any sharp rocks, rocks larger than 1/4-inch diameter, roots or other protrusions. Liner sections will be field-connected and sealed using manufacturer-supplied "fab tape" and pressure-sensitive tape.

The secondary containment system will be sloped along its length to provide gravity drainage toward a common monitoring point. The cross-section of the floor of the secondary containment will be sloped toward its center line. A typical cross-section of the drip pad is illustrated in Figures 7 through 9.

A 4-inch diameter PVC slotted drain will run along the center of the floor of the secondary containment and will connect to a monitoring and collection point at the downgradient extent of the secondary containment system. The PVC drain will be wrapped in geotextile material to impede the accumulation of silt in the pipe. The drain will rest on top of a 2-inch medium sand cushion. Backfill around the drain

will be 1/4-inch pea rock. Pea rock will then be covered with geotextile material. The remainder of the liner will be backfilled and adequately compacted with medium sand in 6-inch lifts. Untreated oak ties will be placed over the secondary containment area and drip pad collection pans installed.

Drip pad collection pans will be constructed of 1/4 inch thick, low-carbon, mild steel plate. The steel plate will be cold formed along the length of the pan to provide a curb/berm, continuous with the structure of the pan, for the containment of liquids. Individual sections of the drip pan will be welded together in the field. Field welds will be fully-penetrating to provide an impermeable and continuous collection pan.

Upon completion of the construction of the drip pan, drip pad rails will be welded to the collection pans. Drip pad rails will be welded to the drip pad using 1/4-inch by 1-inch long fillet welds, every 12 inches on centers, on both sides of each rail. Welds on opposite sides of rail will be staggered. Care shall be taken during welding of the rails to the pad to prevent excessive heat expansion.

The drip pad will be sloped, following the alignment of the secondary containment system, at a grade of 0.50 percent, to free-drain drippage, rain or other liquids to the existing sump. The graded areas will be surveyed to maintain design-specified slopes.

The drip pad has been designed to accommodate a roof structure for protection from precipitation (see Figures 4 and 5). The structure will be designed by an architect and installed prior to certification of the drip pad by a Professional Engineer. DAHL has provided a list of design specifications to the architect which are required by the Federal Regulations. Based on a roof height of 18 feet, the roof structure must extend 17.8 inches beyond the edges of the collection pan, providing complete protection from rainfall events between vertical and 4 degrees, 40 minutes from vertical.

Based upon a telephone conversation with the National Weather Service, Technical Paper 40 specifies the 24-hour, 25-year rain fall event as 4.5 inches and the one hour, 25-year rain fall event as 2.2 inches. The drainage area around the drip pad will be graded to divert run-off generated by these 25-year storm events away from the drip pad (see Figure 10). Drainage from the low area south of the drip pad will be routed under the drip pad through a 12-inch diameter corrugated metal pipe, installed at a grade of 0.5 percent (see Figure 8).

3.2 Installation Inspection and Certification

Inspection of excavation, backfilling and construction related to the installation of the drip pad will be performed by DAHL construction services personnel, under the direct supervision of a DAHL Wisconsin-registered Professional Engineer (P.E.). Final inspection of the drip pad will be performed by, or under the direct supervision

of, a DAHL Wisconsin-registered Professional Engineer. Throughout construction of the drip pad, the inspector will prepare a list of discrepancies which must be corrected prior to certification. Upon completion of all work, including correction of discrepancies, the drip pans and rails may be installed. Final inspection and certification for design and acceptability for use will be made upon completion of rail installation.

3.3 Operation and Maintenance of Drip Pad

The drip pad described above has been designed to collect, drain and convey liquid resulting from the holding of treated wood prior to storage and transport. It will be the responsibility of PWP to operate, maintain and repair the drip pad as necessary to prevent releases of wood treating fluids. Proper operation of the drip pad is to include the maintenance of records of drip pad cleaning and repair, periodic inspections by a Wisconsin-registered Professional Engineer, as required by Federal regulation and any required permits. The drip pad must be operated so that no overfills from the pad occur, and the drip pad secondary containment features must be monitored. It is the responsibility of PWP to obtain and update any permits required by Federal, State or local regulating agencies for the operation of the drip pad and to report and correct any conditions which may have caused a release, according to Federal, State or local regulations. This work plan does not address the closure of the drip pad or other wood-treating operations on site.

4.0 EXCAVATION OF IMPACTED SOILS

The excavation proposed in this work plan addresses only those soils located beneath the present drip track area, including the main track and the spur. DAHL understands that PWP has access to excavation equipment and can provide these construction services. DAHL will provide coordination, consulting and environmental services related to the excavation, segregation and confirmatory sampling of the excavation basin for PCP-impacted soils associated with the existing drip tracks. Excavation of PCP-impacted soils will take place following the removal of the present drip tracks, and prior to the installation of the proposed drip pad.

DAHL assumes that, PWP, as the General Contractor, has and will adhere to a site health and safety plan. A DAHL safety officer will prepare a health and safety plan for DAHL site personnel, pertaining specifically to the site and hazardous materials expected to be encountered during site work, as required by State and Federal laws. The DAHL safety officer will provide training for all on-site DAHL personnel involved with the excavation, either prior to mobilization to the site, or on-site, prior to any on-site activities. DAHL's safety officer is responsible for ensuring that all DAHL personnel comply with the DAHL health and safety plan, or the PWP health and safety plan if it is the more stringent of the two.

DAHL will supervise the establishment of designated work areas to minimize additional impact to areas beyond with drip track and to aid in the proper segregation of soils. An area will be designated for the stockpiling of "clean" soils, as determined through field screening (field-screening methods are described in Section 5.0). An existing concrete pad located on site will be used for the stockpiling of "clean" soils. The pad will be covered with Permalon X-150 or equivalent synthetic, multi-layered, alloyed high-density polyethylene membrane (see Appendix B for specifications and Appendix D for manufacturer's literature) prior to stockpiling. Stockpiled soils will also be covered with Permalon X-150 membrane, or equivalent, and securely anchored or weighted at the end of each working day. Upon completion of excavation, samples will be collected for laboratory analysis of PCP and DRO. Samples will be grab samples, collected from soil at least 6 inches below the surface of the stockpile. Samples will be handled according to the sampling methodology presented in Section 5.0. If laboratory analysis indicates that neither parameter is detectable above minimum method detection limits, the soils will be considered to be non-hazardous and can be used as clean fill anywhere on site.

A loading area will be established for temporary stockpiling and loading of impacted soil. The approximate location and dimensions of the loading area are shown on Figure 2. This area will be graded and covered with Permalon X-150 or equivalent synthetic, multi-layered, alloyed high-density polyethylene membrane. A 6-inch layer of sand will be laid over the polyethylene membrane to protect the work area. Impacted soils will be properly containerized for storage or transportation. Upon completion of excavation, the sand layer and the polyethylene membrane from the loading area will be containerized as per excavated impacted soils.

A work area for sample analysis will be established, where all samples will be taken immediately for preparation, field analysis and packing. This area will be isolated and up-wind from the drip pad work area in order to minimize contamination of samples during sample preparation and analysis.

Excavated soils will be segregated by a DAHL geologist/environmental scientist in the field using a flame ionization detector (FID). Samples will be collected for field analysis by FID every 10 cubic yards until the extent of excavation required for the installation of the secondary containment has been achieved. If volatile organic compounds are detectable in soils at that depth, excavation will continue until either the practical extent of the excavation equipment is reached at 12 feet below grade, or until volatile organic compounds are not detectable. At the depth at which volatile organic compounds are not detectable, field screening will continue by use of a PCP-specific immuno-assay (refer to Section 5.0 and Appendix D for methodologies of PCP field-screening). PCP samples will be collected every 20 feet along the bottom of the trench. At sample locations where no PCP is detected by field-screening, excavation will not continue. At sample locations where PCP is detected by field-screening, excavation will extend the depth of the basin by two feet. At that depth,

PCP field-screening samples will be collected again. This process will continue until either no PCP is detected by field-screening or a depth of 12 feet is reached.

Methodologies for field-screening of soils are presented in Section 5.0. Any soils containing detectable concentrations of volatile compounds or PCP above background levels will be considered to be impacted, as per DNR guidelines. Soils which do not contain detectable concentrations of volatile compounds or PCP will be segregated as "clean" and stockpiled as described above.

When the extent of the excavation has been reached, samples of the excavation floor and sidewalls will be collected for laboratory analysis of DRO and PCP to confirm parameter levels. Samples will be collected for laboratory analysis every 20 feet along the basin floor and sidewalls. If backfilling is to begin prior to receiving the results of laboratory analyses, or if volatile organic compounds or PCP were detectable at the final extent of excavation, a segregation membrane will be installed to minimize migration of contamination to backfilled soil, and backfilling and installation of the secondary containment and leakage detection system and drip pad will proceed. If confirmatory laboratory samples are received prior to backfilling, and parameters tested for where shown to be non-detectable, backfilling will proceed without the installation of the segregation membrane.

Soils will be excavated adjacent to the existing drip tracks to a distance of two feet beyond the edge of the drip tracks, or to the extent required to maintain a 1:1 slope, as per Occupational Safety and Health Administration (OSHA) Regulations 29 CFR 1926.652, Table P-1, which ever is less (see Figures 2 and 3). Soil along the existing building and sump will be excavated to maintain a 1:1 slope, required to prevent structural damage to the existing structures.

Confirmatory laboratory samples of the excavation floor and sidewalls will be collected at each end of the excavation and every 20 feet along the length the basin. Samples will be grab samples collected from at least 6 inches below the excavation surface.

If a segregation membrane is required to be installed to prevent back-contamination from impacted soils left in place at the extent of the excavation, or if PWP wishes to proceed with backfilling prior to receiving results of confirmatory laboratory samples, the membrane will consist of Permalon X-150 or equivalent synthetic, multi-layered, alloyed high-density polyethylene membrane (see Appendix B for specifications and Appendix D for manufacturer's literature). The surface on which the membrane will rest will not contain any sharp rocks, rocks larger than 1/4-inch diameter, roots or other protrusions. Membrane sections will be field-connected and sealed using manufacturer-supplied "fab tape" and pressure-sensitive tape. Backfilling between the bottom membrane and the secondary containment liner will be compacted in 6-inch lifts to approximately a 95% modified proctor density. Installation of the

membrane and backfilling will be observed and inspected by a DAHL Professional Engineer or under his direct supervision.

5.0 METHODOLOGIES

Soil samples will be field-screened for the presence of volatile organic compounds (VOCs) using a Foxboro Model 128GC flame-ionization detector (FID) by a DAHL geologist/environmental scientist, according to the WDNR guidance document entitled "Attachment 2, Field Instrument Techniques".

The calibration of the FID will be checked each day prior to use, and at least once per day, according to the manufacturer's instructions, using methane. Soil jars will be filled 1/2 to 3/4 full, sealed using heavy-gauge aluminum foil or Teflon-sealed lids. Samples will agitated at least 3 seconds. Samples will be allowed to equilibrate away from direct sunlight. Analysis will be conducted and the results will be recorded, along with relevant ambient and instrument conditions, soil characteristics, including relative soil moisture content, noticeable odor or instrument "quenching".

Samples collected for the field-screening of PCP by a DAHL geologist/environmental scientist will be analyzed utilizing an Ensys, Inc. Penta Risc-Test PCP-specific immuno-assay. Manufacturer-provided literature concerning this test is included in Appendix D. Samples will be collected and analyzed according to manufacturer's instructions. Analysis will be conducted and the results will be recorded, along with relevant ambient and instrument conditions and soil characteristics.

Soils samples selected for submission to an analytical laboratory will not be soils used for field screening, and will be split samples collected from the same sampling point as the corresponding field screening sample. Samples will be collected in glass containers provided by the Wisconsin-certified laboratory. Containers will have Teflon or equivalent lined caps, and will be filled so that no headspace remains.

Samples will be sealed and labeled immediately following collection. Samples will be chilled during transport. Chain-of-Custody reports will be completed by those persons responsible for the samples. Samples will be analyzed within the maximum holding time. Temperature blanks will be included in each transport cooler.

One field blank will be submitted for laboratory analysis for every 10 samples submitted.

Soil samples will be analyzed for the presence of #2 fuel oil as Diesel Range Organics (DRO), according to WDNR 1992 guidelines. Soil samples will be analyzed for PCP by EPA Method 8040. One duplicate sample for PCP will be analyzed for every 10 samples submitted per WDNR quality control guidelines.

6.0 QUALITY ASSURANCE/QUALITY CONTROL

6.1 Project Management

Responsibility for each project rests with the project manager who receives technical support from field personnel as well as staff engineers and scientists. All data collected by field technicians or project geologist will be reviewed for accuracy by the project manager and the project director. Figures will be checked at least three times, both manually and with a computer and entered into a data base.

All report drafts will be reviewed by a project director before the final draft is prepared for client review and comment. Reports will be sent to regulatory agencies only after the client has approved the final editions and all text, tables, graphs, maps, and diagrams have been meticulously proof-read and the client requests that the reports be sent.

6.2 Personal Protection and Safety

In accordance with the Employee Right-To-Know Act, Dahl & Associates, Inc. ensures that its employees are made aware of the dangers associated with hazardous substances and harmful physical agents that they may be exposed to in the workplace. This involves an evaluation of the workplace (or sites where DAHL employees may be assigned), written information and employee training provided on the substances and agents to which employees may be exposed, and proper personal protective equipment to eliminate the risk of exposure in the work place.

A 40 hour training course in accordance with the guidelines set forth in OSHA CFR 1910.120 is provided for all DAHL employees exposed to uncontrolled hazards in the work place. This includes all field work associated with environmental investigations and remedial activities at sites, persons conducting facility inspections and performing sampling and analyses.

The design and specifications contained in this work plan represent DAHL's professional opinions and are based on accepted practices and documented industry standards. Services to be performed on this project will be conducted in a manner consistent with standards of care practiced by members of this profession in this area, under similar time and budget restraints. Beyond this, no warranty is expressed or implied.

This report is submitted by:

DAHL & ASSOCIATES, INC.

Linda R. Schorr — 6/12/92

Linda R. Schorr
Project Manager
Hydrogeologist — Date

Rodney M. Jasmer — 6/12/92

Rodney M. Jasmer
Director - Environmental Services
Hydrogeologist — Date

P.E. — 6/12/92

Mark A. Johnson, P.E.
Senior Engineer — Date

APPENDIX A

BACKGROUND INFORMATION

40 CFR Part 264 Subpart W
Draft Interim Stipulation and Preliminary Injunction
Material Safety Data Sheets

(3) For the period immediately following completion of the trial burn, and only for the minimum period sufficient to allow sample analysis, data computation, and submission of the trial burn results by the applicant, and review of the trial burn results and modification of the facility permit by the Regional Administrator, the operating requirements must be those most likely to ensure compliance with the performance standards of § 264.343, based on the Regional Administrator's engineering judgement.

(4) For the remaining duration of the permit, the operating requirements must be those demonstrated, in a trial burn or by alternative data specified in § 270.19(c) of this Chapter, is sufficient to ensure compliance with the performance standards of § 264.343.

[Approved by the Office of Management and Budget under control number 2050-0002]

§ 264.346 Operating requirements.

(a) An incinerator must be operated in accordance with operating requirements specified in the permit. These will be specified on a case-by-case basis as those demonstrated (in a trial burn or in alternative data as specified in § 264.344(b) and included with Part B of a facility's permit application) to be sufficient to comply with the performance standards of § 264.343.

(b) Each set of operating requirements will specify the composition of the waste feed (including acceptable variations in the physical or chemical properties of the waste feed which will not affect compliance with the performance requirement of § 264.343) to which the operating requirements apply. For each such waste feed, the permit will specify acceptable operating limits including the following conditions:

(1) Carbon monoxide (CO) level in the stack exhaust gas;

(2) Waste feed rate;

(3) Combustion temperature;

(4) An appropriate indicator of combustion gas velocity;

(5) Allowable variations in incinerator system design or operating procedures; and

(6) Such other operating requirements as are necessary to ensure that the performance standards of § 264.343 are met.

(c) During start-up and shut-down of an incinerator, hazardous waste (except wastes exempted in accordance with § 264.340) must not be fed into the incinerator unless the incinerator is operating within the conditions of operation (temperature, air feed rate, etc.) specified in the permit.

(d) Fugitive emissions from the combustion zone must be controlled by:

(1) Keeping the combustion zone totally sealed against fugitive emissions; or

(2) Maintaining a combustion zone pressure lower than atmospheric pressure; or

(3) An alternate means of control demonstrated (with Part B of the permit application) to provide fugitive emissions control equivalent to maintenance of combustion zone pressure lower than atmospheric pressure.

(e) An incinerator must be operated with a functioning system to automatically cut off waste feed to the incinerator when operating conditions deviate from limits established under paragraph (a) of this Section.

(f) An incinerator must cease operation when changes in waste feed, incinerator design, or operating conditions exceed limits designated in its permit.

[Approved by the Office of Management and Budget under control number 2050-0002]

§ 264.346 [Reserved]

§ 264.347 Monitoring and inspections.

(a) The owner or operator must conduct, as a minimum, the following monitoring while incinerating hazardous waste:

(1) Combustion temperature, waste feed rate, and the indicator of combustion gas velocity specified in the facility permit must be monitored on a continuous basis.

(2) CO must be monitored on a continuous basis at a point in the incinerator downstream of the combustion zone and prior to release to the atmosphere.

(3) Upon request by the Regional Administrator, sampling and analysis of the waste and exhaust emissions must be conducted to verify that the operating requirements established in the permit achieve the performance standards of § 264.343.

(b) The incinerator and associated equipment (pumps, valves, conveyors, pipes, etc.) must be subjected to thorough visual inspection, at least daily, for leaks, spills, fugitive emissions, and signs of tampering.

(c) The emergency waste feed cutoff system and associated alarms must be tested at least weekly to verify operability, unless the applicant demonstrates to the Regional Administrator that weekly inspections will unduly restrict or upset operations and that less frequent inspection will be adequate. At a minimum, operational testing must be conducted at least monthly.

(d) This monitoring and inspection data must be recorded and the records must be placed in the operating log required by § 264.73.

[Approved by the Office of Management and Budget under control number 2050-0002]

§§ 264.348—264.350 [Reserved]

§ 264.351 Closure.

At closure the owner or operator must remove all hazardous waste and hazardous waste residues (including, but not limited to, ash, scrubber waters, and scrubber sludges) from the incinerator site.

[*Comment:* At closure, as throughout the operating period, unless the owner or operator can demonstrate, in accordance with § 261.3(d) of this chapter, that the residue removed from the incinerator is not a hazardous waste, the owner or operator becomes a generator of hazardous waste and must manage it in accordance with applicable requirements of Parts 262-266 of this chapter.]

§§264.352—264.569 [Reserved]

Subpart W—Drip Pads

[Subpart W added by 55 FR 50484, December 6, 1990; revised by 56 FR 30195, July 1, 1991]

264.570 Applicability.

(a) The requirements of this subpart apply to owners and operators of facilities that use new or existing drip pads to convey treated wood drippage, precipitation, and/or surface water run-on to an associated collection system. Existing drip pads are those constructed before December 6, 1990 and those for which the owner or operator has a design and has entered into binding financial or other agreements for construction prior to December 6, 1990. All other drip pads are new drip pads.

(b) The owner or operator of any drip pad that is inside or under a structure that

[Sec. 264.570(b)]

provides protection from precipitation so that neither run-off nor run-on is generated not subject to regulation under §264.573(a) or §264.573(f), as appropriate.

§264.571 Assessment of existing drip pad integrity.

(a) For each existing drip pad as defined in §264.570 of this subpart, the owner or operator must evaluate the drip pad and determine that it meets all of the requirements of this subpart, except the requirements for liners and leak detection systems of §264.573(b). No later than the effective date of this rule, the owner or operator must obtain and keep on file at the facility a written assessment of the drip pad, reviewed and certified by an independent, qualified registered professional engineer that attests to the results of the evaluation. The assessment must be reviewed, updated and re-certified annually until all upgrades, repairs, or modifications necessary to achieve compliance with all of the standards of §264.573 of this subpart are complete. The evaluation must document the extent to which the drip pad meets each of the design and operating standards of §264.573 of this subpart, except the standards for liners and leak detection systems, specified in §264.573(b) of this subpart, and must document the age of the drip pad to the extent possible, to document compliance with paragraph (b) of this section.

(b) The owner or operator must develop a written plan for upgrading, repairing, and modifying the drip pad to meet the requirements of §264.573(b) of this subpart, and submit the plan to the Regional Administrator no later than 2 years before the date that all repairs, upgrades, and modifications will be complete. This written plan must describe all changes to be made to the drip pad insufficient detail to document compliance with all the requirements of §263.573 of this subpart and must document the age of the drip pad to the extent possible. The plan must be reviewed and certified by an independent qualified registered professional engineer. All upgrades, repairs, and modifications must be completed in accordance with the following:

(1) For existing drip pads of known and documentable age, all upgrades, repairs, and modifications must be completed within two years of the effective date of this rule, or when the drip has reached 10 years of age, whichever comes later.

(2) For existing drip pads for which the age cannot be documented, within 8 years of the effective date of this rule, but if the age of the facility is greater than 7 years, all upgrades, repairs and modifications must be completed by the time the facility reaches 15 years of age or by two years after the effective date of this rule, whichever comes later.

(3) If the owner or operator believes that the drip pad will continue to meet all of the requirements of §264.573 of this subpart after the date upon which all upgrades, repairs and modifications must be completed as established under paragraphs (b)(1) and (2) of this section, the owner or operator may petition the Regional Administrator for an extension of the deadline specified in paragraph (b)(1) or (2) of this section. The Regional Administrator will grant the petition for extension based on a finding that the drip pad meets all of the requirements of §264.573, except that those for liners and lead detection systems specified in §264.573(b), and that it will continue to be protective of human health and the environment.

(c) Upon completion of all upgrades, repairs, and modifications, the owner or operator must submit to the Regional Administrator or State Director, the as-built drawings for the drip pad together with a certification by an independent qualified registered professional engineer attesting that the drip pad conforms to the drawings.

(d) If the drip pad is found to be leaking or unfit for use, the owner or operator must comply with the provisions of §264.573(m) of this subpart or close the drip pad in accordance with §264.575 of this subpart.

§264.572 Design and installation of new drip pads.

Owners and operators of drip pads must ensure that the pads are designed, installed, and operated in accordance with all of the applicable requirements of §§264.573, 264.574 and 264.575 of this subpart.

§264.573 Design and operating requirements.

(a) Drip pads must: (1) Be constructed of non-earthen materials, excluding wood and non-structurally supported asphalt;

(2) Be sloped to free-drain treated wood drippage, rain and other waters, or solutions of drippage and water or other wastes to the associated collection system;

(3) Have a curb or berm around the perimeter;

(4) Be impermeable, e.g., concrete pads must be sealed, coated, or covered with an impermeable material such that the entire surface where drippage occurs or may run across is capable of containing such drippage and mixtures of drippage and precipitation, materials, or other wastes while being routed to an associated collection system; and

(5) Be of sufficient structural strength and thickness to prevent failure due to physical contact, climatic conditions, the stress of daily operations, e.g., variable and moving loads such as vehicle traffic, movement of wood, etc.

Note: EPA will generally consider applicable standards established by professional organizations generally recognized by the industry such as the American Concrete Institute (ACI) or the American Society of Testing Materials (ASTM) in judging the structural integrity requirement of this paragraph.

(b) A new drip pad or an existing drip pad, after the deadline established in §264.571(b) of this subpart, must have:

(1) A synthetic liner installed below the drip pad that is designed, constructed, and installed to prevent leakage from the drip pad into the adjacent subsurface soil or groundwater or surface water at any time during the active life (including the closure period) of the drip pad. The liner must be constructed of materials that will prevent waste from being absorbed into the liner and to prevent releases into the adjacent subsurface soil or groundwater or surface water during the active life of the facility. The liner must be:

(i) Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the waste or drip pad leakage to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation (including stresses from vehicular

[Sec. 264.573(b)(1)(i)]

traffic on the drip pad);

(ii) Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression or uplift; and

(iii) Installated to cover all surrounding earth that could come in contact with the waste or leakage; and

(2) A leakage detection system immediately above the liner that is designed, constructed, maintained and operated to detect leakage from the drip pad. The leakage detection system must be:

(i) Constructed of materials that are:

(A) Chemically resistant to the waste managed in the drip pad and the leakage that might be generated; and

(B) Of sufficient strength and thickness to prevent collapse under the pressures exerted by overlaying materials and by any equipment used at the drip pad;

(ii) Designed and operated to function without clogging through the scheduled closure of the drip pad; and

(iii) Designed so that it will detect the failure of the drip pad or the presence of a release of hazardous waste or accumulated liquid at the earliest practicable time.

(c) Drip pads must be maintained such that they remain free of cracks, gaps, corrosion, or other deterioration that could cause hazardous waste to be released from the drip pad.

Note: Sec. §264.573(m) for remedial action required if deterioration or leakage is detected.

(d) The drip pad and associated collection system must be designed and operated to convey, drain, and collect liquid resulting from drippage or precipitation in order to prevent run-off.

(e) Unless protected by a structure, as described in §264.570(b) of this subpart, the owner or operator must design, construct, operate and maintain a run-on control system capable of preventing flow onto the drip pad during peak discharge from at least a 24-hour, 25-year storm, unless the system has sufficient excess capacity to contain any run-off that might enter the system.

(f) Unless protected by a structure or cover as described in §264.570(b) of this subpart, the owner or operator must design, construct, operate and maintain a run-off management system to collect and control at least the water volume resulting from a 24-hour, 25-year storm.

(g) The drip pad must be evaluated to determine that it meets the requirements of paragraphs (a) through (f) of this section and the owner or operator must obtain a statement from an independent, qualified registered professional engineer certifying that the drip pad design meets the requirements of this section.

(h) Drippage and accumulated precipitation must be removed from the associated collection system as necessary to prevent overflow onto the drip pad.

(i) The drip pad surface must be cleaned thoroughly at least once every seven days such that accumulated residues of hazardous waste or other materials are removed, using an appropriate and effective cleaning technique, including but not limited to, rinsing, washing with detergents or other appropriate solvents, or steam cleaning. The owner or operator must document the date and time of each cleaning and the cleaning procedure used in the facility's operating log.

(j) Drip pads must be operated and maintained in a manner to minimize tracking of hazardous waste or hazardous waste constituents off the drip pad as a result of activities by personnel or equipment.

(k) After being removed from the treatment vessel, treated wood from pressure and non-pressure processes must be held on the drip pad until drippage has ceased. The owner or operator must maintain records sufficient to document that all treated wood is held on the pad following treatment in accordance with this requirement.

(l) Collection and holding units associated with run-on and run-off control systems must be emptied or otherwise managed as soon as possible after storms to maintain design capacity of the system.

(m) Throughout the active life of the drip pad and as specified in the permit, if the owner or operator detects a condition that may have caused or has caused a release of hazardous waste, the condition must be repaired within a reasonably prompt period of time following discovery, in accordance with the following procedures:

(1) Upon detection of a condition that may have caused or has caused a release of hazardous waste (e.g., upon detection of leakage in the leak detection system), the owner or operator must:

(i) Enter a record of the discovery in the facility operating log;

(ii) Immediately remove the portion of the drip pad affected by the condition from service;

(iii) Determine what steps must be taken to repair the drip pad and clean up any leakage from below the drip pad, and establish a schedule for accomplishing the repairs;

(iv) Within 24 hours after discovery of the condition, notify the Regional Administrator of the condition and, within 10 working days, provide written notice to the Regional Administrator with a description of the steps that will be taken to repair the drip pad and clean up any leakage, and the schedule for accomplishing this work.

(2) The Regional Administrator will review the information submitted, make a determination regarding whether the pad must be removed from service completely or partially until repairs and clean up are complete and notify the owner or operator of the determination and the underlying rationale in writing.

(3) Upon completing all repairs and clean up, the owner or operator must notify the Regional Administrator in writing and provide a certification signed by an independent, qualified registered professional engineer, that the repairs and clean up have been completed according to the written plan submitted in accordance with paragraph (m)(1)(iv) of this section.

(n) Should a permit be necessary, the Regional Administrator will specify in the permit all design and operating practices that are necessary to ensure that the requirements of this section are satisfied.

(o) The owner or operator must maintain, as part of the facility operating log, documentation of past operating and waste handling practices. This must include identification of preservative formulations used in the past, a description of drippage management practices, and a description of treated wood storage and handling practices.

§264.574 Inspections.

(a) During construction or installation, liners and cover systems (e.g. membranes, sheets, or coatings) must be inspected for

uniformity, damage and imperfections (e.g., holes, cracks, thin spots, or foreign materials). Immediately after construction or installation, liners must be inspected and certified as meeting the requirements of §264.573 of this subpart by an independent qualified, registered professional engineer. This certification must be maintained at the facility as part of the facility operating record. After installation, liners and covers must be inspected to ensure tight seams and joints and the absence of tears, punctures, or blisters.

(b) While a drip pad is in operation, it must be inspected weekly and after storms to detect evidence of any of the following:

(1) Deterioration, malfunctions or improper operation of run-on and run-off control systems;

(2) The presence of leakage in and proper functioning of leak detection system.

(3) Deterioration or cracking of the drip pad surface.

Note: See §264.573(m) for remedial action required if deterioration or leakage is detected.

§264.575 Closure.

(a) At closure, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components (pad, liners, etc.), contaminated subsoils, and structures and equipment contaminated with waste and leakage, and manage them as hazardous waste.

(b) If, after removing or decontaminating all residues and making all reasonable efforts to effect removal or decontamination of contaminated components, subsoils, structures, and equipment as required in paragraph (a) of this section, the owner or operator finds that not all contaminated subsoils can be practicably removed or decontaminated, he must close the facility and perform post-closure care in accordance with closure and post-closure care requirements that apply to landfills (§264.310). For permitted units, the requirement to have a permit continues throughout the post-closure period. In addition, for the purpose of closure, post-closure, and financial responsibility, such a drip pad is then considered to be landfill, and the owner or operator must meet all of the requirements for landfills specified in subparts G and H of this part.

(c)(1) The owner or operator of an existing drip pad, as defined in §264.570 of this subpart, that does not comply with the liner requirements of §264.573(b)(1) must:

(i) Include in the closure plan for the drip pad under §264.112 both a plan for complying with paragraph (a) of this section and a contingent plan for complying with paragraph (b) of this section in case not all contaminated subsoils can be practicably removed at closure; and

(ii) Prepare a contingent post-closure plan under §264.118 of this part for complying with paragraph (b) of this section in case not all contaminated subsoils can be practicably removed at closure.

(2) The cost estimates calculated under §§264.112 and 264.144 of this part for closure and post-closure care of a drip pad subject to this paragraph must include the cost of complying with the contingent closure plan and the contingent post-closure plan, but are not required to include the cost of expected closure under paragraph (a) of this section.

§§264.576 — 264.599 [Reserved]

Subpart X—Miscellaneous Units

§ 264.600 Applicability.

The requirements in this subpart apply to owners and operators of facilities that treat, store, or dispose of hazardous waste in miscellaneous units, except as § 264.1 provide otherwise.

§ 264.601 Environmental performance standards.

A miscellaneous unit must be located, designed, constructed, operated, maintained, and closed in a manner that will ensure protection of human health and the environment. Permits for miscellaneous units are to contain such terms and provisions as necessary to protect human health and the envi-

Not Chemical Reporter

[Sec. 264.601]

PROPOSED CHANGES TO

DRAFT INTERIM STIPULATION AND PRELIMINARY INJUNCTION

* * *

Page 2,
Par. 3: Change the second sentence to read: "The consultant shall submit an engineering design and specifications and a work plan, which have been approved and signed by a professional engineer and a certified hydrogeologist, to Department of Natural Resources Hazardous Waste Specialist David Kafura by May 14, 1992. The materials shall be deemed submitted when deposited in the United States mail.

Page 2,
Par. 3(a): Change this paragraph to read as follows:

"(a) Excavation of contaminated soil under and adjacent to the area where the new drip pad will be installed, subject to the following provisions:

"(1) Soil under the area where the new drip pad will be installed will be excavated to the depth where uncontaminated soil is reached, or to a depth of twelve feet, whichever is less. For purposes of the excavation, the extent of contaminated soil will be determined by field screening, using a flame ionization detector (FID) and a PCP-specific immuno-assay.

"(2) Soil adjacent to the area where the new drip pad will be installed will be excavated, at the base of the excavation, to the width where uncontaminated soil is reached, or to a width two feet to the south of the southern spur of the existing pad, two feet to the north of the northern spur of the existing pad, and two feet beyond the end points of the existing spurs, whichever is less. At the ground level, soil will be

excavated to the width required by OSHA regulations taking the depth of the excavation into account. For purposes of the excavation, the extent of contaminated soil will be determined as described in paragraph 3(a)(1) above.

"(3) If excavation is stopped before the extent of contaminated soil is reached, an impermeable liner must be placed between the contaminated soil left in place and the clean fill which will be backfilled into the excavation.

"(4) If excavation is stopped because field screening indicates that the extent of contaminated soil has been reached, defendants shall either (1) place an impermeable liner between the soil left in place and the clean fill which will be backfilled into the excavation; or (2) confirm that the soil left in place is uncontaminated by taking soil samples and supplying to the DNR subsequent test results of those samples from a certified laboratory.

Page 2, Par. 3(b): Eliminate and renumber accordingly.

Par. 2, Par. 3(c): Add the following to the existing paragraph:

"Specifically, areas will be designated for the stockpiling of 'clean' and indeterminate soils, as determined through field screening. The surface of these areas will be covered with plastic and stockpiled soils will also be covered with plastic. A loading area will be established for temporary stockpiling and loading of impacted soil. The area will be located so that it will not be disturbed by ongoing excavation or

construction activities, and will be graded and covered with plastic sheeting. A six-inch layer of sand will be laid over the plastic to protect the work area. Impacted soils will be loaded as soon as possible into plastic-lined "roll-offs" for transportation to an approved treatment and/or disposal site. Defendants will arrange to have three "roll-offs" at the site during each day of the excavation, and at the end of each day will place an order for any additional "roll-offs" needed to containerize the impacted soil excavated on that day. 'Clean' or indeterminate soils will be tested to confirm or determine their character. Upon completion of excavation, the sand layer and plastic sheeting of the loading area will be loaded for transportation as with the excavated impacted soils."

Page 2,
Par. 3(d): Add the following to the existing paragraph:

"'Drip pad' does not include the existing sump at the end of the treatment cylinder."

Page 3,
Par. 4: Change to read as follows:

"Defendants agree to commence performance of the design and work plan within ten days of the DNR's approval of the plan or within ten days after they have informed the DNR in writing that they have obtained all necessary local permits or determined that none are necessary, whichever is later, and defendants agree to perform all work in accordance with the design and work plan as approved by the DNR."

Page 3,
Par. 5: Change the first sentence of this paragraph to read as follows:

"Defendants agree to complete the installation of the new drip pad no later than 60 days after the DNR's approval of the plan, or 60 days after after they have informed the DNR in writing that they have obtained all necessary local permits or determined that none are necessary, whichever is later [unless completion is prevented by intervening force majeure"].

Page 3,
Par. 5(b): Change the paragraph to read as follows:

"(b) Pay liquidated damages to the State of $300.00 per day for every day after the deadline that the drip pad is not fully installed and operational."

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STATE OF WISCONSIN CIRCUIT COURT BURNETT COUNTY

STATE OF WISCONSIN,

Plaintiff,

v. Case No. 91-CV-79

PENTA WOOD PRODUCTS, INC., a domestic corporation, and VERNON C. LUNDEQUAM,

Defendants.

INTERIM STIPULATION AND PRELIMINARY INJUNCTION

STIPULATION

The plaintiff has moved for a preliminary injunction regarding certain issues in this case. The parties wish to settle this motion by agreement, now therefore,

IT IS HEREBY STIPULATED AND AGREED that the defendants will take the following steps, under the time frame set forth below, to bring their pentachlorophenol treating operation into compliance with applicable regulations:

1. Defendants understand that it is the State's position that any drippage onto the ground of spent pentachlorophenol formulation from penta-treated logs is considered illegal hazardous waste disposal.

2. Defendants agree to immediately cease the treatment of wood with pentachlorophenol formulation from the present until the time that a permanent containment system (drip pad) which comports with applicable federal regulations for such drip pads for wood preservative operations is installed and ready for use at defendants' facility.

DRAFT

3. Defendants agree to retain a qualified consultant to install this new drip pad. The consultant shall submit an engineering design and specifications and a work plan, which have been approved and signed by a Professional Engineer and a certified hydrogeologist, to Department of Natural Resources Hazardous Waste Specialist David Kafura by May 1, 1992. (?)(--Jim, Dave tells me this is the date Dahl Associates told him they could have a plan to him.) At a minimum, this design and work plan shall provide for:

a) Excavation of all contaminated soil under and adjacent to the area where the new drip pad will be installed. For any soil which is left in place, evidence that it is not contaminated must be supplied by the taking of soil samples and subsequent test results from those samples by a certified lab.

b) If not practicable, as determined by the consultant and agreed to by DNR, to excavate to the extent that uncontaminated soil is reached, an impermeable liner must be placed between the contaminated soil left in place and clean fill which would be backfilled into the excavation.

c) All soil contaminated with pentachlorophenol is considered by the State to be hazardous waste and must be properly containerized as such, and properly disposed of within ninety days according to state hazardous waste regulations.

d) Installation of a new drip pad which comports with subpart W of the federal regulations applicable to new drip pads for wood preserving operations.

4. Defendants agree to commence performance of the design and work plan within ten days of the DNR's approval of the plan, and

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agree to perform all work in accordance with the design and work plan as approved by the DNR.

5. Defendants agree to complete the installation of the new drip pad no later than thirty days after the DNR's approval of the plan. If the drip pad is not installed and operational by that date, defendants agree to do one or the other of the following options, and agree to inform the State in writing on that date which of the options it is electing:

a) Permanently cease using any kind of pentachlorophenol formulation for the treatment of wood; or

b) Pay liquidated damages to the State of $500.00 per day for every day after the deadline that the drip pad is not fully installed and operational.

6. It is agreed by plaintiff and defendants that this stipulation resolves only the Motion for Preliminary Injunction filed by plaintiff and scheduled to be heard by the court on May 6, 1992, and does not resolve and is not intended to resolve all the allegations and demands for relief set forth in the Complaint filed in court by the plaintiff on June 25, 1991.

7. Nothing herein shall be construed to preclude the State from seeking further changes in the defendants' operations or additional investigative or remedial measures.

Dated: _____
JAMES E. DOYLE
Attorney General

Dated: _____
POPHAM, HAIK, SCHNOBRICH
& KAUFMAN, LTD.

_____
LORRAINE C. STOLTZFUS
Assistant Attorney General
Attorneys for Plaintiff

_____
JAMES A. PAYNE
Attorneys for Defendants

DRAFT

ORDER

The terms of the foregoing stipulation are approved by and made the Order of this Court, this ____ ____ day of _____, 1992.

BY THE COURT:

_____
James H. Taylor
Circuit Court Judge

CHAPMAN CHEMICAL COMPANY
416 E. Brooks Road, P.O. Box 9158
Memphis, TN 38109-0158

EMERGENCY TELEPHONES:
BUSINESS: (901) 396-5151
CHEMTREC: (800) 424-9300

MATERIAL SAFETY DATA SHEET

CHAPMAN PRODUCT NAME: PENTA PLUS 40

PENTA WOOD PRODUCTS
R.R.#1 BOX 500
SIREN WISCONSIN
54872-0000
Attn: Safety Manager

Chapman Product Code:	47106
MSDS#:	6101
Date of Issue:	09/04/91
Date of Last Revision:	08/07/91
Chapman Order #:	32593

SEP 7 1991

SECTION 1 - PHYSICAL AND CHEMICAL CHARACTERISTICS

Boiling Point or Range (deg. F):	>260	Specific Gravity (Water=1):	1.10
Vapor Pressure(mm Hg):	14	% Volatile by Volume:	60
Vapor Density(Air=1):	>1	Evaporation Rate(n-BuAc=1):	<1
Solubility in Water:	Negligible		

Appearance and Odor: Dark brown liquid with phenolic, somewhat sweet odor.
DOT Hazardous Material Name: COMBUSTIBLE LIQUID NOS (KETONES/ALCOHOL), (PENTACHLORO) RQ

SECTION 2 - HAZARDOUS INGREDIENTS

COMMON NAME	CHEMICAL NAME	*	C.A.S. #	%	OSHA PEL	ACGIH TLV
Pentachlorophenol, technical	Phenol, pentachloro-	*	87-86-5	35-45	.5 mg/CU M	.5 mg/CU M
Mixed alcohols & ketones	Proprietary mixture			25-35	N/A	N/A
Solvent	Proprietary			25-35	N/A	N/A

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

Flash Point(deg. F, Method): 170 (PMCC) Flammable Limits in Air(LEL/UEL, % by Volume): unknown
Extinguisher Media: Foam, carbon dioxide, dry chemical
Special Fire Fighting Procedures: Wear MSHA/NIOSH-approved, self-contained breathing apparatus and full protective clothing.
Avoid spraying water directly into storage containers because of danger of boilover.
Cool exposed containers with water.
Unusual Fire and Explosion Hazards: Fumes and vapors may contain hydrogen chloride.

SECTION 4 - HEALTH HAZARD DATA (See Section 9 Also)

Signs and Symptoms of Exposure:

Inhalation: Acute toxicity (Rats): LC50 less than 2.17 mg/L.
May cause irritation to upper respiratory tract as evidenced by sneezing and coughing.
Symptoms of overexposure include rapid heartbeat and respiration, elevated temperature and blood pressure, muscular weakness, excessive sweating, dizziness and nausea.
High concentrations can cause unconsciousness and death generally from cardiac arrest.

Eyes: Irritating to eyes at concentrations above 1mg/cu meter.
Severe irritation. May cause irreversible eye damage on prolonged contact.

Skin: Acute Toxicity (Rabbits): LD50 greater than 201 mg/kg.
Pentachlorophenol is readily absorbed through skin, producing the symptoms listed in the Inhalation section.
In solution, toxic amounts can be absorbed through the skin, causing liver, kidney, and central nervous system damage.
Technical pentachlorophenol contains minute amounts of polychlorodibenzodioxins and polychlorodibenzofurans which are believed to be the compounds that cause the skin condition known as chloracne.

Ingestion: Acute toxicity (Rats): LD50 greater than 51 mg/kg.
Weakness, excessive sweating, headache, dizziness, nausea, vomiting, difficulty in breathing.
Symptoms of overexposure are similar to those listed in the Inhalation section.

Medical Conditions Generally Aggravated by Exposure: Acute or chronic kidney or liver disease, asthma, bronchitis, chronic acne and other skin conditions, and disorders of the blood cells.

Listed as a Carcinogen or Potential Carcinogen by: None

Emergency First Aid:

Inhalation: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth.
Get medical attention immediately.

Eyes: Flush eyes with plenty of water, lifting upper and lower lids occasionally. Get medical attention.

Skin: Remove contaminated clothing and wash skin and hair immediately with soap and water. Wash contaminated clothing separately from other laundry before reuse.
Get medical attention if irritation persists.

Ingestion: Do not induce vomiting.
Call a physician or Poison Control Center immediately.
Drink promptly a large quantity of milk, egg white, gelatin solution, or, if these are not available, large quantities of water. Avoid alcohol.

CONTINUED ON NEXT PAGE

BILLING

CHAPMAN CHEMICAL COMPANY
416 E. Brooks Road, P.O. Box 9158
Memphis, TN 38109-0158

EMERGENCY TELEPHONES:
BUSINESS: (901) 396-5151
CHEMTREC: (800) 424-9300

MATERIAL SAFETY DATA SHEET

CHAPMAN PRODUCT NAME: PENTA PLUS 40

PENTA WOOD PRODUCTS
R.R.#1 BOX 500
SIREN WISCONSIN
54872-0000
Attn: Safety Manager

Chapman Product Code:	47106
MSDS#:	6101
Date of Issue:	09/04/91
Date of Last Revision:	08/07/91
Chapman Order #:	32593

Primary Routes of Entry: NOTE TO PHYSICIAN: SEE "NOTE TO PHYSICIAN" BELOW IN SECTION 9!
Inhalation Eyes Skin Ingestion

SEP 7 1991

SECTION 5 - REACTIVITY DATA

Stability: Stable Conditions to Avoid: None
Incompatability: Strong oxidizing agents
Hazardous Decomposition Products: Oxides of carbon, hydrogen chloride, polychlorodibenzodioxins, polychlorodibenzofurans. Also refer to Section 3.
Hazardous Polymerization: Will not occur Conditions to Avoid: None known.

SECTION 6 - SPILL OR LEAK PROCEDURES

Steps to be taken if material is released or spilled:
Small Spill: Wear appropriate protective clothing (see Section 7).
Absorb with sand or clay and place in waste receptacle.

Large Spill: Wear appropriate protective clothing (see Section 7)
Eliminate all ignition sources.
Restrict access to area. Stop spill at source. Dike to prevent spreading. Pump liquid to recovery vessel.
Absorb remainder on absorbent material and shovel into containers.
Prohibit contamination of streams, lakes, or other bodies of water.

Waste Disposal Methods: Pesticide wastes are toxic.
If this product cannot be disposed of by use according to label instructions, contact your State Environmental Control Agency, or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.
Triple rinse container (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by state and local authorities.

SECTION 7 - PROTECTIVE EQUIPMENT

Respiratory Protection: If TLV for product or any component is exceeded, use MSHA/NIOSH-approved respirator.
Ventilation: Ventilate via mechanical methods (general or local exhaust) to maintain exposure below TLV(s).
Protective Gloves: Wear impervious gloves, such as PVA, PVC, neoprene, NBR(Buna-N), or nitrile rubber.
Eye Protection: Wear chemical splash goggles and/or face shield during mixing and when exposed to mist.
Other Protective Equipment: Applicators must wear impervious (PVA, PVC, neoprene, NBR (Buna-N), or nitrile) protective clothing, as necessary to prevent exposure.

SECTION 8 - SPECIAL PRECAUTIONS

Precautions for Handling and Storage: Store away from food or feed in a secure, well-ventilated area protected from extreme temperatures.
Do not store or use in the vicinity of sparks, open flame, or other ignition sources.
Do not transfer to unmarked containers. Keep container closed when not in use.

Other Precautions: Wash thoroughly after skin contact, and before eating, drinking, use of tobacco products, or using restrooms.

SECTION 9 - ADDITIONAL NOTES

The U.S. EPA has determined that pentachlorophenol can produce defects in the offspring of laboratory animals. Exposure to pentachlorophenol during pregnancy should be avoided.
Wash contaminated clothing separately from other laundry before reuse.
Exposure to pentachlorophenol by any route may result in the late development of a skin condition known as chloracne.
As part of a Settlement Agreement between EPA and the wood treating industry, AWPI, SAWP, and NFPA are require implement a voluntary Consumer Awareness Program (CAP) to provide consumers with important information regarding the hazards associated with treated wood. Items pressure treated with this product are subject to that CAP. Chapman urges you to participate in this Program and will provide you detailed information on request.
NOTE TO PHYSICIAN: This product is a metabolic stimulant. Treatment is supportive. Forced diuresis may be effective to reduce total body burden. Treat hyperthermia with physical measures. Do not administer aspirin, phenothiazines, or atropine, since they may enhance toxicity.

HMIS Ratings:
Health: 3 Flammability: 2 Reactivity: 0 Special Hazards: None

HA's Hazard Communication Standard, 29 CFR 1910.1200, may require you to distribute this information to your employees and/or customers. If this product is used

CONTINUED ON NEXT PAGE

CHAPMAN CHEMICAL COMPANY
416 E. Brooks Road, P.O. Box 9158
Memphis, TN 38109-0158

EMERGENCY TELEPHONES:
BUSINESS: (901) 396-5151
CHEMTREC: (800) 424-9300

MATERIAL SAFETY DATA SHEET

CHAPMAN PRODUCT NAME: PENTA PLUS 40

PENTA WOOD PRODUCTS
R.R.#1 BOX 500
SIREN WISCONSIN
54872-0000
Attn: Safety Manager

Chapman Product Code:	47106
MSDS#:	6101
Date of Issue:	09/04/91
Date of Last Revision:	08/07/91
Chapman Order #:	32593

at locations other than the mailing address shown above, it is your responsibility to promptly distribute this information to that location. Additional copies of the Material Safety Data Sheetsare available upon request.

Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40 CFR 372 requires identification of certain toxic chemicals. Any such chemicals contained in this product are listed in Section 2 and identified by an asterisk (*).
This information must be included in all MSDS's that are copied and distributed for this product.

SEP 7 19

The information is to the best of our knowledge and belief accurate and reliable as of the date compiled. However,no representation or guarantee is made as to its accuracy, reliability, or completeness. It relates to the specific material designated and may or may not be valid for such material used in combination with any other materials or in any process. All liability for any loss or damage that may occur from the use of this information is disclaimed.
It is the user's responsibility to satisfy himself from other sources that this material is suitable for his own particular use.
This is neither a license under any applicable patents nor an assurance of freedom from claims under pending or issued patents.
All warrenties against patent infringement are disclaimed.

BILLING

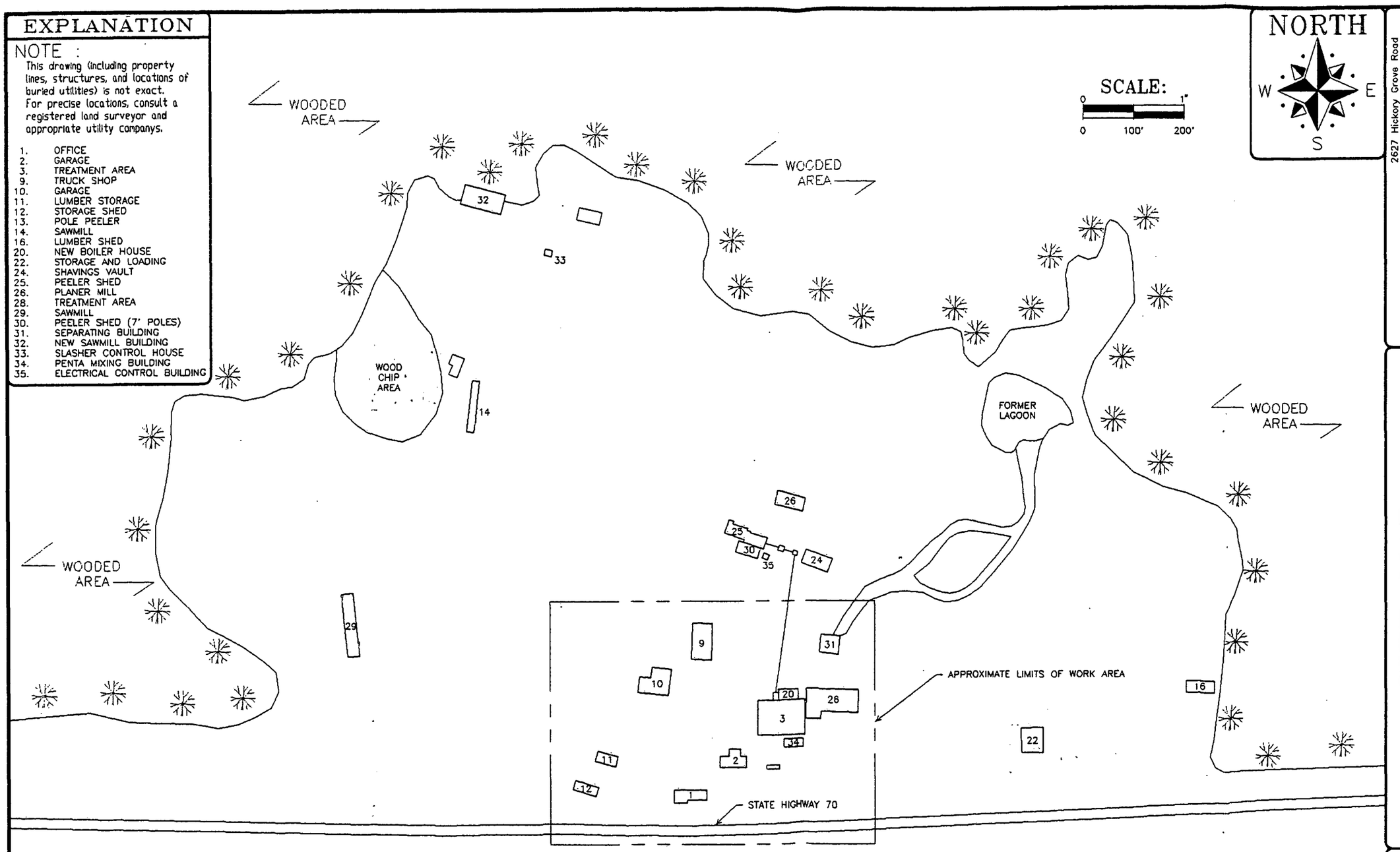
APPENDIX B

DESIGN DRAWINGS AND ENGINEERING SPECIFICATIONS

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility companys.

1. OFFICE
2. GARAGE
3. TREATMENT AREA
9. TRUCK SHOP
10. GARAGE
11. LUMBER STORAGE
12. STORAGE SHED
13. POLE PEELER
14. SAWMILL
16. LUMBER SHED
20. NEW BOILER HOUSE
22. STORAGE AND LOADING
24. SHAVINGS VAULT
25. PEELER SHED
26. PLANER MILL
28. TREATMENT AREA
29. SAWMILL
30. PEELER SHED (7' POLES)
31. SEPARATING BUILDING
32. NEW SAWMILL BUILDING
33. SLASHER CONTROL HOUSE
34. PENTA MIXING BUILDING
35. ELECTRICAL CONTROL BUILDING



SCALE: 0 100' 200'

NORTH
W E
S

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers
2627 Hickory Grove Road
Davenport, IA 52804
Phone (319)388-0888
FAX (319)388-9410

DAHL STD NO: VEWI3180-B-00-A

SITE MAP
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.
SIREN , WISCONSIN

PLOT SCALE 1" = 200'
AutoCAD FILE NAME 3180-03A
PLOT DATE 5-12-92

DATE DRAWN	5/11/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 03 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	1

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility companys.

1. OFFICE
2. GARAGE
3. TREATMENT AREA
9. TRUCK SHOP
10. GARAGE
11. LUMBER STORAGE
12. STORAGE SHED
20. NEW BOILER HOUSE
26. PLANER MILL
31. SEPARATING BUILDING
34. PENTA MIXING BUILDING

NOTES:

1. TAKE CONFIRMATORY LAB SAMPLES.
2. PLACE SEGREGATION LINER.
3. BACKFILL AS REQ'D FOR SECONDARY CONTAINMENT LINER.

NORTH

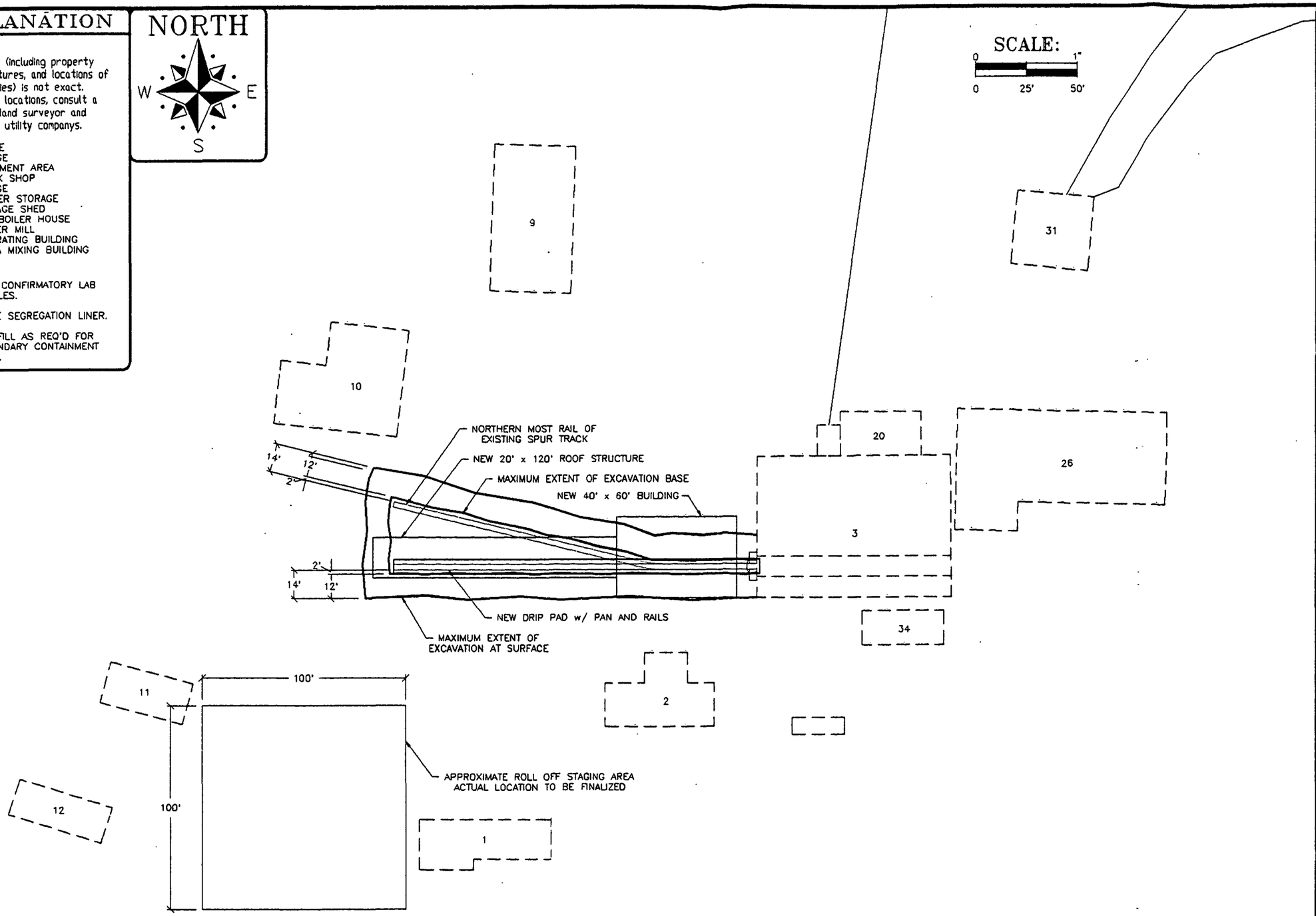
W E

S

SCALE:

0 1"

0 25' 50'



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DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

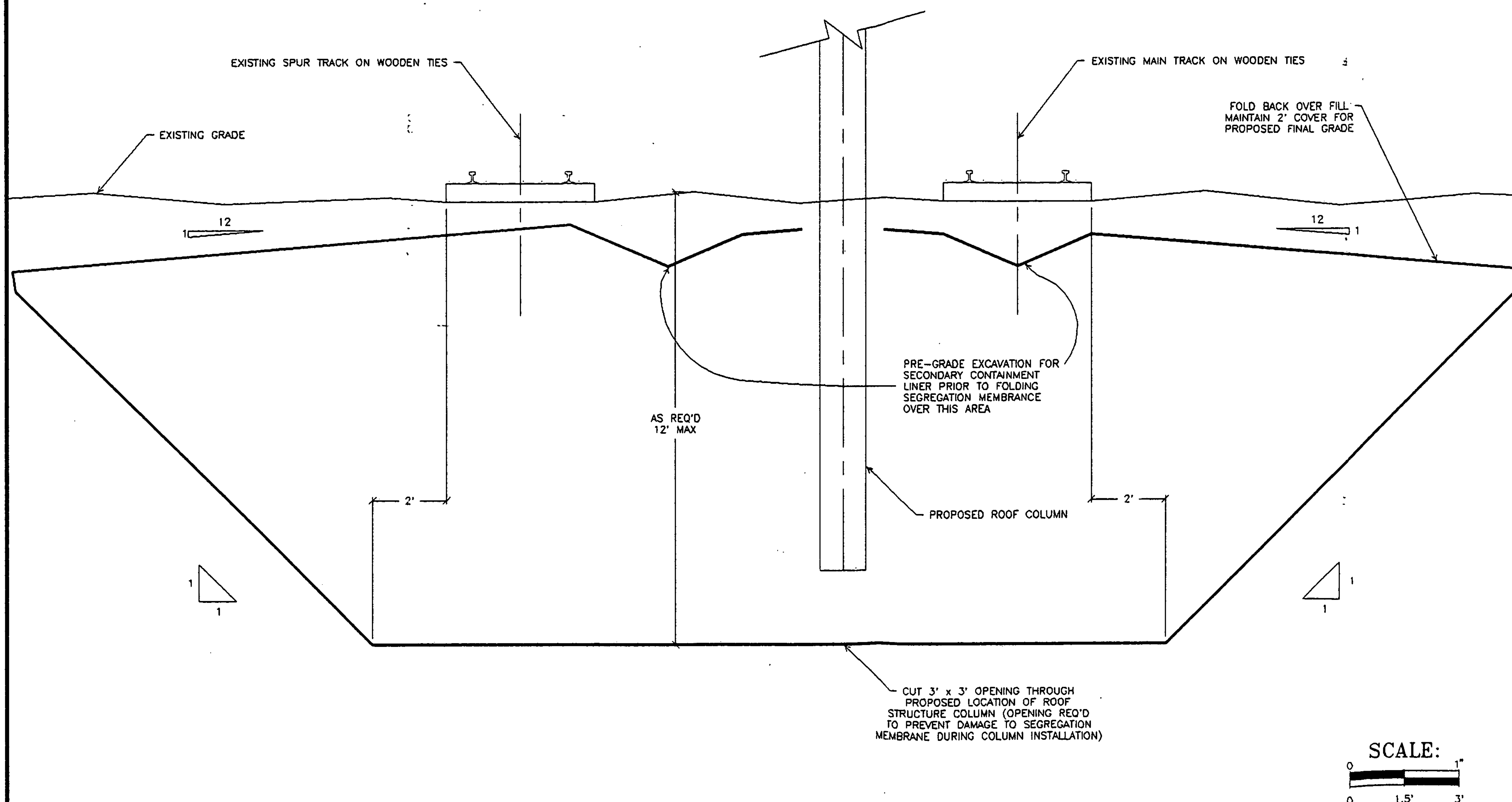
DAHL STD NO: VEWI3180-B-00-A

AREA OF EXCAVATION
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT DATE 5-13-92
AutoCAD FILE NAME 3180-54A
PLOT SCALE 1"=50'

DATE DRAWN	5/13/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 54 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	2



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& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

DAHL STD NO: VEWI3180-B-00-A

TYPICAL SEGREGATION MEMBRANE DETAIL

PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT SCALE 1" = 3'

AutoCAD FILE NAME 3180-58A

PLOT DATE 5-14-92

DATE DRAWN	5/14/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 58 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	3

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility companys.

1. OFFICE
2. GARAGE
3. TREATMENT AREA
9. TRUCK SHOP
10. GARAGE
11. LUMBER STORAGE
12. STORAGE SHED
20. NEW BOILER HOUSE
26. PLANER MILL
31. SEPARATING BUILDING
34. PENTA MIXING BUILDING

NOTE: SECTION LINE A–A' REFERENCES DWG. # 55 "CROSS SECTION A–A"

NORTH

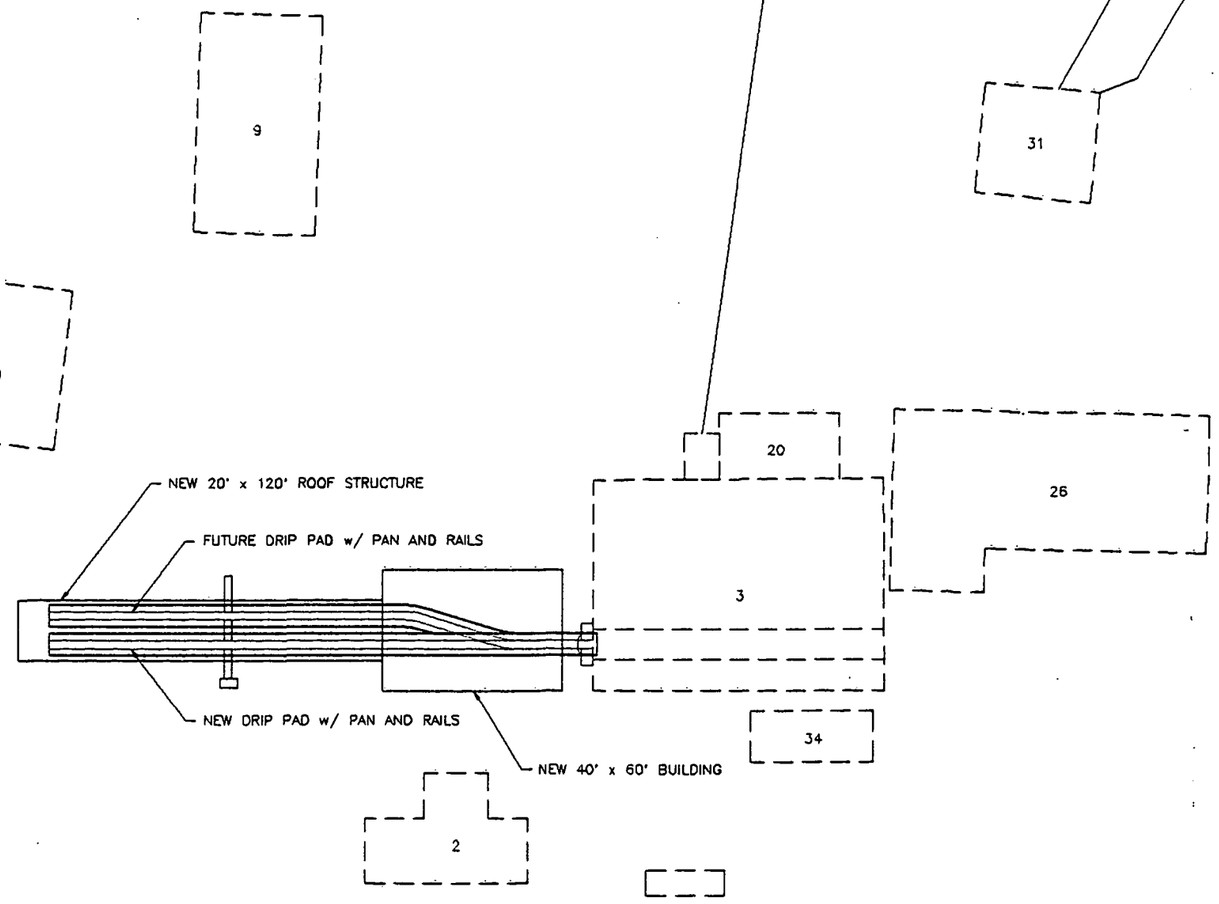
W E

S

SCALE:

0 1"

0 25' 50'



STATE HIGHWAY 70

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Davenport, IA 52804
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FAX (319)388-9410

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

DAHL STD NO: VEW13180–B–00–A

PROPOSED IMPROVEMENTS
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

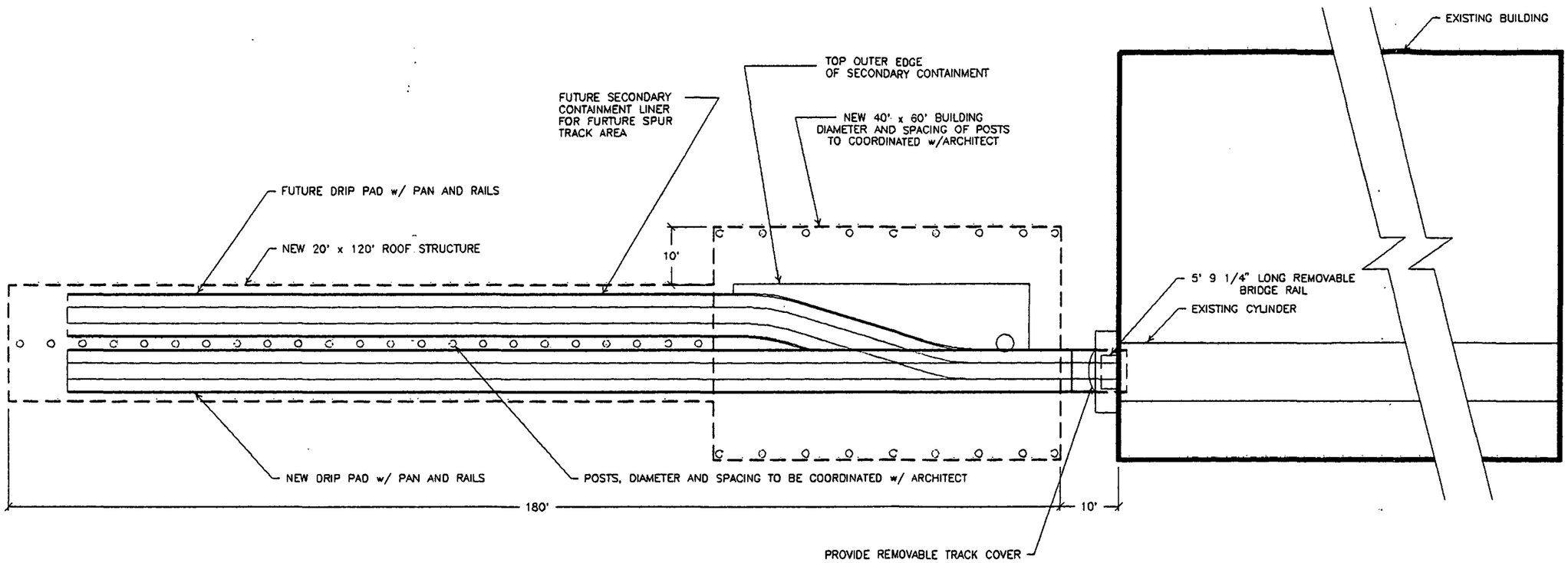
PLOT DATE 5–12–92
AutoCAD FILE NAME 3180–57A
PLOT SCALE 1" =50'

DATE DRAWN	5/12/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B– 57 –A
PROJECT NUMBER	VEW13180
FIGURE NUMBER	4

EXPLANATION

NOTES:

1. FIELD VERIFY ALL DIMENSIONS.
2. FINAL BUILDING AND ROOF STRUCTURE INFORMATION TO BE PROVIDED BY ARCHITECT.



SCALE:

0 1"

0 10' 20'

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Environmental Consultants, Contractors & Engineers

DAHL STD NO. VEW3180-B-00-A

FLOOR PLAN
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT SCALE	1" = 20'
AutoCAD FILE NAME	3180-52B
PLOT DATE	5-11-92
DATE DRAWN	5/11/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 52 -B
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	5

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility companys.

1. OFFICE
2. GARAGE
3. TREATMENT AREA
9. TRUCK SHOP
10. GARAGE
11. LUMBER STORAGE
12. STORAGE SHED
20. NEW BOILER HOUSE
26. PLANER MILL
31. SEPARATING BUILDING
34. PENTA MIXING BUILDING

NOTE: SECTION LINE A–A' REFERENCES DWG. # 55 "CROSS SECTION A–A"

NORTH

W E S

SCALE: 0 25' 50' 1"

9

10

31

20

26

NEW 20' x 120' ROOF STRUCTURE

FUTURE DRIP PAD w/ PAN AND RAILS

C B A

C' B' A'

3

34

NEW DRIP PAD w/ PAN AND RAILS

NEW 40' x 60' BUILDING

2

11

12

1

STATE HIGHWAY 70

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Davenport, IA 52804
Phone (319)388-0888
FAX (319)388-9410

DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

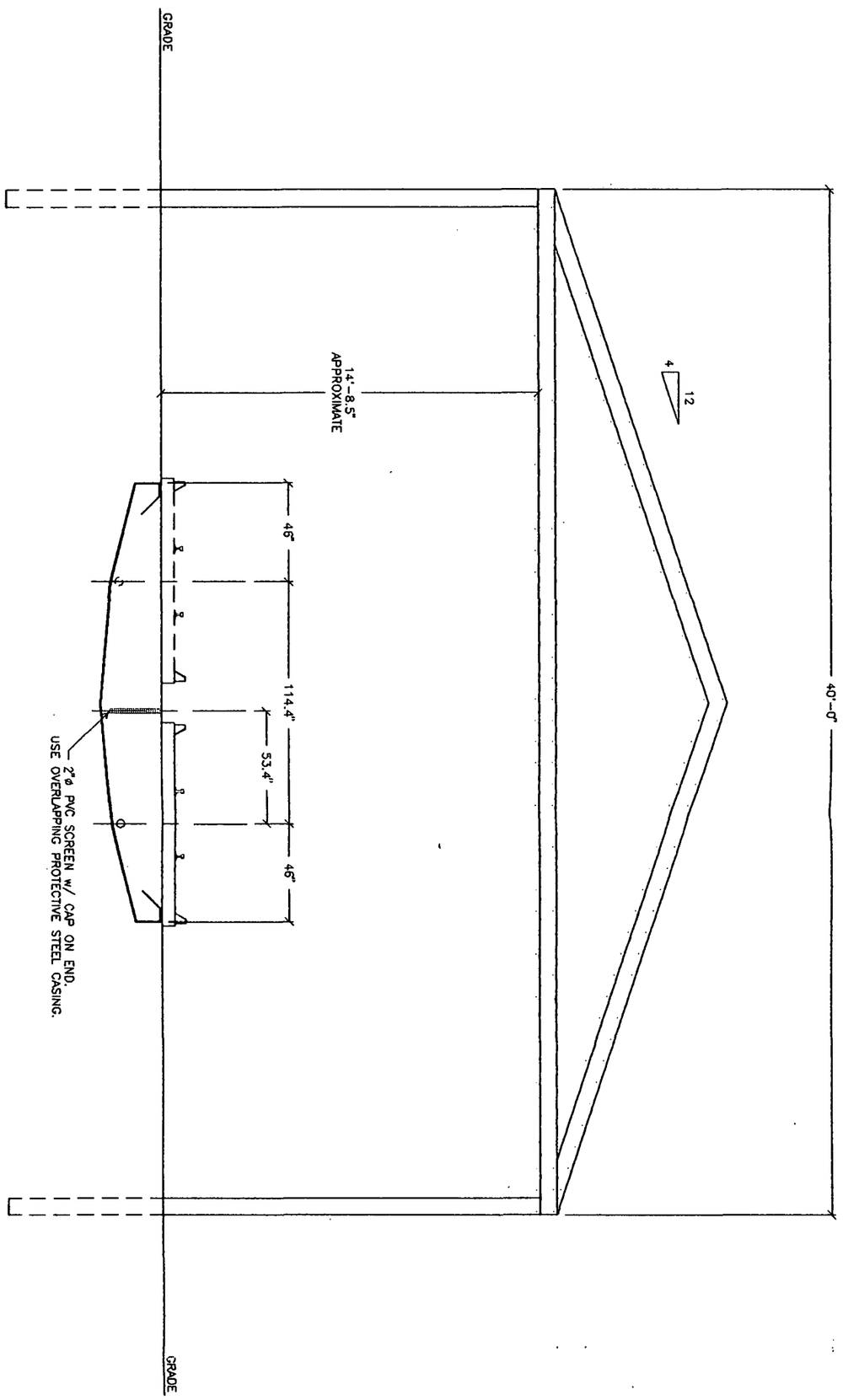
DAHL STD NO: VEW13180–B–00–A

SECTION LOCATIONS
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT DATE 5–13–92
AutoCAD FILE NAME 3180–59A
PLOT SCALE 1" =50'

DATE DRAWN	5/13/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B– 59 –A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	6



SCALE: 0 2.5' 5' 1"

CROSS SECTION A–A'

PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

DATE DRAWN	5/13/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 55 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	7

PLOT DATE 5-13-92 | AutoCAD FILE NAME 3180-55A | PLOT SCALE 1"=5'

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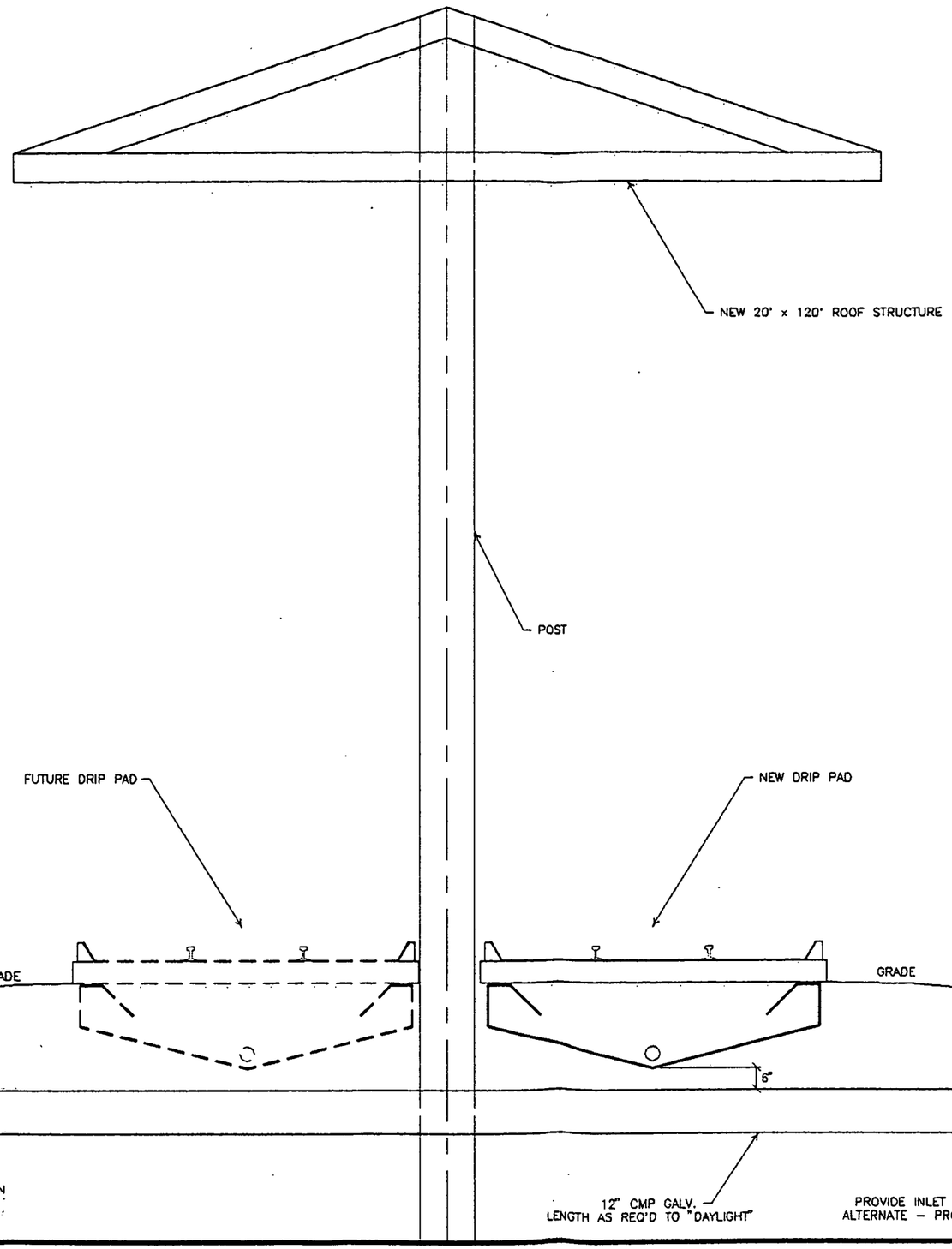
DAHL STD NO: VEWI3180-B-00-A

SCALE:

0 1"

0 1.5' 3'



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FAX (319)388-9410

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Environmental Consultants, Contractors & Engineers

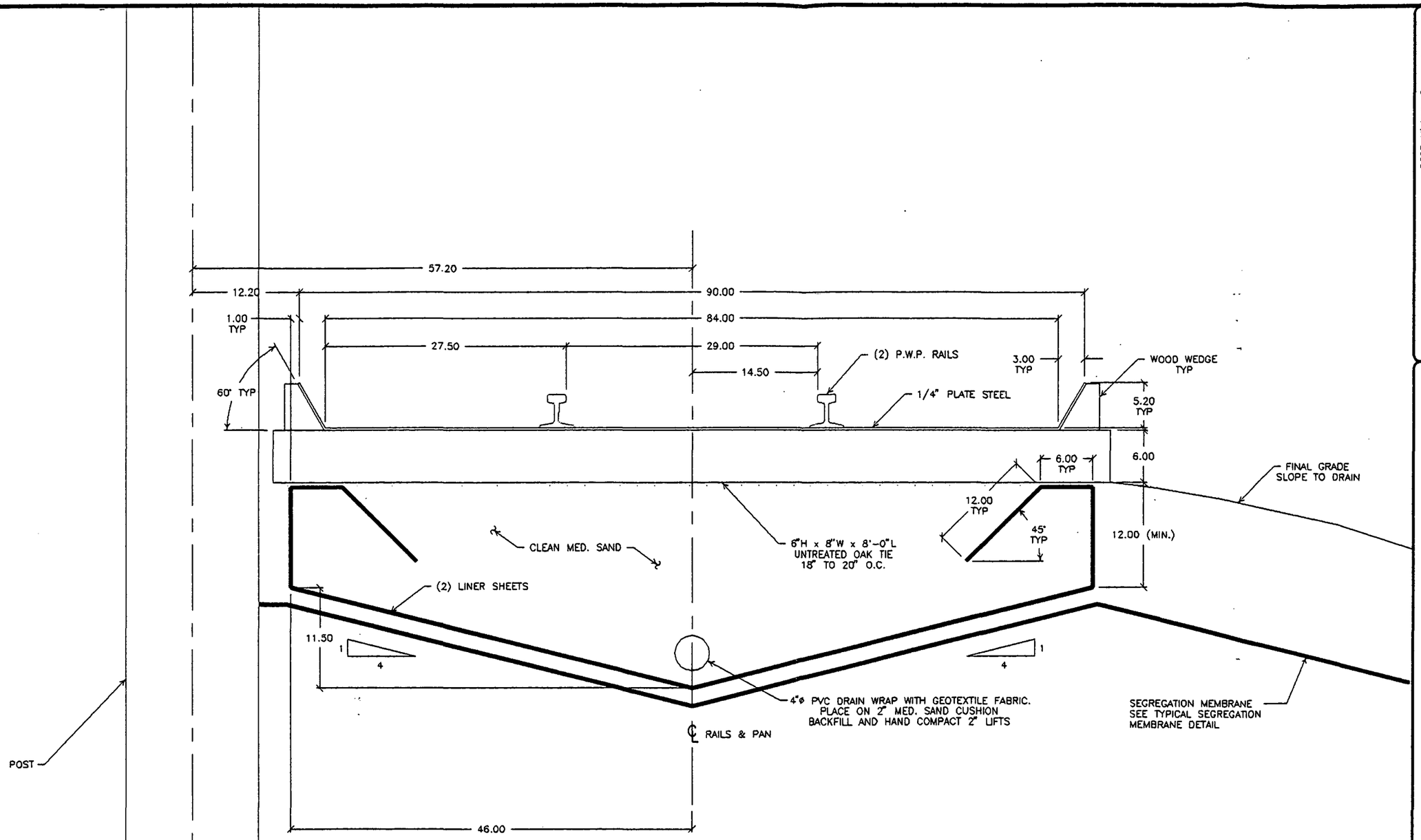
DAHL STD NO: VEWI3180-B-00-A

CROSS SECTION B–B'
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT DATE 5-13-92 | AutoCAD FILE NAME 3180-56A | PLOT SCALE 1" = 3'

DATE DRAWN	5/13/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 56 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	8



SCALE:

0 6" 1'

CROSS SECTION C-C'

PENTA DRIP PAD DESIGN

PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

DATE DRAWN	5/8/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B-50-A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	9

PLOT DATE 5-12-92

AutoCAD FILE NAME 3180-50A

PLOT SCALE 1" = 1'

DAHL STD NO: VEWI3180-B-00-A

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Phone (319)388-0888
FAX (319)388-9410

EXPLANATION

NOTE :
This drawing (including property lines, structures, and locations of buried utilities) is not exact. For precise locations, consult a registered land surveyor and appropriate utility companys.

1. OFFICE
2. GARAGE
3. TREATMENT AREA
9. TRUCK SHOP
10. GARAGE
11. LUMBER STORAGE
12. STORAGE SHED
20. NEW BOILER HOUSE
26. PLANER MILL
31. SEPARATING BUILDING
34. PENTA MIXING BUILDING

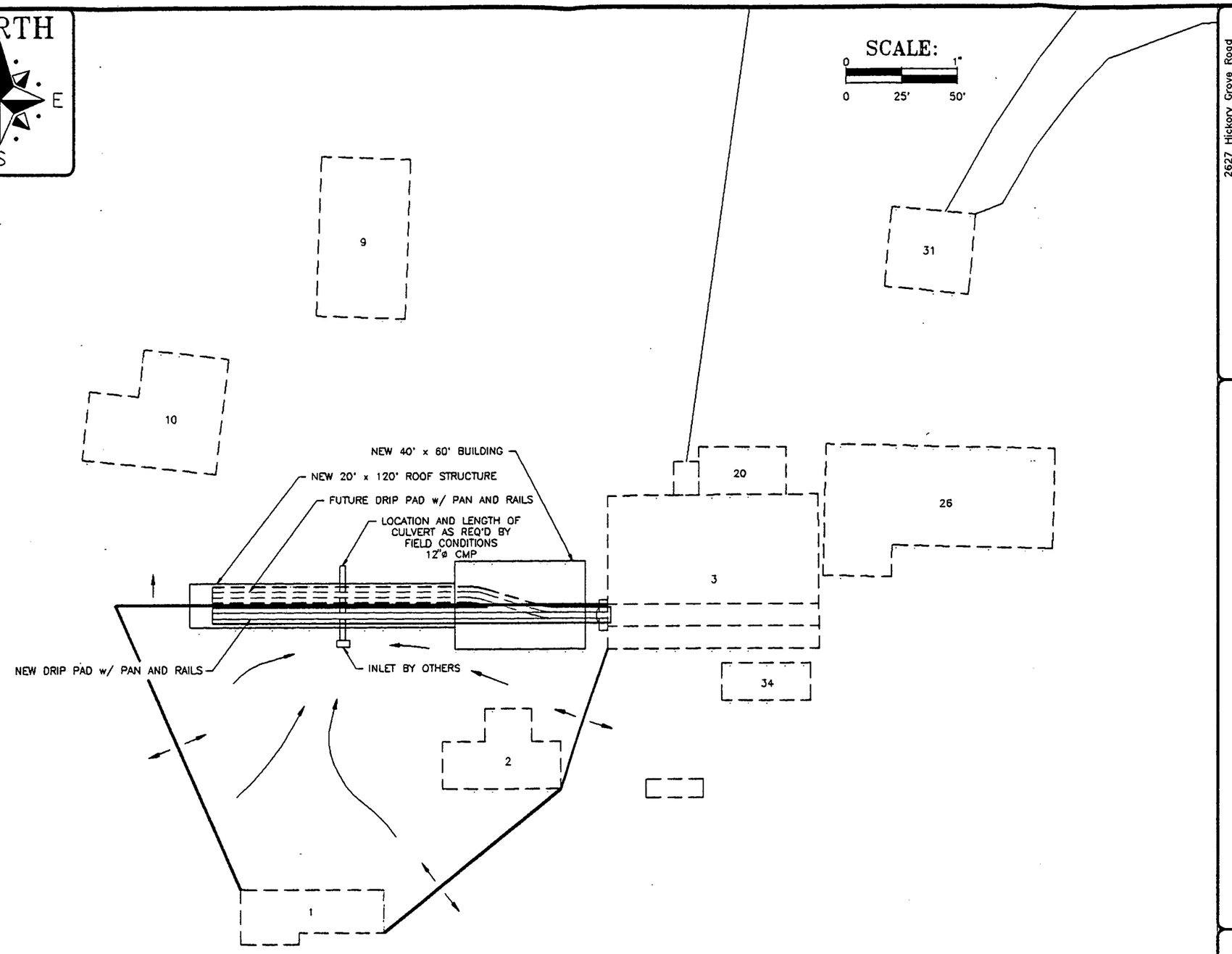
NOTES:

1. GRADE SITE TO PROVIDE DRAINAGE DIVIDE AS SHOWN BY DRAINAGE ARROW ⟶.
2. USE RIP RAP OR OTHER MEASURE TO CONTROL EROSION AT CULVERT OUTLET.
3. PROVIDE INLET STRUCTURE w/ GRATING OR PROVIDE FENCING AROUND INLET.

NORTH

W E S

SCALE:
0 1"
0 25' 50'



STATE HIGHWAY 70

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DAHL & ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

DAHL STD NO: VEWI3180-B-00-A

RUN-ON CONTROL
PENTA DRIP PAD DESIGN
PENTA WOOD PRODUCTS, INC.

SIREN , WISCONSIN

PLOT SCALE 1"=50'
AutoCAD FILE NAME 3180-53A
PLOT DATE 5-12-92

DATE DRAWN	5/12/92
DRAWN BY	Don Mc.
APPROVED BY	
DRAWING NUMBER	B- 53 -A
PROJECT NUMBER	VEWI3180
FIGURE NUMBER	10

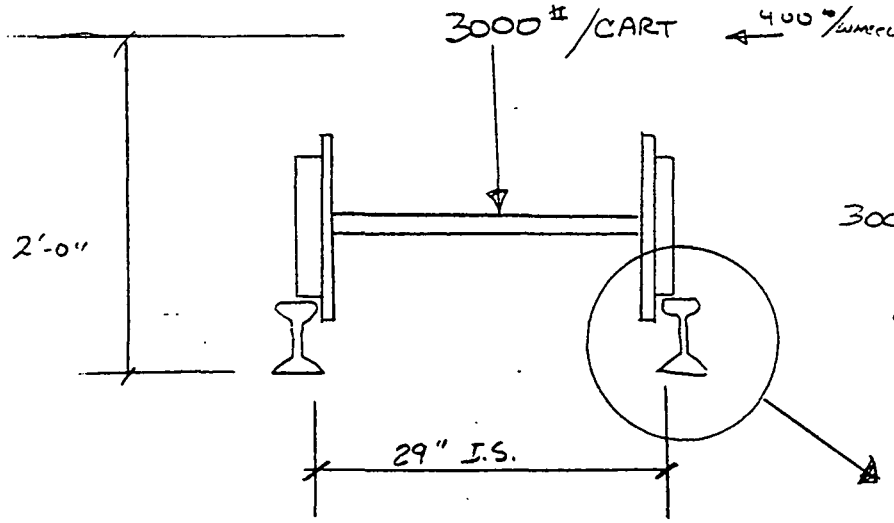
APPENDIX C

ENGINEERING CALCULATIONS

DAHL
& ASSOCIATES, INC.
Environmental Consultants, Contractors & Engineers

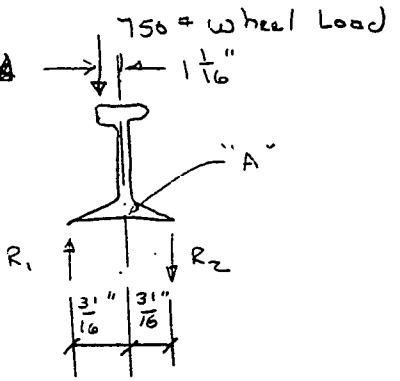
Twin Cities (612) 490-2905 (800) 747-5325
Midwest (319) 388-0888 (800) 373-5325
Southwest (602) 951-1146 (800) 397-5325

PENTA WOOD PRODUCTS, INC.
VEW1 3180
STRUCTURAL CALCULATIONS
5-8-92 MAJ



3000# /CART, 4 wheel/CART

∴ $\frac{3000\#}{4\ \text{wheel}} = 750\#/\text{wheel}$



$+\uparrow \Sigma F = 0 = R_1 - 750\# - R_2 = 0 \Rightarrow R_1 = 750 + R_2$

$\Sigma M_{@A} = 0 = \frac{31}{16} * R_1 - 750 * \frac{17}{16} + \frac{31}{16} * R_2 = 0$

$\therefore \frac{31}{16}(750 + R_2) - 750 * \frac{17}{16} + \frac{31}{16} * R_2 = 0$

$\frac{31}{16} * 750 + \frac{31}{16} * R_2 - 750 * \frac{17}{16} + \frac{31}{16} * R_2 = 0$

$(2)\left(\frac{31}{16}\right)(R_2) + \frac{31}{16} * 750 - \frac{17}{16} * 750 = 0$

$R_2 = \left(\frac{17}{16} - \frac{31}{16}\right) * 750 \Big/ \left(\frac{2 * 31}{16}\right) = -169.355\#$

(NEGATIVE DENOTES DIRECTION OF ARROW IS WRONG)

$\therefore R_1 = 750 - 169.355 = 550.645$

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& ASSOCIATES, INC.
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Twin Cities (612) 490-2905 (800) 747-5325
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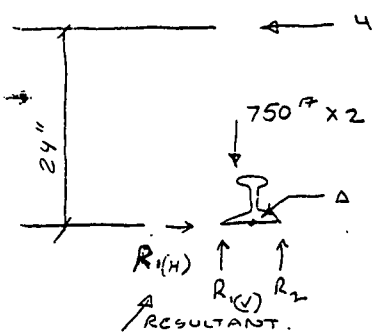
ASSUME:

HORIZONTAL FORCE OF 400#/WHEEL (LOADING/UNLOADING OF CART) ACTING 2' ABOVE PAN & THAT LOAD ON 2 WHEELS (CART TIPPING.



REST OF DIMENSIONS SAME AS BEFORE

$$\Sigma M_A^{\circlearrowleft} = 0 = \frac{31}{16} * R_{1(V)} - 750 * \frac{17}{16} - \frac{31}{16} * R_2 - 400 * 24$$

$$+\uparrow \Sigma F = 0 = R_{1(V)} - 750 * 2 + R_2 \Rightarrow R_{1(V)} = 1500 - R_2$$

$$\rightarrow \Sigma F = 0 = R_{1(H)} - 400 \Rightarrow R_{1(H)} = 400$$

$$\therefore \Sigma M_A^{\circlearrowleft} = 0 = \frac{31}{16}(1500 - R_2) - 750 * \frac{17}{16} - \frac{31}{16} R_2 - 400 * 24$$

$$0 = \frac{31}{16} * 1500 - \frac{31}{16} R_2 - \frac{17}{16} * 750 - \frac{31}{16} R_2 - 400 * 24$$

$$\left(\frac{31}{16} + \frac{31}{16}\right) R_2 = \frac{31}{16} * 1500 - \frac{17}{16} * 750 - 400 * 24$$

$$\therefore R_2 = \frac{\frac{31}{16} * 1500 - \frac{17}{16} * 750 - 400 * 24}{\frac{31}{16} * 2} = -1,933.06\#$$

(NEGATIVE DENOTES DIRECTION OF FORCE OPOSITE DIRECTION OF ARROW)

$$R_{1(V)} = 1500 - R_2 = 1500 - (-1933.06) = 3,433.06\#$$

$$R_{RESULTANT} = \sqrt{R_{1(V)}^2 + R_{1(H)}^2} = \sqrt{3433.06^2 + 400^2} = 3456.28\#$$

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Southwest (602) 951-1146 (800) 397-5325

f_y STEEL = 36,000 PSI
ASSUME WELD EFFICIENCY = 50%
USE 1/4" FILLET WELD

AREA OF WELD REQUIRED ($R_1 > R_2$ ∴ USE R_1)

$$A_W = 1/4" \times L \times 0.5 = \frac{3456.28\#}{36,000\ \#/sq\ in}$$

WHERE: L = LENGTH OF WELD PER 1 FOOT LENGTH OF TRACK

$$\therefore\ L = \frac{3456.28\#}{36,000\ PSI} \times \frac{1}{1/4" \times 0.5} = 0.768\ in$$ USE 1" LONG WELD

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(319) 388-0888
(800) 373-5325

Southwest
(602) 951-1146
(800) 397-5325

PAN STRENGTH REQUIREMENTS

MOMENT DUE TO RAIL LOADS.

$$\Sigma M_{R_1} = 0 = R_1 - 400 \times 24 + 750 \times 2 * \left(\tfrac{31}{16} - \tfrac{17}{16}\right) + 1933.06 * 2 * \tfrac{31}{16}$$

$$\Rightarrow R_1 = 400 * 24 - 750 * 2 * \left(\tfrac{31-17}{16}\right) - 1933.06 * \left(2 * \tfrac{31}{16}\right)$$

$$= 796.89 \text{ \#/LN}$$

$$f_b = \frac{MC}{I} = \frac{796.89 * 0.25/2}{\frac{1}{12} * 12 * (0.25)^3} = 6,375 \text{ psi}$$

$f_y = 36,000$ psi
$\therefore$ okay.

PENTA WOOD PRODUCTS, INC.
VEWI3180
RUN-OFF CALCULATIONS FOR RUN-ON CONTROL
12-May-92 MAJ

GIVEN: FROM TP-40 (TELEPHONE CONVERSATION WITH MR. GARY McDIVITT NATIONAL WEATHER SERVICE)

24 HR, 25 YEAR RAINFALL EVENT	I(24;25)	4.5 INCHES
1 HR, 25 YEAR RAINFALL EVENT	I(1;25)	2.2 INCHES

RUN-OFF COEFICIENTS ("HANDBOOK OF STEEL DRAINAGE & HIGHWAY CONSTRUCTION PRODUCTS)

ROOFS	C	0.75 TO 0.95	USE	0.90
IMPERVIOUS SOILS	C	0.40 TO 0.65	USE	0.65

(NOTE: DUE TO COMPACTED NATURE OF SITE USE HIGHER VALUE FOR UNPAED AREAS)

GENERAL EQUATION:

Q = C * I * A

WHERE:
Q = RUN-OFF (CUBIC FEET/RAINFALL)
C = RUN-OFF COEFICIENT (UNITLESS)
I = RAIN FALL INTENSITY (FEET/RAIN FALL)
A = RUN-OFF AREA (SQUARE FEET)

AREA DESCRIPTION	AREA	C	Q(24;25)	Q(1;25)
OFFICE BUILDING (NORTH HALF ONLY)	650	0.90	219.38	107.25
GARAGE (FORMER VACUUM TREATMENT BUILDING)	1340	0.90	452.25	221.10
PROPOSED ROOF AREA (SOUTH HALF ONLY)	1440	0.90	486.00	237.60
PROPOSED BUILDING AREA (SOUTH HALF ONLY)	1200	0.90	405.00	198.00
UNPAVED AREA	17167	0.65	4184.55	2045.78
TOTAL CALCULATED RUN-OFF			5747.17	2809.73
FLOW RATE (GALLONS PER MINUTE)			29.85	350.28

BASED UPON CAPACITY CHART, USE 12 IN. DIAMETER CORREGATED STEEL CULVERT AT 0.5 % GRADE

APPENDIX D

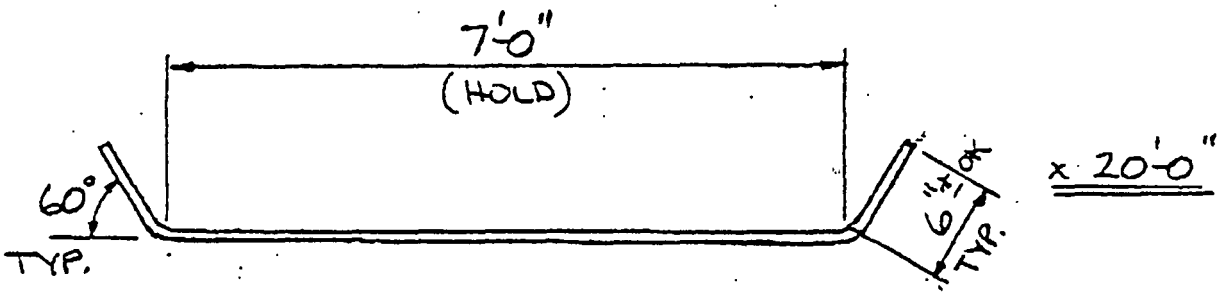
MANUFACTURER'S LITERATURE

PAPER, CALMENSON & CO.
P.O. BOX 43432 • SAINT PAUL, MINNESOTA 55164
(612) 631-1111

CUSTOMER: PENTA WOOD PRODUCTS
ADDRESS:
CITY, STATE:
PART NO. LJ728-181

Description of Part | Shop Notes: Lr. & Up
Gross Wgt. | Shipping Wgt.

CUSTOMER DRWG. NO. _____ PART NO. _____ DRWN. BY LAS DATE 3-24-92



27-PL 1/4" x 96" MILD STEEL x 20'-0"

NOTE - PARTS MUST BE UNIFORM!

ALL DIMEN. ± 1/16 UNLESS NOTED	REVISION	DATE	LETTER

Permalon®

High Strength Specialty Films

Reef Industries, Inc. P.O. Box 750245 Houston, Texas 77275-0245

PERMALON PLY X-210

Product Specifications

Permalon Ply X-210 is a uniquely engineered, multi-layered alloyed high-density polyethylene membrane. The material is composed of numerous distinct layers and is oriented in the machine direction, the transverse direction and at a 45 degree angle to both.

PROPERTY		ASTM METHOD	UNITS	PLY X-210
Thickness		D-2103	mils	18
Weight (msf)		.....	lbs/msf	80
Temp Range		.....	deg F.	-50 +200
1" Tensile	md	D-882	lbs	50
	td	"	"	52
1" Elongation		D-882	%	900
Tongue Tear		D-2262	lbs	36
PPT Tear		D-2262	lbs	37
Drop Dart		D-1709	grams	>760
WVTR		E-96	perms	0.046
Methane Perm		D-1434	$cm^3/100in^2$ atm	45.8
Radon Perm		D-1434	$cm^3/100in^2$ atm	0.078

Bacterial/Fungal transmittivity--Permalon, although not actually bacteriostatic/fungistatic in nature, has no nutritional value to microbes and will not support their growth. In light of the supporting data on gas and water permeability and the fact that polyethylenes are used to manufacture containers for biological waste, no bacterial/fungal movement through the membrane is anticipated.

UV stability - Black Permalon product inherently are the most stable against UV degradation due to the incorporation of carbon black. Fine particle size carbon blacks are the best UVI agents known and have the additional benefit of being chemically inert. The white and natural Permalon products are UV stabilized with hindered amine light stabilizers (HALS) - next to carbon black, the best long term UV stabilizers available for polyethylene.

CALL TOLL-FREE

1 / 800 / 231-2417

In Texas or outside of the continental U.S.A., call collect 713 / 484-6892

FAX: 713 / 947-2053 TELEX: 077-5154

Permalon®

High Strength Specialty Films

Reef Industries, Inc. P.O. Box 750245 Houston, Texas 77275-0245

PERMALON PLY X 210 SPECIFICATIONS

Permalon Ply X-210 is a four layer composite laminate of three layer co-extruded polyolifin film. The material is composed of 12 distinct layers and is oriented in the machine direction, the transverse direction and at a 45 degree angle to both. The polymer is compounded with copolymer impact modifiers and copolymers to improve the impact resistance along with typical properties.

Burial Properties

Physical Property	Initial Result	Post Burial Result	% Change
3" Tensile	128 pounds	126 pounds	-1.5%
3" Elongation	714%	730%	+2.2%
100% Modulus	86 pounds	87 pounds	+1.2%

The differences in the test results fall within the expected machine error for these test methods.

Permeability

The water vapor transmission specifications for the Ply X-210 are as follows:

Less than 0.04 perms.
Less than 0.0035 perm-inches
less than 10 to the -7th power cm/sec.

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FAX: 713 / 947-2053 TELEX: 077-5154

Permalon®

High Strength Specialty Films

Reef Industries, Inc. P.O. Box 750245 Houston, Texas 77275-0245

I wanted to provide you with some weatherability information on our Permalon Ply X-210. This high density, cross-laminated poly is designed to be UV resistant by a state of the art stabilization system. When exposed to harsh weather conditions , including intense sun, X-210 should last in excess of five years. When buried, this material should last indefinitely. X-210 is chemically inert, non-leachable, and is resistant to root penetration, rodents and microbials (it is not a food source). Additionally, it meets ASTM D-3083 (Soil Burial). Ply X-210 is not prone to stress-cracking (ESC), thus, making a very good moisture and Radon barrier .

I hope this information will serve useful to you and please do not hesitate to call if you should have any questions.

Respectfully,

David Dewsnap
Chemist, Reef Industries

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Permalon®

High Strength Specialty Films

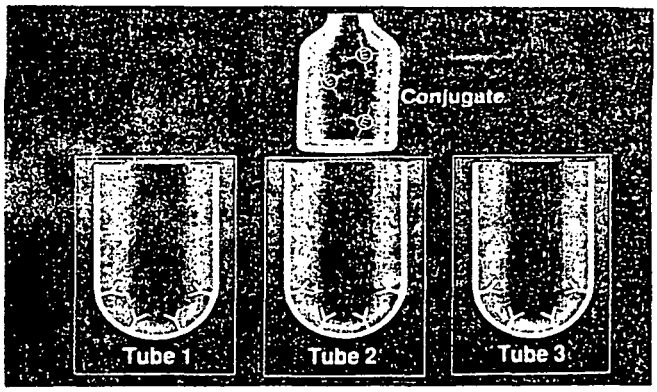
Reef Industries, Inc. P.O. Box 750245 Houston, Texas 77275-0245

PERMALON X-150

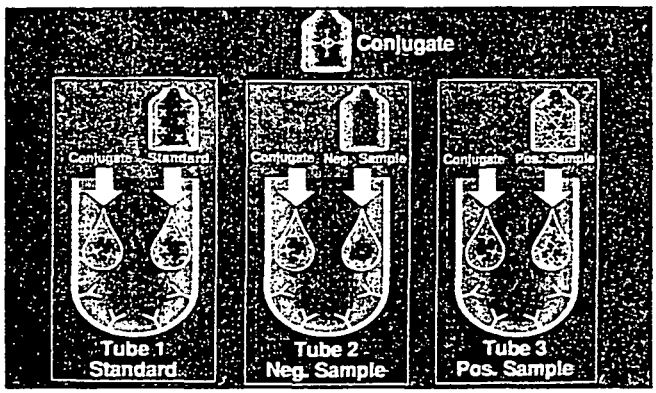
PROPERTY		ASTM	UNITS	VALUE
THICKNESS		D-2103	mils	9.0
STD WT		D-2103	lb/msf	30.5
1" TENSILE	- MD	D- 882	lbf	23.0
1" TENSILE	- TD	D- 882	lbf	27.0
1" ELONGATION	- MD	D- 882	%	550
1" ELONGATION	- TD	D- 882	%	450
TONGUE TEAR	- MD	D-1938	lbf	4.5
TONGUE TEAR	- TD	D-1938	lbf	3.5
PPT TEAR	- MD	D-2582	lbf	25.0
PPT TEAR	- TD	D-2582	lbf	20.0
SHRINKAGE	- AREA	D-1204	%	< 2.0
DROP DART		D-1709	g	900
COLD CRACK		D-1709	°F	< -50

February 20th, 1990
X-150.WK1

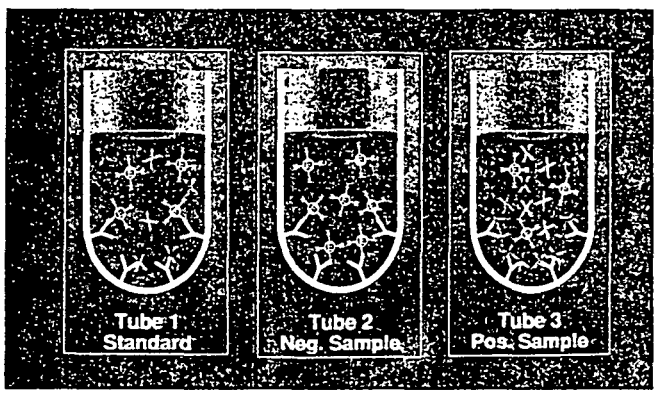
CALL TOLL-FREE
1 / 800 / 231-2417
In Texas or outside of the continental U.S.A., call collect 713 / 484-6892
FAX: 713 / 947-2053 TELEX: 077-5154



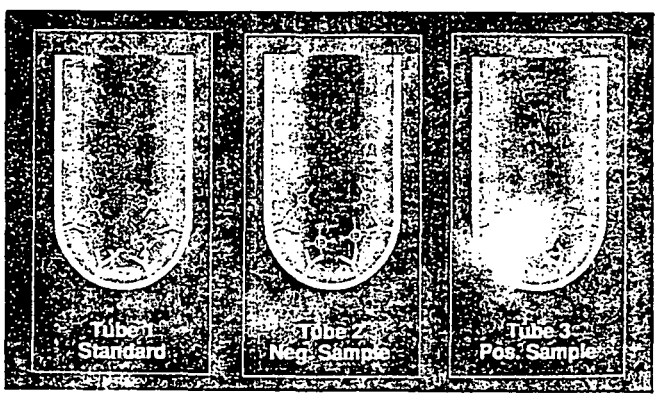
1. Components in ELISA chemistry



2. Enzyme addition



3. Incubation and competitive binding reaction



Ensys Inc.

4. Wash

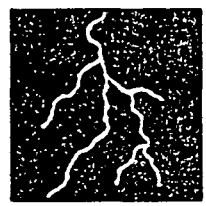
Scientific swapping

Onsite analytical technology uses medical technology to detect organic content

By Kimberly A. Roy

Technology used for home pregnancy tests recently gave birth to an onsite technique for determining environmental contamination. Although the underlying chemistry differs slightly, both procedures rely on immunoassay technology, where the specific binding characteristics of an antibody are used to detect or quantify a substance.

Immunoassay technology made its debut on the environmental stage in January, when a kit to detect pentachlorophenol (PCP) in water was introduced by Ensys Inc. (Research Triangle Park, N.C.). The technology is a proven one whose history dates back almost 100 years, relates Stephen D. Friedman, the company's vice president of research and development and one of its founders. It has been used as the basis for numerous cost-effective and efficient medical tests, including home pregnancy and drugs-of-abuse tests, as well as blood typing. Several immunoassay techniques exist; the one used by Ensys is known as ELISA, or enzyme-linked immunosorbent assay.



NEW TECHNOLOGY

Immunoassay techniques rely on the specific binding characteristics of antibodies. The first step in producing a viable test, therefore, involves cultivating an appropriate antibody that will bind with a high degree of specificity to a contaminant sometimes present in low concentrations.

The body produces antibodies as part of its immune response to foreign substances, such as viruses and pathogenic bacteria. Producing them in the lab typically involves immunizing an animal with low, non-lethal doses of a target contaminant to stimulate an immune response.

Environmental contaminants, although toxic, typically are too small to be recognized by the immune system, Friedman says. Such contaminants, therefore, are conjugated, or "glued," to the surface of a larger molecule, such as the protein albumin, before they are injected into an animal, he says.

Also known as immunogens, these conjugates — contaminant molecules bound to protein molecules — are large enough, complex enough and adequately different for

he notes, can take four to six weeks and cost between $200 and $2,000 per sample. Meanwhile, the Ensys immunoassay tests provide a new tool for subsequent stages of cleanup, he asserts, including site characterization (mapping), remediation and monitoring. For example, the tests can be used to produce onsite a two-dimensional contamination map using a statistically significant number of samples, which would be costly using traditional laboratory techniques. Long lab turnaround times also would make results obsolete, he notes. The kits also can be used to track a subterranean contaminant plume as cleanup progresses and to monitor the effectiveness of remediation after closure.

"I think there are some compelling reasons why there might be a future" for immunoassay tests, says Ensys President Alan Staple. "The most significant impact," he continues, "is likely to be at the field level ... where it will give the crew the ability to act more efficiently (based on) immediate feedback." Besides lower sampling costs — the Ensys technique costs between $15 and $30 per sample — rapid turnaround reduces onsite costs by minimizing downtime associated with slow lab turnaround, he says.

Other alternatives to the Ensys kit exist, Friedman concedes, but he describes them as "somewhat limited in scope." For example, portable gas chromatographs (GCs) require constant calibration and a trained technician, and can process only one sample at a time, he says. Photovoltaic "sniffers," which detect volatile compounds, are "fraught with problems with interference, and their efficiency often is influenced by temperature and humidity factors," he continues. Tests for detecting heavy metals also exist, he adds, but typically are inappropriate for priority pollutants.

Immunoassay tests, on the other hand, "can be applied to a broad range of compounds," Friedman asserts, although they are not without limitations. For example, "they are not directly applicable to many small compounds, including heavy metals and chlorinated solvents, such as methylene chloride and trichloroethylene," he says. "These compounds present technical challenges in stimulating an immune response to produce antibodies. Lipophilic compounds, such as larger polycyclic aromatic hydrocarbons (PAHs), likewise present technical challenges for aqueous-based immunoassays, because many of these compounds have exceptionally low solubility in water.

"Other developmental challenges involve 'relatively unremarkable' contaminants, which chemically look like other compounds," he continues. "Such compounds require a sophisticated approach to immunoassay development in order to avoid producing a highly non-specific method. Through manipulation, however, immunoassays can be adapted in almost all cases to produce useful, cost-effective screening tools."

Test sensitivity also can be affected by temperature, which must be considered when designing a test program, Friedman says. "Masking," where antibodies preferentially recognize a chemical other than the targeted one, also can be a problem, he concedes, but is minimized by screening the antibodies carefully for specificity during the research phase. This phenomenon can cause false positive results but not false negatives, he adds. For example, antibodies that recognize the two methyl groups and benzene ring of xylene also may recognize toluene, which has a single methyl group, if they were not screened carefully for specificity. "The purpose (of the test) must be clear from the beginning of antibody development," he says, noting that the company's test for PCBs is purposely sensitive to all of the major Aroclors rather than one specific molecule or Aroclor mixture.

According to a report by an independent environmental lab on the PENTA RISc™ test for PCP in water, the Ensys test "is highly specific for pentachlorophenol." The cross reactivities of phenol and various chlorinated phenolics, as well as miscellaneous non-phenolic compounds, including diesel fuel, creosote and chromated copper arsenate, were "found to be negligible," the report says. "The only compound that gave a significant response (63 percent) was tetrachlorophenol, which is typically only a minor component of penta wood-treating solutions." Friedman says this cross reactivity is desirable, because members of the wood-treating industry wanted to know about tetrachlorophenol as well as the penta isomer.

Because the Ensys technique relies on a chromogenic reaction, those performing the tests require some training. "We have found that, basically, a lay person trained for an hour or so is effectively able to use the test kit," Friedman says. "After one hour of training, an analyst can achieve an 85 percent confidence level" when results are compared to the GC reference method.

According to an evaluation of the PCB test kit performed by Roy F. Weston Inc. (West Chester, Pa.), results from 27 of 30, or 90 percent, of non-diluted samples matched those of GC analysis. In 25 of 30 tests, or 83 percent, involving diluted samples, the Ensys results matched those achieved with a GC. The tests involved the PCB soil test and were sponsored by the Gas Research Institute (Chicago).

In the Weston evaluation, 20 out of 21 samples with contaminant concentrations greater than 5 ppm (by GC) were reported as such by the Ensys test kit, and nine out of 12 samples greater than 50 ppm were reported correctly. These results indicate a 75 percent confidence level at concentrations greater than 50 ppm and 95 percent at concentrations greater than 5 ppm.

Screening tests "should produce a minimum number of false negatives," Friedman says. "Even false positives are preferable. They can be a nuisance and can be expensive if produced in too high a frequency, but false negatives carry liability."

Immunoassay test kits for PCP in water first were developed by the now-defunct Westinghouse Bio-Analytic Systems (WBAS; Rockville, Md.) and were evaluated under EPA's Superfund Innovative Technology Evaluation (SITE) program at the Agency's Environmental Monitoring Systems Laboratory (Las Vegas). According to Friedman, the antibodies were reported on favorably.

In its report, EPA says: "Although the immunoassay methods evaluated are not as precise as traditional methods, they have several outstanding features. Principal among these are the rapid turnaround times for total analysis and the low cost per sample. The immunoassay methods are also field portable.... The immunoassays have detection limits and linear dynamic ranges comparable to those of traditional methods. A reduced level of accuracy is a limitation usually encountered when a system is configured for simple field-portable use.

"Though an immunoassay can be developed for a specific target analyte, it may be subject to certain interference effects from non-target compounds as well as from matrix effects unless a more involved extraction is used," the report continues. "It is noteworthy that this study found no evidence of false negative results.... The majority of false positives occurred at values near the lower limit of detection for each method.... The overall performance shown in these

United States
Environmental Protection
Agency

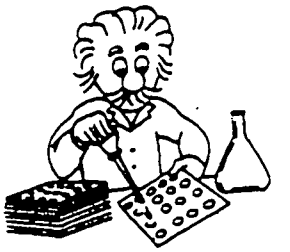
Environmental Monitoring
Systems Laboratory
P.O. Box 93478
Las Vegas NV 89193-3478

November 1991

TECHNOLOGY SUPPORT PROJECT

EPA

Immunochemistry for Environmental Monitoring



INTRODUCTION

The Environmental Monitoring Systems Laboratory - Las Vegas (EMSL-LV) is pioneering an investigation into the usefulness of several immunochemical techniques for monitoring the extent of contamination in various environmental and biological matrices. Immunochemistry includes all methods of sample preparation and analysis that incorporate antibodies that have been developed for specific analytes or groups of analytes. Enzyme-based immunochemical techniques have been in use since the '70s and more recent efforts have focused on their applicability to the complex matrices that face environmental scientists. The EMSL-LV has developed and demonstrated several immunochemical techniques and believes that these methods hold great promise for the quantitative analysis of target analytes for use in ground-water surveillance, *in situ* hazardous waste site monitoring, and assessment of human exposure. Current work involves the analysis of chemicals, like PCBs, nitroaromatics, and certain pesticides, that are difficult to analyze by other analytical methods.

BACKGROUND

Immunochemistry includes techniques such as immunoaffinity and immunoassay. Immunoaffinity is a sample preparation procedure that takes advantage of the attraction between an antibody and a specific analyte. Immunoaffinity preparations have great potential for cleanup of complex samples like dioxins. By rinsing a sample over an antibody-treated surface, scientists can isolate particular compounds in the sample that adhere to the antibody. The isolated compound is then eluted from the immobilized antibody and is ready for analysis by chromatography or immunoassay. One common immunoassay is the enzyme-linked immunosorbent assay (ELISA). The specificity of the antibody for the analyte and the resultant immune complex is the basis for the specificity of immunoassays. Most field immunoassays are colorimetric analytical methods that quantify compounds of interest. A sample is spiked with a known amount of a labelled analyte. The label is typically an enzyme. A chromogenic substrate is added to serve as an indicator of compound concentration in the sample. Laboratory-based immunoassays include fluorescent and radioactive methods that have greater sensitivity but are less portable.

FIELD USE

Immunoassays are portable, rugged, and inexpensive. Their use at hazardous waste sites has been investigated by the EMSL-LV. The results of Superfund Innovative Technology Evaluation (SITE) studies indicate a strong correlation between field immunoassays, laboratory immunoassays, and gas chromatography/mass spectrometry. The only equipment needed is a spectrophotometer, various microtiter plates or test tubes, precision pipets, and immunologic reagents. The 96-well microtiter plate is approximately 3" x 6" and has 96 depressions, each capable of holding about 250 µL liquid. Smaller microtiter strips are available that can be assembled to form modular sections for individual analytes. These plates and test tubes are available precoated with the antibody base.

Another field use of immunochemistry is being explored at the EMSL-LV. This use may revolutionize safety and exposure precautions used by workers who deal with hazardous chemicals. Dosimeter badges with an immunochemical twist are available for pentachlorophenol and nitroaromatics. These personal exposure monitors (PEMs) are lightweight, inexpensive, can be analyzed quickly, and provide real time indication of exposure. These badges employ a microdialysis tubing containing an immobilized antibody phase. Immediate identification of high exposure levels is critical to the conduct of safe site characterization.

National Environmental Technology Applications Corporation (412) 826-5511

NETAC

ENVIRONMENTAL PRODUCT PROFILES

EnSys On-Site Analytical Test Kits

Process Description

- ▲ *Immunoassay/ Chromogenic Technique*

EnSys On-Site Analytical Test Kits provide "real time" analysis of soil and water samples under field conditions. The disposable, hand-held kits operate through the use of immunoassay (antibody reactions) and chromogenic (color generation) technologies orginally developed for the healthcare industry. Samples are tested using tubes coated with an antibody that is specific to an individual compound (e.g., a test for pentachlorophenol) or class of compounds (e.g., a test for PCBs). Reactions with the antibody result in a color change that is proportional to the concentration of the compound in the sample. The color change is then read by a comparative photometer to quantify contaminant concentrations. The test kits are most efficiently used to screen samples to determine the presence of the contaminant of interest. EnSys developed this technique as an alternative to current on-site analysis methods. According to a February 1991 report by the U.S. EPA Environmental Monitoring Systems Laboratory (Las Vegas, Nevada), advantages of the immunoassay method include speed and accuracy of analysis and relatively low cost. Table 1 lists the test kits that are currently available.

TABLE 1: AVAILABLE TEST KITS

Test Kit	Detection Limit
Gasoline soil test	10.0 ppm
PCB soil test	5.0 ppm
PCB wipe test	10 ug per 100 cm^2
PCP soil test	0.5 ppm
PCP water test	5.0 ppb

Reprinted from *Environmental Technology and Product Profiles*, a NETAC publication featuring innovative and emerging environmental technologies.

Process Application

- ▲ *Soil*
- ▲ *Groundwater*
- ▲ *Wastewater*
- ▲ *Field Analysis and Screening*
- ▲ *PCP*
- ▲ *PCBs*
- ▲ *Gasoline*

The test kits can be used to determine contaminant concentrations in soil, groundwater, or wastewater samples. Typical applications include site assessment, contaminant mapping, evaluating the effectiveness of remediation, and groundwater and effluent monitoring at landfills, chemical spill areas, and underground storage tank sites. Specific applications for on-site water testing include effluent discharge permit compliance, wastewater treatment process control, and groundwater quality assessment. The company currently offers test kits that screen for pentachlorophenol, PCBs, or gasoline. A unit that will test for polyaromatic hydrocarbons (PAHs) is currently under development. The pentachlorophenol test kit was evaluated under the U.S. EPA SITE Demonstration Program. This study showed that results obtained using the kit were comparable to GC/MS field results. Table 2 summarizes potential applications of the test kits.

TABLE 2: POTENTIAL APPLICATIONS

- Site assessment and monitoring
- Evaluation of remediation effectiveness
- Emergency response assessments
- Wastewater treatment process control
- Stormwater runoff discharge compliance
- Wastewater treatment discharge compliance

CONTACT: EnSys, Inc. P.O. Box 14063 Research Triangle Park, NC 27709 (800) 242-7472

ENSYS PROFILES

Site Assessment at Formerly Used Wood Treating Sites

SITE CHARACTERISTICS

Wood treating sites are generally large, 10–50 acres, and often have been in service for over 30 years. As a result, soil and groundwater contamination from the continual use of preservative solutions is extensive. The main wood preserving chemical of concern is pentachlorophenol. PCP is listed as a potential carcinogen. It is highly soluble and is often found in ground water at distances of several miles from the wood treating facility.

Wood treating sites are often located in rural or remote areas which increases the cost of all site related activities. Site assessment usually requires a significant mobilization of heavy equipment and engineering staff.

THE PROBLEM

PCP moves relatively easily through soil and water systems. Large wood treating sites require extensive sampling in order to provide an accurate three dimensional assessment of contamination. Sample matrices are complex due to cross contamination by other organic and inorganic compounds. Removal of PCP-contaminated material is expensive. How can site assessments be carried out to provide a realistic estimate of clean–up costs?

THE SOLUTION

The EPA has completed extensive tests of the EnSys PCP RISc™ field analytical system and recommends its use for for field analysis of PCP contaminated samples.

Benefits of On–Site Analysis for PCP

Project Quality

Extensive sampling at remote sites can be carried out with the PCP field test system leading to improved data quality and decision making. With detection capability of 5 parts per billion in water and 500 parts per billion in soil, the test system can ensure that all contaminated areas are located.

Time

Field operators can process 50–75 samples per day with the PCP test system greatly increasing the site area that can be investigated.

Money

The use of this field analytical method typically reduces analytical costs by 60% and site assessment costs by 20%–40%.

PENTA RISC

On-Site Testing for Pentachlorophenol in Soil

TEST USES

Site Mapping
Screening for Contamination During Excavation
Remediation Process Monitoring

ADVANTAGES

Results in 20 Minutes
Sensitive to 0.5 ppm
Accuracy Comparable to GC/MS
Screen On-Site: Reduce Analytical Costs

ENSYS INC.

ENSYS INC.

VALIDATION DATA FOR PENTA RISc™ SOIL TEST KIT

The PENTA RISc™ Soil Test Kit is a fast, easy-to-use system for screening soil samples for pentachlorophenol (PCP) over the range of 500 ppb to 1000 ppm. The test can be performed to indicate whether the pentachlorophenol in a sample is above or below a relevant concentration, or it can be used to establish a range for the pentachlorophenol concentration in a sample.

A comparison of several methods for pentachlorophenol determination in soil is given in Table 1. The PENTA RISc™ Soil Test compares favorably with other commonly used methods for each of the important analysis criteria.

Table 1

PCP IN SOIL
ANALYTICAL METHOD COMPARISON

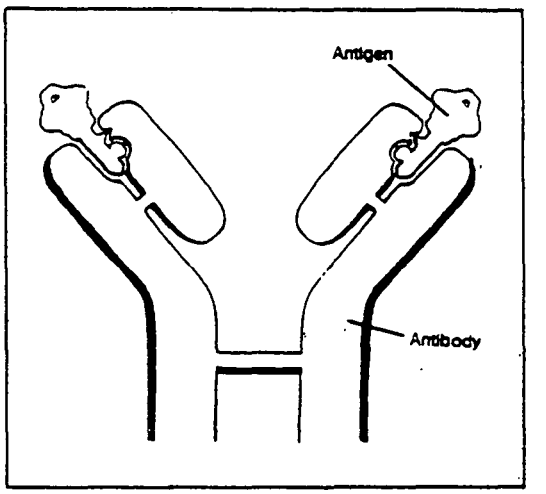
Method	Quantitation Limit	Typical Accuracy	Rapid On-Site Analysis	Total Analysis Time	Cost
EnSys PENTA RISc™	500 ppb	+/- 30%	Yes	0.3 hr.	$50
Field GC	500 ppb	+/-100%	Yes	2.0 hr.	$75
EPA Method 8270 GC/MS	50 ppb	+/- 15%	No	5.0 hr.	$200 - $500

P.O. Box 14063, Research Triangle Park, NC 27709
Royal Center, 4222 Emperor Blvd., Morrisville, NC 27560
(919) 941-5509 (919) 941-5519 FAX

PRINCIPLE OF THE PENTA RISc™ TEST

EnSys' test for pentachlorophenol (PCP) is based on an analytical method in which an antibody recognizes and binds to a specific chemical or antigen.

An antibody is developed that will attach to a small organic molecule such as PCP at very low concentrations (ppb range) with a high degree of specificity. The figure below illustrates how antigen molecules "fit" into antibodies. An antibody is analogous to a lock in the sense that there is a unique antigen shape, or key, that fits into it.



The test itself is a competitive assay in which the specially designed antibodies will bind both with PCP molecules in the unknown sample and with molecules of a PCP-enzyme conjugate. The conjugate reagent is an enzyme to which molecules of PCP have been chemically attached. PCP molecules in the sample compete with the PCP-end of the conjugate reagent for a limited number of antibody binding sites. The greater the number of sample-derived PCP molecules relative to enzyme-attached PCP molecules, the larger the proportion of antibody binding sites that are occupied by PCP molecules originating from the sample.

After an incubation period during which the competitive binding occurs, unbound PCP and PCP-enzyme conjugate molecules are washed away and color-change reagents are added. The enzyme part of the bound conjugate molecules catalyzes the oxidation of a colorless substance to a colored (blue) substance. The reaction is stopped by addition of dilute sulfuric acid (blue solution turns yellow), and the results are conveniently interpreted in the EnSys photometer.

The degree of color development at the end of the test is proportional to the number of PCP-enzyme conjugate molecules bound to the antibody sites. Since the developed color intensity is inversely proportional to the number of PCP molecules in the sample, the concentration of a chemical in an environmental sample can be easily determined.

TYPICAL APPLICATIONS OF PENTA RISc™ SOIL TEST

EnSys PENTA RISc™ Soil Test can be used to survey PCP contamination levels in soil rapidly and cost–effectively. The test can be used both in initially assessing degrees of contamination and in remediation process monitoring.

The high sensitivity and specificity of the PENTA RISc™ Test System permits the clean differentiation of positive soil samples from those containing no pentachlorophenol. The positives can then be sent out for confirmation without incurring the laboratory analysis costs for uncontaminated samples.

The PENTA RISc™ Soil Test has been used to map the extent of contamination of pentachlorophenol on wood preserving sites. To accomplish this a sampling grid is typically set up on the site and samples are collected, composited, and homogenized. A single field worker can then use the PENTA RISc™ Soil Test to screen up to 50 of these samples in an 8 hour day and provide a quick, accurate map of pentachlorophenol contamination on the site. The results can be used to determine the boundaries of contamination, define "clean" ares, and estimate the volume of contaminated soil.

PENTA RISc™ SOIL TEST VALIDATION

The PENTA RISc™ Soil Test system has been evaluated with soil samples collected from six wood preserving plant sites distributed throughout the U.S. The evaluation was conducted by personnel at Mississippi State Forest Products Laboratory (MFPL). MFPL is well–recognized in the wood preserving industry for their analytical expertise.

The soil samples were homogenized, split, and analyzed by the PENTA RISc™ Soil Test and by EPA Method 8270, the standard GC/MS method for semivolatile compounds such as pentachlorophenol.

The PENTA RISc™ Soil Test was used to quickly range the samples. This was done by performing three dilutions of each sample and comparing the color development with a standard.

As shown by the data in Table 2, the PENTA RISc™ Soil Test is very accurate when compared with the GC/MS reference method.

TABLE 2

PENTA RISc™ Soil Test Validation
Mississippi Forest Products Laboratory

Sample ID MFPL #	Interpretation at 0.5 ppm	Interpretation at 5 ppm	Interpretation at 50 ppm	GC/MS value (ppm)	Correct
910312-1	>0.5	<5	<50	2	Yes
910312-2	>0.5	>5	<50	7	Yes
910312-3	>0.5	>5	<50	12	Yes
910312-4	>0.5	<5	<50	3	Yes
910312-5	>0.5	>5	>50	46	No
910312-6	>0.5	<5	<50	<1	Yes
910312-7	>0.5	>5	<50	22	Yes
910321-1	>0.5	<5	<50	3	Yes
910321-2	>0.5	>5	<50	5	Yes
910321-3	>0.5	>5	<50	11	Yes
910405-1	>0.5	>5	<50	20	Yes
910405-2	>0.5	>5	<50	33	Yes
910405-3	>0.5	>5	>50	56	Yes
910405-4	>0.5	>5	>50	65	Yes
910405-5	>0.5	>5	>50	74	Yes

REGULATORY ACCEPTABILITY

The PENTA RISc™ Soil Test employs immunoassay technology, approved by the Food and Drug Administration for numerous medical testing applications. This technology allows rapid (less than 30 minutes), accurate, interference–free testing for the presence of hazardous chemicals in samples of environmental significance (e.g., soil and water matrices).

The immunoassay technology for pentachlorophenol testing has been evaluated for environmental applications under the EPA's Superfund Innovative Technology Evaluation (SITE) program. The EPA study (Van Emon, J. M., et al., "U.S. EPA Evaluation of Two Pentachlorophenol Immunoassay Systems", EPA Environmental Monitoring Systems Laboratory, Las Vegas, NV, 1991) showed that results obtained in the field using the immunoassay test were comparable to the GC/MS results.

In addition, the authors cited several outstanding features of the immunoassay methods: rapid turnaround times for total analysis, low cost per sample, field portability, minimal training requirement, detection limits and linear dynamic ranges comparable to those of traditional methods, and no evidence of false negative results (an important feature of a screening method). The overall performance shown in this study demonstrates that immunoassays can provide appropriate information for rapid on–site field decision–making.

CROSS–REACTIVITY

The PENTA RISc™ Soil Test is highly specific for pentachlorophenol. The cross–reactivities of the following compounds were tested and found to be negligible: phenol and various chlorinated phenolics, miscellaneous non–phenolic compounds including diesel fuel, creosote and chromated copper arsenate. The only compound that gave a significant response (63%) was tetrachlorophenol, which is typically only a minor component of penta wood–treating solutions.