FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

October 6, 2020

Sunny Becker
Washington State Department of Ecology
3190 160th Ave SE,
Bellevue, WA 98008

SUBJECT: CONSENT DECREE COMPLIANCE REVIEW FOR THE PROPOSED RIVERFRONT WORK/LIVE UNITS
Everett Landfill/Tire Fire Site, Everett, Washington

Dear Sunny:

This letter summarizes the findings of our review of the proposed work/live spaces in the Riverfront Community, for construction at the Everett Landfill Site (Site) in Everett, Washington. We have reviewed the proposal and find the design in compliance with all Consent Decree (CD) requirements for structures at the Site, and within the allowable uses for buildings on the landfill. As summarized below, the proposed work/live spaces also meet the requirements of CD Amendment No. 1 as written, and no additional CD amendments should be necessary for approval of the proposed design.

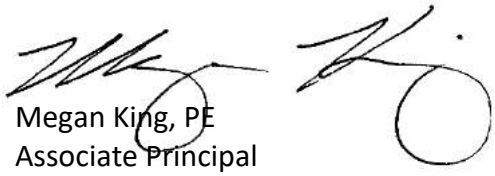
The proposed design includes residential work/live space in the street level of the proposed buildings. CD Amendment No. 1 for the Site allows for construction of residential structures on the landfill, with "ground floor" uses restricted to garage, storage, and laundry only, with special requirements for alarms and ventilation at the ground floor. To comply with the CD requirements, the design includes a ground floor isolated space that is less than 1 foot in height, located between the work/live units at street level and the underlying structural building slab and landfill gas membrane. This ground floor space has been designed to include the alarm and ventilation requirements, providing added protection to the work/live space. There will be no uses of any kind in this ground floor space. The design of the proposed ground floor space is detailed in the attached Technical Memorandum prepared by Herrera.

CD Amendment No. 1 assumed private ownership of structures in the future and outlined restrictions for modifications and improvements of the ground floor space post-construction to ensure protection of landfill gas controls. Because these buildings will remain under developer ownership, tenant restrictions on access, modifications, and improvements to the ground floor space beneath their work/live units will address these CD Amendment No. 1 requirements. The building owner will also maintain responsibility for operations and maintenance and inspection of gas monitoring systems and alarms.

The Cleanup Action Plan (CAP) and Compliance Monitoring and Contingency Plan (CMCP) Exhibits to the Site CD and CD Amendment No. 1 detail methane monitoring and alarm requirements applicable to the proposed work/live units. All monitoring and alarm requirements detailed in CD Amendment No. 1, Sections 3.5 and 4.5.2 of the CMCP, and Section 6.0 bullet 2 of the CAP are met by the proposed design, as detailed in the Technical Memorandum.

Attached to this letter, you will find the Technical Memorandum prepared by Herrera detailing the ground floor construction and alarm and HVAC systems, as well as the completed CD Checklist. Please let us know if you have any questions, and we look forward to receiving your concurrence on the acceptability of the proposed work/live design concept.

Sincerely,
FLOYD | SNIDER



Megan King, PE
Associate Principal

Encl.: Riverfront Work/Live Units Technical Memorandum
Everett Landfill/Tire Fire Site City/Development Review Checklist

HERRERA

TECHNICAL MEMORANDUM

Date: October 1, 2020

To: Kate Snider – Floyd | Snider

From: Tyson Wright – Herrera Environmental Consultants

Subject: Riverfront Work/Live Units

The following Technical Memo has been prepared as a supplement to the Riverfront EDR. This memo has been prepared to address the environmental compliance for the inclusion of Commercial Work/Live spaces in the Riverfront Community.

Since the advent of COVID-19, together with the changing nature of retail, mixed use residential communities have begun to implement a number of work/live spaces that can allow residents and business to occupy a space that affords both a working area together with a lofted bedroom space. This work from home option provides an effective combination of commercial and residential spaces. This technical memorandum was prepared to describe the environmental compliance measures for these Work/Live spaces under the regulatory framework of the Department of Ecology's Consent Decree at Riverfront.

For reference, included with this technical memorandum are Attachments of the following drawings and specifications. Attachment A is the SMR Architects drawings which include three sheets. Sheet WL1 incorporates the technical aspects that would be implemented to ensure compliance with the consent decree and the engineering design of the various protection measures for these spaces within Buildings A, B, C and D of the Riverfront Mixed Use Community on the formerly closed Everett Landfill. Sheet WL2 provides a floor plan and schematic of a Work/Live Space with the requisite work and residential areas designated on the plans. Sheet WL3 provides a site plan of the Riverfront Mixed Use Development indicating locations where the proposed Work/Live Spaces would be accommodated. Attachment B are the technical specifications for the products identified as part of the mechanical venting and floor systems.

As indicated above, and shown in Attachment A, the Work Live spaces are multifunctional spaces that allow for residents and business to combine living and working functions with bedrooms placed on an upper mezzanine level. (See Sheet WL2).

During the previous permit review for Riverfront Buildings A and B, these spaces were shown as shell spaces that could accommodate a variety of commercial and retail users authorized under the Development Agreement and in compliance with the Consent Decree. Consistent with the

terms of the Consent Decree and EDR, these spaces on the ground floor were designed with a below grade and below slab active methane collection system described in further detail below.

Given the market conditions referenced above, this technical memorandum outlines the additional measures beyond the active methane collection system, approved with the previous permits, that would be implemented with the Work Live spaces as shown on Sheet WL1. Further, this technical memorandum serves to amend the Riverfront Engineering Design Report with technical specifications and drawings for how these spaces would be implemented under the Consent Decree. In particular this memorandum serves to address the following "ground floor" statements in the Consent Decree Amendment 1, filed in Court April 2008 that reads "…residential units may be developed at the Property with ground floor uses restricted solely to garage, storage and laundry…" and, "Methane monitoring alarms shall be installed in each ground floor area and shall have a low level response that will trigger exhaust fans in the garage area and notify maintenance personnel. In addition, a high-level alarm is required that will trigger evacuation." As prescribed in the Consent Decree, the low-level response is triggered at 1,000 ppm, or two percent of the lower explosive limit, and the high-level response is triggered at 10,000 ppm, or twenty percent of the lower explosive limit for methane. This high level response trigger is lower and more conservative than the prescribed Landfilling Standards of the WAC 173-304 which states, "An owner or operator of a landfill shall not allow explosive gases generated by the facility whose concentration exceeds: (A) Twenty-five percent of the lower explosive limit for the gases in facility structures…". Twenty-five percent of the lower explosive limit for methane is 12,500 ppm.

Another important action level for methane inside buildings is 100 ppm. As prescribed in the Consent Decree, in addition to the continuous monitoring requirements described above, monitoring with a handheld instrument will occur every two weeks after the building and/or exterior area is opened for public access. If results do not show an air quality concern for three months, monitoring will be performed quarterly. Any result exceeding 100 ppm inside buildings or 500 ppm for exterior areas would be subject to corrective contingency measures.

To address the ground floor statements above, this technical memorandum incorporates the changes of an independent ground floor space between the living space and LFG barrier/structural slab. The ground floor space consists of 9-inch metal flooring joists with 6-inch x 9-inch openings spaced at 48 inches along each joist. The joists are placed on 1/4-inch protection board for protection/covering of the 30 mil PVC liner which is the LFG barrier above the structural slab. Above the joists would be 3/4-inch concrete structural panels with air barrier taped seams. Above the structural panels would be a 3/4-inch layer of self-leveling concrete gypsum which provides the unit flooring a proper laydown surface. (See Sheet WL1 Details 1 and 2)

In this ground floor space of each unit there would be one continuously monitoring methane detector and mechanical venting in the form of an exhaust fan located at the exterior wall of the building. This fan will pull air through a vent in the unit flooring, located towards the back of the unit, through the ground floor space, and exhaust it to the exterior of the building. The methane

detector in the ground floor space will have a low-level response that will trigger the exhaust fans in the ground floor space and notify maintenance personnel for source control. The detector will also have a high-level alarm that would trigger evacuation. Additionally, it is proposed that one detector be placed in both the lower and mezzanine levels of the Work/Live units above the inserted ground floor space.

The approved design, which is consistent with the EDR, for each of the building's first floor HVAC system is setup as continuous air flow fans at one air change per hour. This option was selected as the most favorable approach for an "Active System" with mechanical ventilation dictated by the nationally recognized Methane Hazard Mitigation Standards. An "Active System" is one that consists of a Sub-slab Collection System and a Lowest Occupied Space System. The Lowest Occupied Space System consists of the methane detectors, HVAC, and alarms. All these elements will be maintained in the Work/Live units in similar fashion by utilizing energy recovery ventilators (ERVs) in each unit. The ERV pulls air from the exterior, heats or cools it, and allows for venting of air flow from interior to exterior.

The ground floor space would also be equipped with a spark resistant exhaust fan triggered only at the low-level alarm. The exhaust fan will be capable of doing four air exchanges per hour. Both the ERV and the exhaust fan will have failure alarms to notify maintenance personnel of any issues. The ERVs, exhaust fans and methane detectors will be on backup power. Due to the added institutional control elements in these Work/Live units, the units will carry lease terms that allow for maintenance access and inspection at regular intervals.

These measures would be in addition to the Sub-slab Collection System which is an LFG trench comprised of a perforated HDPE pipe within 4.5 feet deep by 2 feet wide trench filled with drain gravel. The trench will be connected to either the LFG header installed in Riverfront Boulevard or LFG header to be installed with Phase 1 and 2 Site Development. The trench shall provide the required LFG collection under the building and located such to meet the 100 feet spacing requirement for the site. Above the slab is a 30 mil PVC membrane which provides the protection from LFG migrating into the building. See Sheet WL1 Detail 1 for LFG trench and Detail 2 for 30 mil PVC membrane. All membrane penetrations through slabs and/or liner are to be sealed or booted. The specifications for the 30 mil PVC membrane are included as Attachment C.

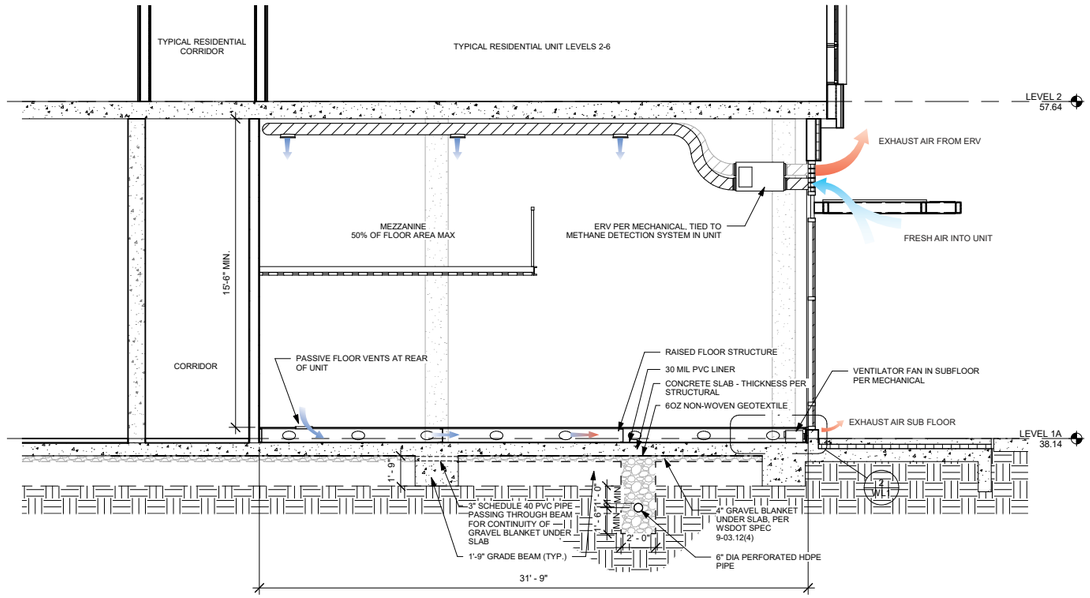
The measures to be implemented inside the building are safeguards and consent decree requirements for public safety in the low probability that the sitewide system (inclusive of the sub-slab collection system) fails or is down for an extended period. As previously indicated in this tech memo, the sitewide landfill gas collection system is the first line of defense for preventing methane from accumulating below the structural slab and somehow finding a pathway through the sealed flooring. The collection system will also be equipped with communications to notify maintenance personnel if the system shuts down or certain components of the system fail. The landfill gas collection system is to be installed as part of the

Everett Riverfront Phase 1 and 2 Site Development which was permitted for construction in August 2020.

In summary, this tech memo with its corresponding drawings and specifications provide the required elements for Work/Live units to be permissible on the first floor of buildings that are to be constructed at Everett Riverfront. Ground floor spaces with environmental controls that are located below the flooring of the units yet above the structural slab (with its LFG membrane) will provide the safeguard intent of the Consent Decree.

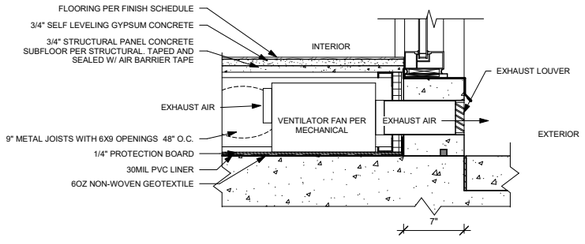
ATTACHMENT A

Everett Work/Live Detail Set



1 WORK/LIVE UNIT SECTION TYP.

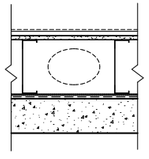
SCALE: NTS



2 SECTION - RAISED FLOOR @ CURB

SCALE: NTS

TYPICAL METAL FLOOR @ LIVE WORK UNITS



• FINISH FLOORING PER FINISH SCHEDULE			
• 3/4" MINIMUM GYPSUM CONCRETE			
• 3/4" STRUCTURAL PANEL CONCRETE SUBFLOOR PER STRUCTURAL			
• 9" PERFORATED COLD-FORMED STEEL JOISTS @ 16" O.C. MAXIMUM PER STRUCTURAL			
• 1/4" PROTECTION BOARD			
• 30mil PVC LINER			
• 6oz NON-WOVEN GEOTEXTILE			
• CONCRETE SLAB - THICKNESS PER STRUCTURAL			

LIVE WORK RAISED FLOOR ASSEMBLY

SCALE: NTS

GENERAL NOTES:

1. EACH UNIT TO BE PROVIDED WITH METHANE DETECTOR IN GROUND FLOOR SPACE (SUBFLOOR), AND THE LOWER AND MEZZANINE LEVELS OF THE WORK LIVE UNIT.

VENTING AND ALARM CONCEPT:

1. UNIT TO BE EXHAUSTED VIA ERV, EXHAUST THROUGH EXTERIOR WALL OR STOREFRONT

2. GROUND FLOOR SPACE IS VENTILATED VIA FANS LOCATED IN FLOOR, EXHAUST AT EXTERIOR CURB WALL.

3. ERV AND EXHAUST FANS ARE TIED TO METHANE DETECTION SYSTEM. ALARM ALERT LEVELS PER MECHANICAL AND LFG CONSULTANTS

MEP VENTING EQUIPMENT:

SEF (SUBFLOOR EXHAUST FAN)
BOD: ALDES, VS SERIES (SINGLE PORT) AND MPV SERIES (MULTI-PORT)
IN-LINE, DIRECT DRIVE FAN
CONTROLS: INTERMITTENT CONTROL, TO OPERATE UPON METHANE ALARM SYSTEM

ERV (ENERGY RECOVERY VENTILATORS)
BOD: RENEWAIRE, EV300
PACKAGED UNIT WITH SUPPLY FAN, EXHAUST FAN, PLATE & FRAME HEAT EXCHANGER, MERV 8 FILTERS
CONTROLS: CONTINUOUS VENTILATION SIZED FOR 1 ACH FOR OCCUPIED SPACE

NOTE PER LFG CONSULTANT:

PER THE CONSENT DECREE AMENDMENT 1, FILED IN COURT APRIL 2008, ". . .RESIDENTIAL UNITS MAY BE DEVELOPED AT THE PROPERTY WITH GROUND FLOOR USES RESTRICTED SOLELY TO GARAGE, STORAGE AND LAUNDRY. . ." "METHANE MONITORING ALARMS SHALL BE INSTALLED IN EACH GROUND FLOOR AREA AND SHALL HAVE A LOW LEVEL RESPONSE THAT WILL TRIGGER EXHAUST FANS IN THE GARAGE AREA AND NOTIFY MAINTENANCE PERSONNEL. IN ADDITION, A HIGH LEVEL ALARM IS REQUIRED THAT WILL TRIGGER EVACUATION."

THESE WORK/LIVE UNITS CREATE AN INDEPENDENT GROUND FLOOR SPACE BETWEEN THE LIVING SPACE AND LFG BARRIER/STRUCTURAL SLAB. IN THIS GROUND FLOOR SPACE OF EACH UNIT THERE WOULD BE ONE METHANE DETECTOR AND MECHANICAL VENTING IN THE FORM OF AN EXHAUST FAN THAT PULLS AIR THROUGH A VENT IN THE FLOOR AT THE BACK OF THE UNIT, THROUGH THE SUBFLOOR SPACE, AND EXHAUSTS IT TO THE EXTERIOR OF THE BUILDING. THE METHANE DETECTOR IN THE GROUND FLOOR SPACE WILL HAVE A LOW LEVEL RESPONSE THAT WILL TRIGGER THE EXHAUST FANS IN THE GROUND FLOOR SPACE AND NOTIFY MAINTENANCE PERSONNEL. IN ADDITION, A HIGH LEVEL ALARM WILL TRIGGER EVACUATION. ADDITIONALLY, IT IS PROPOSED THAT ONE DETECTOR BE PLACED IN BOTH THE LOWER AND MEZZANINE LEVELS OF THE WORK/LIVE UNITS.

CURRENT DESIGN OF THE BUILDING'S FIRST FLOOR HVAC SYSTEM IS SETUP AS CONTINUOUS AIR FLOW FANS AT 1 AIR CHANGE PER HOUR. THIS WOULD BE MAINTAINED IN THE WORK/LIVE UNITS IN SIMILAR FASHION BY UTILIZING ERVS IN EACH UNIT. THE ERV PULLS AIR FROM THE EXTERIOR, HEAT'S OR COOLS IT, AND ALSO ALLOWS FOR VENTING OF AIR FLOW FROM INTERIOR TO EXTERIOR. THE GROUND FLOOR SPACE WOULD BE EQUIPPED WITH A SPARK RESISTANT EXHAUST FAN TRIGGERED ONLY AT THE LOW LEVEL ALARM. THE EXHAUST FAN WILL BE CAPABLE OF DOING 4 AIR EXCHANGES PER HOUR. BOTH THE ERV AND THE EXHAUST FAN WILL HAVE FAILURE ALARMS TO NOTIFY MAINTENANCE PERSONNEL OF ANY ISSUES. THE ERVS, EXHASUST FANS AND METHANE DETECTORS WILL BE ON BACKUP POWER.

THE MEASURES TO BE IMPLEMENTED INSIDE THE BUILDING ARE SAFEGUARDS AND CONSENT DECREE REQUIREMENTS FOR PUBLIC SAFETY IN THE LOW PROBABILITY THAT THE SITEWIDE SYSTEM FAILS OR IS DOWN FOR AN EXTENDED PERIOD OF TIME. THE SITEWIDE LANDFILL GAS COLLECTION SYSTEM IS THE FIRST LINE OF DEFENSE FOR PREVENTING METHANE FROM ACCUMULATING BELOW THE STRUCTURAL SLAB AND SOMEHOW FINDING A PATHWAY THROUGH THE SEALED FLOORING. THE LANDFILL GAS COLLECTION SYSTEM IS TO BE INSTALLED AS PART OF THE EVERETT RIVERFRONT SITE PHASE 1 AND PHASE 2 DEVELOPMENT WHICH WAS PERMITTED FOR CONSTRUCTION IN AUGUST 2020.

SMR ARCHITECTS

SMR Architects
117 S. Main St., Suite 400
Seattle, WA 98104

PH: 206.623.1104
FX: 206.623.5285

EVERETT RIVERFRONT

3810 RIVERFRONT BLVD
EVERETT, WA 98201

REVISIONS / NOTES

NO	DATE	DESCRIPTION

TITLE

TYPICAL WORK LIVE DETAILS

PERMIT #	
DRAWN	
CHECKED	
ISSUE DATE	07/16/20
JOB NO.	17054
SHEET NO.:	

WL1

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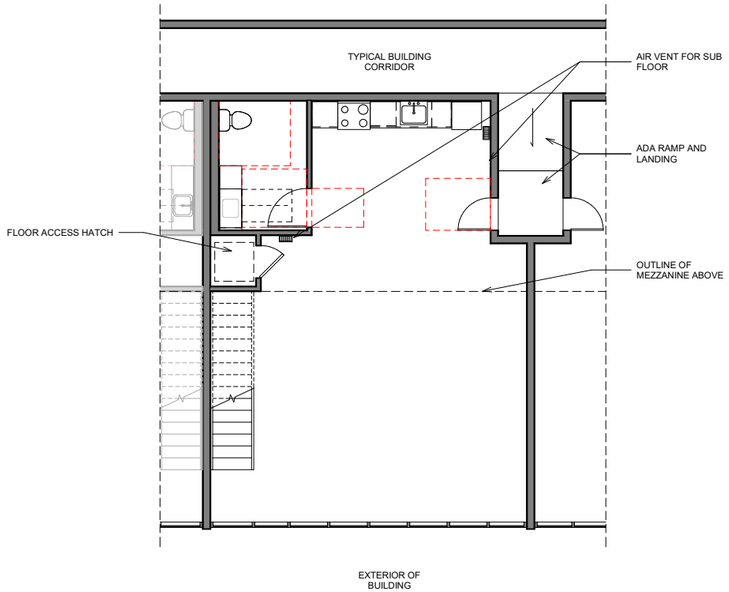
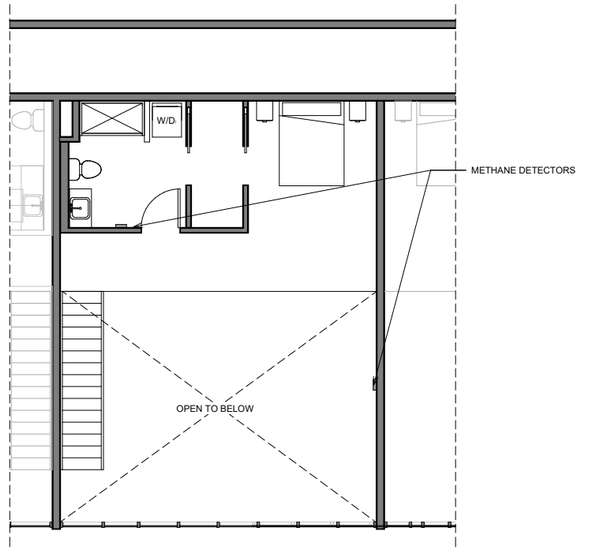
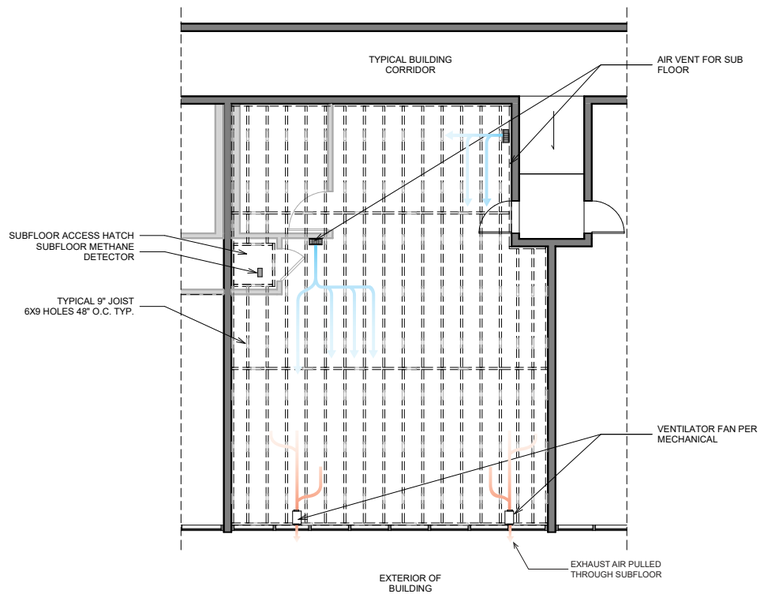


1 WORK LIVE TYPICAL RAMP LEVEL 1
SCALE: NTS



2 WORK LIVE TYPICAL LEVEL 2
SCALE: NTS



3 WORK LIVE TYPICAL RAMP SUBFLOOR
SCALE: NTS

GENERAL NOTES:

1. EACH UNIT TO BE PROVIDED WITH METHANE DETECTOR IN GROUND FLOOR SPACE (SUBFLOOR), AND THE LOWER AND MEZZANINE LEVELS OF THE WORK LIVE UNIT.

VENTING AND ALARM CONCEPT:

1. UNIT TO BE EXHAUSTED VIA ERV, EXHAUST THROUGH EXTERIOR WALL OR STOREFRONT

2. GROUND FLOOR SPACE IS VENTILATED VIA FANS LOCATED IN FLOOR, EXHAUST AT EXTERIOR CURB WALL.

3. ERV AND EXHAUST FANS ARE TIED TO METHANE DETECTION SYSTEM. ALARM ALERT LEVELS PER MECHANICAL AND LFG CONSULTANTS

SMR ARCHITECTS

SMR Architects
117 S. Main St., Suite 400
Seattle, WA 98104

PH: 206.623.1104
FX: 206.623.5285

EVERETT RIVERFRONT

3810 RIVERFRONT BLVD
EVERETT, WA 98021

REVISIONS / NOTES

NO	DATE	DESCRIPTION

TITLE

TYPICAL UNIT PLANS

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ISSUE DATE	07/17/20
JOB NO.	17054
SHEET NO.:	

WL2

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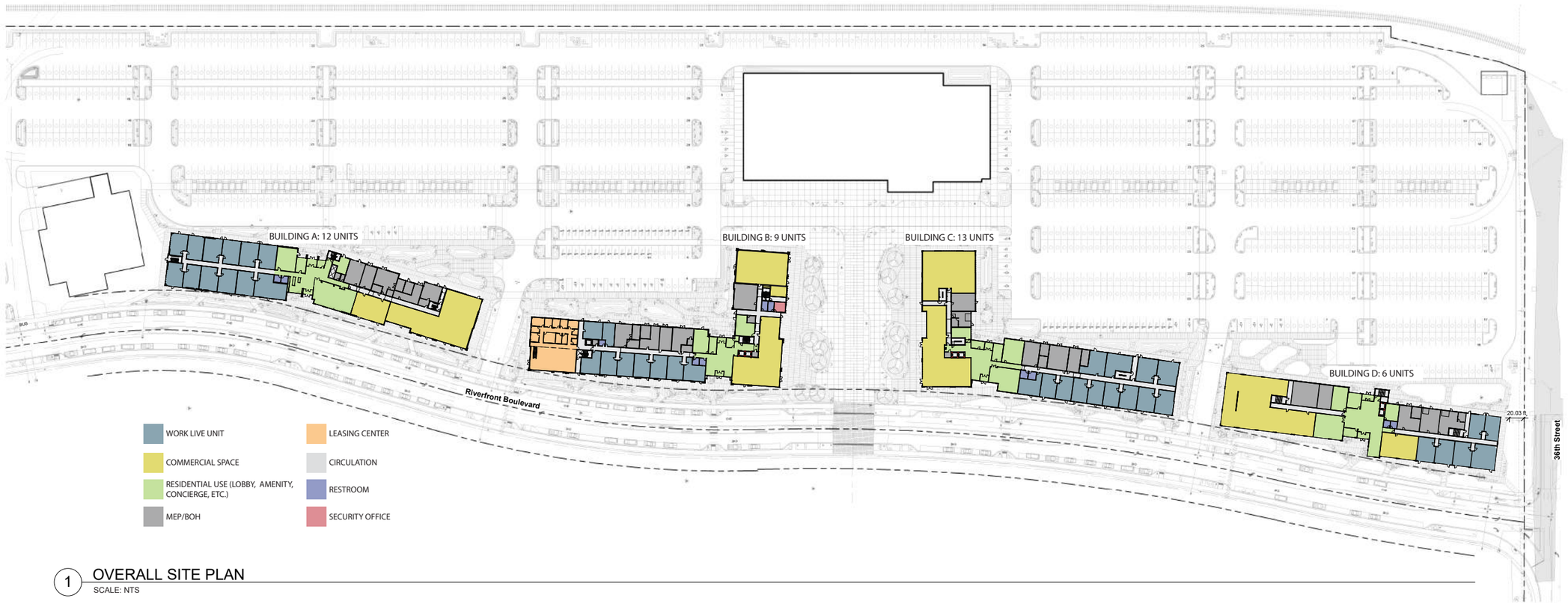

1 OVERALL SITE PLAN
SCALE: NTS

SMR ARCHITECTS

SMR Architects
117 S. Main St., Suite 400
Seattle, WA 98104

PH: 206.623.1104
FX: 206.623.5285

EVERETT RIVERFRONT

3810 RIVERFRONT BLVD
EVERETT, WA 98201

REVISIONS / NOTES
NO DATE DESCRIPTION

TITLE
SITE PLAN

PERMIT #	
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ISSUE DATE	07/16/20
JOB NO.	17054
SHEET NO.:	

WL3

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ATTACHMENT B

Everett Work/Live Specifications and Cut Sheets

05 40 00 COLD-FORMED METAL FRAMING

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes non-loadbearing steel stud framing, interior steel partition framing and wall furring and vertical shaft wall installation.

B. Related Section:
1. Section 06 10 00 – Rough Carpentry.
2. Section 07 90 00 – Joint Protection.
3. Section 09 21 16 - Gypsum Board.
4. Structural Engineering drawings.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM A123– Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
2. ASTM A570– Specification for Steel, Sheet and Strip, Carbon, Hot-rolled, Structural Quality.
3. ASTM A611– Specification for Structural Steel (SS), Sheet, Carbon, Cold-rolled.
4. ASTM A 653 – Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvanealled) by the Hot-Dip Process.
5. ASTM A 924 – Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
6. ASTM C 645 – Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track,) and Rigid Furring Channels for Screw Application for Gypsum Board.
7. ASTM C 754 – Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
8. ASTM C954– Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. to 0.112 in. in Thickness.
9. ASTM C955 – Specification for Load-bearing (Transverse and Axial) Steel Studs, Runners (Track), and Bracing or Bridging, for Screw Application of Gypsum Board and Metal Plaster Bases.
10. ASTM C 1002 – Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.

B. GA 203 Installation of Screw - Type Steel Framing Members to Receive Gypsum board.

C. American National Standards Institute (ANSI): A 97.2 Standard Specifications for the Installation of Steel Framing Members to Receive Screw Attached Gypsum Wallboard and Backing Board.

D. Federal Specifications (FS):
1. FS QQ-S-698 Steel, Sheet and Strip, Low Carbon.

2. FS QQ-S-775E Steel Sheets, Carbon, Zinc-Coated (Galvanized) by the Hot Dip Process.

E. American Iron and Steel Institute (AISI), 1016th Street NW, Washington, DC 20036.

F. Northwest Wall and Ceiling Bureau.

1.3 SUBMITTALS

A. Design Data:
1. Refer to general structural notes.

B. Product Data: Submit per Section 01 33 00 and the following:
1. Submit shop drawings. Indicate special components and installations not fully dimensioned or detailed in manufacturer's product data. Include placing drawings for framing members. Show size and gage designation, number, type, location, and spacing. Indicate supplemental backing, splices, accessories, and the like details as required for proper installation.
2. Submit triplicate product data. Include manufacturer's specifications and installation instructions for each type of metal stud and accessories. Include other data as may be required to show compliance with the Specifications.

1.4 QUALITY ASSURANCE

A. Manufacturer/Erector Qualifications: To be "Specialist" as defined in Section 011000.

B. Regulatory Requirements:
1. See referenced Codes, ordinances, and the like in Section 01 06 00.
2. Underwriters Laboratories (UL) Fire Resistance Index.

C. Perform work in accordance with GA 20.3 and ASTM C 754.

1.5 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01 60 00 and the following:
1. Deliver in unopened containers or bundles, fully identified with name, brand, type, and grade.
2. Acceptance at site: Verify undamaged conditions.
3. Protection before installation:
a. Store off the ground in dry, well-ventilated space.
b. Protect from rusting and damage.

1.8 BUILDING INTERIOR CONDITIONS

B. Certify conditions for application are as required by manufacturer.

PART 2 – PRODUCTS

2.1 MATERIALS/GENERAL

A. Manufacturers will be approved or rejected subject to satisfactory submittals referencing design requirements. Standards for metal framing members and accessories: All products are to be identical with those tested in structural or fire resistive tests and meet ASTM C 645 requirements for the item and use intended.
   1. Steel Joists TRADEREADY as manufactured by Clark Dietrick.
   2. Stud depths as required by floor section detail, 2” flanges
   3. Standard hole spacing; hole size per member depth.
   4. Bridging as required for solid installation; 8’-0” maximum
   5. Horizontal backing support: Unless otherwise indicated, use 14 gauge flat stock sheet metal between 14 gauge studs.
   6. Fasteners: In accordance with referenced ASTM C 646, and in required lengths and types. Fasteners used in exterior wall assemblies to meet ASTM C954 and be cadmium plated to prevent corrosion related to moisture.
   7. Anchorage devices: Power driven or powder actuated bolts, or as specifically accepted to transfer design load.
   8. Galvanized finish: Provide zinc coating to metal framing components complying with ASTM A 653 or ASTM A924 for minimum G 90 coating.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify installation conditions as satisfactory to receive work of this section. Do not install until any unsatisfactory conditions are corrected. Beginning work constitutes acceptance of conditions as satisfactory.

3.2 PREPARATION

A. Protect installed finish work of other trades and surfaces to preclude damage from work of this section. Maintain gas vapor barrier integrity.

B. Meet at project site with the installers of other work, including door frames, windows, mechanical and electrical work. Review areas of potential interference and conflicts. Coordinate layout and support provisions for interfacing work, particularly where wall finish materials change.

3.3 INSTALLATION

A. Erect the work in accordance with “Quality Assurance” provisions, “References”, Specifications, and manufacturer’s directions. Where these may be in conflict, the more stringent requirements govern.

B. Interior Steel Partition Framing:

   1. General::install as required to meet standards for Structural Panel Concrete Sub flooring.

   2. Supplementary framing:

a. Install supplementary framing, blocking, and backing wherever walls or equipment, or alarm monitors,.
b. Where type of supplementary support is not otherwise indicated, comply with the stud manufacturer's recommendations and industry standards for resulting weight and loading requirement.

3.4 CLEANING

A. Leave installations clean and free of residue of work of this section.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Refer to Section 01 74 19 for specific requirements.

END OF SECTION

06 12 13 FLOORING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Description of Work: Work of this Section includes, but is not limited to, the following:
   1. Framing.
   2. Fasteners.
   3. Underlayment and floor coverings.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. See Section 05 20 00, Metal Joists
B. See Section 05 40 00, Cold-Formed Metal Framing
C. See Section 06 10 00, Rough Carpentry
D. See Section 09 30 00, Tiling
E. See Section 09 60 00, Flooring

1.03 SYSTEM DESCRIPTION

USG Structural Panel floor system consists of steel joists, trusses or framing members and USG Structural Panel Concrete Subfloor installed with mechanical fasteners. USG Structural Panel Concrete Subfloor is a high-strength reinforced concrete panel typically for use in noncombustible construction, as required by the applicable building codes. Adhesives are not recommended, nor required.

1.04 REFERENCES

A. ICC-ES AC318 – Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels
B. ICC-ES AC319 – Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Floor Sheathing Panels Attached to Cold-Formed Steel Framing
C. ASTM A588/A588M – Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
D. ANSI/AISI S100 – North American Specification for the Design of Cold-Formed Steel Structural Members
E. ANSI/AISI S210 – North American Specification for Cold-Formed Steel Framing – Floor and Roof System Design
F. ANSI/AISI S214 – North American Specification for Cold-Formed Steel Framing – Truss Design
G. ANSI/AISI S230 – Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings
H. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
I. ASTM E119 – Standard Test Method for Fire Tests of Building Construction and Materials

J. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750° C

1.05 SYSTEM REQUIREMENTS

A. Performance Requirements: Fabricate and install systems as indicated:
   1. Floor Framing:
      a. Standard systems:
         i. Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 120 PSF (5.7 kPa) (Allowable) for framing spaced at 24" (610 mm) on center.
         ii. Floor framing shall be designed with a minimum deflection of L/360, where the Uniform Floor Load is 283 PSF (13.5 kPa) (Allowable) for framing spaced at 16" (406 mm) on center.
   2. Fasteners:
      a. Follow the selected fastener layout for Screw Patterns, for the design Diaphragm Loads as described in the current Progressive Engineering, Inc.'s Evaluation Report PER-13067. Available at www.per13067.com.
   3. Panel Layout:
      a. Follow the USG Structural Panel Concrete Subfloor application described in the current Progressive Engineering, Inc.'s Evaluation Report PER-13067.

B. Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL or tested according to ASTM E119 for type of construction shown.
***Note**: Fire-resistance ratings may require lighter gauge framing than that required for Shear- or Uniform-Loading. In this case, the gauge and joist depth must be selected by the strongest governing factor.*

C. Noncombustible Ratings: Where noncombustible assemblies are required, provide materials and application procedures identical to those tested according to ASTM E136, "Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 °C."
***Note**: Materials with modified ASTM E136-16 evaluations are not acceptable.*

1.06 DELIVERY, STORAGE AND HANDLING

A. Delivery:
   1. Deliver material to site promptly without undue exposure to weather.
   2. Deliver in manufacturer's unopened containers, pallets, or panels fully identified with name, brand, type and grade.

B. Storage:
   1. Store above ground in dry, ventilated space.
   2. Protect materials from soiling, exposure, and damage.

3. If stored outside, material shall be covered with waterproof tarps.
   ***Note**: If USG Structural Panels are frozen while stored outdoors, allow to thaw-out naturally. Do not use salts or fertilizers to defrost the panels or attempt to pry them apart.*
4. Panels must be stored over stable soil or other surface. Soil or surface must be able to carry the load of the stored pallet(s). Each 20-piece pallet weights 3500 lbs (1542 kg). It is recommended that the load carrying capacity of the floor or surface be verified before storing panels.
5. Pallets must not be stacked out of alignment by more than +/- 1/2" (13 mm) , measured on any side of the pallet.

1.09 PROJECT CONDITIONS

A. Environmental Requirements:
   1. When mechanically fastened, do not install USG Structural Panel Concrete Subfloor when ambient or conditioned temperature is below 0 °F (-18 °C).
   2. Prior to the application of finished flooring, USG Structural Panel Concrete Subfloor must be conditioned at the same temperature as required for the finished flooring for at least 48 hours.
   3. Do not apply finished flooring over USG Structural Panel Concrete Subfloor when wet, frozen or with surface frost.
      Note: If installed panels have snow or ice, do not use salts or defrosting agents, sand is recommended over slippery surfaces.

PART 2 – PRODUCTS

2.01 PRODUCTS AND MANUFACTURERS

A. Structural Concrete Panel: Listed products establish standard of quality and are manufactured by United States Gypsum Company (USG), Chicago, IL.

2.02 MATERIALS

A. Structural Concrete Panel:
   1. USG Structural Panel Concrete Subfloor, A noncombustible structural subfloor panel manufactured in accordance with Acceptance Criteria AC318.
      a. Panel Dimensions:
         i. Thickness: **3/4" (19 mm)**
         ii. Width: **4' (1220 mm)**
         iii. Lengths: **[8' (2440 mm)]** or **[6' (1829 mm)]** or **[6'-8" (2032 mm)]**
         iv. Long Edges: **Tongue and Groove**
      b. Panel Properties:

i. Density: **75 lb/ft^3 (1200 kg/m^3)** tested in accordance with ASTM C1185
ii. Weight: **5.0 lbs/ft^2 (24.4 kg/m^2)** tested in accordance with ASTM D1037 at a thickness of 3/4 inch (19 mm)
iii. Noncombustibility: **Pass** tested in accordance to ASTM E136
iv. Surface Burning Characteristics: **0 – Flame Spread / 0 Smoke Developed** tested in accordance with ASTM E84
v. Mold Resistance: **10** tested in accordance with ASTM D3273
0 tested in accordance with G21.

B. USG Structural Panel Concrete Subfloor Recommended Fasteners:
a. In accordance with PER-13067 (Subfloor) and PER-14076 (Roof Deck), PER-15092 (Foundation Wall), and ESR-1792 (Subfloor).
b. Use only fasteners recommended by USG. Go to www.USGSCP95.com for the current list of recommended fasteners.
c. Install using the recommended spacing and distance from the Ends (square cut) and Edges (tongue & groove) of the panel.
d. Any length of USG recommended fasteners may be used but do not use a larger size fastener unless specified by the structural engineer.
e. Seal panel joints with tape or caulking to provide barrier to contain underfloor gases.

C. Floor Coverings and Underlayment: Per finish schedule.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Examine substrates, adjoining construction and conditions under which Work is to be installed. Do not proceed with Work until unsatisfactory conditions are corrected.
B. Steel framing to receive the USG Structural Panel Concrete Subfloor shall be structurally sound, free from bows, twists or other malformations and in general compliance with local building code requirements. Damaged framing shall be replaced before installation of USG Structural Panel Concrete Subfloor.

3.02 GENERAL INSTALLATION REQUIREMENTS

A. Cold-Formed Steel Framing:
1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
2. The attachment flange or bearing edge for cold-formed steel must be a minimum 1-5/8" (41 mm) wide, 2” preferred, with at least 3/4" (19 mm) of the panel bearing on the supporting flange.

3. The size of the cold-formed steel framing flange required will vary based on the specified mil thickness/gauge and fastener selected.
4. Cold-formed steel framing thickness and size is always based on diaphragm capacity but must be a minimum 43 mil (18 gauge) and spaced no greater than 24" (610 mm) o.c. for up to 450 plf. When significant diaphragm capacity is required, 54 mil (16 gauge) may be required.
5. Joist bearing shall be provided at the foundation that is uniform and level.
6. Cold-formed steel joists shall be located directly over bearing studs or a header installed at the top of the bearing wall to distribute the load.
7. Joist framing must be perpendicular to rim joists.
8. On steel framing, a web stiffener shall be provided at reaction points and/or concentrated loads as specified in the contract documents. End blocking shall be provided where joist ends are not otherwise restrained from rotation.
9. Additional joists shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
10. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Subfloor.
11. Framing must be of good quality, free of bows, twists or other malformations.

B. Hot-Rolled Steel Framing:
   1. The floor joists and other floor framing components must be designed to meet the strength and deflection criteria specified in the contract documents.
   2. Framing shape and size is always based on diaphragm capacity.
   3. Hot-rolled steel framing shall have a 3” (76 mm) or larger bearing surface suitable for fastener insertion and panels must bear a minimum of 1 1/4” (32 mm) on the framing member.
   4. Framing bearing shall be provided at the foundation that is uniform and level.
   5. Joist framing must be perpendicular to support beams.
   6. Additional framing members shall be provided under parallel partitions and around all floor openings that interrupt one or more spanning members. Framing must be properly fastened to the supporting walls or structure.
   7. All blocking or bridging must be installed prior to the installation of USG Structural Panel Concrete Subfloor.
   8. Framing must be of good quality, free of bows, twists or other malformations.

C. USG Structural Panel Concrete Subfloor:
   1. This product may contain respirable crystalline silica. Refer to OSHA Rule 29 CFR 1926.1153 for specific details about limiting worker exposure to respirable silica.
   2. The panels shall be cut to size with a circular saw equipped with carbide-tipped cutting blade and a dry dust industrial HEPA vacuum collection device .for control of dust and silica. Wear

safety glasses and a NIOSH-approved dust mask when cutting the panel. Collected dust shall be disposed in a safe manner and in compliance with local, state and federal ordinances.

3. USG Structural Panel Concrete Subfloor shall be installed with the long edges (tongue & groove) perpendicular to the framing.
4. The fire, sound and structural ratings listed in the USG Structural Panel Fire and Acoustic Manual - SCP100 for the USG Structural Panel Concrete Subfloor system are based on fastener attachment only, no adhesives. www.USGSCP100.com.
5. Begin panel installation by snapping a line across the joists parallel to the rim joist at a distance equal to the width of the first panel being placed. Given that panel width is 48" (1220 mm), plan the layout so the first and last panel row width is a minimum of 24" (610 mm) wide. In the case where the row width is less than 24" (610 mm) wide, panels shall be blocked on all edges by framing (strapping is not sufficient).
6. Ensure that all supporting members are free of debris before placing panels. Place the cut edge or tongue along the rim joist. Place each panel across three or more supports [minimum two-span condition]. Less than full length panels at the end of a row may span a single framing opening. Cut panels to length as needed to ensure that the butt end of the panel is centered on the framing member. Install panels in a direction that ensures that the butt end falls over the open side of the joist. This will help keep adjacent ends in the same place.
7. USG Structural Panel Concrete Subfloor shall be fastened following the fastening schedule listed in the contract documents. Begin fastening at one end and fan out across the panel. Do not fasten all the corners first. After the installation of one complete row, begin the next row. Slide panels together so that the tongue of the panel being installed fits into the groove of the installed panel. If there is construction debris lodged inside the groove, do not force the tongue into the clogged groove. Clean the plugged groove with a stiff bristle brush to dislodge the trapped debris. Do not gap the panels. Install the second panel and all subsequent panels in a similar manner to complete the row. Install all rows in a running bond pattern so that end joints fall over the center of the framing members and are staggered by at least two supports from where the end joints fall in the adjacent rows. Less than full length panels at the end of a row may be staggered by a single support.
8. Penetrations in the panels should be made before installing the panel whenever possible. If a penetration is required after the panel is installed, set the depth of the saw blade to ensure that the framing is not scored. Support the ends and edges of any penetrations with framing if they are greater than 6" (153 mm) in any direction (refer to SCP14 Installation Guidelines).
9. Ensure panel is flush with supporting member, drive fasteners so the heads are flush with the surface of the board. Go to www.USGSCP95.com for the current list of recommended fasteners.
10. Construction Traffic Protection – prior to floor finishing, place minimum 3/8” (9.525 mm) thick plywood sheathing materials on the floor in high traffic areas over newly installed USG Structural Panel Concrete Subfloor (i.e. additional USG Structural Panels or plywood). ¼” plywood may be used in lieu of 3/8” material provided it is fastened at all four corners to prevent shifting and curling. Thicker protecting material may be required if heavier loads are expected or work is to be performed that may damage USG Structural Subfloor.

D. Underlayments

2. USG Fiberock® Underlayment (over USG Structural Panel Concrete Subfloor without sound mat):

1) Lay cut edges of USG Fiberock® Underlayment against the wall; only factory edges should be joined. Begin laying panels at one corner. Maintain 1/4" (6.35 mm) space between panels and perimeter walls. Stagger joints a minimum of 16" (406 mm) so that four panel corners never meet, and offset end and edge joints of panels a minimum of 12" - 16" (305 mm - 406 mm) from subfloor panel joints. Adjoin panel edges and ends lightly together. A maximum 1/32" (0.76 mm) gap is allowed.

2) The USG Fiberock® Underlayment must be bonded with modified thin set mortar

3) Staples (1/4" (6.35 mm) crown, 43 mil (18 ga.), and 1" (25.4 mm) legs) to be installed at 4" (102 mm) on center in the field and 1" (25.4 mm) on center along the perimeter of the USG Fiberock® panel. Set pneumatic tool pressure to drive fasteners flush or slightly below underlayment surface. To prevent fastener heads from telegraphing through resilient floor covering, do not countersink more than 1/16" (1.58 mm) below surface.

4) Use patching compound sparingly to fill wide joints, repair any surface voids and correct joint lippage (panel edge sitting above or below the floor plane). Carefully fill joints wider than 1/32" (0.76 mm) and any surface imperfections with only enough material to infill void - do not feather. Correct joint lip-page by applying patching compound to low side only and feathering to level. Allow compound to dry completely (90 min. minimum), then lightly sand or scrape, taking care not to scuff panel surface; use a flat blade to scrape away any excess material. Remove dust, dirt and debris from underlayment surface before application of floor covering.

E. Floor Finish:

1. Leftover material shall be removed from the job site.
2. Remove all foreign material from the floor surface and vacuum all dust from the surface.
3. Before the application of floor finish materials, ensure that all panels are properly fastened, with the fastener head driven flush or slightly below the surface of the panels. If required butt joints and T&G joints shall be filled with an elastomeric patching compound [*cement-based compounds, can crack*].
4. Direct application of bonded floor finishes to USG Structural Subfloor is not recommended.
5. Engineered Wood – Apply a building paper, No. 15 felt or equivalent, over USG Structural Panel Concrete Subfloor prior to applying wood flooring. For engineered wood flooring, use the moisture barrier recommended for the engineered wood flooring system specified in lieu of the building paper. Follow the wood flooring manufacturer’s installation instructions for applying wood flooring to plywood or OSB floor sheathing. USG Structural Panels must be kept dry and maintained in a conditioned space for a minimum of 30 days prior to installation of wood flooring.

6. Ceramic Tile – Ceramic tile should be installed over an underlayment panel or poured underlayment as described in §3.02.D of this specification. Apply Ceramic tile in accordance with ceramic tile manufacturer's instructions.
7. Carpet – For residential carpet & pad, apply tackless strips (designed for concrete application) for the installation of stretched carpet. Residential carpet and pad can be installed directly to USG Structural Panel Concrete Subfloor or to an underlayment. For all Carpet Tile, it is recommended to use an underlayment as described in §3.02.D of this specification.
8. Vinyl Flooring - An appropriate underlayment should be used as described in §3.02.D of this specification.
9. If USG Structural Panel Concrete Subfloor is left bare in extremely-light traffic areas, it is recommended that you seal the panels with a concrete sealer to seal the porous surface.

END OF SECTION

07 22 20 ROOF BOARD

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Fiberglass-mat faced gypsum roof boards for application directly under roof membrane systems.

1.02 REFERENCES

A. ASTM International (ASTM):
1. ASTM C209 Standard Test Method for Cell. Fiber Insulating Board
2. ASTM C472 Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete.
3. ASTM C473 Standard Test Methods for Physical Testing of Gypsum Panel Products.
4. ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
5. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
6. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
7. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
8. ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings
9. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C.
10. ASTM E661 Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads.

B. Underwriters Laboratories (UL): UL 790 Standard Test Methods for Fire Tests of Roof Coverings.

1.03 SUBMITTALS

A. Product Data and Installation Instructions: Submit manufacturer's product data including installation instructions and substrate preparation recommendations

B. Sample warranty: Submit a sample warranty identifying the terms and conditions of the warranty as herein specified.

1.04 QUALITY ASSURANCE

A. Inspection: Where applicable, allow for Owner's inspection and moisture testing and reporting prior to installation of roof boards.

B. Install roof board in mock-up.

1.05 DELIVERY, STORAGE, AND HANDLING

A. All components used in roofing systems, including DensDecko Prime Roof Boards, shall be protected from exposure to moisture before, during and after installation.

B. Remove any plastic packaging from roof boards immediately upon receipt of delivery. Failure to remove plastic packaging may result in entrapment of condensation or moisture, which may cause application problems that are not the responsibility of manufacturer

C. Any protective, plastic factory packaging that is used to wrap roof boards for shipment is intended to provide temporary protection from moisture exposure during transit only and is not intended to provide protection during storage after delivery.

D. Roof boards stored outside shall be stored level and off the ground and protected by a waterproof covering. Provide means for air circulation around and under stored bundles of DensDeckC› Prime Roof Boards. Use adequate supports to keep the bundles flat, level and dry.

E. Care should also be taken during installation to avoid the accumulation of moisture in the system. Roof boards shall be covered the same day as installed. Avoid application of roof boards during rain, heavy fog and any other conditions that may deposit moisture on the surface, and avoid the overuse of non-vented, direct-fired heaters during winter months.

1.06 FIELD CONDITIONS

A. Application standards where applicable are in accordance with design assembly specifics, system manufacturer requirements and the DensDeck@ Technical Guide.

B. Installed DensDeck@ Prime Roof Boards shall be dry, with free moisture content of less than 1% using a moisture meter that has been set to the gypsum scale, before applying adhesive, asphalt or membrane.

C. All components used in roofing systems, including DensDecko Roof Boards, shall be protected from exposure to moisture before, during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Georgia-Pacific Gypsum, LLC, products as specified herein.

2.02 COATED PRIME FIBERGLASS-MAT FACED GYPSUM ROOF BOARDS:

A. Fiberglass Mat Faced Gypsum Roof Board:
1. Acceptable Product: GP Gypsum, DensDecko Prime Roof Boards.
2. Thickness: 1/4 inch.
3. Width: 4 feet.
4. Length: [4 feet] [8 feet].
5. Weight:1.2 lb/sq. ft.
6. Surfacing: Primed Fiberglass Mat.
7. Flexural Strength, Parallel (ASTM C473): 40 Ibf, minimum.
8. Flute Span (ASTM E661): 2-5/8 inches.
9. Permeance (ASTM E96): Greater than 30 perms.
10. R-Value (ASTM C518): 0.28.
11. Water Absorption (ASTM C473): Less than 5 percent of weight.
12. Surface Water Absorption (ASTM C473): Nominal 1.0 grams.
13. Compressive Strength (Applicable Sections of ASTM C472): Nominal 900 pounds per square inch.
14. Flame Spread/ Smoke Development (ASTM E84): Not more than 0 Flame Spread, O Smoke Development
15. Combustibility (ASTM E136): Noncombustible
16. Fire resistance rating (UL 790 and ASTM E108): Class A
17. Mold Resistance (ASTM D3273): Scored a 10

PART 3 EXECUTION

3.01 INSTALLATION

A Apply only as many roof boards as can be covered by a roof membrane system in the same day.

B Board edges and ends shall be butted tightly together; do not gap edges or ends.

C. Adhesive Installation over Thermal Insulation, under Single-Ply Roofing Systems:
1. Stagger roof board end and edge joints minimum 12" over installed insulation layers.
2. Stagger roof board end and edge joints minimum 6".
3. Adhere roof boards over installed insulation using adhesive as recommended by roofing system manufacturer's product data.
4. Apply overall pressure to ensure full adhesion. Do not slide into place.

D. Concrete and Lightweight Concrete Roof Decks; new roofing and re-roofing: When roofing systems are installed on new poured concrete or light weight concrete decks or when re-roofing over an existing concrete deck, install a vapor barrier above the concrete to limit the migration of water from the concrete into the roof assembly. Consult the roofing system manufacturer or design authority for specific instructions for applying other products to roof boards.

3.02 PROTECTION

A. Protect roof board installations from damage and deterioration until the date of Substantial Completion.

END OF SECTION 07 22 20

SECTION 08 31 13 ACCESS DOORS AND FRAMES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes: fire resistive rated and non-rated access doors and panels with frames. Provide for access to controls, valves, traps, dampers, cleanouts, and similar items requiring maintenance behind inaccessible finished surfaces.

B. The work of this Section is based on Unit Prices. Refer to Part 2.

C. The Owner has established sustainability goals for this project, and this Section contains specific information and requirements for compliance. Refer to Section 01 81 15 for specific requirements.

D. Related Sections:
1. Section 03 10 00 - Concrete Forming and Accessories.
2. Section 09 90 00 - Painting and Coating.
3. Division 22 - Plumbing.
4. Division 23 - Heating, Ventilating, and Air Conditioning.
5. Division 26 - Electrical.

1.2 REFERENCES

A. ASTM International: ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. Intertek Testing Services (Warnock Hersey Listed): WH - Certification Listings.

C. National Fire Protection Association: NFPA 80 - Standard for Fire Doors, Fire Windows.

D. Underwriters Laboratories Inc.: UL - Building Materials Directory.

1.3 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Product Data: Submit literature indicating sizes, types, finishes, hardware, scheduled locations, fire resistance listings, and details of adjoining Work.

C. Manufacturer's Installation Instructions: Submit installation requirements and rough-in dimensions.

D. VOC Limits: Include manufacturer’s literature for each adhesive, coating and sealant used in this Section identifying VOC limits and chemical components.

1.4 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of access units.

1.5 QUALITY ASSURANCE

A. Fire Resistance Ratings: Where indicated as fire rated provide assemblies from manufacturers listed in UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

B. Fire Rated Horizontal and Vertical Access Doors: Rating to match wall or ceiling assembly into which door is placed. Tested Rating: Determined in accordance with ASTM E119.

C. Attach label from agency approved by authority having jurisdiction to identify each fire rated access door.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified with minimum three years experience, and with service facilities within 300 miles of Project.

1.7 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Requirements for coordination.

B. Coordinate Work with work requiring controls, valves, traps, dampers, cleanouts, and similar items requiring operation being located behind finished surfaces.

PART 2 PRODUCTS

2.1 ACCESS DOORS AND PANELS

A. Manufacturers:
1. Acudor Products, Inc.
2. Bilco Co.
3. Babcock-Davis
4. Nystrom Products Co.
5. Milcor LTD, Partnership.
6. Substitutions: Section 01 25 13 – Product Substitution Procedures.

B. Flush Framed Access Doors (Type 1): Frames and nominal 1 inch wide exposed flanges of 16 gage steel and door panels of 14 gage steel; latching door with standard non-keyed cam latch.

C. Flush Framed Access Doors (Type 2): Frames and nominal 1 inch wide exposed flanges of 16 gage steel and door panels of 14 gage steel; latching door with keyed standard cam lock.

D. Gypsum Board Access Doors (Type 3): Frames and nominal 1 inch wide flanges of 16 gage steel and door panels of 14 gage steel. Design flanges to be concealed by gypsum board joint finishing compound specified in Section 09 21 16. Latching door with keyed standard cam lock.

E. Fire Rated Access Doors (Type 4): Frames and nominal 1 inch wide exposed flanges of minimum 16 gage steel and door panels of 20 gage steel. Provide self-closing and latching doors with keyed standard cam lock.

F. Gypsum Board Fire Rated Access Doors (Type 5): 16 gage steel frames with minimum 22 gage galvanized steel drywall bead flanges and door panels of 20 gage steel. Design flanges to be concealed by gypsum board joint finishing compound specified in Section 09 21 16. Provide self-closing and latching doors with keyed standard cam lock.

G. Locks: Manufacturer's standard cam locks with Schlage core and key. All access doors on this project to be keyed to one key.

H. Live/Work floor access door (Type 6): ACUDOR FT-804, aluminum door and frame; provide rubber seals all sides of door frame; size 24” x 24”; locate over mechanical fans and or connections and methane duct detectors.

2.2 FABRICATION

A. Fabricate units of continuous welded construction; weld, fill, and grind joints to assure flush and square unit.

B. Wall and Ceiling Access Door and Panel Hardware:
   1. Hinge: Standard continuous or concealed spring pin type, 175-degree steel hinges.
   2. Lock: Self-latching lock. Removable wrench lift handle.

C. Size Variations: Obtain acceptance of manufacturer’s standard size units that vary slightly from sizes shown or scheduled.

2.3 LOCATIONS AND NUMBER

A. Coordinate with mechanical and electrical trades. Locate access doors in walls or ceilings wherever components of work requiring service or maintenance are located behind finished surfaces. Such components include, but are not limited to, plumbing valves, trap primers, control devices, electrical grounds or bonds, and the like. All locations to be reviewed with Architect prior to installation.

B. Size of access doors to suit application, but not smaller than 12" x 12".

C. Unit Price: Refer to Section 01 20 00 for Unit Price procedures.

2.4 SHOP FINISHING

A. Base Metal Protection: Prime coat units with baked on primer.

B. Finish: Two coats baked enamel, color as selected by Architect from standard line.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify rough openings for access doors and panels are correctly sized and located.

3.2 INSTALLATION

A. Secure frames rigidly in place, plumb and level in opening, with plane of door and panel face aligned with adjacent finished surfaces. Set concealed frame type units flush with adjacent finished surfaces.

B. Position unit to provide convenient access to concealed work requiring access.

C. Install fire rated units in accordance with NFPA 80 and requirements for fire listing.

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Refer to Section 01 74 19 for specific requirements.

END OF SECTION

SECTION 23 34 13

FANS AND VENTS

PART 1 - GENERAL

1.1 APPLICABLE REQUIREMENTS

A. All work to be furnished and installed under this section shall comply with all the requirements of General Conditions, Supplemental Conditions, Division 01 - General Requirements, Section 230500 - Basic HVAC Materials and Methods, and other Sections in Division 23 specified herein.

1.2 SCOPE

A. All work to be furnished and installed under this Section shall comply with all the requirements of Division 1, and shall include, but not necessarily be limited to, the following:
   1. Small Cabinet Fans (Ceiling Mounted and Inline)
   2. Large Belt Driven Cabinet Fans
   3. Tubular Fans
      a. In-line tubular or square centrifugal fans.
   4. Gravity roof vents

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Section 230500: Basic HVAC Materials and Methods

B. Section 230593: Testing, Adjusting and Balancing

C. Section 230713: Duct Insulation

D. Section 230716: Equipment Insulation

E. Section 233113: Air Distribution

F. Division 26: Electrical

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Provide air handling units that are the standard product of an equipment manufacturer regularly engaged in the production of such units who issues complete catalog information on such products. Units shall not be fabricated by the Contractor.

B. Certifications: Provide certified ratings of units based on tests performed in accordance with ARI 430, "Central-Station Air Handling Units."

C. Codes and Standards: Provide air handling units conforming to the requirements of the latest addition of the following:
   1. Air Movement and Control Association (AMCA):
      a. 99 Standards Handbook
      b. 210 Laboratory Methods of Testing Fans for Rating [Unit shall bear AMCA Certified Rating Seal]

c. 300 Reverberant Room Method for Sound Testing of Fans [Unit shall bear AMCA Certified Rating Seal]
d. 301 Methods for Calculating Fan Sound Ratings from Laboratory Test Data
e. 500 Test Method for Louvers, Dampers, and Shutters

2. American National Standards Institute (ANSI):
   a. 9 Load Ratings and Fatigue Life for Ball Bearings
   b. 11 Load Ratings and Fatigue Life for Roller Bearings
   c. 900 Test Performance of Air Filter Units
3. Air-Conditioning, Heating and Refrigeration Institute (AHRI):
   a. 350 Sound Rating of Non-Ducted Indoor Air-Conditioning Equipment
   b. 410 Forced-Circulation Air-Cooling and Air-Heating Coils
   c. 430 Central-Station Air-Handling Units
   d. 440 Room Fan-Coil Air-Conditioners
4. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   a. 15 Safety Code for Mechanical Refrigeration
5. National Electrical Manufacturers Association (NEMA): Except for motors, provide electrical components required as part of air handling units, which comply with NEMA Standards.
6. National Fire Protection Association (NFPA): Provide air handling unit internal insulation having flame spread rating not higher than 25 and smoke developed rating not higher than 50:
   a. 70 National Electrical Code
   b. 90A Standard for the Installation of Air Conditioning and Ventilating Systems
   c. 90B Standard for the Installation of Warm Air Heating and Air Conditioning Systems
7. Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA): Comply with applicable SMACNA standards including "HVAC Duct Construction Standards - Metal and Flexible."
8. Underwriters Laboratories, Inc. (UL): Except for motors, provide electrical components required as part of air handling units, which have been listed and labeled by UL.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for air handling units showing dimensions, weights, capacities, ratings, fan performance with operating point clearly indicated, motor electrical characteristics, and finishes of materials, installation instructions, sound and vibration test report, and bearing life calculations.

B. Shop Drawings: Submit shop drawings showing unit dimensions, weight loadings, required clearances, field connection details and methods of support. Draw to a scale of 1/4” per one foot. Include field fabricated mixing boxes, dampers and duct connections.

C. Maintenance Data: Submit maintenance instructions, including instructions for lubrication, filter replacement, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in operating and maintenance manuals.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver unit to the site in containers with manufacturer's stamp or label affixed.

B. Store and protect equipment and products against dirt, water, chemical, and mechanical damage. Do not install damaged unit - remove from project site.

1.8 SAFETY PROVISIONS

A. Provide all open drives and fan wheels subject to maintenance and potential entanglement with protective guards or screens meeting OSHA requirements.

1.9 WARRANTY

A. Provide minimum one-year warranty from date of Substantial Completion, including all parts, material, labor and travel.

B. Refer to Section 230500 for additional warranty and Substantial Completion requirements.

PART 2 - PRODUCTS

2.1 GENERAL FAN REQUIREMENTS

A. Construction, Rating and Testing: Provide fans constructed and factory tested in accordance with the Air Moving and Conditioning Association (AMCA). All fan wheels shall be statically and dynamically balanced. Size, capacity and features as indicated on the Drawings. Provide extended bearing lubrication fittings where necessary to assure accessibility of all lubrication points.

B. Motors and Drives: Provide premium efficiency drip-proof motors with temperature rise not greater than 40°C above ambient temperature or electronically commutated (EC) motors. Belt drive assemblies, where applicable, shall be capable of 150% of the motor rated horsepower on one less than the total number of belts, for belt drives with two or more belts.

C. Accessories: Provide, as indicated on the Drawings and specified in other paragraphs of this Section, all related accessories to match the fan section, including access sections, diffusion sections, transition sections, flexible connections, vibration eliminators, and belt guards.

D. Submissions: For shop drawings include complete dimensional and physical data, CFM, SP, HP, discharge arrangement, rotation, class, base details, and fan curves.

2.2 SMALL CABINET FANS (CEILING MOUNTED AND INLINE CABINET)

A. Ceiling mounted exhaust fans:
   1. Manufacturer: Greenheck, Panasonic, Cook, Penn, Carnes, Twin City, Air King or equal.
   2. General: Provide centrifugal direct drive type ceiling exhaust fan. The fan wheel(s) shall be of the forward curved centrifugal type and dynamically balanced.
   3. Noise Data: Provide sone or octave band noise values at the required air delivery.
      a. 0.3 sones at 80 cfm to 112 cfm
   4. Fan Housing: The fan housing shall be constructed of heavy gauge galvanized steel. The housing interior shall be lined with 1/2- inch acoustical insulation. The outlet duct collar shall include a backdraft damper on all sizes and shall be spring loaded on larger units above 200 cfm.
      a. Integral backdraft damper shall be totally shatterproof with no metal-to-metal contact.
      b. Entire fan, motor and wheel assembly shall be easily removable without disturbing the housing.
      c. Outlet shall be adaptable for horizontal or vertical discharge.
   5. Motor speeds shall not exceed 1100 RPM and all fan motors shall be suitably grounded and mounted on rubber-in-shear vibration isolators.
   6. Grille: For 300 cfm and smaller fans the grille shall be constructed of high impact polystyrene and for larger sizes the grille shall be constructed of aluminum. Grilles shall be non-yellowing.
   7. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type. The motor shall be mounted on vibration isolators.
   8. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance and shall be UL/cUL Listed.

2.3 LARGE BELT DRIVEN CABINET FANS

A. Manufacturer: Greenheck, Cook, Penn, Carnes, Twin City or approved equal.

B. Duct mounted supply, exhaust or return fans shall be of the centrifugal, belt driven in-line type.

C. Housing: The fan housing shall be of the rectangular design constructed of heavy gauge galvanized steel and shall include rectangular duct mounting collars. A hinged or removable panel shall be provided in the fan cabinet of sufficient size to permit access for service to all of the fan’s internal components without dismantling the cabinet.

D. The fan wheel shall be of the galvanized steel, forward curved, centrifugal type. Wheels shall be dynamically and statically balanced. The wheel shaft shall be ground and polished steel mounted in permanently sealed pillow block bearings.

E. Drives shall be sized for a minimum of 150% of driven horsepower. Pulleys shall be of the machined cast iron type, keyed and securely attached to the wheel and motor shafts. The motor pulleys shall be adjustable for final system balancing.

F. Motors shall be of the heavy-duty type with permanently sealed ball bearings.

G. All fans shall bear the AMCA Certified Ratings Seal for air performance.

H. Options:
1. Discharge position: Top Horizontal (TH) or Upblast (UB)
2. Filter Boxes: Fixed or sliding drawer.
3. Mixing Boxes:
   a. Inlet without damper(s).
   b. Inlets with damper(s).
4. Side Access Doors– Specify left or right side of cabinet as viewed from discharge end.
5. Insulated Housing
6. Disconnect

2.4 IN-LINE OR TUBULAR FANS

A. Inline Tubular or Square Centrifugal Fans
1. Manufacturer: Greenheck, Carnes, Cook, Penn, Twin City or approved equal.
2. Drive:
   a. Belt Drive: Duct mounted supply, exhaust or return fans shall be of the centrifugal belt driven in-line type.
3. Housing: The fan housing shall be of the square or cylindrical design as scheduled, constructed of heavy gauge galvanized steel or aluminum and shall include duct mounting collars. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
4. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
5. Motors shall be heavy-duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Fan motor shall be premium efficiency, open drip-proof foot mounted, continuous duty and suitable for operation in either vertical or horizontal or angular position. Provide VFD compatible motors where indicated on the drawings.
6. Motors and Drive Access:
   a. Belt Driven: Motor and drives shall be mounted out of the airstream. Motors shall be readily accessible for maintenance. Precision ground and polished fan shafts shall be mounted in

permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum L10 life in excess of 100,000 hours (L50 life at 500,000 hours) at maximum cataloged operating speed. Drives shall be sized for a minimum of 150% if driven horsepower. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts. Motor pulleys shall be adjustable for final system balancing.

7. A NEMA 1 disconnect switch shall be provided as standard, except with explosion resistant motors, where disconnects are optional. Factory wiring shall be provided from motor to the handy box.
8. All fans shall bear the AMCA Certified Ratings Seal for both sound and air performance. The fan manufacturer must furnish published sound power level data based on actual tests on the fan sizes being furnished, and conducted in accordance with current AMCA standards. Such data is to define Sound Power Levels (PWL), re: 10-12 watts for each of the eight (8) frequency bands. Manufacturers furnishing estimate data will not be approved.
9. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

2.5 GRAVITY VENTILATOR

A. Refer to drawings for locations and sizes.

B. Manufacturer: Greenheck FGR, Cook, Penn or equal.

C. Type:Gravity ventilator.

D. Construction: 0.080 gauge extruded aluminum tiers welded to 8-gauge aluminum support frame. Hood constructed of minimum 0.063 aluminum and provided with a layer of anti-condensate coating. Base to be continuously welded curb cap corners. Birdscreen constructed of 1/2" galvanized mesh shall be mounted across the opening.

E. Sizing: Pressure drop less than or equal to 0.09"w.g.

F. Required Accessories: Prefab roof curb, bird screen, and removable hood.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Coordinate motor starters with Division 26 and controls contractor.

B. Install in accordance with manufacturer's instructions.

C. Examine site to verify if site is ready to receive work. Provide layout drawings of air handlers and fan locations to electrical installer.

D. Install unit on vibration isolators.

E. Install 3" flexible duct connection at inlets and outlets of units.

F. Control installers shall install all wiring associated with control signals into the fan starters.

G. Electrical installer shall install all line voltage power wiring and conduit. Coordinate with Division 26 work

3.2 MANUFACTURER'S START-UP SERVICES

A. The manufacturer shall provide start-up service in the form of a factory trained service technician. The service technician shall verify correct installation, verify unit mounting, verify fan rotation, verify spring isolator adjustments, verify control wiring, verify power wiring, start-up the fans, and check for proper operation. The service technician shall provide final adjustments to meet the specified performance requirements. Fully staffed parts and service personnel shall be within four-hours travel from the job site.

END OF SECTION

EV 300

Energy Recovery Ventilator
Standard

2100 HVI CERTIFIED

c UL us LISTED DUCTED HEAT RECOVERY VENTILATOR 89S5

INDOOR UNIT

Download specification at:
renewaire.com/specifications

SPECIFICATIONS

Ventilation Type:
Static plate, heat and humidity transfer

Typical Airflow Range: 150-300 CFM

Unit is HVI Tested/Certified per CSA C439 Protocol: Using one L-100 G5 Core

Standard Features:
White painted cabinet
Line-cord power supply
Low-voltage circuit for controls
Unit may be mounted in any orientation
Cross-core differential pressure ports

Controls:
Onboard 24 VAC transformer/relay package with switched dry contacts

Filters:
Total qty. 2, MERV 8, spun-polyester media: 10 1/2" x 21 3/4" x 1"

Unit Dimensions & Weight:
33 3/4" L x 24" W x 20" H
72 lbs.

Max. Shipping Dimensions & Weight (on pallet):
34" L x 44" W x 34" H
115 lbs.

Motor(s):
Qty. 1, Double-shaft standard motor

Accessories:
Backdraft damper 6", 8"
Automatic balancing damper 4", 5", 6"
Louvered wall vent 8" - taupe vinyl, galvanized, paintable galvanneal
Louvered wall vent with 8" round duct connection - 12" W x 8" H
Carbon dioxide sensor/control - wall mount (CO2-W)
IAQ sensor - wall mount (IAQ-W)
Motion occupancy sensor/control - ceiling mount (MC-C), wall mount (MC-W)
Percentage timer control (PTL)
Push-button point-of-use controls (PBL), PTL req'd.
Percentage timer control with furnace interlock (FM)
MERV 13 filter - OA airstream
Electric duct heater - RH series (1-11.5 kW); designed for indoor ductwork installation only

Note: Indirect Gas-Fired Duct Furnace is not available on the EV300.

ELECTRICAL DATA

HP	Volts	HZ	Phase	Input Watts	FLA
0.2	120	60	Single	315 @ 297 CFM	3.3

UNIT PERFORMANCE

Airflow CFM	ESP in H_2O
170	1.0
191	0.9
215	0.8
256	0.7
277	0.6
295	0.5
311	0.4

CORE PERFORMANCE

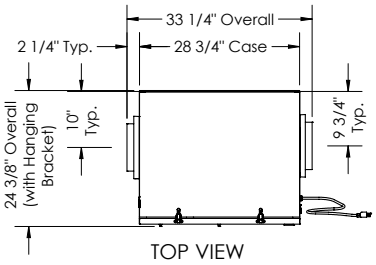
Airflow CFM	Temp EFF%	Total EFF% Winter/Summer*
170	78	73/59
191	77	71/57
215	75	69/55
256	73	66/51
277	71	65/49
295	70	63/47
311	69	62/46

Note: These are core-only ratings and are not HVI certified.
HVI ratings apply to complete units only.
See HVI certification ratings on pg. 24 of Single/Multi-Family Catalog.

UNIT DIMENSIONS

AIRFLOW ORIENTATION
Available as shown in dimension drawing.

UNIT MOUNTING & APPLICATION
Can be mounted in any orientation. RA/EA airstream can be switched with OA/FA airstream.



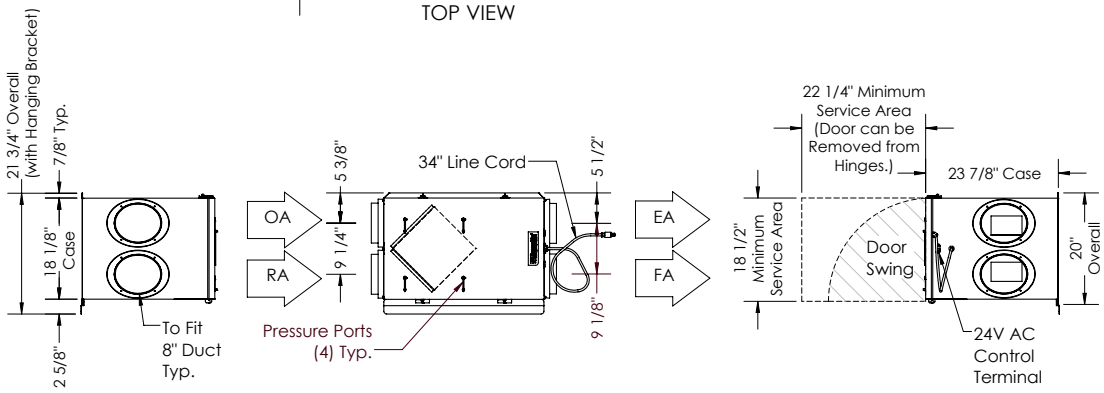
TOP VIEW

ABBREVIATIONS
EA: Exhaust Air to outside
OA: Outside Air intake
RA: Room Air to be exhausted
FA: Fresh Air to inside

INSTALLATION ORIENTATION
Unit may be installed in any orientation.

NOTE
1.UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE ROUNDED TO THE NEAREST EIGHTH OF AN INCH.

2.SPECIFICATIONS MAY BE SUBJECT TO CHANGE WITHOUT NOTICE.



LEFT VIEW FRONT VIEW RIGHT VIEW

Specifications may be subject to change without notice.

RenewAire Energy Recovery Ventilation

VENTERGY® SERIES FANS

MPVS100 & MPVS120

Multi-Port Exhaust Ventilators

PRODUCT SPECIFICATIONS & TECHNICAL DATA

VENTERGY® SERIES FANS

Ventergy® Series Multi-Port Ventilators (MPVS) are highly versatile, continuous-duty rated fan units for residential and light commercial applications. The MPVS100 meets ENERGY STAR efficiency criteria for low-energy consumption. The most popular use is central, continuous exhaust ventilation of bathrooms, kitchens, laundry rooms, and other rooms where humidity is a controlling factor since the fan has a single exhaust discharge duct directly to the outdoors.

The principal advantage of the MPVS is the assurance of controlled indoor air quality ventilation and the elimination of standard noisy bath fans, with the benefits of reduced noise and fewer penetrations to the exterior of the building. With the increasingly tight construction of energy-efficient buildings, there is a growing need for mechanical ventilation for indoor air quality. These fans are designed to serve this purpose by providing effective bathroom ventilation with the ability to run intermittently or continuously. The quiet, energy-efficient, permanent-split-capacitor type of external-rotor motor has permanently sealed bearings that provide many years of maintenance-free performance.

CONSTRUCTION

The MPVS is constructed of heavy-gauge galvanized steel to prevent corrosion caused by moisture. The cabinet is internally lined with acoustic, closed-cell foam insulation that acts as a vapor barrier. This allows installation directly above living spaces or in unheated plenum spaces without concern for noise or condensation.

FAN AND MOTOR

The fan motor is an energy-efficient, permanent-split-capacitor type of external-rotor design. Totally sealed to protect against moisture and contaminants, it is approved for removing steam and moisture from kitchen and bath areas. The motor incorporates permanently lubricated and sealed bearings and automatic-reset thermal-overload protection. It is designed and certified for continuous duty or intermittent operation.

The fan uses a backward-inclined impeller design that prevents dust from collecting on the blades. Each fan is statically and dynamically balanced in the factory to eliminate vibration and ensure quiet operation. The entire motor and fan assembly is mounted on a drop-down hinged access panel for simple service and inspection, and it can be removed from the fan without disassembling the duct connections.

CONTROLS

The fans can be operated manually or automatically by a programmable timer or dehumidistat. They may also be operated in conjunction with a variable speed control.

LOCATING AND INSTALLING THE FAN

The compact dimensions and versatile mounting options permit installation above drop ceilings, between ceiling joists, or within a small soffit location. The fan can be installed horizontally or vertically.

ACCESSORIES

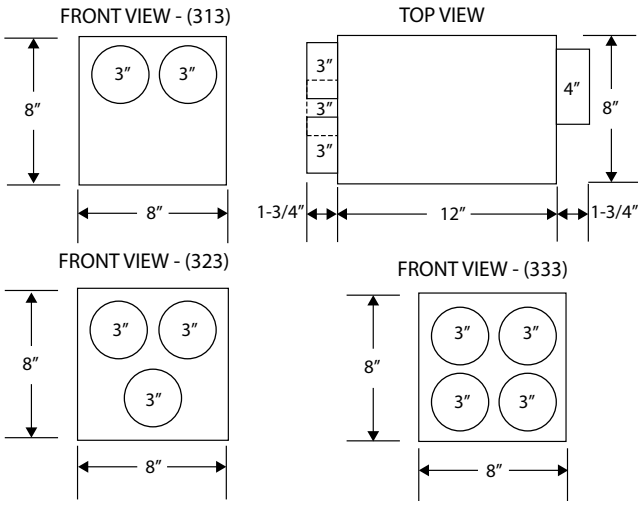
Accessories are available to accommodate two-to-six bathrooms. Accessories are included only when ordered as a Ventergy® Series IAQ-MPVS Multi-Port Ventilator Kit.

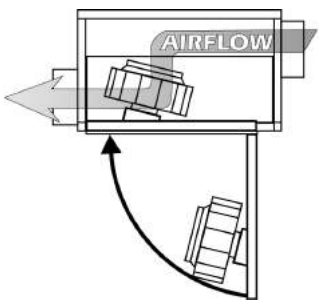
Airflow rates can be automatically set with pre-calibrated ALDES Constant Airflow Regulators (CAR Classic). The passive control element in each duct run inflates or deflates automatically in response to system pressure to maintain constant airflow. CAR Classics are sold separately or provided with kits.

PERFORMANCE

Fan airflow and energy performance shall be tested in accordance with HVI procedures.

DIMENSIONS & DUCT CONFIGURATIONS 313, 323, 333





Drop-down hinged access panel for simple service and inspection

Performance

ELECTRICAL AND AIRFLOW PERFORMANCE*								
Model	Watts at 0.2" Ps	CFM vs. Static Pressure						ENERGY STAR Certified
		0"	0.2"	0.4"	0.6"	0.8"	1.0"	
MPVS100	20.8	108	88	68	48	25	--	✓
MPVS120	37.5	143	128	111	95	74	45	

*Certified airflow rating at 0.2" w.g. is derated from actual test results per HVI Certification procedure 920.
The HVI Certified Rate for MPVS100 = 80 CFM, MPVS120 = 120 CFM.
NOTE: Performance shown does not reflect use of optional balancing devices.

ELECTRICAL DATA
MPVS100: 115 V, 60 Hz, 21 W, 0.19 A, 2500 RPM
MPVS120: 115 V, 60 Hz, 34 W, 0.29 A, 3135 RPM
Above ratings are intended for sizing electrical wiring only. Actual consumption will be lower.

ENERGY STAR
*MPVS100 only

Intertek

2100 HVI CERTIFIED

Typical Specification

MULTI-PORT EXHAUST FAN
American ALDES Ventilation Corporation, Florida (1-800-255-7749). ALDES model MPVS100 or MPVS120.

GENERAL
The fan shall be continuous-duty type with a backward-inclined centrifugal blower housed in a multi-port enclosure specifically designed for residential and commercial use. The fan shall be safety tested per UL standards and bear the agency listing certified mark, and be approved for use over cooking areas and tub/shower enclosures when used with GFCI branch circuiting.

CONSTRUCTION
The housing shall be of a minimum 22-gauge steel with a G90 galvanized coating or baked enamel paint finish. All interior surfaces of the housing shall be lined with non-porous, closed-cell foam insulation to allow installation above ceilings and in unheated spaces without concern for condensation or absorption of water. The unit shall not exceed 8" in total height and 8" in width to allow mounting within ceiling/floor joist spaces. The blower shall be a centrifugal-type, external-rotor motor with backward-inclined impeller blades. The motor and blower assembly shall be mounted on a drop-down hinged access panel so as to permit removal from the housing without disassembly of the ducting connections. The intake duct connections shall be dimensioned so as to accept constant airflow regulators with a secure fit. The intake duct dimensions shall be nominal 3" round. The discharge duct dimension shall be nominal 4" round. The fan housing and intake duct collar(s) shall be designed to allow removal and repositioning in the field to accommodate different installation requirements. Mounting brackets shall be provided for attachment to the fan housing, allowing vertical or horizontal installations.

MOTOR
The motor shall be direct-drive, external-rotor, high-efficiency, PSC type with permanently lubricated and sealed ball bearings. The motor shall have automatic thermal-overload protection and must be totally sealed to protect against contaminants and moisture. Naturally vented air-over motors are not acceptable.

ELECTRICAL
The fan will operate on 115V, 50/60Hz, and single-phase current. The motor will be listed for use with a solid-state speed control.

CONSTANT AIRFLOW REGULATORS
When specified, each return air intake collar shall accommodate an integral constant airflow control device that operates on duct system pressures and maintains specified airflow rates over a range of 0.2" to 0.8" Ps w.g. Devices shall be calibrated at the factory to the specified airflow rates. The devices shall be field installed in the appropriate duct connections. The device shall not exhaust any air to the outside during operation.

WARRANTY

The entire unit is guaranteed for three (3) years, from date of shipment, against all manufacturing defects, provided the material has been installed and operated per manufacturer's instructions and under normal conditions. Warranty is limited to the repair or replacement of the material upon its return freight paid to our factory. This warranty is not transferable and is limited to the original end user.

American ALDES Ventilation Corporation • 4521 19th Street Court East, Suite 104 • Bradenton, FL 34203 – USA
941.351.3441 • 800.255.7749 • 941.351.3442 (fax) • info@americanaldes.com • www.aldes.us

VENTERGY® SERIES FANS

VS Series

In-line Ventilators

PRODUCT SPECIFICATIONS & TECHNICAL DATA

VENTERGY® SERIES FANS

Ventergy® Series In-line Ventilator Fans represent years of engineering development to combine the energy efficiency and sound performance of a forward-curved fan with the durability and pressure characteristics of a backward-inclined impeller fan.

GENERAL

VS Series In-line Ventilators are highly versatile, continuous-duty rated fans for residential and light commercial applications. The VS4, VS6, and VS6 MAX meet ENERGY STAR efficiency criteria for low energy consumption. The most popular use is exhaust ventilation of bathrooms, kitchens, laundry rooms, and garages with the principal advantage of eliminating the high noise levels found in traditional fans. With the increasingly tight construction of energy-efficient buildings, there is a growing need for mechanical ventilation for indoor air quality. These fans are designed to serve this purpose by providing effective bathroom ventilation with a provision to run the fan intermittently or continuously. Quiet, continuous-duty, energy-efficient, external-rotor motors with permanently sealed bearings provide many years of maintenance-free performance.

CONSTRUCTION

VS Series fans are constructed of heavy-gauge galvanized steel to prevent corrosion caused by moisture. The cabinet is internally lined with an acoustic, closed-cell foam insulation that acts as a vapor barrier. This allows installation directly above living spaces or in unheated plenums without concern for noise or condensation.

FAN AND MOTOR

The fan motor is an energy-efficient, permanent split-capacitor type of external-rotor design. Totally sealed to protect against moisture and contaminants, it is approved for use to remove steam and moisture in kitchen and bath areas. The motor incorporates permanently lubricated and sealed bearings and automatic-reset thermal-overload protection. It is designed and certified for continuous duty or intermittent operation.

The fan uses a backward-inclined impeller design that minimizes dust from collecting on the blades. Each fan is statically and dynamically balanced at the factory to eliminate vibration and ensure quiet operation. The entire motor and fan assembly is mounted on a drop-down hinged access panel for simple service and inspection, and it can be removed from the fan without disassembling the duct connections.

FAN CONTROLS

The fan can be operated manually or automatically by a programmable timer, dehumidistat, or other appropriate electronic switch device. The fan may also be operated in conjunction with a variable-speed control.

LOCATING AND INSTALLING THE FAN

The compact dimensions and versatile mounting options permit installation above drop ceilings, between ceiling joists, or within a small soffit location. The fan can be installed horizontally or vertically.

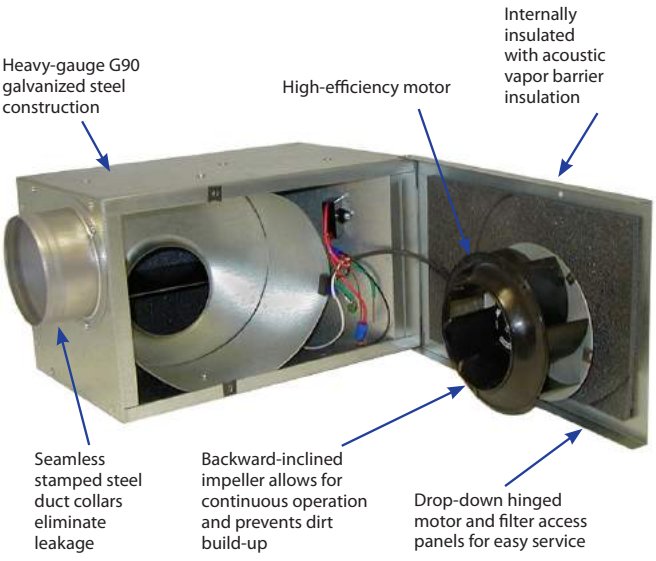
ACCESSORIES

Accessories are available to accommodate one or two bathrooms. Accessories are included only when ordered as a Single-Port Bath Fan Kit (SBFK).

PERFORMANCE

Fan airflow and energy performance are tested in accordance with HVI procedures.

VS SERIES COMPONENTS



Performance & Dimensions

ELECTRICAL AND AIRFLOW PERFORMANCE*											
Model	Watts at 0.2" Ps	CFM vs. Static Pressure									ENERGY STAR Certified
		0"	0.2"	0.4"	0.6"	0.8"	1.0"	1.2"	1.4"	1.6"	
VS4	19.6	104	80	60	37	13	--	--	--	--	✓
VS4 MAX	38.1	138	120	106	87	66	39	--	--	--	
VS6	40.1	220	170	141	105	78	46	19	--	--	✓
VS6 MAX	63.3	287	261	234	205	178	151	120	89	38	✓

*Certified airflow rating at 0.2" w.g. is derated from actual test results per HVI Certification procedure 920.
The HVI Certified Rate for VS4 = 80 CFM, VS4 MAX = 120 CFM, VS6 = 170 CFM, VS6 MAX = 260 CFM.
NOTE: Performance shown does not reflect use of optional balancing devices.

ELECTRICAL DATA

VS4: 115 V, 60 Hz, 20 W, 0.17 A, 2324 RPM
VS4 MAX: 115 V, 60 Hz, 34 W, 0.29 A, 3135 RPM
VS6: 115 V, 60 Hz, 41 W, 0.34 A, 2200 RPM
VS6 MAX: 115 V, 60 Hz, 59 W, 0.53 A, 2960 RPM

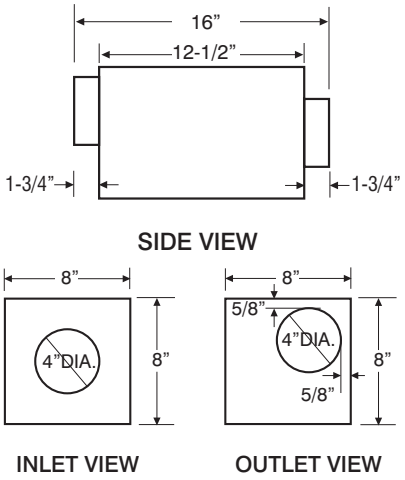
Above ratings are intended for sizing electrical wiring only. Actual consumption will be lower.

ENERGY STAR
*VS4, VS6, and VS6 MAX only

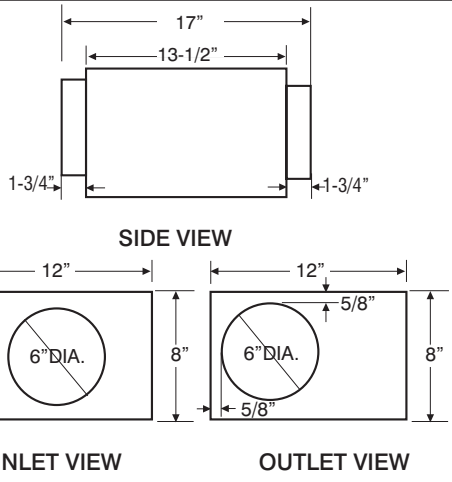
Intertek

2100 HVI CERTIFIED

VS4 and VS4 MAX DIMENSIONS



VS6 and VS6 MAX DIMENSIONS



Typical Specification

VENTILATOR FAN
American ALDES Ventilation Corporation, Florida (1-800-255-7749). ALDES model VS4, VS4 MAX, VS6, or VS6 MAX.

GENERAL
The fan shall be continuous-duty type with a backward-inclined centrifugal blower housed in an insulated enclosure specifically designed for residential and commercial use. The fan shall be safety tested per UL standards and bear the agency listing certified mark, and be approved for use over cooking areas and tub/shower enclosures when used with GFCI branch circuiting. Fan models VS4, VS6, and VS6 MAX must meet ENERGY STAR performance criteria for energy efficiency and bear the ENERGY STAR mark.

CONSTRUCTION
The housing shall be of a minimum 22-gauge steel with a G90 galvanized coating or baked enamel paint finish. All interior surfaces of the housing shall be lined with non-porous, closed-cell foam insulation to allow installation above ceilings and in unheated spaces without concern for condensation or absorption of water. The unit shall not exceed 8" in total height and 12” in width to allow mounting within ceiling/floor joist spaces. The blower shall be external-rotor motor of centrifugal type with backward-inclined impeller blades. The motor and blower assembly shall be mounted on a drop-down hinged access panel so as to permit removal from the housing without disassembly of the ducting connections. The intake and discharge duct connections shall be dimensioned so as to accept standard flexible or rigid duct. Mounting brackets shall be provided for attachment to the fan housing allowing vertical or horizontal installations.

MOTOR
The motor shall be direct-drive, external-rotor, high-efficiency, PSC type with permanently lubricated and sealed ball bearings. The motor shall have automatic thermal-overload protection and must be totally sealed to protect against contaminants and moisture. Naturally vented air-over motors are not acceptable.

ELECTRICAL
The fan shall operate on 115V, 50/60Hz, and single-phase current. The motor shall be listed for use with a solid-state speed control.

WARRANTY

The entire unit is guaranteed for three (3) years, from date of shipment, against all manufacturing defects, provided the material has been installed and operated per manufacturer's instructions and under normal conditions. Warranty is limited to the repair or replacement of the material upon its return freight paid to our factory. This warranty is not transferable and is limited to the original end user.

For more information, contact your Aldes sales advisor, visit aldes-na.com, call 1.800.255.7749, or find us on

Product Information Sheet

DuPont™ Tyvek® Tape

Waterproof Seam Tape for Maximum Reduction of Air and Water Infiltration

FEATURES/BENEFITS

Description

Using a quality weather barrier on a commercial building is as important as installing it properly. Taping the seams after wrapping – in addition to taping any tears or holes – is the best practice for maximum reduction of air and water intrusion into the building envelope. Finish the building envelope with the superior seam tape – **DuPont™ Tyvek® Tape**.

Tyvek® Tape works when other tapes won't, sealing seams for a continuous protective barrier against air and water infiltration. It features a specially engineered adhesive to create the best adhesion to DuPont™ Tyvek® Weather Barrier Systems in any climate. As part of a complete building envelope system, DuPont™ Flashing Tape will help reduce the risk of water damage, increase building comfort, and improve energy efficiency.

Air and Water Barrier Performance

Tyvek® Tape is strong, easy to use, and highly waterproof. It is constructed of an oriented polypropylene film, coated with a specially formulated permanent acrylic adhesive to create the best adhesion between seam tape and DuPont™ Tyvek® weather barriers. Some features and benefits include:

- Durability – strong, high tack, easy to use and waterproof
- Heat/cold resistance – withstands temperature extremes from -40°F to 220°F
- Pliability – no cracking when bent around 5 mm mandrel @ -4°
- Quality engineering – covered with UV-resistant, biaxially-oriented polypropylene film coated with a specially formulated permanent acrylic adhesive
- Compliance – **Tyvek® Tape** is compliant to the Canadian Construction Materials Centre Technical Guide for Sheathing Tape (CCMC 07281) testing standard

Available Sizes

TABLE 1: Stock Sizes for Tyvek® Tape

Product/Size	Packaging	Quantity
1.88" x 54.6 yds.	bulk packed	36 rolls/case
1.88" x 54.6 yds.	individually retail wrapped	36 rolls/case
2.82" x 54.6 yds.	bulk packed	24 rolls/case
2" Tape Dispenser	bulk packed	70 units/case
3" Tape Dispenser	individually boxed	20 units/case

Complete System

For maximum protection against air and water infiltration in homes, use **DuPont™ Tyvek® Tape** with DuPont™ Tyvek® Weatherization Systems, including Tyvek® CommercialWrap®, Tyvek® HomeWrap®, Tyvek® StuccoWrap®, Tyvek® DrainWrap™, DuPont™ Flashing Systems and Tyvek® Wrap Caps.

Sustainable Solutions

From a single family home to an office tower, air and water infiltration can make insulation significantly less effective, heating and air conditioning more costly. Tyvek® Tape contributes to energy efficiency by helping to seal the building envelope, which controls air flow and water intrusion in the wall assembly.

As part of an overall building envelope system with other Tyvek® materials, **Tyvek® Tape** can:

- Allow systems to meet requirements of ASHRAE 90.1 and IECC Air Leakage Requirements, when tested in accordance with ASTM E2357.
- Allow systems to meet requirements of Wisconsin Energy code (ASTM E1677 and/or ASTM E23571).
- Help contribute towards LEED® (Leadership in Energy and Environmental Design) points.

PROPERTIES

Tyvek® Tape exhibits physical properties as indicated in Table 2 when tested as represented. Review all instructions and (Material) Safety Data Sheet ((M)SDS) before use. Please contact DuPont at 1-800-488-9835 when additional guidance is required for writing specifications that include this product.

TABLE 2: Physical Properties for DuPont™ Tyvek® Tape

Property	Typical Value	Units
Roll length	50 (54.68)	meters (yards)
Tensile strength	27	lbs./in.
Elongation	125	% by length, max.
Caliper (total/adhesive/backing)	3.0/1.6/1.4	mm.
Wet grab adhesion	50	oz./in.
Peel adhesion	40	oz./in.
180 degree peel adhesion (immediate)	24.0	oz.in.
180 degree peel adhesion (after 72 h. dwell)	35.0	oz.in.
Temperature resistance	-40 to 220	°F
Pliability	No cracking when bent around mandrel	5 mm., -4°F
Moisture vapor transmission rate (@ 100°F and 90% relative humidity)	0.3	g/100 in^2/24 h.

DUPONT Tyvek®

For more information visit us at tyvek.com or call 1-800-448-9835

43-D100065-enNA-1119 CDP

ATTACHMENT C

Riverfront Liner Membrane Specifications

NOTE: FOR SPECIFICATIONS NOT INCLUDED ON THESE PLANS, REFER TO THE EVERETT RIVERFRONT BOULEVARD PROJECT DOCUMENTS.

CSI SPECIFICATION SECTION 31 05 33

PVC - FLEXIBLE MEMBRANE LINER

Part 1 - GENERAL

1.01 DESCRIPTION

A. The work under this section consists of providing all operations pertaining to the furnishing, installing, and testing of the polyvinyl chloride (PVC) Flexible Membrane Liner (FML) in accordance with these Specifications in conformity with the lines and grades shown on the Drawings or as established by the Engineer.

1.02 REFERENCE STANDARDS

A. The latest revision of the following standards of the American Society of Testing and Materials (ASTM) are hereby made a part of these Specifications:

1. ASTM D374 - Test Methods for Thickness of Solid Electrical Insulation
2. ASTM D570 - Test Method for Water Absorption of Plastics
3. ASTM D638 - Test Method for Tensile Properties of Plastics
4. ASTM D696 - Test Method for Coefficient of Linear Thermal Expansion of Plastics
5. ASTM D792 - Test Methods for Specific Gravity and Density of Plastics by Displacement
6. ASTM D882 - Test Methods for Tensile Properties of Thin Plastic Sheeting
7. ASTM D1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting
8. ASTM D-1203 - Test Methods for Volatile Loss from Plastics Using Activated Carbon Methods
9. ASTM D1204 - Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature
10. ASTM D1239 - Test Method for Resistance of Plastic Films to Extraction by Chemicals
11. ASTM D1435 - Recommended Practice for Outdoor Weathering of Plastics
12. ASTM D1593 - Specification for Non-Rigid Vinyl Chloride Plastic Sheeting
13. ASTM D1790 - Test Method for Brittleness Temperature of Plastic Sheeting by Impact
14. ASTM D1922 - Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method
15. ASTM D3083 - Specification for Flexible Poly (Vinyl Chloride) Plastic Sheeting for Pond, Canal, and Reservoir Lining
16. ASTM D4545 - Practice for Determining the Integrity of Factory Seams Used in Joining Manufactured Flexible Sheet Geomembrane
17. ASTM F88 - Test Method for Seal Strength of Flexible Barrier Materials

B. Federal Test Method Standards

1. 101 C - Puncture Resistance and Elongation Test

C. National Sanitation Foundation (NSF)

1. NSF 54 - Flexible Membrane Liners

1.03 CONTRACTOR QUALIFICATION

A. Installation of all PVC-FML shall be performed by one geomembrane installation contractor that has previously installed a minimum of 5,000,000 square feet of the material (PVC) within the last five (5) years, with a minimum of 200,000 square feet in a single installation.

1. The geomembrane superintendent assigned to the project shall have satisfactorily installed 2,000,000 square feet of the material (PVC) within the past three (3) years.
2. The geomembrane installation company shall, at their own expense, provide a Technical Representative of the geomembrane fabricator at the job site to ensure compliance with the manufacturer's directions for handling and installing the geomembrane. The Technical Representative must be present when the geomembrane installation is started and whenever geomembrane is installed, unless this requirement is waived by the Engineer. The Technical Representative shall observe the work, report unsatisfactory conditions, and make recommendations for improvement in procedures to the Contractor.

1.04 WARRANTY

A. The Contractor of the PVC-FML to be used in the work shall warrant workmanship to be free of defects on a non-prorata basis for two years after final acceptance of the work. This warranty shall include, but not be limited to, all seams, geomembrane attachments to appurtenances, and penetration seals. The installer shall provide all warranty work required by the Owner at Contractor's sole expense.

1. The manufacturer shall provide a 20-year, industry standard, warranty. All warranties shall be valid for temperatures ranging from minus (-) 20 DEGF to plus (+) 110 DEGF.
2. Should a defect or failure occur within the aforesaid periods, the Contractor shall bear all costs for repair and/or replacement of the PVC-FML and shall in addition bear all costs for the excavation of any cover, backfill dewatering & pumping or sludge removal that is required to be removed in order to repair and/or replace the PVC-FML. All materials removed to allow repairs to be made shall be reinstalled by the Contractor, at the Contractor's expense, in accordance with these Contract Documents.

1.05 SUBMITTALS

A. Submittals shall be made before commencing the work specified in this section. The following shall be submitted in accordance with Submittal procedures outlined in the Everett Riverfront Boulevard Specifications.

1. Factory Test Results: Published product properties, specifications and seaming techniques for the proposed PVC-FML, as well as factory test results of materials certified by the geomembrane manufacturer shall be submitted showing conformance with the requirements of these Specifications. In addition, the Contractor shall submit the manufacturer's certification stating that the material proposed is similar and of the same formulation as that for which test results are submitted and which by actual usage has been demonstrated to be satisfactory for the intended application.
2. Geomembrane Sample: Samples of the geomembrane sheeting and sheeting seams demonstrating factory and field seams shall be provided to the Engineer. Samples shall have a minimum width of 4 IN and a length of at least 10 IN plus the seam width.
3. Laboratory certification stating that the PVC-FML meets the product requirements. (See Part 2 of this Section.)
4. Copy of quality control certificates issued by the manufacturer.
5. Test reports from the manufacturer.
6. Delivery, storage, and handling instructions.
7. Installation instructions.
8. Shop Drawings and Schedule: Installation drawings, procedures, and a schedule for carrying out the work shall be provided by the Contractor to the Engineer. Shop drawings shall have membrane sheet layout with proposed size, number, position, and sequence of placing of all factory-fabricated sheets and indicating the location of all factory and field joints and the direction of shop joints on each sheet. Shop drawings shall also show complete details and/or methods for anchoring the membrane at the edges of the liner, making field seams, and making seals around pipes and structures penetrating the membrane as well as details not conforming to the Contract Drawings. Upon acceptance, these drawings shall be used for the PVC-FML installation.
9. Certification of Factory Seams: The membrane fabricator shall certify that all factory seams conform to the specifications and shall submit certified test results from an independent testing laboratory.
10. Delivery schedule for all materials.
11. Written procedures for quality assurance/quality control in compliance with these Specifications, describing specific methods for handling and installation of the geomembrane, including:
    a. Names of supervisors, and testing personnel that will perform the liner installation, and a complete description of each person's experience, qualifications, and references for all jobs performed within the past three years.
12. Certification stating the resin is 100 PCT virgin polyvinyl chloride.
13. At least five references for the proposed geomembrane manufacturer and installer, with names and addresses of project, Owner, Owner's representative, design engineer, and square feet installed for similar lining projects using similar materials.
14. The Contractor shall, at least 10 days prior to geomembrane superintendent arriving at the site, submit for review the following information:
    a. Name and detailed resume of the geomembrane cover installation superintendent who will supervise the project.
    b. The resume submittals and minimum qualifications of the geomembrane installation superintendent shall be as follows:
        1) The total project history of the proposed geomembrane superintendent for approximately the last three years. The proposed geomembrane superintendent shall have a minimum of two years experience as a geomembrane installation superintendent with total project installation responsibility and have been an employee of the FML installation contractor for a minimum of 6 months.
        2) The proposed superintendent shall have project experience similar in scope to this project, particularly with projects utilizing polyvinyl chlorine geomembrane as large or larger than this project and under similar climatic conditions during installation. The proposed geomembrane superintendant shall have installed a minimum 2,000,000 SQFT of polyvinylchlorine geomembrane.
        3) Details of past projects and scope of projects, including type and thickness of geomembrane installation, size of installation, location of installation, and names and telephone numbers of owners/engineers who were closely associated with the construction and installation of the geomembrane.
        4) Listing of all exceptions to the requirements specified herein.
    c. Based on its sole discretion, the Owner reserves the right to reject any superintendent, proposed by the Contractor. If in the opinion of the Owner, the proposed superintendent is not qualified, the Contractor shall submit additional names until such time as an acceptable superintendent is identified. At no time, and under no circumstances, shall the Contractor be entitled to any additional compensation from the Owner for determining a qualified geomembrane superintendent for this project.
15. A written statement from the manufacturer and installer stating that the warranty, will be provided.
16. Subgrade acceptance certificates, submitted daily to the Engineer prior to the start of that day's installation, signed by the installer for each area to be covered by the PVC-FML.
17. After installation is complete, submit the following:
    a. Certificate stating the liner has been installed in accordance with the plans and specifications;
    b. Manufacturer/Fabricator and Installation warranty; and
    c. Record Drawing Information: Record drawings including but not limited to drawings showing the location of all seams, panels, repairs, patches, destructive samples, trenches, pipes, and appurtenances, including measurements, shall be prepared by the Contractor and submitted to the Engineer after completion of the project.

Part 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. The materials supplied under these specifications shall be first quality products designed and manufactured specifically for the purposes of this work, and which have been satisfactorily demonstrated by prior use to be suitable and durable for such purposes. Polyvinyl chloride (PVC) plastic cover shall consist of minimum 84 IN widths of calendared polyvinyl chloride sheeting fabricated into sections by means of dielectric-bonded seams into panels of dimensions required to fit the job site.
2. Rolls of PVC and PVC-FML panels shall be identified such that the roll numbers and lot numbers used to make each panel will be traceable.

B. Resin: The resin used shall be 100 PCT virgin polyvinyl chloride resin compounded and manufactured specifically for producing PVC-FML. No reprocessed or reground material will be allowed. No water soluble ingredients can be used. Only first quality phthalate and/or phosphate plasticizers with a viable biocide formulation may be used.

C. Bonding Agent: Only vinyl-to-vinyl bonding solvent of medium body recommended by the manufacturer may be used for glued seams. No caulk, or other substitutions will be allowed.

D. Solvent: Solvent for cleaning the contact surfaces of field joints, and for other required uses shall be as recommended by the geomembrane manufacturer for use on the particular material specified.

E. Polyvinyl Chloride (PVC) Flexible Membrane Liner (FML):

1. The PVC-FML material shall have the following characteristics:

Minimum Manufacturer Property	Test Method	Specification
Sheet Thickness	ASTM D5199	30 MILS ± 1.5
Specific Gravity	ASTM D792	1.20
Tensile Strength Break, PPI, Width, Minimum	ASTM D882-B	73
Elongation at Break, Percent Minimum	ASTM D882-B	380
100 Percent Modulus, PPI	ASTM D882-B	32
Tear Strength, LBS	ASTM D1004	8
Dimensional Stability (Each Direction)	ASTM D1204	± 3 PCT
Low Temperature Brittleness, DEGF	ASTM D1790	-20
Volatile Loss, Percent Maximum	ASTM D1203	0.7
Water Extraction, Percent Loss Maximum	ASTM D1239	0.15 PCT
Resistance to Soil Burial		
Percent Change Maximum:	ASTM G160	
Tensile Strength		5
Elongation, @ Break		20
Modulus @ 100 PCT Elongation		20
Hydrostatic Resistance, PSI, Min.	ASTM D751	100
Factory Bonded Seam Shear Strength, PPI, Min.	ASTM D882-B	58.4
Factory Seam Peel Strength, PPI or FTB, Min.	ASTM D882-B	15
Alkali Resistance	Passes Corps of Engineers	CDR-572-61
Outdoor Exposure, Sun Hours		1500
Color		Gray/Black

2. PVC-FML shall be manufactured from domestic virgin PVC resin, and specifically compounded for use in hydraulic facilities. Reprocessed material shall not be used. The PVC shall be dark in color, and produced in a standard minimum roll width of 76-1/4 IN. The thickness shall be 30 MIL. The material will be provided as a finished product free of defects. The surface shall be of good quality, uniform in color, size and thickness.
3. The individual widths of PVC materials shall be factory fabricated into large sections, into a single piece, or into the minimum number of pieces, up to 100 FT wide, as are required to fit the project. Lap joints with a minimum joint width of 1 IN shall be used. After fabrication, the lining shall be accordion-folded in both directions and placed into heavy cardboard or wooden boxes for shipment purposes.

F. Ultra Violet (UV) Stabilization

1. Photochemical attack of polymers is caused by Ultra Violet (UV) light that foster oxidation of the polymer. UV resistance in the PVC-FML will be achieved by adding a low (<5 PCT) percentage of carbon black to the virgin polymer to make the membrane opaque.

G. Manufacturer Source Quality Control

1. Perform the following quality control tests at the manufacturer's plant for every 10,000 LBS of PVC-FML product supplied to the project. Meet the requirements shown.

Test Designation	Minimum Test	Requirements
Sheet Thickness	ASTM D5199	30 MILS ± 1.5 MILS
Specific Gravity	ASTM D792	1.20
Tensile Strength Break, ppi, Width, Minimum	ASTM D882-B	73
Elongation at Break, Percent Minimum	ASTM D882-B	380
Tear Strength, lbs, Minimum	ASTM D1004	8

2. Perform the following quality control tests at the manufacturer's plant for every 40,000 LBS of PVC-FML product supplied to the project. Meet the requirements shown.

Test Designation	Test Requirements	
Volatile Loss	ASTM D1203	0.7 PCT max. loss
Water Extraction	ASTM D1239	0.15 PCT max. los
Dimensional Stability (each direction)	ASTM D1204	± 3 PCT
Low Temperature Brittleness	ASTM D1790	-20 DEGF
Resistance to Soil Burial	ASTM G160	max. change
Tensile Strength		-5
Elongation, @ Break		-20
Modulus @ 100 PCT Elongation		+20

Note: The manufacturer shall certify that the soil burial results are applicable for this project.

3. Perform the following quality control tests at the fabricator's plant for every 4 HRS of factory bonded seam for products supplied to the project. Meet the requirements shown.

Test Designation	Minimum Test Requirements	
Factory Bonded Seam Shear Strength	ASTM D882-B	58.4 PPI
Factory Seam Peel Strength	ASTM D882-B	15 ppi or FTB

4. The Contractor shall pay for all of the quality control tests described in 1., 2., and 3. above.

Part 3 - EXECUTION

3.01 CONSTRUCTION

A. Delivery, Storage and Handling: The material shall be handled in strict accordance with the manufacturer's recommendations.

1. Delivery:
    a. Deliver material wrapped with scrap geomembrane or geotextile strong enough to prevent damage to the contents. Plastic band the material to heavy duty wood pallets.
    b. Separate damaged pallets and store at locations designated by the Engineer until proper disposition of material is determined by the Engineer.
    c. The Engineer will determine damage.
2. Storage:
    a. Store in the original unopened boxes in a safe, dry area protected from direct heat of the sun.
    b. Provide 6 IN minimum air space between pallets.
    c. Do not stack boxes and/or pallets.
3. Handling:
    a. Use equipment recommended by the manufacturer to load, transport, and deploy the material.
    b. Do not drag material.

B. Manufacturer's Services: The geomembrane manufacturer's representative shall inspect the subsurface for acceptability and provide onsite technical supervision and assistance at all times during the installation of the membrane and placement of the overlying and soil materials. The manufacturer's representative shall furnish the Engineer with certification that the membrane was installed in accordance with manufacturer's recommendations.

C. Subbase Inspection: Immediately prior to placement of each panel, the area to be covered shall be walked by the Engineer and the manufacturer's technical representative to determine the acceptability of the subsurface. No debris, rocks, survey stakes, or any other objects that protrude will be allowed. The manufacturer's technical representative and installer shall verify daily in writing to the Engineer that the subgrade on which the PVC-FML will be installed is acceptable. The manufacturer may provide verification that the installer shall act as a manufacturer's representative. Installation without written acceptance from installer/manu-facturer means acceptance.

D. Preparation: Repair damage caused to subgrade during deployment. Excavate anchor trenches prior to deployment. Round edges of anchor trenches or cushion with geotextiles.

E. Installation of PVC-FML:

1. The geomembrane shall be placed over the prepared surfaces to be covered in such a manner as to assure minimum handling. Any portion of FML damaged during installation by any cause shall be removed and repaired by using an additional piece of FML, as specified hereinafter. All field joints, joints to structures, and repairs to PVC FML shall be performed during dry weather conditions with a minimum air temperature of 50 DEGF and a maximum of 95 DEGF.
2. Assign each panel an identifying code number or letter consistent with the contractor's submitted panel layout drawing. The coding is subject to review by the Engineer. Deploy no more panels in one shift that can be bonded or secured during that same day. Do not damage the PVC-FML by handling, by traffic, or leakage of hydrocarbons or any other means. Do not wear damaging shoes or engage in activities that could damage the PVC-FML. Unfold the PVC-FML panels using methods that will not damage, stretch or crimp the PVC-FML. Use deployment methods that will minimize wrinkles and differential wrinkles between adjacent panels. Place ballast on PVC-FML that prevents uplift from wind and will not damage the PVC-FML. Protect the PVC-FML in areas of heavy traffic by placing a protective cover which is compatible with and will not damage the PVC-FML. Do not allow vehicular traffic directly on the PVC-FML. Visually inspect the PVC-FML for imperfections and mark areas for repair.

F. Seam Layout: Orient both factory and field seams parallel to a line of maximum slopes, (i.e., orient down, not across slope).

G. Field Joints: Visually inspect all factory seams. Lap joints shall be used to seal factory-fabricated pieces of PVC together in the field. Lap joints shall be formed by lapping the edges of pieces a minimum of 6 IN. The contact surfaces of the pieces shall be wiped clean to remove all dirt, dust, moisture, or other foreign material. Sufficient vinyl-to-vinyl bonding solution shall be applied to both surfaces in the joint area, and the two surfaces pressed together immediately. Adhesive bond width shall be a minimum of 2 IN. Any wrinkles shall be smoothed out. Use hand-held rollers or other reviewed methods to apply even pressure to the bonded seam. Wipe excess bonding agent from the PVC-FML. Seaming boards shall be used on all seams.

H. Joints to Structures: All curing compounds and coating shall be completely removed from the joint area. Joining of PVC-FML to concrete shall be made with approved mechanical connection methods. Where shown on the drawings, batten strips shall be used to reinforce the adhesive bond. Any pipe boots required shall be made of the same material. All boots, flaps or other attachments to the PVC-FML shall not be made until the initial cover material has been placed, in order to prevent the PVC-FML from shifting.

I. Quality of Workmanship: All joints, on completion of the work, shall be tightly bonded. Any FML surface showing injury due to scuffing, penetration by foreign objects, or distress from rough subgrade shall, as directed by the Engineer, be replaced or covered and sealed with an additional layer of PVC-FML of the proper size.

J. Field Quality Control

1. General: Manufacturer, Fabricator, and Installer will participate in and conform with all terms and requirements of the Construction Quality Assurance program. The Contractor shall be responsible for assuring this participation. Quality Assurance requirements are specified in this Section.
2. Conformance Testing (Performed by the Engineer):
    a. Perform conformance testing on PVC-FML
    b. Obtain one sample per 100,000 SQFT of material supplied. Engineer will obtain samples.
    c. Forward samples to Construction Quality Assurance Laboratory.
    d. Perform, as a minimum, the following tests for conformance with design specifications and guaranteed properties.
        1) Relative Density: ASTM D792
        2) Sheet Thickness: ASTM D1593
        3) Tensile Properties: ASTM D882
        4) Tear Resistance: ASTM D1004
        5) Factory Bonded Seam Strength: ASTM D3083
    e. Sampling Procedures
        1) Sample across the entire width of the roll, including the factory bonded seam.
        2) Cut sample 3 FT by the width of the roll.
3. Non-Destructive Field Testing (Performed by Installer):
    a. General: Non-destructively test all field seams over their full length using the Air Lance Test. Perform testing 24-hours after the seam bonding process to allow the bonded seam to cure. Air Lance Testing shall be done in the presence of the Engineer.
    b. Air Lance Testing Equipment
        1) 3/8 IN air lance wand.
        2) 3/32 IN air nozzle.
        3) Rubber pressure hose with fittings, valves, and connections.
        4) Air compressor with pressure regulator.
    c. Air Lance Test Procedures (ASTM 4437)
        1) Engineer shall be present during all air lancing of seams.
        2) Hold air lance wand at a 45 DEG angle with the nozzle approximately 2 IN from the upper edge of the bonded seam.
        3) Direct 55 PSI of air at the upper edge of the bonded seam.
        4) Visually observe air riffles or pockets indicating unbonded areas within the seam.
        5) Mark and repair unbonded areas in accordance with the repair procedures described in this Section.
4. Destructive Seam Testing (Performed independently by the Engineer and the Installer):
    a. Location and frequency of testing
        1) Collect destructive test samples at a minimum frequency of one test location per 500 FT of seam length.
        2) Determine test locations after seam bonding. Locations may be prompted by excessive or insufficient bonding agent, contamination, insufficient overlap, or suspected defect. Engineer will be responsible for choosing the locations. Engineer will not notify Installer in advance of selecting locations where samples will be taken.
        3) The Engineer may increase the test frequency based on test results.
    b. Sampling Procedures
        1) Contractor shall cut samples at locations designated by the Engineer 24-hours after the bonding process in order for the bonded seam to cure.
        2) Engineer will number each sample and mark sample number and location in compliance with the CQA program.
    c. Immediately repair sample holes in the PVC-FML. Repair in accordance with repair procedures described in part L.4 of this section. Test the continuity of the repair by the air lance test method 24-hours after the repair is bonded.
    d. Size of Samples: Minimum 12 IN wide by 44 IN long with the seam centered lengthwise. Cut a 1 IN wide strip from each end of the sample and test for bonded seam strength in the field. Cut the remaining sample into three parts for distribution as follows:
        1) One portion for the installer: 12 IN by 12 IN.
        2) One portion for the Construction Quality Assurance Laboratory testing: 12 IN by 18 IN.
        3) One portion to the Owner for archive storage: 12 IN by 12 IN.
    e. Field Testing
        1) Test the two 1 IN wide specimens specified in paragraph K.4.d above by tensiometer for bonded seam strength and peel adhesion.
        2) Test specimens must meet bonded seam strength and peel adhesion requirements for bonded seams specified in this Specification.
        3) If any field test specimen fails, follow procedures outlined in this Specification.
5. Laboratory Testing by Engineer and Installer
    a. Test bonded seam strength (ASTM D3083).
    b. Test peel adhesion (ASTM D413).
    c. Test at least five specimens for each test method.
        1) A sample passes when the bonded seam strength of four of the five specimens is 90 PCT of the specified tensile strength at break and when the peel adhesion of four of the five specimens is 10 ppi or film tearing bond.
6. Failed Seam Procedures
    a. Follow these procedures when there is a destructive test failure. Procedures apply when test failure is conducted by the Construction Quality Assurance Laboratory, the Fabricators Laboratory, or by field tensiometer. Follow one of the following two options:
        1) First Option:
            a) Recap the seam between any two passed test locations.
        2) Second Option:
            a) Trace the seam to a location at least 10 FT or to where bonded seam ends, in both directions from the failed test location.
            b) Obtain a small sample at both locations for an additional field test.
            c) If these additional test samples pass field tests, then take laboratory samples.
            d) If the laboratory samples pass, then recap the seam between the test sample locations.
            e) If any sample fails, then repeat the process to establish the zone in which the seam must be recapped.
7. Acceptable Bonded Seams:
    a. Bounded by two locations from which samples have passed destructive tests and seam has been repaired as required by this Specification.
    b. For recapped seams exceeding 50 FT, a sample taken from within the recapped seam passes destructive testing.
    c. Whenever a sample fails, provide additional testing for seams that were bonded by the same seaming technician.

K. Repair Procedures

1. Remove damaged PVC-FML and replace with acceptable PVC-FML materials if damage cannot be repaired.
2. Repair, removal, and replacement shall be at Contractor's expense if the damage results from the Contractor's, Installer's or the Contractor's subcontractor activities.
3. Repair any portion of the PVC-FML exhibiting a flaw, failing a destructive test, or failing a non-destructive test. Installer will be responsible for repair of damaged or defective areas. Agreement upon the appropriate repair method shall be decided between the Engineer and the Installer. Repair procedures include:
    a. Patching: Used to repair holes, tears, undispersed raw materials, and contamination by foreign matter.
    b. Recapping: Used to repair large lengths of failed seams.
4. Repair procedures:
    a. Clean and dry all surfaces at the time of repair.
    b. Verify acceptance of the repair procedures, materials, and techniques by the Engineer in advance of the specific repair.
    c. Extend patches or caps at least 6 IN beyond the edge of the defect.
    d. Apply sufficient bonding agent to contact surfaces and press firmly together.
    e. Apply even pressure over bonded areas with hand held rollers. Wipe excessive bonding agent from PVC-FML.
5. Verification of repair:
    a. Number and log each repair.
    b. Non-destructively test each repair using the Air Lance Test method.
    c. Destructive tests may be required at the discretion of the Engineer and will be at the Contractor's expense.
    d. Reconstruct repairs until tests indicate passing results.
    e. Technician making repairs shall initial each repair.

L. Flexible Membrane Liner Acceptance

1. Contractor retains all ownership and responsibility for the PVC-FML until acceptance by the Owner.
2. The PVC-FML installation shall be accepted by the Owner when:
    a. Conformance test results meet project specifications.
    b. All required documentation from the Manufacturer, Fabricator, and Installer has been received and accepted including the Owner's testing lab final report.
    c. The installation is finished.
    d. Verification of the adequacy of all field seams and repairs, including associated testing, is complete.
    e. Written certification documents, including record drawings, have been received by the Owner.

END OF SECTION

HERRERA
2200 6th AVE
Suite 1100
Seattle, Wa. 98121
206-441-9080
http://www.herrerainc.com

Shelter HOLDINGS

EVERETT RIVERFRONT

3810 RIVERFRONT BLVD
EVERETT, WA 98201

CONSTRUCTION SET
07/31/20

12/17/19

DRAWING SETS

DATE	DESCRIPTION
12/19/19	BUILDING PERMIT
03/02/20	BID SET
07/31/20	CONST. SET

REVISIONS / NOTES

NO	DATE	DESCRIPTION

PHASE-BUILDING

1-B

TITLE

LINER MEMBRANE SPECIFICATIONS

PERMIT #	B1912-032
DRAWN	R. HULME
CHECKED	T. WRIGHT, P.E.
ISSUE DATE	DEC 2019
JOB NO.	15-06075-002
SHEET NO.:	

LFG1B3

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

811 Know what's below. Call before you dig.

All documents submitted to the City associated with proposed development at the Landfill Site must be reviewed for compliance with environmental requirements of the Cleanup Action Plan. The following checklist summarizes environmental requirements for each type of development component and provides a means of highlighting pertinent documentation and tracking City and Ecology reviews. Attach additional pages as necessary.

Name of Document(s) Under Review: Riverfront Work/Live Units Technical Memorandum

Received From: Herrera

Name of City Reviewer: Megan King

Date Received for City Review: 10/1/2020 **Date City Review Completed**: 10/5/2020

City Review Summary and Requested Action: The City's review finds this submittal in compliance with Consent Decree requirements, and the City requests Ecology concurrence of this finding.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
General Layout		
Phased development areas.	The Site may be developed in several separate projects or phases, depending on Site ownership and project plans. In that event, the phases shall be adjacent to Site boundaries and to prior phases, allowing CAP requirements to be fully operational and effective for each phase and in total. Special consideration shall be given to landfill gas system boundary conditions. Access will be controlled during development to maintain separation between developed and undeveloped areas of the landfill, and to prevent damage to environmental systems from subsequent construction.	Not applicable to this submittal. Work in this submittal is associated with the Building A and Building B plans already reviewed and approved.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Construction Disruption		
Site re-grading including cut and fill magnitudes typical for an urban redevelopment site. Assume regrading could encounter refuse, and perched groundwater. Subsurface excavation for utilities and structures. Import and export of soils, potential localized refuse removal, and stockpiling.	Dust and odor controls during construction – During Site construction activities, dust and odor controls would be required to prevent migration of materials outside the construction zone at levels of concern. These measures will include daily cover of any exposed waste, and could include localized wetting, application of suppressant foams, or use of temporary cover materials. Stormwater management – Erosion controls using best management practices, as necessary, in accordance with the City of Everett's Stormwater Management Manual and provisions of a NPDES permit for construction sites greater than five acres, as applicable. Run-on controls to prevent run-on of surface water onto exposed landfilled materials. Direct contact controls – Health and safety requirements for construction crews, to be triggered if construction occurs below the elevation of the clean soil cap. Construction dewatering procedures – Excavation construction for future potential development will likely encounter perched groundwater in portions of the waste. This water must be assumed contaminated and handled accordingly. Pumped dewatering water could be discharged into the leachate collection system provided it is approved by City Industrial Pretreatment Program. Or, the water could be stored in mobile tanks, tested for contaminants and disposed of accordingly. Construction performance monitoring and inspection – During Site construction activities, inspections for adequate perimeter dust controls, erosion controls, and dewatering and odor controls are required. On-site construction oversight by a health and safety professional or inspector is required of all applicable development activities as described in the CMCP. Controlled on-site relocation and re-capping of excavated refuse during construction activities is allowed. Location and quantities will be approved prior to excavation. As necessary, excavated refuse could also be disposed off-site in an active municipal landfill. Following construction, all developed areas of the landfill must be covered with pavement, buildings, or clean soil underlain by hydraulic barrier.	Not applicable to this submittal. Work proposed would be within the building shell (above the building slab) constructed as part of the Building A and Building B construction documents already reviewed and approved.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Temporary Facilities, Operations and Hydraulic Control		
	Describe and acknowledge temporary leachate collection system, gas collection system and stormwater. Maintain hydraulic control of shallow aquifer.	Not applicable to this submittal.
Site Infrastructure		
Water lines.	Utility trenches or corridors below developed area cover elevation will be lined with a geotextile and backfilled with clean soil, to allow maintenance without additional health and safety requirements for contaminated materials. Construction methods and materials to accommodate expected settlements are required. Seal entry into buildings or enclosed structures including utility manholes/vaults to prevent landfill gas leaks. Backfill trench with low permeability soil where utility line leaves property.	Not applicable to this submittal.
Sanitary sewer lines.	For sanitary sewer and storm drainage systems, watertight manholes using gasketed riser sections and rubber boot connections are recommended. HDPE piping is recommended. Additional measures to mitigate settlement include flexible telescoping sleeves and flexible connections at vaults and interfaces with buildings, and pipe hangers beneath pile supported structures. Seal entry into buildings or manholes to prevent landfill gas leaks. Backfill trench with low permeability soil where utility line leaves property.	Not applicable to this submittal

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Site Infrastructure (cont.)		
Storm sewer lines.	Stormwater will not be allowed to infiltrate into the landfill. Measures described above for sanitary sewer and storm drainage systems will be taken. All stormwater will be collected for off-site discharge. Seal entry into catch basins and manholes to prevent landfill gas leaks. Backfill trench with low permeability soil where utility line leaves property.	Not applicable to this submittal.
Manholes and maintenance access.	Vaults will be designed with water and gas tight joints and will be clearly labeled for necessary confined space entry procedures per gas pathway requirements.	Not applicable to this submittal.
Electrical, telephone and gas lines.	For electric, telephone, and natural gas systems, settlement can be accommodated by the use of additional wire lengths or flexible piping. Light fixtures and similar features shall either be finished above the underlying gas barrier or, if penetrating the gas barrier, be internally sealed and booted to the barrier layer to preclude intrusion of landfill gas. Seal conduit at building entry to prevent landfill gas leaks. Ensure interior of conduit is sealed as well.	Not applicable to this submittal.
Pavements (concrete and/or asphalt) for roadways, parking lots and sidewalks.	Subgrade reinforcement (such as a geotextile or geogrid material) may be used to minimize areas of localized, uneven settlement. Pavements should be designed to accommodate settlement at boundary conditions to pile-supported buildings. Penetrations below landfill cover sections in paved areas will not be allowed without appropriate procedures to address health and safety and repair. A construction quality assurance plan shall detail pavement permeability testing procedures. Install phased active landfill gas controls including perforated pipes in gravel filled trenches connected to header pipes and a vacuum source. The perforated pipes and gravel bed would be located beneath the pavement. The phased active landfill gas controls will be installed continuously throughout developed areas, below pavement, open space and buildings. Quarterly monitoring with a hand held sensor would trigger repair of pavement cracks if methane concentrations above 500ppm were detected. Routine inspection of paved areas is required to identify and repair areas of pavement cracking or locations where required landfill cover may be compromised.	Not applicable to this submittal.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Buildings		
Potential light structures with shallow foundations.	If design of structures can address seismic stability concerns, light structures with shallow foundations would be allowed.	Not applicable to this submittal.
Heavy structures with pile supported foundations	Pile supported structures are anticipated at the Site. Either driven or drilled pile types may be installed, following implementation of the groundwater compliance monitoring program and completion of evaluation re: potential zones of pile-type restrictions. Piles to support structures would be installed through refuse, through the underlying clay and peat layers into bearing sands. Piling or foundations that penetrate the gas barrier layer shall be booted or sealed to the barrier layer. All areas of the Site are restricted to augercast type pile construction or equivalent. This determination will be made following additional shallow aquifer sampling and evaluation.	Not applicable to this submittal.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Buildings (continued)		
Potential basement or below grade parking areas. Gas controls beneath buildings	Excavation requirements are listed under "Construction Disruption" requirements above. Particular care should be given to design of utility and pavement connections at the interface of pile supported buildings and surrounding Site areas, where significant differential settlement is expected. Buildings will be protected by a geomembrane beneath the foundation slab that is booted and sealed around piles and utility penetrations. Phased active gas controls will be installed continuously below developed areas, including perforated extraction piping in gravel trenches, spaced a maximum of 100' on center. Below buildings, extraction piping would be installed in development fill or slab subgrade – above refuse. The extraction piping will be connected to header pipes, a vacuum source and a discharge location. A full-time continuous ground floor methane monitoring system will be installed in all buildings. Methane concentrations exceeding 1,000 ppm will automatically activate the building's HVAC system and notify operations personnel. Methane concentrations exceeding 10,000 ppm will activate audible alarms and trigger building evacuation. Monitoring with a hand held sensor would be used to identify any locations with methane exceeding 100ppm for repair. Temporary enclosures erected over pavement or open space areas will contain continuous methane monitors that would activate an alarm if triggered.	Building geomembrane and active gas controls are included in the designs for Buildings A and B, already reviewed and approved. Full-time continuous ground floor methane monitoring system is included in this design, shown on Drawing WL1, and described in the Technical Memorandum text. The methane monitoring and alarm and evacuation triggers are described in the Technical Memorandum and are in compliance with Consent Decree requirements. No temporary enclosures are proposed as part of this work.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Open Space / Landscaping		
Landscaped areas around buildings and parking areas. Recreational use/park areas and trails.	Landscaped or open space areas will be constructed with a low permeable hydraulic barrier underlying clean soil established with vegetation to prevent erosion. Hydraulic barriers should obtain permeability similar to that of asphalt pavement. Institutional controls and property management procedures are required to prevent unauthorized digging and potential disturbance of hydraulic barrier. Subdrainage is required above the hydraulic barrier, to collect drainage above the barrier for off-site discharge. In landscaped areas where it is impracticable to connect with the storm water system for discharge, a drain may be placed in the hydraulic barrier to allow infiltration into the landfill, as long as it does not compromise gas collection system effectiveness. Phased active gas controls will be installed continuously below developed areas, including perforated extraction piping in gravel trenches, spaced a maximum of 100' on center. Below landscaped areas, extraction piping would be installed in development fill below the hydraulic barrier – above refuse. The extraction piping will be connected to header pipes, a vacuum source and a discharge location. Quarterly surface monitoring with a hand held sensor would be used to identify any locations with methane exceeding 500 ppm for repair. Fence posts shall either be finished above the underlying gas barrier or, if penetrating the gas barrier, be internally sealed and booted to the barrier layer to preclude intrusion of landfill gas. A Stormwater Pollution Prevention Plan and routine inspection of open space areas will be required to ensure cap integrity is not compromised by erosion.	Not applicable to this submittal.
Public Access		
Unlimited public access in developed areas.	Public will be allowed access to all developed areas of the Site, except controlled entry to confined spaces and maintenance corridors. Warning signage may be placed as appropriate. Landfill gas controls must be installed and operational in developed areas for public access.	Not applicable to this submittal.

Development Components	Environmental Requirements	City Review Comments and submittal reference (i.e., page, sheet #)
Public Access (cont.)		
Access restrictions to undeveloped areas.	Perimeter fencing with secured entries will restrict access to undeveloped portions of the Site.	This work will be conducted within the secured fencing installed as part of the other redevelopment work on the landfill.

Additional Comments:

CD Amendment No. 1 for the Site allows for construction of residential structures on the landfill, with "ground floor" uses restricted to garage, storage, and laundry only, with special requirements for alarms and ventilation at the ground floor. To comply with the CD requirements, the proposed work/live design includes a "ground floor" isolated space that is less than 1 foot in height, located between the work/live units at street level, and the underlying structural building slab and landfill gas membrane. This ground floor space has been designed to include the alarm and ventilation requirements, providing added protection to the work/live space.