RESIDENTIAL TREATMENT AND RESPITE FACILITY

FINAL REPORT

Prepared For:

Management Team
Orpe Human Rights Advocates.
Member of HAND

Prepared By:

Construction Option
April 3, 2021

Integrated Behavioral Health Facility

PROJECT TEAM

Owner: Orpe Human Rights Advocates

Design-Builder: H Construction + Engineering Services

Architect: Evan Wivell

Associate Architect: Evan Wivell

Civil Engineer: Wiles Mensch

Landscape: AGLA Consulting

Structural: ADTEK

M/E/P: Setty and Associates International, PLLC

BUILDING STATISTICS

Function: Integrated Behavioral Health & Supportive Services Facility
Size: 14,950 SF
Building A: 2 stories, 12,950

SF Building B: 1story, 8,500 SF

Construction: June 2021— August 2022 Delivery

Method: Design-Build w/ CM at Risk

ARCHITECTURE

Purpose: Residential Treatment & Respite Facility for Pregnant & Postpartum Women with SUD

Spaces: Behavioral Health Building, Primary Care, Rehab and supportive services Building: Clinic, Residential-20 Beds; Conference rooms, Classrooms, Admin Spaces

Material: Prefab Modular Structure, Sandwich Panels, Aluminum Panels and Storefront Style Glass Curtain Walls

STRUCTURAL

Main Floors: Ordinary Steel Construction with Concentrically braced frames.

Roof: metal decking on Open Web Steel Truss

Foundation: Spread Footings on Structural Fill or Undisturbed Earth

ELECTRICAL

Power Distribution: Two Switchboards 3,000A 480/277V 3PH 4W

Step Down Transformers: Multiple per floor for 208/120V Loads

MECHANICAL

Ventilation: Dedicated Outdoor Air System with VAV's **Hea Loads:** Gas Fired Parallel Boilers supply AHU's and Reheat Coils at VAV's

Cooling Loads: Cooling tower with 2 Dual Centrifugal Chillers supply AHU's and DOAS/VAV System

TABLE OF CONTENTS

Part 2: Project Budget Narrative

Part 3: APPENDIX

EXECUTIVE SUMMARY

The following report contains information and analyzes related to the construction of Residential Treatment and Respite Facility in Maryland . The initial sections contain background information and data pertaining to the project , followed by four analyzes created to theoretically study the Constructability, Schedule Acceleration and Value Engineering of a construction project. The framework for this report is created by the Construction Management Team of Orpe Human Rights Advocates and Architectural Team from AGLA Consulting.

Analysis One: Maximizing BIM Investment

The use of Building Information Modeling, BIM, on Orpe Residential Treatment Facility was an effective way to facilitate trade coordination . Using BIM assisted in coordinating the large amount of MEP systems in areas confined by low floor to structure heights and the desire to eliminate field clashes of these components. While this decision was one great way to coordinate MEP Systems there are many uses that can make BIM efforts more beneficial. Building Information Modeling can be much more than a 3- D clash detecting model if the goals and uses are defined early on in a project. This critical industry issue of high initial costs associated with BIM can be justified if the end results and valuable inputs of Building Information Modeling are maximized. This topic was a Critical Industry discussion at the Orpe Charity's Construction Management Team Roundtables.

Analysis Two: Optimizing Value Engineering

Analysis two looks at some possible Value Engineering (VE) Solutions to clear the hurdle of “LEED” elements being excluded from the VE Process. The pre-engineering structure steel frame, metal stud crete, slab-on-grade foundation, and green roof will be at the center of this analysis and investigation. We focus into the impacts of the green roof on other building systems. Value Engineering that dismisses LEED elements can unknowingly overlook cost effective benefits that can add real value and reduce total project costs and schedule.

Analysis Three: Alternative Exterior Wall Assemblies

Exterior enclosure is a major schedule risk to the projects timely completion. The current design for the exterior walls is exterior modular panels. Issues that come from use of a CMU wall are its duration, weather impacts, cleanliness and ability for changes and acceleration during MEP rough in. Analysis three will develop and evaluate two alternate assemblies. The path to this topic began with a site visit, during which the engineers analyzed the environmental impact of the project and advising the easy assembling building prefab house built with cost saving light weight building wall panels.

BACKGROUND

A. INTRODUCTION

The Orpe Charity 's Residential Treatment and Respite Facility will be a 21,400 gross square foot new facility divided in two buildings (A) and (B). Building (A) will serve for Residential and Respite Center dedicated to house pregnant and postpartum women with substance use disorders (SU) and their infants . The building (A) will have 24 rooms and 24 beds, nurse station, control center , commercial kitchen , eating , visitor rooms , psychologist and mental heath specialist offices , rehab specialist stations , conference room , classrooms for training and skills building , computer lab, beauty salon , and fitness center . The facility of a size of 74'x 183 ' or 8, 450 SF is designed to conform the SAMSHA requirements of OTP . Treatment Programs include MAT (Medical Assisted Treatment), and holistic treatments - self-sufficient income programs including vocational education and self-efficacy programs . This newly developed STEM Concept allows participants to learn in a very practical and hands -on manner . The STEM requirements allow for integral design of classroom and laboratory spaces . An emphasis on using the most current classroom technologies . Classrooms will use interactive smart board technology . The building (B) is dedicated to serve as a community primary care health clinic and capacity building and educational building . This 2 stories building of a total size of 14950 SF. The building will seat primary care clinic and coordinated supportive and social services . The building seats the following services : reception area , nurse station , 4 exam rooms , procedure room , doctor /physician offices , labs, and intake rooms . The educational and skills building component is dedicated to low-incomes from the status of insufficient to the status of self-sufficient incomes. This developed STEM Concept draws on providing professional skills to participants to learn in a very practical and hands -on manner . The STEM requirements allow for integral design of classroom and laboratory spaces . An emphasis on using the most current classroom technologies . Classrooms will use interactive smart board technology . The building (B) is dedicated to serve as a community primary care health clinic and capacity building and educational building . This 2 stories building of a total size of 14950 SF. The building will seat primary care clinic and coordinated supportive and social services . The building seats the following services : reception area , nurse station , 4 exam rooms , procedure room , doctor / physician offices , labs , intake rooms , ant room , social works rooms , breakroom , manager officers , administration offices. the building has reserved space where will seat services such as coordinated supportive services and social services.

B. THE INITIATIVE

Orpe Human Rights Advocates also doing business under Orpe Charity is the initiator of this project. The organization is a recognized 501 (C)(3) entity . The project will be implemented in partnership with the University of Maryland Baltimore Washington Medical Center . The overall concept that Orpe Charity is really excited about on this project is that it will be the first nonprofit in Maryland to promote a concept a rehabilitation program based on "All in One " that integrate behavioral health , primary care , social services , legal aid, capacity and skills building within the purpose of moving low income or people living poverty from the status of insufficient incomes towards the status of self -sufficient incomes . Programs are built within the concern of restoring human dignity and the development of low-income community of Maryland. Part of the programs that don't respond to the criterion of the project MOM will be made available to the public without discrimination based on race , gender , religion, ethnic origin, nationality, or sexual orientation. The stakeholders will be satisfied with the effectiveness of this after being implemented in Maryland . The University of Maryland Baltimore Washington Medical Center has already offered support to the project, proving that this facility is highly regarded and public in Maryland.

Part I

Project Description

Orpe Construction P. Mgmt Team

Orpe Construction Project Management Team (OCPMT) is aware that a successful project is established when proper planning and procedures are implemented systematically ." Project controls encompass the processes , experience , people skills, and tools used to plan, manage , monitor and mitigate any risk or event that may effect the cost and schedule of a project. These controls are the discipline and methodical processes used to support project management methodologies that focus on controlling the schedule and cost of the project . Orpe Project Management Team will be focusing on controlling the following tasks:

1. Planning & Scheduling
2. Risk Management (Assessment, Identification & Mitigation)
3. Cost Estimating
4. Cost Management & Assurance
5. Schedule Management & Control
6. Change Order Management
7. Document Control
8. Supplier Performance
9. Project Reporting

The role of OCPMT is to bear responsibility for completing each project in accordance with the performance objectives outlined in the construction contract.

ORPE Project Management Team is composed of project management consultants and project costs control specialists who will be conveying the projects status and direction from a schedule , cost and risk perspective . By examining the trends and remaining focused on all areas within a project , any approaching risks potentially impacting the project schedule or budget are brought to the forefront , initially for team discussion and mitigation . Not only do these controls clarify the gravity of trends , they will rigidly be documenting all facets of the project journey for future reference . Project controls are essential to successful project and program management , regardless of cost or scope . " PROJECT CONTROLS : Establish the reporting structure and customized reports , thus bridging the information gap among stakeholders Compile and access the projects ' actual progress (schedule & cost) on regular intervals to leverage trends and forecast a realistic completion Clearly identify how approaching risks impact the projects ' schedule and budget , and drive these to the forefront for discussion and mitigation if necessary . Enable complete transparency and accountability of all projects WHAT IS A PROJECT CONTROL DOCUMENT ? A project control document is a formal report vetted by the entire project management team that clearly conveys the project 's status and direction from a schedule , cost and risk perspective . These critical documents contain data that supports forecasts and highlights decision points to ensure that the project remains on course to successful completion . In the case of a troubled project , this data has the tenor to get the project back on the rails for a satisfactory conclusion to the cycle.

As a project and program management team working across all sectors of the built environment , OCPMT focuses on minimizing risk and creating opportunities to maximize the value of our organization 's development and property assets . OCPMT will continually be building on a strong foundation of predictable excellence by utilizing years of technical expertise , innovative technologies , and unrivaled dedication of its members and consultants . With some of its OCPMT experts having an extensive history of mastery in project controls , we are able to provide valuable insight and service in:

1) Project Management : Some of the OCPMT have executed projects through effective planning , the right team , and rigorous controls . our project management approach reduces risk and helps deliver projects in a consistent and improved manner while managing a process that is demanding and complex , especially when under acute time pressure.

2) Program Management : Our team members have experience of working with entities that organize the creation of the world ' s most extensive , sophisticated and fast-paced programs of work within the built environment . They are consultants and are expert in providing independent advice , comprehensive support, and an unrivaled commitment to successful delivery .

3) Cost Management : One of our utmost goal is optimizing cost performance at every stage throughout the program from day one. With our breadth of market intelligence , we will be establishing project viability with a clean , robust baseline . From inception to post -completion , our network of experts provide expertise on cost management that ensures value for our organization when projects come in on budget . 4) Risk Management : By identifying risks at the earliest possible stage, effective mitigation strategies can be implemented to control and manage risk proactively . With our systematic approach to Risk Management , OCPMT will be undertaking a concurrent cost and schedule risk analysis that allows us to run multiple scenarios on the budget and program .

PROJECT DELIVERY SYSTEM

The original project was arranged to be a Design-Build with CM at Risk. Through conversations with involved parties, the project has morphed into a more structural steel delivery. Structural steel delivery l method was chosen to allow the project to begin development prior to completion of all Construction Documents . To allow for completion on time and satisfy the wants from the owner in the time desired created a scenario that would be best fit by the Structural Steel Delivery Method . The design and construction component was entrusted to AISC - Mrs . Stacy Chu , structural steel specialistswas entrusted the duty of overseeing over the excusion of this project.

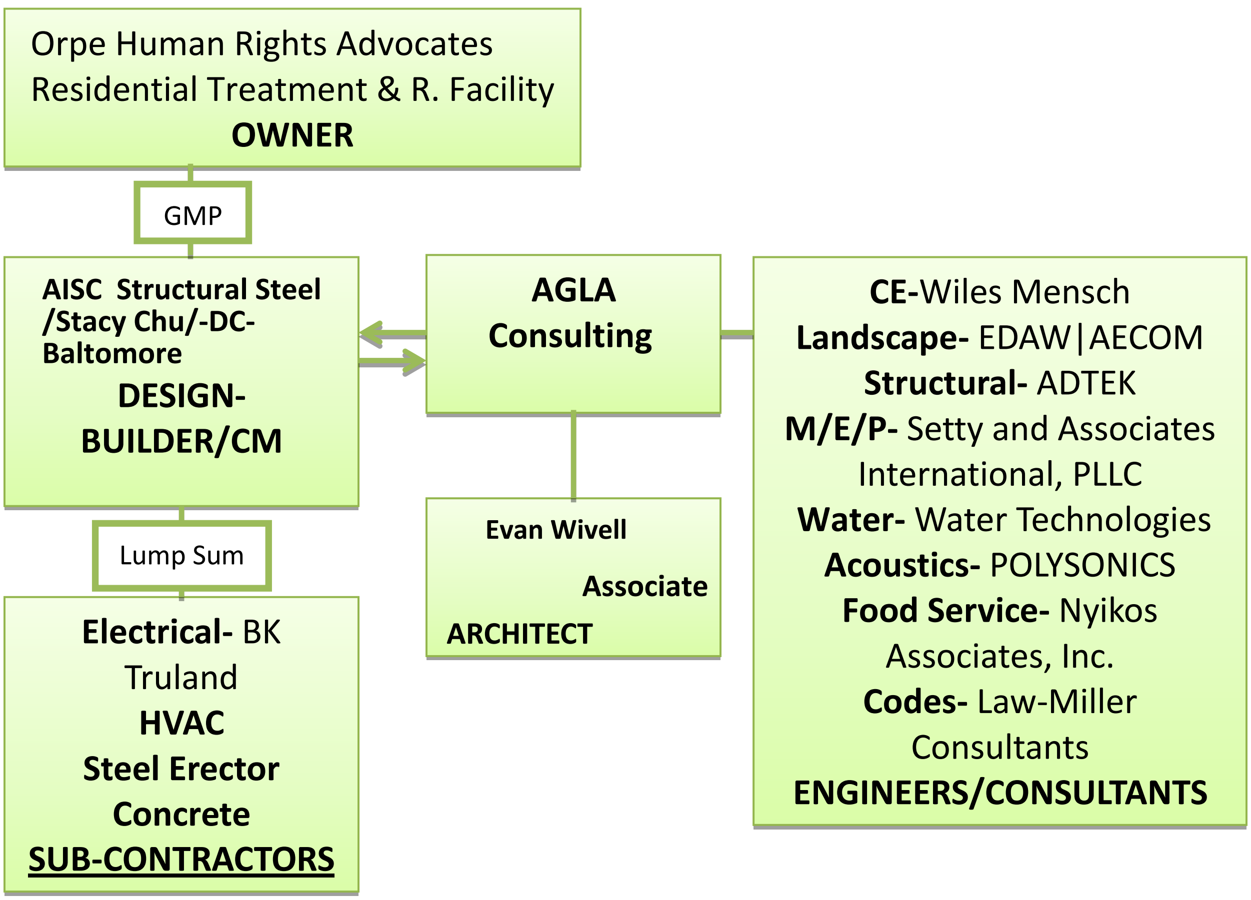


Figure 7: Integrated Behavioral Health Organizational Chart

SITE CONDITIONS

The Residential Treatment and Supportive Social Services is expected to be constructed in the following address:

7560 Old Telegraph Road Hanover, MD 21076

This site has engineering work completed for landscaping , sewage and mechanical . Ready to be built by new owner . Feasibility works for other uses by original engineering company approximately $2, 800-$3,000

Site Amenities

* Municipal Utilities: Water, Electricity, Septic

TRANSPORTATION

COMMUTER RAIL

* BWI Airport Commuter Rail (Penn Line)
* Maryland Area Regional Commuter Trains Penn Line 8 min drive 3.5 mi
* Dorsey Commuter Rail (Camden Line)Maryland Area Regional Commuter Trains Camden Line 9 min drive 4.6 mi airplane icon

AIRPORT

* Baltimore-Washington International Airport 11 min drive 4.2 mi

PERTY TAXES

* Parcel Number 05-000-06857000

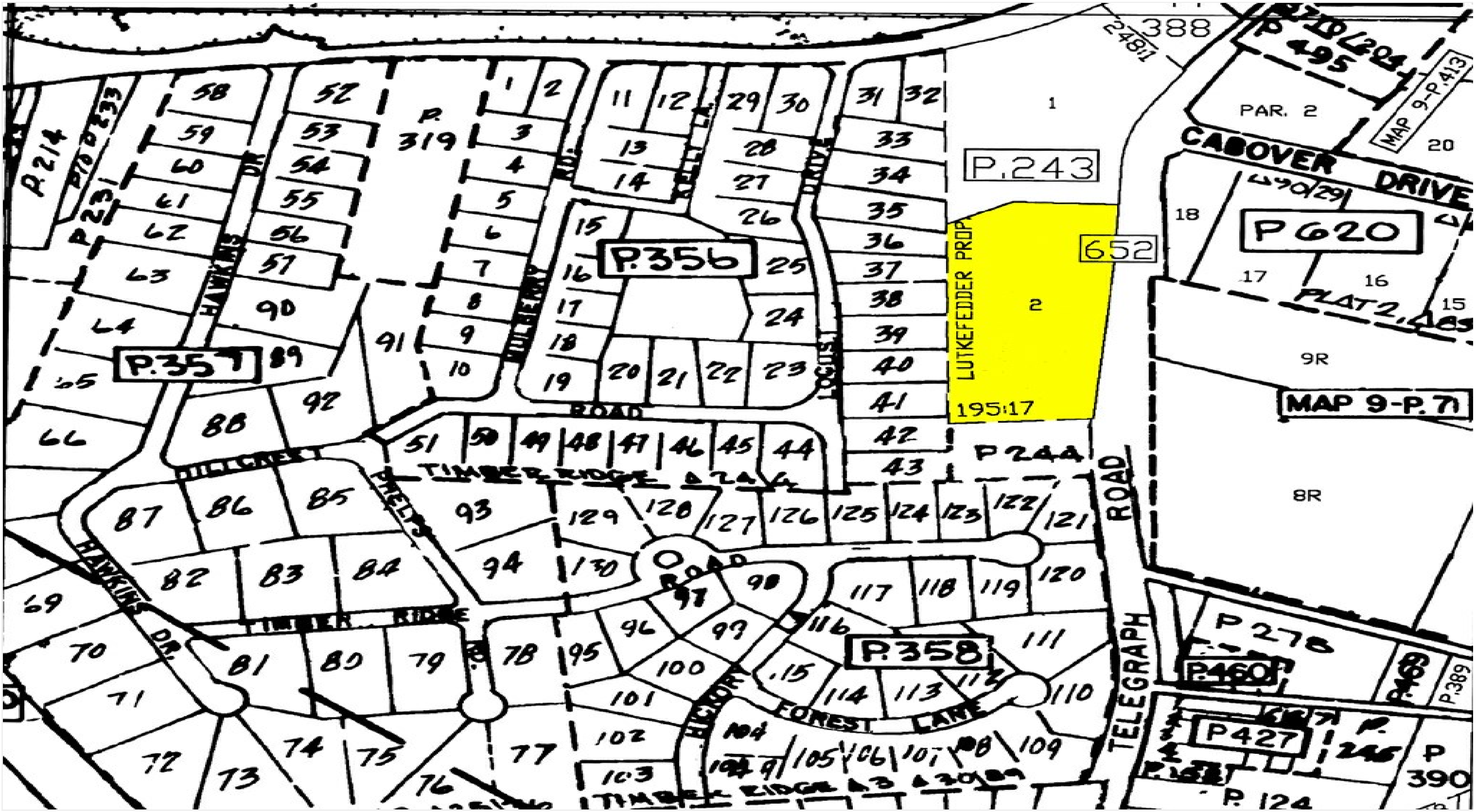
ZONING: Zoning Code R-2, County

7560 Old Telegraph Rd

7560 Old Telegraph Rd, Hanover, MD 21076

BERKSHIRE HATHAWAY | PenFed Realty
HomeServices

Presented By:
Berkshire Hathaway Commercial Services



7560 Old Telegraph Rd

7560 Old Telegraph Rd, Hanover, MD 21076

Property Details

Engineering work complete for landscaping, sewage and mechanicals. Ready to be built by new owner. Feasibility work for other uses by original engineering company approximately $2,800-$3,000.

Price: $689,000

- Heavy Daytime Traffic

View the full listing here: https://www.loopnet.com/Listing/7560-Old-Telegraph-Rd-Hanover-MD/18855820/

Price:	$689,000
Property Type:	Land
Property Subtype:	Residential
Proposed Use:	Mixed Use
Sale Type:	Investment
Total Lot Size:	5.00 AC
No. Lots:	1
Zoning Description:	R-2, County
APN / Parcel ID:	05-000-06857000

7560 Old Telegraph Rd

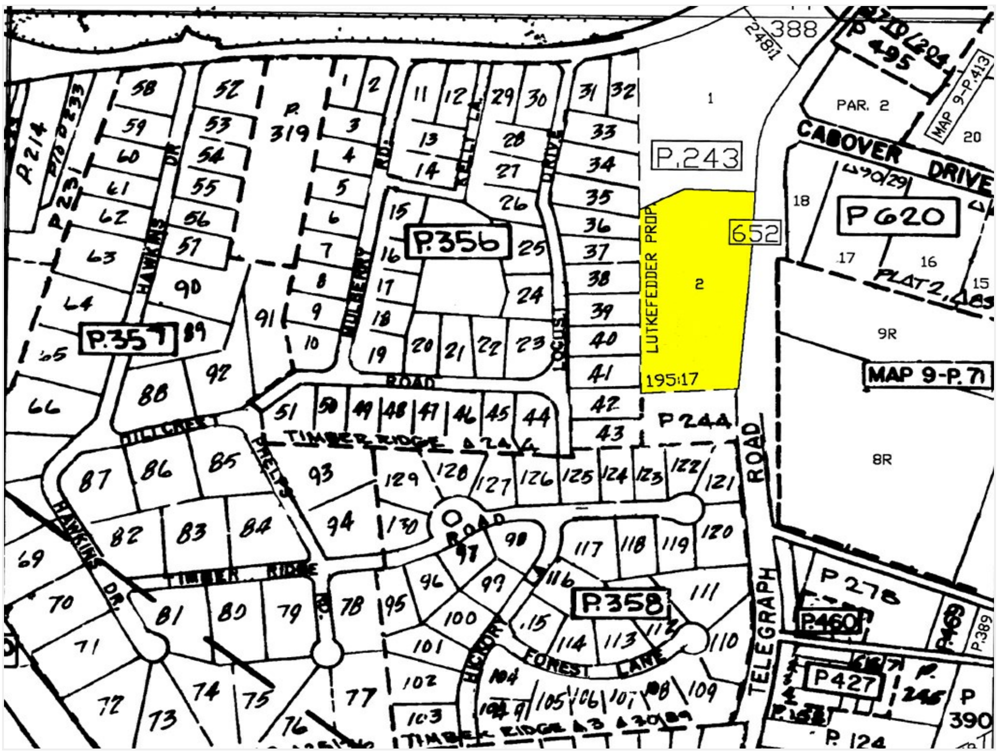
7560 Old Telegraph Rd, Hanover, MD 21076

Location

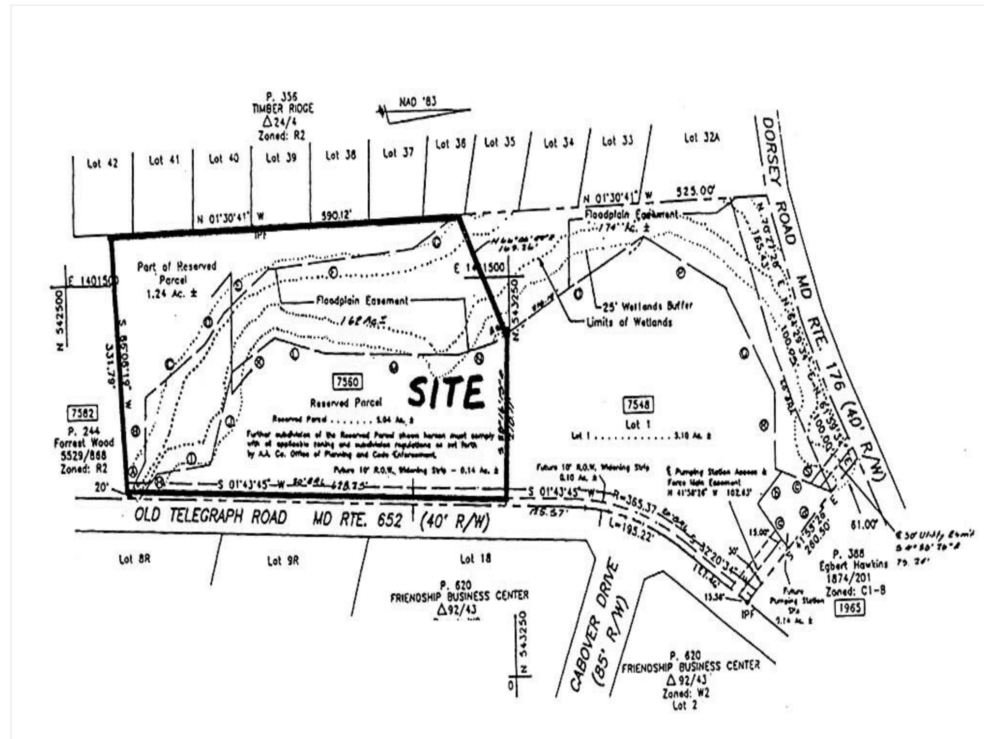
7560 Old Telegraph Rd

7560 Old Telegraph Rd, Hanover, MD 21076

Property Photos



Plat Map

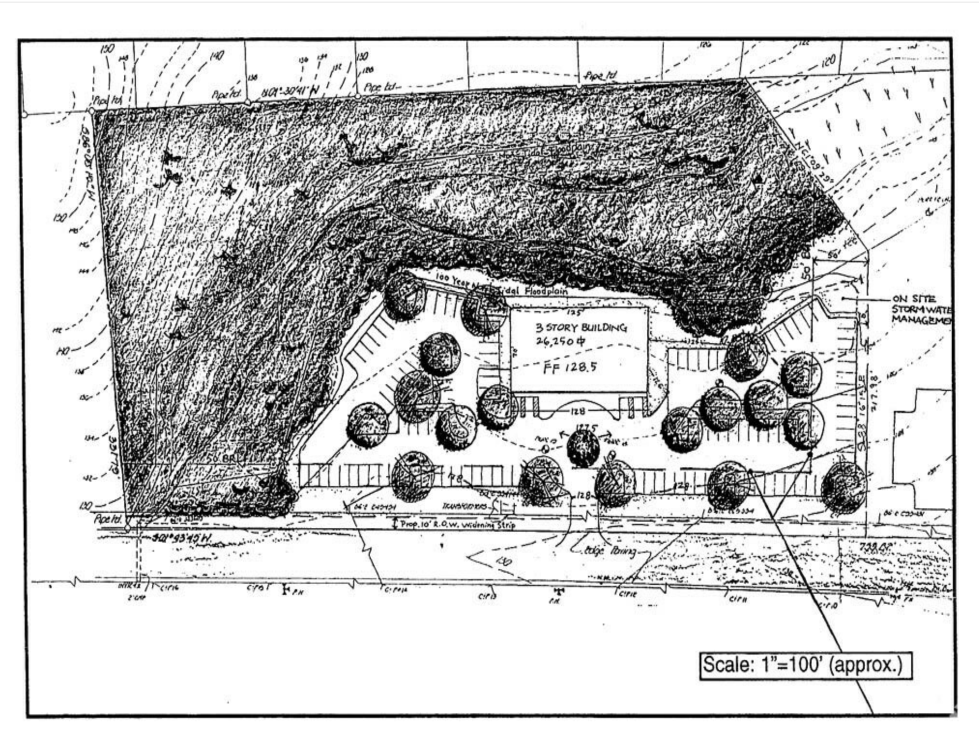


Land Survey

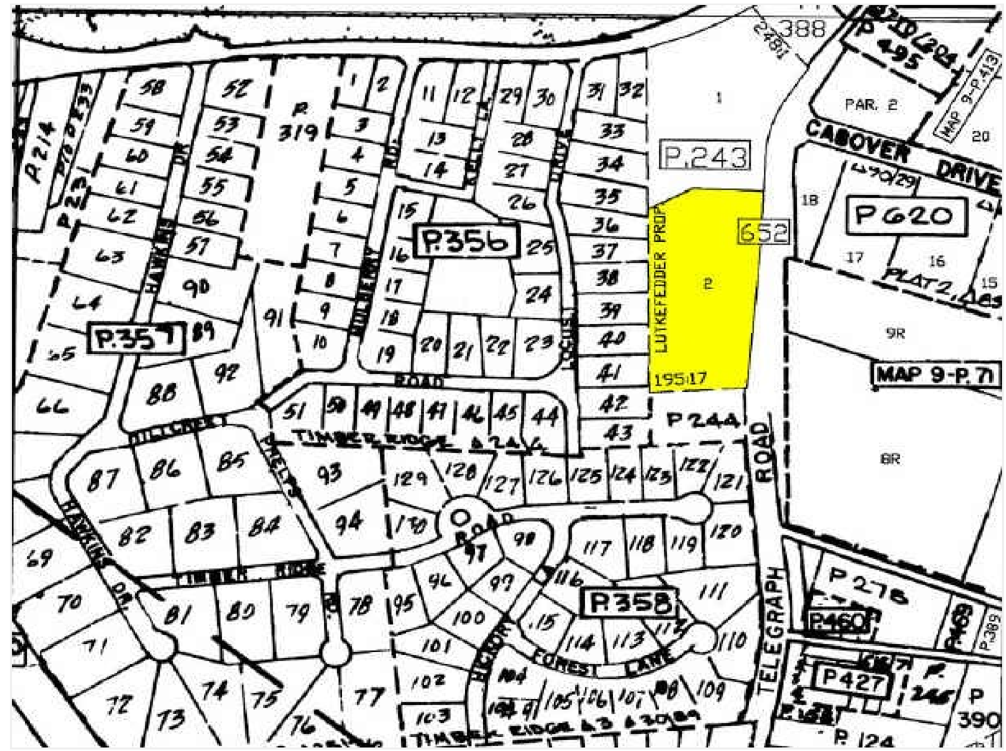
7560 Old Telegraph Rd

7560 Old Telegraph Rd, Hanover, MD 21076

Property Photos



Potential Use



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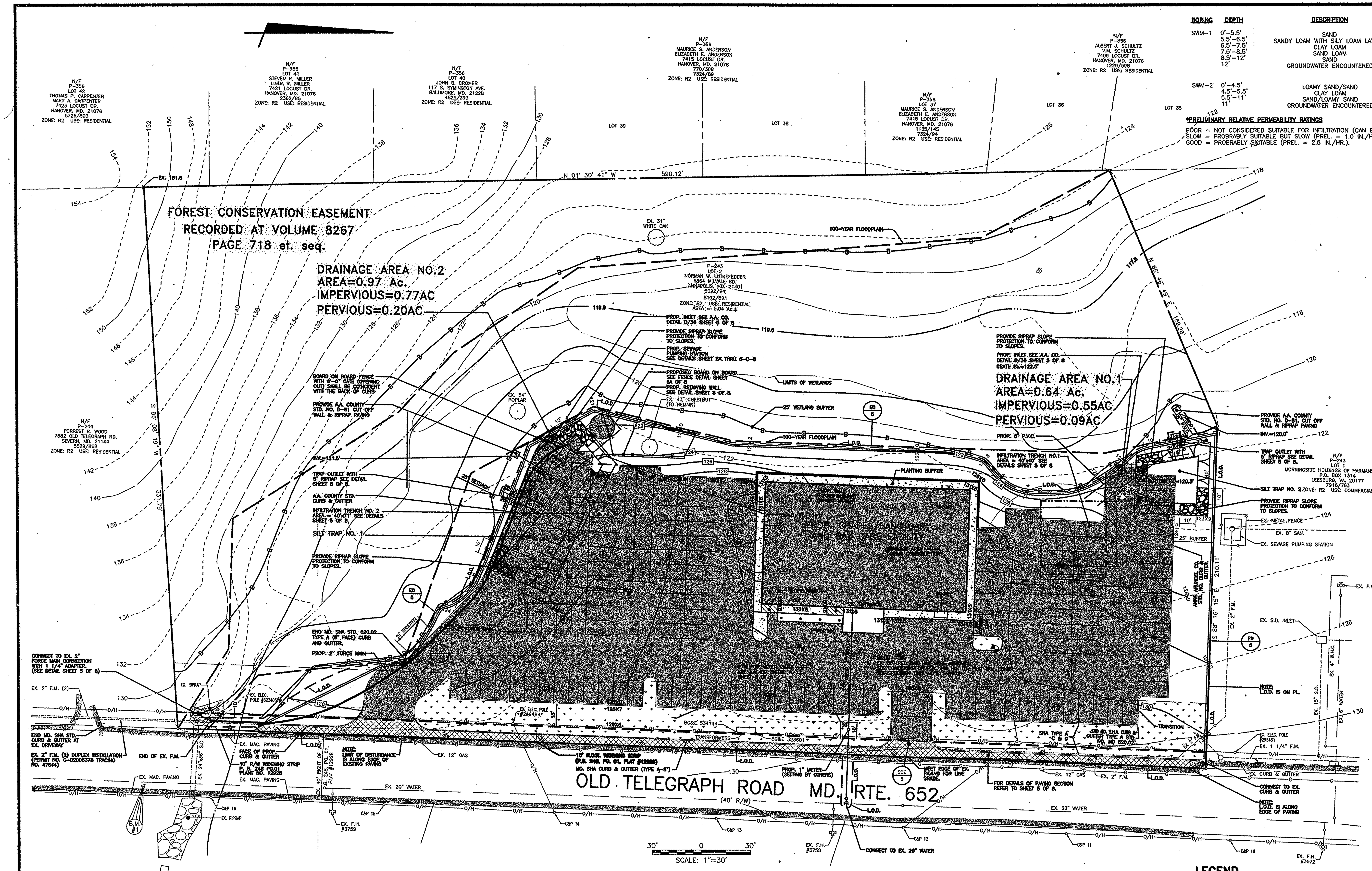
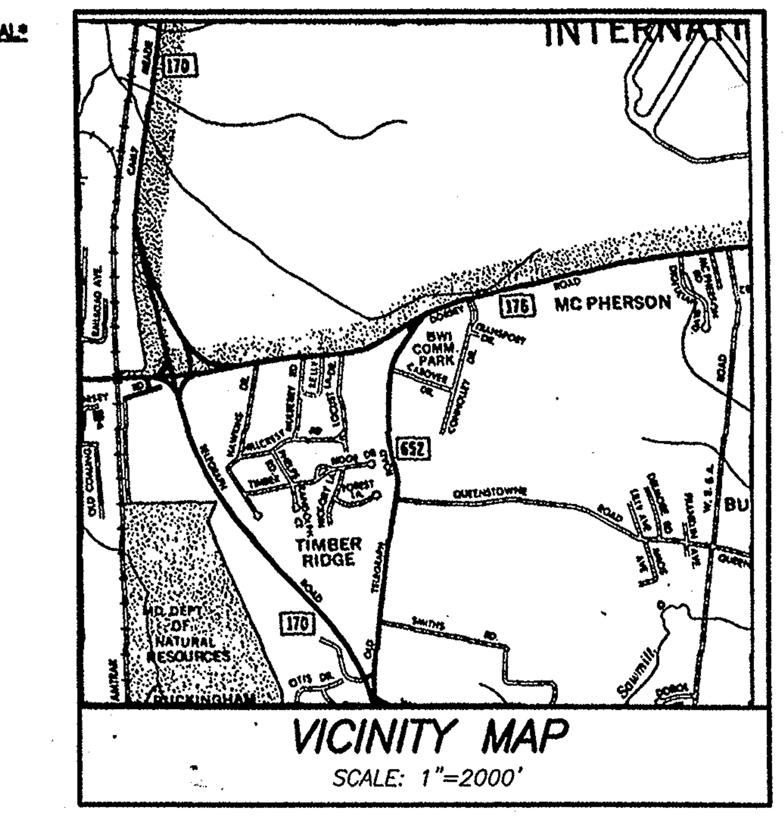




BORING	DEPTH	DESCRIPTION	INFILTRATION POTENTIAL*
SWM-1	0'-5.5'	SAND	GOOD
	5.5'-6.5'	SANDY LOAM WITH SILY LOAM LAYERS	POOR
	6.5'-7.5'	CLAY LOAM	UNSUITABLE
	7.5'-8.5'	SAND LOAM	SLOW
	8.5'-12'	SAND	GOOD
	12'	GROUNDWATER ENCOUNTERED	
SWM-2	0'-4.5'	LOAMY SAND/SAND	GOOD
	4.5'-5.5'	CLAY LOAM	UNSUITABLE
	5.5'-11'	SAND/LOAMY SAND	GOOD
	11'	GROUNDWATER ENCOUNTERED	

*PRELIMINARY RELATIVE PERMEABILITY RATINGS
POOR = NOT CONSIDERED SUITABLE FOR INFILTRATION (CAN BE DUE TO THIN LAYERS)
SLOW = PROBABLY SUITABLE BUT SLOW (PREL. = 1.0 IN./HR.)
GOOD = PROBABLY SUITABLE (PREL. = 2.5 IN./HR.)

SOIL BORING BY: MARSHALL ENGINEERING, INC.

Hand Auger Summary
BORING NO.: SWM-1

PROJECT: Redeemed Christian Church of God
CLIENT: C.D. Meekins
LOCATION: See Boring Plan
PROJECT NO.: 02236
DATE: 10/01/02
ELEVATION: 123'±
LOGGED BY: mec

DEPTH TO WATER> AT COMPLETION: 12.0' AFTER HOURS:
DEPTH TO CAVE-IN> AT COMPLETION: 12.0' AFTER HOURS:

USCS	Depth	Description
SP-SM	0	Damp Brown f-m Sand (SP-SM) – tan w/trace coarse Sand below 4' – w/trace gravel below 5'
SM	5.5	Damp White f-c Sandy Loam (SM) w/gravel and Silty Loam layers
CL	6.5	Damp Tan and White Clay Loam (CL)
SM	7.5	Damp to Moist Brown f-c Sandy Loam (SM)
SP-SM	8.5	Damp Tan f-m Sand (SP-SM) – moist below 10' – very moist below 11' – wet below 12'
	12.5	Bottom of Boring 12.5'

*Blows to drive Dynamic Cone Penetrometer up to 3 increments of 1 3/4"
N= blow count to drive the Dynamic Cone Penetrometer 1 3/4" after seating
This information pertains only to this boring and should not be interpreted as being indicative of the site.

Hand Auger Summary
BORING NO.: SWM-2

PROJECT: Redeemed Christian Church of God
CLIENT: C.D. Meekins
LOCATION: See Boring Plan
PROJECT NO.: 02236
DATE: 10/01/02
ELEVATION: 123'±
LOGGED BY: mec

DEPTH TO WATER> AT COMPLETION: 11.0' AFTER HOURS:
DEPTH TO CAVE-IN> AT COMPLETION: 12.0' AFTER HOURS:

USCS	Depth	Description
SM	0	Damp Dark Brown f-m Loamy Sand (SM) w/trace organics
SP-SM	1.5	Damp Brown f-m Loamy Sand (SM) to Sand (SP-SM) – w/trace gravel below 2.5' – f-c below 3.5'
CL	4.5	Damp White and Tan Clay Loam (CL)
SP-SM	5.5	Damp Tan f-m Sand (SP-SM) w/trace gravel
SM	7.5	Moist Tan and White Loamy Sand (SM)
SP-SM	8.5	Damp Tan f-m Sand (SP-SM) – moist to very moist below 9.5' – wet below 11'
	12.5	Bottom of Boring 12.5'

*Blows to drive Dynamic Cone Penetrometer up to 3 increments of 1 3/4"
N= blow count to drive the Dynamic Cone Penetrometer 1 3/4" after seating
This information pertains only to this boring and should not be interpreted as being indicative of the site.

SUMMARY OF GENERAL STORAGE REQUIREMENTS

STEP	REQUIREMENT	VOLUME REQUIRED	NOTES
1.	WATER QUALITY VOLUME (WQv)	DA.#1 2708 CFT. DA#2 3439 CFT.	
2.	RECHARGE VOLUME (Rev)	N/A	THIS VOLUME IS INCLUDED WITHIN THE WQv STORAGE
3.	CHANNEL PROTECTION VOLUME (Cpv)	N/A	CPv = 0.04 CFS.
4.	OVERBANK FLOOD PROTECTION VOLUME (Qp)	NOT REQUIRED SINCE LOCAL AUTHORITIES (A.A.Co.) HAVE CONTROL OF FLOODPLAIN DEVELOPMENT, INFRASTRUCUTRE AND CONVEYANCE SYSTEM CAPACITY DESIGN-STATE MANUAL-SEC 2.4.	NOT REQUIRED SINCE LOCAL AUTHORITIES (A.A.Co.) HAVE CONTROL OF FLOOD PLAIN DEVELOPMENT, INFRASTRUCTURE AND CONVEYANCE SYSTEM CAPACITY DESIGN-STATE MANUAL-SEC 2.4.
5.	EXTREME FLOOD VOLUME (Qf)	N/A	DEVELOPMENT DOWNSTREAM OF THIS PROJECT IS LOCATED OUTSIDE OF 100 YEAR FLOOD PLAIN LIMITS PER APPROPRIATE SECTIONS OF THE COUNTY CODE.

PERC TEST RESULTS – T02004369

NO.	RESULT	TIME	DEPTH	LOG	WATER
P-16	P	5 min.	1'	0-2 LOAM, 2-8 SAND	H20 @ 8
P-17	P	5 min.	1'	0-5 SAND PERCHED H20 @ 5, 5-8 CLAY & SAND	H20 @ 8
P-18	P	5 min.	2'	0-2 LOAM, 2-6 SAND, 6-8 CLAY & SAND	H20 @ 8
P-19	P	5 min.	2'	0-5 SAND, 5-9 CLAY & SAND	H20 @ 9
P-22	P	6 min.	2'	0-5 LOAM, 5-9 CLAY & SAND	H20 @ 9
P-23	P	6 min.	2'	0-5 LOAM, 5-9 CLAY	H20 @ 9

SOIL BORINGS BY MARSHALL ENGINEERING INC.

LEGEND

- N/F — NOW OR FORMERLY
- EX. PAVEMENT
- PROP. PAVEMENT
- 25' WETLAND BUFFER
- LIMITS OF WETLANDS
- 100 YEAR FLOODPLAIN LIMITS
- 100 YEAR FLOODPLAIN LIMITS
- P-1 — PERC TEST LOCATION
- SWM-1 — SOIL BORING
- --99-- EXISTING CONTOURS
- 99 PROPOSED CONTOURS
- 100·4 EXISTING SPOT ELEVATION
- 100×4 PROPOSED SPOT ELEVATION
- METAL FENCE
- LIMIT OF DISTURBANCE (L.O.D.)
- SSF — SUPER SILT FENCE
- BENCH MARK
- S.C.E. — STABILIZED CONSTRUCTION ENTRANCE
- SF-1 — DETAIL IDENTIFIER
- 4 — SHEET NUMBER
- OVERLAND FLOW

C. D. MEEKINS & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
159 MAIN ST., SECOND FLOOR, ANNAPOLIS, MD.
MAILING ADDRESS: P.O. BOX 2151, ANNAPOLIS, MD. 21404-2151
ANNAPOLIS: (410) 267-0744 BALTIMORE: (410) 269-7807 FACSIMILE: (410) 267-0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:
C. DOUGLAS MEEKINS
6708 P.E. NO. — 9153 L.S. NO. — 11-22-05 DATE
DESIGNED: J.P. — CHECKED: C.D.M. — SCALE: AS SHOWN
DRAWN: M.J.B. — DATE: — REF.:

STATE OF MARYLAND — REGISTERED PROFESSIONAL ENGINEER

PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

SITE LAYOUT PLAN
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-22-05 CDM: 02-5269B
JOB NUMBER 02-5269
SHEET NO. 2 OF 8 SHEETS

REDEEMED CHRISTIAN CHURCH OF GOD

Copy

STANDARD RESPONSIBILITY NOTES

I (WE) CERTIFY THAT:

(A) ALL DEVELOPMENT AND CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH THIS SEDIMENT AND EROSION CONTROL PLAN, AND FURTHER, AUTHORIZE THE RIGHT OF ENTRY FOR PERIODIC ON-SITE EVALUATION BY THE ANNE ARUNDEL SOIL CONSERVATION DISTRICT BOARD OF SUPERVISORS OR THEIR AUTHORIZED AGENTS.

(B) ANY RESPONSIBLE PERSONNEL INVOLVED IN THE CONSTRUCTION PROJECT WILL HAVE A CERTIFICATE OF ATTENDANCE FROM THE MARYLAND DEPARTMENT OF THE ENVIRONMENT'S APPROVED TRAINING PROGRAM FOR THE CONTROL OF SEDIMENT AND EROSION BEFORE BEGINNING THE PROJECT.

RESPONSIBLE PERSONNEL ON SITE: CERTIFICATE NO.

(C) THE APPROPRIATE ENCLOSURE WILL BE CONSTRUCTED AND MAINTAINED ON SEDIMENT BASIN(S) INCLUDED IN THIS PLAN. SUCH STRUCTURE(S) WILL BE IN COMPLIANCE WITH ARTICLE 21, SECTION 2-304 OF THE ANNE ARUNDEL COUNTY CODE.

2 THE DEVELOPER IS RESPONSIBLE FOR THE ACQUISITION OF ALL EASEMENTS, RIGHTS, AND/OR RIGHTS- OF-WAY THAT MAY BE REQUIRED FOR THE SEDIMENT AND EROSION CONTROL PRACTICES, STORMWATER MANAGEMENT PRACTICES AND THE DISCHARGE OF STORMWATER ONTO OR ACROSS ADJACENT OR DOWNSTREAM PROPERTIES INCLUDED IN THIS PLAN. HE IS ALSO RESPONSIBLE FOR THE ACQUISITION OF ALL EASEMENTS, RIGHTS AND/OR RIGHTS-OF-WAY THAT MAY BE REQUIRED FOR GRADING AND/OR WORK ON ADJACENT PROPERTIES INCLUDED IN THIS PLAN.

3 FOLLOWING INITIAL SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN SEVEN CALENDAR DAYS AS TO THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1) AND FOURTEEN DAYS AS TO ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

4 THE SEDIMENT CONTROL APPROVALS ON THIS PLAN EXTEND ONLY TO AREAS AND PRACTICES IDENTIFIED AS PROPOSED WORK.

5 THE APPROVAL OF THIS PLAN FOR SEDIMENT AND EROSION CONTROL DOES NOT RELIEVE THE DEVELOPER/CONSULTANT FROM COMPLYING WITH ANY FEDERAL/STATE/COUNTY REQUIREMENTS APPERTAINING TO ENVIRONMENTAL ISSUES.

6 THE DEVELOPER MUST REQUEST THAT THE DEPARTMENT OF INSPECTIONS AND PERMITS APPROVE WORK COMPLETED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN, THE GRADING OR BUILDING PERMIT, AND THE ORDINANCE.

7 ON ALL SITES WITH DISTURBED AREAS IN EXCESS OF 2 ACRES, APPROVAL OF THE DEPARTMENT OF INSPECTIONS AND PERMITS SHALL BE REQUIRED ON COMPLETION OF INSTALLATION OF PERIMETER EROSION AND SEDIMENT CONTROLS, BUT BEFORE PROCEEDING WITH ANY OTHER EARTH DISTURBANCE OR GRADING. OTHER BUILDING OR GRADING INSPECTION APPROVALS MAY NOT BE AUTHORIZED UNTIL THE INITIAL APPROVAL BY THE DEPARTMENT OF INSPECTIONS AND PERMITS IS GIVEN.

8 APPROVAL SHALL BE REQUESTED ON FINAL STABILIZATION OF ALL SITES WITH DISTURBED AREAS IN EXCESS OF 2 ACRES BEFORE REMOVAL OF CONTROLS.

SIGNATURE(S) OF DEVELOPER/OWNER — DATE

ABIODUN OLADIMEJI
NAME

PASTOR
TITLE

7154 CRADLEROCK WAY

COLUMBIA, MD. 21045
ADDRESS

301-621-8220
TELEPHONE NUMBER

ANNE ARUNDEL SOIL CONSERVATION DISTRICT
DETAILS AND SPECIFICATIONS FOR VEGETATIVE ESTABLISHMENT

FOLLOWING INITIAL SOIL DISTURBANCE OR REDISTURBANCE, PERMANENT OR TEMPORARY STABILIZATION SHALL BE COMPLETED WITHIN SEVEN CALENDAR DAYS FOR THE SURFACE OF ALL PERIMETER CONTROLS, DIKES, SWALES, DITCHES, PERIMETER SLOPES, AND ALL SLOPES GREATER THAN 3 HORIZONTAL TO 1 VERTICAL (3:1) AND FOURTEEN DAYS FOR ALL OTHER DISTURBED OR GRADED AREAS ON THE PROJECT SITE.

1 PERMANENT SEEDING:

A. SOIL TESTS: LIME AND FERTILIZER WILL BE APPLIED PER SOILS TESTS RESULTS FOR SITES GREATER THAN 5 ACRES. SOIL TESTS WILL BE DONE AT COMPLETION OF ROUGH GRADING. RATES AND ANALYSES WILL BE PROVIDED TO THE GRADING INSPECTOR AS WELL AS THE CONTRACTOR.

1. OCCURRENCE OF ACID SULFATE SOILS (GRAYISH BLACK COLOR) WILL REQUIRE COVERING WITH A MINIMUM OF 12 INCHES OF CLEAN SOIL WITH 6 INCHES MINIMUM CAPPING OF TOP SOIL. NO STOCKPILING OF MATERIAL IS ALLOWED. IF NEEDED, SOIL TESTS SHOULD BE DONE BEFORE AND AFTER A 6 WEEK INCUBATION PERIOD TO ALLOW OXIDATION OF SULFATES.

B. SEEDBED PREPARATION: AREA TO BE SEEDED SHALL BE LOOSE AND FRIABLE TO A DEPTH OF AT LEAST 3 INCHES. THE TOP LAYER SHALL BE LOOSENED BY RAKING, DISKING OR OTHER ACCEPTABLE MEANS BEFORE SEEDING OCCURS. FOR SITES LESS THAN 5 ACRES, APPLY 100 POUNDS OF DOLOMITIC LIMESTONE AND 21 POUNDS OF 10-20-20 FERTILIZER PER 1,000 SQUARE FEET. HARROW OR DISK LIME AND FERTILIZER INTO THE SOIL TO A DEPTH OF AT LEAST 3 INCHES ON SLOPES FLATTER THAN 3:1.

C. SEEDING: APPLY 5-6 POUNDS PER 1,000 SQUARE FEET OF TALL FESCUE BETWEEN FEBRUARY 1 AND APRIL 30 OR BETWEEN AUGUST 15 AND OCTOBER 31. APPLY SEED UNIFORMLY ON A MOIST FIRM SEEDBED WITH A CYCLONE SEEDED DRILL, CULTIPACKER SEEDER OR HYDROSEEDER (SLURRY INCLUDES SEEDS AND FERTILIZER, RECOMMENDED ON STEEP SLOPES ONLY). MAXIMUM SEED DEPTH SHOULD BE 1/4 INCH IN CLAYEY SOILS AND 1/2 INCH IN SANDY SOILS WHEN USING OTHER THAN THE HYDROSEEDER METHOD. IRRIGATE IF SOIL MOISTURE IS DEFICIENT TO SUPPORT ADEQUATE GROWTH UNTIL VEGETATION IS FIRMLY ESTABLISHED. IF OTHER SEED MIXES ARE TO BE USED, SELECT FROM TABLE 25, ENTITLED "PERMANENT SEEDING FOR LOW MAINTENANCE AREAS" FROM THE 1994 STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. MIXES SUITABLE FOR THIS AREA ARE 1, 3 AND 5-7. MIXES 5-7 ARE SUITABLE IN NON-MOWABLE SITUATIONS.

D. MULCHING: MULCH SHALL BE APPLIED TO ALL SEEDED AREAS IMMEDIATELY AFTER SEEDING. DURING THE TIME PERIODS WHEN SEEDING IS NOT PERMITTED, MULCH SHALL BE APPLIED IMMEDIATELY AFTER GRADING.

MULCH SHALL BE UNROTTED, UNCHOPPED, SMALL GRAIN STRAW APPLIED AT A RATE OF 2 TONS PER ACRE OR 90 POUNDS PER 1,000 SQUARE FEET (2 BALES). IF A MULCH ANCHORING TOOL IS USED, APPLY 2.5 TONS PER ACRE. MULCH MATERIALS SHALL BE RELATIVELY FREE OF ALL KINDS OF WEEDS AND SHALL BE COMPLETELY FREE OF PROHIBITED NOXIOUS WEEDS. SPREAD MULCH UNIFORMLY, MECHANICALLY OR BY HAND, TO A DEPTH OF 1-2 INCHES.

E. SECURING STRAW MULCH: STRAW MULCH SHALL BE SECURED IMMEDIATELY FOLLOWING MULCH APPLICATION TO MINIMIZE MOVEMENT BY WIND OR WATER. THE FOLLOWING METHODS ARE PERMITTED:

(i) USE A MULCH ANCHORING TOOL WHICH IS DESIGNED TO PUNCH AND ANCHOR MULCH INTO THE SOIL SURFACE TO A MINIMUM DEPTH OF 2 INCHES. THIS IS THE MOST EFFECTIVE METHOD FOR SECURING MULCH, HOWEVER, IT IS LIMITED TO RELATIVELY FLAT AREAS WHERE EQUIPMENT CAN OPERATE SAFELY.

(ii) WOOD CELLULOSE FIBER MAY BE USED FOR ANCHORING STRAW. APPLY THE FIBER BINDER AT A NET DRY WEIGHT OF 750 POUNDS PER ACRE. IF MIXED WITH WATER, USE 50 POUNDS OF WOOD CELLULOSE FIBER PER 100 GALLONS OF WATER.

(iii) LIQUID BINDERS MAY BE USED AND APPLIED HEAVIER AT THE EDGES WHERE WIND CATCHES MULCH, SUCH AS IN VALLEYS AND ON CRESTS OF SLOPES. THE REMAINDER OF THE AREA SHOULD APPEAR UNIFORM AFTER BINDER APPLICATION. BINDERS LISTED IN THE 1994 STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL OR APPROVED EQUAL SHALL BE APPLIED AT RATES RECOMMENDED BY THE MANUFACTURERS.

(iv) LIGHTWEIGHT PLASTIC NETTING MAY BE USED TO SECURE MULCH. THE NETTING WILL BE STAPLED TO THE GROUND ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

2 TEMPORARY SEEDING:

LIME: 100 POUNDS OF DOLOMITIC LIMESTONE PER 1,000 SQUARE FEET.

FERTILIZER: 15 POUNDS OF 10-10-10 PER 1,000 SQUARE FEET.

SEED: PERENNIAL RYE - 0.92 POUNDS PER 1,000 SQUARE FEET (FEBRUARY 1 THROUGH APRIL 30 OR AUGUST 15 THROUGH NOVEMBER 1).

MILLET - 0.92 POUNDS PER 1,000 SQUARE FEET (MAY 1 THROUGH AUGUST 15).

MULCH: SAME AS 1 D AND E ABOVE.

3 NO FILLS MAY BE PLACED ON FROZEN GROUND. ALL FILL TO BE PLACED IN APPROXIMATELY HORIZONTAL LAYERS, EACH LAYER HAVING A LOOSE THICKNESS OF NOT MORE THAN 8 INCHES. ALL FILL IN ROADWAYS AND PARKING AREAS IS TO BE CLASSIFIED TYPE 2 AS PER ANNE ARUNDEL COUNTY CODE - ARTICLE 21, SECTION 2-308, AND COMPACTED TO 90% DENSITY; COMPACTION TO BE DETERMINED BY ASTM D-1557-66T (MODIFIED PROCTOR). ANY FILL WITHIN THE BUILDING AREA IS TO BE COMPACTED TO A MINIMUM OF 95% AS DETERMINED BY METHODS PREVIOUSLY MENTIONED. FILLS FOR POND EMBANKMENTS SHALL BE COMPACTED AS PER MD- 378 CONSTRUCTION SPECIFICATIONS. ALL OTHER FILLS SHALL BE COMPACTED SUFFICIENTLY SO AS TO BE STABLE AND PREVENT EROSION AND SLIPPAGE.

4 PERMANENT SOD:

INSTALLATION OF SOD SHOULD FOLLOW PERMANENT SEEDING DATES. PERMANENT SOD IS TO BE TALL FESCUE, STATE APPROVED SOD; LIME AND FERTILIZER PER PERMANENT SEEDING SPECIFICATIONS AND LIGHTLY IRRIGATE SOIL PRIOR TO LAYING SOD. SOD IS TO BE LAID ON THE CONTOUR WITH ALL ENDS TIGHTLY ABUTTING. JOINTS ARE TO BE STAGGERED BETWEEN ROWS. WATER AND ROLL OR TAMP SOD TO INSURE POSITIVE ROOT CONTACT WITH SOIL. ALL SLOPES STEEPER THAN 3:1, AS SHOWN, ARE TO BE PERMANENT SODDED OR PROTECTED WITH AN APPROVED EROSION CONTROL NETTING. ADDITIONAL WATERING FOR ESTABLISHMENT MAY BE REQUIRED. SOD IS NOT TO BE APPLIED ON FROZEN GROUND. SOD SHALL NOT BE HARVESTED OR TRANSPLANTED WHEN MOISTURE CONTENT (DRY OR WET) AND/OR EXTREME TEMPERATURE MAY ADVERSELY AFFECT ITS SURVIVAL. IN THE ABSENCE OF ADEQUATE RAINFALL, IRRIGATION SHOULD BE PERFORMED TO INSURE ESTABLISHED SOD.

5 MINING OPERATIONS:

SEDIMENT CONTROL PLANS FOR MINING OPERATIONS MUST INCLUDE THE FOLLOWING SEEDING DATES AND MIXTURES:

FOR SEEDING DATES OF:

FEBRUARY 1 THROUGH APRIL 30 AND AUGUST 15 THROUGH OCTOBER 31, USE SEED MIXTURE OF TALL FESCUE AT THE RATE OF 2 POUNDS PER 1,000 SQUARE FEET AND SERICEA LESPEDEZA AT THE RATE OF 0.5 POUNDS PER 1,000 SQUARE FEET.

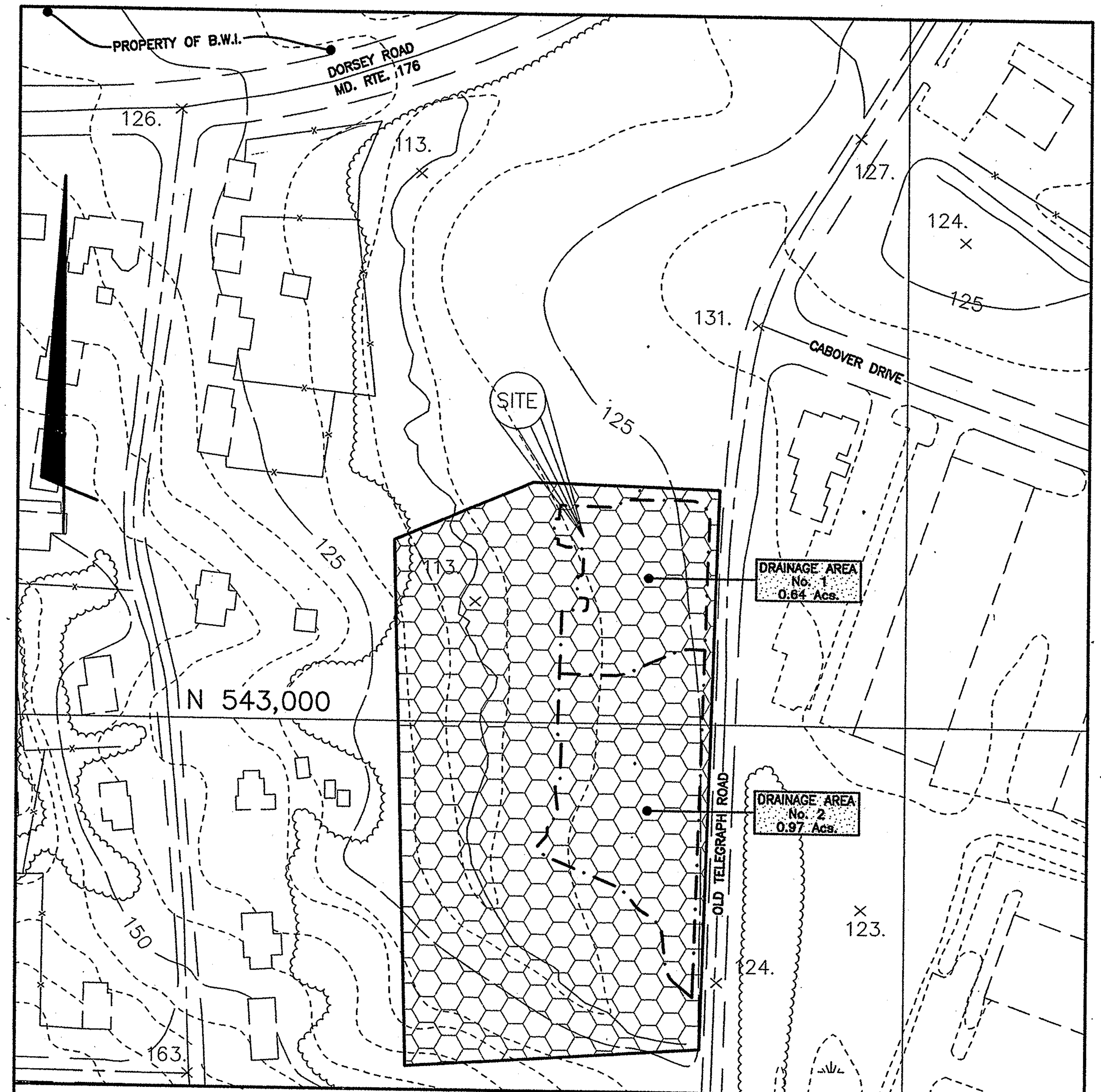
FOR SEEDING DATES OF MAY 1 THROUGH AUGUST 14, USE SEED MIXTURE OF TALL FESCUE AT THE RATE OF 2 POUNDS PER 1,000 SQUARE FEET AND WEEPING LOVEGRASS AT THE RATE OF 0.1 POUND PER 1,00 SQUARE FEET.

NOTE: USE OF THIS INFORMATION DOES NOT PRECLUDE MEETING ALL OF THE REQUIREMENTS OF THE "1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL."

NOTE: THE EXISTING UTILITIES ARE SHOWN FROM THE BEST RECORDS AVAILABLE. SUPPORTED BY FIELD SURVEY CONDUCTED BY C.D. MEEKINS ON OR ABOUT SEPTEMBER, 2002. THE CONTRACTOR MUST DIG TEST PITS BY HAND, 48 HOURS PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL NOTIFY C.D. MEEKINS & ASSOC., INC. AT 410-267-0744 IMMEDIATELY OF ANY APPARENT CONFLICT EITHER VERTICALLY OR HORIZONTALLY.

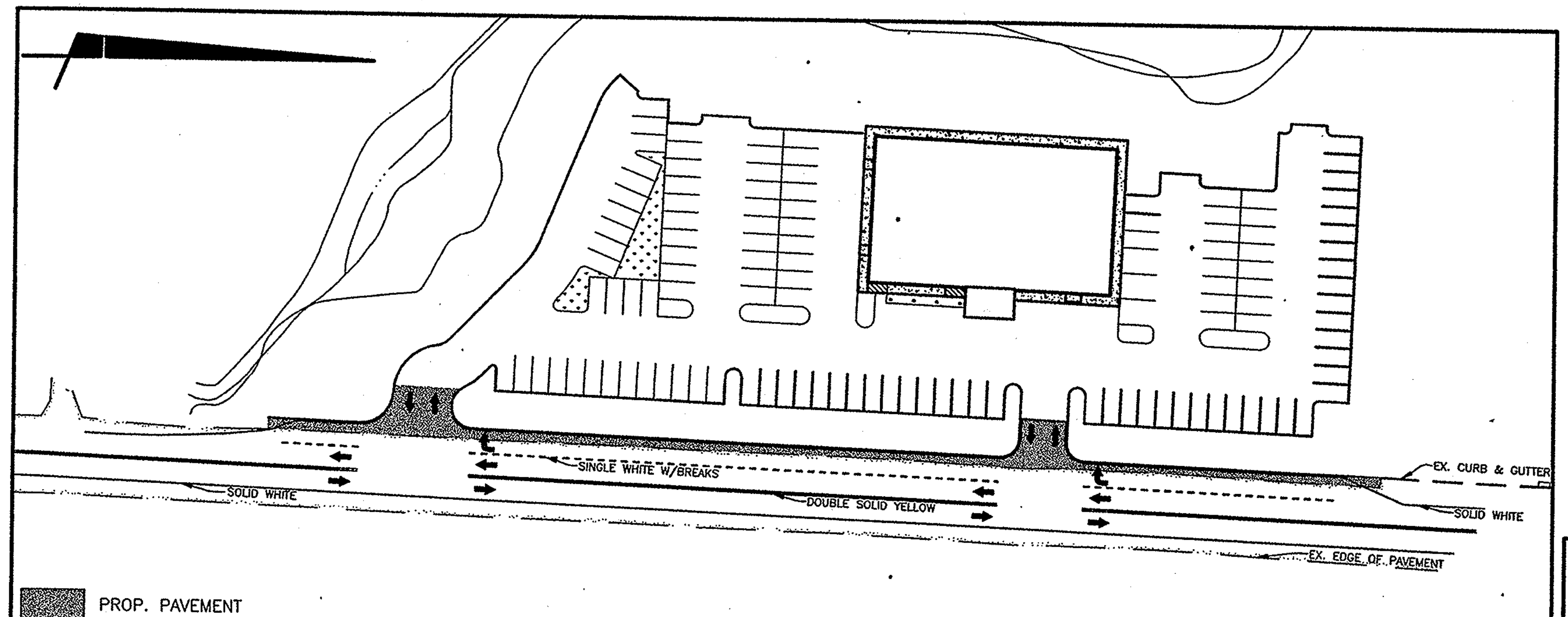
MISS UTILITY NOTE

OWNER/CONTRACTOR TO CONTACT "MISS UTILITY" AT 1-800-257-7777 MINIMUM 72 HOURS PRIOR TO THE START OF CONSTRUCTION FOR LOCATION EXISTING UNDERGROUND UTILITIES.

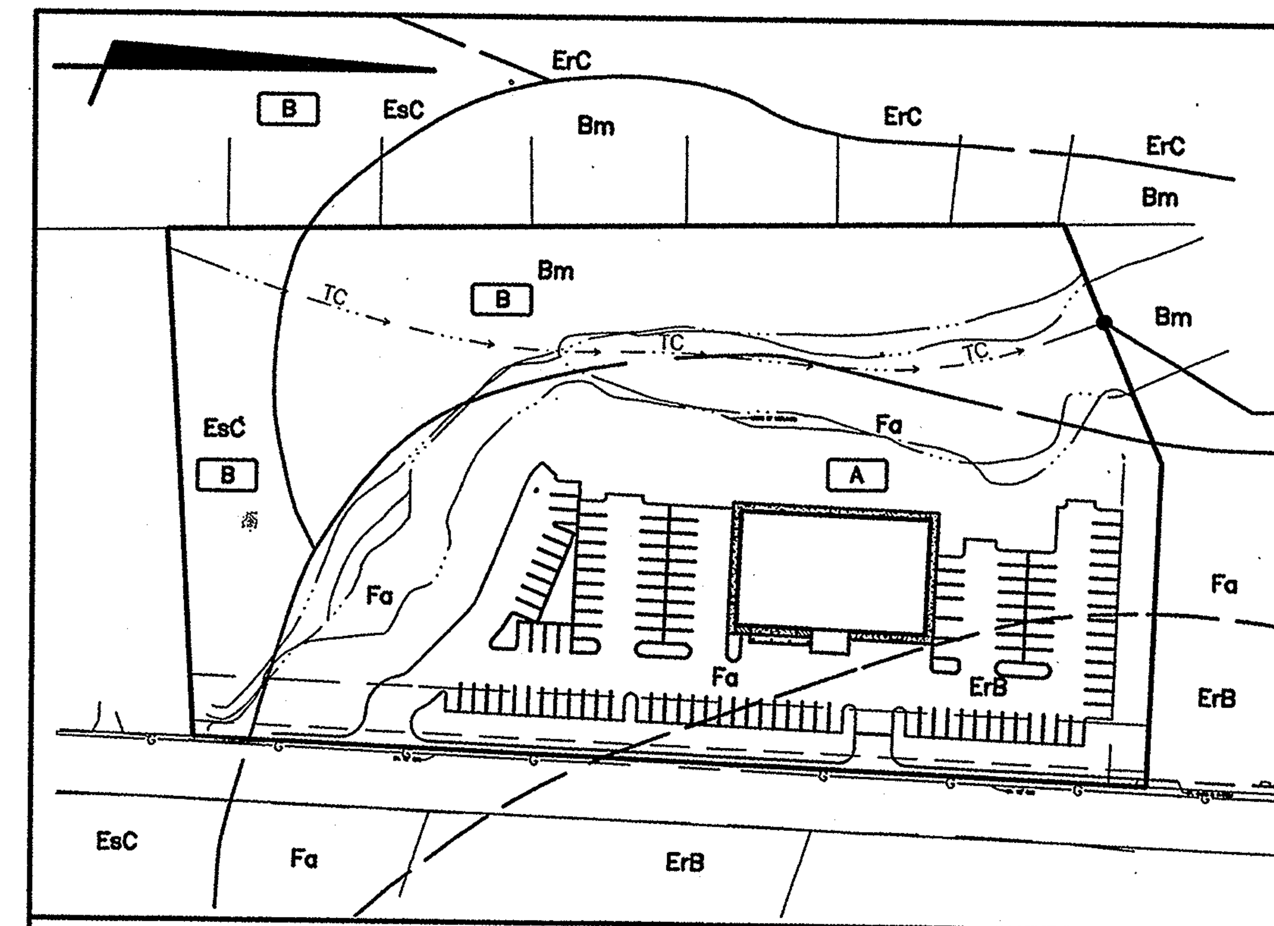


DRAINAGE AREA MAP
SCALE: 1"=100'

NOTE: ALL OF THE INFORMATION SHOWN ON THIS PLAN IS BASED ON COPYRIGHTED MAP PRODUCTS FROM ANNE ARUNDEL COUNTY, MARYLAND, AND MAY NOT BE COPIED OR REPRODUCED WITHOUT EXPRESS WRITTEN PERMISSION FROM THE COUNTY.

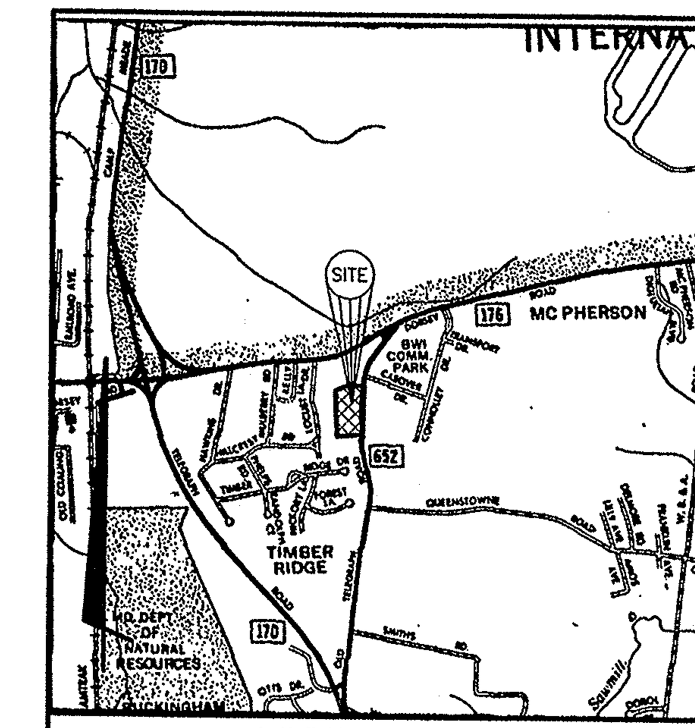


STRIPING PLAN
SCALE: 1"=60'



PROPERTY MAP
SCALE: 1"=100'

Bm = BIBB SILT LOAM
EsC = EVESBORO & GALESTOWN LOAMY SANDS B
Fa = FALLSINGTON SANDY LOAM B
ErB = EVESBORO LOAMY SAND B
DESIGNATES HYDRAULIC SOILS GROUP



VICINITY MAP
SCALE: 1"=2000'

SHEET INDEX

SHEET NO.	TITLE
1	COVER SHEET
2	SITE LAYOUT PLAN
3	GRADING PLAN
4	SEDIMENT CONTROL PLAN
5	SITE DETAILS
6	S.P.S. DETAILS
7	LANDSCAPE PLAN
8	LANDSCAPE NOTES AND DETAILS

CONSTRUCTION NOTES

GEOTECHNICAL REPORT NOTE: ALL CONSTRUCTION TO BE IN ACCORDANCE WITH GEOTECHNICAL REPORT.

PAVING NOTE: ALL AREAS TO BE LIGHT DUTY PAVEMENT SECTION. SEE DETAILS SHEET 5 OF 8. CONTACT ENGINEER FOR VERIFICATION. SEE SEPARATE DETAIL FOR PAVING WITHIN SHA RIGHT OF WAY.

ROOF DRAIN NOTE: ROOF DRAINS SHALL BE DISCHARGED ONTO SPLASH BLOCKS TO DRAIN ACROSS THE OPEN AREA AT THE EAST SIDE OF THE BUILDING TO THE EXISTING VEGETATION.

CURB & GUTTER NOTE: A.A. CO. STD. I/24 IS STANDARD 6" CURB AND GUTTER. A.A. CO. STD. I/25 IS REVERSE SLOPE 6" CURB AND GUTTER. USE STD. I/25 WHEREVER SLOPE OF PAVEMENT IS AWAY FROM CURB.

WATER LINE NOTE: ALL WATER LINES TO BE CEMENT LINED DUCTILE IRON PIPE OR SHALL BE COPPER TYPE 'K' FOR 2" SIZES AND HAVE A MINIMUM 4' OF COVER.

DEWATERING NOTE: CONTRACTOR TO PROVIDE FOR DEWATERING AS MAY BE NECESSARY FOR ALL PHASES OF CONSTRUCTION.

LIMIT OF DISTURBANCE NOTE: L.O.D. IS SHOWN ON SHEET 4 OF 8.

STAKEOUT NOTE: NO SEPARATE PAYMENT WILL BE MADE FOR CONSTRUCTION STAKEOUT. IN ADDITION TO WHAT THE CONTRACTOR REQUIRES FOR ON-SITE WORK, CERTIFIED STAKEOUT BY LICENSED SURVEYOR WILL BE REQUIRED, AND SHALL BE INCLUDED IN OTHER ITEMS IN THE PROPOSAL UNDER BASE BID.

SEQUENCE OF CONSTRUCTION: SEE SHEET 5 OF 8 FOR SEQUENCE OF CONSTRUCTION.

STORMDRAIN NOTE: ALL STORMDRAIN IS PRIVATE AND SHALL BE MAINTAINED BY THE OWNERS.

PARKING TABULATION

NUMBER OF SEATS PROVIDED	= 200
NUMBER OF PARKING SPACES REQUIRED	= 67
NUMBER OF PARKING SPACES PROVIDED	= 108
NUMBER OF VAN ACCESSIBLE SPACES REQUIRED	= 1
NUMBER OF VAN ACCESSIBLE PROVIDED	= 1
NUMBER OF HANDICAP SPACES REQUIRED	= 4
NUMBER OF HANDICAP SPACES PROVIDED	= 5
1 SPACE FOR EVERY 3 SEATS	
$=\frac{200}{3} = 67$ REQ'D.	
HANDICAP PARKING SPACES REQ'D.	= 4

OWNER-AS BUILT CERTIFICATION

"ALL GRADING, DRAINAGE, STRUCTURES, AND/OR SYSTEMS, EROSION AND SEDIMENT CONTROL PRACTICES, AND VEGETATIVE MEASURES HAVE BEEN COMPLETED IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS".

OWNER — DATE

AS-BUILT CERTIFICATION

"ALL GRADING, DRAINAGE, STRUCTURES, PUBLIC UTILITIES, AND/OR SYSTEMS, EROSION AND SEDIMENT CONTROL PRACTICES, AND VEGETATIVE MEASURES HAVE BEEN COMPLETED IN CONFORMANCE WITH THE APPROVED PLANS AND SPECIFICATIONS".

PROFESSIONAL ENGINEER — DATE

CONSULTANT'S CERTIFICATION

THE DEVELOPER'S PLAN TO CONTROL SILT AND EROSION IS ADEQUATE TO CONTAIN THE SILT AND EROSION ON THE PROPERTY COVERED BY THE PLAN. I CERTIFY THAT THIS PLAN OF EROSION AND SEDIMENT CONTROL REPRESENTS A PRACTICAL AND WORKABLE PLAN BASED ON MY PERSONAL KNOWLEDGE OF THIS SITE, AND WAS PREPARED IN ACCORDANCE WITH THE REQUIREMENTS OF THE ANNE ARUNDEL SOIL CONSERVATION DISTRICT PLAN SUBMITTAL GUIDELINES AND THE CURRENT MARYLAND STANDARDS AND SPECIFICATIONS FOR SEDIMENT AND EROSION CONTROL. I HAVE REVIEWED THIS EROSION AND SEDIMENT CONTROL PLAN WITH THE OWNER/DEVELOPER.

11-22-05

REGISTERED PROFESSIONAL ENGINEER — DATE

Anne Arundel Soil Conservation District
Sediment and Erosion Control Approval

District Official — Date

AASCD # — SMALL POND (S) #

Reviewed for technical adequacy by
USDA, Natural Resource Conservation Service

C. D. MEEKINS & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
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ANNAPOLIS, MD. 21404-2151
ANNAPOLIS: (410) 267-0744 BALTIMORE: (410) 269-7807 FACSIMILE: (410) 267-0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:
C. DOUGLAS MEEKINS

6708	9153	11-22-05
P.E. NO.	L.S. NO.	DATE

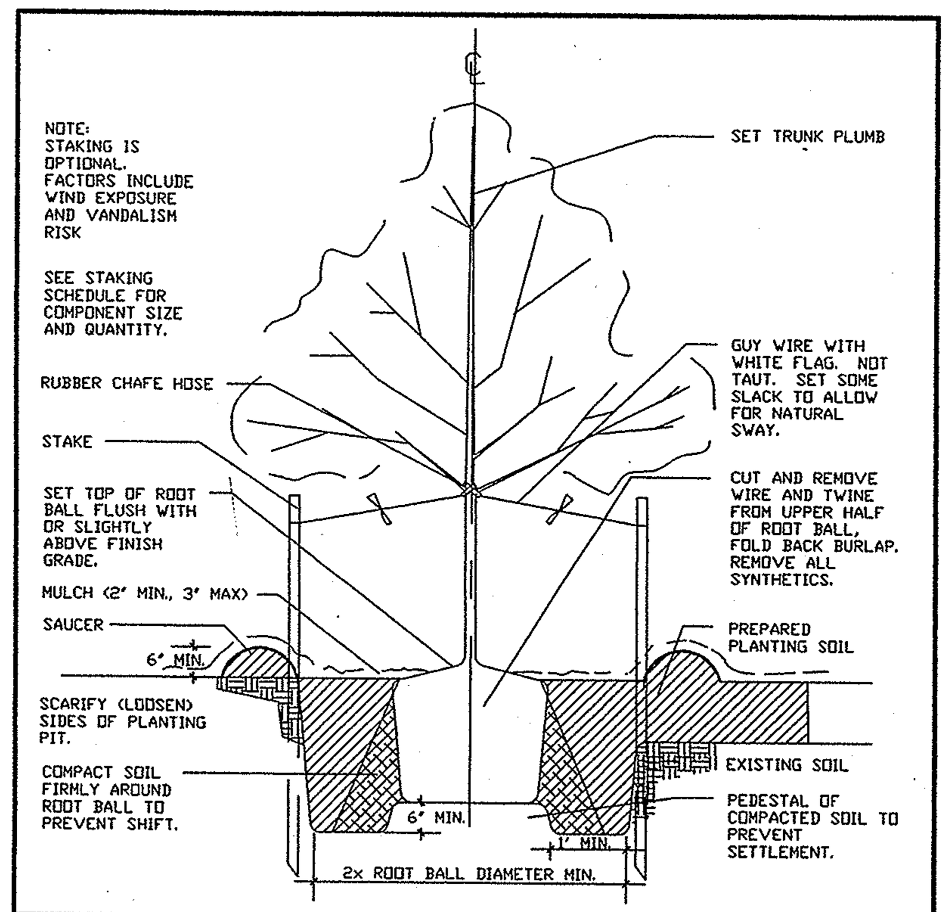
DESIGNED: J.P. CHECKED: C.D.M. SCALE: AS SHOWN
DRAWN: M.J.B. DATE: REF.:

11-22-05

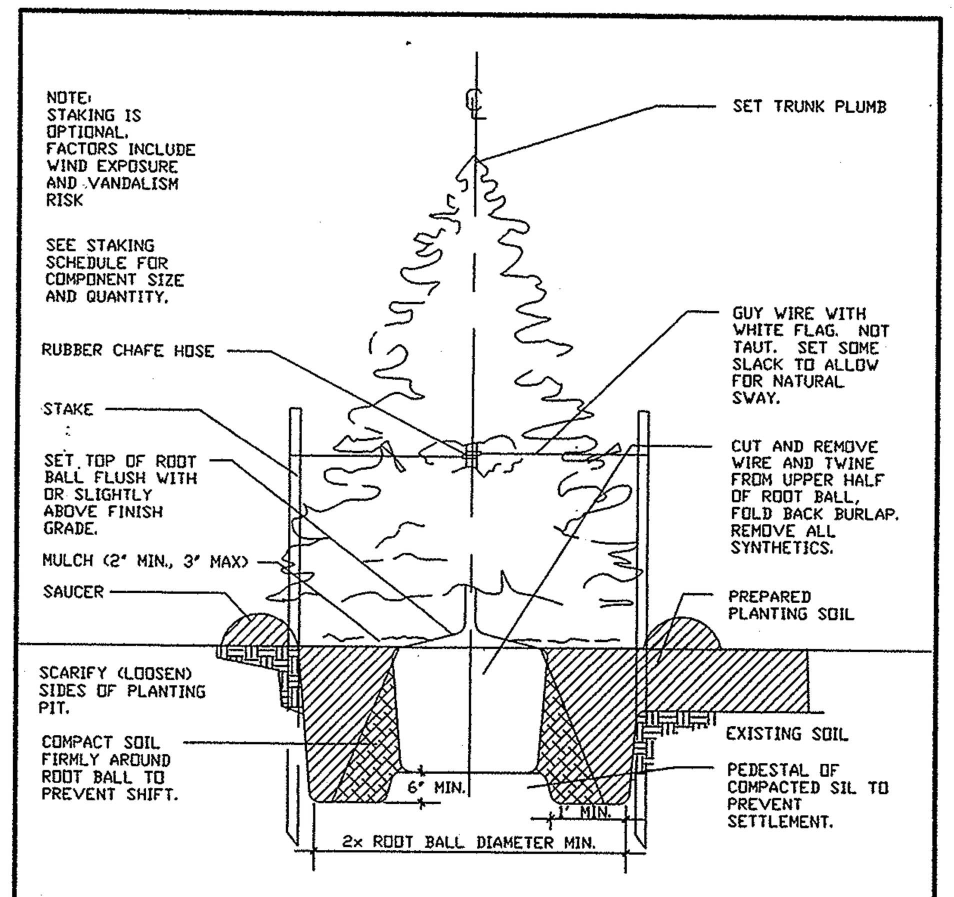
PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

COVER SHEET
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

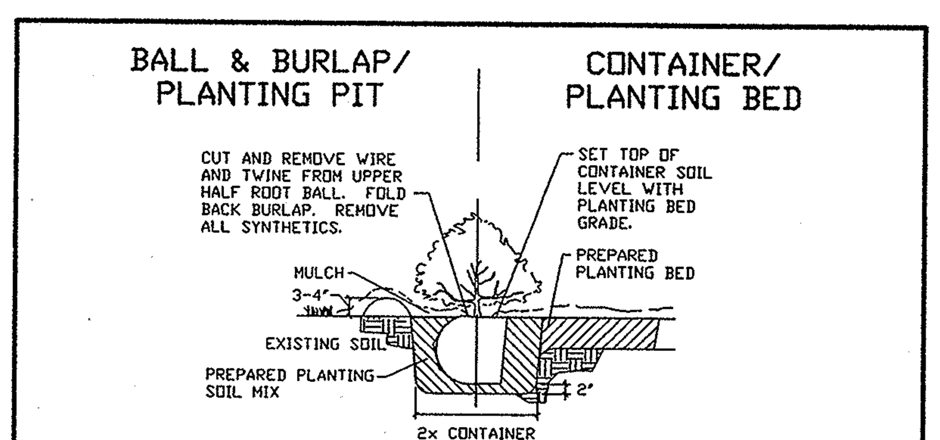
JOB NUMBER 02-5269
SHEET NO. 1 OF 8 SHEETS



DETAIL – DECIDUOUS TREE PLANTING – TO 2 1/2" CALIPER
PLANTING PIT – SINGLE PLANTING PIT – PLANTING BED
NOT TO SCALE



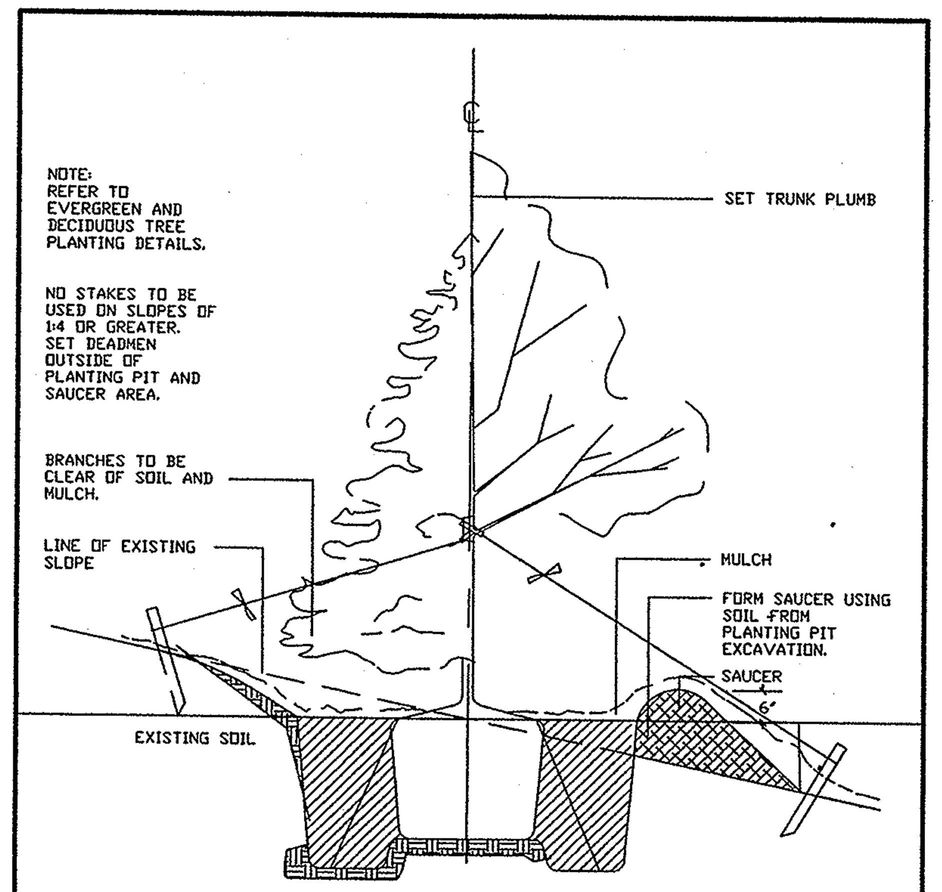
DETAIL – EVERGREEN TREE PLANTING – TO 12' HEIGHT
PLANTING PIT – SINGLE PLANTING PIT – PLANTING BED
NOT TO SCALE



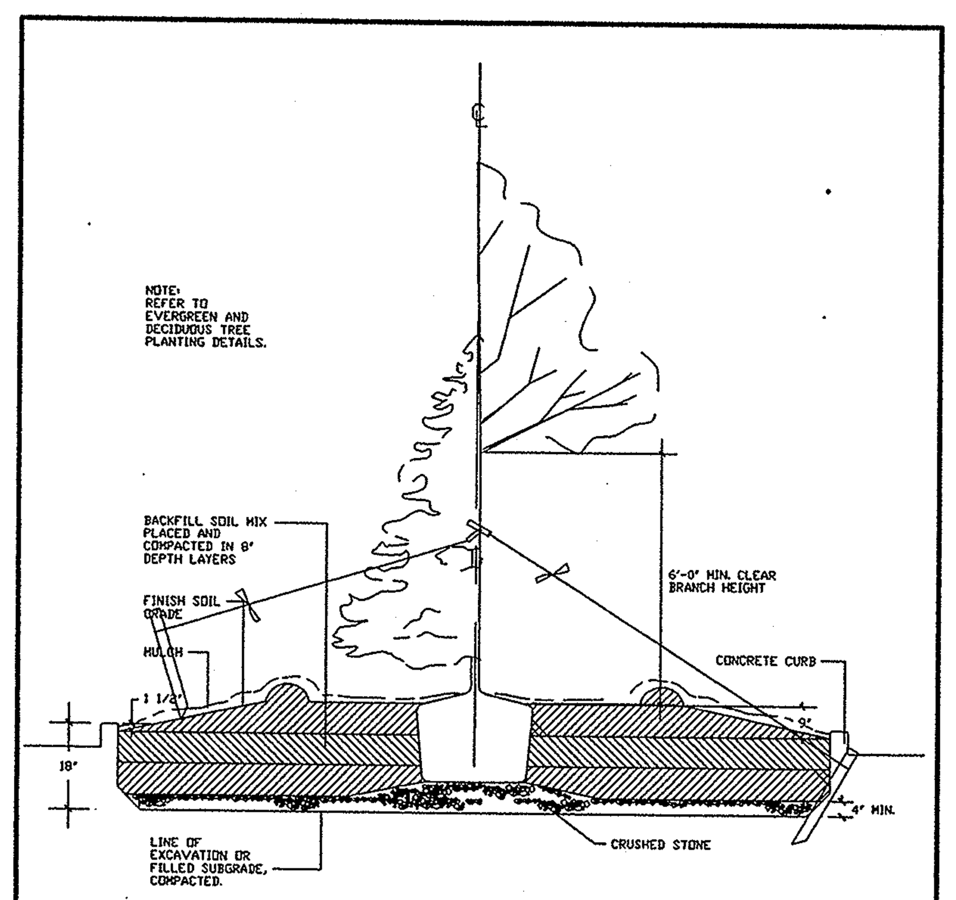
DETAIL – SHRUB PLANTING
NOT TO SCALE

Tree Size	Stake Quantity	Stake Size	Wire Size
6 - 10' or 1 - 2" caliper	2	2" x 2" x 6' min.	14 gauge
10 - 12' or 2 - 2 1/2" caliper	2	2" x 2" x 8' min.	14 gauge
12 - 16' or 2 1/2" - 4" caliper	3 deadmen	24" min.	12 gauge
16 - 20' or 4 - 6" caliper	3 deadmen	30" min.	14 gauge
over 20' or over 6" caliper	3 deadmen		3/16" with turnbuckles

TREE STAKING SCHEDULE



DETAIL – TREE PLANTING ON A SLOPE
NOT TO SCALE



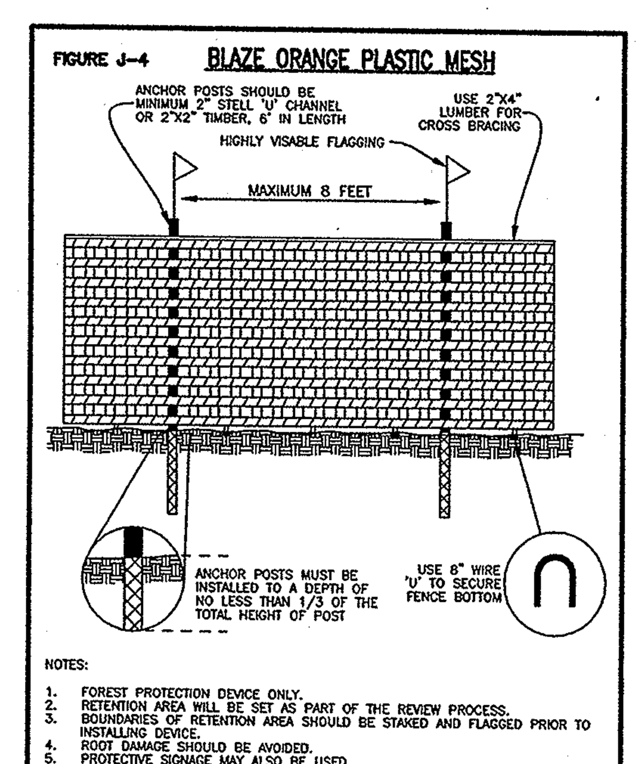
DETAIL – LANDSCAPE ISLAND PLANTING BED
NOT TO SCALE

PLANT LIST–INTERIOR & BUFFER

SYM	Q'TY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	SP'C'G
AG	27	Abelia x grandiflora	Glossy Abelia	3 – 4'	cont	5'
CA	21	Clethra alnifolia	Summersweet / Clethra	18 – 24"	cont	4'
CL	10	Cupressopyparus x leylandii	Leyland Cypress	5 – 6'	b&b	8'
EA	73	Euonymus alata compacta	Compact Burning Bush	30 – 36"	cont	4'
FI	5	Forsythia intermedia	Border Forsythia	3 – 4'	b&b	6'
FP	12	Fraxinus pennsylvanica 'MArshall's Seedless'	Marshall's Seedless Ash	2–2 1/2"cal	"	shown
IG	57	Ilex glabra 'Nordic'	Nordic Inkberry	24 – 30"	cont	4'
JS	80	Juniperus chinensis sargenti	Sargent Juniper	3 gal	"	3'
KP	13	Koelreuteria paniculata	Goldenrain Tree	2–2 1/2"cal	b&b	shown
PF	15	Photinia x fraseri	Fraser's Photina	3 –4'	cont	6'
PC	4	PRunus cersifera	Purpleleaf Plum	6 – 8'	cont	shown
SS	39	Spiraea japonica 'Shirobana'	Shirobana Spirea	3 gal	"	3'
UP	17	Ulmus parviflora	Chinese LAcebark Elm	2–2 1/2"cal	b&b	shown

PLANT LIST – FOUNDATION

SYM	Q'TY	BOTANICAL NAME	COMMON NAME	SIZE	ROOT	SP'C'G
AEG	13	Abelia 'Edward Goucher'	Edward Goucher Abelia	3 gal	cont	3'
FI	13	Forsythia x intermedia	Forsythia	3–4'	b&b	6'
IH	7	Ilex crenata 'Helleri'	Helleri Holly	18–21"	cont	3'
IG	16	Ilex glabra 'Nordic'	Nordic Inkberry	21– 24"	cont	4'



PLANTING NOTES

1. All planting shall conform to currently approved standard horticultural practice. See PLANTING DETAILS. Planting shall take place between March 15 – June 1 or September 15 – November 15.
2. All plants shall conform to current standards as defined by the American Nurseryman's Association and each shall be clearly tagged with its botanical name. No substitutions shall be permitted after bid is accepted. No plants shall be pruned other than to remove a damaged branch. No plant with a dead or pruned out central leader will be accepted.
3. All plants shall be certified by the Contractor to be free of pests, fungi and diseases and/or deformities or damage.
4. Planting beds and pits shall be rendered free of all rocks over 2" and any debris found during the tilling and preparation process.
5. Planting beds shall be tilled to a minimum depth of 8". If any unsuitable conditions, such as extreme compaction or high water table are encountered, the Landscape Architect shall be notified immediately.
6. A minimum of 2" depth 'Leaf–Gro', peat moss or equivalent and 2" clean loamy topsoil shall be spread evenly over all planting beds and incorporated by tilling. In compacted or clay conditions, a minimum of 1" depth of sand shall also be incorporated.
7. A suitable slow–release fertilizer shall be used in accordance with the manufacturer's recommendations and based on soil samples taken on–site after grading has been completed. Submit fertilizer information to the Landscape Architect for approval prior to commencing planting operations. Composted cow manure may be substituted for slow–release fertilizer, applied at a minimum depth of 1/2" and tilled in with other soil amendments.
8. Soil mix for planting pits shall consist of 3 parts by volume of existing on–site soil, i part 'Leaf–Gro', peat moss or equivalent and slow–release fertilizer combined per manufacturer's recommendations. In compacted conditions or clay, also add 1 part clean sand. This mix shall be prepared prior to use as back fill Planting Mix.
9. If any underground obstructions or other site conditions are encountered that conflict with the planned plantings, notify the Landscape Architect immediately.
10. Landscape Architect shall be notified in writing for inspection and approval of all plant materials prior to any installation. This may be waived by the General Contractor/Owner.
11. If any conflicts are found between the information shown on the Landscape Plan and that shown in the Plant Lists, notify the Landscape Architect prior to the time the final bid is submitted.
12. All planting beds shall be neatly hand edged unless otherwise specified.
13. All planting beds and pits shall be provided with a 3" depth of shredded, bark mulch, spread evenly, unless otherwise specified. In addition, planting pits shall have a 6" high rim or 'saucer' provided.
14. A water source for planting and maintenance operations will be provided by the Owner/Client. If a source is not available on–site, Contractor will included a water supply cost in his/her bid.
15. Any lawn, paving or other surfaces damaged by the Contractor's operations shall be repaired in kind before the project will be accepted for final approval and payment.
16. The Owner's property and any affected abutting property shall be left clean and free of any debris or excess materials resulting from any phase of the landscape operations.
17. The Contractor is responsible for repairing or replacing as necessary, any property of the Owner/Client or any affected abutting property that is damaged by the Contractor's operations, equipment or crew. Any such repair or replacement shall take place in a timely fashion and in a manner that meets with the approval of the Owner/Client.
18. Contractor shall notify the Landscape Architect or Owner/Client at the completion of landscape installation for a project acceptance inspection. All plants must be in accordance with specifications and be in healthy, vigorous condition for acceptance.
19. All plant material shall be warranted for one year starting from the date of installation acceptance. This shall include one replacement to match the original. If the Contractor is of the opinion that a specified plant will not survive its planned location, the Landscape Architect shall be notified prior to bid. A tree shall be replaced if the main leader has died back of if the canopy is 25% or greater dead. A shrub shall be replaced if the crown is 25% or greater dead.
20. Contractor is responsible for all maintenance for a three month period following project acceptance. Maintenance shall include but not be limited to to watering, herbicide, pesticide, fungicide or fertilizer applications, patching or reapplying mulch to maintain depth, pruning, adjusting stakes, weeding and repairing bed edges. This shall be included as a separate bid item. During the entire warranty period the Contractor is responsible for checking the project and making maintenance suggestions to the Owner/Client.

GENERAL NOTES

1. Check location of all underground utilities. Call "MISS UTILITY" at 1–800–257–7777 at least 5 days prior to commencing any excavation.
2. Contractor is required to carry any/all Workmen's Compensation and other Liability insurance's as required by the General Contractor and/or Owner.
3. Contractor is required to comply with any/all laws, codes, regulations & ordinances that apply to the work performed on this Project.
4. Contractor shall coordinate the execution of all work performed with the General Contractor/ Owner and shall complete all work in a timely fashion.
5. General Contractor/Owner is responsible for obtaining site permits and paying fees unless otherwise specified.
6. All clearing, grubbing, rough and fine grading, installation and maintenance of erosion control devices, sodding and seeding are separate operations and not included in this Landscape Plan. Except as specifically stated, disturbed areas of site shall be seeded or sodded in all areas that are not landscaped, as shown.
7. These plans are to be used for Landscape purposes only.
8. If stockpile areas are required on–site by the Contractor, locations will be designated by the General Contractor/Owner.

PREVIOUSLY APPROVED

C. D. MEEKINS & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
159 MAIN ST., SECOND FLOOR, ANNAPOLIS, MD.
MAILING ADDRESS: P.O. BOX 2151, ANNAPOLIS, MD. 21404–2151
ANNAPOLIS: (410) 267–0744 BALTIMORE: (410) 269–7807 FACSIMILE: (410) 267–0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

DEBORAH M. SCHWAB
Landscape Architecture
409 Washington Street, Annapolis, MD. 21430
Ph: 410 268 5291 Email: dschwabla@erols.com Fax: 410 267 7809

DESIGNED:	CHECKED: D.M.S.	SCALE: AS SHOWN
DRAWN: V.P./D.S.	DATE: 1-8-03	REF.:

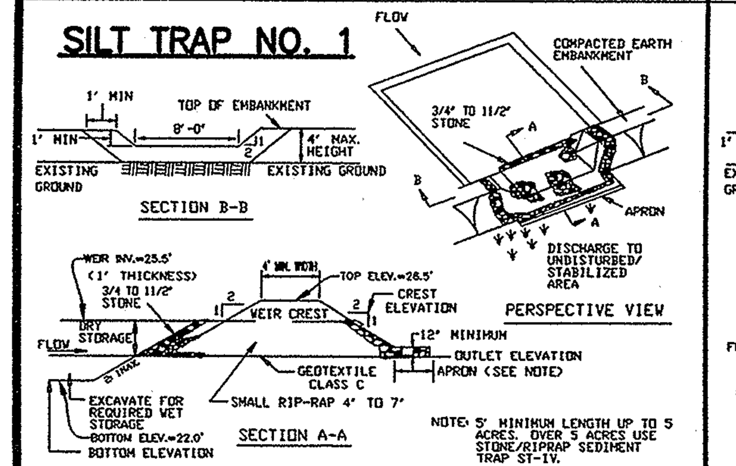
PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301–621–8220

LANDSCAPE NOTES AND DETAILS
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-17-05 | CDM: 02-5269H
JOB NUMBER 02–5269
SHEET NO. 8 OF 8 SHEETS

DETAIL 9 - STONE OUTLET SEDIMENT TRAP - ST II

SILT TRAP NO. 1

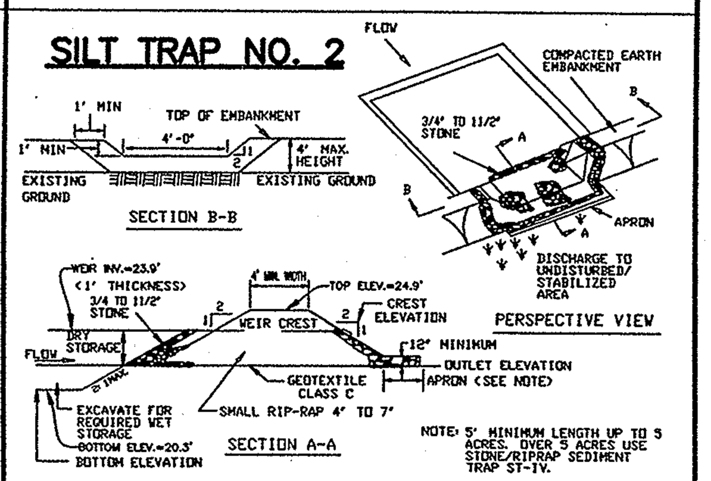


Construction Specifications

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE C - 9 - 15 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL 9 - STONE OUTLET SEDIMENT TRAP - ST II

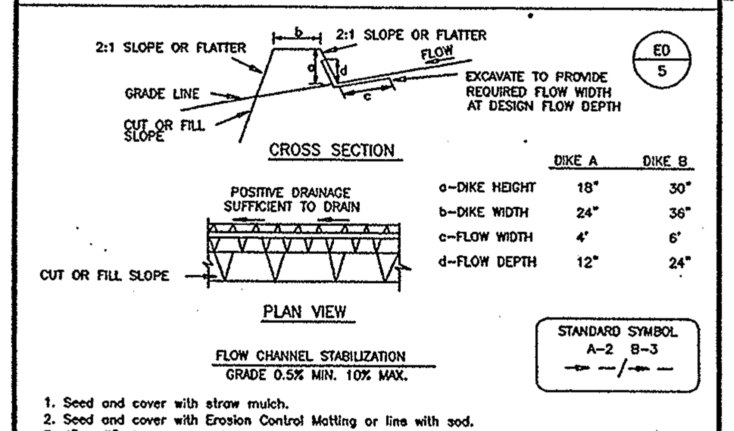
SILT TRAP NO. 2



Construction Specifications

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE C - 9 - 15 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL 1 - EARTH DIKE



Construction Specifications

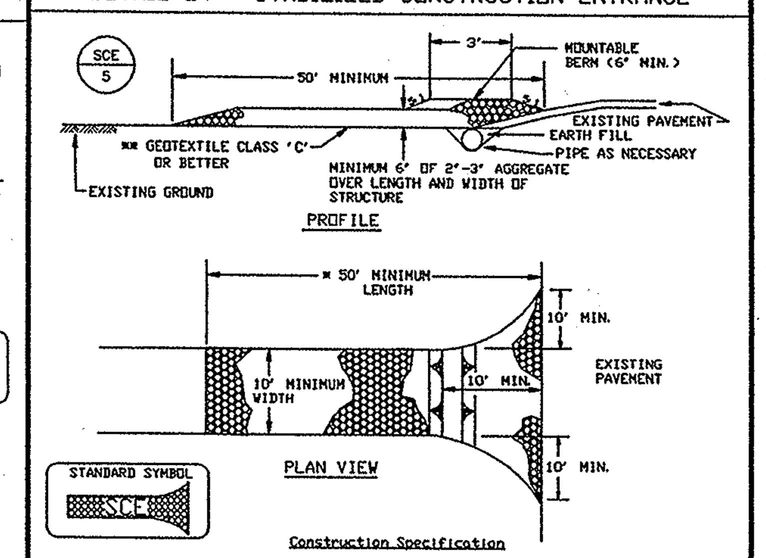
6. Fill shall be compacted by earth moving equipment.

7. All earth removed and not needed for construction shall be placed so that it will not interfere with the functioning of the dike.

8. Inspection and maintenance must be provided periodically and after each rain event.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE A - 1 - 6 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

DETAIL 24 - STABILIZED CONSTRUCTION ENTRANCE



Construction Specification

6. Location - A stabilized construction entrance shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance.

U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE | PAGE F - 17 - 3 | MARYLAND DEPARTMENT OF ENVIRONMENT WATER MANAGEMENT ADMINISTRATION

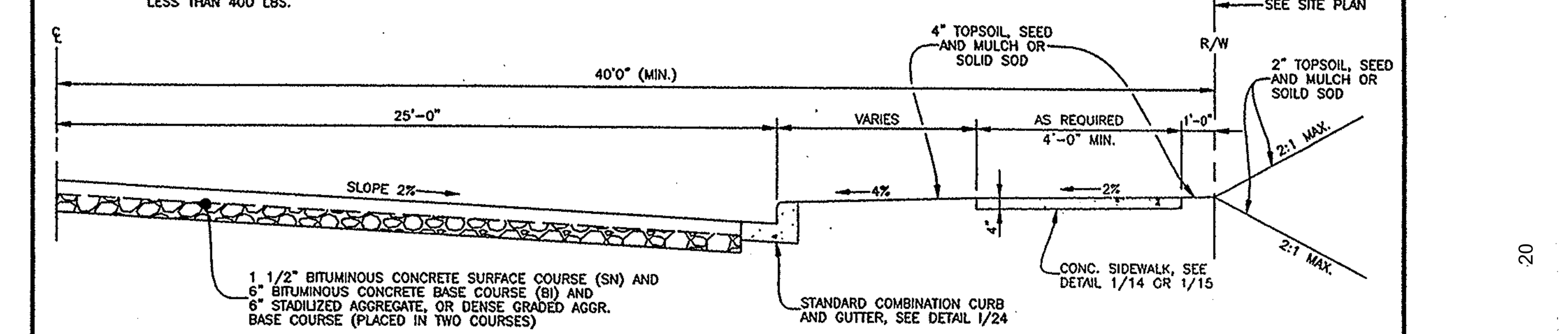
GENERAL NOTES

1. TOTAL AREA OF LOT = 219,542 S.F.± / 5.04 Ac.±
2. TOTAL AREA TO BE DISTURBED DURING CONSTRUCTION = 92,640 S.F. / 2.1267 Ac.±
3. TOTAL AREA TO BE VEGETATIVELY STABILIZED = 1,716 S.F.± / 0.0394 Ac.±
4. SEE SOIL DELINEATION MAP NO. 3 SOIL TYPE Bm, Fo, Erb, EsC
5. EARTHWORK QUANTITIES:
   TOTAL CUT: 2,690 CUBIC YARDS
   TOTAL FILL: 4,933 CUBIC YARDS
6. TEMPORARY STOCK PILE AREA TO BE WITHIN THE L.O.D. OF SITE.
7. THIS PARCEL IS NOT IN THE 100 YEAR HURRICANE FLOOD AREA.
8. EXCESS SPOIL MATERIAL IF ANY TO BE TRUCKED OFF SITE TO AN APPROVED SITE.
9. SEE F.E.M.A.'S FLOOD INSURANCE RATE MAP PANEL NUMBER 11 ZONE C.
10. THIS PARCEL IS LOCATED OUTSIDE THE CHESAPEAKE BAY CRITICAL AREA.
11. DEVELOPER MUST CONFORM TO BILL NO. 18-85 AND SPECIFICALLY THE FOLLOWING:
    A. "THE DEVELOPER MUST REQUEST THAT THE DEPARTMENT OF INSPECTIONS AND PERMITS APPROVE WORK COMPLETED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN, THE GRADING OR BUILDING PERMIT, AND THE ORDINANCE;"
    B. "ON ALL SITES WITH DISTURBED AREAS IN EXCESS OF 2 ACRES, APPROVAL OF THE DEPARTMENT OF INSPECTIONS AND PERMITS SHALL BE REQUIRED ON COMPLETION OF INSTALLATION OF PERIMETER EROSION AND SEDIMENT CONTROLS, BUT BEFORE PROCEEDING WITH ANY OTHER EARTH DISTURBANCE OR AUTHORIZED UNTIL THE INITIAL APPROVAL BY THE DEPARTMENT OF INSPECTIONS AND PERMITS IS GIVEN;"
    C. "APPROVAL SHALL BE REQUESTED ON FINAL STABILIZATION OF ALL SITES WITH DISTURBED AREAS IN EXCESS OF 2 ACRES BEFORE REMOVAL OF CONTROLS."
12. THIS PARCEL IS ZONED = R-2

NOTE: CONTRACTOR SHALL DETERMINE HIS OWN QUANTITIES FOR PAYMENT FOR EARTHWORK.

NOTES:

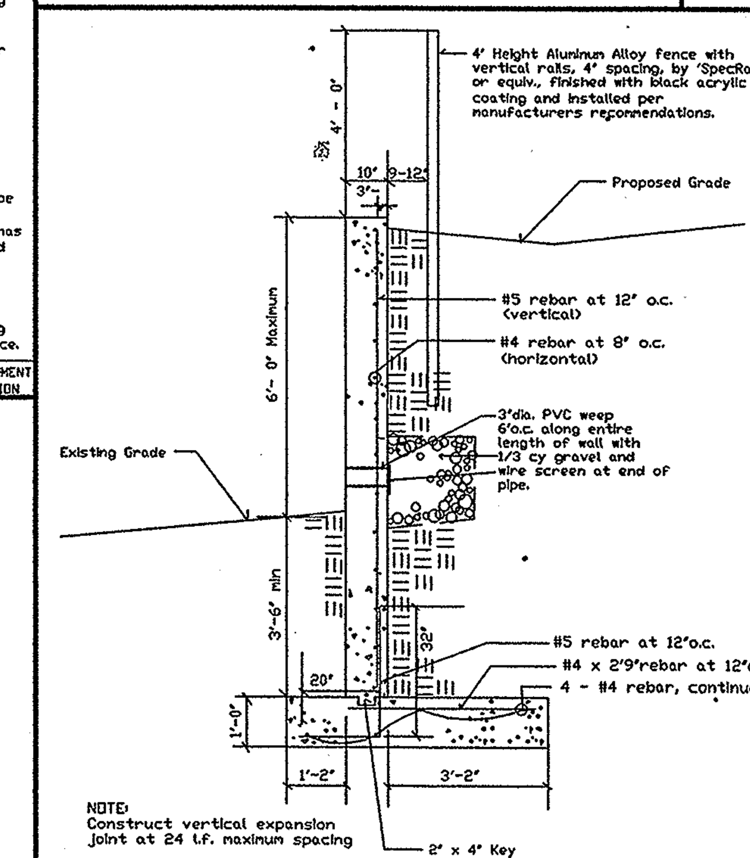
1. BITUMINOUS CONCRETE BAND DESIGNATIONS ARE MD. STATE HIGHWAY ADMINISTRATION.
2. BITUMINOUS CONCRETE, STABILIZED AGGREGATE BASE COURSE, DENSE GRADED AGGREGATE AND/OR GRAVEL SHALL BE MIXED AND PLACED IN ACCORDANCE WITH LATEST SPECIFICATIONS.
3. A TACK COAT OF 0.5 GAL./SQ.YD. OF AE-4 SHALL BE APPLIED TO EACH UNDERLYING LAYER OF BITUMINOUS CONCRETE PRIOR TO PLACING SUBSEQUENT COURSES.
4. A PRIME COAT OF 0.3 GAL./SQ.YD. OF MC-70 SHALL BE APPLIED ON THE TOP OF ALL GRANULAR BASE COURSES.
5. THE SAND ASPHALT MARSHALL SPECIMEN'S SHALL HAVE MINIMUM STABILITY OF NOT LESS THAN 400 LBS.



PAVING DETAIL RIGHT OF WAY FOR STATE HIGHWAY ROUTE 652

DETAIL - CONCRETE RETAINING WALL, 6' HT.

NOT TO SCALE



STANDARD WATER DETAILS

STANDARD INSTALLATION 1" METERED DOMESTIC SERVICE

ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS

INFILTRATION TRENCH #1

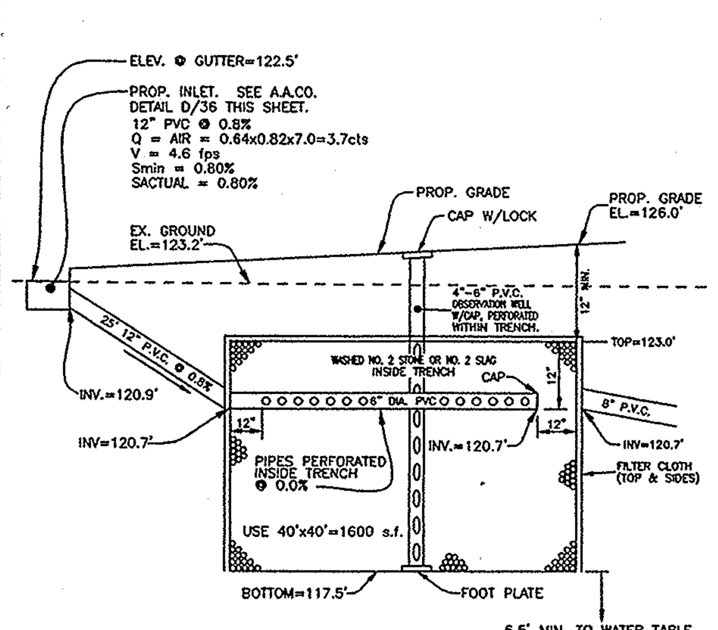
AVAILABLE DEPTH FOR INFILTRATION

USE 120.7-117.5=3.2 FT.

DETERMINE AREA OF TRENCH REQUIRED WHERE:

At = 1,593 sq. ft.

USE TRENCH AREA = 26.0X12.0 = 312 S.F.



TYPICAL INFILTRATION SECTION

(N.T.S.)

INFILTRATION TRENCH #2

AVAILABLE DEPTH FOR INFILTRATION

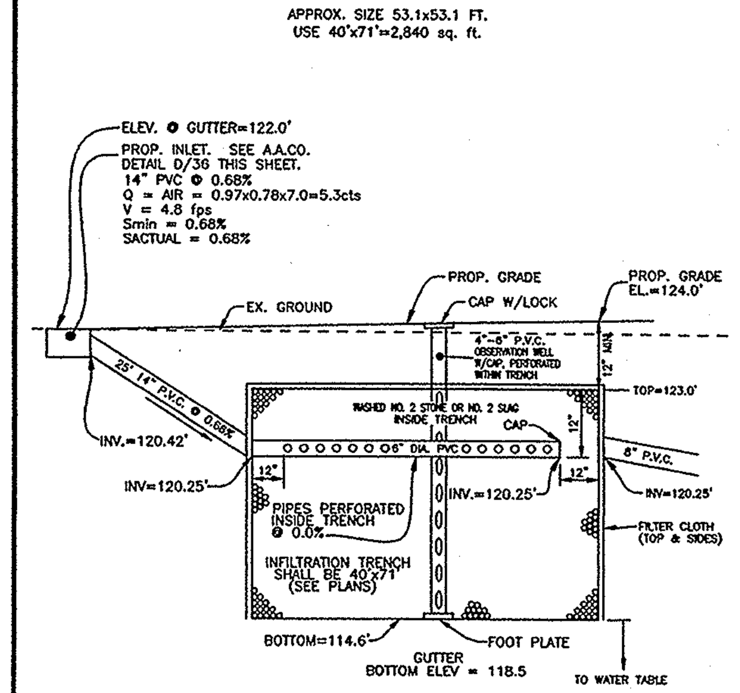
USE 120.5-118.5=2.0 FT.

DETERMINE AREA OF TRENCH REQUIRED WHERE:

At = 2,820 sq. ft.

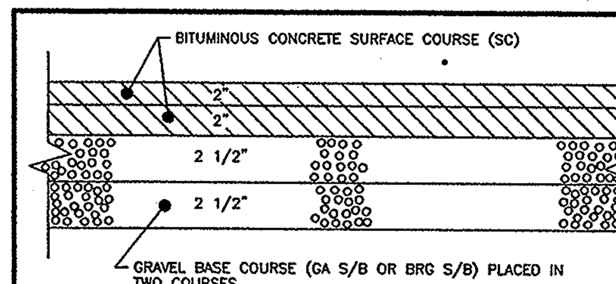
APPROX. SIZE 53.1x53.1 FT.

USE 40'x71'=2,840 sq. ft.



TYPICAL INFILTRATION SECTION

(N.T.S.)



TYPICAL PAVING SECTION

ON SITE PAVING

(NOT TO SCALE)

GENERAL PAVING NOTES

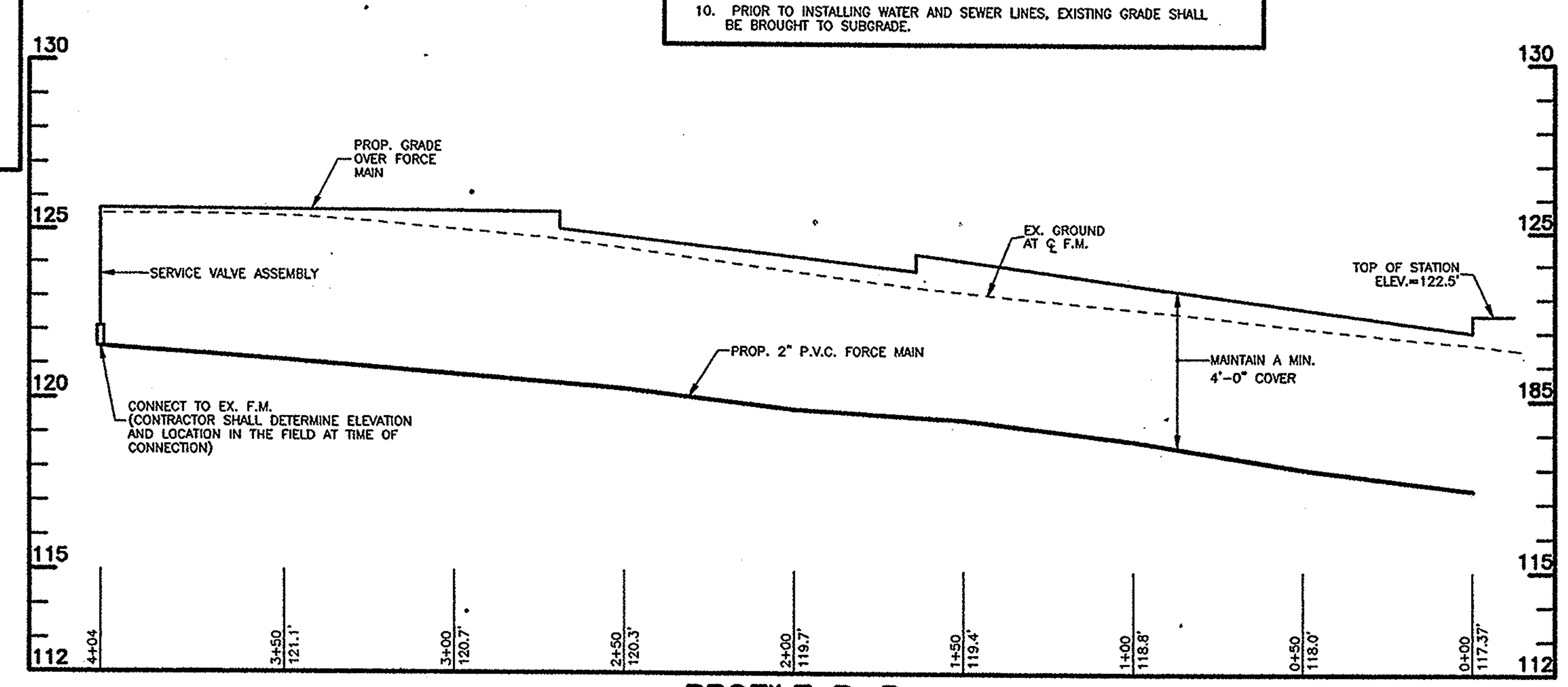
1. ALL PAVING OPERATIONS INCLUDING BUT NOT LIMITED TO UNDERCUTTING, COMPACTION, PLACEMENT, PRIME COATING, TACKCOATING, PAVING, TESTING, ETC., SHALL BE IN TOTAL CONFORMANCE TO THE LATEST EDITION OF THE ANNE ARUNDEL COUNTY, DEPARTMENT OF PUBLIC WORKS STANDARD SPECIFICATIONS AND DETAILS. THE PROJECT ENGINEER ASSIGNED TO THIS PROJECT SHALL BE NOTIFIED OF ANY YIELDING OR SATURATED SUBGRADE CONDITIONS, IF ANY, PRIOR TO PLACEMENT OF GRAVEL BASE COURSE.
2. BITUMINOUS CONCRETE BAND DESIGNATIONS ARE MD. STATE HIGHWAY ADMINISTRATION.
3. BITUMINOUS CONCRETE, MACADAM, DENSE GRADED AGGREGATE AND/OR GRAVEL SHALL BE PLACED IN ACCORDANCE WITH LATEST MD. STATE HIGHWAY ADMINISTRATION SPECIFICATIONS.
4. A TACK COAT OF 0.005 GAL/SQ. YD. OF AE-4 SHALL BE APPLIED TO EACH UNDERLYING LAYER OF BITUMINOUS CONCRETE PRIOR TO PLACING SUBSEQUENT COURSES.
5. A PRIME COAT OF 0.3 GAL/SQ. YD. OF MC. 70 SHALL BE APPLIED ON THE TOP OF ALL GRANULAR BASE COURSES.
6. THE SAND ASPHALT MARSHALL SPECIMENS SHALL HAVE MINIMUM STABILITY OF NOT LESS THAN 400 LBS.

CONSTRUCTION GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS "STANDARDS AND SPECIFICATIONS" UNLESS OTHERWISE NOTED.
2. EXISTING UTILITIES AND OBSTRUCTIONS SHOWN ARE TAKEN FROM THE BEST AVAILABLE RECORDS AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION. NECESSARY PRECAUTIONS SHALL BE TAKEN TO PROTECT EXISTING SERVICES AND MAINS, ANY DAMAGE DUE TO NEGLIGENCE SHALL BE IMMEDIATELY REPAIRED AT THE CONTRACTORS EXPENSE.
3. THE CONTRACTOR SHALL NOTIFY THE BALTIMORE GAS & ELECTRIC COMPANY (410) 234-5691 AND MISS UTILITY 1-800-257-7777 AT LEAST FIVE (5) WORKING DAYS BEFORE BEGINNING CONSTRUCTION.
4. THE CONTRACTOR SHALL NOTIFY THE C & P TELEPHONE COMPANY (410) 393-3648 AT LEAST FIVE (5) WORKING DAYS BEFORE BEGINNING CONSTRUCTION.
5. THE CONTRACTOR SHALL NOTE THAT IN CASE OF A DISCREPANCY BETWEEN SCALED AND NOTED DIMENSIONS SHOWN ON THESE PLANS ALL NOTED DIMENSIONS SHALL GOVERN.
6. IT SHALL BE DISTINCTLY UNDERSTOOD THAT FAILURE TO MENTION SPECIFICALLY ANY WORK WHICH WOULD NORMALLY BE REQUIRED TO COMPLETE THIS PROJECT SHALL NOT RELIEVE THE CONTRACTOR OF ANY RESPONSIBILITY TO PERFORM SUCH WORK.
7. ALL STORM DRAIN STRUCTURES NOT DETAILED ON THIS PLAN AND ALL WORK TO BE PERFORMED UNDER THE STORM DRAIN CONSTRUCTION SHALL CONFORM TO ANNE ARUNDEL COUNTY "DESIGN MANUAL" AND "DETAILS & SPECIFICATIONS" (MOST RECENT EDITION).

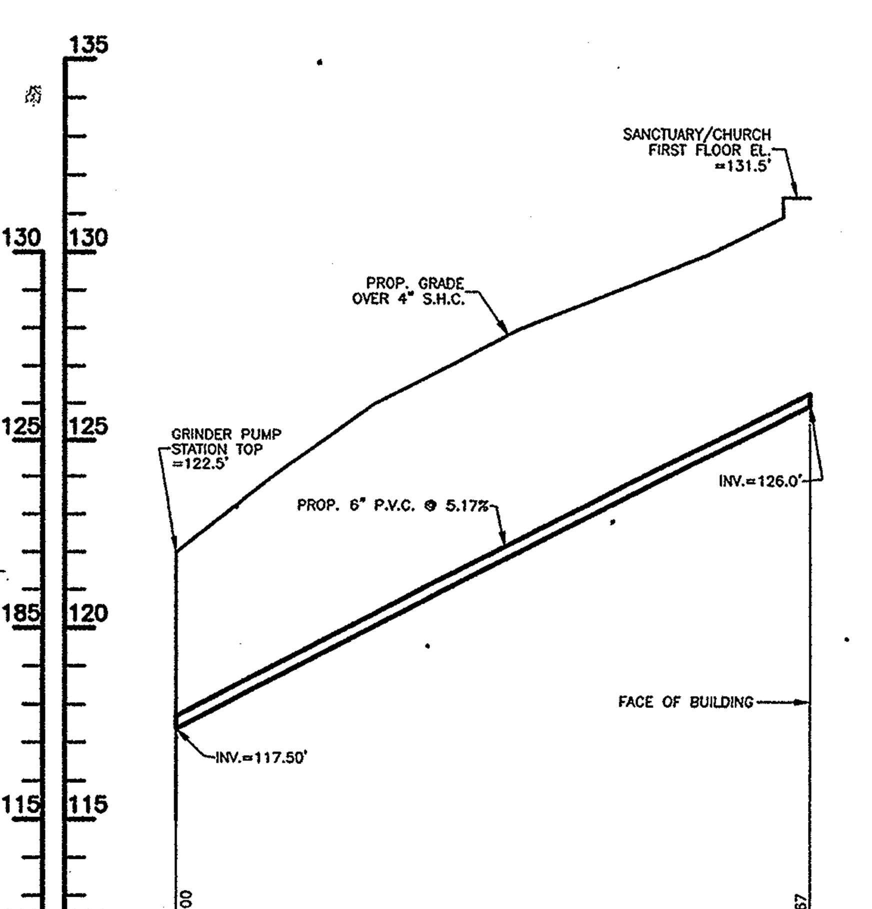
GENERAL NOTES

1. ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE ANNE ARUNDEL COUNTY "STANDARD DETAILS AND SPECIFICATIONS FOR CONSTRUCTION" AND OTHER REVISION THEREOF.
2. THE EXISTING UTILITIES AND OBSTRUCTIONS SHOWN ARE FROM THE BEST AVAILABLE RECORDS AND SHALL BE VERIFIED BY THE CONTRACTOR TO HIS SATISFACTION PRIOR TO CONSTRUCTION. NECESSARY PRECAUTIONS SHALL BE TAKEN BY THE CONTRACTOR TO PROTECT EXISTING SERVICES AND MAINS, AND ANY DAMAGE TO THEM, DUE TO HIS NEGLIGENCE, SHALL BE PREPARED IMMEDIATELY AT THE HIS OWN EXPENSE.
3. THE CONTRACTOR SHALL NOTE THAT IN CASE OF A DISCREPANCY BETWEEN THE SCALED AND FIGURED DIMENSIONS SHOWN ON THESE PLANS, THE FIGURED DIMENSIONS SHALL GOVERN.
4. IT SHALL BE DISTINCTLY UNDERSTOOD THAT FAILURE TO MENTION SPECIFICALLY ANY WORK WHICH WOULD NORMALLY BE REQUIRED TO COMPLETE THE PROJECT SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO COMPLETE SUCH WORK.
5. THE CONTRACTOR SHALL NOTIFY THE FOLLOWING AGENCIES AT LEAST FIVE (5) WORKING DAYS PRIOR TO CONSTRUCTION.
   A. ANNE ARUNDEL COUNTY DEPARTMENT OF INSPECTIONS AND PERMITS (410) 222-7347/
   B. BALTIMORE GAS AND ELECTRIC COMPANY (410) 234-5691
   C. MISS UTILITIES 1-800-257-7777
6. TAMPED FILL SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DRY DENSITY AS DETERMINED BY AASHTO DESIGNATION T-180 METHOD-C.
7. UNLESS OTHERWISE NOTED, PIPE ELEVATIONS FOR WATER REFER TO TOP OF PIPE AND SANITARY SEWER ELEVATIONS REFER TO THE INVERT.
8. UNLESS OTHERWISE NOTED ALL GRAVITY SEWER PIPE SHALL BE PVC SDR-35 CONFORMING TO THE REQUIREMENTS OF THE ASTM SPECIFICATIONS D-3034, TYPE PSM. PIPE FITTINGS SHALL BE MANUFACTURED WITH INTEGRALLY FORMED BELL AND SPIGOT TYPE JOINTS IN ACCORDANCE WITH ASTM SPECIFICATIONS D-3212. ALL DUCTILE IRON PIPE SHALL BE CL. 50 UNLESS OTHERWISE NOTED.
9. ALL WORK SHALL COMPLY WITH ALL APPLICABLE PROVISIONS OF THE "1994 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL IN DEVELOPING AREAS", ISSUED BY THE U.S.D.A. SOIL CONSERVATION SERVICE. THE MEASURES REQUIRED IN THE APPROVED SEDIMENT CONTROL PLAN SHALL APPLY AS IF SHOWN ON THIS PLAN, AND SHALL BE COMPLETED AND IN SERVICE PRIOR TO CONSTRUCTION OF THE UTILITIES SHOWN ON THIS PLAN.
10. PRIOR TO INSTALLING WATER AND SEWER LINES, EXISTING GRADE SHALL BE BROUGHT TO SUBGRADE.



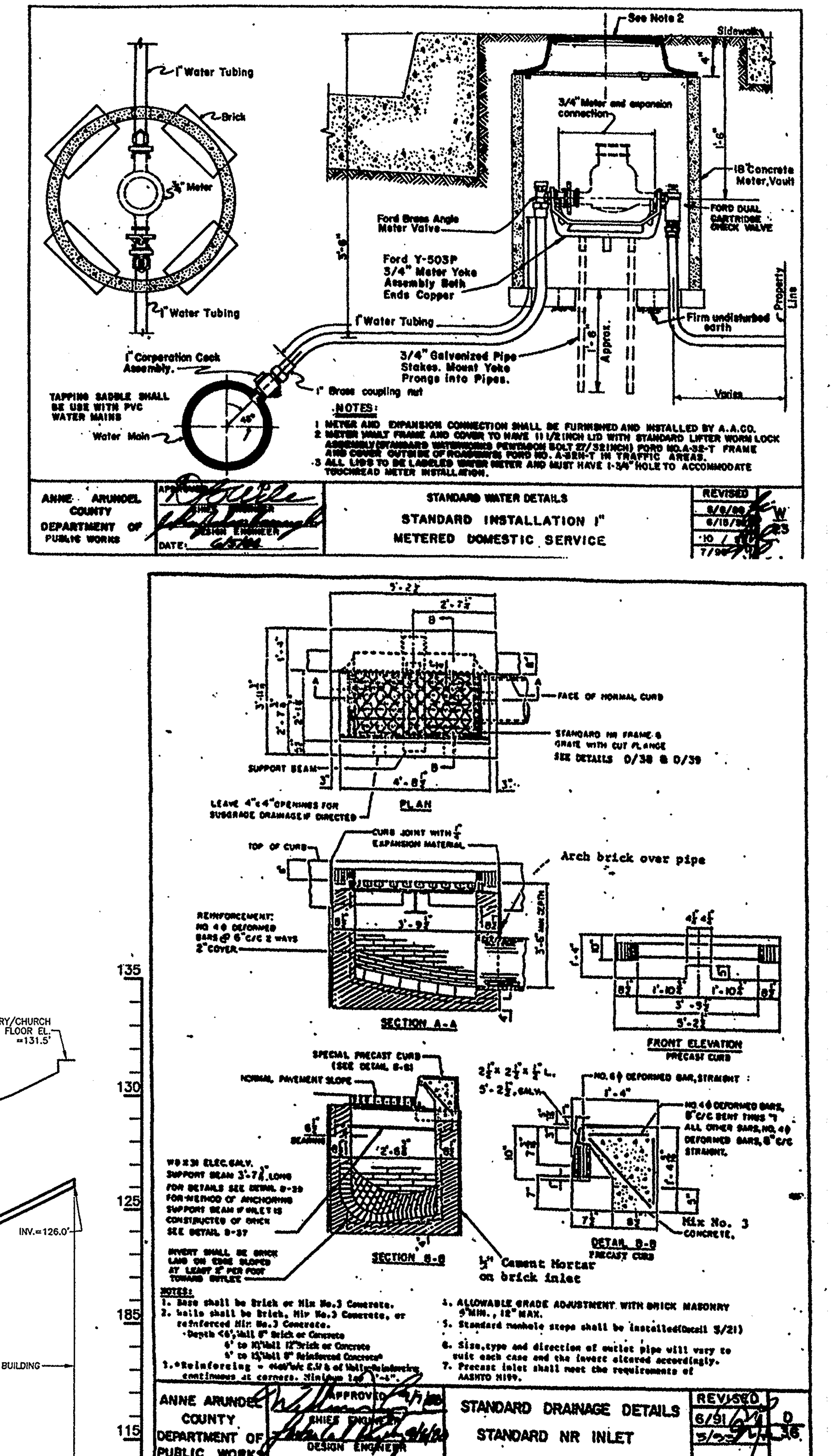
PROFILE B-B

SCALE: 1"=40' HOR.
1"=4' VER.



S.H.C. PROFILE

SCALE: 1"=40' HOR.
1"=4' VER.



ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS

STANDARD DRAINAGE DETAILS

STANDARD NR INLET

C. D. MEEKINS & ASSOCIATES, INC.

CONSULTING ENGINEERS AND SURVEYORS

159 MAIN ST., SECOND FLOOR, ANNAPOLIS, MD.
MAILING ADDRESS: P.O. BOX 2151, ANNAPOLIS, MD. 21404-2151
ANNAPOLIS: (410) 267-0744 BALTIMORE: (410) 269-7807 FACSIMILE: (410) 267-0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:

C. DOUGLAS MEEKINS

6708	9153	11-22-05
P.E. NO.	L.S. NO.	DATE
DESIGNED: J.P.	CHECKED: C.D.M.	SCALE: AS SHOWN
DRAWN: M.J.B.	DATE:	REF.:

PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

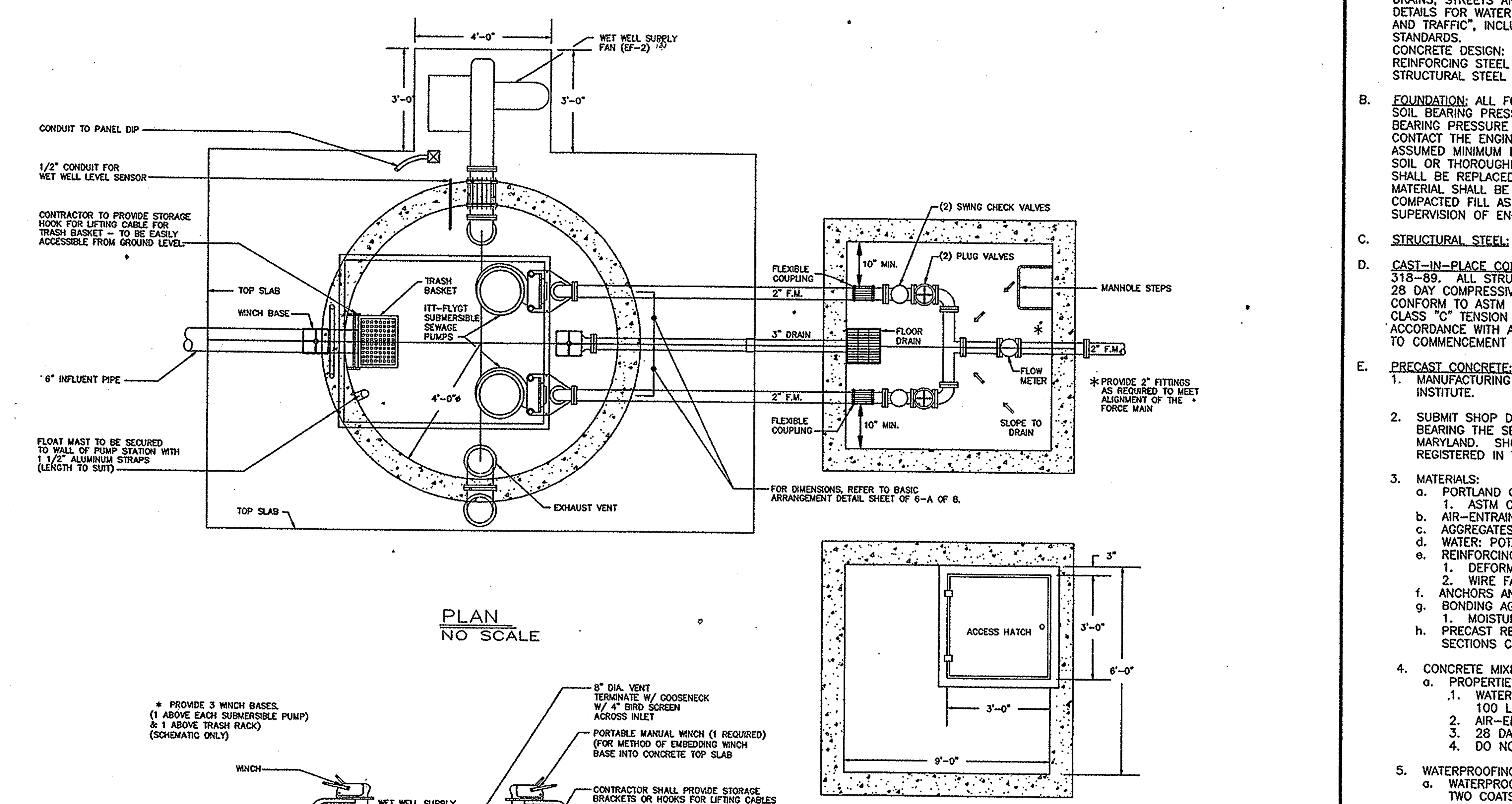
SITE DETAILS
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-22-05 | CDM: 02-5269E

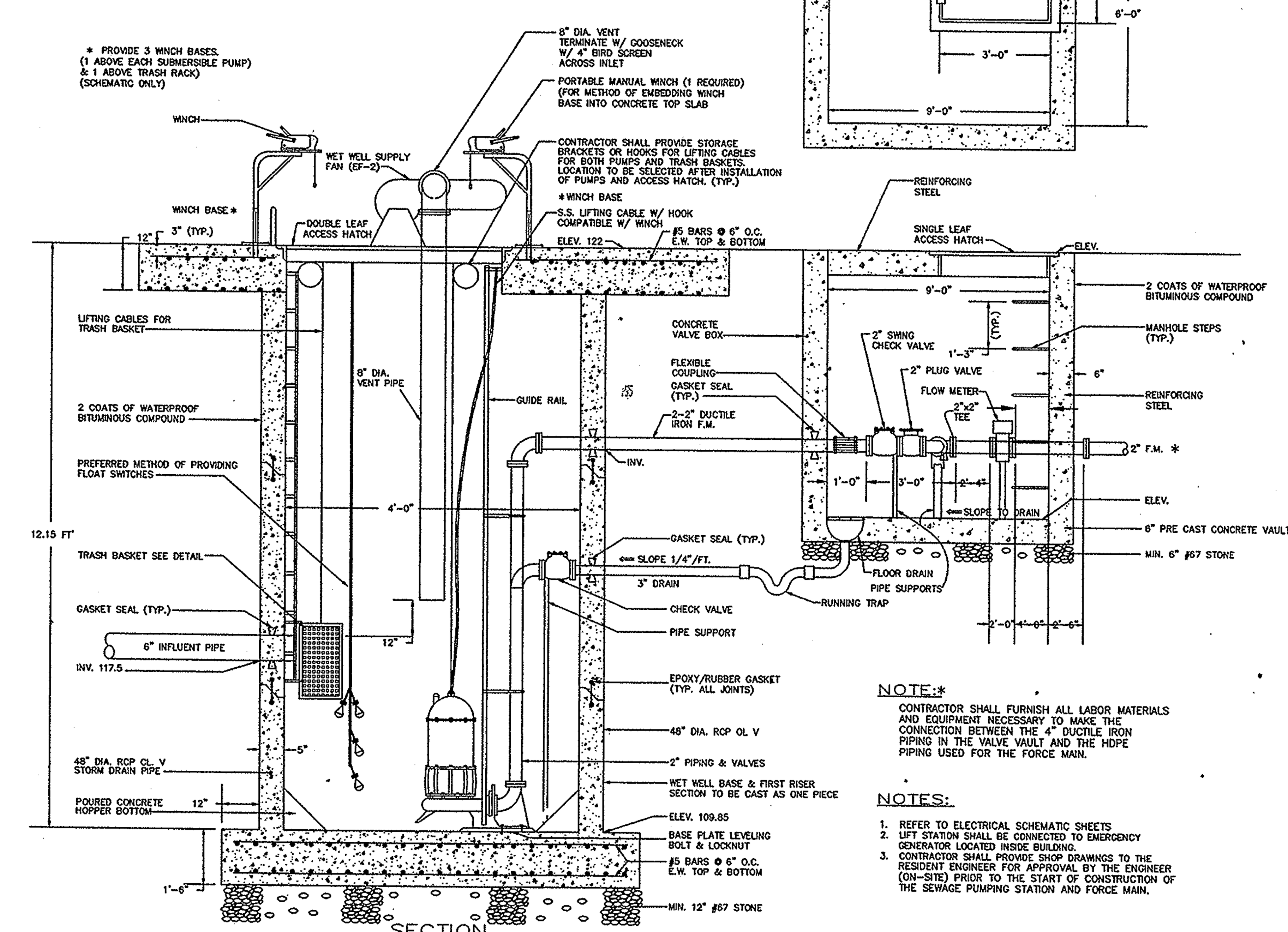
JOB NUMBER 02-5269

SHEET NO. 5 OF 8 SHEETS

FS 4	HIGH LEVEL ALARM	EL. = 117.00
FS 3	LAG PUMP ON	EL. = 116.50
FS 2	LEAD PUMP ON	EL. = 114.50
FS 1	BOTH PUMPS OFF	EL. = 110.85



PLAN
NO SCALE



SECTION

NOTE: FOR DETAILS & DIMENSIONS NOT SHOWN REFER TO "LIFT STATION DIMENSIONS".

NOTE:*

CONTRACTOR SHALL FURNISH ALL LABOR MATERIALS AND EQUIPMENT NECESSARY TO MAKE THE CONNECTION BETWEEN THE 4" DUCTILE IRON PIPING IN THE VALVE VAULT AND THE HDPE PIPING USED FOR THE FORCE MAIN.

NOTES:

1. REFER TO ELECTRICAL SCHEMATIC SHEETS
2. LIFT STATION SHALL BE CONNECTED TO EMERGENCY GENERATOR LOCATED INSIDE BUILDING.
3. CONTRACTOR SHALL PROVIDE SHOP DRAWINGS TO THE RESIDENT ENGINEER FOR APPROVAL BY THE ENGINEER (ON-SITE) PRIOR TO THE START OF CONSTRUCTION OF THE SEWAGE PUMPING STATION AND FORCE MAIN.

THE FLOW METER SHOWN SHALL BE 2" FOXBORO MAGNETIC FLOWTUBE WITH MAGNETIC FLOW TRANSMITTER.

4' DIAMETER DUPLEX LIFT STATION
NO SCALE

GENERAL NOTES

A. SPECIFICATIONS: ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF ANNE ARUNDEL COUNTY DEPARTMENT OF PUBLIC WORKS "STANDARD SPECIFICATIONS FOR CONSTRUCTION OF WATER MAINS, SANITARY SEWERS, STORM DRAINS, STREETS AND ROADS", LATEST EDITION, INCLUDING ALL ADDENDA, "STANDARD DETAILS FOR WATER MAINS, SANITARY SEWERS, AND STORM DRAINS, ROADS, STREETS AND TRAFFIC", INCLUDING ALL REVISIONS AND ADDENDA, AND ALL APPLICABLE OSHA STANDARDS.
CONCRETE DESIGN: SERVICE LOAD DESIGN METHOD fc=1350 PSI
REINFORCING STEEL DESIGN: fs=24,000 PSI
STRUCTURAL STEEL DESIGN: ELASTIC DESIGN METHOD

B. FOUNDATION: ALL FOUNDATION DESIGNS ARE BASED ON AN ASSUMED MINIMUM SAFE SOIL BEARING PRESSURE OF 2,000 PSF. THE CONTRACTOR SHALL VERIFY THE SOIL BEARING PRESSURE BEFORE CONSTRUCTION COMMENCES AND SHALL IMMEDIATELY CONTACT THE ENGINEER IF THE ACTUAL SOIL BEARING PRESSURE DOES NOT MEET THE ASSUMED MINIMUM DESIGN VALUE. ALL FOUNDATIONS SHALL BEAR UPON UNDISTURBED SOIL OR THOROUGHLY COMPACTED FILL. ALL DISTURBED SOIL UNDER FOUNDATIONS SHALL BE REPLACED BY S.H.A. MIX No. 1 CONCRETE. UNSUITABLE FOUNDATION MATERIAL SHALL BE REMOVED TO FIRM, NATURAL SOILS AND REPLACED WITH COMPACTED FILL AS DIRECTED AND SPECIFIED. PROOFROLL FILL SUBGRADES, UNDER SUPERVISION OF ENGINEER, PRIOR TO REPLACEMENT.

C. STRUCTURAL STEEL: ALL STRUCTURAL STEEL SHALL BE ASTM A-36.

D. CAST-IN-PLACE CONCRETE: ALL CONCRETE WORK SHALL BE IN ACCORDANCE WITH ACI 318-89. ALL STRUCTURAL CONCRETE SHALL BE S.H.A. MIX No. 2 WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3,500 PSI. ALL REINFORCING STEEL SHALL CONFORM TO ASTM SPECIFICATIONS A 615, GRADE 60 FOR BARS. BAR LAP SHALL BE CLASS "C" TENSION LAP, PROVIDE CONCRETE COVER OVER REINFORCING BARS IN ACCORDANCE WITH ACI 318.77. CONTRACTOR TO SUBMIT DETAILS TO ENGINEER PRIOR TO COMMENCEMENT OF WORK.

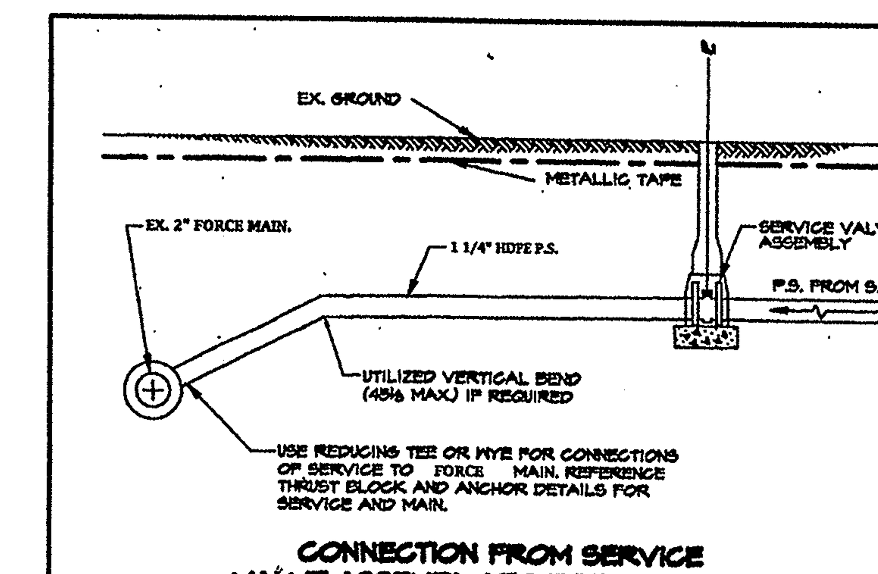
E. PRECAST CONCRETE:
1. MANUFACTURING PLANTS SHALL BE CERTIFIED BY THE PRECAST CONCRETE INSTITUTE.
2. SUBMIT SHOP DRAWINGS, CONCRETE TEST REPORTS AND DESIGN CALCULATIONS BEARING THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MARYLAND. SHOP DRAWINGS SHALL HAVE A SEAL OF A PROFESSIONAL ENGINEER REGISTERED IN THE STATE OF MARYLAND.
3. MATERIALS:
   a. PORTLAND CEMENT
      1. ASTM C 150, TYPE II
   b. AIR-ENTRAINING AGENT: ASTM C 260
   c. AGGREGATES: ASTM C 33
   d. WATER: POTABLE
   e. REINFORCING STEEL:
      1. DEFORMED BILLET STEEL: ASTM A 615 GRADE 60
      2. WIRE FABRIC WELDED STEEL, ASTM A 185
   f. ANCHORS AND INSERTS MATERIAL: TYPE 304 STAINLESS STEEL
   g. BONDING AGENT.
      1. MOISTURE INSENSITIVE, EPOXY-RESIN BONDING AGENT
   h. PRECAST REINFORCING WETWELL RISERS SHALL CONSIST OF MANHOLE RISER SECTIONS CONFORMING TO ASTM C 478.
4. CONCRETE MIXES
   a. PROPERTIES
      1. WATER-CEMENT RATIO: MAXIMUM 40 LBS. (18 KG.) OF WATER TO 100 LBS. (45 KG.) OF CEMENT.
      2. AIR-ENTRAINMENT: MINIMUM 3%, MAXIMUM 6%.
      3. 28 DAY COMPRESSIVE STRENGTH: MINIMUM OF 3,500 PSI.
      4. DO NOT USE CALCIUM CHLORIDE OR OTHER SALTS.
5. WATERPROOFING
   a. WATERPROOF THE EXTERIOR OF ALL BURIED CONCRETE CONSTRUCTION WITH TWO COATS OF BITUMINOUS WATERPROOFING. THICKNESS SHALL BE 5 MIL. PER COAT (MINIMUM) FOR A TOTAL OF 10 MIL. MINIMUM.

F. COFFERDAM: COFFERDAM DESIGN CALCULATIONS SHALL BEAR THE SEAL OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MARYLAND, DEWATERING PLAN AND/OR WELL POINT LAYOUT SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.

CONTRACTOR SHALL PROVIDE AT LEAST 2,000 PSF BEARING CAPACITY SOIL FOR SUPPORT OF STRUCTURES.

STRUCTURES SHALL BE COATED WITH TWO COATS OF BITUMINOUS WATERPROOFING. PROVIDE 3/4 INCH BEVEL AT ALL EXPOSED CONCRETE EDGES.

SUBMITTALS
ALL EQUIPMENT SPECIFIED ON THESE DRAWINGS SHALL BE REVIEWED AND APPROVED BY THE ENGINEER PRIOR TO PURCHASE AND INSTALLATION BY THE CONTRACTOR. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF MANUFACTURERS' LITERATURE TO ENGINEER. CONTRACTOR SHALL SUBMIT LAYOUT OF PUMPING STATION INCLUDING SIZE OF STRUCTURES AND SHOP DRAWING SHOWING PROPOSED PIPING LAYOUT INCLUDING DIMENSIONS.



CONNECTION FROM SERVICE VALVE ASSEMBLY TO PRESSURE MAIN
N.T.S.

C. D. MEEKINS & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
159 MAIN ST., SECOND FLOOR
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VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:
C. DOUGLAS MEEKINS

6708	9153	11-22-05
P.E. NO.	L.S. NO.	DATE

DESIGNED: J.P.	CHECKED: C.D.M.	SCALE: AS SHOWN
DRAWN: E.H.	DATE:	REF.:

STATE OF MARYLAND · C. DOUGLAS MEEKINS · No. 6708 · REGISTERED PROFESSIONAL ENGINEER

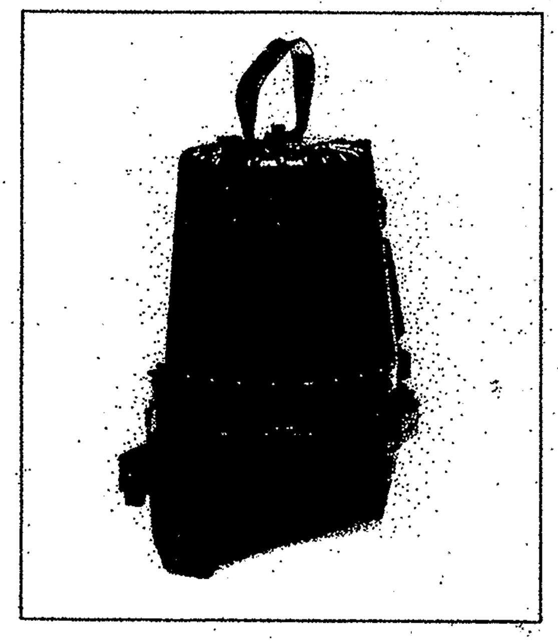
PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

DETAILS
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-22-05 | CDM: 02-5269P
JOB NUMBER
02-5269
SHEET NO.
6-C
OF 8 SHEETS

M-3127
Submersible Wastewater Grinder Pump

SECTION	PAGE
9	3
SUPERSEDES	ISSUED
6/90	6/94



Design Features:

A Junction chamber: In the cable entry, water sealing is functionally separated from strain relief, (no epoxy). Grommet's controlled compression assures leakproof sealing. Beyond the cable entry, a rubber lead-through compressed by a gland provides a secondary seal between junction chamber and motor housing.

B Motor: Squirrel cage induction motor NEMA type B. Class F (155°C) insulated stator winding. Capable of starting up to 15 times/hour (max.).

Cooling: Motor casings with integral cooling ribs for maximum heat dissipation.

C Pump/motor shaft: Common pump/motor shaft and compact seal design permit short overhang minimizing shaft deflection.

D Shaft mounting: Robust maintenance free design, comprising pre-greased ball bearings.

E Shaft sealing: Two independent mechanical face seals assembled in tandem provide reliable and durable sealing performance and maximum resistance to abrasion and thermal shock.

F Oil Casing: Oil filled housing for lubricating and cooling mechanical seal units provides an additional leakage barrier.

G Pump Volute: Volute incorporates replaceable hardened cutting ring at the inlet.

H Impeller: Multi-vane semi-open impeller with replaceable cutting head.

Grinder Pump:
7.5 HP 3Ø

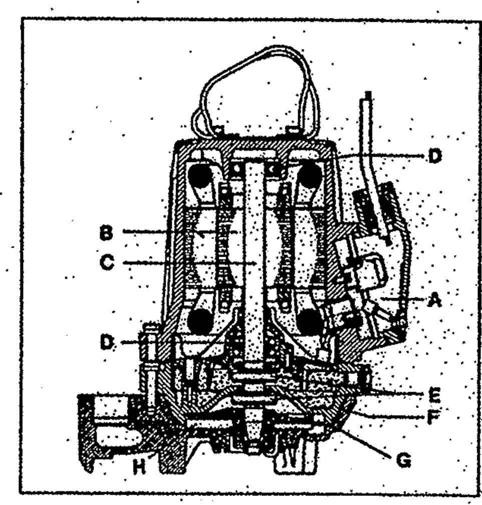
Available in the following configurations:

Type MP - Wet pit installation. Pump lowered via guide bars to automatically connect to a permanently mounted discharge connection.

Type MF - Portable, free standing. For pipeline connection in restricted sumps.

Application:

The M-3127 is designed for residential and commercial wastewater.

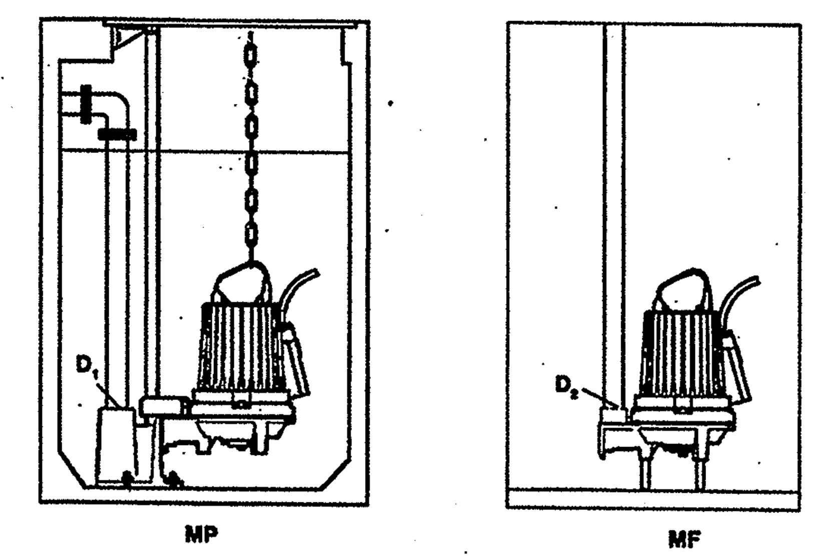


M-3127
Impeller/Motor/Nominal Sizes

PAGE	SECTION
4	9
ISSUED	SUPERSEDES
12/91	2/88

GRINDER MODEL	IMPELLER CODE	HP RATING MP & MF	VAC	RPM	D1	D2
M-3127 3Ø	212 262	7.5	200 230/460 575	3475	2"	2"
M-3127 1Ø	216 266	5.0	230	3430	2"	2"

Notice:
For other than domestic grinder pump usage, please consult ITT Flygt Engineering for evaluation of product application.



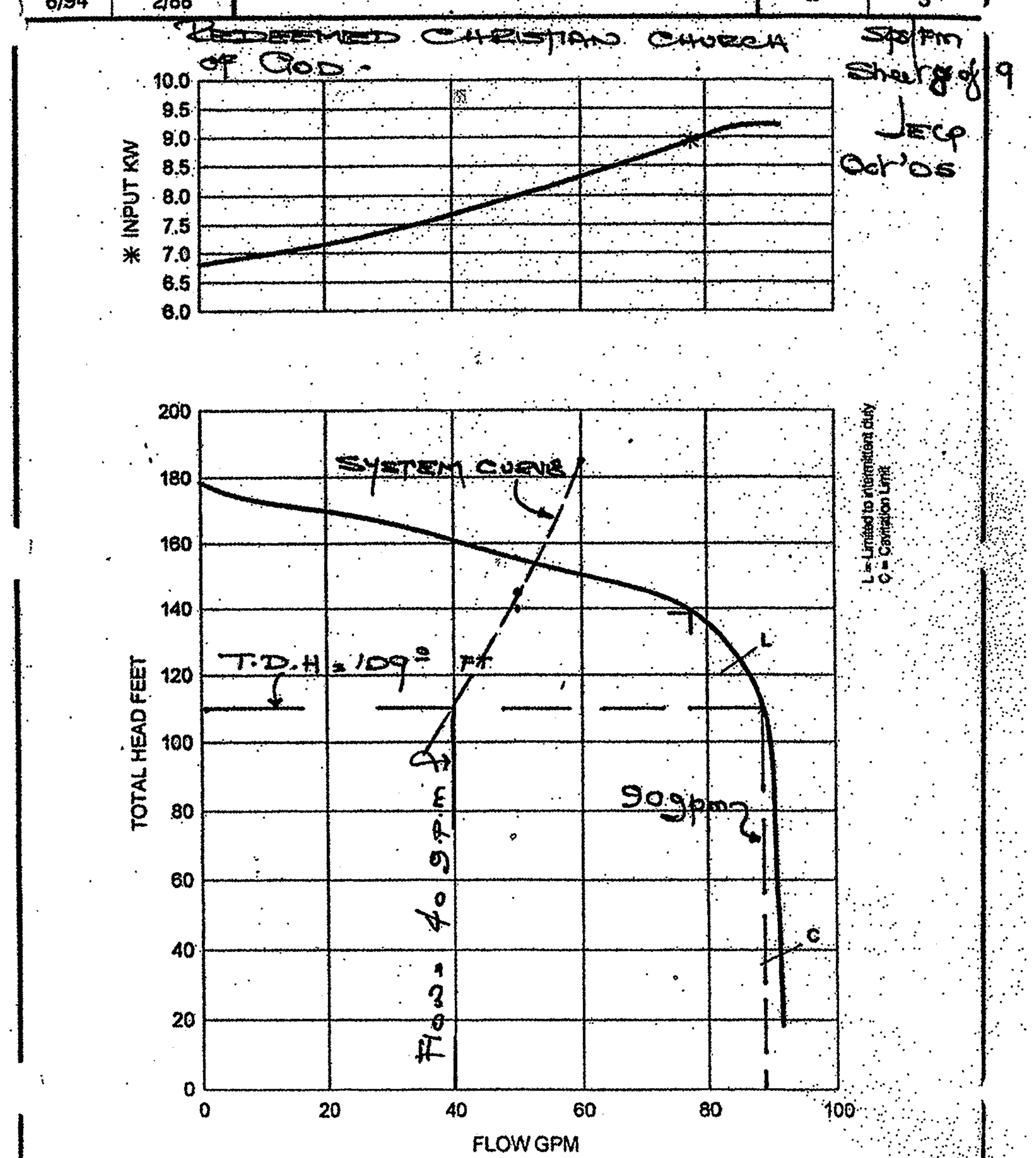
NOT TO SCALE

M-3127
262 Impeller

PAGE	SECTION
8	9
ISSUED	SUPERSEDES
6/94	2/88

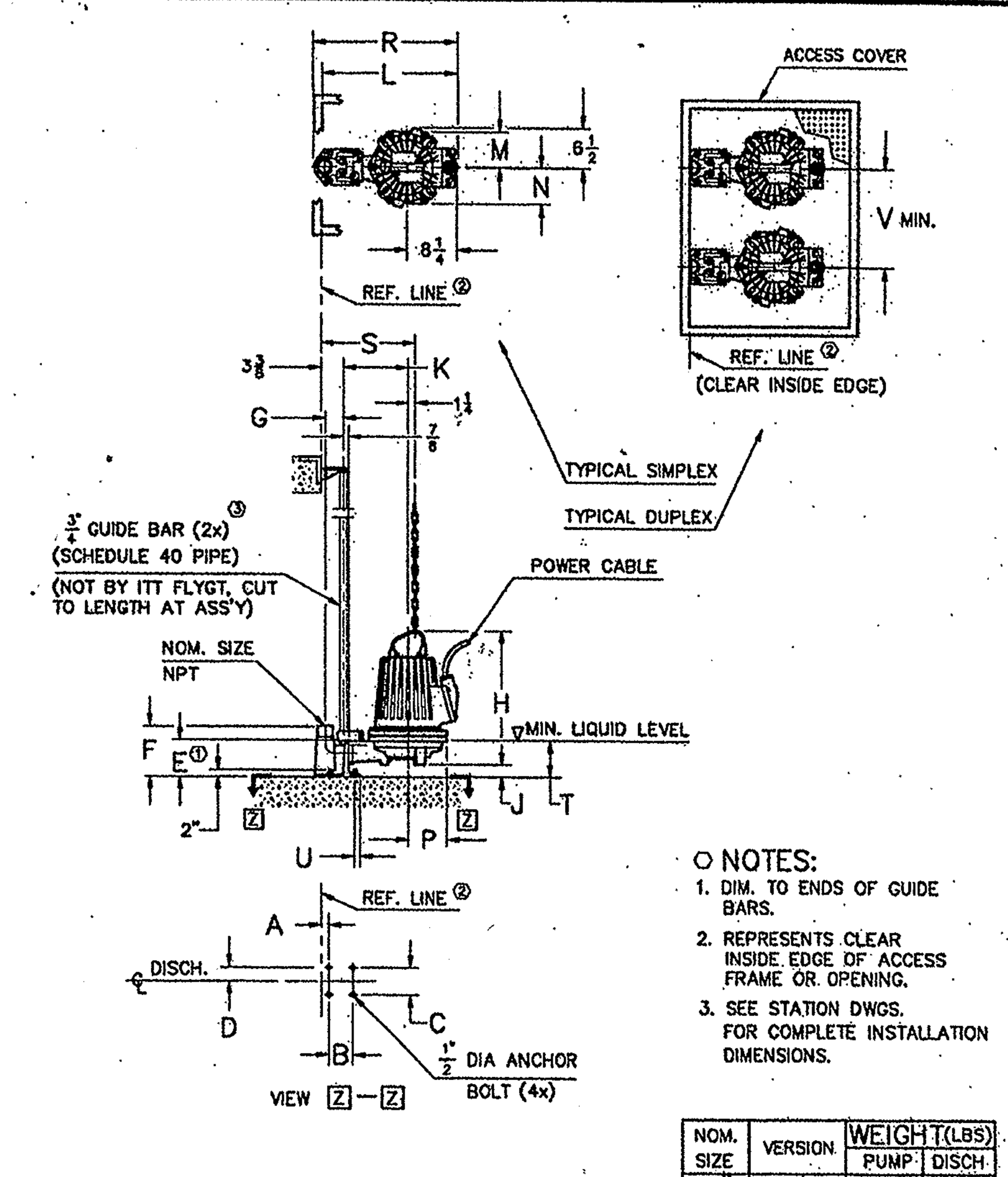
CONFIG.	
MP/MF	
VANES	PHASE
-	3

Redeemed Christian Church of God - System Sharg 8/9 Jecp Oct '05



MP-3127
Outline Dimensions

SECTION	PAGE
9	11
SUPERSEDES	ISSUED
6/90	6/94



O NOTES:
1. DIM. TO ENDS OF GUIDE BARS.
2. REPRESENTS CLEAR INSIDE EDGE OF ACCESS FRAME OR OPENING.
3. SEE STATION DWGS. FOR COMPLETE INSTALLATION DIMENSIONS.

NOM. SIZE	VERSION	WEIGHT (LBS) PUMP	DISCH
2"	HT/LT	250	15

ALL DIMENSIONS IN INCHES

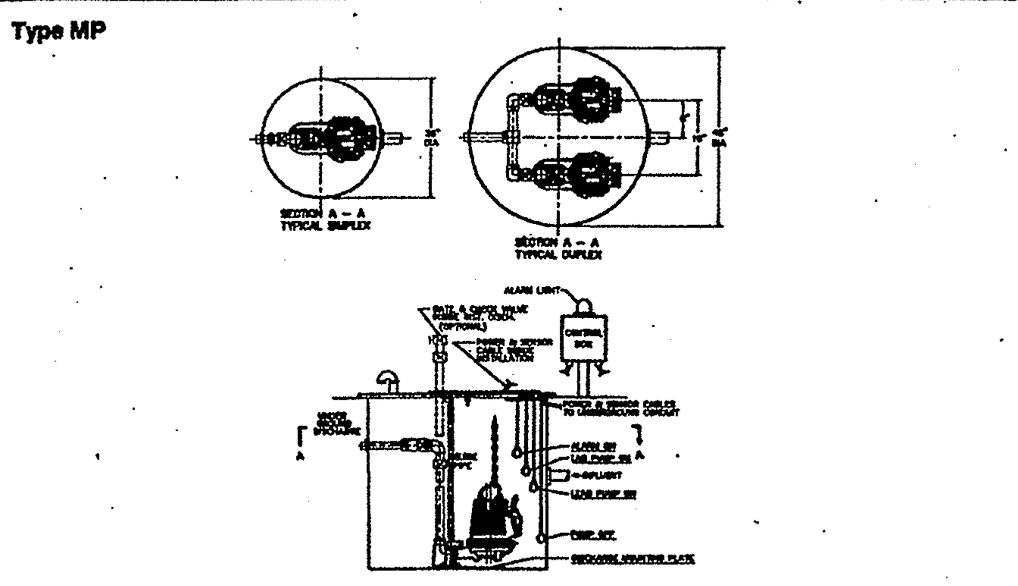
DIMENSIONAL CHART

NOM. SIZE	VERSION	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V
2"	HT/LT	1¼	4	4½	2¼	5¼	8¼	3	22	2¼	10¾	22¼	5¾	5¾	6½	23¾	15¾	7	¾	15½

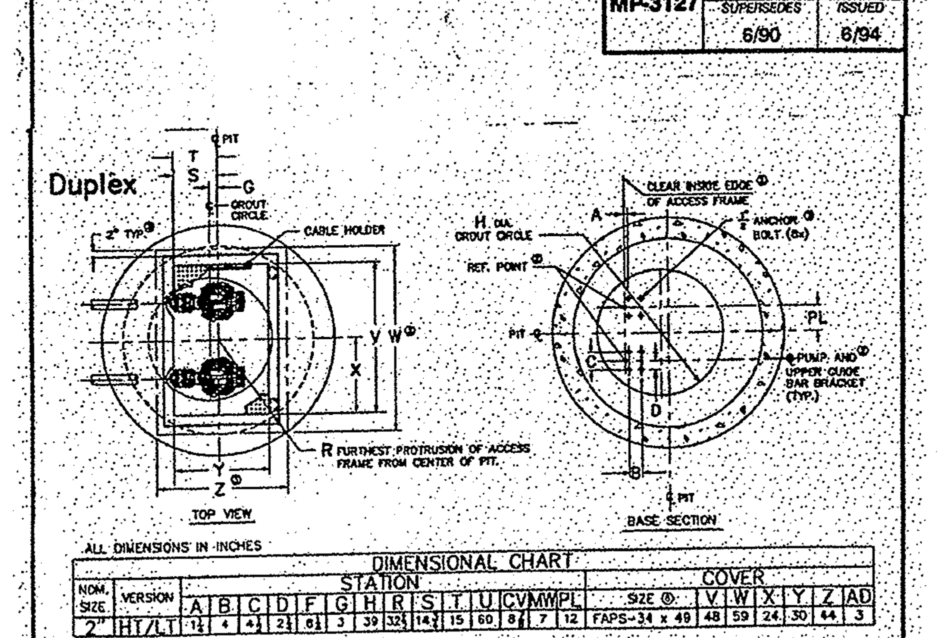
M-3127
Basic Arrangements (Fiberglass or steel)

SECTION	PAGE
9	13
SUPERSEDES	ISSUED
6/90	6/94

Type MP



MODEL	SECTION	PAGE
MP-3127	9	15
	SUPERSEDES	ISSUED
	6/90	6/94



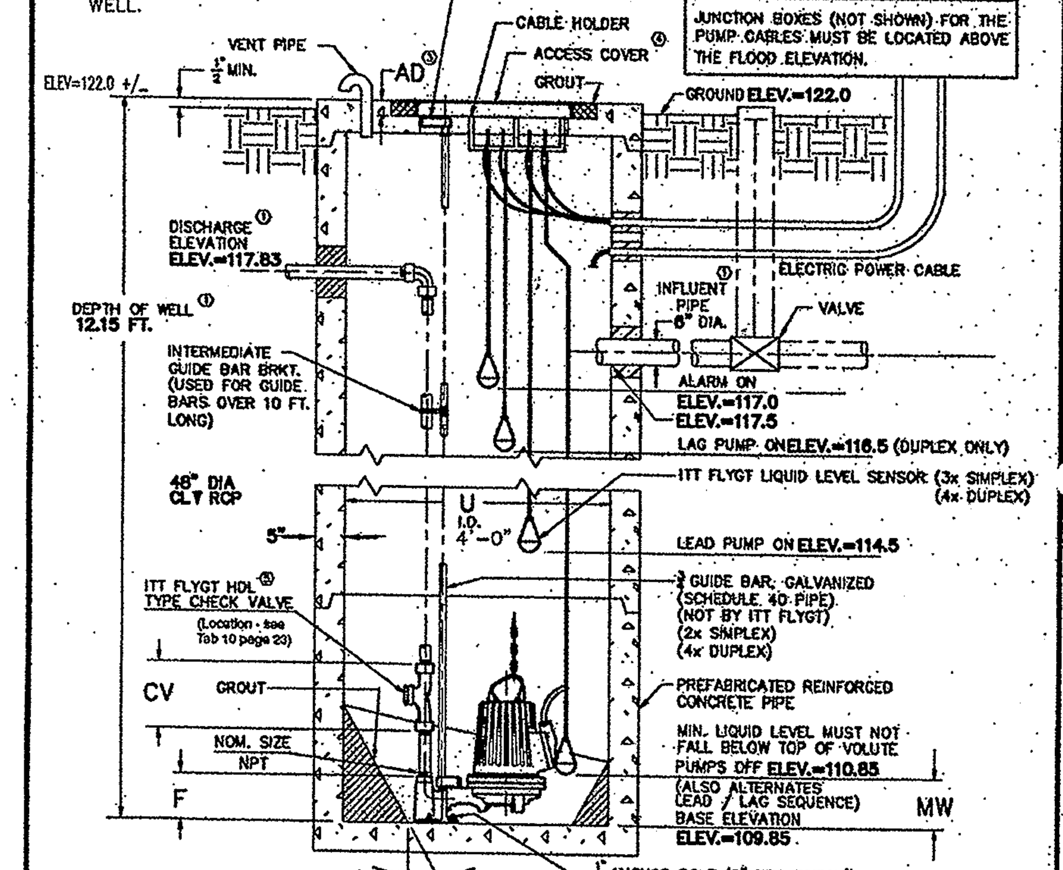
MP-3127
Lift Station Dimensions

PAGE	SECTION
14	9
ISSUED	SUPERSEDES
6/94	6/90

FLOAT SWITCHES ARE SHOWN SCHEMATIC ONLY. INSTALLATION SHALL BE POLE MOUNTED WITH POLE ATTACHEDTO WALL OF WET WELL.

ITT FLYGT CONTROL CENTER
SUBJECT TO ENGINEER'S SPECIFICATIONS (WALL, POLE, OR PEDESTAL MOUNTING)

JUNCTION BOXES (NOT SHOWN) FOR THE PUMP CABLES MUST BE LOCATED ABOVE THE FLOOD ELEVATION.



O NOTES:
1. INDICATES INFORMATION TO BE DETERMINED BY OTHERS.
2. LOCATE ANCHOR BOLTS USING CLEAR INSIDE EDGE OF ACCESS FRAME AND CENTER LINE OF PUMP AS REF. POINT. BOLT LOCATIONS MUST BE HELD TO MAINTAIN EXACT POSITION OF PUMP RELATIVE TO ACCESS FRAME.
3. GROUT OPENING FOR ACCESS FRAME.
4. COVER SHOWN IS FOR STANDARD DUTY ANGLE FRAME. FOR ADDITIONAL DIMENSIONS ON STANDARD DUTY TROUGH FRAME, HEAVY DUTY ANGLE FRAME AND HEAVY DUTY TROUGH FRAME, CONSULT ITT FLYGT CORP. ENGINEERING DEPT.
5. CONFIGURATION AND DIMS. SHOWN ARE SUGGESTED REQUIREMENTS ONLY. ALL DETAILS, INCLUDING SIZING OF PIT, TYPE, LOCATION AND ARRANGEMENT OF VALVES AND PIPING, ETC. ARE TO BE SPECIFIED BY THE CONSULTING ENGINEER AND ARE SUBJECT TO HIS APPROVAL.
6. ACCESS COVER: U.S. FOUNDRY & MANUFACTURING. CALL 1-800-258-6873.

NOT TO SCALE

M-3127
Electrical Data

PAGE	SECTION
16	9
ISSUED	SUPERSEDES
12/91	1/89

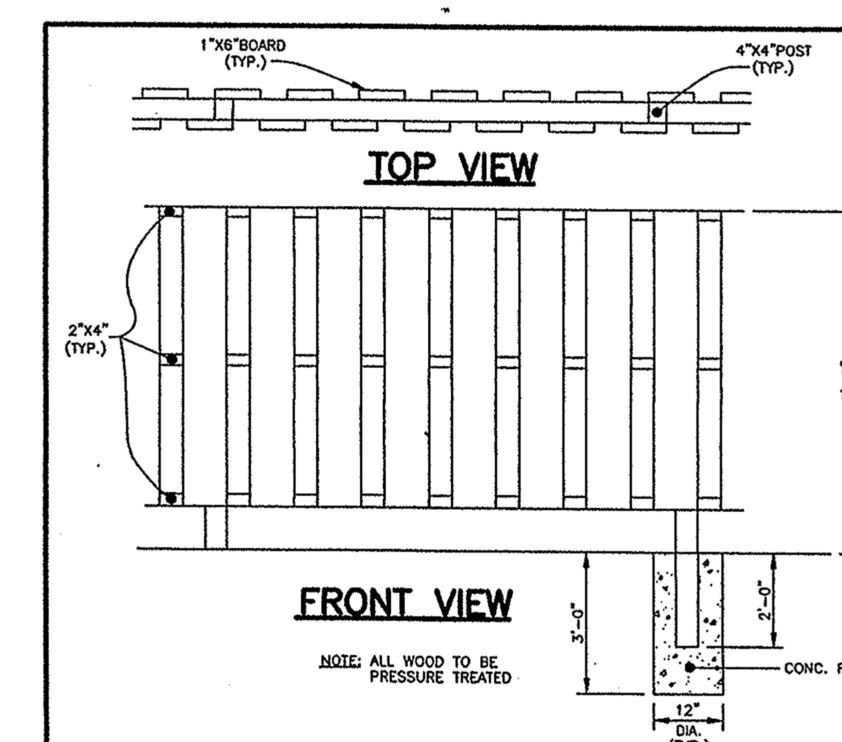
Motor Data

NAMEPLATE HP (KW)	SERVICE FACTOR	S.F. HP (KW)	Ø	VOLTS	S.F. AMPS	STARTING AMPS SURGE/LR	LOCKED ROTOR KVA	NEC CODE LETTER	INPUT KW	RPM
7.5 (5.63)	1.47	11.0 (8.3)	3	200 230 460 575	30.0 26.0 13.0 10.0	261/189 244/164 122/82 94/66	65.3	G	9.5	3475
5.0 (3.75)	1.88	9.4 (7.0)	1	230	38.0	205/170	39.0	D	8.8	3430

Pump Motor HP at (SF)	EFFICIENCY 100% LOAD	75% LOAD	50% LOAD	POWER FACTOR 100% LOAD	75% LOAD	50% LOAD
11.0	0.845	0.84	0.82	0.91	0.88	0.82
9.4	0.795	0.79	0.75	0.99	0.99	0.98

Cable Data

(SF) HP	VOLTS	MAX. LENGTH FT.	GAUGE	NOMINAL DIA.	CONDUCTORS (IN ONE CABLE)
9.4	230	125	# 8/3	28.2mm (1.11")	(3) #8AWG (PWR) (2) #10AWG (CTRL) (1) #8AWG (GND) (1) #10AWG (G.C.)
11.0	200 230 460 575	175 230 800 1400			



BOARD ON BOARD FENCE DETAIL
(N.T.S.)

SERVICE AREA DESIGN FLOWS

NUMBER OF FIXTURE UNITS =	53
AVERAGE TOTAL SEWER FLOW =	53 G.P.M.
TOTAL DYNAMIC HEAD =	109.0
REFERENCE =	NATIONAL PLUMBING CODE

DENOTES THIS PROJECT

C. D. MEEKINS & ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
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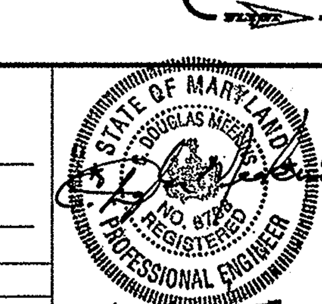
ANNAPOLIS: (410) 267-0744 BALTIMORE: (410) 269-7807 FACSIMILE: (410) 267-0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:
C. DOUGLAS MEEKINS

6708	9153	11-22-05
P.E. NO.	L.S. NO.	DATE
DESIGNED: J.P.	CHECKED: C.D.M.	SCALE: AS SHOWN
DRAWN: E.H.	DATE:	REF.:

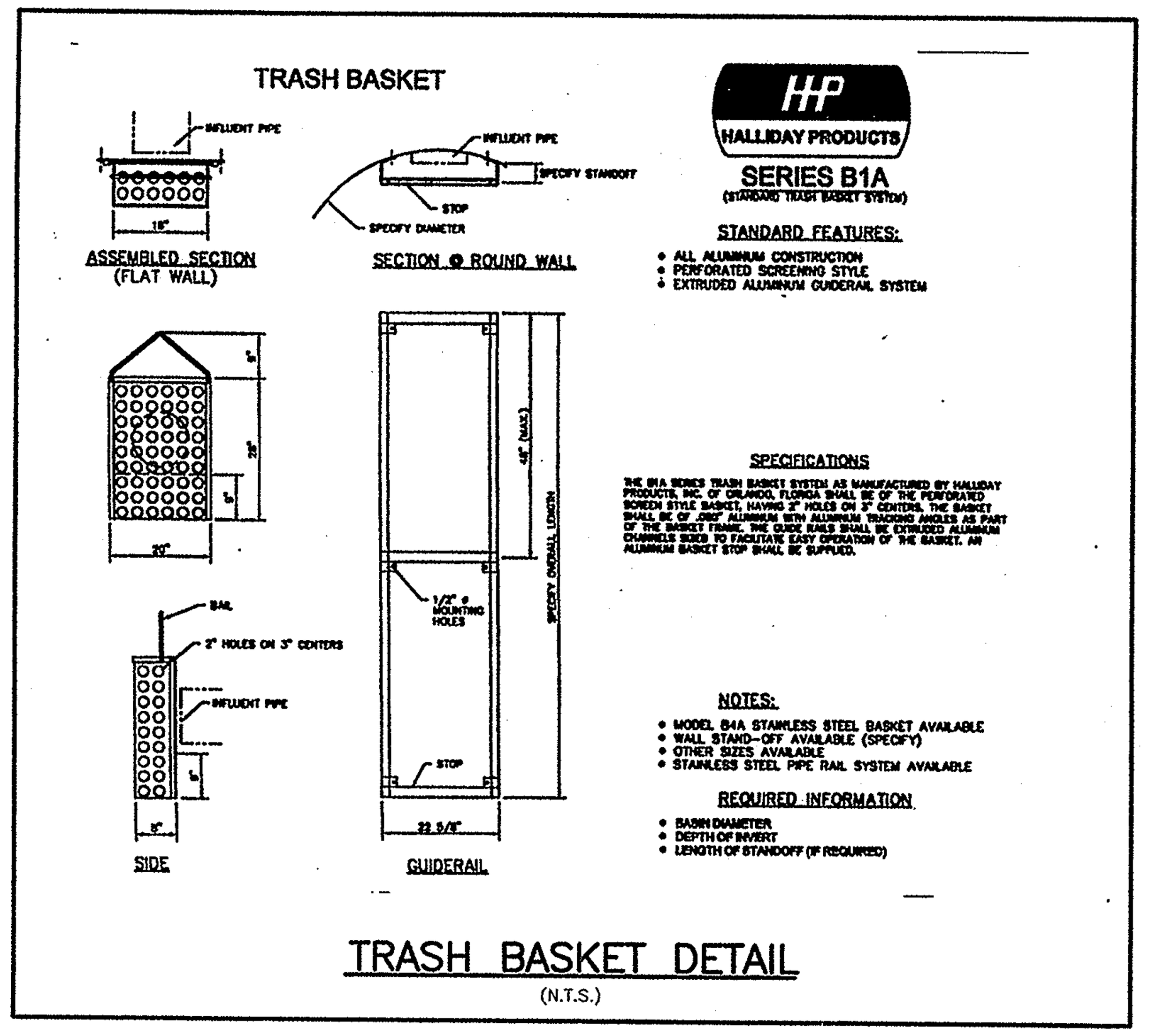


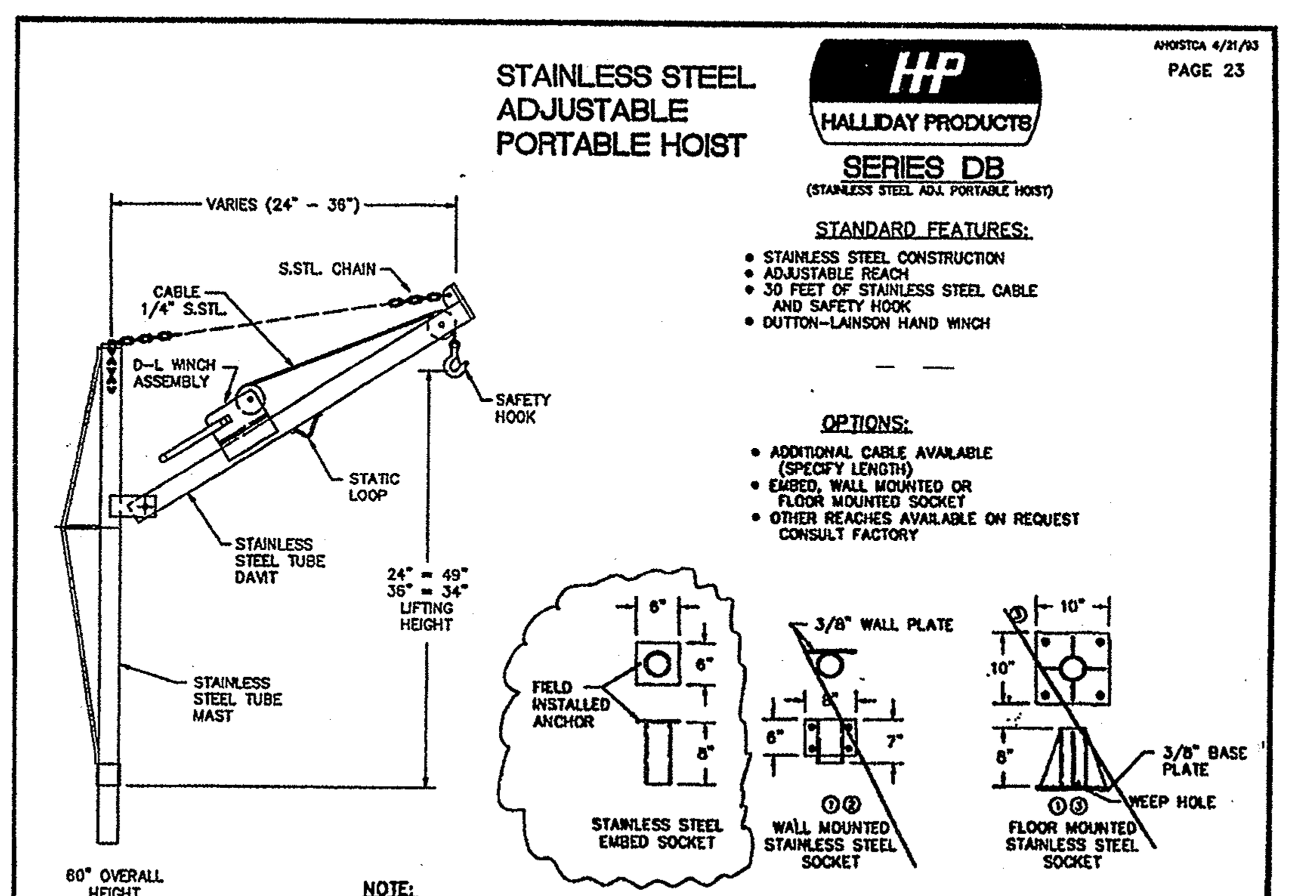
PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

SEWAGE PUMPING STATION TO SERVICE
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-22-05 | CDM: 02-5269

JOB NUMBER 02-5269
SHEET NO.
6-A
OF 8 SHEETS

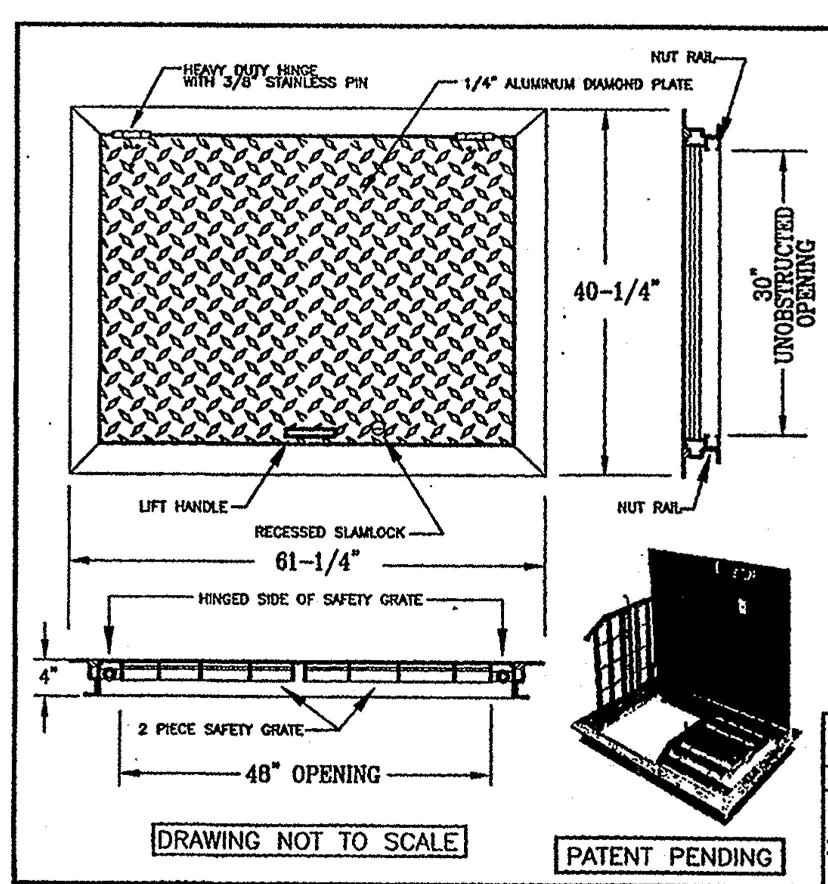




NOTE:

1. FOR MODELS D1B36B & D2B36B MOUNTING HOLES ARE 3/4"ø
2. NOT AVAILABLE FOR MODEL D3B36B
3. FOR MODEL D3B36B MOUNTING HOLES ARE 7/8"ø AND BASE PLATE DIMENSIONS ARE 12" X 12"

MODEL NO.	MAST DIA.	LOAD (MAX.)	UNIT WEIGHT
D1B36B	2 3/8"	300 LBS.	73 LBS.
D2B36B	3 1/2"	1000 LBS.	96 LBS.



NOTES:

1.) STYLE "FLE-AOSH" ACCESS HATCH, AS MANUFACTURED FOR ITT/FLYGT.

2.) UNIT DESIGNED LIGHT DUTY, FOR 300 PSF LOADS

3.) UNIT SUPPLIED WITH AN ALUMINUM 2-PIECE HINGED SAFETY GRATE (SEE SAFETY GRATE SPECS ON SEPERATE PAGE).

4.) EACH HATCH SHALL BE EQUIPPED WITH A HOLD OPEN ARM. DOOR SHALL LOCK OPEN IN THE 90 DEGREE POSITION.

5.) MATERIAL SHALL BE ALUMINUM WITH MILL FINISH.

6.) UNIT SHALL BE SUPPLIED WITH A RECESSED SLAMLOCK (SEE ATTACHED DWG.).

7) TWO LENGTHS OF NUTRAIL IS SUPPLIED AS SHOWN ON THIS DRAWING.

8) ALL HARDWARE SHALL BE STAINLESS STEEL.

REMOVABLE TEE HANDLE — Inside Turn Handle — STAINLESS STEEL SLAM LOCK

"FLE-6AOSH" LIGHT DUTY ALUMINUM HATCH WITH HINGED SAFETY GRATE

DRAWN BY: C.M.A. | DATE: 07/13/99 | DRAWING # FLE6SHAO

ITT – FLYGT
P.O. Box 1004 / 35 Nutmeg Drive
Trumbull, CT. 06611-0943
Tel:203/380-4700 Fax:203/380-4705

M-3127 Performance Specification

SECTION 9 | PAGE 17 | SUPERSEDES 12/91 | ISSUED 6/94

GRINDER
Each grinder pump shall be a **heavy duty pump** modified to be used as a grinder. Each grinder pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter shall consist of **hardened 316 "L" stainless steel** and the rotary cutter shall consist of chrome alloyed cast iron. The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end, shall be similar to the heavy duty pumps used in larger pump stations for daily operation.

REQUIREMENTS
Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with 7.5 HP, submersible electric motor connected for operation on volts, 3 phase, 60 hertz, ___ wire service, with submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pump shall be supplied with a mating cast iron 2" inch discharge connection and be capable of delivering 40 GPM at 109 TDH. An additional point on the same curve shall be 53 GPM at 155 feet total head. Shut off head shall be __ feet (minimum). Each pump shall be fitted with 20 feet of 3/8 lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

PUMP DESIGN
Grinder pump(s) shall be available in the following three configurations:

1. MP - Guide Bar Mounting - 2" Discharge.

The MP Grinder pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. **Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable.** No portion of the pump shall bear directly on the sump floor.

PUMP CONSTRUCTION
Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel or brass construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

COOLING SYSTEM
Motors are sufficiently cooled by the environmental atmosphere or pumped media. A water jacket is not required.

CABLE ENTRY SEAL
The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. **The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**

MOTOR
The pump motor shall be induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber, Nema B type. The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155°C (311°F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be

M-3127 Performance Specification

PAGE 18 | SECTION 9 | ISSUED 6/94 | SUPERSEDES 12/91

made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator lead coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board, shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. Wire nuts or crimping type connection devices are not acceptable. The motor and pump shall be designed and manufactured by the same source.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.47. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting current and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chloroprene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

BEARINGS
The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Sleeve or single row lower bearings are not acceptable.**

MECHANICAL SEAL
Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating **tungsten-carbide** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **ceramic** seal ring and one positively driven rotating **carbon** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor **depend on direction of rotation for sealing.** The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. Cartridge type systems will not be acceptable. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with an lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. **The motor shall be able to operate dry without damage while pumping under load.**

Seal lubricant shall be FDA Approved, non-toxic.

PUMP SHAFT
Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The shaft shall be AISI type 420 stainless steel.

If a shaft material of lower quality than 420 stainless steel is used, a shaft sleeve of 420 stainless steel is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

IMPELLER
The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Mass moment of inertia calculations shall be provided by

M-3127 Performance Specification

SECTION 9 | PAGE 19 | SUPERSEDES 6/90 | ISSUED 12/91

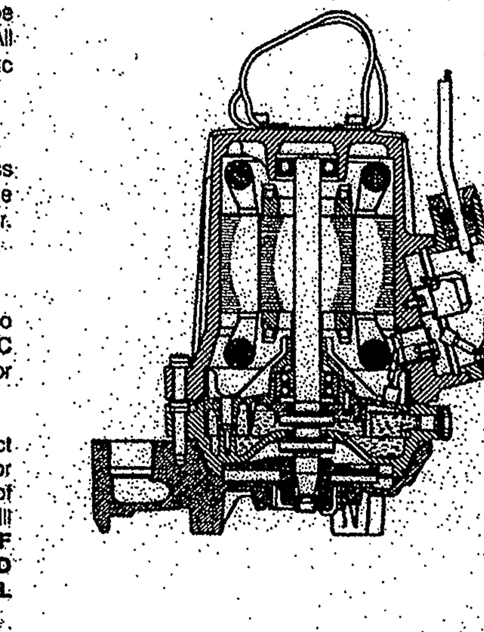
the pump manufacturer upon request. Impeller(s) shall be taper collet fitted and retained with an allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

VOLUTE
Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

PROTECTION
All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**

The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel.



24

Style 'FDRN-HD-AOSH' access hatch, as manufactured for ITT Flygt Corp.

Material shall be 6061-T6 aluminum for bars, angles, and extrusions. 1/4" diamond plate shall be 5086 aluminum.

Unit designed heavy duty, for H-20 wheel loads, where not subject to high density traffic. Channel frame and bearing plate must be cast into and supported by concrete.

Each grate shall be supplied with a heavy duty, stainless steel pneu-spring, for ease of operation when opening cover.

Each door and grate shall be equipped with a grade 316 stainless steel hold open arm. Door and Grate shall lock open in the 90 degree position.

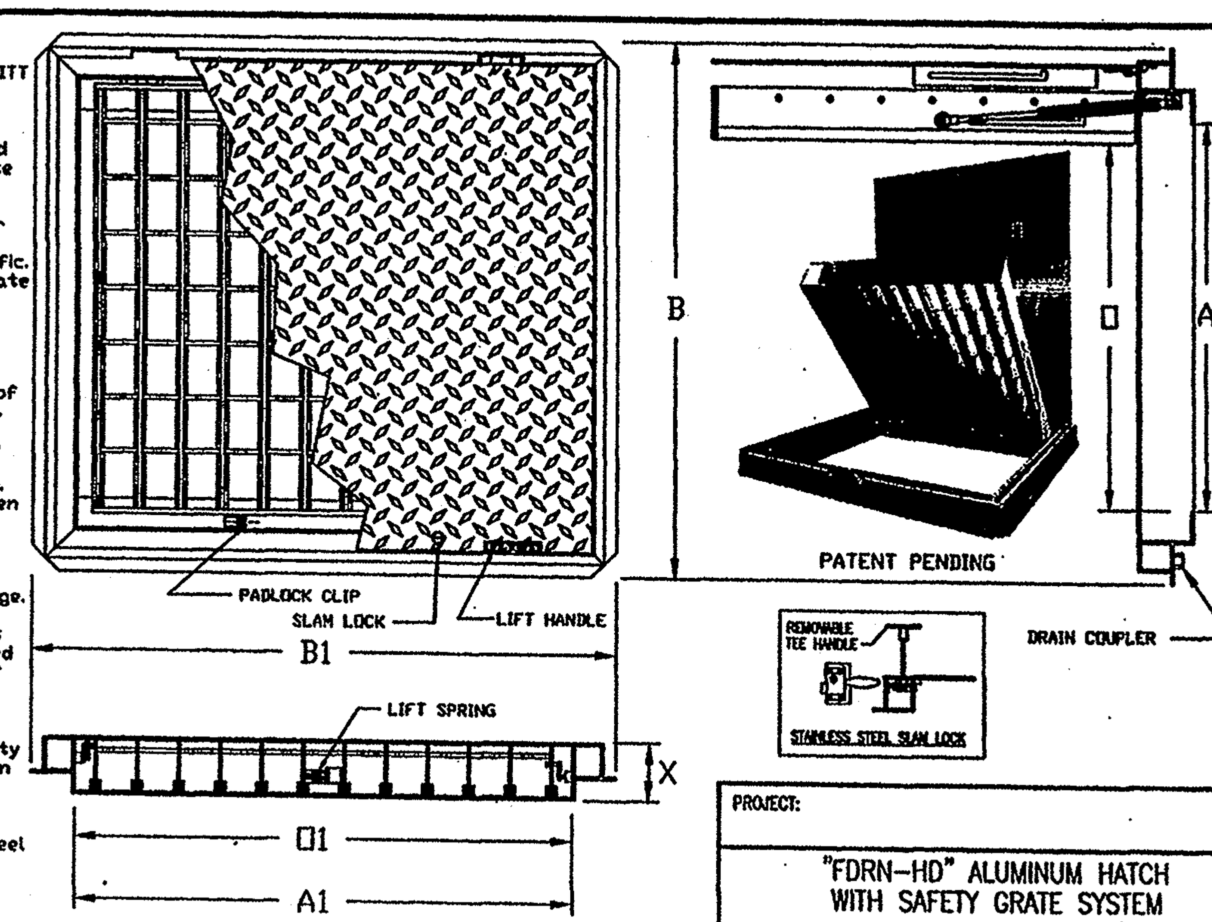
Channel frame shall be of extruded aluminum, with a continuous 1-1/4" anchor flange.

Each 'FDRN-HD' style hatch is supplied with a 1-1/2" threaded drain coupler on underside of channel frame for pipe connection.

Unit supplied with hinged safety grate to aid in fall prevention and unauthorized entry.

Each hatch shall be supplied with a grade 316 stainless steel slam lock.

Each hatch shall be equipped with a stainless steel lift handle.



PATTERN NO.	DIMENSIONS IN INCHES		UNOBSTRUCTED CLEAR OPENING	TOTAL HEIGHT
ALUMINUM	A x A1	B x B1	O x O1	X
FDRN-HD-6AOSH	32" x 48"	46-1/2" x 56-1/2"	30" x 48"	5-1/2"
FDRN-HD-8AOSH	38" x 48"	52-1/2" x 56-1/2"	36" x 48"	5-1/2"

PROJECT:

"FDRN-HD" ALUMINUM HATCH WITH SAFETY GRATE SYSTEM

DRAWING # NSFDRNHD-RECT-SH
Drawn By: ARO | DATE: 07/05/00 | Revised By: | Revised:

ITT Flygt Corporation
35 Nutmeg Drive – P.O. BOX 1004
TRUMBULL, CT. 06611-0943
Phone: (203) 380-4700 Fax: (203) 380-4705

Flygt

ITT Industries
Engineered for life

Flygt Corporation

35 Nutmeg Drive
P.O. Box 1060
Trumbull, Connecticut 06611
Tel: 203/380-4870 Fax: 203/380-4899

"Safe Hatch" Specifications

04/25/00

As manufactured for Flygt Corporation. Each "Safe Hatch" shall be designed to combine covering of the opening, fall through protection per OSHA standard 1910.23 and controlled confine space entry per OSHA standard 1910.146.

The safety grate shall be made of 6061-T6 aluminum with a minimum ultimate strength of 38,000 p.s.i. and a minimum yield strength of 35,000 p.s.i., as per A.S.T.M. B221. Grate design shall use safety factors as defined in the "Specifications for Aluminum Structures", by the Aluminum Association, Inc., 5th addition, for "Bridge Type Structures".

Grating shall be designed to withstand a minimum live load of 300 pounds per square foot. Deflection shall not exceed 1/150th of the span.

Grate openings shall be 5" x 5", which will allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.

Design must assure that the fall through protection is in place before the doors can be closed, thereby protecting the next operator.

Each grate shall be provided with a permanent hinging system, which will lock the grate in the 90 degree position once opened. Grates in the open position create a physical barrier around the opening, protecting passing pedestrians.

Each grate shall have an opening arm, with a red vinyl grip handle, which will allow opening of the grate, while providing the grate as a barrier between the operator and the pit. The opening arm shall also be equipped with a controlled confined space entry lock (lock provided by others). This locking device will prevent unauthorized entry to the confined space. The grating system will allow anyone to make visual inspection and float adjustments without entering the confined space.

Grate shall be coated with an OSHA type safety orange color, promoting visual awareness of the hazard. The aluminum safety grates shall receive a two-coat powder coat system, applied by the electrostatic spray process. The base coat is a thermosetting epoxy powder coat finish with a minimum thickness of 2-4 mils. The top coat is a mar-resistant, TGIC polyester powder coating with a minimum thickness of 2-4 mils. Each coat shall be baked at 350-375 degrees F until cured.

Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.

C. D. MEEKINS & ASSOCIATES, INC.
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ANNAPOLIS: (410) 267-0744 BALTIMORE: (410) 269-7807 FACSIMILE: (410) 267-0338
VISIT: WWW.CDMEEKINS.COM EMAIL: MEEKINS@IX.NETCOM.COM

NO.	REVISIONS	BY	DATE

PREPARED UNDER THE SUPERVISION OF:
C. DOUGLAS MEEKINS

6708	9153	11-22-05
P.E. NO.	L.S. NO.	DATE

DESIGNED: J.P.	CHECKED: C.D.M.	SCALE: AS SHOWN
DRAWN: E.H.	DATE:	REF.:

STATE OF MARYLAND — DOUGLAS MEEKINS — NO. 6708 — REGISTERED PROFESSIONAL ENGINEER

PREPARED FOR
REDEEMED CHRISTIAN CHURCH OF GOD
C/O PASTOR ABIODUN OLADIMEJI
7154 CRADLEROCK WAY
COLUMBIA, MD. 21045
PHONE: 301-621-8220 CELL: 240-350-5676

DETAILS
REDEEMED CHRISTIAN CHURCH OF GOD
PROPOSED SANCTUARY
7560 OLD TELEGRAPH ROAD, HARMANS, MARYLAND, 21076
TAX MAP 8, BLOCK 24, PARCEL 243, LOT 2

DATE: 11-22-05 | CDM: 02-5269
JOB NUMBER 02-5269
SHEET NO. 6-B
OF 8 SHEETS

ARCHITECTURE

Design and Functional Components

Integrated Behavioral Health, Primary Care and Rehabilitation Facility designated of restoring human dignity is a new facility that will consist of two building sections or bays separated by fire walls. The Building (A) has 1 level and features a behavioral health treatment and rehabilitation facility with bleacher seating along with ancillary space . A Fitness Area , Health Area , Patient Dining , Patient Commons , Classrooms and Administrative Offices and serves as the main entrance to the building . The Building (B) is spaces where seat Conference room , Classrooms , Administrative Offices , Library , and Computer Lab . The entry level is where , in south section , with cafeteria and common areas adjacent . Directly opposite the main entry are the administrative offices . The upper floor in the second of the building (B) include 2 distinct "learning communities ." Each is configured to support the Orpe system of learning . Integrated classrooms provide flexible arrangements and allow for the use of a central integrated learning suite and conferencing area surrounding a collaborative learning space . Additionally , a media center on the second level , near the main entrance off the center bay , is intended to offer community use . The purpose is to reflect the culture of the learning in a shared learning environment through the use of technology.

Building -A Envelope

Materials include pre-engineered structure frame; modular panels . Aluminum cladding is also used for exterior walls and overhang spaces . Metal stub crete Walls will also be used throughout the two buildings. *Click in building image to watch the interior design in 3D-video*.

Figure 4: Rendered view of main entrance (Courtesy of cx graae + spack)

Figure 5: Residential Treatment & Respite Facility, aerial view

Twenty-two modules to be assembled together to achieve this stately 8,500 square foot building. The exterior of the building features Hardi-panel stucco siding with bronze windows and Hardi-trim cut on an angle. The roofline is trimmed out with a seamless gutter. Handicap ramps and decks provide a ground level entry for elderly patients. Orpe added faux rock corners to accentuate the corners of the staggered modules and eliminate that typical “big-box” look of a standard modular. Inside, the welcoming lobby features a bead board chair rail molding, painted sheetrock walls, and eleven foot high raised ceiling height with beautiful pendant lighting.

Orpe Charity
Residential Treatment & Respite Facility

Blueprint / Building - A

Primary Care Building Envelope

Materials include faux brick,sandwich panels, modular panels, Prefab Structure.

Aluminum cladding is also used for exterior walls and overhang spaces. Storefront style Glass Walls will also be used throughout the two buildings.If the budget will permit, one ofthe main features ofthe building will be its

COMMUNITY EMPOWERMENT
Restoring Human Dignity

PROJECT MOM

ORPE Charity
Health Center, Coordinated Supportive and Human Services

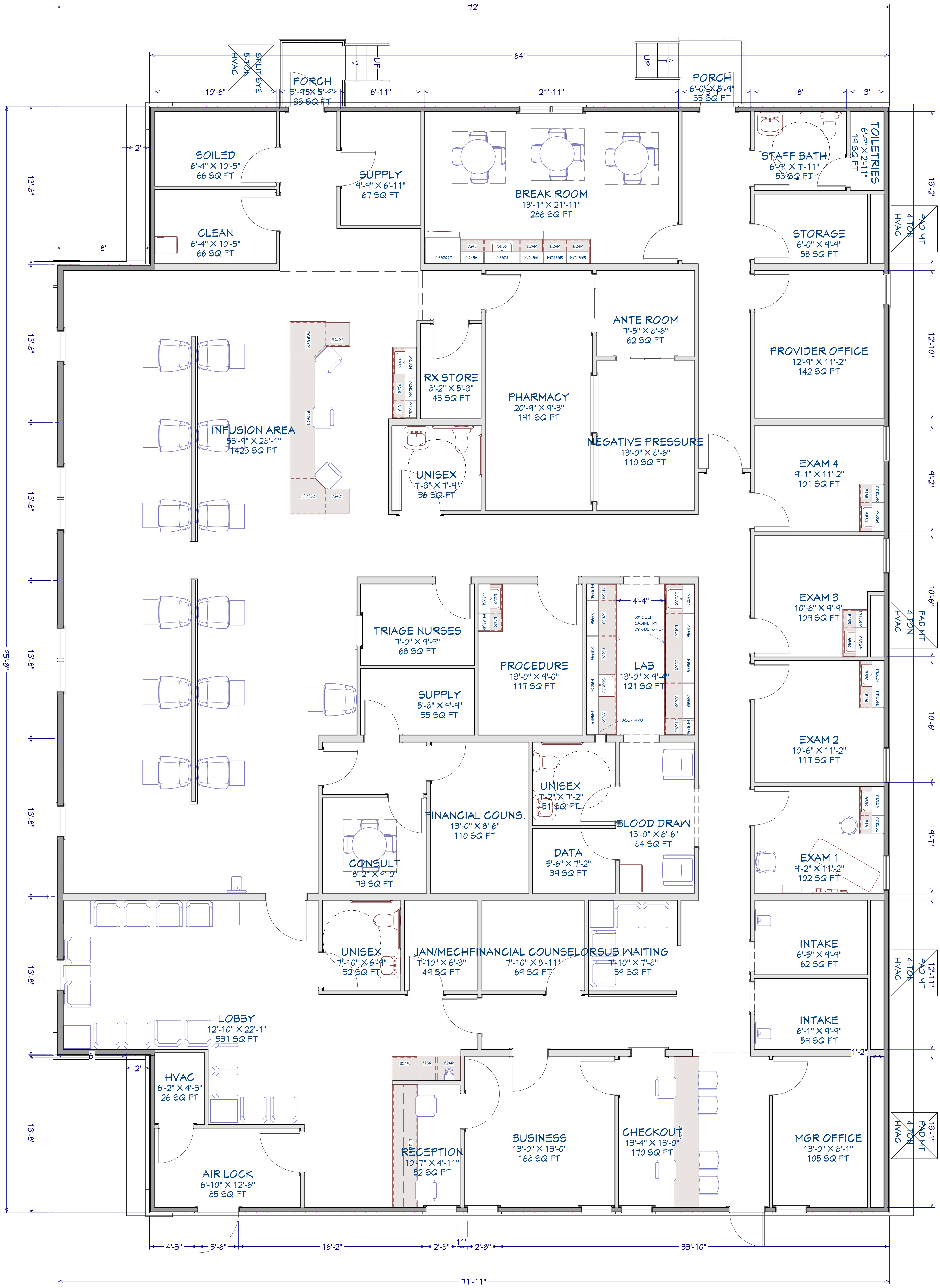
Health Care Programs

* Primary Care
* Health Care for Uninsured
* Case Management and Social Works
* Women Health
* HIV
* Pediatric Services
* Dentistry Services

Coordinated Supportive Services *

Housing Programs
* Self-sufficient Income Programs
* Legal Services
* Education, Training, Skills Building,
* Job Placements Services
* Social Works

ORPE Human Rights Advocates



SHEET:	SCALE:	2/2/21	DATE:	AGLA Consulting 5457 Twin Knolls Rd Suite 300 Columbia, MD 21045	BLUEPRINT Orpe Charity Clinic

REVISION TABLE

NUMBER	DATE	REVISED BY	DESCRIPTION

Residential Treatment Facility: Health Care Building - ORPE Charity

Building-B

LEFT ANGLED 3D VIEW
PROJECT MOM

RIGHT ANGLE 3D VIEW
ORPE CHARITY

FRONT3DVIEW

P '
ORPE CHARITY

REVISION TABLE		
NUMBER	DATE	REVISED BY	DESCRIPTION

ORPE Primary
Care & Coordinated
Supportive Services

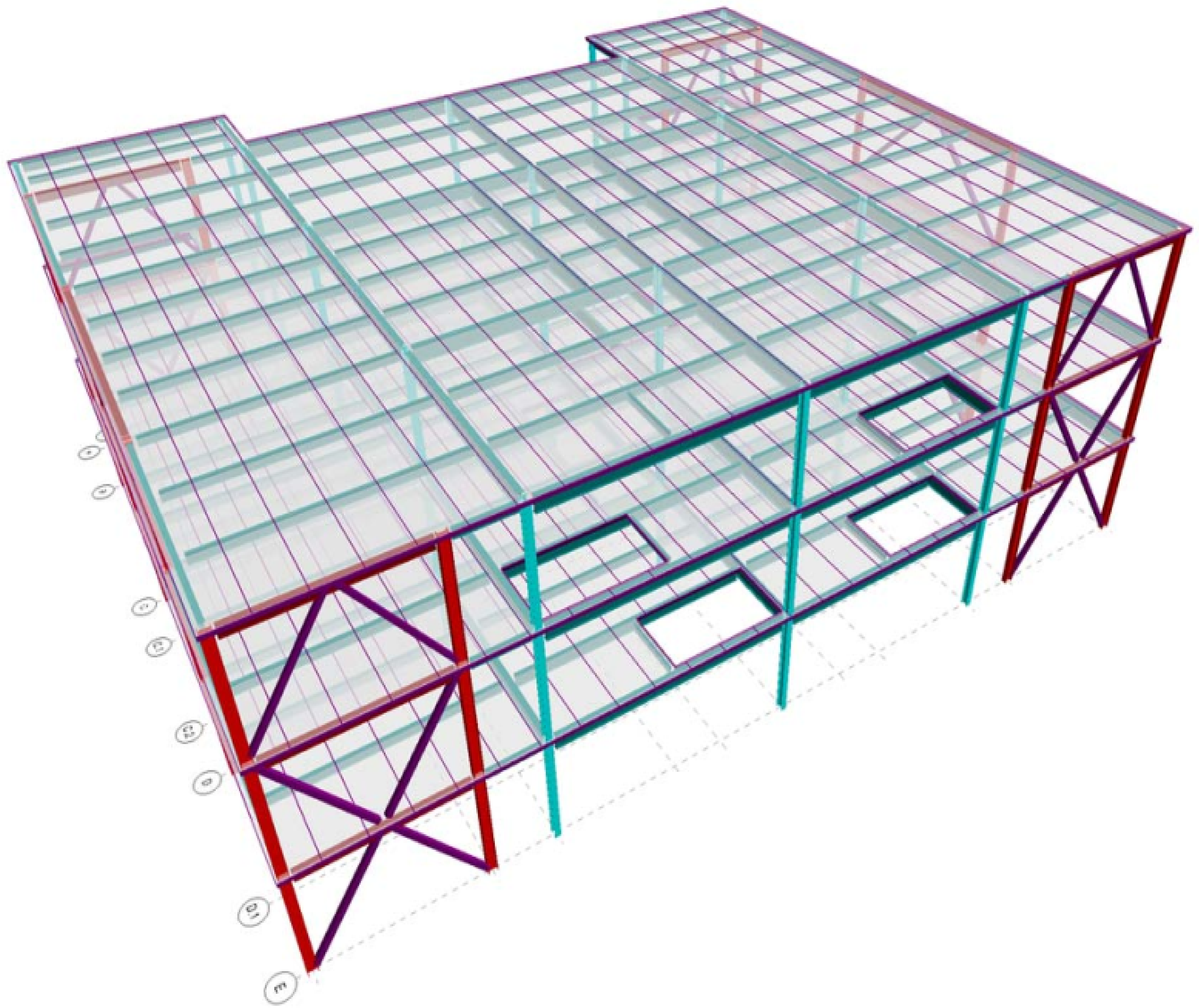
DRAWINGS PROVIDED BY:
AGLA Consulting
P.O. Box275
Columbia, MD 21045

DATE:
2/2/21

SCALE:
AS NOTED

SHEET:
P-1

Pre-engineered Structural Steel Building Frame



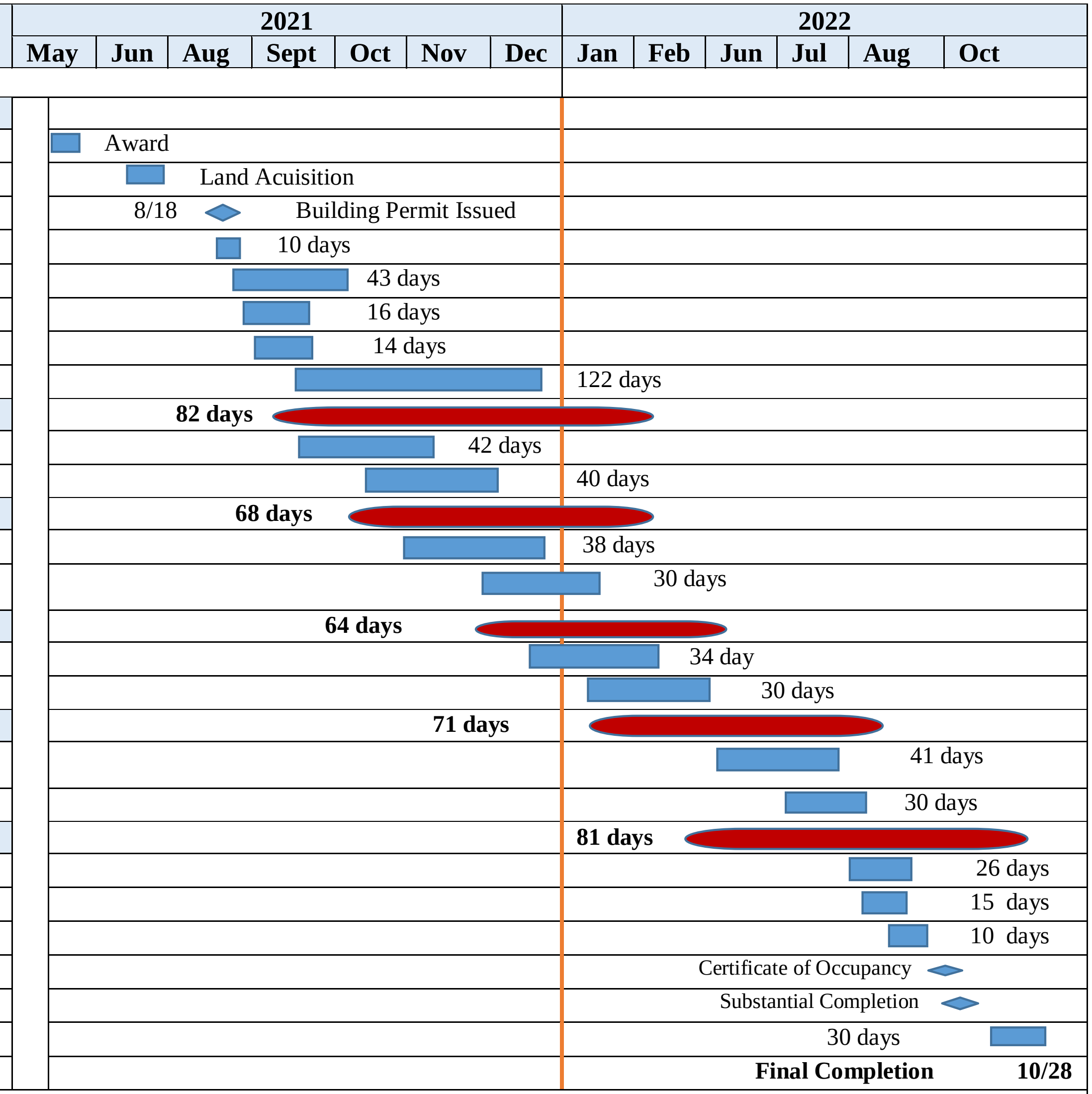
PROJECT SCHEDULE SUMMARY

Schedule Overview

The total project is scheduled to take 318 Days. This does not include pre-design land preparation. Note that this project will be constructed with prefabricated structures to be manufactured by the company . Both structures are projected to last 30 days , superstructures will take 45 days and the rough -in and finish timeline is 18 days . Materials shipment to the United States 45 days . US Customer service process will last 8 days . Transportation from the port of Baltimore to the Site located at 7569 Old telegraph Road, Hanover , Maryland will take 1 day. Creation of the Foundation will take 30 days . Construction works will take 90 days . Building closeout includes testing for LEED point verification and other testing and balances , as well as final punch list work . Final completion is expected to be August 12 , 2022 . See Gantt chart Summary Schedule Appendix A.

SCHEDULE SUMMARY – Total Project Schedule Summary Gantt Chart

ID	Task Name	Duration	Start
	SCHEDULE SUMMARY	**359 days**	**Fri 5/14/21**
1	• **Design Completion/BID/Award**	0 days	Fri 5/14/21
	• **Land Acquisition (closing)**	0 days	Fri 5/29/21
2	• **Buildings Permit Issued**	0 days	Wed 8/18/21
3	• **Award Contracts**	10 days	Wed 8/18/21
4	• **Offsite Utilities**	43 days	Thu 8/19/21
5	• **Residential Building Pad**	16 days	Thu 8/27/21
6	• **Clinic Building Pad**	14 days	Tue 8/31/21
7	• **Offsite Utilities**	122 Days	Thu 9/16/21
8	**SUBSTRUCTURE**	**82 days**	**Thu 9/16/21**
9	• **Residential Building Substructure**	42 days	Thu 9/16/21
10	• **Clinic Building Substructure**	40 days	Thu 10/9/21
11	**SUPERSTRUCTURE**	**68 days**	**Tue 10/26/21**
12	• **Resid. Building Superstructure**	38 days	Tue 10/26/21
13	• **Clinic Building Superstructure**	30 days	Thu 11/25/21
14	**ENCLOSURE**	**64 days**	**Wed 12/8/21**
15	• **Residential Building Enclosure**	34 days	Wed 12/8/21
16	• **Clinic Building Enclosure**	30 days	Mon 1/10/22
17	**ROUGH – INS AND FINISHES**	71 days	Mon 2/14/22
18	• **Resid Build. Rough-ins and Finishes**	41 days	Mon 2/14/22
19	• **Clinic Build. Rough-in and Finishes**	30 days	Tue 2/15/22
20	**BUILDINGS CLOSEOUT**	**81 days**	**Fri 6/13/22**
21	• **Punchlist for Substantial Completion**	26 days	Fri 6/13/22
22	• **HESS Final Inspections**	15 days	Fri 6/15/22
23	• **O&M Training / Final Cleanings**	10 days	Thu 6/21/22
24	• **Certificate Occupancy Issued**	0	Thu 7/7/22
25	• **Substantial Completion**	0	Thu 7/28/22
26	• **Final Closeout Procedures**	30 days	Fri 8/12/22
27	• **Final Completion**	0	Fri 10/28/22



Project: Schedule Summary
Date: 4/10/21

Summary: **Manual Tasks:**

- Orpe Human Rights Advocates
- Residential Treatment Facility - Pregnant and Postpartum Women with SUD and their Infants

PROJECT COST EVALUATION

Construction Cost	Components	Construction Cost per SF
$ 1046,500	Buildings (14,950 SF)	$ 70
$ 149,500	Foundations (14,950 SF)	$ 10
$ 1,196,000	Total Construction Cost	$ 70

Table 1: Square foot estimates summary

The total project has a budget of $2 million and construction cost of $1,196,000. The actual buildings cost per square foot was calculated to be $70. Land acquisition of 217,800 SF will cost $ 636,000. Other project development costs: $ 168,000

System	System Cost	% of Total	Cost per SF
Mechanical	$15,575*	1.75	$ 57.14
Electrical	$ 12,905	1.45	$ 68.96
HVAC	$24,350	2.30	$48.50

Table 2: MEP and structural cost estimates summary *Estimated Values

EXTENAL VIEW OF THE BUILDING

The Images presented below are Prototypes . They only serve the purpose of showing how the buildings concept will look like.

Construction Works Procedure

Note that the Images presented below are Prototypes. They only serve the purpose of showing how the buildings and rooms will look like.

Ground Level Entries Prototype -
Orpe Community Empowerment Concept

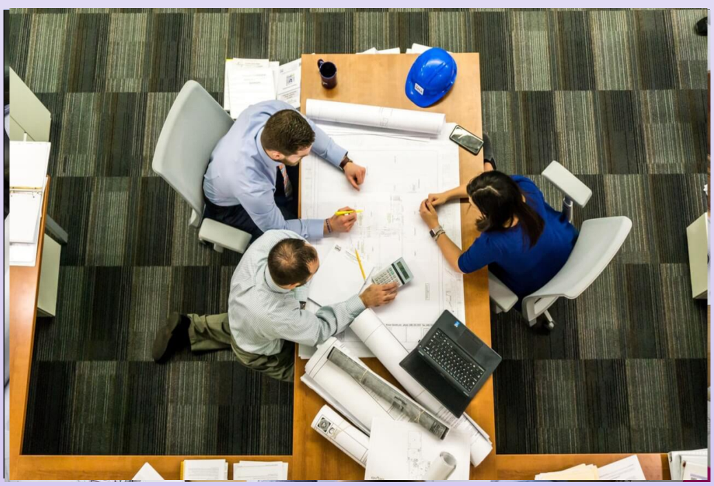
Prototype of External View
Orpe Community Health Approach

Ground Level Entry for a Hybrid Modular Building

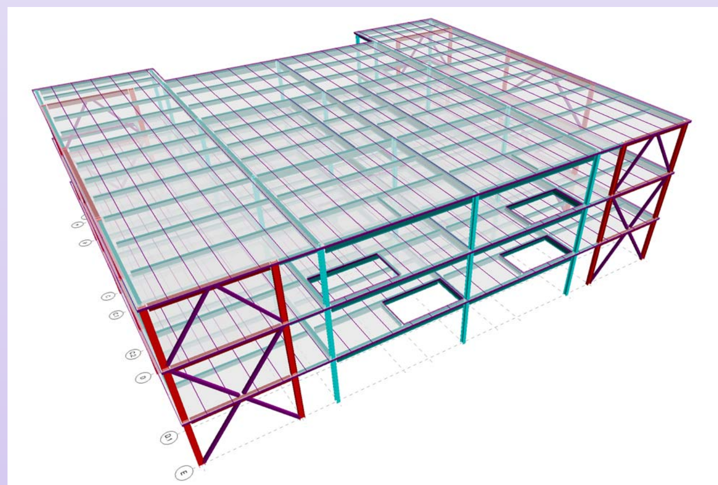
Project MOM Clinic - ORPE is expected to be constructed at 7560 Old Telegraph Rd, Hanover , MD 21076. The Clinic will have ground level walk-in entrances as shown in figure by the use of short retaining walls and concrete landings . These types of entrances eliminate the need for unsightly wood ramps and decks . This entrance is handicap accessible and very convenient for clients and employees . A local concrete contractor will poured this concrete pad after the building was constructed.

STEP 1: The site is prepared with a concrete retaining wall and poured concrete footings at the same time the building is being prefabricated by the manufacturer.

STEP 2: When the completed building materials and components arrive on site from the factory , they will be parked over the footings , while the foundation is being created . Then after , precisely maneuvered into place against the retaining wall by the setup crew using a Translift.



STEP 3: **Orpe Controls & Project Management Team worki**



STEP 4: **Steel framing building offers versatility and significant saving over conventional construction. The frame systems use only all steel rigid mainframes that can meet any customer application. It can accommodate different exteriors including block, brick, concrete, EFIS and stucco.**

STEP 5: Prefabricated structure (with 50 year warranty) will be installed to the building foundation to give the building an architectural of awesome appearance . The siding material may be applied directly on top of the concrete slab.

STEP 6: The result is a finish that easily rivals any stick-built construction. This completed look is attractive but also accommodating with easy handicap access . Ground level entries eliminate the need for unsightly wooden or metal steps, decks and long handicap ramps.

CHARACTERISTICS OF THE INTERNAL DESIGN OF THE CLINIC BUILDING

The Images presented below are Prototypes . They only serve the purpose of showing how the internal design will look like.

Characteristics of the Internal Design of the Clinic Building

The internal design of the clinic will have features comparable to the following:

WAITING ROOMS

Lobby can be customized with painted walls, crown moldings, wainscot, or faux brick panels, and even 11 foot ceilings for a WOW first impression as clients walk into the door. **Optional design still available. We want an environment where clients feel save and confident.**

Below is a prototype of interior design available for the Project MOM.

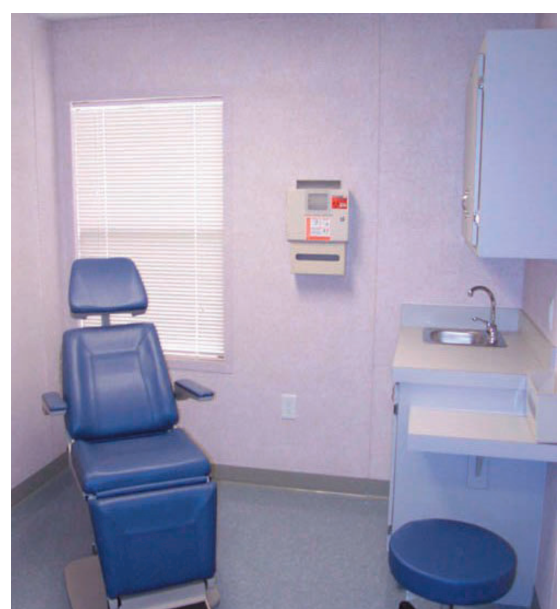
KEEPPING UP WITH THE TREND: Chairs in the side lobby dedicated to clientele feature built-in laptop tablets and will be offering unlimited Wi-Fi to patients.

RECEPTIONISTS & NURSE STATIONS

At Orpe Charity we believe that it is important to care for individuals that society tends to overlook. Our goal is to contribute in ending homelessness through programs that help people secure affordable housing and support themselves.

EXAM ROOMS

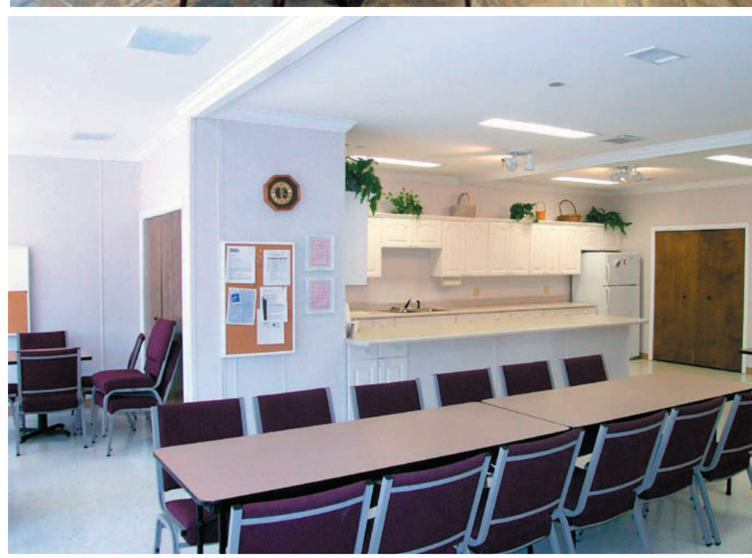
Exam rooms are the workhorses of a medical practice. Durability is the key in high-traffic areas. Upgraded features such as solid surface countertops and oak cabinets help increase the longevity of the building investment.



SPECIALTY SERVICES

- X- Ray
- CAT Scan Suite
- Wound Care Centers
- Women Health
- Labs
- Wellness Centers
- Behavioral Health
- Dental Clinics
- Medical Clinics
- Primary Care Services
- Ultra Sound Suite
- Pediatric
- Rehab services
- HIV/AIDS
- Social Services
- Case Management

CONFERENCE AND BREAK ROOMS



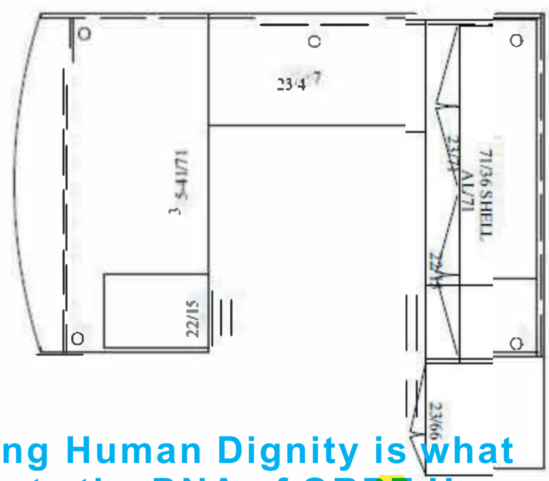
SIDE BACK VIEW OF THE BUILDING

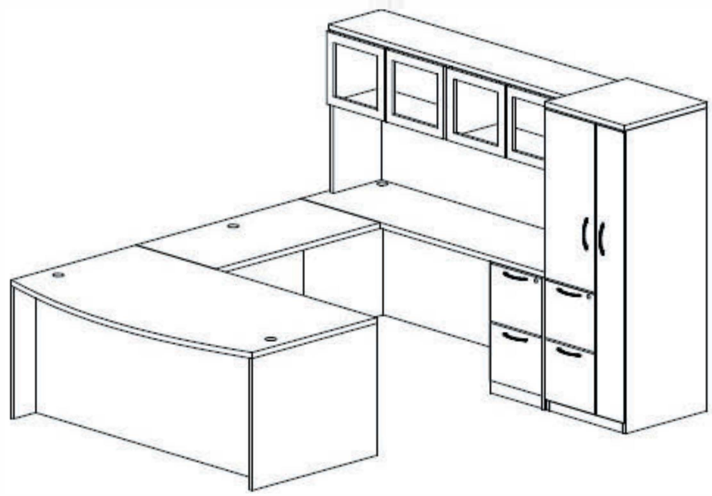
ORPE CHARITY CLINIC PROTOTYPE - 12,000 square feet

Coordinated Supportive & Human Services Workstations

This is a prototype of how the Department of Coordinated Supportive and Social Services will be organized at the ORPE Facility . This prototype was approved by the Board of ORPE Human Rights Advocates . The department will be providing services support in the following areas:

* Housing
* Education, Training, Skills Building
* Homeless Services
* Self-Sufficient Income Programs *
* Mom's hardships
* Legal Services





Restoring Human Dignity is what constitute the DNA of ORPE Human Rights Advocates

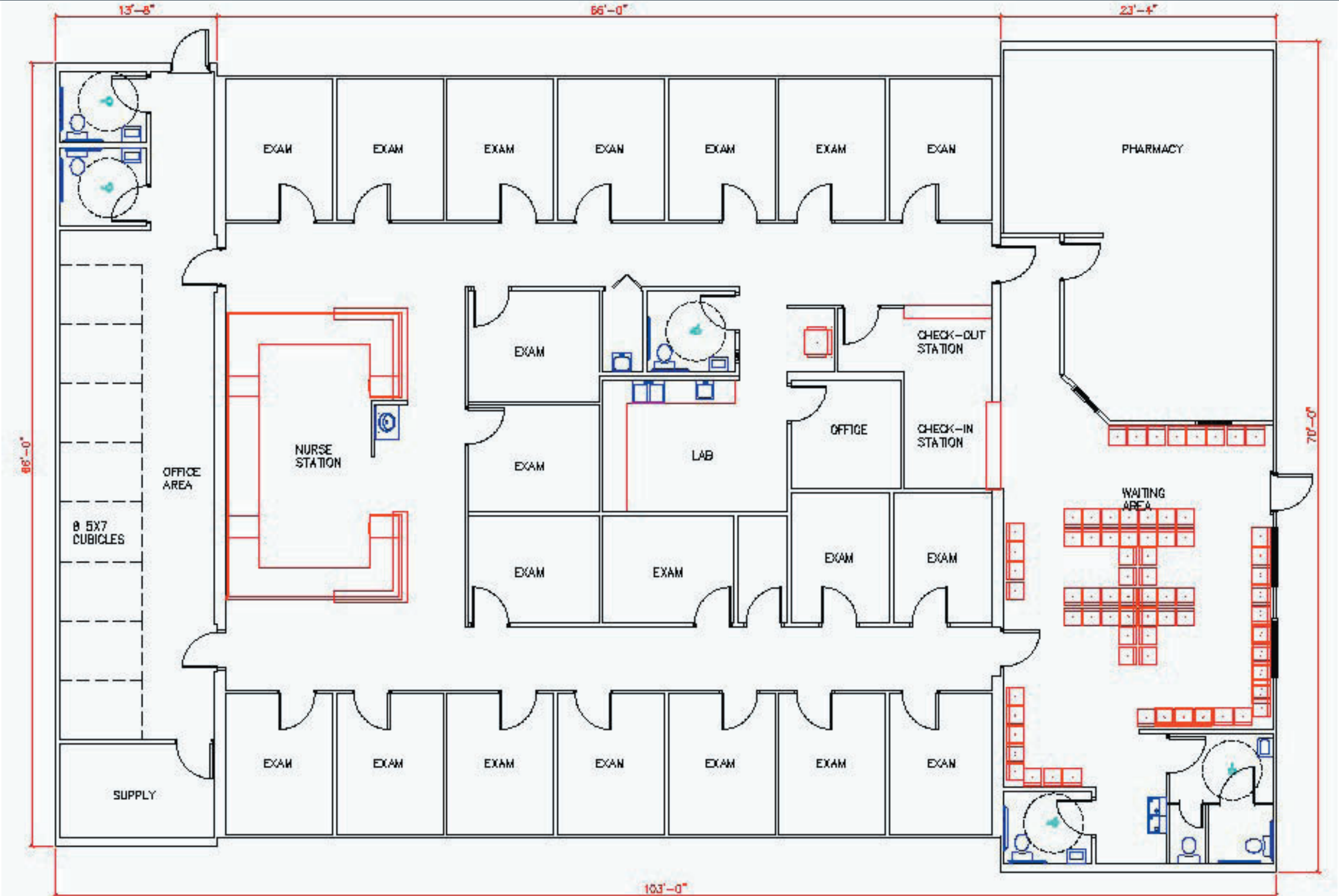
As changer makers, we dedicated ourselves in transforming lives of homeless , low-income, veterans from the status of insufficient incomes to the status of self - sufficient incomes.

We Are Light Shiners in the Midst of Darkness!.

Waiting Room

Exam rooms: 20 | Doctor Offices: multi

Break Room: Yes | X-Ray:



LOCAL CONDITIONS

Typically in the Anne Arundel region the preferred method of construction is cast in place concrete. It is interesting that the structural system is mainly ordinary steel construction. With building height not being a design limitation, in respect to maximizing number of floors this may have factored into the method chosen.

The 2017,800 SF representing the site allows significant space to construct on-site parking. The surrounding area is mostly residential and street parking will provide sufficient parking spaces during construction.

The site seats trees therefore in the land preparation process, there will be need of aggregated site tree recycling companies as the site to contribute in the process of site cleaning. This process must take place before the Design-Build Process started.

Subsurface and site conditions don 't have components susceptible of posing a hazard to the surrounding area. Certain areas ranged from 6 to 14 feet below grade and contained up to 10 feet of water. The soil bearing capacity does not require anything more than the use of geo-piers in certain locations. Spread footings are sufficient in most areas and for detached structure around the building (B).

Foundation, Structure, Finishes Narrative

The foundations will be constructed with Slab-on-Grade.

CONSTRUCTION PHASES

* Site Preparation
* Substructure
* Superstructure

LEED CONSIDERATIONS

The Residential Treatment and Respite Facility is currently projected to meet LEED Gold under LEED for integrated behavioral, primary care and social programs. This rating will be achieved by focusing on Indoor Air Quality and Optimizing Energy Performance. A large portion of the roof (over 40%) will be extensive green roof gardens, while the remaining areas will be a highly reflective EPDM roofing material. The complete LEED Scorecard can be seen in Appendix A, however a summary can be seen below in Table 3.

LEED 2021 Integrated Health and Social Services New Construction			
Category	**Points Planned to be Earned**		
	Yes	**Maybe**	**No**
Sustainable Site	16	3	5
Water Efficiency	9	2	0
Energy and Atmosphere	12	0	20
Materials and Resources	6	1	6
Indoor Environmental Quality	16	0	1
Innovation and Design Process	2	1	3
Regional Priority Credits	0	0	0
TOTAL	61	7	35
	GOLD = 60 to 79 points		

Table 3: LEED Scorecard Summary

ANALYSIS 1: OPTIMIZING VALUE ENGINEERING

Problem Identification

This analysis looks at some possible Value Engineering (VE) Solutions to clear the hurdle of "LEED" elements being excluded from the VE Process. The green roof will be at the center of this analysis and investigation onto the impacts of the green roof on the project MOM building systems . Value Engineering that dismisses LEED elements can unknowingly overlook cost effective benefits that can add real value and reduce total project costs and schedule.

Comparative Benefits of Green Roof Option to the EPDM Roof Option - Goal

Compare the benefits of choosing the option of green roof. To identify the benefits of green roof and the impacts of not adopting of green roof within this project. To develop a way to ensure that the LEED points can still be claimed to achieve LEED Gold at a lower cost and within a shorter duration . Determine the possible missed opportunities that occur when LEED elements are not properly evaluated during the total project Value Engineering Process.

Analysis Introduction

This analysis started with an investigation into the green roof. The properties of the green roof analyzed included: cost, thermal efficiency, storm water storage capacity, weight, and construction duration. Upon investigation into these properties, the impacts of eliminating the green roof on other systems were considered. The storm water retention of the green roof will affect the greywater system sizing and capacity. Weight reduction provides potential for a reduction of the steel framing members, which will be studied as a breadth topic. Thermal properties of the green roof system are very complex and will require careful and creative considerations . Construction duration for the roof system can be reduced dramatically. Finally, cost will be studied with changes and impacts of the other systems to determine the viability of eliminating the green roof. To conclude this analysis taking LEED certification, Value Engineering and Schedule Reduction into consideration will determine the risks and opportunities associated with Optimizing Value Engineering.

Green Roof Background

Residential Treatment & Respite Facility 's design would like to incorporate extensive green roof as part of the roof system . Extensive green roof is an innovative use of the thermal and moisture properties associated with soil and plant life material to create a sustainable feature in many modern day construction projects . This particular type of green roof , extensive , provides capacity of only up to 6" of soil on top of the roof. In Figure 12, a simplified diagram of the extensive green roof utilized at HD Woodson is shown to allow the visualization of a basic extensive green roof assembly.

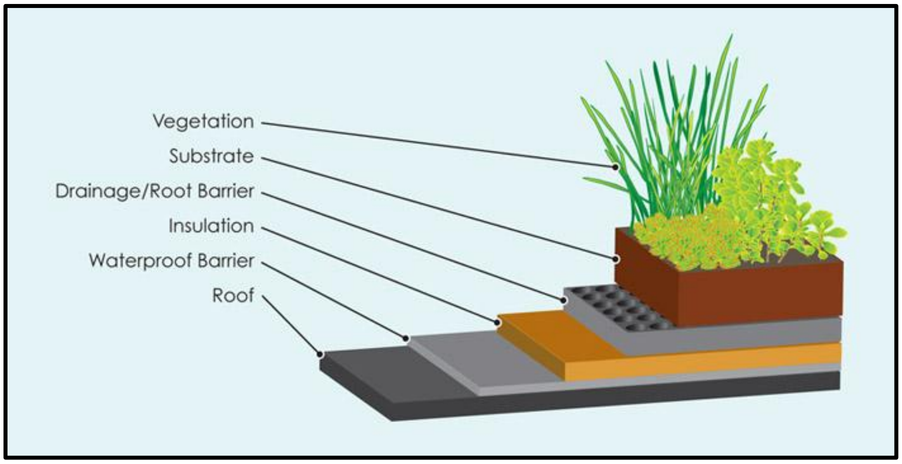


Figure 12: Simplified Extensive Roof Example

The soil medium layer as designed is planned to be four inches and the system selected for use allows the base layer of the assembly to be insulation directly on Concrete, which is not typical for most green roof assemblies . The detailed assembly designed specifically for Residential Treatment Facility is shown in Figure 13.

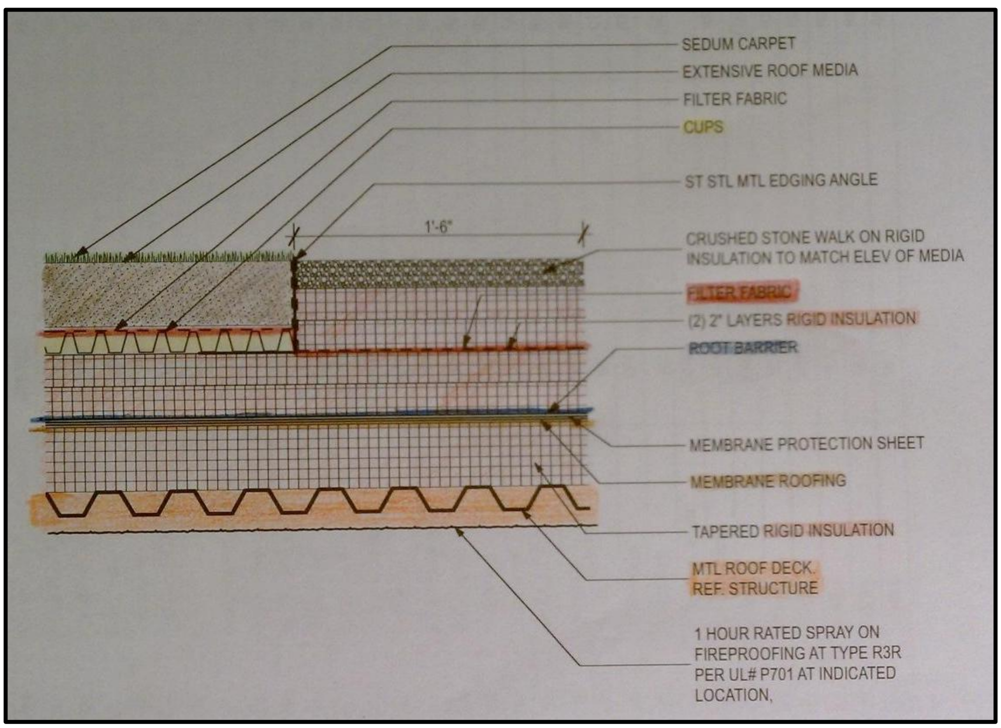


Figure 13: Detailed Actual Extensive Green Roof Assembly

Green roofs provide many advantages and disadvantages that must all be considered when deciding if it is a suitable option for a roofing assembly . A few advantages to green roofs are : storm water management properties , acts as a thermal mass, ability to clean the air and possible long term energy savings . Some disadvantages are: high initial costs, increased roof dead loads, maintenance concerns and costly repairs if required. Some of these pros and cons associated with green roofs will be discussed further in the following sections . The green roof designed would cover 8500 sf. A total of 8500 sf of roof area runoff would be controlled by the green roof . The 6450 sf and the area that would be an EPDM reflective roofing materials. That will brink a total of roofing square feet at 14950 sf.

Green Roof Estimate

The green roof estimate was generated by first looking at case studies of green roof costs in the MD Region. The use of six case studies resulted in $10 per square foot for the green roof installation. Table 4 shows the case studies and the average cost per square foot costs . This cost did not include the waterproofing membrane so an additional $2.50 per square foot will be added in order to account for this cost. The total cost per square foot that will be used to compare the green roof system costs to replacement with reflective EPDM will be $ 28.07 per square foot. The cost used for EPDM price per square foot was researched and the range for installed Reflective EPDM roofing is $ 7.00 per square foot. With the green roof being at the higher end of national averages for installation costs, the $ 7.00 cost per square foot for reflective EPDM roofing will be used.

EPDM Roofing Case Studies			
Building	Square Feet (SF)	Cost	Cost per SF
Anacostia Gateway Building	10,500	$ 78,750	$ 7.00
Orpe Charity	14,950	$ 104,650	$ 7.00
DC Dept. of Parks and Recreation	5,400	$ 19,008	$ 7.52
Latin American Montessori Bilingual Charter School	2,682	$ 18,774	$ 7.00
Service Employees International Union Hdqrts	Not provided	Not provided	$ 4.00
US Dept. of Interior- Main Interior Building	6,495	$ 47,153	$ 7.26
Case Study Average			**$ 7.50**
Cost Used for Estimate			**$ 4.07**

Table 4: MD Region Roof Case Studies

Green Roof Cost Estimate		Reflective EPDM Roofing	
$ per Square Foot	$ 10	$ 7.00	$ per Square Foot
Square Feet	14,950	14,950	Square Feet
TOTAL	$ 149,500		TOTAL $ 104,650
Potential Savings	$ 44,850		

Table 5: Green roof vs. EPDM Roofing Costs

Durations and Schedule Reduction Scenario

The current schedule allowed 3 days for the installation of the EPDM roof on all the bays of the two buildings. However, the actual EPDM roof, or plant material installation is not on the critical path of the project. The waterproof membrane is the critical portion of the roof enclosure, which will still be the same or a similar process for the EPDM reflective roofing membrane.

Thermal Property Considerations

Thermal properties of a green roof are very complex and difficult to quantify. The R-value of soil can be taken into account, though it is poor, it does not represent accurately all the benefits that the green roof thermally provides. The R-value does not take into account the thermal mass that the soil provides to the construction assembly , creating a longer period of time for heat to transfer to or from the conditioned space. However, this report does not allow the time and depth needed to take this into account while comparing thermal properties; it is an important note to make about the system, but was not accounted for in the alternative design proposal. Equally as important to note about the EPDM roofing membrane is its reflective properties that are not taken into account in this proposal as well.

The as-is design of the green roof has a combined R-value of 43. The alternative assembly being proposed will provide an R-value of 50 and become consistent with the EPDM reflective roofing material. Table 6: R and U value Assembly comparisons. Table 6 breaks down the assembly of the green roof system and alternative system by R-value. However, when looking into these systems further the Solar Reflectance and Emmittance should be taken into account, it was not included in this report.

Green Roof		Alternative Assembly	
	R-Value	R-Value	
Sedum Carpet	0	0	EPDM Roof Membrane
Extensive Roof Medium	1.25		
(2) 2" Layers Rigid Ins.	20	20	(2) 2" Layers Rigid Ins.
Tapered Ins. Average	21.6 (average)	21.6	Tapered Ins. Average
Cementitious FP (1HR)	0	8.33	Blazeshield II FP
TOTAL R-value	42.85	49.93	Total R-value
U value (1/R)	0.02334	0.02003	U value (1/R)

Table 6: R and U value Assembly comparisons

To determine roughly the amount of BTU/hr that will be transferred through the 14950sf of EPDM Roof the winter extreme and summer extreme temperatures were used to calculate heat transfer per hour . In order to calculate the heat transferred through the shingles roof area and potential savings ASHRAE Handbook Fundamentals 2020 was used to determine winter and summer extreme temperatures . These numbers were used to calculate Change in Temperature from one side of the assembly to the other according to the corresponding indoor design temperature. The additional R-value is gained by a proposed Fireproofing system that provides an R of 3.33 per inch and 2.5 inches are required for the 1 hour rating on the underside of the metal decking . The product is Blazeshield II and can be installed for 10 to 15 % less than the typical cementitious Spray-on Fireproofing , appendix B Shows the product data sheets.

Design Temperatures and Heat Transfer					
	U Value	Season	Indoor Design Temperature	Outdoor Temp. (BWI)	Change in Temperature (ΔT)
EPDM Roof	0.02334	Winter[1]	70	16.3	53.7
A= 45,502 sf	0.02334	Summer[2]	75	94.3	19.3
$Q = U * A\Delta T$ (BTU/hour)		Q^1=57024			
		Q^2=20494			
Alternative	0.02003	Winter[1]	70	16.3	53.7
A= 45,502 sf	0.02003	Summer[2]	75	94.3	19.3
$Q = U * A\Delta T$ (BTU/hour)		Q^1=48943			
		Q^2=17590			

Table 7: Heat Transfer by Season

Greywater and Potable Water System Impacts

Another LEED designed element that will impact the ORPE Residential Treatement and Respite Facility is the Greywater reuse system . The removal of the green roof will have a large impact on taking advantage of this system . One of the benefits to the green roof was its ability to retain storm water , filtering it and releasing it slowly. However, the Greywater system is another system that assists in Storm Water Management. Part of considering the removal of the green roof was the impacts on other systems . In order to Optimize Value Engineering , redundancy of systems to solve the same problem may not always be the best solution . By expanding the capacity and uses of the greywater system can provide more than assistance in Storm Water Management.

Upon investigation into the total water supply and management, both potable and non-potable as well as Storm Water, a number of interesting discoveries were made. The first being the redundancy of the green roof and greywater system, secondly the grey water system and conventional plumbing both required for toilet flushing. Toilet flushing also contributes the highest demand for the sizing of the water main coming to the building from the street. The next few sections will explain and justify, in terms of water use, the removal of the green roof, expansion of the greywater system, greywater and trickle tank concept for toilet flushing, as well as downsizing the main water line from the street.

Green Roof Storm Water Storage Capacities

An advantages that will be lost when removing the green roof will be its ability to retain water, filter it and release it slowly. The water storage capacity of the roof is calculated using the Area, Voids ratio of the soil and the thickness. The Total Capacity of the green roof would have been 6,006 cf, or 44,928 gallons. Using the short cut routing method an engineer on the project determined that the maximum volume that would be required during either a 2 year or 15 year storm event would be 3,540 cf and 4, 656 cf respectively. This means that the system had well over the required capacity for a 15 year rain

Green Roof Storage Volume Capacity			
Square Footage	Voids Ratio (%)	Thickness of Soil (ft)	Storage Volume (cubic feet)
45,502	0.4	0.33	6,006

Table 8: Green Roof Storage Volume

Water System Design Considerations/ Or Municipality Water

In case of the water system would be private and not the municipality one, they would have been a need of taking into consideration "Water System Design". In that case, the total system capacity to required to support the Residential Treatment and Respite would be 50,000 gallons or, 6,685 cf. However, as the location where the project will take place is covered by the municipality watergate system, there is no need of constructing a private Water System. Only the connection fees needed.

Water Management System

Water Management System will take into consideration a design deemed to maintain the water coming into the building sufficient enough to support all programs. We propose a water system management based on the criteria shown in Table 9. 5,355 gallons per minute to be designed for toilet and urinal flushing, and about 6,000 gallons per minute would reserved to make up the rest of the domestic water demand.

Fixture	GPM/fixture	# of Fixtures	GPM
Faucet (kitchen sink)	2.2	56	123
Faucet (lavatory)	1.5	118	177
Shower	2.5	23	58
Faucet (Utility Sink)	4	9	36
Urinal (flush)	35	29	1015
Toilet (flush valve)	35	124	**4340**
TOTAL GPM			**5749**
Total Toilet Flushing			**5,355**

Table 9: Water Main Design Criteria

This large portion of water demand will be able to be met entirely by exploring the municipality water system. However, if greywater system would been approved, combing the expansion of the greywater/ rain storage collection with a smaller water main connection to slowly fill the storage tanks and act as buffers for this large demand. The plumbing engineer would have to study the possibility of downsizing the water main upon proposal of this system. If the water main can be reduced after looking at demand for fire suppression systems and worst case scenarios for the buffer tanks getting minimal rainfall amounts. The location of the tank would be to the right of to the grey water tanks. Figure 13 shows the original design and location of the two water storage tanks under the parking lot at the south of the complex. To the east or right of the tank is where the additional proposed 20,000 gallon tank would also have been installed. Table 10 displays a breakdown of estimated additional costs of installing the additional tank. This estimated water system is out of the current budget.

20,000 Gallon Storage Tank Costs		
	Impact on Schedule	Cost
Excavation	2 Day	$ 15,000
Tank (20,000 gal)		$ 10,000
Plumbing	1 day for connections	$ 1,000 allowance
TOTAL		**$ 26,000**

Table 10: Added Storage Tank Costs

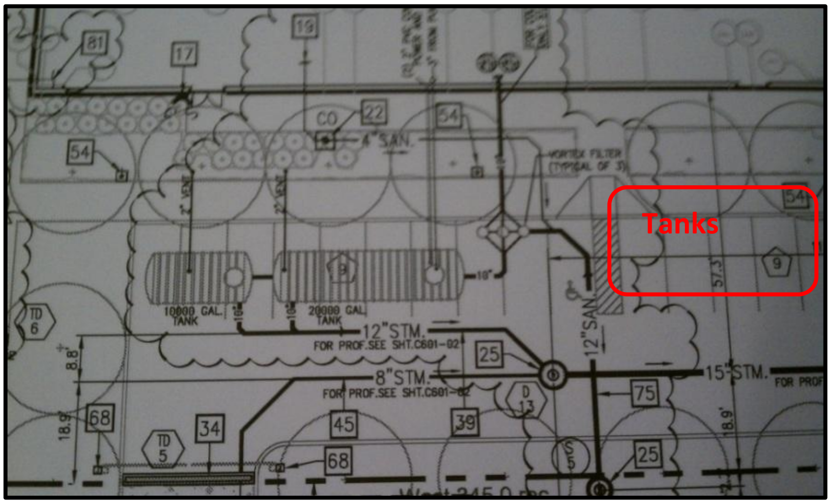


Figure 14: Original Design and Location of Greywater Tanks

Expected Rainfall

Table 11, shows the average monthly rainfall in the MD area . These averages were used to determine how much rain water can be expected to be collected per month. The rainiest month provides on average 8,049 gallons per day. With a storage capacity increased to 50,000 gallons the ability to significantly reduce the amount of potable water being used for toilet flushing is greatly reduced.

Average Monthly Rainfall from 1971 to 2010 Reagan Airport					
	Inches	Feet	Roof Area	CF	Gallons
January	3.21	0.268	101406	27,126	202,917
February	2.63	0.219	101406	22,225	166,253
March	3.60	0.300	101406	30,422	227,571
April	2.77	0.231	101406	23,408	175,103
May	3.82	0.318	101406	32,281	241,478
June	3.13	0.261	101406	26,450	197,860
July	3.66	0.305	101406	30,929	231,363
August	3.44	0.287	101406	29,070	217,456
September	3.79	0.316	101406	32,027	239,581
October	3.22	0.268	101406	27,211	203,549
November	3.03	0.253	101406	25,605	191,539
December	3.05	0.254	101406	25,774	192,803
MAX	3.82		MAY	32,281	241,478
MIN	2.63		FEB	22,225	166,253
AVERAGE	3.28			27,711	207,289
TOTAL				332,527	2,487,473

Table 11: Average Monthly Rainfall

Effects on LEED Criteria

By removing the green roof in this project the potential to lose thermal efficiency may become difficult depending on how much the mechanical system will be designed, relied on the thermal mass of the green roof. In order to combat this issue, the proposal to use a higher R-Value spray on fire proofing is suggested . The impact on cost for this spray on fireproofing is minimal and claims to be at a 10% to 20% reduction of normal cementitious spray on fireproofing . If additional insulation for the green roof area, 14,950 sf, is needed an additional 2 2" layers for rigid insulation would cost under $80,000. That price can be cut in if only a single layer is required per the mechanical engineer's recommendation.

Water efficiency points will also not be affected due to the green roof removal, if the expansion of the grey water system is implemented. The two systems, while quite different, work to combat the same problems of rapid discharged storm water and water use efficiency.

Beam Design Loads and Reduction

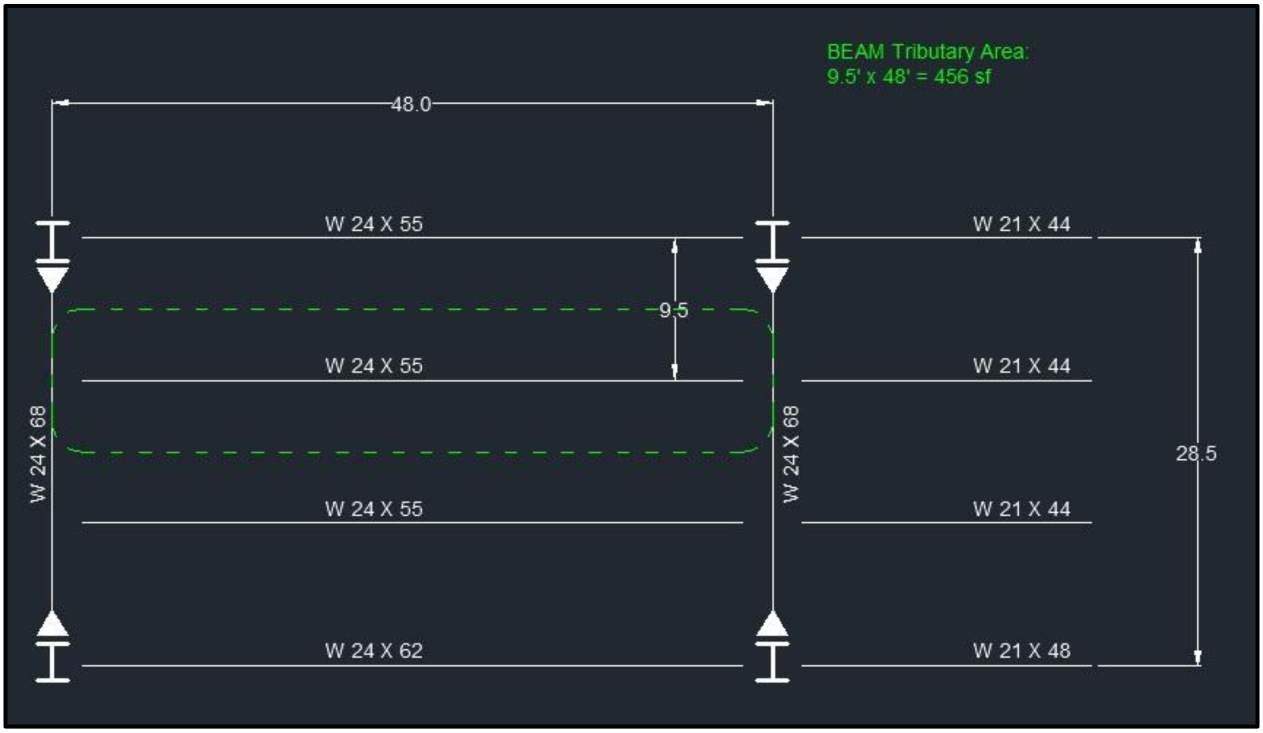
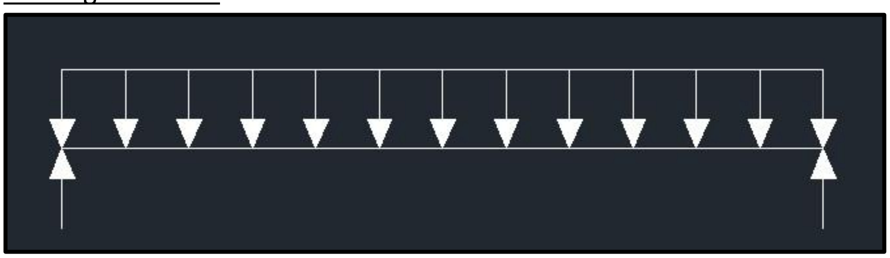


Figure 16: Beam B Tributary Area and Original Member Sizes

<u>Loading Condition</u>



<u>W 24x55 Loading Calculations</u>

Factored Load: 1.2(30 PSF + 30 PSF) + 1.6(21) = 105.6 PSF

Load (PLF): 105.6 PSF x 9.5' (width of Trib. Area) = 1003.2 PLF (1.003 KLF)

Load per Support: (1.003 KLF x 48') / 2 Supports = 24.072 kips (at each support)

Bending Moment: $w_u l^2/8$ = (1.003 KLF) x $(48')^2/8$ = 288.9 kip-ft.

W 24x55 Max Bending Moment: **503 > 288.9 (57%) OK**

<u>Deflection Calculations</u>

Load: 60 PSF + 21 PSF = 81 PSF, 81 PSF x 9.5' = 769.5 PLF

Deflection: $(5wl^2)$ / (384EI) = 5(769.5 PLF)$(48')^4$(1728 Conversion) / [(384)(29,000,000)(1350)= 2.34"

Max Allowable Deflection Total Load: L/240 = [48' x (12"/1')]/240 = **2.4">2.34" OK**

Reduced Load Calculations

Factored Load: 1.2(30 PSF) + 1.6(21) = 69.6 PSF

Load (PLF): 69.6 PSF x 9.5' (width of Trib. Area) = 661.2 PLF (.661 KLF)

Load per Support: (.661 KLF x 48') / 2 Supports = 15.87 kips (at each support)

Bending Moment: $w_u l^2/8$ = (.661 KLF) x $(48')^2/8$ = 190.4 kip-ft.

Maintain 57% for unknown factors: 190.4 + 57% = 299 kip-ft.

W 21x44 Max Bending Moment: **358 kip-ft. > 299**

W 18x40 Max Bending Moment: **294 kip-ft. «» 299**

Reduced Load Deflection Calculations

W 21x44

Load: 30 PSF + 21 PSF = 51 PSF, 51 PSF x 9.5' = 484.5 PLF

Deflection: $(5wl^2)$ / (384EI) = 5(484.5 PLF)$(48')^4$(1728 Conversion) / [(384)(29,000,000)(843)= 2.36"

Max Allowable Deflection Total Load: L/240 = [48' x (12"/1')]/240 = **2.4">2.36" OK**

W 18x40

Load: 30 PSF + 21 PSF = 51 PSF, 51 PSF x 9.5' = 484.5 PLF

Deflection: $(5wl^2)$ / (384EI) = 5(484.5 PLF)$(48')^4$(1728 Conversion) / [(384)(29,000,000)(612)= 3.26"

Max Allowable Deflection Total Load: L/240 = [48' x (12"/1')]/240 = **2.4"<3.26" NOT OK**

In the bay studied the W24x55 can be reduced to W21x44 and the W21x44 beams to the right of the bay can be reduced to W18x40s. The calculations for this second reduction can be found in Appendix C. The reason these beams were analyzed was to allow the reduction of the Girder A. The reduced beams are shown in Figure 17 with the possibility to resize the Girder to be investigated in the rest of the Structural Breadth.

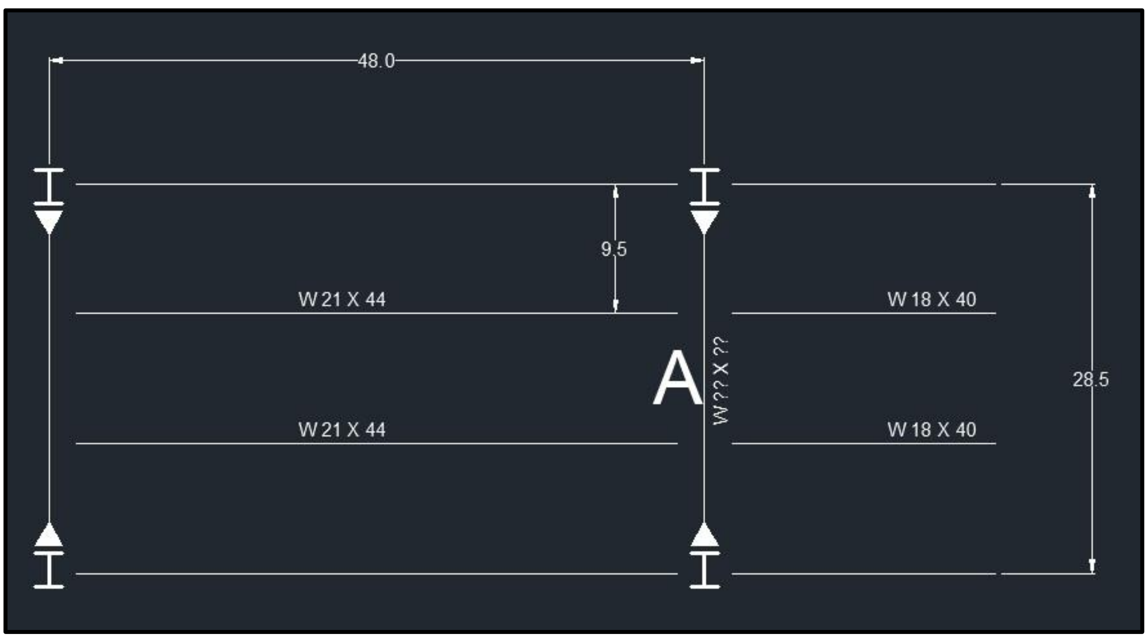


Figure 17: Reduced Beam Designations Influencing Girder A

Girder Design Loads and Reduction

In order to re-size Girder A an investigation into the existing design was first done to explore the possibility of downsizing at all. Figure 18 Displays the Tributary Area and design of the steel members with the green roof loads accounted for.

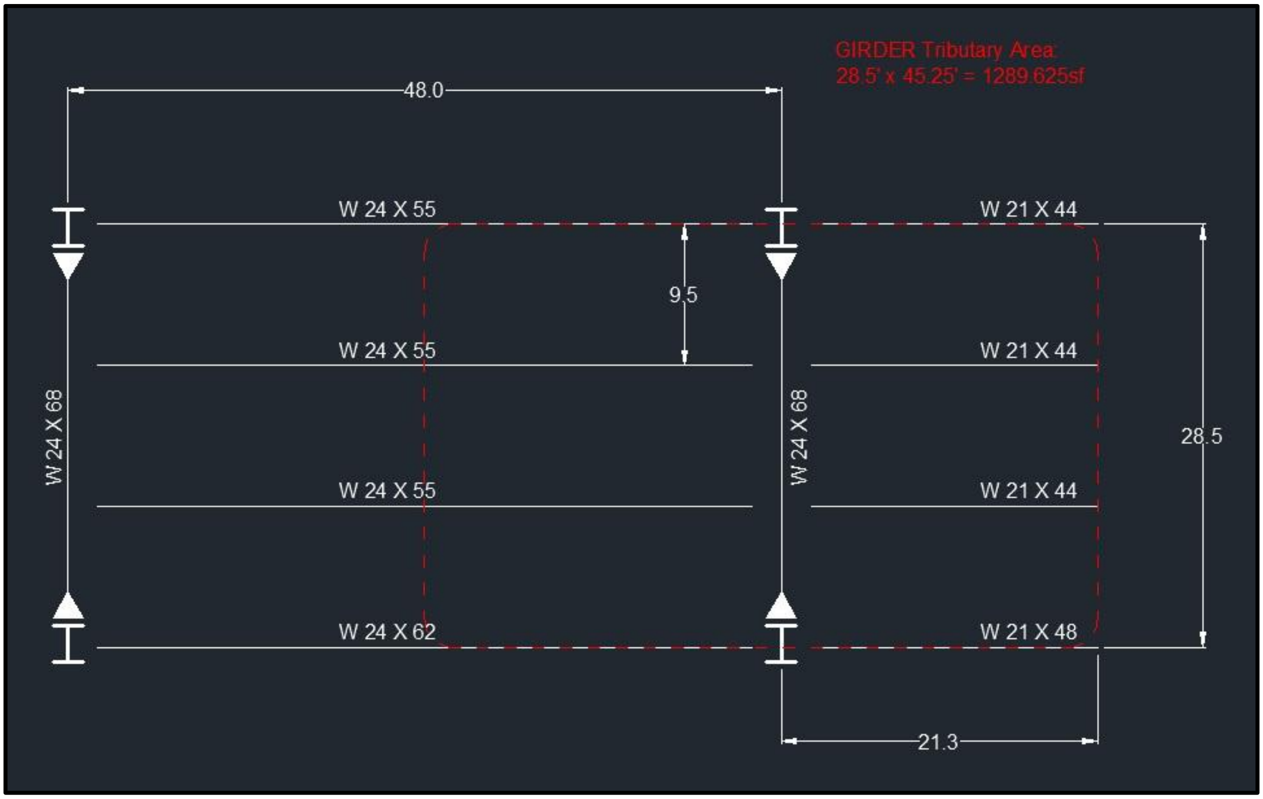


Figure 18: Girder A Tributary Area with Original Member Sizes

W 24x68 Loading Calculations

Factored Load: 1.2(30 PSF + 30 PSF) + 1.6(21) = 105.6 PSF

Additional Self Weight of Connecting Beams: 105.6 + 3.5 PSF = 109.1 PSF

Load (PLF): 109.1 PSF x 45.25' (width of Trib. Area) = 4936.8 PLF (4.94 KLF)

Load per Support: (4.94 KLF x 28.5') / 2 Supports = 70.4 kips (at each support)

Bending Moment: $w_u l^2/8$ = (4.94 KLF) x $(28.5')^2/8$ = 501.6 kip-ft.

W 24x68 Max Bending Moment: **664 kip-ft. > 501.6 kip-ft. OK** (75%)

Deflection Calculations

Load: 60 PSF + 21 PSF = 81 PSF, 81 PSF x 45.25' = 3,665.25 PLF

Deflection: $(5wl^2) / (384EI)$ = 5(3665.25 PLF)$(28.5')^4$(1728 Conversion)/[(384)(29,000,000)(1830) = 1.03"

Max Allowable Deflection Total Load: L/240 = [28.5' x (12"/1')]/240 = **1.43">1.03" OK**

Reduced Load Calculations

Factored Load: 1.2(30 PSF) + 1.6(21) = 69.6 PSF

Additional Self Weight of Connecting Beams: 69.6 + 2.96 PSF = 72.6 PSF
Load (PLF): 72.6 PSF x 45.25' (width of Trib. Area) = 3285.2 PLF (3.285 KLF)
Load per Support: (3.285 KLF x 28.5') / 2 Supports = 46.8 kips (at each support)
Bending Moment: $w_u l^2/8$ = (3.285 KLF) x $(28.5')^2/8$ = 333.5 kip-ft.
Maintain 75% for unknown factors: 333.5 + 75% = 416.9 kip-ft.
W 21x55 Max Bending Moment: **473 kip-ft. > 416.9 kip-ft.**
W 18x55 Max Bending Moment: **420 kip-ft. > 416.9 kip-ft.**

<u>Reduced Load Deflection Calculations</u>
W 21x55
Load: 30 PSF + 21 PSF = 51 PSF, 51 PSF x 45.25' = 2307.8 PLF
Deflection: $(5wl^2) / (384EI)$ = 5(2307.8 PLF)$(28.5')^4$(1728 Conversion) / [(384)(29,000,000)(1140)= 1.04"
Max Allowable Deflection Total Load: L/240 = [28.5' x (12"/1')]/240 = **1.43">1.04" OK**

W 18x55
Load: 30 PSF + 21 PSF = 51 PSF, 51 PSF x 45.25' = 2307.8 PLF
Deflection: $(5wl^2) / (384EI)$ = 5(2307.8 PLF)$(28.5')^4$(1728 Conversion) / [(384)(29,000,000)(890)= 1.34"
Max Allowable Deflection Total Load: L/240 = [28.5' x (12"/1')]/240 = **1.43">1.33" OK**

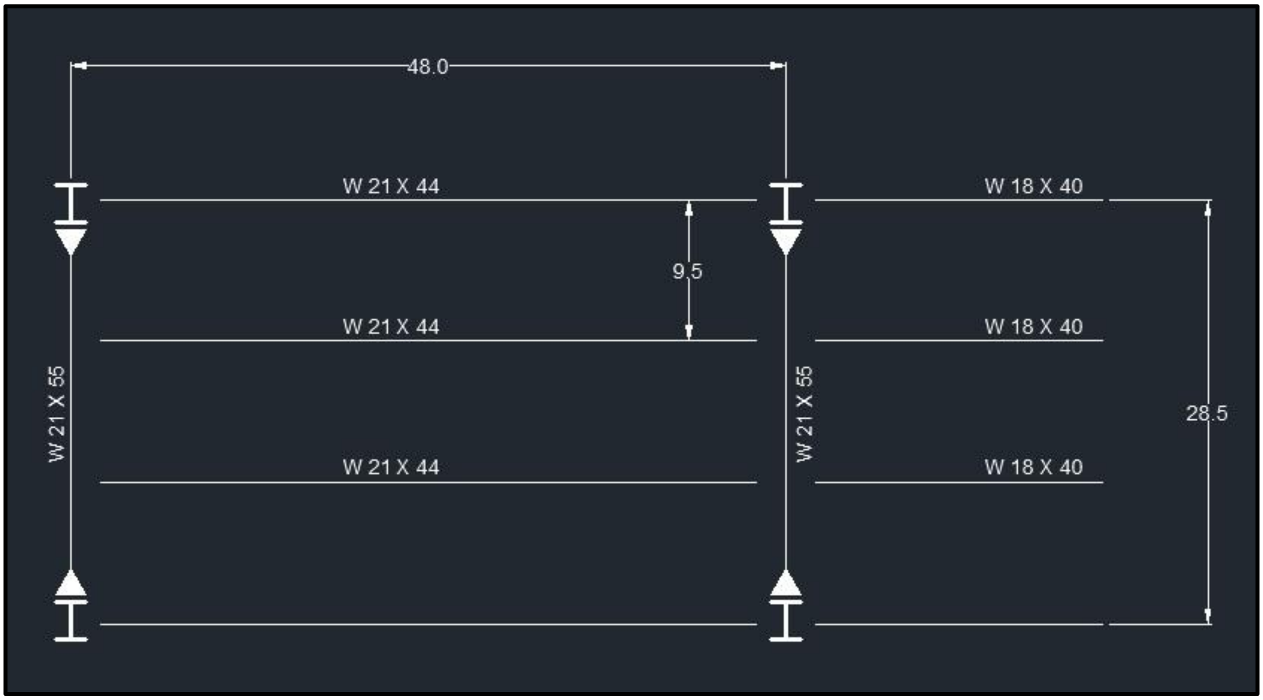


Figure 19: Resized Beams and Girders

Figure 19 shows the reductions able to be made to the structural steel with the deletion of the green roof loads. On average each the beams were able to be reduced by 16%. Upon verification by the structural engineer on the project a reduction of all steel that was originally under green roof area could be reduced by 16% by weight. Removing the green roof would result in the 44% of originally designed roof structure reducing its structural steel member total weight by 16 to 18 tons and saving nearly $50,000.

Optimizing Value Engineering Conclusion

Analyzing and expanding the Value Engineering Process at Orpe Residential Treatment and Respite Facility in this analysis yielded three important points. Excluding designated LEED elements from the VE Process poses a risk to improve the building while reducing costs. Removing a green roof can add benefits that outweigh the advantages it provides. Greywater systems and rainwater harvesting are viable ways to reduce water usage and waste. Overall the VE Options discussed throughout Analysis 2 has the ability to save $ while not adding any time to the overall project schedule.

VE Option	Cost
Green Roof Removed	
Cost of 20,000 gal. tank	**$ 26,000**
Reduced Roof Steel Members	$ 50,000

Table 12: Value Engineering Cost Summary

ANALYSIS 2: ALTERNATIVE EXTERIOR WALL ASSEMBLIES

Problem Identification

The exterior building foundations enclosure may present a major schedule risk to the projects timely completion . The current design of building foundation walls is exterior masonry panels with CMU backing. Issues that come from use of a CMU wall are its duration, weather impacts, cleanliness and ability for changes and acceleration during MEP rough in. The weather is directly related with CMU construction. When the temperatures reach a certain point it must either be completely shut down or costly temporary heat and tents must be used. The process also tends to clutter a site and requires vigilant "house cleaning" efforts. It also makes the MEP rough in cumbersome, especially the in-wall electrical conduits. However, schedule risk tends to be minimized since the the construction is based on prefabricated modular panels and the total square feet associated with the building foundations are will be built with the slab-Grade. At that point, the weather will have less impact on the alteration of the efficiency of the exterior masonry.

Research Goal

To develop and chose a more jobsite friendly and efficient exterior enclosure wall assembly, that has potential to accelerate the schedule and eliminate risk of delaying the exterior enclosure construction. The impact of the alternative system must also provide little to no impact to the architecture, while maintaining or improving the material properties and their impact on other building systems.

Analysis 2 Introduction

The analysis of alternative exterior wall assembly options includes comparison of cost, schedule time, thermal properties, through a Mechanical Breadth study, and feasibility. The two alternatives that will be assessed are an innovative product, Metal Stud Crete, and system. Both these options are only being assessed to understand the most efficient and cost effective of constructing our project's exterior wall. The square footage of this area is 14,950 square feet . After the two systems are analyzed a summary and recommendation will be made.

Original Design - Modular or Architectural Wall

The original design documents call for an Modular Architectural Walls Precast exterior finish on 21,400 square feet of exterior walls at Orpe Residential Treatment Facility . Reasons for proposing this Modular or Architectural wall element are related to the schedule risks associated with masonry construction , the need for integrated and simultaneous construction with multiple trades and reduction of on-site congestion, economic of scale on the total cost of building a project of a size of 21, 400 sf, and delivery time-line cut by 50%.

The project team allowed 90 days for the modular walls exterior enclosure to be completed . The begin date starting was July23, 2021 and end on November 2, 2021. If the choice would have been to build with CMU, the risk with laying CMU walls during the winter could have been great. When the ambient temperature drops below 40 degrees F additional precautions must start to be implemented . More drastic measures are required as the temperature drops lower, starting with simply having to heat the mortar to having to heat the CMU Blocks or even to the need to “tent” the areas under construction . This comes with a large price tag and decreased efficiency.

Furthermore , laying CMU walls and simultaneously installing conduits and boxes for electrical and other components is not an efficient process. The two crews working together could become frustrated with the other and matching pace with another trade will always require one of the trades to progress slower than typically accepted . This risk of feuding trade contractors , and decreased efficiency make the use of CMU Back Up walls questioned as the best solution.

In addition , CMU Construction process tend to clutter a site and increase the costs of general cleaning and maintenance of an organized safe site . The use of scaffolding can begin to limit safe site and building access. Safety concerns do not allow workers to be near the base of the scaffold limiting the amount of work that can be done in a specific area of the site. The mortar mixing stations along with stockpiles of material require a sizable area. Cutting masonry units creates dust, and tripping hazards raising safety risks and concerns. Broken and cut-off pieces of the CMU blocks also require continuous clean up. Storing of CMU on site also can take up a large area.

An excellent solution to reduce or eliminate all or most of these issues is desirable . That 's why we 've considered the Prefabricated Structure System with Metal Stud Crete ’ s innovative system and standard stud metal stud wall systems for alternative solutions. The system is 4 times cost effective than the traditional system of construction.

Metal Stud Crete®

Metal Stud Crete System is a structural , composite wall panel system combining regular hard rock concrete , approximately two inches thick , on exterior side, constructed as a composite with standard light -gauge steel framing on the interior . Metal Stud Crete ' s patented structural , composite shear connector bonds these two to create a load bearing , wall designed to carry floor and roof loads and rapidly enclose a building . For the ORPE Project MOM Residential Treatment and Respite Facility the Metal Stud Crete is being proposed as an alternative to the exterior CMU Backup walls. Metal Stud Crete can be prefabricated within 500 miles of any site in the United States . Pricing information was found by contacting Earl Corporation ; the company that makes Metal Stud Crete , for the MD Region an average of $ 18.40 per square foot was given . This price includes Prefabrication , Transportation and Erection . Below , the prefabrication process of the precast panels is shown , photos and typical details , courtesy of Earl Corporation.

Metal stud framing, welded wire fabric and shear connectors laid out on casting beds.

Concrete being poured between stud cavities, leaving stud, (interior) exposed for ease of rough-ins, insulation and gypsum wallboard hanging.

Lifting the Panels out of the Beds to be stacked on the trucks for transportation.

Unloading panels on a site for installation.

Erecting panels to provide exterior enclosure and interior wall framing.

An example of interior view after erection, prior to rough-in and insulation.

Metal Stud Crete and LEED

Metal Stud Crete also qualifies for a number of LEED Credits. They use a large portion of recycled content and regional materials to construct lighter weight pre-cast panels that offer innovation and opportunities to increase building envelope efficiency.

Materials and Resources:

Recycled Content MR 4.0

Regional Materials MR 5.0

Energy & Atmosphere

Steel Stud Cavities allow for variety of insulations

Innovation & Design Process

Exceptional Performance

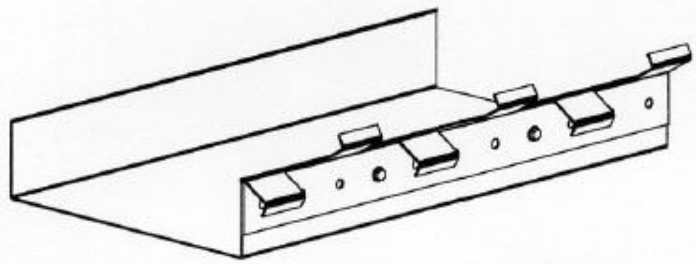
-Resource Conservation (65% concrete and reinforcing steel

-Conserve resources in Structure (Reduced Dead Load on Foundation)

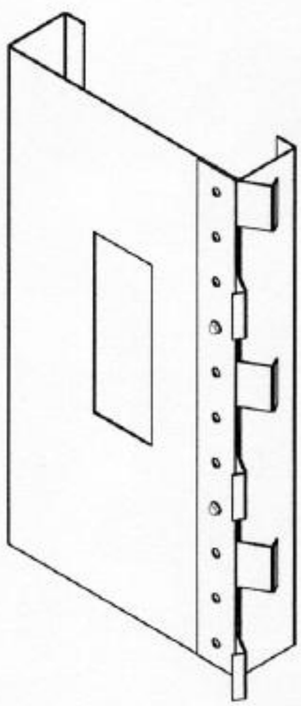
Typical Metal Stud Crete Details

A number of typical details are provided by Earl Corporation to assist in explaining their product function and design. Two options are shown for attaching the composite connection to the studs, either a face flange is screwed to the stud or a flange is screwed to the slide of the stud. The final design and shop drawings would be done in a collaborative effort with Earl Corporation. The exterior finish would also need to be approved by the architect on the project, a very similar look to the oversized precast can be achieved.

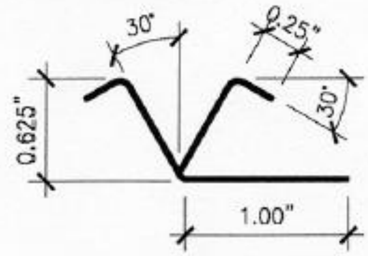
Metal Stud Crete® Composite System



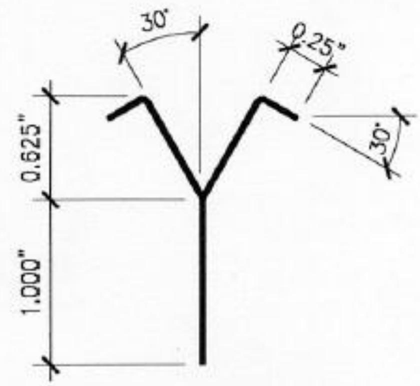
M.S.C. TRACK COMPOSITE CONNECTOR



M.S.C. WEB COMPOSITE CONNECTOR



M.S.C. TRACK STRIP
ALL RADIUS = 0.05"



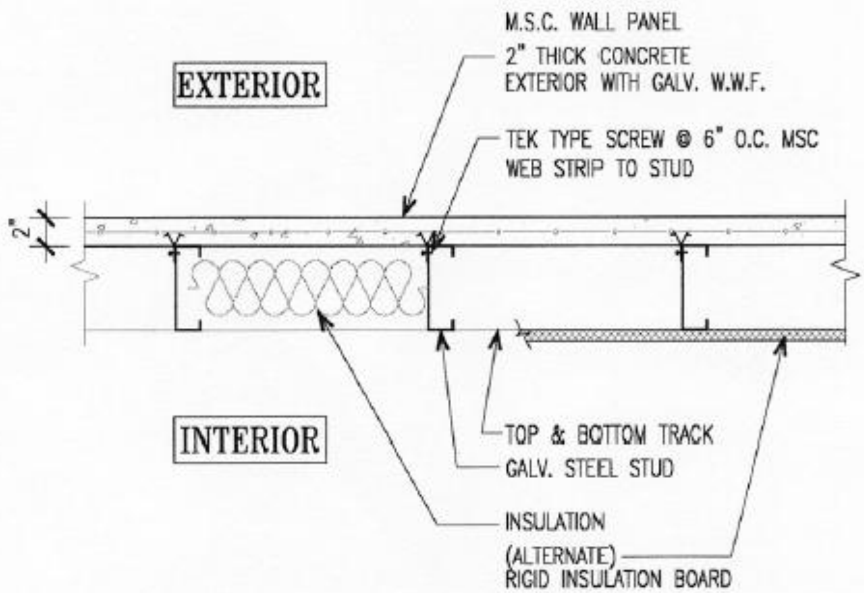
M.S.C. WEB STRIP
ALL RADIUS = 0.05"

For further details on Metal Stud Crete® panels, contact:

EARL COMPOSITE SYSTEMS

(800) 796-3275, Fax (626) 796-6194
E-Mail: metalcrete@earlcorp.com
Website: www.metalcrete.com

Metal Stud Crete® Composite System



M.S.C. WALL – PLAN VIEW
1" = 1'-0"

For further details on Metal Stud Crete® panels, contact:

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(800) 796-3275, Fax (626) 796-6194
E-Mail: metalcrete@earlcorp.com
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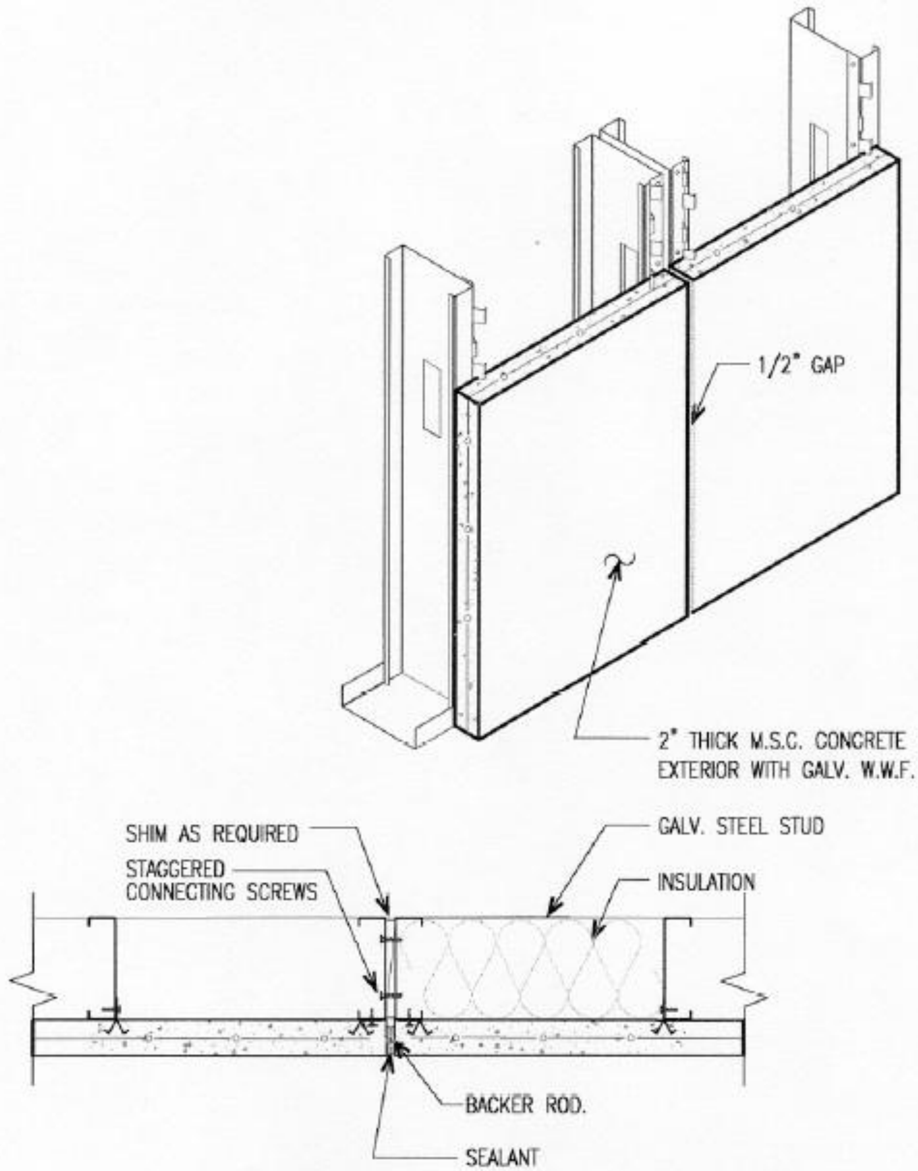
Metal Stud Crete® Composite System



TYPICAL IN-LINE BUTT JOINT

N.T.S.

For further details on Metal Stud Crete® panels, contact:

EARL COMPOSITE SYSTEMS

(800) 796-3275, Fax (626) 796-6194

E-Mail: metalcrete@earlcorp.com

Website: www.metalcrete.com

Schedule and Cost of Metal Stud Crete System

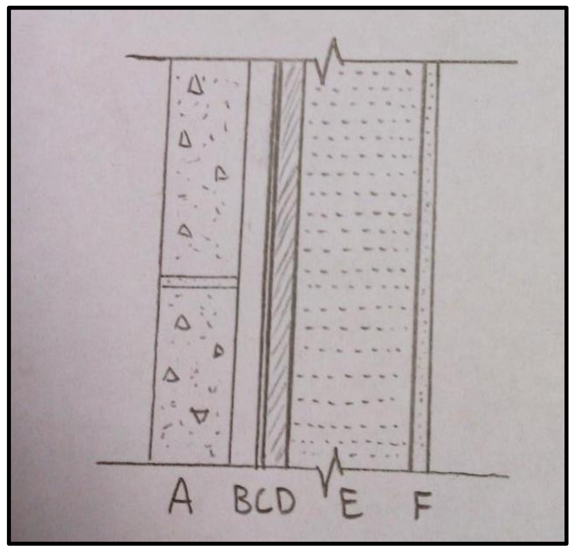
To evaluate the cost of the Metal Stud Crete System , a conversation with a representative of Earl Corporation took place. During the conversation a verbal statement , for the MD Region, on average the panels cost $16 per square foot . This price includes pre -casting of concrete walls at one of their locations within 500 miles of the site, transportation to the site and erection of the panels. The price did not include insulation, so an additional phone conversation with NOVA Spray Foam Insulation, LLC, a DC Metropolitan region spray foam services company was utilized to obtain spray foam information and pricing . And additional $2.40 was added per square foot for open cell foam on the interior, making the total $18.40 per square foot. Total system cost is estimated at $ 275,080.

Projected on site erection time for the panels is 17 days. Compared to the original 90 day duration, this product will provide an 80% reduction of the total cost of the project. 60 of those original days were on the critical path. There will be an added lead time that can be accounted for that would not exist with the CMU backup system. Besides the direct impact of the affected 14,950SF of CMU Composite walls other aspects of the building rough -ins and finishes will also be affected . The in-wall electrical rough -in was originally done in conjunction with the masons laying the block . This is a slower process and increases difficulty of CMU Masonry Construction, ultimately making it less efficient.

Regular Metal Stud Back Up

The alternative of using metal stud framing was also identified as a possible option for schedule acceleration and envelope efficiency improvement. An assembly consisting of 25 GA. 6 inch studs, open cell spray foam , 1 inch fiberglass board and the originally designed architectural precast panels . Advantages of using this system include the ability to increase the speed of enclosing the exterior envelope . Flexibility is increased with possibly changes after installation , prior to precast exterior installation. Also the rough in process for other trades, such as electrical will be increased. The ability to allow trades to follow one another will result in an increased efficiency for both trades and avoid potential conflicts that may arise. Coordination prior to the exterior Back Up walls are installed can be shortened for in wall items, as the metal studs allow increased ability for field adjustments after being enclosed.

6” Metal Stud Back Up for 4” Architectural Precast Concrete



Schedule and Cost of Regular Metal Stud Back Up

The estimated cost of the assembly was calculated at $34.00 per square foot, equaling a total of $ 508,300. This cost includes the stud walls, fiberglass board, insulation and precast masonry. It does not include any general conditions costs.

The expected duration for this system will reduce the originally allotted time by 30%. 60 days has been estimated as the duration needed to install this system. The lead times will not be of major concern with this assembly; the materials are typically stocked items at local suppliers.

Alternative Systems Cost Comparisons

Alternative System Cost Comparisons					
	Area (SF)	Assembly $/SF	Estimated Cost	Cost Difference	Duration (days)
CMU Back Up	14950	$ 12.94	$ 193,453	-	90
Metal Stud Crete	14950	$ 18.40	$ 275,080	$ 81,627	17
Regular Stud Walls	14950	$ 32.00	$ 478,400	$ 396,773	60

Table 13: Alternative Wall Assemblies Comparison

The originally designed CMU assembly was estimated to be the lowest cost version for the wall assembly itself , but it also has the longest duration . The middle price was $ 275,080 with a reduction in schedule time by 30 days . The most expensive assembly is the Metal Stud Crete system that also takes the least amount of time, allowing for the possibility of reducing general conditions cost significantly on the overall project this option begins to be a more realistic figure.

Thermal Property Considerations – Mechanical Breadth

In order to demonstrate mechanical breath a comparison of wall assembly effects on the building mechanical system loads was calculated. The R and U values were calculated for the original CMU walls and the two alternatives . The U value was then used to determine the Q (BTU/hr) through the wall assemblies . This value will then be used to calculate the potential impact on the Mechanical System load using BIM in the form of Revit MEP. Refer to BIM Influences on Analysis 3 for the detail on how the loads were determined for comparison.

The original system has 2" of closed cell spray foam on the exterior of the CMU wall, between the precast and CMU. The other two assemblies have been selected using open cell spray foam on the interior side between the stud cavities. Open cell and closed cell spray foams have a few differences that are important to know when deciding the location in the assembly and application desired. They both provide very good air sealing and low air infiltration compared to fiberglass batt and cellulose insulation. The reason for selecting the open cell for the alternative systems is the exposure factors and the cost. The closed cell is overkill for the space and the insulation will be well protected in both alternatives. Closed cell can also add a slight increase in wall strength.

Open Cell vs. Closed Cell Spray Foam		
	Open Cell	**Closed Cell**
Cost per Board Foot (1"x12"x12")	$ 0.60	$ 1.50
R-Value per inch	**3.5**	**6.0**
Typical Exposure/Durability	Softer feeling and weaker, air fills voids in tiny cells that aren't completely closed (Usually towards interior side of assembly for protection)	Gas filled tiny cells are able to resist water vapor and moisture infiltration (Can be applied closer to exterior or below grade, and roofing application)
Density	Medium (1.75 - 2.25 lbs/ft^3)	Low (0.4 - 1.2 lbs/ft^3)

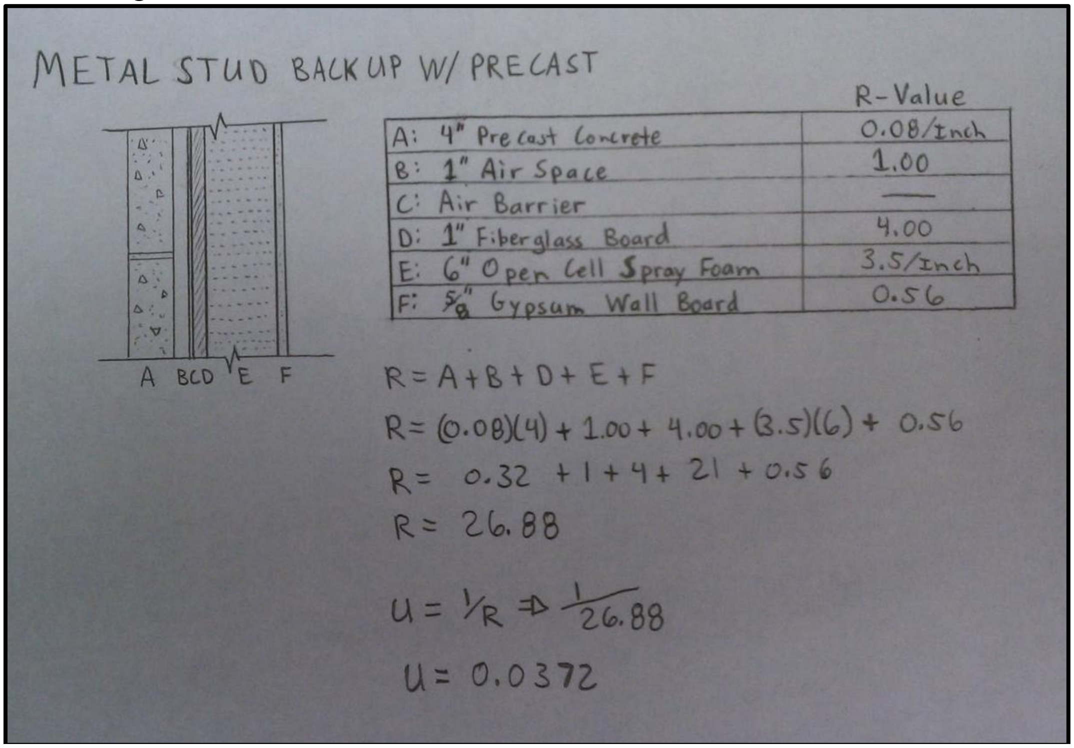
Table 14: Open Cell vs. Closed Cell Spray Foam

The R and U value are the basis of comparison for the mechanical breadth. These calculations were done by hand and the results are summarized below as well as the individual calculations.

Wall Assembly Options R and U Values		
	R	U
Original CMU	14.43	0.0693
Metal Stud Crete	21.72	0.04604
Metal Stud Framing	26.88	0.0372

Table 15: R and U value Comparisons

Metal Stud Framing



Heating and Cooling Loads Comparison

The two alternate systems proposed for exterior wall assemblies reduce the load on the mechanical system. The load contributed by the exterior walls is reduced. This load differential is not a significant change and will not add cost of upgrading the mechanical system; however it is recommended that the Mechanical Engineer be consulted for potential downsizing and verification upon alternative wall assembly selection. The three walls are compared in Table 16 and Table 17.

Space 1 - Heating and Cooling Load Comparisons						
	Cooling			Heating		
	Loads BTU/hr	% of Total	Cooling Savings	Loads BTU/hr	% of Total	Heat Savings
Original CMU Back Up	19	0.14%		36.6	0.26%	
Metal Stud Crete	12.5	0.09%	6.5	24.6	0.17%	12
Metal Stud Back Up	10.3	0.08%	8.7	20.3	0.14%	16.3

Table 16: Space 1 Load Comparisons

Space 2 - Heating and Cooling Load Comparisons						
	Cooling			Heating		
	Loads BTU/hr	% of Total	Cooling Savings	Loads BTU/hr	% of Total	Heat Savings
Original CMU Back Up	22.4	0.14%		48.8	0.29%	
Metal Stud Crete	11.8	0.07%	10.6	32.7	0.19%	16.1
Metal Stud Back Up	9.8	0.06%	12.6	27.1	0.16%	21.7

Table 17: Space 2 Load Comparisons

Overall the exterior wall enclosure accounts for less than 1% of the space load. 90% of the space loads are contributed by the Occupants , Lighting and Power (computers). However comparisons of the exterior walls are still advantageous . Table 18 shows the Zone Summary for Space 1, a third floor classroom with exterior wall exposure to the South. The total cooling load (BTU/hour) is 19 or 0.14% and heating load (BTU/hour) is 36.6, 0.26%. This report is for the CMU Back Up walls or the basis on which the alternate system would need to improve upon. The other space summaries can be found in Appendix D.

Original CMU Assembly- Space 1				
Components	Cooling		Heating	
	Loads (Btu/h)	Percentage of Total	Loads (Btu/h)	Percentage of Total
Wall	19	0.14%	36.6	0.26%
Window	1,075.50	7.92%	1,261.10	8.92%
Door	0	0.00%	0	0.00%
Roof	208.7	1.54%	560.2	3.96%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	2,504.10	18.43%	-2,504.10	-17.71%
Power	3,130.10	23.04%	-3,130.10	-22.14%
People	6,646.10	48.93%	-6,646.10	-47.01%
Plenum	0	0.00%		
Total	**13,583.50**	**100%**	**-10,422.30**	**100%**

Table 18: Typical Heating and Cooling Load Summary by Zone

CMU vs. Metal Stud Electrical Rough In

An important aspect of changing wall types to consider is the electrical in-wall rough-in. There are many differences in the rough-in process to analyze. The CMU rough-in process is more time consuming and more expensive for both material and labor. In order to rough-in CMU walls EMT conduit must be used. Typical when EMT is used 10' sections are able to be installed, however; when used in CMU walls 3' sections are installed, in the vertical direction, as an assembly working in conjunction with the masons. Wires would then also have to be pulled through the conduits as well. When discussing this topic with the electrical sub-contractor labor and costs were discussed, based on a 10' section with a single device. The cost of devices will not vary but the CMU assembly is significantly longer time and at a higher cost. The labor rate for rough in is very contingent on the Masons as well. The comparison below shows best case scenario for rough-in.

Metal Stud walls and the specifications for the Project MOM implemented Orpe Charity allow for the use of MC Cable. MC Cable is a flexible metal conduit with wire already in it. The process is much simpler and allows for a faster rough-in. The cable can be pulled in many directions and snake through much easier, with supports every 4'. Both assembly comparisons include the boxes and box supports. The possibility to save $ 8.50 per 10' device and rough-in assembly and a labor saving of half an hour exists.

Electrical Rough-in CMU vs. Metal Studs		
	CMU Walls (EMT + Wire)	Metal Studs (MC Cable)
Material Assembly (10' section)	$ 16.50	$ 8.00
Labor	1.5 hours (best case)	1 hour

Table 19: Electrical Rough-in Comparison

Alternative Exterior Wall Assemblies Conclusion

By establishing the baseline characteristics and properties of the originally design CMU Back Up exterior wall assemblies and developing two alternatives to eliminate risks and improve the over quality of the project a viable solution was found. The Metal Stud Crete is recommended to replace the CMU Back Up assembly.

The Metal Stud Crete, while being the most expensive of the three options discussed it also provides the best solutions to eliminate schedule risk and site congestion. The improvement in the thermal envelope are also notable, though the existing design was very good system to compare to. The ability to have all on site construction completed for the exterior walls in less than 20 days, with the exception of caulk joints, saves on general conditions and reduced safety risk. The added benefit of rough in of MEP systems through metal stud walls is also a huge benefit.

Using BIM assisted in developing these alternatives, by providing valuable data and calculations in a very short period of time. The ability to do quantity takeoffs and mechanical system load analysis allowed for better and faster decision making on alternative designs that add value to projects.

Cost of Creating a Building Foundation that Correspond to the Project MOM Infrastructure

We elected for Slab-on-Grade foundations because these types of foundations are energy cost efficient as opposed to Crawl Space Foundation. This is a single foundation, several inches thick, with the edges thicker than the center . Result from the previous engineering soil testing confirmed that the 2017,800 sf of land to be purchased indicated a perfect ground which does not freeze . Slab -on-Grade foundation is sometimes called a monolithic foundation because it is poured at one time. These are the simplest and fastest foundations to pour . The cost of Slab -on-Grade Foundation is $ 10 per square foot that bring the total cost of creating foundations on 14950 sf is $ 149,500.

Cost of Soil Boring associated with the Land where the Project MOM will be Carry Out

One of the most fundamental aspects of any land development project is the need to determine a site's characteristics to ensure the interaction between the structure and subsurface materials , soil and rock. Although the soil associated with the land of the project MOM was previously tested , it is our belief that still exist need for this to retested . Based on this assumption , we have contacted with the geotechnical services of the soil boring company Intertek . Interlink has confirmed to us that they perform soil testing and the cost associated the soil boring is around $ 2000 . The Soil Boring company contact is 1 866-741-3637.

Cost of Paving a Parking Lot

Based on the recommendations from the project consultants , the construction Board of the Orpe Human Rights Advocates has been advised that at the first glance , the new parking lot associated with the Project MOM facility to be constructed needs to have a minimum paved space capable of welcoming a minimum of 30 cars . Experts have indicated that a spot of 1 car is the equivalent of 300 sf. 30 cars x 300 sf equal 9000 sf . Research has also shown that the cost of paving a parking lot surround around $4.50 per square foot for both materials and labor . Our team has contacted a local company specialized in commercial and residential paving known under the name of "All County Paving " and have discussed cost . All Count Paving has suggested the cost of $ 3.50 for asphalt and $5.50 for concrete . Our board has resolved to choose asphalt option that brink the cost of 30 cars parking lot at **$31,500**.

Design and Construction of Slab-On-Grade Construction

Under the Recommendations and advice from Engineers , Architects and Consultants , the ORPE Charity's Construction Management Board has decided that the Design and promote the construction of the Residential Treatment Facility associated with the Project MOM with **Slab-on-Grade Foundation Design.** This chapter summarizes the major recommendations and practices related to slab-on-grade foundation design.

Section 1 summarizes design and construction practices covering the following areas : structural aspects, location of insulation, drainage, termite and wood decay control, and radon control. Section 2 includes a series of alternative construction details . Section 3 provides animations for selected configurations . Section 4 is a checklist to be used during the design and construction of a slab-on-grade foundation.

Recommendations on Slab-On-Grade Construction

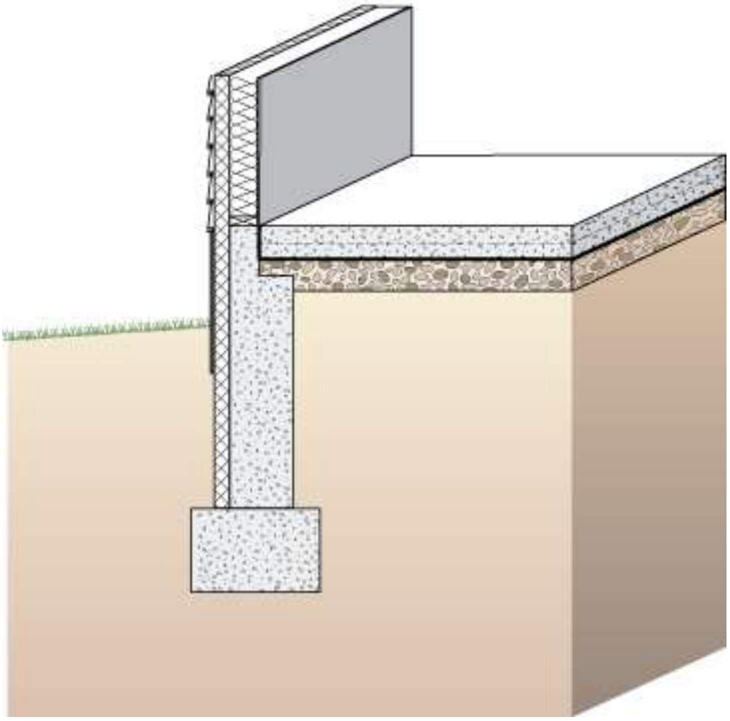


Figure 1. Slab-on-Grade Foundation with Exterior Insulation

1 Recommended Design and Construction Details

STRUCTURAL DESIGN

The major structural components of a slab-on-grade foundation are the floor slab itself and either grade beams or foundation walls with footings at the perimeter of the slab (see Figures 4-2 and 4-3). In some cases additional footings (often a thickened slab) are necessary under bearing walls or columns in the center of the slab. Concrete slab-on-grade floors are generally designed to have sufficient strength to support floor loads without reinforcing when poured on undisturbed or compacted soil. The proper use of welded wire fabric and concrete with a low water/cement ratio can reduce shrinkage cracking, which is an important concern for appearance and can also aid radon infiltration control strategies.

Foundation walls are typically constructed of cast-in-place concrete or concrete masonry units. Foundation walls must be designed to resist vertical loads from the structure above and transfer these loads to the footing. Concrete spread footings must provide support beneath foundation walls and columns. Similarly, grade beams at the edge of the foundation support the superstructure above. Footings must be designed with adequate size to distribute the load to the soil. Freezing water beneath footings can heave, causing cracking and other structural problems. For this reason, footings must be placed beneath the maximum frost penetration depth unless founded on bedrock or proven non-frost susceptible soil or insulated to prevent frost penetration.

Where expansive soils are present or in areas of high seismic activity, special foundation construction techniques may be necessary. In these cases, consultation with local building officials and a structural engineer is recommended.

WATER / MOISTURE MANAGEMENT

In general, moisture management schemes must control water in two states. First, since the soil in contact with the foundation and floor slab is always at 100% relative humidity, foundations must deal with water vapor that will tend to migrate toward the interior under most conditions. Second, liquid water must be kept from accumulating around and under the foundation. Liquid water comes from sources such as:

- Uncontrolled flows of surface water
- High water table
- Capillary flow through subsurface foundation assemblies

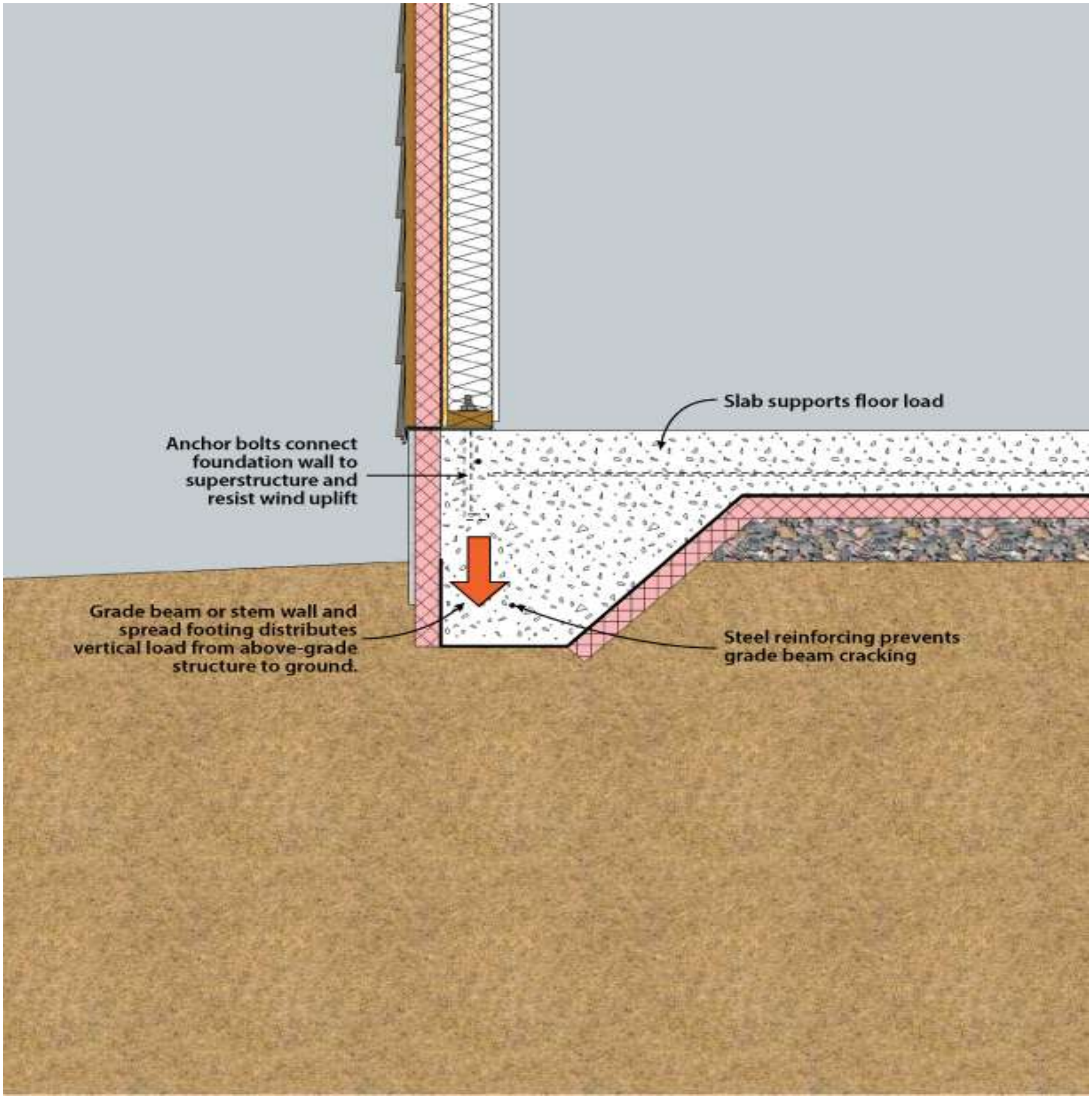


Figure 2. Structural System Components of Slab-on-Grade Foundation with Grade Beam

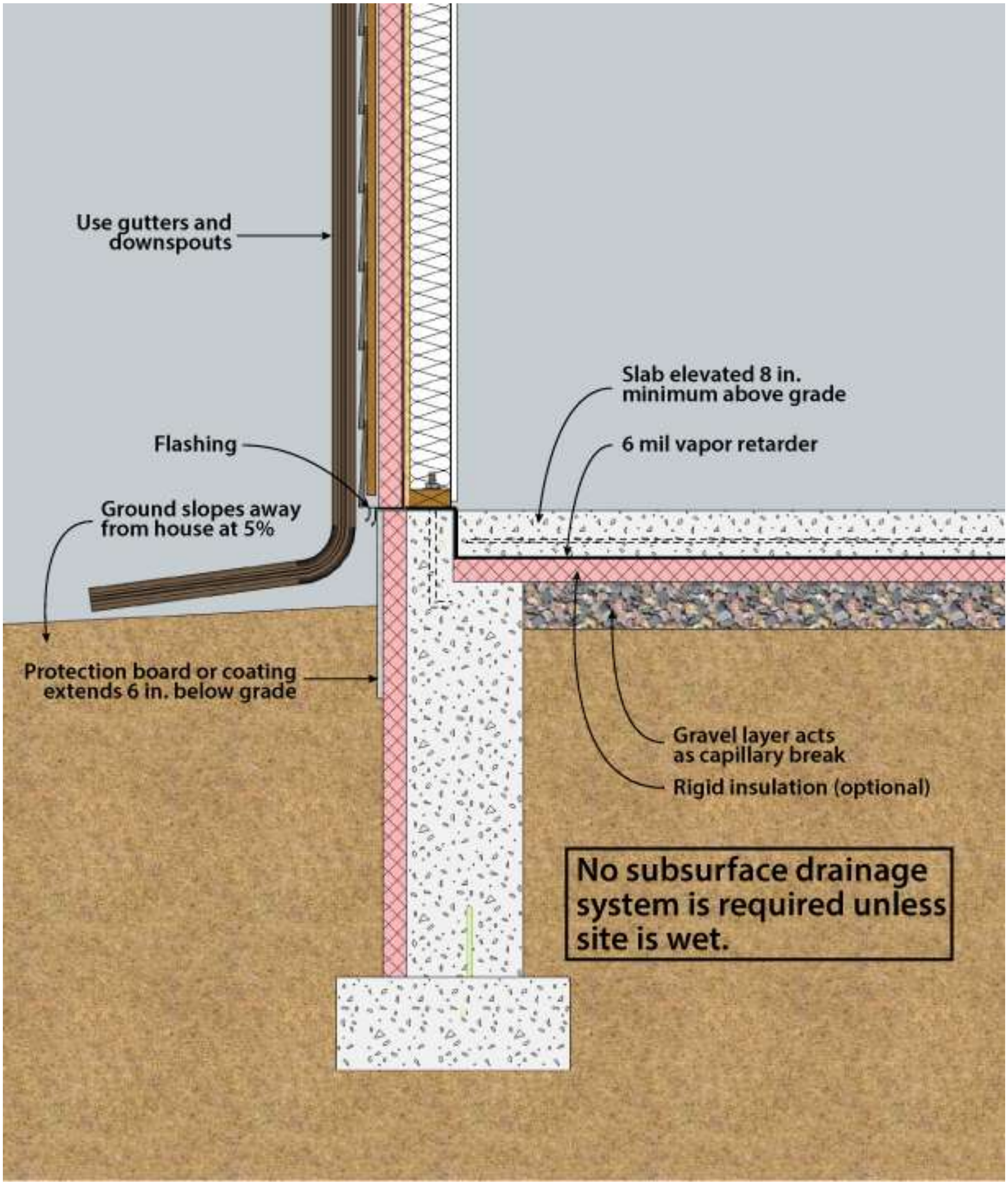


Figure 3. Drainage Techniques for Slab-on-Grade Foundations

Techniques for controlling the build-up and movement of moisture in the foundation are an essential component of the overall construction. Improper moisture management can lead to structural damage, damage to floor finishes, and mold growth, which can be very costly to repair and hazardous to one's health.

The following construction practices will prevent excess water in the form of liquid water and vapor from creating problems. This is done by using adequate drainage and by the use of vapor retarders. These guidelines and recommendations apply to thickened edge/monolithic slabs and stem wall foundations with independent above grade slab configurations (PATH 2006). These two slab-on-grade configurations are illustrated in Figures 4-2 and 4-3.

- Manage exterior ground and rain water by using gutters and downspouts and by grading the ground around the perimeter at least six inches of fall over ten feet of run.
- A vapor retarder such as a 6 mil thick polyethylene sheet should be placed directly below the concrete slab (DOE 2009). The vapor retarder will prevent moisture in the ground from diffusing through the slab and into the building. It is recommended that the vapor retarder be in direct contact with the concrete slab and that no sand or gravel be placed in between (Lstiburek 2008).
- A capillary break layer consisting of three to four inches of clean gravel (no fines) should be installed below the vapor retarder. This layer helps to further prevent bulk soil moisture from wicking up to the slab and allows for that moisture to be drained out if a drainage system is installed (PATH 2006). This layer also serves as a pressure field extender for a soil gas ventilation system, if one is installed.
- Add a capillary break (a closed cell foam sill sealer or gasket) between the top of the concrete and the sill plate to prevent moisture migration between the concrete foundation and the wall structure above. For integral grade beam designs, extend the sub-slab vapor retarder under the footing, bringing it up to grade level.
- There are several different floor finishes that can be employed on a slab-on-grade foundation, however impermeable materials like vinyl flooring should be avoided because they prevent slab moisture from drying to the interior of the home. Moisture resistant finishes such as tile, terrazzo, and concrete stains are recommended specially for humid climates. Moisture sensitive finishes such as carpet and wood flooring may also be used. For these to be used appropriately, however, sub-slab, slab surface, or slab perimeter insulation should be used to moderate the slab temperature. Low temperatures can cause condensation on the slab, leading to damage to the finish as well as mold growth.
- Once the concrete for the slab has been poured, it will still contain large amounts of moisture and has to be allowed to cure. It is recommend that low water content concrete be used to reduce the amount of left over moisture that needs to dry after the slab is set. To prevent cracking and warping during the curing process, damp-curing techniques should be used in conjunction with welded wire fabric reinforcement. Horizontal, continuous, #5 rebar reinforcement at the top and bottom of stem wall or thickened slab edge should also be used to prevent cracking (PATH 2006). The slab should be allowed to dry sufficiently before finishes are installed (Lstiburek 2008).

DRAINAGE AND WATERPROOFING

Since slab foundations do not enclose below-grade space, traditional waterproofing is often not required. However a continuous layer of capillary break / vapor retarder materials is required between the ground and the interior / above grade portions of the building. Depending on foundation design, this can include subslab vapor retarders, sill sealers, gaskets, waterproofing membranes, or other appropriate materials.

Rain water can be properly managed by using a well designed gutter and downspout system and by grading the ground around the foundation (6 inch drop in 10 feet) to channel water away from the foundation (Lstiburek 2006). The slab should also be elevated at least eight inches above grade to prevent water accumulating at the foundation (PATH 2006).

Since slab foundations place all the living space above grade, subgrade drainage is not always necessary. In some cases where seasonal surface water pooling may occur, or on sites with impermeable soils, it is recommended that a foundation drain be installed directly beside the bottom of the footing as recommended for basements and crawl spaces. The foundation drain assembly includes a filter fabric, gravel, and a perforated plastic drain pipe typically 4 inches in diameter. The drain runs to daylight or a sealed sump..

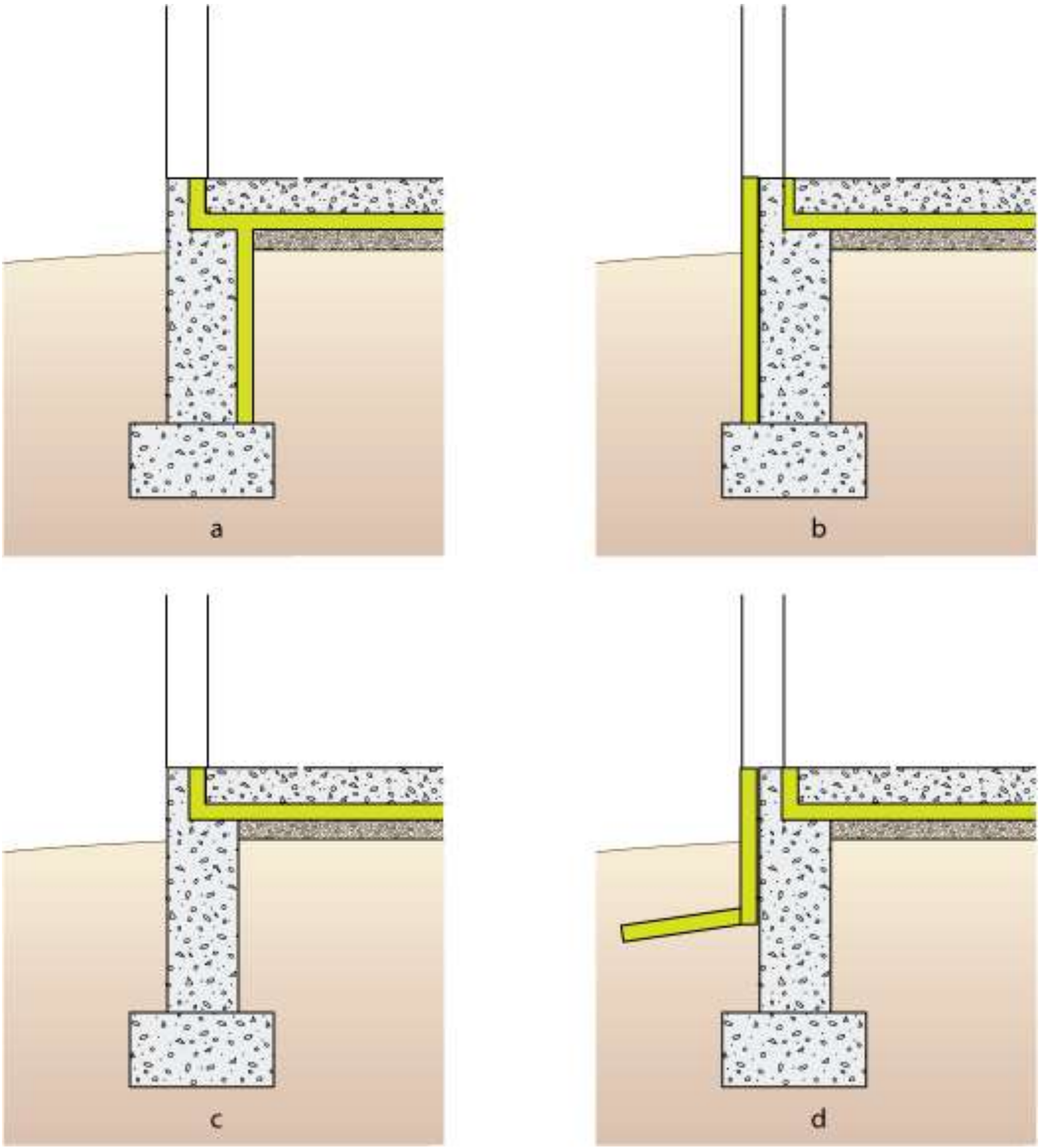


Figure 4. Potential Locations for Slab on Grade Insulation

LOCATION OF INSULATION

Insulation is included in slab-on-grade construction for two purposes:

1. Insulation prevents heat loss in winter, and heat gain in summer. This effect is most pronounced at the slab perimeter, where the slab edge otherwise comes in direct contact with outdoor air.
2. Even in climates and locations on the slab (perimeter vs. middle) where slab insulation may not confer large energy benefits, thermal isolation of the slab can prevent cool slab temperatures that can otherwise cause condensation inside the house. This can lead to mold and other moisture-related problems, especially if the slab is carpeted.

A wide variety of techniques can be employed to insulate slab-on-grade foundations (Figures 4-4 and 4-5). Good construction practice demands elevating the slab above grade by no less than 8 inches to isolate the wood framing from rain splash, soil dampness, and termites, and to keep the subslab drainage layer above the surrounding ground. The most intense heat transfer is through this small area of foundation wall above grade, so it requires special care in detailing and installation. Heat is also transferred between the slab and the soil, through which it migrates to the exterior ground surface and the air. Heat transfer with the soil is greatest at the edge, and diminishes rapidly with distance from it. In hot climates, direct coupling of the soil to the slab may moderate cooling loads, though at the risk of condensing moisture from the indoor air.

Both components of the slab heat transfer — at the edge and through the soil — must be considered in designing the insulation system. Insulation can be placed vertically outside the foundation wall or grade beam. This approach effectively insulates the exposed slab edge above grade and extends down to reduce heat flow from the floor slab to the ground surface outside the building. Vertical exterior insulation (Figure 4-5a) is the only method of reducing heat loss at the edge of an integral grade beam and slab foundation. For stemwall foundations, the major advantage of exterior insulation is that the interior joint between the slab and foundation may not need to be insulated, which simplifies construction. One drawback is that rigid insulation must be covered above grade with a protective board, coating, or flashing material. Another limitation is that the depth of the exterior insulation is controlled by the footing depth. However additional exterior insulation can be provided by extending insulation horizontally from the foundation wall. Since this approach can control frost penetration near the footing, it can be used to reduce footing depth requirements under certain circumstances (Figure 4-5a). This method is known as a "frost protected shallow foundation" (FPSF). A variation for unheated buildings is shown in Figure 4-5b. See NAHB (2004) for more information on this technique, which can substantially reduce the initial foundation construction cost.

Exterior insulation must be approved for below-grade use. Typically, three products are used below grade: extruded polystyrene, expanded polystyrene, and rigid mineral fiber panels. (Baechler et al. 2005). Extruded polystyrene (nominal R-5 per inch) is a common choice. Expanded polystyrene (nominal R-4 per inch) is less expensive, but it has a lower insulating value. Below-grade foams can be at risk for moisture accumulation under certain conditions. Experimental data indicate that this moisture accumulation may reduce the effective R-value as much as 35%-44%. Research conducted at Oak Ridge National Laboratories studied the moisture content and thermal resistance of foam insulation exposed below grade for fifteen years; moisture may continue to accumulate and degrade thermal performance beyond the fifteen-year timeframe of the study. This potential reduction should be accounted for when selecting the amount and type of insulation to be used (Kehrer, et al., 2012, Crandell 2010).

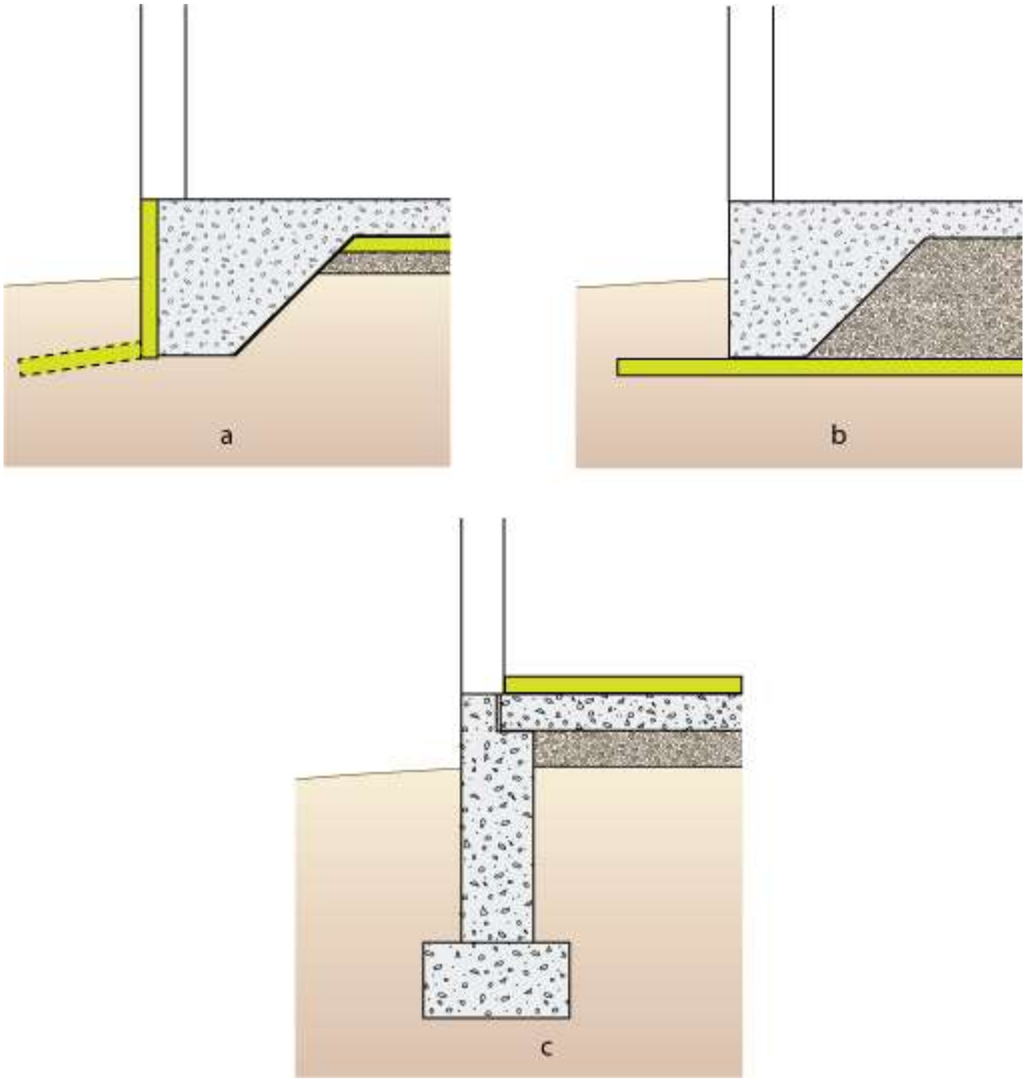


Figure 5. Potential Locations for Slab on Grade Insulation

Insulation also can be placed vertically on the interior of a stemwall or horizontally under the slab. In both cases, heat loss from the floor is reduced and the difficulty of placing and protecting exterior insulation is avoided. Interior vertical insulation is limited to the depth of the footing but underslab insulation is not limited in this respect. Usually the outer 2 to 4 feet of the slab perimeter is insulated but the entire floor may be insulated if desired. Remember that condensation control is an important consideration, along with heating energy use. It is essential to insulate the joint between the slab and the foundation wall whenever insulation is placed inside the foundation wall or under the slab. Otherwise, a significant amount of heat transfer occurs through the thermal bridge at the slab edge. The insulation is generally limited to no more than 1 inch in thickness at this point. Figure 4-4d shows insulation under the slab and at the slab edge to control the temperature of the slab, with exterior insulation placed vertically and horizontally to prevent frost penetration to the footing.

Another option for insulating a slab-on-grade foundation is to place insulation above the floor slab (Figure 4-5c). This may be the only option for retrofit applications. It can be appropriate for new construction as well, especially when wood is the desired floor finish. These techniques have critical details that must be followed to avoid moisture problems; full descriptions can be found in Lstiburek (2006).

Other specialty systems can be used for slab-on-grade stemwalls. These include insulated concrete forms (ICFs), post-tensioned slabs, and systems that place foam insulation between two layers of cast in place concrete.

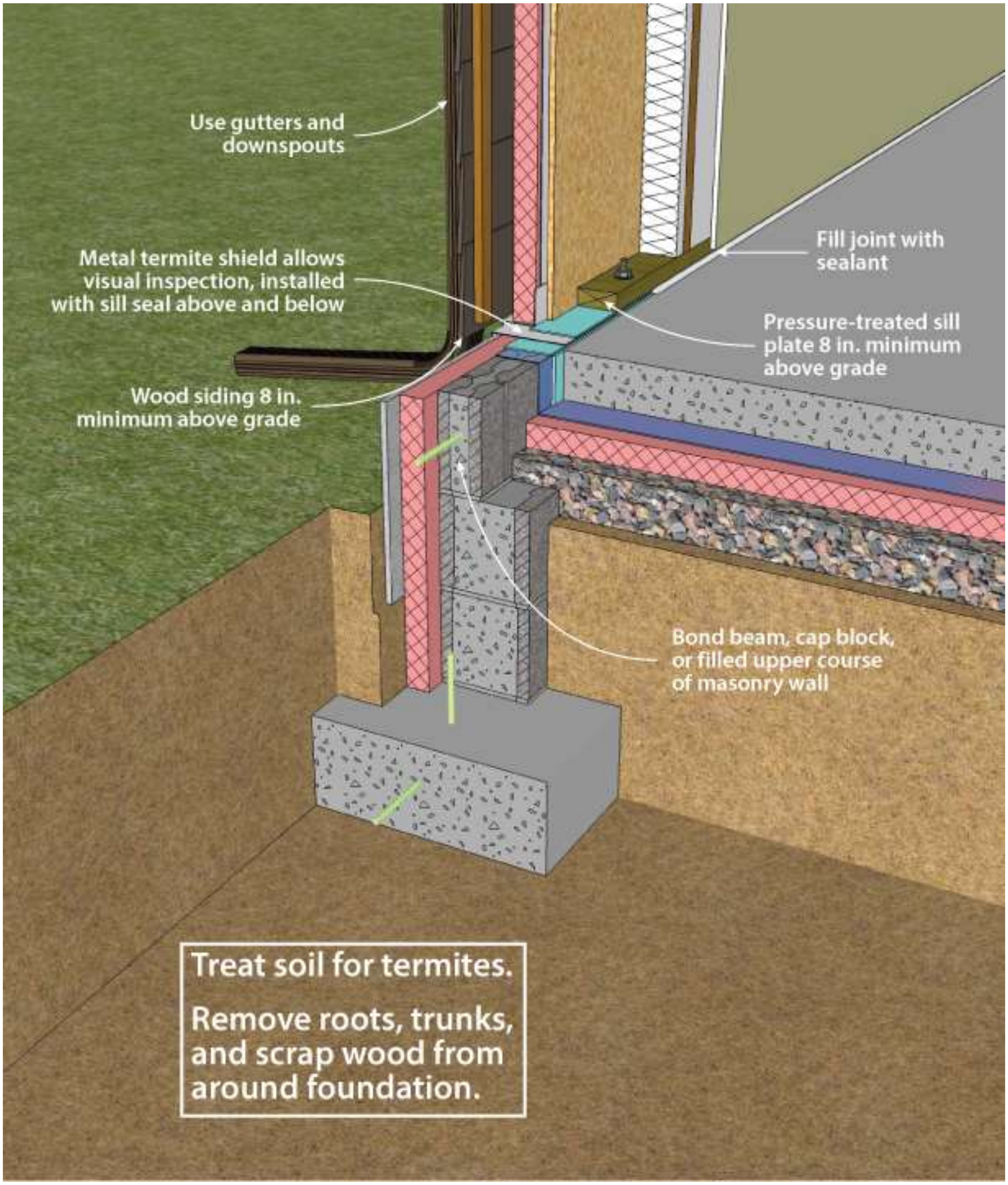


Figure 6. Slab-on-Grade Termite Control Techniques

TERMITE AND WOOD DECAY CONTROL TECHNIQUES

Techniques for controlling the entry of termites through residential foundations are necessary in much of the United States (see Figure 4-6). Consult with local building officials and codes for further details.

1. Minimize soil moisture around the foundation by surface drainage and by using gutters, downspouts, and runouts to remove roof water.
2. Remove all roots, stumps, and wood from the site. Wood stakes and form work should also be removed from the foundation area.
3. Treat soil with termiticide on all sites vulnerable to termites (Labs et al. 1988).

4. Place a bond beam or course of solid cap blocks on top of all concrete masonry foundation walls to ensure that no open cores are left exposed. Alternatively, fill all cores on the top course with mortar. The mortar joint beneath the top course or bond beam should be reinforced for additional insurance.
5. Place the sill plate at least 8 inches above grade; it should be pressure-preservative treated to resist decay. Since termite shields are often damaged or not installed carefully enough, they are considered optional and should not be regarded as sufficient defense by themselves.
6. Be sure that exterior wood siding and trim are at least 6 inches above grade.
7. Construct porches and exterior slabs so that they slope away from the foundation wall, are reinforced with steel or wire mesh, usually are at least 2 inches below exterior siding, and are separated from all wood members by a 2-inch gap visible for inspection or a continuous metal flashing soldered at all seams.
8. Fill the joint between a slab-on-grade floor and foundation wall with liquid-poured urethane caulk or coal tar pitch to form a termite and radon barrier.

Plastic foam and mineral wool insulation materials have no food value to termites, but they can provide protective cover and easy tunneling. Insulation installations can be detailed for ease of inspection, although often by sacrificing thermal efficiency.

In principle, termite shields offer protection, but should not be relied upon as a barrier. Termite shields are shown in this document as a component of all slab-on-grade designs. Their purpose is to force any insects ascending through the wall out to the exterior, where they can be seen. For this reason, termite shields must be continuous, and all seams must be sealed to prevent bypass by the insects.

These concerns over insulation and the unreliability of termite shields have led to the conclusion that soil treatment is the most effective technique to control termites with an insulated foundation. However, the restrictions on widely used termiticides may make this option either unavailable or cause the substitution of products that are more expensive and possibly less effective. This situation should encourage insulation techniques that enhance visual inspection and provide effective barriers to termites. For more information on termite mitigation techniques, see NAHB (2006).

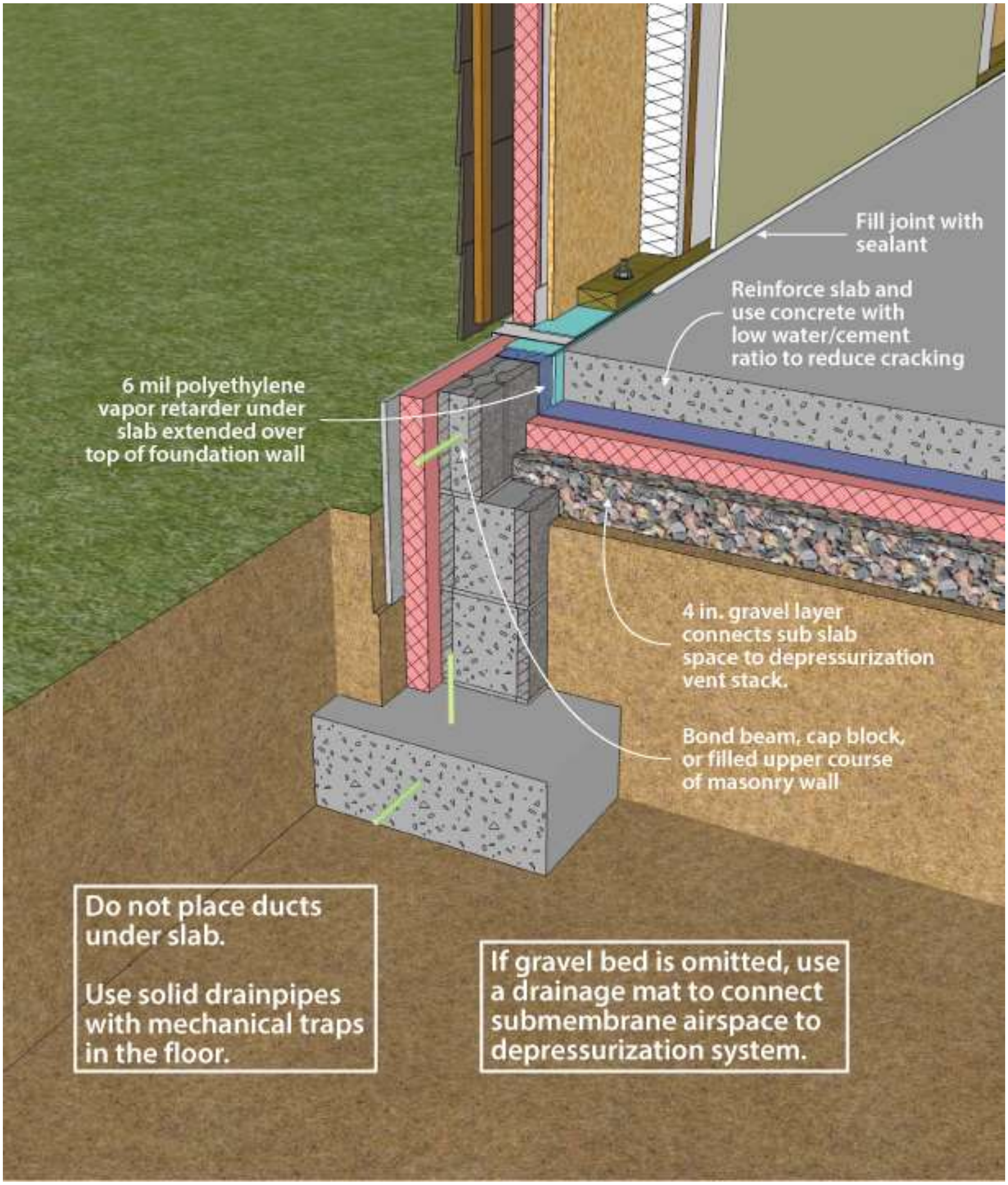


Figure 7. Slab-on-Grade Radon Control Techniques

RADON CONTROL TECHNIQUES

Sealing the Slab

The following techniques for minimizing radon infiltration through a slab-on-grade foundation are appropriate, especially in moderate or high potential radon areas (zones 1 and 2) as designated by EPA (see Figures 4-7 and 4-8). To determine this, contact the state radon staff.

1. Use solid pipes for floor discharge drains to daylight or provide mechanical traps if they discharge to subsurface drains.

2. Lay a 6-mil polyethylene film on top of the gravel drainage layer beneath the slab. This film serves both as a radon and moisture retarder. Slit an “x” in the polyethylene membrane at penetrations. Turn up the tabs and seal them to the penetration using caulk or tape. Care should be taken to avoid unintentionally puncturing the barrier; consider using riverbed gravel if available at a reasonable price. The round riverbed gravel allows for freer movement of the soil gas and has no sharp edges to penetrate the polyethylene. The edges should be lapped at least 12 inches. The polyethylene should extend over the top of the foundation wall, or extend under a monolithic slab-grade beam or patio, terminating no lower than finished grade. Use concrete with a low water/cement ratio to minimize cracking.
3. Provide an isolation joint between the foundation wall and slab floor where vertical movement is expected. After the slab has cured for several days, seal the joint by pouring polyurethane or similar caulk into the 1/2-inch channel formed with a removable strip. Polyurethane caulks adhere well to masonry and are long-lived. They do not stick to polyethylene. Do not use latex caulk.
4. Install welded wire in the slab to reduce the impact of shrinkage cracking. Consider control joints or additional reinforcing near the inside corner of “L” shaped slabs. Two pieces of No. 4 reinforcing bar, 3 feet long and on 12-inch centers, across areas where additional stress is anticipated, should reduce cracking. Use of fibers within concrete will also reduce the amount of plastic shrinkage cracking.
5. Control joints should be finished with a 1/2-inch depression. Fill this recess fully with polyurethane or similar caulk.
6. Minimize the number of pours to avoid cold joints. Begin curing the concrete immediately after the pour, according to recommendations of the American Concrete Institute (1980; 1983). At least three days are required at 70F, and longer at lower temperatures. Use an impervious cover sheet or wetted burlap.
7. Form a gap of at least 1/2-inch width around all plumbing and utility lead-ins through the slab to a depth of at least 1/2 inch. Fill with polyurethane or similar caulking.
8. Place HVAC condensate drains so that they run to daylight outside the building envelope, or to a floor drain suitably sealed against radon penetration. Condensate drains that connect to dry wells or other soil may become direct conduits for soil gas, and can be a major entry point for radon.
9. Place a solid block course, bond beam, or cap block on top of all masonry foundation walls to seal cores, or fill open block cores in the top course with concrete. An alternative approach is to leave the masonry cores open and fill solid at the time the floor slab is cast by flowing concrete into the top course of block.
10. Do not place HVAC ducts under the slab.

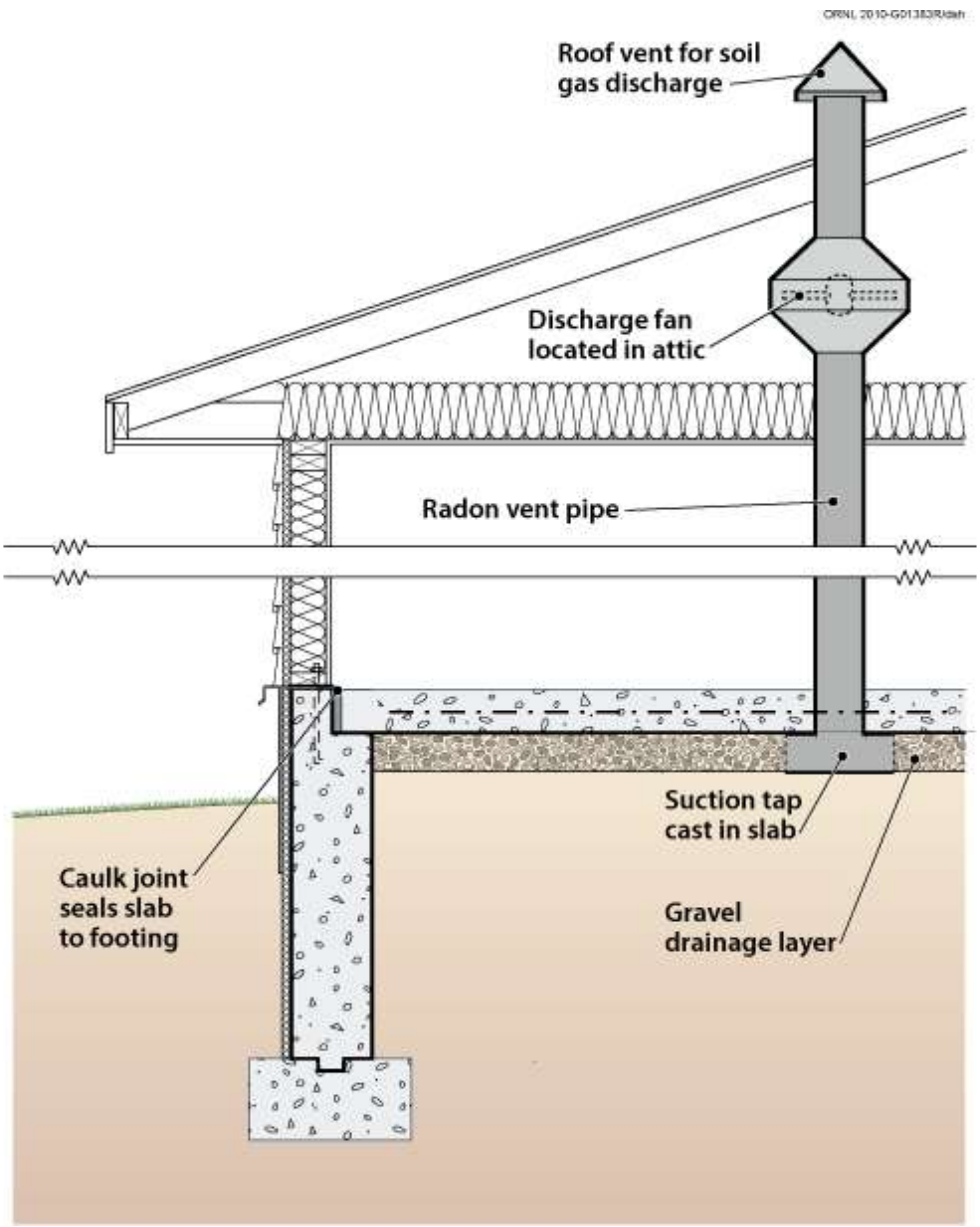


Figure 8. Soil Gas Collection and Discharge Techniques

Intercepting Soil Gas

The most effective way to limit radon and other soil gas entry is through the use of active soil depressurization (ASD). ASD works by lowering the air pressure in the soil relative to the indoors. Avoiding foundation openings to the soil, or sealing those openings, as well as limiting sources of indoor depressurization aid ASD systems. Sometimes a passive soil depressurization (PSD, with no fan) system is used. If post-occupancy radon testing indicates further radon reduction is desirable, a fan can be installed in the vent pipe (see Figure 4-8).

Subslab depressurization has proven to be an effective technique for reducing radon concentrations to acceptable levels, even in homes with extremely high concentrations (Dudney 1988). This technique lowers the pressure around the foundation envelope, causing the soil gas to be routed into a collection system, avoiding the inside spaces and discharging to the outdoors.

A foundation with good subsurface drainage already has a collection system. The underslab gravel drainage layer can be used to collect soil gas. It should be at least 4 inches thick, and of clean aggregate no less than 1/2 inch in diameter. The gravel should be covered with a 6-mil polyethylene radon and vapor retarder.

A 3- or 4-inch diameter PVC vent pipe should be routed from the subslab gravel layer through the conditioned portion of the building and through the highest roof plane. The pipe should terminate below the slab with a “tee” fitting. To prevent clogging the pipe with gravel, ten-foot lengths of perforated draintile can be attached to the legs of the tee, and sealed at the ends. Alternately, the vent pipe can be connected to a perimeter drain system, as long as that system does not connect to the outdoor environment. Horizontal vent pipes could connect the vent stack through below grade walls to permeable areas beneath adjoining slabs. A single vent pipe is adequate for most houses with less than 2,500 square feet of slab area that also include a permeable subslab layer. The vent pipe is routed to the roof through plumbing chases, interior walls, or closets.

A PSD system requires the floor slab to be nearly airtight so that collection efforts are not short-circuited by drawing excessive room air down through the slab and into the system. Cracks, slab penetrations, and control joints must be sealed. Floor drains that discharge to the gravel beneath the slab should be avoided, but when used, should be fitted with a mechanical trap capable of providing an airtight seal.

While a properly installed passive soil depressurization (PSD) system may reduce indoor radon concentrations by about 50%, active soil depressurization (ASD) systems can reduce indoor radon concentrations by up to 99%. A PSD system is more limited in terms of vent pipe routing options, and is less forgiving of construction defects than ASD systems. Furthermore, in new construction, small ASD fans (25-40 watt) may be used with minimal energy impact. Active systems use quiet, in-line duct fans to draw gas from the soil. The fan should be located outside, and ideally above, the conditioned space so that any air leaks from the positive pressure side of the fan or vent stack are not in the living space. The fan should be oriented to prevent accumulation of condensed water in the fan housing. The ASD stack should be routed up through the building or an attached garage or carport, and extend twelve inches above the roof. It can also be carried out through the band joist and up along the outside of wall, to a point high enough so that there is no danger of the exhaust being redirected into the building through attic vents or other pathways. Because PSD systems rely on natural buoyancy to operate, a PSD stack must be routed through the conditioned portion of the home.

A fan capable of maintaining 0.2 inch of water suction under installation conditions is adequate for serving subslab collection systems for most houses (Labs 1988). This is often achieved with a 0.03 hp (25W), 160 cfm centrifugal fan (maximum capacity) capable of drawing up to 1 inch of water before stalling. Under field conditions of 0.2 inch of water, such a fan operates at about 80 cfm.

It is possible to test the suction of the subslab system by drilling a small (1/4-inch) hole in areas of the slab remote from the suction point, and measuring the suction through the hole using a micromanometer or inclined manometer. The goal of a subslab depressurization system is to create negative air pressure below the slab, relative to the air pressure in the adjacent interior space. A suction of 5 Pascals is considered satisfactory when the house is placed in a worst-case depressurization condition (i.e., house closed, all exhaust fans and devices operating, and with the HVAC system operating with interior doors shut). The hole must be sealed after the test.

PSD systems require near perfection in sealing of openings to the soil, since the system relies on a 3- or 4-inch pipe to vent more effectively than the entire house. Sealing openings to the soil is less critical for radon control with ASD systems, although it is highly desirable in order to limit the energy penalty associated with conditioned indoor air leaking into a depressurized subslab, and from there to the outdoors. ASD fans have service lives averaging about ten years, with a higher life expectancy if the fan is protected from the elements. Since an ASD system may be turned off by occupants, service switches are usually located in areas with limited access.

Checklist for Design & Construction of Slab-on-Grade Foundations

This checklist serves as a chapter summary, helps review the completeness of construction drawings and specifications, and provides general guidance on project management. The checklist could be used many ways. For example, use one set of blanks during design and the second set during construction inspection. Note that not all measures are necessary under all conditions. Use different symbols to distinguish items that have been satisfied (+) from those that have been checked but do not apply (x). Leave unfinished items unchecked.

OVERALL SLAB CONSTRUCTION

General considerations. Slab floors require advance planning for plumbing and electrical service. They generally minimize moisture and radon hazard but make detection of termite intrusions especially difficult. Expansive soils require special measures.

—— —— Elevate slab above existing grade

—— —— Provide minimum 4-inch-thick aggregate drainage layer under slab

—— —— Locate plumbing to be cast in slab

—— —— Locate electrical service to be cast in slab

—— —— Locate gas service to be cast in slab

SITEWORK

—— —— Locate building at the highest point if the site is wet

—— —— Define "finish subgrade" (grading contractor), "base grade" (construction contractor), "rough grade" level before to is respread, "finish grade" (landscape contractor)

—— —— Establish elevations of finish grades, drainage swales, catch basins, foundation drain outfalls, bulkheads, c driveways, property corners, changes in boundaries

—— —— Establish grading tolerances

—— —— Provide intercepting drains upgrade of foundation if needed

—— —— Locate dry wells and recharge pits below foundation level

____ Establish precautions for stabilizing excavation

____ Establish limits of excavation and determine trees, roots, buried cables, pipes, sewers, etc., to be protected from da

____ Confirm elevation of water table

____ Determine type and dimensions of drainage systems

____ Discharge roof drainage away from foundation

____ Remove stumps and grubbing debris from site

____ Provide frost heave protection for winter construction

____ Call for test hole (full depth hole in proposed foundation location)

____ Locate stakes and benchmarks

____ Strip and stock pile topsoil

____ Define spoil site

FOOTINGS

____ Unless using a frost protected shallow foundation (FPSF) design, position bottom of footing at least 6 inches below depth around perimeter (frost wall at garage, slabs supporting roofs, other elements attached to structure).

____ Confirm adequacy of footing sizes

____ Do not fill the overexcavated footing trench

____ Install longitudinal reinforcing

____ Reinforce footing at spans over utility trenches

____ Do not bear footings partially on rock (sand fill)

____ Do not pour footings on frozen ground

____ Indicate minimum concrete compressive strength after 28 days

____ Call out elevations of top of footings and dimension elevation changes in plan

____ Use keyway or steel dowels to anchor foundation walls

____ Dimension stepped footings according to local codes and good practice (conform to masonry dimensions if applica

____ Provide a capillary break between footing and stemwall

STRUCTURAL

____ Avoid ledge-supported slabs unless structurally reinforced

____ Place isolation joints at frost wall, columns, footings, fireplace foundations, mechanical equipment pads, s sidewalks, garage and carport slabs, drains

____ Check that partition load does not exceed 500 pounds per linear foot on unreinforced slab

____ Call out depressed bottom of slab where top is depressed

____ Reinforce slab at depressions greater than 1-1/2 inch

____ Use wire chairs or precast pedestals to support welded wire mesh reinforcing

____ Compact fill under slab

Determine general concrete specifications:

____ ____Minimum compressive strength after 28 days

____ ____Maximum water/cement ratio. Note: add no water at site

——— ———Allowable slump

——— ———Acceptable and unacceptable admixtures

——— ———Dampening of subgrade prior to pour

——— ———Determine form-release agents acceptable to WPM (waterproof membrane) manufacturer if used

——— ———Establish curing requirements (special hot, cold, dry conditions)

——— ———Establish surface finish requirements and preparation for WPM (plug all form tie holes)

——— ———For shrinkage control: use horizontal reinforcing at top of wall and/or control joints

——— ———Design width of wall to resist height of fill, seismic loads, and loads transmitted through soil from adjacent founda

——— ———Use two-way reinforcing (horizontal and vertical) for strength, watertightness, termite and radon resistance

——— ———Establish anchor bolt depth and spacing requirements, and install accordingly

——— ———Determine brick shelf widths and elevations

FLOOR SLAB

——— ——— Determine minimum compressive strength after 28 days

——— ——— Determine maximum water/cement ratio. (Note: add no water at site)

——— ——— Determine allowable slump

——— ——— Determine acceptable and unacceptable admixtures

——— ——— Establish curing requirements (special hot, cold, dry conditions)

——— ——— Determine surface finish

—— —— Provide shrinkage control: WWF (welded wire fabric) reinforcement or control joints

—— —— Provide isolation joints at wall perimeter and column pads

—— —— Provide vapor retarder under slab

—— —— Compact fill under slab

BACKFILLING AND COMPACTION

—— —— Establish condition of fill material (if site material stays in clump after soaking and squeezing in hand, do not u backfill)

—— —— Determine proper compaction

—— —— Cap backfill with an impermeable cover

MOISTUREPROOFING

General considerations. Since slab on grade foundations do not contain below-grade living space, the key consideration is isolating the interior of the building from ground moisture. This can be accommodated with a variety of membranes, liquid applied materials, and gaskets. In all cases, provide a continuous vapor retarder directly under the slab.

—— —— Isolate the slab from the ground with appropriate waterproofing membranes or other materials

—— —— Place a polyethylene vapor retarder under floor slabs

For more information visit Water Managed Foundations within the Building America Solution Center.

THERMAL AND MOISTURE CONTROLS

General considerations. Heat loss rate is greatest at the exposed slab edge or frost wall above grade, and at the floor perimeter. Continuity of insulation is difficult except for exterior placement. Horizontal exterior insulation reduces frost penetration depth.

—— —— Verify that wall insulation R-value and depth meet local codes at a minimum

—— —— If used, specify exterior insulation product suitable for in-ground use

____ ____ Install protective coating for exterior insulation

____ ____ Install infiltration sealing gasket and through-wall termite shield under sill plate

For more information visit [Minimum Thermal Bridging](#) within the [Building America Solution Center](#).

DECAY AND TERMITE CONTROL MEASURES

General considerations. Strategy: (1) Isolate wood members from soil by an air space or impermeable retarder; (2) expose critical areas for inspection. Pressure-treated lumber is less susceptible to attack, but is no substitute for proper detailing. Termite shields are not reliable retarders unless installed correctly.

____ ____ Reinforce slab

____ ____ Remove all grade stakes, spreader sticks, wood embedded in concrete during pour

____ ____ Do not disturb treated soil prior to concreting

____ ____ Avoid ducts beneath floor slab top surface

____ ____ Specify pressure-treated wall sole plates and sleepers

____ ____ Pressure-treat sill plates, rim joists, wood members in contact with foundation walls and floors

____ ____ Pressure-treat all outdoor weather-exposed wood members

____ ____ Install dampproof membrane and through-wall termite shield under sill plate (flashing or sill seal gasket)

____ ____ Elevate sill plate minimum 8 inches above exterior grade

____ ____ Elevate wood posts and framing supporting porches, stairs, decks, etc., above grade (6-inch minimum) on concrete

____ ____ Elevate wood siding, door sills, other finish wood members at least 6 inches above grade (rain splash protection)

____ ____ Separate raised porches and decks from the building by 2-inch horizontal clearance or provide proper flashing drainage and termite inspection)

____ Pitch solid surface porches, decks, patios for drainage (minimum 1/4 in/ft)

____ Detail slab porch and patios to prevent termite access to superstructure (structural slab over inspectable crawl spa

____ Treat soil with termiticide, especially with insulated slab

RADON CONTROL MEASURES

General considerations. The potential for radon hazard is present in all buildings. Check state and local health agencies for need of protection. Strategies include: (1) passively or actively depressurizing soil and crawl space air pressure relative to the indoors; (2) soil gas retarding membranes; (3) provisions to activate passive soil depressurization systems. Since radon is a gas, its rate of entry through the foundation depends on suction due to stack effect, HVAC system imbalances, exhaust devices, and air leakage especially at high points in the building envelope

____ ____ Reinforce slab

____ ____ Remove all grade stakes, spreader sticks, wood embedded in concrete during pour

____ ____ Form perimeter wall joint with trough, fill with pour-in sealant

____ ____ Place vapor retarder under slab

____ ____ Caulk joints around pipes and conduits

____ ____ Place minimum 4-inch-thick layer of coarse, clean gravel under the slab

____ ____ Separate outdoor intakes for combustion devices

____ ____ Install air retarder wrap around building envelope

____ ____ Seal around flues, chases, vent stacks, attic stairs

PLANS, CONTRACTS, AND BUILDING PERMITS

____ Plans and specs

____ Bid package

____ Establish contractual arrangements (describe principals, describe the work by referencing the blueprints and specs, the start/completion dates, price, payment schedule, handling of change orders, handling of disputes, excav allowance, and procedure for firing) Use signoff on work statements, work ready, and work finished quality assur procedures.

____ Building permits

SITE INSPECTIONS DURING CONSTRUCTION

____ ____ After excavation and before concrete is poured for the footings

____ ____ After the footings have been poured before foundation wall construction

____ ____ After foundation construction and dampproofing before rough framing

____ ____ After rough framing

____ ____ After rough plumbing

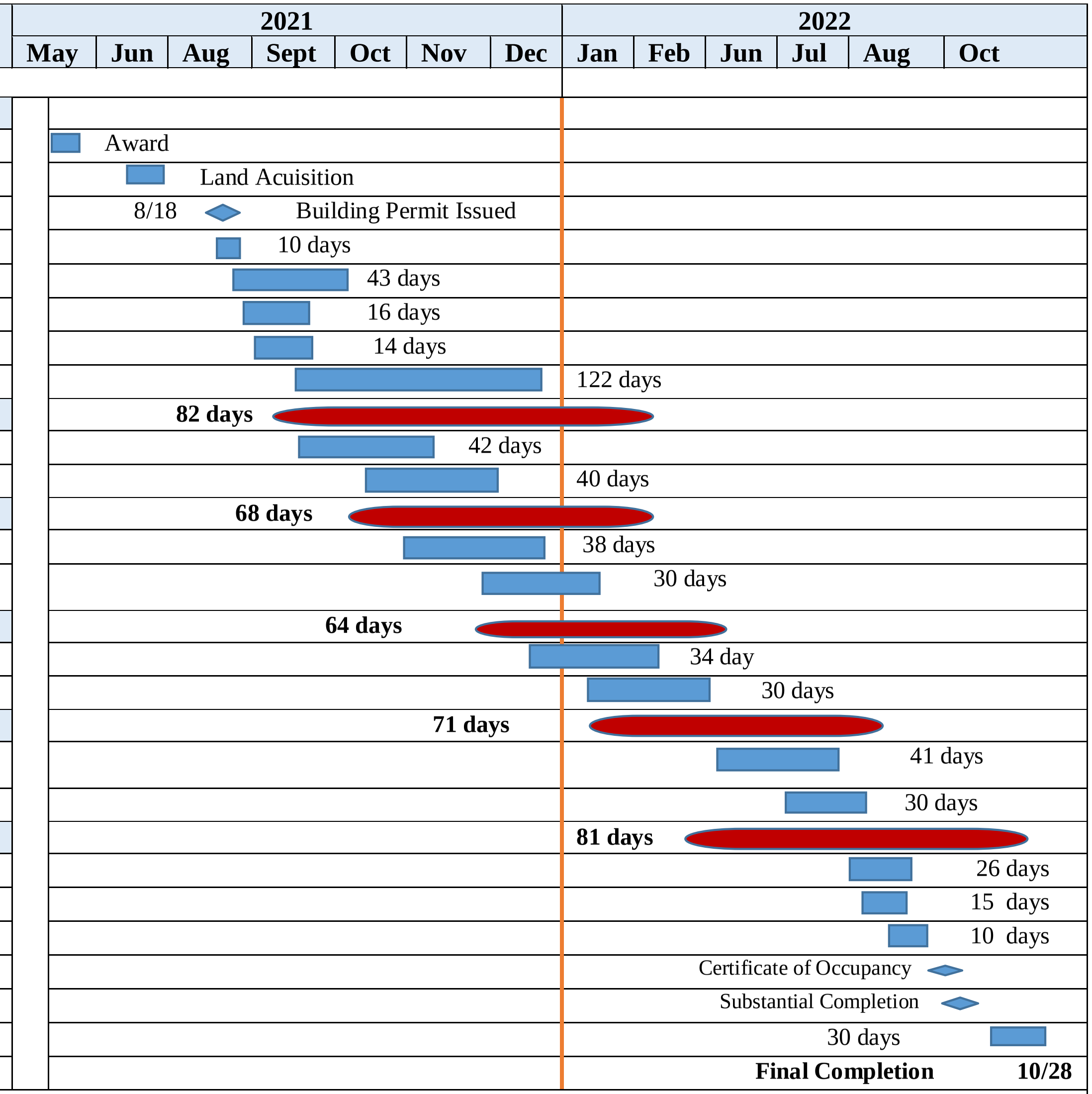
____ ____ After rough electrical

____ ____ After insulation installation before drywall and backfilling in case of exterior insulation

____ ____ Final

SCHEDULE SUMMARY – Total Project Schedule Summary - Gantt Chart

ID	Task Name	Duration	Start
	SCHEDULE SUMMARY	**359 days**	**Fri 5/14/21**
1	• **Design Completion/BID/Award**	0 days	Fri 5/14/21
	• **Land Acquisition (closing)**	0 days	Fri 5/29/21
2	• **Buildings Permit Issued**	0 days	Wed 8/18/21
3	• **Award Contracts**	10 days	Wed 8/18/21
4	• **Offsite Utilities**	43 days	Thu 8/19/21
5	• **Residential Building Pad**	16 days	Thu 8/27/21
6	• **Clinic Building Pad**	14 days	Tue 8/31/21
7	• **Offsite Utilities**	122 Days	Thu 9/16/21
8	**SUBSTRUCTURE**	**82 days**	**Thu 9/16/21**
9	• **Residential Building Substructure**	42 days	Thu 9/16/21
10	• **Clinic Building Substructure**	40 days	Thu 10/9/21
11	**SUPERSTRUCTURE**	**68 days**	**Tue 10/26/21**
12	• **Resid. Building Superstructure**	38 days	Tue 10/26/21
13	• **Clinic Building Superstructure**	30 days	Thu 11/25/21
14	**ENCLOSURE**	**64 days**	**Wed 12/8/21**
15	• **Residential Building Enclosure**	34 days	Wed 12/8/21
16	• **Clinic Building Enclosure**	30 days	Mon 1/10/22
17	**ROUGH – INS AND FINISHES**	71 days	Mon 2/14/22
18	• **Resid Build. Rough-ins and Finishes**	41 days	Mon 2/14/22
19	• **Clinic Build. Rough-in and Finishes**	30 days	Tue 2/15/22
20	**BUILDINGS CLOSEOUT**	**81 days**	**Fri 6/13/22**
21	• **Punchlist for Substantial Completion**	26 days	Fri 6/13/22
22	• **HESS Final Inspections**	15 days	Fri 6/15/22
23	• **O&M Training / Final Cleanings**	10 days	Thu 6/21/22
24	• **Certificate Occupancy Issued**	0	Thu 7/7/22
25	• **Substantial Completion**	0	Thu 7/28/22
26	• **Final Closeout Procedures**	30 days	Fri 8/12/22
27	• **Final Completion**	0	Fri 10/28/22



Project: Schedule Summary
Date: 4/10/21

Summary: **Manual Tasks:**

- Orpe Human Rights Advocates
- Residential Treatment Facility - Pregnant and Postpartum Women with SUD and their Infants

Part II
Construction Budget Narrative

For the Part III of this Report see the Construction Budget Narrative Manual associated with the Construction of the Project MOM Residential Treatment Facility

FINAL CONCLUSIONS

This building Information Modeling can be a very valuable tool and process in the process of starting the construction works of the Residential Treatment and Respite Facility deemed to serve pregnant and postpartum women with substance use disorders and their infants . Through the Building Information Modeling Execution Planning Guide , developed by the Construction Team of Orpe Hunman Rights Advocates , allows the maximum value to be achieved with BIM . The Orpe Project Team used BIM effectively on the project.

Value Engineering is the process that includes developing and evaluating alternative construction methods and techniques to add value to a project . In Analysis two the suggestion of LEED elements being excluded from the value engineering process explores a potential situation if the green roof was used as a viable option in the value engineering process.

Alternative Exterior Wall Assemblies were explored and two options were developed to compare to the original system . The recommendation of the Metal Stud Crete system was made . This system , while initially costing less can provide serious schedule acceleration for the exterior enclosure . It will also provide a reduction of loading on the mechanical system from the exterior walls.

These analyzes and breadth topics have allowed a study into how building system assemblies and construction techniques can affect other systems of a building . Through Building information modeling alternative designs and options can be explored quickly and efficiently , allowing more opportunities and options to be explored.

APPENDIX

SCHEDULE SUMMARY – Total Project Schedule Summary Gantt Chart

ID	Task Name	Duration	Start	2021: May, Jun, Aug, Sept, Oct, Nov, Dec — 2022: Jan, Feb, Jun, Jul, Aug, Oct
	SCHEDULE SUMMARY	**359 days**	**Fri 5/14/21**	
1	• **Design Completion/BID/Award**	0 days	Fri 5/14/21	Award
	• **Land Acquisition (closing)**	0 days	Fri 5/29/21	Land Acuisition
2	• **Buildings Permit Issued**	0 days	Wed 8/18/21	8/18/21 Building Permit Issued
3	• **Award Contracts**	10 days	Wed 8/18/21	10 days
4	• **Offsite Utilities**	43 days	Thu 8/19/21	43 days
5	• **Residential Building Pad**	16 days	Thu 8/27/21	16 days
6	• **Clinic Building Pad**	14 days	Tue 8/31/21	14 days
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12	• **Resid. Building Superstructure**	38 days	Tue 10/26/21	38 days
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23	• **O&M Training / Final Cleanings**	10 days	Thu 6/21/22	10 days
24	• **Certificate Occupancy Issued**	0	Thu 7/7/22	Certificate of Occupancy
25	• **Substantial Completion**	0	Thu 7/28/22	Substantial Completion
26	• **Final Closeout Procedures**	30 days	Fri 8/12/22	30 days
27	• **Final Completion**	0	Fri 10/28/22	**Final Completion 10/28/22**
	Project: Schedule Summary **Date:** 4/10/21	**Summary:**		**Manual Tasks:**

- Orpe Human Rights Advocates
- Residential Treatment Facility - Pregnant and Postpartum Women with SUD and their Infants

LEED Scorecard for Original Design

LEED 2009 for Schools New Construction and Major Renovations
Project Checklist

Project Name
Date

Y	?	N			
16	3	5	**Sustainable Sites**	**Possible Points:**	**24**
Y			Prereq 1	Construction Activity Pollution Prevention	
Y			Prereq 2	Environmental Site Assessment	
		1	Credit 1	Site Selection	1
4			Credit 2	Development Density and Community Connectivity	4
		1	Credit 3	Brownfield Redevelopment	1
4			Credit 4.1	Alternative Transportation—Public Transportation Access	4
1			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Roon	1
	2		Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Ve	2
2			Credit 4.4	Alternative Transportation—Parking Capacity	2
		1	Credit 5.1	Site Development—Protect or Restore Habitat	1
		1	Credit 5.2	Site Development—Maximize Open Space	1
	1		Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
		1	Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1
1			Credit 9	Site Master Plan	1
1			Credit 10	Joint Use of Facilities	1
9	2		**Water Efficiency**	**Possible Points:**	**11**
Y			Prereq 1	Water Use Reduction—20% Reduction	
4			Credit 1	Water Efficient Landscaping	2 to 4
2			Credit 2	Innovative Wastewater Technologies	2
2	2		Credit 3	Water Use Reduction	2 to 4
1			Credit 3	Process Water Use Reduction	1
12		20	**Energy and Atmosphere**	**Possible Points:**	**33**
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
7		11	Credit 1	Optimize Energy Performance	1 to 19
		7	Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
1			Credit 4	Enhanced Refrigerant Management	1
2			Credit 5	Measurement and Verification	2
		2	Credit 6	Green Power	2
6	1	6	**Materials and Resources**	**Possible Points:**	**13**
Y			Prereq 1	Storage and Collection of Recyclables	
		2	Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 2
		1	Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Element	1
2			Credit 2	Construction Waste Management	1 to 2
			Materials and Resources, Continued		
		2	Credit 3	Materials Reuse	1 to 2
2			Credit 4	Recycled Content	1 to 2
2			Credit 5	Regional Materials	1 to 2
		1	Credit 6	Rapidly Renewable Materials	1
	1		Credit 7	Certified Wood	1
16		1	**Indoor Environmental Quality**	**Possible Points:**	**19**
Y			Prereq 1	Minimum Indoor Air Quality Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y			Prereq 3	Minimum Acoustical Performance	
1			Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
4			Credit 4	Low-Emitting Materials	1 to 4
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1 to 3
		1	Credit 8.2	Daylight and Views—Views	1
1			Credit 9	Enhanced Acoustical Performance	1
1			Credit 10	Mold Prevention	1
2	1	3	**Innovation and Design Process**	**Possible Points:**	**6**
	1		Credit 1.1	Innovation in Design: Specific Title	1
		1	Credit 1.2	Innovation in Design: Specific Title	1
		1	Credit 1.3	Innovation in Design: Specific Title	1
		1	Credit 1.4	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1
1			Credit 3	The School as a Teaching Tool	1
			Regional Priority Credits	**Possible Points:**	**4**
			Credit 1.1	Regional Priority: Specific Credit	1
			Credit 1.2	Regional Priority: Specific Credit	1
			Credit 1.3	Regional Priority: Specific Credit	1
			Credit 1.4	Regional Priority: Specific Credit	1
61	7	35	**Total**	**Possible Points:**	**110**

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

Figure 27: LEED Scorecard for Original Design

APPENDIX C

Blazeshield II

BLAZE-SHIELD® II

Spray-Applied Fire Resistive Material

CAFCO® BLAZE-SHIELD® II is a portland cement based spray-applied fire resistive material (SFRM) designed to provide fire resistive ratings for structural steel and concrete in commercial construction.

Applied directly to deck, steel beams, columns or concrete surfaces, the outstanding value and proven fire resistive performance of BLAZE-SHIELD II make it an excellent choice for concealed commercial environments.

BLAZE-SHIELD II is applied exclusively by CAFCO licensed and trained contractors. Our technical staff works closely with building team members to meet all fire protection needs.

Code Compliances

CAFCO BLAZE-SHIELD II satisfies the requirements of the following:

- IBC—International Building Code
- SBCCI—Southern Building Code Congress International (Report No. 9423E)
- ICBO—International Conference of Building Officials (Report No. 1244)
- BOCA—Building Officials and Code Administrators International
- New York City—MEA
- NBC—National Building Code of Canada, Sections 2.5, 3.1.5, and 3.1.7

Major Specifications

BLAZE-SHIELD II complies with the requirements of the following specifications:

- General Services Administration (GSA): AIA/SC/GSA: 07811
- Department of the Navy NAVFACENGCOM Guide Specification NFGS 07810, Sprayed-On Fireproofing
- Veterans Administration (VA): H-08-1
- U.S. ARMY Corps of Engineers. CEGS-07811
- U.S. Environmental Protection Agency (EPA): Regulation 40
- Construction Specification Canada (CSC) TEK-AID

Fire Test Performance

CAFCO BLAZE-SHIELD II has been extensively tested for fire endurance by Underwriters Laboratories, Inc. (UL) and Underwriters Laboratories of Canada (ULC) in accordance with ASTM E119 (UL 263, CAN/ULC-S101).

These tests have resulted in ratings of up to 4 hours for:

- Floor Assemblies
- Beams
- Joists
- Columns
- Roof Assemblies
- Walls and Partitions

BLAZE-SHIELD II has also been tested in accordance with ASTM E84 and CAN/ULC-S102 and has the following Surface Burning Characteristics:

Flame Spread..................0
Smoke Developed 0

Thermal Properties

The unique formulation of CAFCO® BLAZE-SHIELD® II makes it a very effective thermal insulator. This benefit is important in reducing heat loss, particularly when applied to the underside of a roof deck. The R-value added by BLAZE-SHIELD II may allow a reduction in roof insulation.

Product	Conductivity (k)*	Resistance (R/inch)
BLAZE-SHIELD II	0.30 BTU in/hr ft² °F @ 75°F (0.043 W/mK @ 24°C)	3.33

*When tested in accordance with ASTM C518

Acoustical Properties

As an efficient sound-absorbing material, BLAZE-SHIELD II adds value to the fire protection application in areas where high-noise levels are anticipated. Typical acoustical performance is as follows:

Product	Thickness	Base	NRC Rating*
BLAZE-SHIELD II	1/2 inch (13 mm)	Deck & Beam	0.75
BLAZE-SHIELD II	1 inch (25 mm)	Solid	0.75

*When tested in accordance with ASTM C423

Physical Performance

Characteristic	ASTM Method	Standard Performance*	Tested Performance**
Density	E605	15 pcf (240 kg/m³)	16 pcf (256 kg/m³)
Combustibility	E136	Noncombustible	Noncombustible
Cohesion/Adhesion	E736	150 psf (7.2 kPa)	360 psf (17.2 kPa)
Deflection	E759	No Cracks or Delaminations	No Cracks or Delaminations
Bond Impact	E760	No Cracks or Delaminations	No Cracks or Delaminations
Compressive Strength	E761	750 psf (35.9 kPa)	2,380 psf (114 kPa)
Air Erosion Resistance	E859	Less than 0.025 g/ft² (0.27 g/m²)	0.000 g/ft² (0.000 g/m²)
Corrosion Resistance	E937, Mil. Std. 810	Does Not Promote Corrosion of Steel	Does Not Promote Corrosion of Steel
Sound Absorption	C423		0.75 NRC, 1/2" (13mm) onto deck and beam

.* Standard performance based on General Services Administration AIA/SC/GSA/07811 except for density, which is based on UL. Refer to UL design for density requirement.

** Values represent independent laboratory tests under controlled conditions

BLAZE-SHIELD II Guide Specification

PART 1 – GENERAL

1.1 Work Included

1.1.1 Provide all labor, materials, equipment and services necessary for, and incidental to, the complete and proper installation of all spray-applied fire resistive material and related work as shown on the drawings or where specified herein, and in accordance with all applicable requirements of the Contract Documents.

1.1.2 The material and installation shall conform to the applicable building code requirements and the requirements of all authorities having jurisdiction.

1.2 Quality Assurance

1.2.1 Work shall be performed by a firm with expertise in the installation of fire protection or similar materials. This firm shall be licensed or otherwise approved by the spray-applied fire resistive material manufacturer.

1.2.2 Before proceeding with the fire protection work, approval of the proposed material thicknesses and densities shall be obtained from the architect and other applicable authorities having jurisdiction.

1.3 Related Sections

1.3.1 Section 05100 - Structural Steel.
1.3.2 Section 05300 - Metal Decking.
1.3.3 Section 07200 - Insulation.
1.3.4 Section 07270 - Firestopping.
1.3.5 Section 07812 - Intumescent Coatings.
1.3.6 Section 09200 - Lath and Plaster.
1.3.7 Section 09900 - Painting.

1.4 References

A. ASTM E84 - Surface Burning Characteristics of Building Materials.
B. ASTM E119 - Fire Tests of Building Construction and Materials.
C. ASTM E136 - (Noncombustibility) Behavior of Materials in a Vertical Tube Furnace at 750ºC.
D. ASTM E605 - Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members.
E. ASTM E736 - Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
F. ASTM E759 - Effect of Deflection of Sprayed Fire-Resistive Materials Applied to Structural Members.
G. ASTM E760 - Effect of Impact on Bonding of Sprayed Fire-Resistive Materials Applied to Structural Members.
H. ASTM E761 - Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.
I. ASTM E859 - Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members.
J. ASTM E937 - Corrosion of Steel by Sprayed Fire-Resistive Materials Applied to Structural Members.
K. CAN/ULC-S101 - Standard Methods of Fire Tests of Building Construction and Materials.
L. CAN/ULC-S102 Steiner Tunnel Test.
M. CAN4-S114 Standard Test Method for Determination of Noncombustibility in Building Materials.

1.4.1 Underwriters Laboratories, Inc. (UL) Fire Resistance Directory.

1.4.2 Underwriters Laboratories of Canada (ULC) List of Equipment and Materials.

1.4.3 Uniform Building Code Standard No. 7-6 (current edition): Thickness and Density Determination for Spray-Applied Fire Protection.

1.4.4 AWCI Publication: Technical Manual 12-A Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials; an Annotated Guide.

1.5 Submittals

1.5.1 Manufacturer's Data: Submit manufacturer's specifications, including certification as may be required to show material compliance with Contract Documents.

1.5.2 Test Data: Independent laboratory test results shall be submitted for all specified performance criteria.

1.6 Delivery, Storage and Handling

1.6.1 Deliver materials to the project in manufacturer's unopened packages, fully identified as to trade name, type and other identifying data. Packaging shall bear the UL and ULC labels for fire hazard and fire-resistance classifications.

1.6.2 Store materials above ground, in a dry location, protected from the weather. Damaged packages found unsuitable for use should be rejected and removed from the project.

1.7 Project Conditions

1.7.1 When the prevailing outdoor temperature at the building is less than 40° F (4° C), a minimum substrate and ambient temperature of 40° F (4° C) shall be maintained prior to, during, and a minimum of 24 hours after application of spray-applied fire resistive material. If necessary for job progress General Contractor shall provide enclosures with heat to maintain temperatures.

1.7.2 General Contractor shall provide ventilation to allow proper drying of the spray-applied fire resistive material during and subsequent to its application.

1.7.2.1 In enclosed areas ventilation shall not be less than 4 complete air changes per hour.

1.8 Sequencing/Scheduling

1.8.1 All fire protection work on a floor shall be completed before proceeding to the next floor.

1.8.2 The Contractor shall cooperate in the coordination and scheduling of fire protection work to avoid delays in job progress.

PART 2 – PRODUCTS

2.1 Acceptable Manufacturers. The spray-applied fire resistive material shall be manufactured under the CAFCO® brand name, by authorized producers.

2.2 Materials

2.2.1 Materials shall be BLAZE-SHIELD® II, (UL/ULC designation: Type II) applied to conform to the drawings, specifications and following test criteria:

2.2.1.1 Deflection: When tested in accordance with ASTM E759, the material shall not crack or delaminate when the non-concrete topped galvanized deck to which it is applied is subjected to a one time vertical centerload resulting in a downward deflection of 1/120th of the span.

2.2.1.2 Bond Impact: When tested in accordance with ASTM E760, the material shall not crack or delaminate from the concrete topped galvanized deck to which it is applied.

2.2.1.3 Cohesion/Adhesion (bond strength): When tested in accordance with ASTM E736, the material applied over uncoated or galvanized steel shall have an average bond strength of 150 psf (7.2 kPa).

2.2.1.4 Air Erosion: When tested in accordance with ASTM E859, the material shall not be subject to losses from the finished application greater than 0.025 grams per sq. ft. (0.27 grams per square meter).

2.2.1.5 Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 750 psf (35.9 kPa).

2.2.1.6 Corrosion Resistance: When tested in accordance with ASTM E937, the material shall not promote corrosion of steel.

2.2.1.7 Noncombustibility: When tested in accordance with ASTM E136 or CAN4-S114, the material shall be noncombustible.

2.2.1.8 Surface Burning Characteristics: When tested in accordance with ASTM E84 or CAN/ULC-S102, the material shall exhibit the following surface burning characteristics:
Flame Spread..........0
Smoke Developed.....0

2.2.1.9 Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL / ULC design or as required by the authority having jurisdiction.

2.2.2 The material shall have been tested and classified by Underwriters Laboratories, Inc. (UL) or Underwriters Laboratories of Canada (ULC) in accordance with the procedures of UL 263 (ASTM E119) or CAN/ULC-S101.

2.2.3 Spray-applied fire resistive materials shall be applied at the approved minimum thickness and density to achieve the following ratings:
Floor assemblies ___hr.
Roof assemblies ___hr.
Beams ___hr.
Girders ___hr.
Columns ___hr.
Joists ___hr.

2.2.4 Potable water shall be used for the application of spray-applied fire resistive materials.

2.2.5 Spray-applied fire resistive materials shall be free of all forms of asbestos, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall provide certification of such upon request.

PART 3 – EXECUTION

3.1 Preparation

3.1.1 All surfaces to receive fire protection shall be free of oil, grease, loose mill scale, dirt, paints/primers or other foreign materials which would impair satisfactory bonding to the surface. Manufacturer shall be contacted for procedures on handling primed/painted steel. Any cleaning of surfaces to receive spray-applied fire resistive material shall be the responsibility of the General Contractor or Steel Erector, as outlined in the structural steel or steel deck section.

3.1.2 Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of spray-applied fire resistive materials.

3.1.3 The installation of ducts, piping, conduit or other suspended equipment shall not take place until the application of spray-applied fire resistive material is complete in an area.

3.1.4 The spray-applied fire resistive material shall only be applied to steel deck which has been fabricated and erected in accordance with the criteria set by the Steel Deck Institute.

3.1.5 When roof traffic is anticipated, as in the case of periodic maintenance, roofing pavers shall be installed as a walkway to distribute loads.

3.2 Application

3.2.1 Equipment, mixing and application shall be in accordance with the manufacturer's written application instructions.

3.2.2 The application of spray-applied fire resistive material shall not commence until certification has been received by the General Contractor that surfaces to receive spray-applied fire resistive material have been inspected by the applicator and are acceptable to receive spray-applied fire resistive material.

3.2.3 All unsuitable substrates must be identified and made known to the General Contractor and corrected prior to application of the spray-applied fire resistive material.

3.2.4 Spray-applied fire resistive material shall not be applied to steel floor decks prior to the completion of concrete work on that deck.

3.2.5 The application of spray-applied fire resistive material to the underside of roof deck shall not commence until the roofing is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and after construction roof traffic has ceased.

3.2.6 Proper temperature and ventilation shall be maintained as specified in 1.7.1, 1.7.2 and 1.7.2.1.

3.2.7 Provide masking, drop cloths or other suitable coverings to prevent overspray from coming in contact with surfaces not intended to be sprayed.

3.2.8 CAFCO® BOND-SEAL (Type EBS) adhesive shall be applied as per the appropriate UL/ULC fire resistance design and manufacturer's written recommendations.

3.3 Repairing and Cleaning

3.3.1 All patching of and repair to spray-applied fire resistive material, due to damage by other trades, shall be performed under this section and paid for by the trade responsible for the damage.

3.3.2 After the completion of the work in this section, equipment shall be removed and all surfaces not to be sprayed shall be cleaned to the extent previously agreed to by the applicator and General Contractor.

3.4 Inspection and Testing

3.4.1 The spray-applied fire resistive material shall be tested for thickness and density in accordance with one of the following procedures: ASTM E605 - Standard Test Method of Sprayed Fire-Resistive Materials Applied to Structural Members. AWCI - Technical Manual 12-A Standard Practice for the Testing and Inspection of Field Applied Sprayed Fire-Resistive Materials an Annotated Guide.UBC Standard No. 7-6 - Thickness and Density Determination for Spray-Applied Fire Protection.

Product Availability

CAFCO Spray-Applied Fire Resistive Materials are available to trained, licensed contractors around the world from strategically located production and distribution points in the U.S., Canada, Mexico, Europe and the Pacific Basin.

For Further Information

ISOLATEK INTERNATIONAL is registered with the AIA Continuing Education System (AIA/CES)

For Further Information CAFCO® Technical and Sales Representatives are always available to lend assistance. Additional printed materials, including Material Safety Data Sheets, and other product literature, are available upon request.
For more information about our CAFCO® line of sprayed fire protection, thermal and acoustical treatments, SprayFilm™ Intumescent Coatings, and CAFCO-BOARD™ or for the name of the Sales Representative in your area, please contact:

In the United States: Isolatek International, Stanhope, New Jersey Tel: 800.631.9600 Fax: 973.347.9170
In Mexico & Central America: Cafco Mexico S.A. de C.V., Mexico D.F. Tel: 52.55.5254.6683 Fax: 52.55.5531.7826
In Andean Countries: Cafco Andina S.A., Santiago, Chile Tel: 562.378.5120 Fax: 562.378.5121
In Canada: Cafco Industries, Toronto, Ontario Tel: 888.873.0003 Fax: 416.679.2933

For more detailed product information, visit our website at
www.cafco.com or contact us at cafco@isolatek.com

ISOLATEK INTERNATIONAL

2/03

APPENDIX D

Mechanical Breadth- Space Heating and Cooling Load Summaries

CMU Back Up

Space Summary - Space1	
Inputs	
Area (SF)	775.41
Volume (CF)	6,170.61
Wall Area (SF)	55
Roof Area (SF)	46.12
Door Area (SF)	40.08
Partition Area (SF)	0
Window Area (SF)	45.31
Skylight Area (SF)	0
Lighting Load (W)	930
Power Load (W)	1,163
Number of People	18
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**13,583.50**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	10,341.80
Peak Cooling Latent Load (Btu/h)	3,241.70
Peak Cooling Airflow (CFM)	495
Peak Heating Load (Btu/h)	**-10,422.30**
Peak Heating Airflow (CFM)	64

Original CMU Assembly- Space 1 (3rd floor class Room Exterior Wall facing South)				
Components	**Cooling**		**Heating**	
	Loads (Btu/h)	**Percentage of Total**	**Loads (Btu/h)**	**Percentage of Total**
Wall	**19**	**0.14%**	**36.6**	**0.26%**
Window	1,075.50	7.92%	1,261.10	8.92%
Door	0	0.00%	0	0.00%
Roof	208.7	1.54%	560.2	3.96%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	2,504.10	18.43%	-2,504.10	-17.71%
Power	3,130.10	23.04%	-3,130.10	-22.14%
People	6,646.10	48.93%	-6,646.10	-47.01%
Plenum	0	0.00%		
Total	**13,583.50**	**100%**	**-10,422.30**	**100%**

Space Summary - Space 2

Inputs	
Area (SF)	954.46
Volume (CF)	7,601.26
Wall Area (SF)	73.14
Roof Area (SF)	48.68
Door Area (SF)	37.79
Partition Area (SF)	0
Window Area (SF)	60.24
Skylight Area (SF)	0
Lighting Load (W)	1,145
Power Load (W)	1,432
Number of People	23
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**15,434.20**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	11,443.90
Peak Cooling Latent Load (Btu/h)	3,990.20
Peak Cooling Airflow (CFM)	562
Peak Heating Load (Btu/h)	**-12,173.40**
Peak Heating Airflow (CFM)	80

Original CMU Assembly- Space 2 (2nd floor class Room-Exterior Wall facing North)				
Components	**Cooling**		**Heating**	
	Loads (Btu/h)	**Percentage of Total**	**Loads (Btu/h)**	**Percentage of Total**
Wall	**22.4**	**0.14%**	**48.8**	**0.29%**
Window	701.3	4.54%	1,676.80	9.98%
Door	0	0.00%	0	0.00%
Roof	220.3	1.43%	591.3	3.52%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	2,902.50	18.81%	-2,902.50	-17.27%
Power	3,628.10	23.51%	-3,628.10	-21.59%
People	7,959.70	51.57%	-7,959.70	-47.36%
Plenum	0	0.00%		
Total	**15,434.20**	**100%**	**-12,173.40**	**100%**

Metal Stud Crete

Space Summary - Space 1

Inputs	
Area (SF)	775.41
Volume (CF)	6,170.61
Wall Area (SF)	55
Roof Area (SF)	46.12
Door Area (SF)	40.08
Partition Area (SF)	0
Window Area (SF)	45.31
Skylight Area (SF)	0
Lighting Load (W)	930
Power Load (W)	1,163
Number of People	18
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**13,642.20**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	10,400.50
Peak Cooling Latent Load (Btu/h)	3,241.70
Peak Cooling Airflow (CFM)	501
Peak Heating Load (Btu/h)	**-10,434.40**
Peak Heating Airflow (CFM)	64

Metal Stud Crete - Space 1 (3rd floor class Room Exterior Wall facing South)

Components	Cooling		Heating	
	Loads (Btu/h)	Percentage of Total	Loads (Btu/h)	Percentage of Total
Wall	**12.5**	**0.09%**	**24.6**	**0.17%**
Window	1,140.70	8.36%	1,261.10	8.93%
Door	0	0.00%	0	0.00%
Roof	208.7	1.53%	560.2	3.97%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	2,504.10	18.36%	-2,504.10	-17.73%
Power	3,130.10	22.94%	-3,130.10	-22.16%
People	6,646.10	48.72%	-6,646.10	-47.05%
Plenum	0	0.00%		
Total	**13,642.20**	**100%**	**-10,434.40**	**100%**

Space Summary - Space 2

Inputs	
Area (SF)	954.46
Volume (CF)	7,601.26
Wall Area (SF)	73.14
Roof Area (SF)	48.68
Door Area (SF)	37.79
Partition Area (SF)	0
Window Area (SF)	60.24
Skylight Area (SF)	0
Lighting Load (W)	1,145
Power Load (W)	1,432
Number of People	23
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**16,003.90**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	12,013.70
Peak Cooling Latent Load (Btu/h)	3,990.20
Peak Cooling Airflow (CFM)	587
Peak Heating Load (Btu/h)	**-12,815.20**
Peak Heating Airflow (CFM)	79

Metal Stud Crete - Space 2 (2nd floor class Room Exterior Wall facing North)

Components	**Cooling**		**Heating**	
	Loads (Btu/h)	**Percentage of Total**	**Loads (Btu/h)**	**Percentage of Total**
Wall	**11.8**	**0.07%**	**32.7**	**0.19%**
Window	655.8	4.10%	1,676.80	9.63%
Door	0	0.00%	0	0.00%
Roof	220.3	1.38%	591.3	3.40%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	3,082.30	19.26%	-3,082.30	-17.70%
Power	3,852.90	24.07%	-3,852.90	-22.12%
People	8,180.80	51.12%	-8,180.80	-46.97%
Plenum	0	0.00%		
Total	**16,003.90**	**100%**	**-12,815.20**	**100%**

Metal Stud Back Up

Space Summary - Space 1

Inputs	
Area (SF)	775.41
Volume (CF)	6,170.61
Wall Area (SF)	55
Roof Area (SF)	46.12
Door Area (SF)	40.08
Partition Area (SF)	0
Window Area (SF)	45.31
Skylight Area (SF)	0
Lighting Load (W)	930
Power Load (W)	1,163
Number of People	18
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**13,640.10**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	10,398.40
Peak Cooling Latent Load (Btu/h)	3,241.70
Peak Cooling Airflow (CFM)	501
Peak Heating Load (Btu/h)	**-10,438.60**
Peak Heating Airflow (CFM)	64

Metal Stud Back Up - Space 1 (3rd floor class Room Exterior Wall facing South)

Components	Cooling		Heating	
	Loads (Btu/h)	Percentage of Total	Loads (Btu/h)	Percentage of Total
Wall	**10.3**	**0.08%**	**20.3**	**0.14%**
Window	1,140.70	8.36%	1,261.10	8.93%
Door	0	0.00%	0	0.00%
Roof	208.7	1.53%	560.2	3.97%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	2,504.10	18.36%	-2,504.10	-17.73%
Power	3,130.10	22.95%	-3,130.10	-22.16%
People	6,646.10	48.73%	-6,646.10	-47.06%
Plenum	0	0.00%		
Total	**13,640.10**	**100%**	**-10,438.60**	**100%**

Space Summary - Space 2

Inputs	
Area (SF)	954.46
Volume (CF)	7,601.26
Wall Area (SF)	73.14
Roof Area (SF)	48.68
Door Area (SF)	37.79
Partition Area (SF)	0
Window Area (SF)	60.24
Skylight Area (SF)	0
Lighting Load (W)	1,145
Power Load (W)	1,432
Number of People	23
Sensible Heat Gain / Person (Btu/h)	250
Latent Heat Gain / Person (Btu/h)	200
Infiltration Airflow (CFM)	0
Space Type	School or University (inherited from building type)
Calculated Results	
Peak Cooling Load (Btu/h)	**16,001.90**
Peak Cooling Month and Hour	July 10:00 AM
Peak Cooling Sensible Load (Btu/h)	12,011.60
Peak Cooling Latent Load (Btu/h)	3,990.20
Peak Cooling Airflow (CFM)	587
Peak Heating Load (Btu/h)	**-12,820.80**
Peak Heating Airflow (CFM)	79

Metal Stud Back Up- Space 2 (2nd floor class Room-Exterior Wall facing North)

Components	Cooling		Heating	
	Loads (Btu/h)	Percentage of Total	Loads (Btu/h)	Percentage of Total
Wall	**9.8**	**0.06%**	**27.1**	**0.16%**
Window	655.8	4.10%	1,676.80	9.63%
Door	0	0.00%	0	0.00%
Roof	220.3	1.38%	591.3	3.40%
Skylight	0	0.00%	0	0.00%
Partition	0	0.00%	0	0.00%
Infiltration	0	0.00%	0	0.00%
Lighting	3,082.30	19.26%	-3,082.30	-17.70%
Power	3,852.90	24.08%	-3,852.90	-22.13%
People	8,180.80	51.12%	-8,180.80	-46.99%
Plenum	0	0.00%		
Total	**16,001.90**	**100%**	**-12,820.80**	**100%**