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CITY OF PORTLAND, OREGON - BUREAU OF DEVELOPMENT SERVICES

1900 SW Fourth Avenue, Suite 5000 • Portland, Oregon 97201 • www.portlandonline.com/bds • Fax 503-823-7425

Facility Permit Plan Intake Form

FOR INTAKE, STAFF USE ONLY

Date Received 7/3/12

Building Registration # _____

Fixed Bid _____

Bin # _____

Building Permit # 11-204325-DFS-1-FA

Mechanical # _____

Plumbing Permit # _____

Electrical Permit # _____

Building/Mechanical DAVE

Electrical _____

Plumbing _____

Fire JEFF 2

Planning _____

BES _____

PDOT _____

Structural ISAIC

Other _____

APPLICANT: Complete all sections below that apply to the project. Please print legibly.

Print Name D&R Masonry Sign Name _____

Street Address 8890 SE McLoughlin Blvd.

City Milwaukie State OR Zip Code 97222

Day Phone 503-353-1650 FAX 503-654-1291 email dan@drmasonry.com

Plans / permits available for pick up at 1900 SW 4th Avenue, 2nd floor between 8:00 am to 5:00 pm

Contact Name for plan/permit pick up Dan Elkins

Day Phone 503-353-1650 email dan@drmasonry.com

Project Building Name / # Legacy Emanuel Hospital Adult Services

Project Address or Location 2801 N. Gantenbein, Portland, OR 97227

Project Name and Description Legacy Emanuel ASR Column and Slab Strengthening

Total Project Value _____ Project Reference #/Billing ID # 12151

Building Contractor Hoffman Construction CCB # 28417

MechanicalContractor _____ CCB # _____

Electrical Contractor _____ CCB# _____ License # _____

Plumbing Contractor _____ CCB# _____ License # _____

☐ **Building Permit**

No. of Stories _____

Const. Type _____

[Y] [N] Alarms Required

[Y] [N] Smoke Det. Req'd

[Y] [N] Sprinklers Req'd

[Y] [N] Struct. Eng / Calcs Submitted

☐ **Mechanical Permit**

Mechanical Valuation _____

Description _____

☐ **Electrical Permit**

Please provide a completed standard electrical permit application form. You may mail or deliver it to 1900 SW 4th Avenue, Portland, Oregon 97201 or FAX to 503-823-7425.

☐ **Plumbing Permit**

Number of Fixtures _____

Back Flow Devices _____

Water Service (# of Feet) _____

Medical Gas _____

Other _____

City of Portland
REVIEWED FOR CODE COMPLIANCE
JUL 11 2012
11-204325-DFS-2-FA
Permit Number

11-204325-DFS-2-FA

B2

Deferred Submittal

For:

Legacy Emanuel Hospital

FRP Slab Strengthening

PERMIT # 11-204325 FA

11-204325-DS-2-FA

B-2

SPECIAL INSPECTIONS ARE REQUIRED ON THIS PERMIT FOR THE FOLLOWING AREAS OF CONSTRUCTION:

☐ STRUCTURAL STEEL ☐ ADHESIVE ANCHORS

☐ REINFORCED CONCRETE ☒ FRP

☒ STRUCTURAL OBSERVATION BY THE ENGINEER IS TO OCCUR AT THE FOLLOWING STAGES OF CONSTRUCTION:

BY WDY ENGINEERS

Spec Section 032500
Composite Fiber Reinforcement (FRP)

HOFFMAN CONSTRUCTION COMPANY

This submittal has been reviewed for general conformance with the contract documents. Contractor's review does not relieve the Vendor/Subcontractor of responsibility for compliance with all requirements of the contract, including completeness and accuracy of this submittal.

06/13/2012 — Date
032500-0087-0 — Submittal #
MS — Reviewed By

City of Portland
REVIEWED FOR CODE COMPLIANCE
JUL 11 2012
11-204325-DFS-2-FA
Permit Number

☒ REVIEWED ☒ MAKE CORRECTIONS NOTED
☐ REJECTED ☐ REVISE AND RESUBMIT

THIS REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT, CRITERIA, AND INFORMATION GIVEN IN THE CONSTRUCTION DOCUMENTS. CORRECTIONS OR COMMENTS MADE ON THIS SUBMITTAL DURING THIS REVIEW DO NOT RELEASE THE CONTRACTOR OR THEIR AGENTS FROM COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. REVIEW OF A SPECIFIC ITEM SHALL NOT INCLUDE REVIEW OF AN ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. THE CONTRACTOR AND THEIR AGENTS ARE RESPONSIBLE FOR: DIMENSIONS TO BE CONFIRMED AND CORRELATED AT THE JOBSITE; ADHERENCE TO APPLICABLE CODES AND STANDARDS; INFORMATION THAT PERTAINS SOLELY TO THE FABRICATION PROCESSES OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION; COORDINATING THE WORK WITH ALL OTHER TRADES; AND PERFORMING ALL WORK IN A SAFE AND SATISFACTORY MANNER.

6/22/12 — DATE
CATENA CONSULTING ENGINEERS
AAM — BY

Slab reinforcement was core drilled through on Level 3 in IDF Room 3684. FRP strengthening is required to replace the compromised bars. Provide FRP strengthening as shown in attached RFI 124 response.
Avery Morris/catena

Sika Corporation
201 Polito Avenue
Lyndhurst, NJ 07071

Telephone: 201-933-8800
Fax: 201-933-6225

May 23, 2012

D & R Masonry Restoration Inc.
10005 East Burnside Street
Portland, OR 97216

Attn: Mr. Dan Elkins

Dear Mr. Elkins:

Re: Contractor Qualifications, Legacy Hospital project

Based on their past experience and personnel training, Sika Corporation considers D & R Masonry Restoration to be a qualified applicator for Sika Repair and Protection Division products. Applicator personnel have completed a program of instruction and training in the use of Sikawrap/Sika Carbodur FRP reinforcement.

Yours truly

David Annal
Western Region Sales Manager
Sika Corporation

cc: Thad Brown, Sika Corporation

Product Data Sheet
Edition 6.23.2010
Identification no. 332-30
SikaWrap Hex 103C

SikaWrap® Hex 103C

Carbon fiber fabric for structural strengthening

Description	SikaWrap Hex 103C is a high strength, unidirectional carbon fiber fabric. Material is field laminated using Sikadur 300, Sikadur Hex 300 or Sikadur Hex 306 epoxy to form a carbon fiber reinforced polymer (CFRP) used to strengthen structural elements.
Where to Use	**Load increases** ▪ Increased live loads in warehouses ▪ Increased traffic volumes on bridges ▪ Installation of heavy machinery in industrial buildings ▪ Vibrating structures ▪ Changes of building utilization **Seismic strengthening** ▪ Column wrapping ▪ Masonry walls **Damage to structural parts** ▪ Aging of construction materials ▪ Vehicle impact ▪ Fire ▪ Blast resistance **Change in structural system** ▪ Removal of walls or columns ▪ Removal of slab sections for openings **Design or construction defects** ▪ Insufficient reinforcements ▪ Insufficient structural depth
Advantages	▪ Approved by ICBO/ICC ER-5558. ▪ Used for shear, confinement or flexural strengthening. ▪ Flexible, can be wrapped around complex shapes. ▪ High strength. ▪ Light weight. ▪ Non-corrosive. ▪ Alkali resistant. ▪ Low aesthetic impact.
Packaging	**Rolls:** 25 in. x 50 ft.; 25 in. x 300 ft.

How to Use

Surface Preparation

Surface must be clean and sound. It may be dry or damp, but free of standing water and frost. Remove dust, laitance, grease, curing compounds, impregnations, waxes, foreign particles, disintegrated materials and other bond inhibiting materials from the surface. Consult Sikadur 300, Sikadur Hex 300/306 and Sikadur 330 technical data sheets for additional information on surface preparation.
Existing uneven surfaces must be filled with an appropriate repair mortar. The adhesive strength of the concrete must be verified after surface preparation by random pull-off testing (ACI 503R) at the discretion of the engineer. Minimum tensile strength, 200 psi (1.4 MPa) with concrete substrate failure.

Typical Data

Storage Conditions	Store dry at 40°-95°F (4°-35°C)
Color	Black
Primary Fiber Direction	0° (unidirectional)
Weight Per Square Yard	18 oz. (618 g/m²)

Fiber Properties

Tensile Strength	5.5 x 10^5 psi (3,793 MPa)
Tensile Modulus	34 x 10^6 psi (234,500 MPa)
Elongation	1.5%
Density	0.065 lbs./in.³ (1.8 g/cc)

Cured Laminate Properties with Sikadur Hex 300 Epoxy
Properties after standard cure followed by standard post cure.
[70°-75°F (21°-24°C) - 5 days and 48 hour post cure at 140°F (60°C)]

Property	Average Value[1]		Design Value[2]		
	US Units psi	SI Units MPa	US Units psi	SI Units MPa	ASTM Test Method
Tensile Strength*	123,200	849	104,000	717	D-3039
Tensile Modulus*	10,239,800	70,552	9,446,600	65,087	D-3039
Tensile % Elongation*	1.12	1.12	0.98	0.98	D-3039
140° F - Tensile Strength	123,000	847	101,400	699	D-3039
140° F - Tensile Modulus	10,136,900	69,843	9,156,500	63,088	D-3039
140° F - % Elongation	1.13	1.13	0.97	0.97	D-3039
Compressive Strength	113,000	779	103,800	715	D-695
Compressive Modulus	9,726,000	67,014	8,930,600	61,532	D-695
90 deg Tensile Strength	3,500	24	2,300	16	D-3039
90 deg Tensile Modulus	705,500	4,861	576,700	3,973	D-3039
90 deg % Tensile Elongation	0.45	0.45	0.33	0.33	D-3039
Shear Strength +/-45 in. Plane	7,500	52	6,700	46	D-3518
Shear Modulus +/-45 in. Plane	362,500	2,498	347,500	2,394	D-3518
Ply Thickness (inch/mm)	0.04	1.016	—	—	—
Tensile Strength per inch width	4,928 lbs.	21.9 kN	4,160 lbs.	18.5kN	D-3039

Cured Laminate Properties with Sikadur Hex 306 Epoxy
Properties after standard cure followed by standard post cure.
[70°-75°F(21°-24°C) - 5 days and 48 hour post cure at 140°F(60°C)]

Property	Average Value[1]		Design Value[2]		
	US Units psi	SI Units MPa	US Units psi	SI Units MPa	ASTM Test Method
Tensile Strength*	116,200	801	97,000	668	D-3039
Tensile Modulus*	9,754,500	67,269	8,421,100	58,021	D-3039
Tensile % Elongation*	1.13	1.13	0.99	0.99	D-3039
140° F - Tensile Strength	117,700	811	102,700	708	D-3039
140° F - Tensile Modulus	10,107,800	69,641	9,470,200	65,305	D-3039
140° F - % Elongation	1.10	1.10	0.94	0.94	D-3039
Compressive Strength	93,300	643	55,900	385	D-695
Compressive Modulus	9,755,100	67,213	8,678,700	59,796	D-695
90 deg Tensile Strength	4,100	28	3,300	23	D-3039
90 deg Tensile Modulus	651,700	4,490	606,700	4,042	D-3039
90 deg % Tensile Elongation	0.64	0.64	0.52	0.52	D-3039
Shear Strength +/-45 in. plane	7,100	49	6,100	42	D-3518
Shear Modulus +/-45 in. plane	344,300	2,372	326,500	2,250	D-3518
Ply Thickness (inch/mm)	0.04	1.016	—	—	—
Tensile Strength per inch width	4,648 lbs.	20.6 kN	3,880 lbs.	17.2kN	D-3039

* 24 sample coupons per test series; all other values based on 6 coupon test series
[1] Average value of test series
[2] Average value minus 2 standard deviations

Preparation Work: Concrete - Blast clean, shotblast or use other approved mechanical means to provide an open roughened texture.
In certain applications and at the engineer's discretion, the intimate contact between the substrate and the fabric may be determined to be non-critical. In these cases, a thorough cleaning of the substrate using low pressure sand or water blasting is sufficient.

Mixing

Consult Sikadur 300 or Sikadur Hex 300/306 data sheets for information on epoxy resins.

Application

Prior to placing the fabric, the concrete surface is primed and sealed using Sikadur 300 or Sikadur Hex 300 epoxy. Material may be applied by spray, brush or roller. SikaWrap Hex 103C can be impregnated using either the Sikadur 300, Sikadur Hex 300 or Sikadur Hex 306 epoxy. For best results on larger projects, the impregnation process should be accomplished using a mechanically driven fabric saturator or similar device. In special cases where the size of the project does not justify the use of a saturator, the fabric may be saturated by hand using a roller prior to placement. In either case, installation of this system should be performed only by a specially trained contractor.
For overhead or vertical applications, prime concrete with Sikadur 30 or Sikadur 330 to improve tack. Saturate fabric with Sikadur 300, Sikadur Hex 300 or Sikadur Hex 306.

Cutting SikaWrap

Fabric can be cut to appropriate length by using a commercial quality heavy duty scissor. Since dull or worn cutting implements can damage, weaken or fray the fiber their use should be avoided. Consult MSDS for proper handling procedures.

Limitations

- Design calculations must be made and certified by an independent licensed professional engineer.
- System is a vapor barrier. Concrete should not be encapsulated in areas of freeze/thaw.

Caution

SikaWrap fabric is non-reactive. However, caution must be used when handling since a fine "carbon dust" may be present on the surface. Gloves must therefore be worn to protect against skin irritation.
Caution must also be used when cutting SikaWrap fabric to protect against airborne carbon dust generated by the cutting procedure. Use of an appropriate, properly fitted NIOSH approved respirator is recommended.

KEEP CONTAINER TIGHTLY CLOSED • KEEP OUT OF REACH OF CHILDREN • NOT FOR INTERNAL CONSUMPTION • FOR INDUSTRIAL USE ONLY

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Fax: 52 442 2250537

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Product Data Sheet
Edition 7.2003
Identification no. 322-OH
Sikadur Hex 300/306

Sikadur® Hex 300/306

High-modulus, high-strength, impregnating resin

Description	Sikadur Hex 300 and Sikadur Hex 306 are two-component 100% solids, moisture-tolerant, high strength, high modulus epoxies. Sikadur Hex 300/306 is approved for use by ICBO/ICC (ER 5558).
Where to use	▪ For use as an impregnating resin with SikaWrap Structural Strengthening System. ▪ Sikadur Hex 300 is used as a seal coat and impregnating resin for horizontal and vertical applications. ▪ Sikadur Hex 306 is a thixotropic version of Sikadur Hex 300 used as an impregnating resin for overhead applications.
Advantages	▪ Long pot life. ▪ Long open time. ▪ Easy to mix. ▪ Tolerant of moisture before, during and after cure. ▪ High strength, high modulus adhesive. ▪ Excellent adhesion to concrete, masonry metals, wood and most structural materials. ▪ Fully compatible and developed specifically for the SikaWrap System. ▪ Thixotropic version ideal for overhead applications. ▪ High temperature resistance. ▪ High creep resistance under permanent load. ▪ High abrasion and shock resistance. ▪ Solvent-free, VOC compliant.
Coverage	As a sealer: 100 ft²/gal. As an impregnating resin: 60 ft²/gal.
Packaging	4 gallon units

Typical Data *(Material and curing conditions @ 73°F (23°C) and 50% R.H.)*

Shelf Life	2 years in original, unopened container.	
Storage Conditions	Store dry at 40°-95°F (4°-35°C). **Condition material to 65°-75°F (18°-24°C) before using.**	
Color	Clear, amber.	
Mixing Ratio	Mix entire unit, do not batch.	
Viscosity	Sikadur Hex 300 - 550 cps	Sikadur Hex 306 - 7,000 cps
Pot Life	4 hours	
Tack Free	20 hours	
Glass Transition Temp. (Tg)	174°F (79°C) after 48 hrs./140°F (60°C) post cure 115°F (46°C) after 120 hrs./70°F (21°C) post cure	
Service Temperature Range	-40° to 140°F (-40 to 60°C)	

Mechanical Properties *(Min. 7 day cure @ 73°F (23°C) and 50% R.H.)*

Tensile Strength (ASTM D-638)	10,500 psi (72.5 MPa)
Tensile Modulus (ASTM D-638)	4.6 x 10^5 psi (3,174 MPa)
Elongation @ Break (ASTM D-638)	4.8%
Flexural Strength (ASTM D-790)	17,900 psi (123.5 MPa)
Flexural Modulus (ASTM D-790)	4.5 x 10^5 psi (3,105 MPa)

How to Use

Surface Preparation

The concrete surface should be prepared to a minimum concrete surface profile (CSP) 3 as defined by the ICRI-surface-profile chips. Localized out-of-plane variations, including form lines, should not exceed 1/32 in. (1 mm). Substrate must be clean, sound, and free of surface moisture. Remove dust, laitance, grease, oils, curing compounds, waxes, impregnations, foreign particles, coatings and disintegrated materials by mechanical means (i.e. sandblasting). For best results, substrate should be dry. However, a saturated surface dry condition is acceptable.

Mixing

Pre-mix each component. Mix entire unit, do not batch. Pour contents of part 'B' to part 'A'. Mix thoroughly for 5 minutes using a paddle style mixer on low speed (400-600 rpm) drill until uniformly blended.

Application

As a sealer: Apply mixed Sikadur Hex 300 epoxy to a properly prepared substrate using a brush, roller or airless sprayer. Sikadur Hex 300 should be applied at a sufficient rate to fully saturate the substrate without producing a surface film. Coverage rates are based on a substrate with normal porosity.

As an impregnating resin: For vertical and horizontal applications, use Sikadur Hex 300. For overhead applications use Sikadur Hex 306. Resins may be applied to fabric by either manual or mechanical means. For further information, consult installation guidelines.

Limitations

- Minimum substrate and ambient temperature 40°F (4°C).
- Do not thin with solvents.
- Material is a vapor barrier after cure.
- Minimum age of concrete must be 21-28 days depending on curing and drying conditions

Caution

Component 'A' - Irritant; Sensitizer - Contains epoxy resin. Can cause sensitization after prolonged or repeated contact. Skin and eye irritant. High concentrations of vapor may cause respiratory irritation. Avoid skin contact. Use only with adequate ventilation. Use of safety goggles and chemical resistant gloves is recommended. In case of exceedance of PELs, use an appropriate, properly fitted NIOSH approved respirator. Remove contaminated clothing. Consult MSDS for more detailed information.

Component 'B' - Corrosive; Sensitizer Contains amines. Contact with eyes or skin may cause severe burns. Can cause sensitization after prolonged or repeated contact. Skin and eye irritant. High concentrations of vapor may cause respiratory irritation. Avoid skin contact. Use only with adequate ventilation. Use of safety goggles and chemical resistant gloves is recommended. In case of exceedance of PELs, use an appropriate NIOSH approved respirator. Remove contaminated clothing. Consult MSDS for more detailed information.

First Aid

Eyes: Hold eyelids apart and flush thoroughly with water for 15 minutes. **Skin:** Remove contaminated clothing. Wash skin thoroughly for 15 minutes with soap and water. **Inhalation:** Remove person to fresh air. **Ingestion:** Do not induce vomiting. **In all cases, contact a physician immediately if symptoms persist.**

Clean Up

Ventilate area. Confine spill. Collect with absorbent material. Dispose of in accordance with current, applicable local, state and federal regulations. Uncured material can be removed with approved solvent. Cured material can only be removed mechanically.

KEEP CONTAINER TIGHTLY CLOSED — KEEP OUT OF REACH OF CHILDREI
NOT FOR INTERNAL CONSUMPTION — FOR INDUSTRIAL USE ONL
CONSULT MATERIAL SAFETY DATA SHEET FOR MORE INFORMATION

Sika warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Technical Data Sheet if used as directed within shelf life. User determines suitability of produ for intended use and assumes all risks. Buyer's sole remedy shall be limited to the purchase price or replacement of produ exclusive of labor or cost of labor.

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C.P. 76920
Phone: 52 442 2385800
Fax: 52 442 2250537

QUALITY ISO 9001 9002 ACHIEVEMEN

Quality Certification Numbers: Lyndhurst: FM 69711 (ISO 9001), FM 70121 (QS 9000), Marion: FM 69715, Kansas City: FM 69107, Santa Fe Springs: FM 63405

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VELACARB 600U

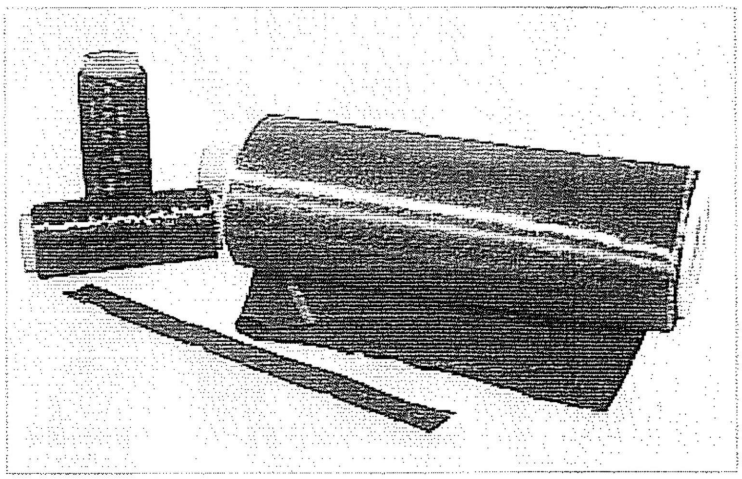
EDGE STRUCTURAL COMPOSITES

DESCRIPTION

VelaCarb 600U is a Pan based dry, unidirectional carbon fiber fabric that is field-impregnated with **Veloxx LR** laminating resin to create a carbon fiber reinforced polymer (CFRP) laminate. **VelaCarb** fabrics are produced under ISO 9002 standards.

VelaCarb 600U is a patented part of the FiberBond™ Strengthening System, a highly engineered product for strengthening concrete and masonry structures.

For most applications **VelaCarb 600U** is a proven cost effective alternative to traditional strengthening techniques.



Color	Black	
Primary Fiber Direction	0° (unidirectional)	
Flame Spread Index[1] (ASTM E84)	25 (Class 1)	
Fabric areal weight density	18 oz/yd²	600 g/m²
Fabric thickness per ply[2]	0.00689 in² per in	1.75 cm² per m
Tensile Strength	650,000 psi	4,480 MPa
Modulus of Elasticity	34x10⁶ psi	234,400 MPa
Elongation at Break	1.9%	1.9%
Average thickness per ply	0.050 in	1.27 mm
Tensile Strength[3] (ASTM D3039)	140,000 psi	966 MPa
Modulus of Elasticity (ASTM D3039)	10.1 x 10⁶ psi	70,000 N/mm²
Elongation at Break[3] (ASTM D3039)	1.2%	1.2%
Strength per unit width (per ply)	7000 lbs/in	1217 kN/m
Shear Bond Strength (Concrete failure)	680 psi	4-68 N/mm²

Notes: (1) Tests conducted on fully cured samples of **VelaCarb 600U** without a protective coating.
(2) Fabric thickness is based on the area of fibers.
(3) Properties are statistically based and can be used for design without further reductions.

USE VELACARB 600U FOR:

Flexural Strengthening
- Beams, joists, girders.
- One-way and two-way slabs.
- Columns.
- Walls.

Shear Strengthening
- Beams, columns, walls.
- Diaphragms.

Tensile Strengthening
- Silos, tanks, bins.
- Pipes.
- Chimneys.

Ductility Enhancement (Seismic)
- Columns, beams.
- Beam-column joints.

Serviceability
- Crack control.
- Fatigue.
- Reduced deflections.

USE VELACARB 600U TO ADDRESS:

Increased Loads
- Increased floor live loads in buildings and warehouses (e.g. filing systems).
- Increased vehicular live loads on bridges.

Damage and Deterioration
- Corrosion-related section loss of reinforcing steel or post-tensioning tendons.
- Vehicle impact.

Seismic Retrofit
- Insufficient shear strength.
- Improper reinforcing steel details.
- Enhanced ductility.

Design/Construction Defects
- Insufficient reinforcing steel or post-tensioning tendons.

Other
- Cut reinforcing steel around slab openings.
- Restoration of historic structures.
- Blast upgrades.

ADVANTAGES
- High strength.
- Lightweight, can be installed without heavy equipment.
- Can be used on both, reinforced and prestressed concrete structures.
- Class I flame spread classification (ASTM E84), can be used in all building types.
- Durable, highly resistant to aggressive environments.
- Flexible, fabric can be wrapped around structural elements.
- Woven fabric is ideally suited for construction sites, fibers will not fray or separate under normal handling.
- Thin, minimal aesthetic impact.
- Can be applied dry or pre-impregnated with resin.
- Economical, installed costs competitive with traditional alternates.

LIMITATIONS
- All applications of **VelaCarb 600U** should be evaluated and designed by a licensed engineer.
- All installations of **VelaCarb 600U** should be inspected by a qualified independent testing agency.
- **VelaCarb 600U** should not be used when the operating temperature exceeds 160 °F (70 °C) unless special precautions are taken to insulate the system.
- Substrate strength for bond-critical applications should exceed 200 psi.
- System is a vapor barrier. Avoid completely encapsulating concrete in areas where freeze/thaw is likely to occur.

PACKAGING
Available in 6", 12", 24" & 48" width x 100yds rolls.

STORAGE AND HANDLING
Store in a dry area at 40-90°F (4-32°C) away from direct sunlight, flame, or other hazards. When properly stored the product has an indefinite shelf life.

INSTALLATION
Detailed installation procedures for **VelaCarb 600U** are outlined in the FiberBond™ Installation Manual. Installation of VelaCarb 335U should only be performed by contractors trained and certified by EDGE STRUCTURAL COMPOSITES.

SAFETY
Product material safety data sheets (MSDS) should be consulted during application of or when handling this product.
VelaCarb 600U contains carbon fibers. Carbon fibers are conductive and special precautions should be taken when using this product around electric tools and machinery.

RELATED PRODUCTS
The following products are typically used with **VelaCarb 600U**:
- **Veloxx LR** Laminating Resin
- **Veloxx LVP** Low Viscosity Primer
- **Veloxx AP** Adhesive Paste/Filler
- **Velacoat** Top Coats
- **Velanchor** Anchors

DISCLAIMER/WARRANTY STATEMENT

Data reported are based on testing conducted at independent testing agencies. EDGE STRUCTURAL COMPOSITES reserves the right to change or modify, at its discretion, and without prior notice, any of the information contained in this document.
EDGE STRUCTURAL COMPOSITES warrants this product to free of manufacturing defects and that it will meet the current published properties when applied per EDGE's installation procedure and tested in accordance with ASTM standards. The user determines the suitability for use of this product assumes all risk associated with its use.

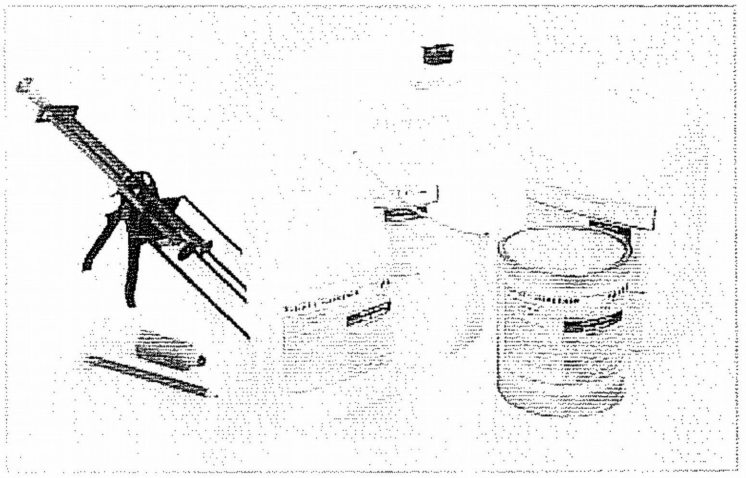
VELOXX LR

EDGE STRUCTURAL COMPOSITES

DESCRIPTION

Veloxx LR is a two-component, 100% solids, two-phase, epoxy used for impregnating FiberBond™ dry sheet products.

Veloxx LR is a patented, ICBO/ICC-ES approved (ER #5836) part of the FiberBond™ Strengthening System, a highly engineered product for the external strengthening of concrete and masonry structures.



Color	Green (Part A) Amber (Part B) Green (Mixed)	
Storage Conditions	Store in a dry place at 40-90° F (4-32° C) out of direct sunlight.	
Shelf Life	12 months in original, unopened container.	
Mixed Viscosity	20,000 cps @ 50° F (10° C) 2,200 cps @ 77° F (25° C)	
Pot Life (1 gallon unit)	180 minutes @ 50° F (10° C) 45 minutes @ 77° F (25° C) 20 minutes @ 90° F (32° C)	
Mix Ratio	100A : 62B (by weight) 100A : 70B (by volume)	
T_g	145° F	63° C
Tensile Strength (ASTM D638)	6,500 psi	44.8 MPa
Tensile Modulus (ASTM D638)	300 psi x 10^3	2,068 MPa
Elongation at Failure (ASTM D638)	5.5 %	5.5 %
Hardness (Shore D)	77	
Compressive Strength (ASTM D695)	10.3 ksi	71 MPa
Compressive Modulus (ASTM D695)	290 ksi	2000 MPa
Shear Bond Strength	2.189 ksi	15.01 MPa

Notes: (1) Neat resin properties measured at 7 days unless noted otherwise.

TYPICAL USES

- **Veloxx LR** can be used for machine or hand impregnation of FiberBond™ sheets.

ADVANTAGES

- Developed specifically for the FiberBond™ Strengthening System for concrete and masonry structures.
- Fully compatible with **Veloxx LVP** Low Viscosity Primer and **Veloxx AP** Adhesive Paste.
- Long pot life.
- Easy to mix.
- Excellent adhesion to concrete and masonry materials.
- Solvent free, VOC compliant.
- Minimum substrate and ambient temperature is 40° F.

PACKAGING

- Available in 1, 5 and 55 gallon units.

STORAGE AND HANDLING

- Store in a dry area at 40 - 90° F (4 - 32° C) away from direct sunlight, flame, or other hazards. When properly stored the product has an indefinite shelf life.

INSTALLATION

- Detailed installation procedures for **Veloxx LR** are outlined in the FiberBond™ Installation Manual.
- Installation of **Veloxx LR** should only be performed by contractors trained and certified by EDGE STRUCTURAL COMPOSITES.

SAFETY

- Product material safety data sheets (MSDS) should be consulted during application of or when handling this product.

RELATED PRODUCTS

The following products are typically used with **Veloxx LR**:

- **Veloxx LVP** Low Viscosity Primer
- **Veloxx AP** Adhesive Paste/Filler
- **Velacoat** Top Coats
- **Velanchor** Anchors
- **Velacarb XXX** Carbon Fiber Sheets
- **Velaglass XXX** Glass Fiber Sheets

DISCLAIMER/WARRANTY STATEMENT

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Engineered Calc's and Dwg's

EDCI ENGINEERS

HOFFMAN CONSTRUCTION COMPANY

This submittal has been reviewed for general conformance with the contract documents. Contractor's review does not relieve the Vendor/Subcontractor of responsibility for compliance with all requirements of the contract, including completeness and accuracy of this submittal.

06/13/2012 — Date
032500-0087-0 — Submittal #
MS — Reviewed By

Structural Calculations

For:

Emanuel Medical Center

Adult Services Building Renovation

FRP Strengthening

☒ REVIEWED ☐ MAKE CORRECTIONS NOTED
☐ REJECTED ☐ REVISE AND RESUBMIT

THIS REVIEW IS ONLY FOR GENERAL CONFORMANCE WITH THE DESIGN CONCEPT, CRITERIA, AND INFORMATION GIVEN IN THE CONSTRUCTION DOCUMENTS. CORRECTIONS OR COMMENTS MADE ON THIS SUBMITTAL DURING THIS REVIEW DO NOT RELEASE THE CONTRACTOR OR THEIR AGENTS FROM COMPLIANCE WITH THE REQUIREMENTS OF THE DRAWINGS AND SPECIFICATIONS. REVIEW OF A SPECIFIC ITEM SHALL NOT INCLUDE REVIEW OF AN ASSEMBLY OF WHICH THE ITEM IS A COMPONENT. THE CONTRACTOR AND THEIR AGENTS ARE RESPONSIBLE FOR: DIMENSIONS TO BE CONFIRMED AND CORRELATED AT THE JOBSITE; ADHERENCE TO APPLICABLE CODES AND STANDARDS; INFORMATION THAT PERTAINS SOLELY TO THE FABRICATION PROCESSES OR TO THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES OF CONSTRUCTION; COORDINATING THE WORK WITH ALL OTHER TRADES; AND PERFORMING ALL WORK IN A SAFE AND SATISFACTORY MANNER.

6/22/12 — DATE — CATENA CONSULTING ENGINEERS — AAM — BY

REGISTERED PROFESSIONAL ENGINEER
12219
OREGON
JULY 15, 1983
WADE W. YOUNIE
EXPIRES: 06-30-2012

Prepared For:
D&R Masonry

24-May-12

Job Number: 12031-0041

400 SW 6th Avenue, Suite 605 Portland, OR 97204 Phone: (503) 242.2448 Fax: (503) 242.2449
Bellevue Spokane Everett Portland San Diego Austin

DCI ENGINEERS

Project # : 12031-0041 Page # : 1
Proj. Name : Emanuel FRP
Engineer : AJ Date : 5/24/2012
Subject : Columns

Column FRP Wrap

Required Additional Shear Strength from FRP Only

		At middle of column		At upper and lower ends of column	
		V =	**88 kips**	V =	**50 kips**

Material Properties

HEX 103 System Carbon Fiber

Ultimate rupture strain	ε_{fu}* =	**0.0098**		ε_{fu}* =	**0.0098**	
Environmental reduction factor	C_e =	**0.85**		C_e =	**0.85**	
Design rupture strain	$\varepsilon_{fu} = C_E \varepsilon_{fu}$ =	0.0083		$\varepsilon_{fu} = C_E \varepsilon_{fu}$ =	0.0083	
Check ACI limit to strain (Eq 11-6a)	ε_{fe} =	0.0040		ε_{fe} =	0.0040	
FRP composite modulus	E_f =	**9939 ksi**		E_f =	**9939 ksi**	
Effective design stress	$f_{fe} = \varepsilon_{fe} * E_f$ =	39.8 ksi		$f_{fe} = \varepsilon_{fe} * E_f$ =	39.8 ksi	

Geometric Properties

Thickness of each layer	t =	**0.04 in**		t =	**0.04 in**	
Dimension of column (diameter or width)	d =	**24 in**		d =	**24 in**	
Number of plies (fully wrapped)	n =	**(2)**	< - middle of columns	n =	**(1)**	< - ends of columns

Governing Equation: $\Phi V_n = \Phi(V_c + V_s + \psi_f V_f)$

ACI 318 Reduction factor for shear	Φ =	**0.85**		Φ =	**0.85**
ACI 440 Reduction factor (fully wrapped)	ψ_f =	**0.95**		ψ_f =	**0.95**

Nominal strength of FRP: $V_f = A_{fv} * f_{fe} = (2) * n * t_f * d_{col} * f_{fe}$

Additional Shear Strength from FRP Only	**$\Phi * \psi_f V_n$ =**	**123 kips**		**$\Phi * \psi_f V_n$ =**	**62 kips**
Demand on FRP	V_u =	88 kips		V_u =	50 kips
Stress Ratio	0.71	**OK**		0.81	**OK**

DCI ENGINEERS

Project # : 12031-0041 Page # : 2
Proj. Name : Emanuel FRP
Engineer : AJ Date : 5/24/2012
Subject : Beams

Slab FRP Reinforcement

Required Additional Moment from FRP Only		M =	**2100 k-in**		M =	**1100 k-in**
		FRP on top face of slab			FRP on underside of slab	
Material Properties						
HEX 103 System Carbon Fiber						
Ultimate rupture strain		ε_{fu}* =	**0.0098**		ε_{fu}* =	**0.0098**
Environmental reduction factor		C_E =	**0.95**		C_E =	**0.95**
Design rupture strain		$\varepsilon_{fu} = C_E\ \varepsilon_{fu}$ =	0.0093		$\varepsilon_{fu} = C_E\ \varepsilon_{fu}$ =	0.0093
Strain at debonding (Eq 10-2) $\varepsilon_{fd} = 0.083\sqrt{\frac{f'_c}{nE_f t_f}} \le 0.9\ \varepsilon_{fu}$		ε_{fd} =	0.0034		ε_{fd} =	0.0059
FRP composite modulus		E_f =	**9939 ksi**		E_f =	**9939 ksi**
Design rupture stress		$f_{des.fu} = \varepsilon_{fu} * E_f$ =	92.5 ksi		$f_{des.fu} = \varepsilon_{fu} * E_f$ =	92.5 ksi
Stress limited by debonding		$f_{deb.fu} = \varepsilon_{fd} * E_f$ =	33.8 ksi		$f_{deb.fu} = \varepsilon_{fd} * E_f$ =	58.5 ksi
Allowable stress under cyclic loading		$f_{cfu} = 0.55\ f_{dfu}$ =	50.9 ksi		$f_{cfu} = 0.55\ f_{dfu}$ =	50.9 ksi
Controlling stress		f_{fe} =	33.8 ksi		f_{fe} =	50.9 ksi
Geometric Properties of Slab						
Strength of slab		f'$_c$ =	**4000 psi**		f'$_c$ =	**4000 psi**
Thickness of slab		t_{slab} =	**10 in**		t_{slab} =	**10 in**
Width of slab being considered		w_{slab} =	**36 in**		w_{slab} =	**36 in**
Approx moment arm of in-service slab		$d = 0.9\ t_{slab}$ =	9.0 in		$d = 0.9\ t_{slab}$ =	9.0 in
Cover to existing rebar		c =	**1.0 in**		c =	**1.0 in**
Approx moment arm to FRP		$d_f = d + c$ =	10.0 in		$d_f = d + c$ =	10.0 in
Required tension in FRP		$T = M/d_f$ =	210 kips		$T = M/d_f$ =	110 kips
Geometric Properties of FRP						
Thickness of each layer		t =	**0.04 in**		t =	**0.04 in**
Width of plies		w_{slab} =	36 in		w_{slab} =	36 in
Number of plies at tension face		n =	**(6)**	< - top of slab	n =	**(2)** < - bot of slab
Minimum devlopment length $l_{df} = 0.057\sqrt{\frac{nE_f t_f}{\sqrt{f'_c}}}$		l_{df} =	11.1 in		l_{df} =	6.4 in

Governing Equation: $\Phi M_n = \Phi(M_n + \psi_f M_f)$

ACI 318 Reduction factor for flexure	Φ =	**0.9**		Φ =	**0.9**
ACI 440 Reduction factor for FRP flexure	ψ_f =	**0.85**		ψ_f =	**0.85**

Nominal strength of FRP: $M_f = A_f * f_{fe} * d_f = n * t_f * w_{slab} * f_{fe} * d_f$

Additional Shear Strength from FRP Only	$\Phi * \psi_f M_f$ =	**2233 k-in**		$\Phi * \psi_f M_f$ =	**1121 k-in**
Demand on FRP	M_u =	2100 k-in		M_u =	1100 k-in
Stress Ratio	0.94	OK		0.98	OK

ABBREVIATIONS

∠	Angle	FIN	Finish	PSI	Pounds Per Square Inch
AB	Anchor Bolt	FLR	Floor	PSL	Parallel Strand Lumber
ADDL	Additional	FRP	Fiberglass Reinforced Plastic	P-T	Post-Tensioned
ALT	Alternate	FTG	Footing	PT	Pressure Treated
ARCH	Architectural	F/	Face of	R	Radius
B or BOT	Bottom	GA	Gage	RD	Roof Drain
B/	Bottom Of	GALV	Galvanized	REF	Refer/Reference
BLDG	Building	GEOTECH	Geotechnical	REINF	Reinforcing
BLKG	Blocking	GL	Glue Laminated Timber	REQD	Required
BMU	Brick Masonry Unit	GWB	Gypsum Wall Board	RET	Retaining
BP	Baseplate	HDR	Header	SCB	Special Concentric Braced
BRB	Buckling Resisting Braced	HF	Hem-Fir	SCHED	Schedule
BRG	Bearing	HGR	Hanger	SHTHG	Sheathing
BTWN	Between	HD	Hold-down	SIM	Similar
℄	Centerline	HORIZ	Horizontal	SMF	Special Moment Frame
C	Camber	HP	High Point	SOG	Slab on Grade
CB	Castellated Beam	HSS	= TS (Hollow Structural Section)	SPEC	Specification
CIP	Cast in Place	IBC	International Building Code	SQ	Square
CJ	Construction or Control Joint	ID	Inside Diameter	SR	Studrail
CJP	Complete Joint Penetration	IE	Invert Elevation	SF	Square Foot
CLR	Clear	IF	Inside Face	SST	Stainless Steel
CMU	Concrete Masonry Unit	INT	Interior	STAGG	Stagger/Staggered
COL	Column	k	Kips	STD	Standard
CONC	Concrete	KSF	Kips Per Square Foot	STIFF	Stiffener
CONN	Connection	LF	Lineal Foot	STL	Steel
CONST	Construction	LL	Live Load	STRUCT	Structural
CONT	Continuous	LLH	Long Leg Horizontal	SWWJ	Solid Web Wood Joist
C'SINK	Countersink	LLV	Long Leg Vertical	SYM	Symmetrical
CTRD	Centered	LP	Low Point	T	Top
ø	Diameter	LONGIT	Longitudinal	T/	Top Of
DB	Drop Beam	LSL	Laminated Strand Lumber	T&B	Top & Bottom
DBA	Deformed Bar Anchor	LVL	Laminated Veneer Lumber	TC AX LD	Top Chord Axial Load
DBL	Double	MAS	Masonry	TCX	Top Chord Extension
DEMO	Demolish	MAX	Maximum	TDS	Tie Down System
DEV	Development	MECH	Mechanical	T&G	Tongue & Groove
DF	Douglas Fir	MEZZ	Mezzanine	THKND	Thickened
DIAG	Diagonal	MFR	Manufacturer	THRD	Threaded
DIST	Distributed	MIN	Minimum	THRU	Through
DL	Dead Load	MISC	Miscellaneous	TRANSV	Transverse
DN	Down	NIC	Not In Contract	TYP	Typical
DO	Ditto	NTS	Not To Scale	UBC	Uniform Building Code
DP	Depth/Deep	OC	On Center	UNO	Unless Noted Otherwise
DWG	Drawing	OCB	Ordinary Concentric Braced	URM	Unreinforced Masonry Unit
(E)	Existing	OD	Outside Diameter	VERT	Vertical
EA	Each	OF	Outside Face	W	Wide
EF	Each Face	OPNG	Opening	W/	With
EL	Elevation	OPP	Opposite	W/O	Without
ELEC	Electrical	OWSJ	Open Web Steel Joist	WHS	Welded Headed Stud
ELEV	Elevator	OWWJ	Open Web Wood Joist	WP	Working Point
EMBED	Embedment	ℙ	Plate	WWF	Welded Wire Fabric
EQ	Equal	PAF	Powder Actuated Fastener	±	Plus or Minus
EQUIP	Equipment	PC	Precast		
EW	Each Way	PERP	Perpendicular		
EXP	Expansion	PLWD	Plywood		
EXP JT	Expansion Joint	PP	Partial Penetration		
EXT	Exterior	PREFAB	Prefabricated		
FD	Floor Drain	PSF	Pounds per Square Foot		
FDN	Foundation				

FIBER REINFORCED POLYMER (FRP) COMPOSITE SYSTEM

FRP PROJECT NARRATIVE: The Emanuel Medical Center Adult Service building is undergoing a remodel including a seismic upgrade. FRP is being used as part of the seismic strengthening on the interior concrete columns and selected locations on the floor slabs. DCI is acting as the structural specialty engineer (SSE), designing the FRP to meet the strengthening criteria defined by Catena, the project engineer of record (EOR). These notes describe the FRP materials, installation procedures and quality control program.

REFERENCE STANDARDS: Conform to:

1) ACI 540.2R-08, Guide for the Design and Construction of Externally Bonded FRP Systems for the Strengthening Concrete Structures
2) IBC Chapter 19-Concrete.
3) ASTM D7522-09 Standard Test Method for Pull-off Strength of FRP bonded to Concrete.
4) ASTM D3039 Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

SUBMITTALS: Conform to ACI 301 Sec. 3.1.1 "Submittals, data and drawings"

1) FRP Manufacturer's product data, specifications and recommended application procedures showing compliance with the project requirements.
2) Certification from the FRP manufacturer of the material and section properties for the supplied material, an approved ICC Evaluation Report number in the name of the proposed system and the system's manufacturer, written verification from the FRP system's manufacturer that the applicators have received the required certifications and training.
3) A list of a minimum of five (5) completed composite strengthening projects performed by the application contractor. The list should include at a minimum, the dates of work, type, description and amount of work performed, and the name and telephone number of a contact person at the agency or company for which the work was completed. In addition, provide the names of the applicator's key personnel (superintendent and assistant) who will perform the actual work. The superintendent and assistant shall have a minimum experience of 1 year involved in directing projects such as this.
4) Submit for record Material Safety Data Sheets (MSDS) of each product, used on site.

MATERIALS:

1) Composite fabric: SIKA HEX 103C, unidirectional carbon fiber.
2) Epoxy saturant: HEX-3R 300 epoxy matrix.
3) Primer/Filler: Thickened epoxy for protective seal coat and filling voids. Design the composite system, per ICC ES AC125 design criteria, to achieve the structural performance shown on the structural drawings.
4) Deliver epoxy materials in factory-sealed containers with the manufacturer's labels intact and legible with verification of date of manufacture and shelf life.
5) Store materials in a protected area at a temperature between 40°F and 90°F.
6) Products shall be stored according to the manufacturer's requirements and shall avoid contact with moisture.
7) Finish Paint: Pre project specification section 032500

MANUFACTURER:
SIKA/HEXCEL Corp, 11711 Dublin Blvd, Dublin, CA 94568.

OTHER MATERIALS:
Provide other materials as needed for the proper installation of the complete composite system as selected by the contractor in conformance with these specifications.

INSTALLATION: Composite system shall be installed by a specialty application contractor certified by the manufacturer. The application contractor shall provide a quality control procedure in compliance with the manufacturer's installation requirements.

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CIVIL / STRUCTURAL

PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S1.01
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL GENERAL NOTES & ABBREVIATIONS
BY: JCF	

12031-0041 S1.01.dwg 24 May 2012 - 5:11 pm jfleming

STRUCTURAL REGISTERED PROFESSIONAL ENGINEER 12219 OREGON JULY 15, 1983 WADE W. YOUNIE

EXPIRES: 6-30-12

Surface Preparation

1) The surface to receive composite shall be free from fins, sharp edges and protrusions that will cause voids behind the installed FRP, in the opinion of the SSE, will damage the fibers. Existing uneven surfaces to receive FRP shall be filled with epoxy filler or other material approved by the SSE. Prior to the application of the saturated composite fabric, fill any uneven surfaces with the manufacturer's thickened epoxy
2) The contact surfaces shall have no free moisture on them at the time of application. If moisture cannot be avoided, use the manufacturer's suggested wet prime epoxy.
3) For column wraps, round off sharp and chamfered corners to a radius of 1/2 inch (±0.125") means of grinding or forming with the system's thickened epoxy. Variations in the radius along the vertical edge shall not exceed 1/2" for every 12 feet of column height.
4) Column surfaces shall have all foreign materials removed and be broom cleaned. Stripping off well-adhered paint or concrete from column surfaces is not required.
5) Slab surfaces shall be prepared for bonding by means of abrasive blasting or grinding to achieve 1/16" minimum amplitude. All contact surfaces shall then be cleaned by hand or compressed air.
6) One prime coat of the manufacturer's epoxy shall be applied and allowed to cure for a minimum of one hour. Primer must be covered with fiber within 24 hours of application, depending on temperature conditions. If 24-hour window is exceeded, the primed surfaces must be solvent wiped with a fast flashing solvent (e.g. MEK) or roughened with sandpaper to break the amine blush.

Procedures for FRP Application

1) Prepare the epoxy matrix by combining components at a weight ratio specified on the manufacturer's labeled units, with an allowable tolerance of ± 10%. The components of epoxy resin shall be mixed with a mechanical mixer until uniformly mixed, typically 5 minutes at 400-600 rpm. Components that have exceeded their shelf life (as designated on the material label) shall not be used.
2) Wet Lay-Up
    a. Apply FRP Reinforcement in accordance with Manufacturer's recommendations.
    b. When using saturator equipment, follow Manufacturer's procedures for proper machine set-up and calibration. Rollers shall be calibrated to saturate the fabric with the proper resin-to-fabric ratio. The roller gap shall be checked daily by a qualified technician for accuracy. The resin-to-fabric ratio shall also be verified by resin usage and documented on the daily project logs.
    c. Once the fabric is saturated, it may then either be spooled for easy handling, or cut to specified lengths and booked for handling. Care must be taken not to damage the fibers.
    d. The fabric may then be applied to the surface with no delay. Work from one end to the other, taking care to orient the fibers as specified. Remove any air entrapped in the fabric with a ribbed roller or squeegee.
    e. Sheets shall be lapped in the longitudinal direction 6 inches minimum or as indicated on the Drawings. Note: no lapping is required of the sheets parallel to the direction of fiber orientation. Apply subsequent layers, continuously or spliced, until designed number of layers is achieved, per project drawings.
    f. Epoxy curing temperatures shall be maintained in the temperature range designated for the formulation used. Temperature cure ranges and times to be determined by manufacturer. The composite system shall be protected from contact by moisture for a period of a minimum of 24 hours.
3) Penetrations per EOR plans may be cut after FRP is cured. Holes per 4 and 2/S8.01 shall be cut through the FRP with a core saw. Small slab penetrations per note 5, 3/S8.01 should be aligned parallel to the unidirectional FRP fiber in (2) 1" wide strips.

Procedure Modifications

Installation procedures may be modified to achieve maximum results, subject to approval by the SSE, EOR, and BDS. Procedure modifications shall be discussed with the SSE, EOR and BDS prior to implementing the modifications.

Repairs

1) All defects (including bubbles, delaminations, and fabric tears) spanning more than 5% of the surface area, or as specified by the owner or SSE, shall be repaired. Repair procedures shall be performed in accordance with guidelines established by ACI 440.2R-08 (paragraph 7.2.3) and approved by the SSE. All repairs shall be subject to the same application, curing and quality control specifications as the original work. Repairs for various defect shall follow:
    a. Small delaminations and voids less than 2 in^2 each are permissible as long as the delaminated area is less than 5% of the total laminate area and there are no more than 10 such delaminations per 10 ft^2.
    b. Medium sized delaminations and voids greater than 2 in^2 but less than 25 in^2 may be repaired by epoxy resin injection or ply replacement, depending on the size and number of delaminations and their location. The repair procedure should be determined by the Project Engineer.
    c. Larger size delaminations and voids greater than 25 in^2 should be repaired by selectively cutting away the affected sheet and applying an overlapping sheet patch of equivalent plies. The overlap should extend a minimum of 6 in. in all directions.

FIELD QUALITY CONTROL RESPONSIBILITES:

1) SSE will visit the site, prior to the application of the FRP, to observe the surface preparation and patch work.
2) The testing agency shall receive and review the FRP drawings and the project specifications.
3) The testing agency will verify ambient and concrete temperatures. No work shall proceed if the temperature of the concrete surface being repaired is less than 40 degrees Fahrenheit or greater than 90 degrees Fahrenheit. The temperature of the epoxy components shall be between 40 and 90 degree F at the time of mixing or as specified on the component labels. When air temperature is outside the prescribed range, other measures must be employed to ensure components' temperature is maintained within this range.
4) The applicator shall record batch numbers for fabric and epoxy used each day, and note locations of installation. Measure square footage of fabric and volume of epoxy used each day.
3) The applicator shall prepare 12" x 12" samples for tensile testing per ASTM D3039 procedures. . On a smooth, flat, level surface covered with polyethylene sheeting, or 16 mil plastic film, prime with epoxy resin, then prepare sample by placing two layers of saturated fabric oriented in the same direction. Apply additional topping of epoxy. Cover with plastic film and squeegee out all bubbles. Samples shall be stored in a sample box and not moved for a minimum 48 hours after casting. The prepared, identified samples shall be given to the testing agency.
4) The testing agency shall precondition tensile samples for 48 hours at 140 degree F before testing (see ASTM D3039 for testing requirements)
5) Tensile testing results shall be made available within 3 weeks of sample submission. The testing shall provide average values that must meet or exceed the following:
    a. Ultimate Tensile Strength as a function of Tensile Modulus times effective Sectional Area.
    b. Ultimate Tensile Modulus E_u=9,930 KSI for Carbon Fiber FRP.
    c. Maximum Elongation = 0.98% for Carbon Fiber FRP.
6) The applicator shall prepare sacrificial patch of FRP on the slabs, as describe in these notes, for the ASTM D7522-09 Pull-off test. The sacrificial FRP patch shall be adjacent to and prepared the same as the production FRP.
7) The testing agency will conduct ASTM D7522-09 Pull-off test, as described in these notes.
8) The testing agency will provide on-site special inspections as defined in the Testing and Inspection Section of these notes. During the FRP installation, inspections should conducted and the duties shall include:
    a) Report the date and time of installation include:
        - Location of the FRP being installed. Use building levels and grid numbers.
        - Ambient temperature
        - Relative humidity
        - Surface temperature of concrete
        - Batch numbers
        - Mix ratios
        - Mixing time
        - Installation time

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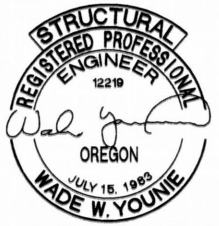
PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S1.02
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL GENERAL NOTES CONTINUED
BY: JCF	

12031-0041 S1.02.dwg 24 May 2012 - 5:12 pm jfleming



EXPIRES: 6-30-12

b) Verify at least one (1) batch mix of resin, primer and adhesives per day.
c) Verify proper application of resin to fibers for wet lay-up systems.
d) Spot-check at least three (3) areas per day, to verify fiber alignment, number of layers, and the direction of fibers of each layer
e) Verify proper curing of FRP system.
f) Verify correct preparation and curing of tensile test samples. Transport samples to laboratory.
g) Conduct field bond pull-off test per ASTM.
h) Identify and map any defects or substandard areas.
i) To inspect the repair of all defects and verify that they meet engineer's recommendations

TESTS AND INSPECTIONS:

Inspections: Special Inspections and Testing shall be done in accordance the Statement Of Special Inspections per OSSC Sections 1704, 1705, as applicable.

Special Inspectors: Special Inspectors shall be employed by the Owner to provide Special Inspections for the project. Special Inspectors shall be qualified persons who are registered with an Approved Agency.

Statement Of Special Inspections per 1704 and 1705. Special Inspections and Testing are required by 1704, 1706, 1707 and 1708 for the following:

FRP Special Inspection On-site Inspections

- **Continuous** inspection, including the duties listed above for the 1st week of FRP installation.
- **Periodic** inspection, including the duties listed above provided once a day for 2 hours for the next two weeks of the project. After the third week of the project, provide one inspection, for two hours, once every week for the remaining duration of the project.

FRP Special Inspection On-site Testing

- ASTM D7522-09 Pull off test: Two pull-off test for the top of slab and one bottom of slab per each visit for the 1st three weeks of the project. For the duration of the project after 3 week, conduct one pull-off test at the top of slab for the rest of the project.

FRP Special Inspection Laboratory Testing

- ASTM D3039 Tension test: One tensile sample per day for the 1st week of the project. One sample per week for the duration of the project.

INSPECTION SUBMITTALS: Special inspection and testing reports shall be provided on a weekly basis. Final special inspection reports will be required by each special inspection firm per OSSC 1704.1.2. Submit copies of all inspection reports to the Contractor, Architect, EOR, SSE and the BDS for review.

STRUCTURAL OBSERVATION: Structural Observation shall be provided for structures in accordance with OSSC Section 1710 and Section 107.3.4.1. Structural observation site visits will be as follows:

- **During preparation of the concrete receiving FRP**
- **After all FRP is installed**

Contractor shall notify the SSE in a timely manner to allow scheduled Observations to occur. Field Observation Reports will be distributed to Contractor, Architect, EOR, SSE and the BDS for review.

Provide other materials as needed for the proper installation of the complete composite system as selected by the contractor in conformance with these specifications.

INSTALLATION: Composite system shall be installed by a specialty application contractor certified by the manufacturer. The application contractor shall provide a quality control procedure in compliance with the manufacturer's installation requirements.

Surface Preparation

1) The surface to receive composite shall be free from fins, sharp edges and protrusions that will cause voids behind the installed FRP, in the opinion of the SSE, will damage the fibers. Existing uneven surfaces to receive FRP shall be filled with epoxy filler or other material approved by the SSE. Prior to the application of the saturated composite fabric, fill any uneven surfaces with the manufacturer's thickened epoxy
2) The contact surfaces shall have no free moisture on them at the time of application. If moisture cannot be avoided, use the manufacturer's suggested wet prime epoxy.
3) For column wraps, round off sharp and chamfered corners to a radius of 1/2 inch (± 0.125") means of grinding or forming with the system's thickened epoxy. Variations in the radius along the vertical edge shall not exceed 1/2" for every 12 feet of column height.
4) Column surfaces shall have all foreign materials removed and be broom cleaned. Stripping off well-adhered paint or concrete from column surfaces is not required.
5) Slab surfaces shall be prepared for bonding by means of abrasive blasting or grinding to achieve 1/16" minimum amplitude. All contact surfaces shall then be cleaned by hand or compressed air.
6) One prime coat of the manufacturer's epoxy shall be applied and allowed to cure for a minimum of one hour. Primer must be covered with fiber within 24 hours of application, depending on temperature conditions. If 24-hour window is exceeded, the primed surfaces must be solvent wiped with a fast flashing solvent (e.g. MEK) or roughened with sandpaper to break the amine blush.

Procedures for FRP Application

1) Prepare the epoxy matrix by combining components at a weight ratio specified on the manufacturer's labeled units, with an allowable tolerance of ± 10%. The components of epoxy resin shall be mixed with a mechanical mixer until uniformly mixed, typically 5 minutes at 400-600 rpm. Components that have exceeded their shelf life (as designated on the material label) shall not be used.
2) Wet Lay-Up
   a. Apply FRP Reinforcement in accordance with Manufacturer's recommendations.
   b. When using saturator equipment, follow Manufacturer's procedures for proper machine set-up and calibration. Rollers shall be calibrated to saturate the fabric with the proper resin-to-fabric ratio. The roller gap shall be checked daily by a qualified technician for accuracy. The resin-to-fabric ratio shall also be verified by resin usage and documented on the daily project logs.
   c. Once the fabric is saturated, it may then either be spooled for easy handling, or cut to specified lengths and booked for handling. Care must be taken not to damage the fibers.
   d. The fabric may then be applied to the surface with no delay. Work from one end to the other, taking care to orient the fibers as specified. Remove any air entrapped in the fabric with a ribbed roller or squeegee.
   e. Sheets shall be lapped in the longitudinal direction 6 inches minimum or as indicated on the Drawings. Note: no lapping is required of the sheets parallel to the direction of fiber orientation. Apply subsequent layers, continuously or spliced, until designed number of layers is achieved, per project drawings.
   f. Epoxy curing temperatures shall be maintained in the temperature range designated for the formulation used. Temperature cure ranges and times to be determined by manufacturer. The composite system shall be protected from contact by moisture for a period of a minimum of 24 hours.
3) Penetrations per EOR plans may be cut after FRP is cured. Holes per 4 and 2/S8.01 shall be cut through the FRP with a core saw. Small slab penetrations per note 5, 3/S8.01 should be aligned parallel to the unidirectional FRP fiber in (2) 1" wide strips.

Procedure Modifications

Installation procedures may be modified to achieve maximum results, subject to approval by the SSE, EOR, and BDS. Procedure modifications shall be discussed with the SSE, EOR and BDS prior to implementing the modifications.

Repairs

1) All defects (including bubbles, delaminations, and fabric tears) spanning more than 5% of the surface area, or as specified by the owner or SSE, shall be repaired. Repair procedures shall be performed in accordance with guidelines established by ACI 440.2R-08 (paragraph 7.2.3) and approved by the SSE. All repairs shall be subject to the same application, curing and quality control specifications as the original work. Repairs for various defect shall follow:
   a. Small delaminations and voids less than 2 in^2 each are permissible as long as the delaminated area is less than 5% of the total laminate area and there are no more than 10 such de-

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PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S1.03
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL GENERAL NOTES CONTINUED
BY: JCF	

12031-0041 S1.03.dwg 24 May 2012 - 5:13 pm jfleming

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a. Small delaminations and voids less than 2 in^2 each are permissible as long as the delaminated area is less than 5% of the total laminate area and there are no more than 10 such delaminations per 10 ft^2.
b. Medium sized delaminations and voids greater than 2 in^2 but less than 25 in^2 may be repaired by epoxy resin injection or ply replacement, depending on the size and number of delaminations and their location. The repair procedure should be determined by the Project Engineer.
c. Larger size delaminations and voids greater than 25 in^2 should be repaired by selectively cutting away the affected sheet and applying an overlapping sheet patch of equivalent plies. The overlap should extend a minimum of 6 in. in all directions.

FIELD QUALITY CONTROL RESPONSIBILITES:

1) SSE will visit the site, prior to the application of the FRP, to observe the surface preparation and patch work.
2) The testing agency shall receive and review the FRP drawings and the project specifications.
3) The testing agency will verify ambient and concrete temperatures. No work shall proceed if the temperature of the concrete surface being repaired is less than 40 degrees Fahrenheit or greater than 90 degrees Fahrenheit. The temperature of the epoxy components shall be between 40 and 90 degree F at the time of mixing or as specified on the component labels. When air temperature is outside the prescribed range, other measures must be employed to ensure components' temperature is maintained within this range.
4) The applicator shall record batch numbers for fabric and epoxy used each day, and note locations of installation. Measure square footage of fabric and volume of epoxy used each day.
3) The applicator shall prepare 12" x 12" samples for tensile testing per ASTM D3039 procedures. . On a smooth, flat, level surface covered with polyethylene sheeting, or 16 mil plastic film, prime with epoxy resin, then prepare sample by placing two layers of saturated fabric oriented in the same direction. Apply additional topping of epoxy. Cover with plastic film and squeegee out all bubbles. Samples shall be stored in a sample box and not moved for a minimum 48 hours after casting. The prepared, identified samples shall be given to the testing agency.
4) The testing agency shall precondition tensile samples for 48 hours at 140 degree F before testing (see ASTM D3039 for testing requirements)
5) Tensile testing results shall be made available within 3 weeks of sample submission. The testing shall provide average values that must meet or exceed the following:
   a. Ultimate Tensile Strength as a function of Tensile Modulus times effective Sectional Area.
   b. Ultimate Tensile Modulus E_u=9,930 KSI for Carbon Fiber FRP.
   c. Maximum Elongation = 0.98% for Carbon Fiber FRP.
6) The applicator shall prepare sacrificial patch of FRP on the slabs, as describe in these notes, for the ASTM D7522-09 Pull-off test. The sacrificial FRP patch shall be adjacent to and prepared the same as the production FRP.
7) The testing agency will conduct ASTM D7522-09 Pull-off test, as described in these notes.
8) The testing agency will provide on-site special inspections as defined in the Testing and Inspection Section of these notes. During the FRP installation, inspections should conducted and the duties shall include:
   a) Report the date and time of installation include:
      - Location of the FRP being installed. Use building levels and grid numbers.
      - Ambient temperature
      - Relative humidity
      - Surface temperature of concrete
      - Batch numbers
      - Mix ratios
      - Mixing time
      - Installation time
   b) Verify at least one (1) batch mix of resin, primer and adhesives per day.
   c) Verify proper application of resin to fibers for wet lay-up systems.
   d) Spot-check at least three (3) areas per day, to verify fiber alignment, number of layers, and the direction of fibers of each layer
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PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S1.04
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL GENERAL NOTES CONTINUED
BY: JCF	

12031-0041 S1.04.dwg 24 May 2012 - 5:13 pm jfleming

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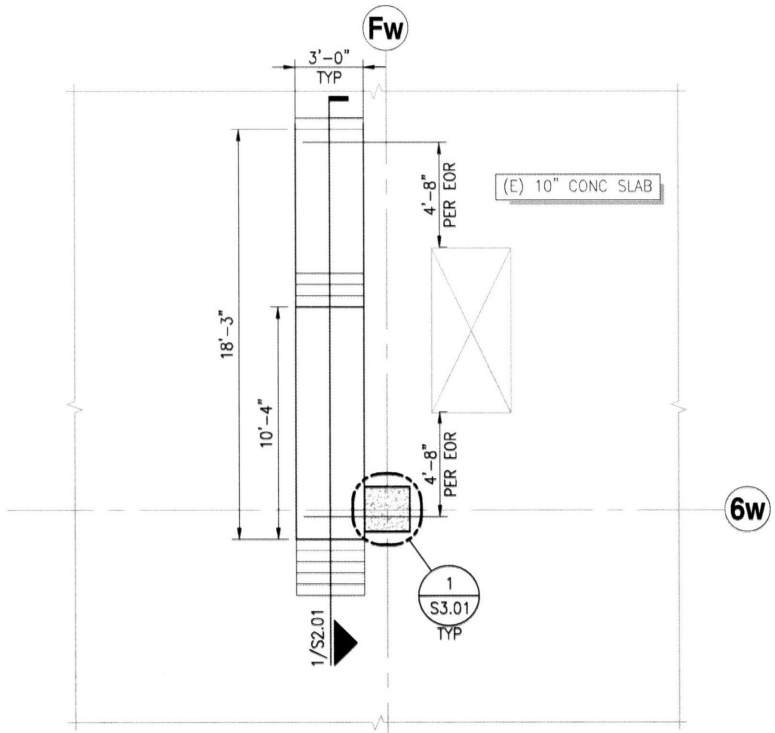

PARTIAL PLAN - LEVEL 1

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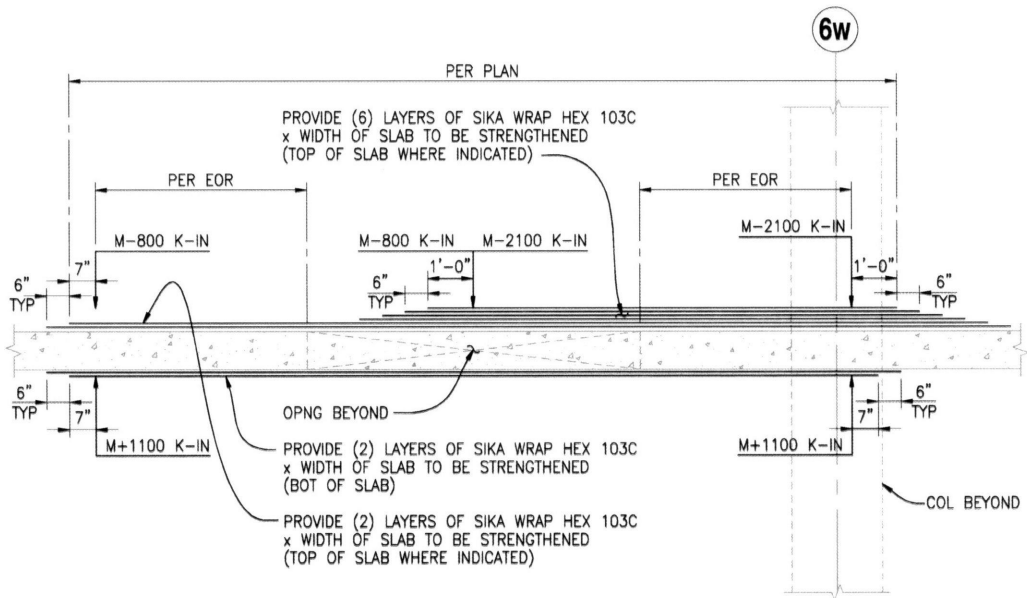

SLAB STRENGTHENING DETAIL

SCALE: 3/8"=1'-0"

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PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S2.01
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL PARTIAL PLAN - LEVEL 1 & DETAIL
BY: JCF	

12031-0041 S2.01.dwg 24 May 2012 - 2:46 pm jfleming

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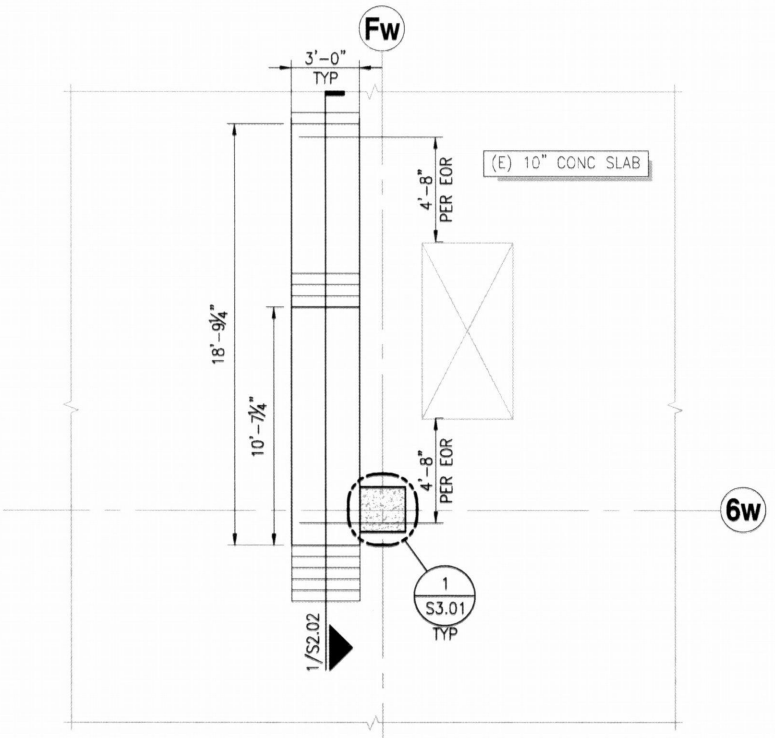

PARTIAL PLAN - LEVEL 2

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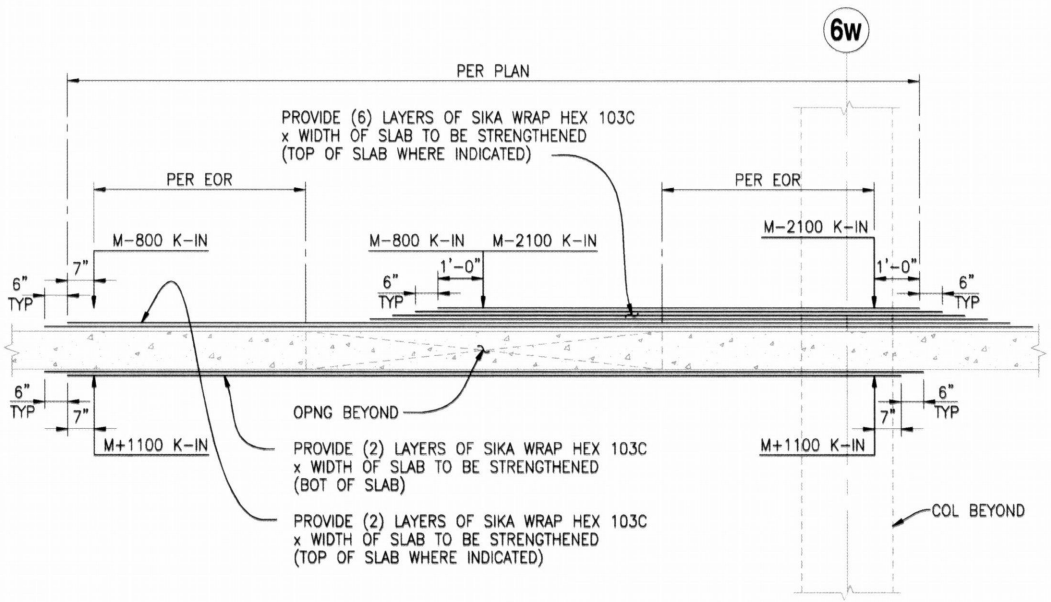

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PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S2.02
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL PARTIAL PLAN - LEVEL 2 & DETAIL
BY: JCF	

12031-0041 S2.02.dwg 24 May 2012 - 2:49 pm jfleming

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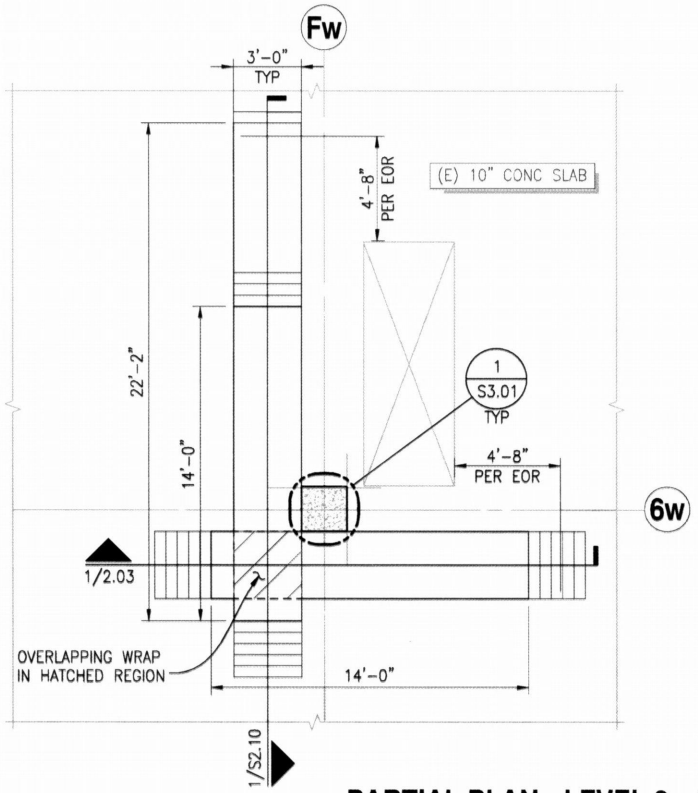

PARTIAL PLAN - LEVEL 3

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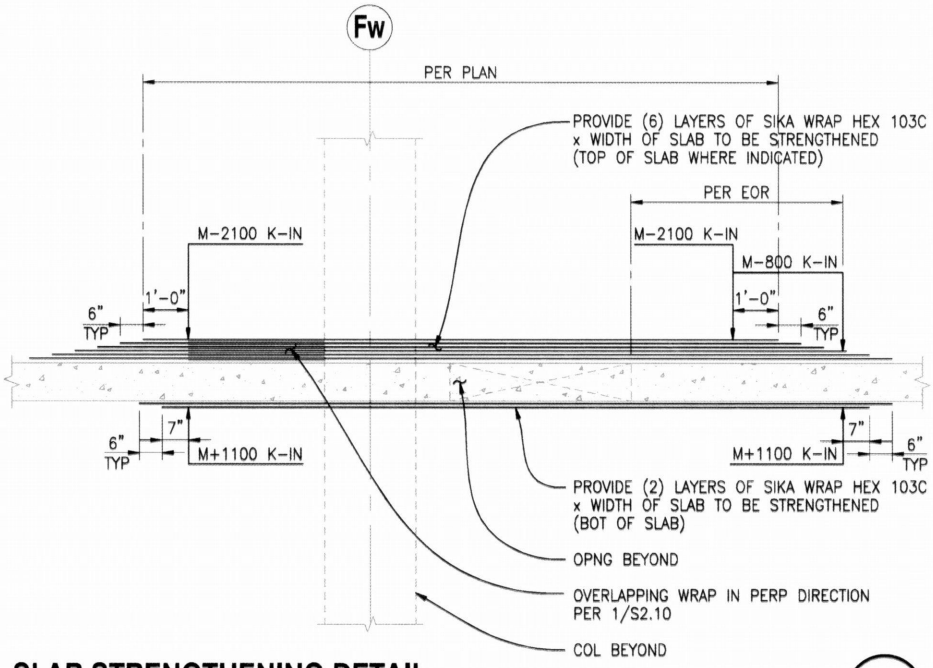

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DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL PARTIAL PLAN - LEVEL 3 & DETAIL
BY: JCF	

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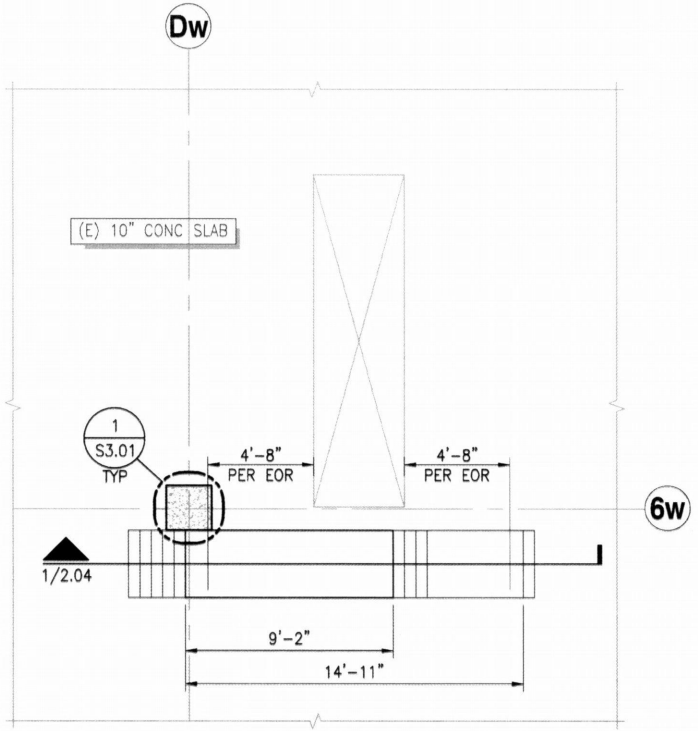

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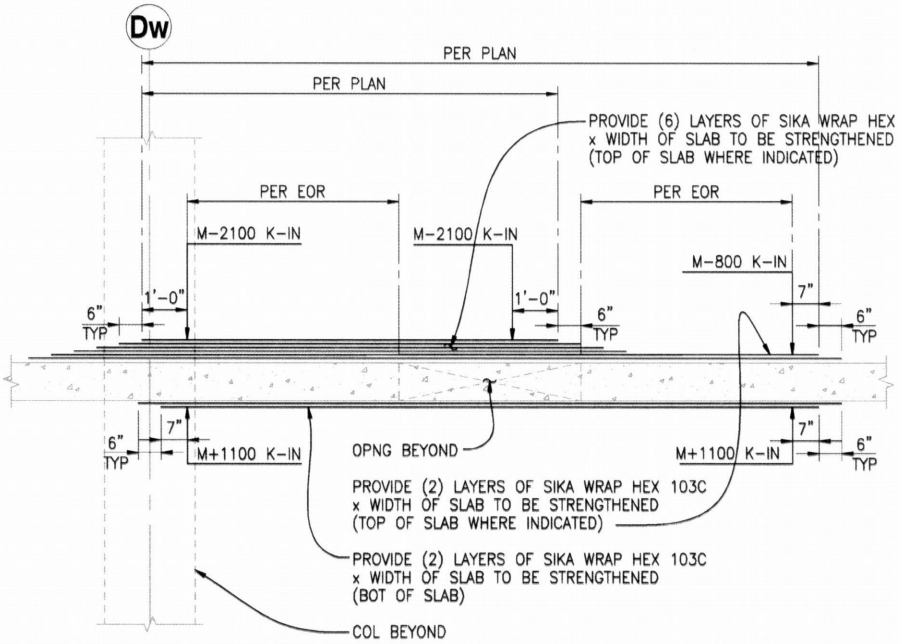

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BY: JCF	

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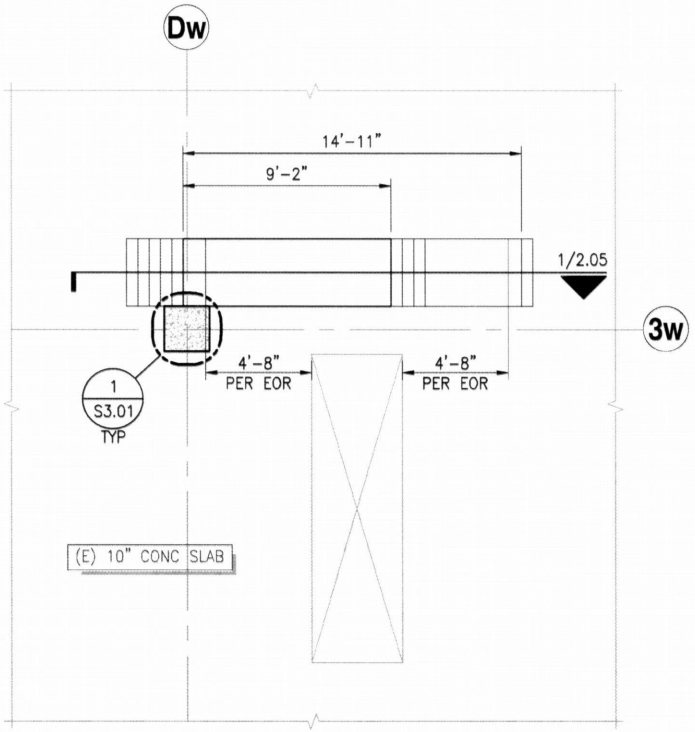

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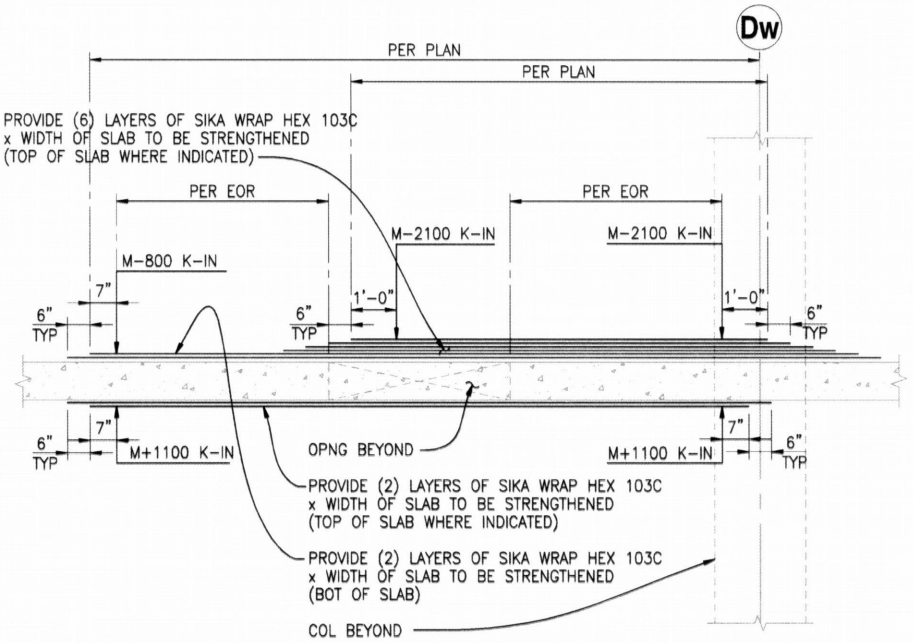

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DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL PARTIAL PLAN - LEVEL 3 & DETAIL
BY: JCF	

12031-0041 S2.05.dwg 24 May 2012 - 2:55 pm jfleming

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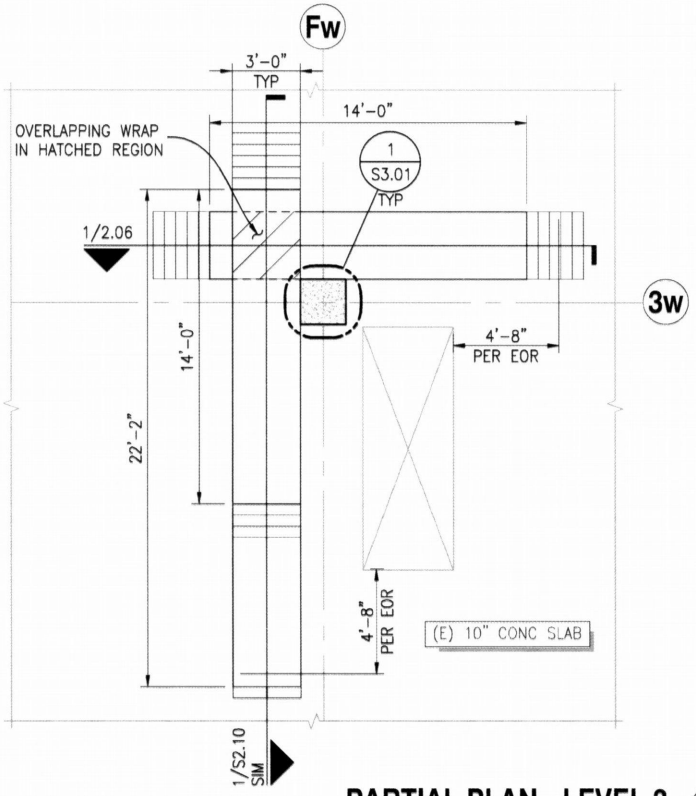

PARTIAL PLAN - LEVEL 3

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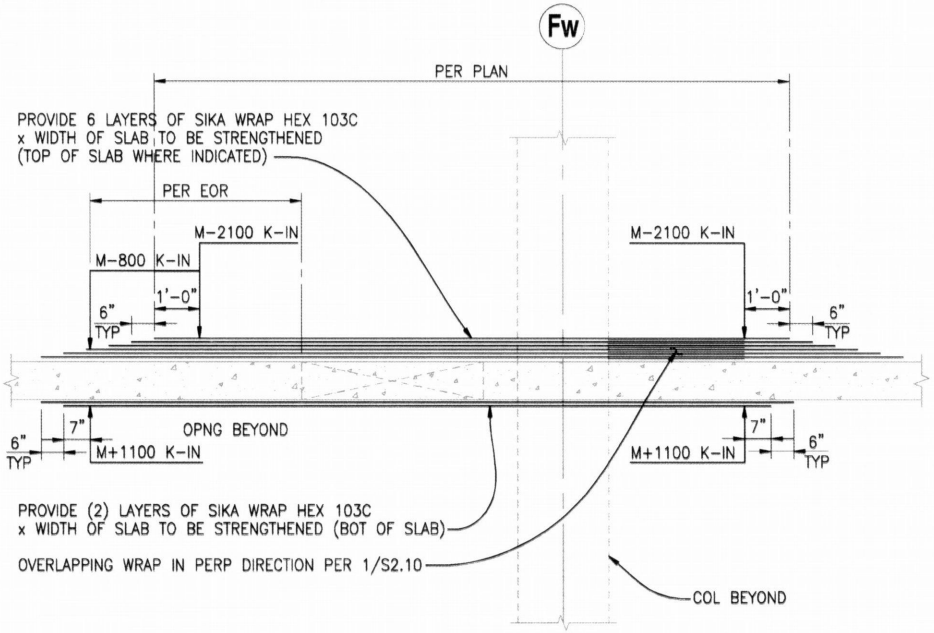

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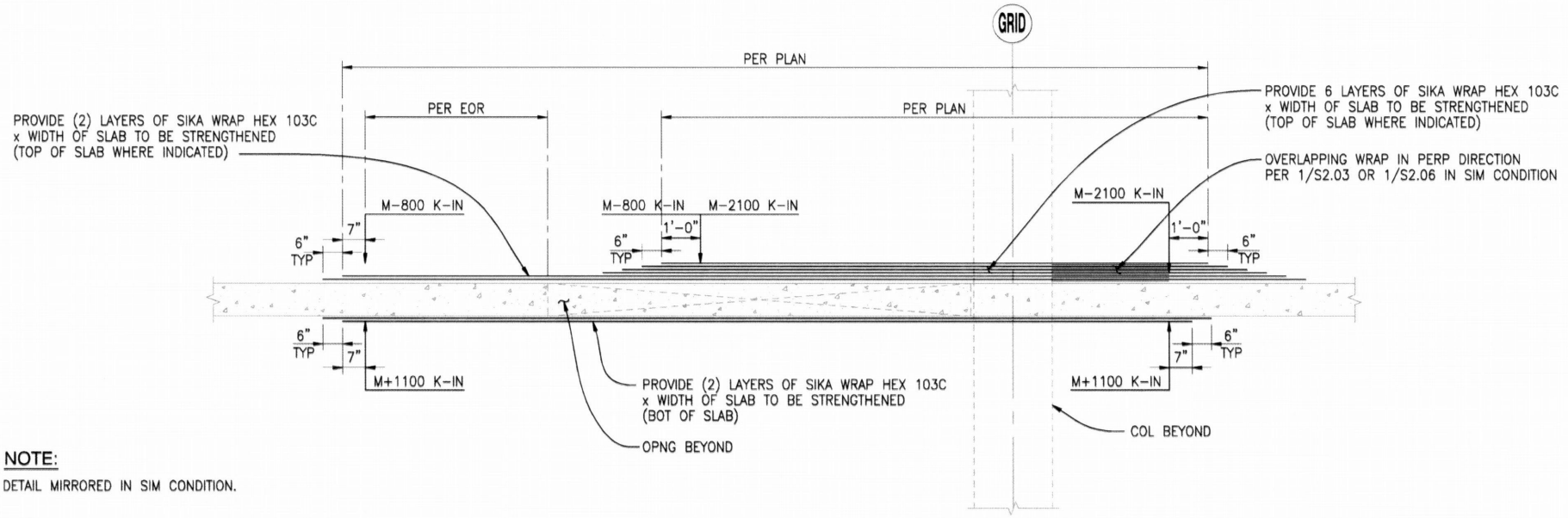

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SCALE: 3/8"=1'-0"

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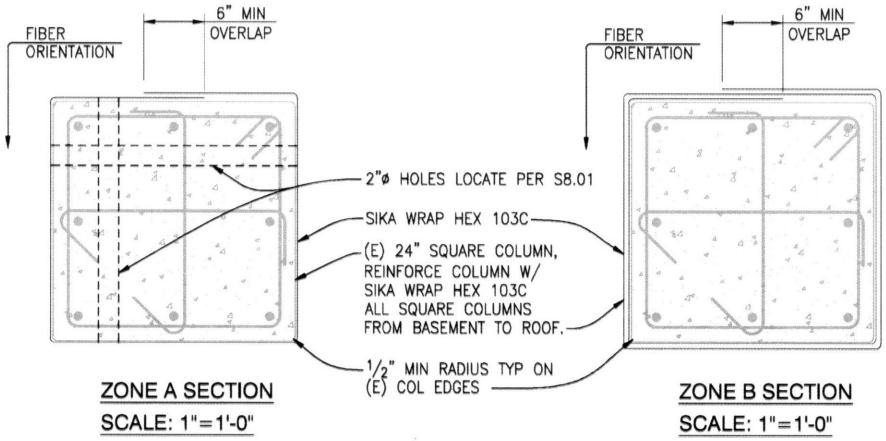
DCI ENGINEERS®
400 SW 6TH AVENUE • SUITE 605
PORTLAND, OREGON 97204
PHONE: (503) 242-2448 • FAX: (503) 242-2449
WEBSITE: www.dci-engineers.com
CIVIL / STRUCTURAL

PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S2.10
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL FIBER REINFORCMENT DETAILS
BY: JCF	

12031-0041 S2.10.dwg 24 May 2012 - 2:59 pm jfleming

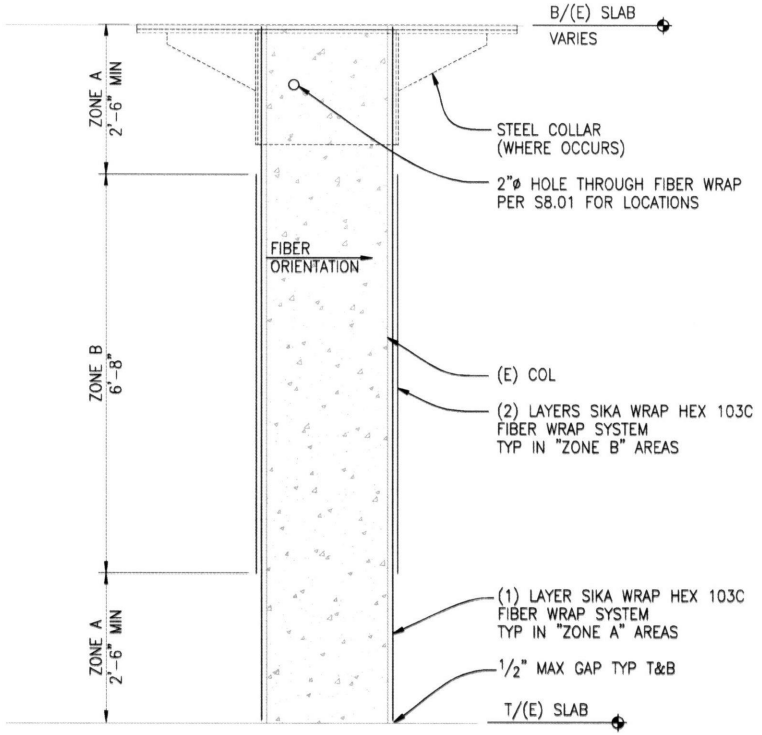
STRUCTURAL REGISTERED PROFESSIONAL ENGINEER 12219 OREGON JULY 15, 1983 WADE W. YOUNIE

EXPIRES: 6-30-12



ZONE A SECTION
SCALE: 1"=1'-0"

ZONE B SECTION
SCALE: 1"=1'-0"



ELEVATION
SCALE: 1/2" = 1'-0"

TYPICAL RECTANGULAR COLUMN WRAP DETAIL

SCALE: AS NOTED

1

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CIVIL / STRUCTURAL

PROJECT NAME: EMANUEL ADULT SERVICES FRP	
PROJECT NO: 12031-0041	SKETCH NO: S3.10
DATE: 05/22/2012	CONSTRUCTION FIELD SKETCH: STRUCTURAL COLUMN FIBER WRAP DETAILS
BY: JCF	

12031-0041 S3.01.dwg 24 May 2012 - 3:18 pm jfleming

STRUCTURAL REGISTERED PROFESSIONAL ENGINEER 12219 OREGON JULY 15, 1983 WADE W. YOUNIE

EXPIRES: 6-30-12

HOFFMAN CONSTRUCTION COMPANY
OF OREGON

805 SW BROADWAY, SUITE 2100
PORTLAND, OR 97205
TEL: 503/221-8811 • FAX: 503/221-8934

Request For Information 0124

Legacy Emanuel ASR
3001 N Gantenbein Ave
Portland, OR 97227

Project # 4440012
Tel: Fax:

Hoffman Construction Co of Oregon

RFI #: 0124 **Date Created: 6/8/2012**

Author: Hoffman Corporation
Brad Jenks
(503)
brad-jenks@hoffmancorp.com

Answered By:

Author RFI# **Responsible Engineer**

Subject			Discipline	Specification Section
WW Data riser locations			Electrical	
Date Required:	**Priority**	**Schedule Impact**	**Cost Impact**	**Drawings**
6/15/2012		TBD	TBD	

Question

Owner directed phasing mandates that L3 of west wing be completed prior to other floors. Data system and other backbone risers originate in the basement and rise up through the west wing.

1) New data room 3684 is located where the existing energized Motor control center is located. There are a number of existing live conduits running the existing air handlers that cannot be relocated nor abandoned and penetrated. Solution is to locate riser sleeves within 3684, and outside of 2603A, and add conduit offsets to get into 2603 cable tray. Please see attached layout and confirm. (duct tape indicates conduit locations)

2) Existing feeder ductwork in operating emergency room obstructs location of conduit through floor of 2603A. Please confim conduit can be located as shown on the attached drawing.

3) Location shown for conduit sleeves 1661 is in the center of a hallway that is operationally important for occupied emergency department on L1. Please confirm conduits can be relocated next to doorway as indicated in the attached.

Suggestion

Answer **Date Answered:**

Comments

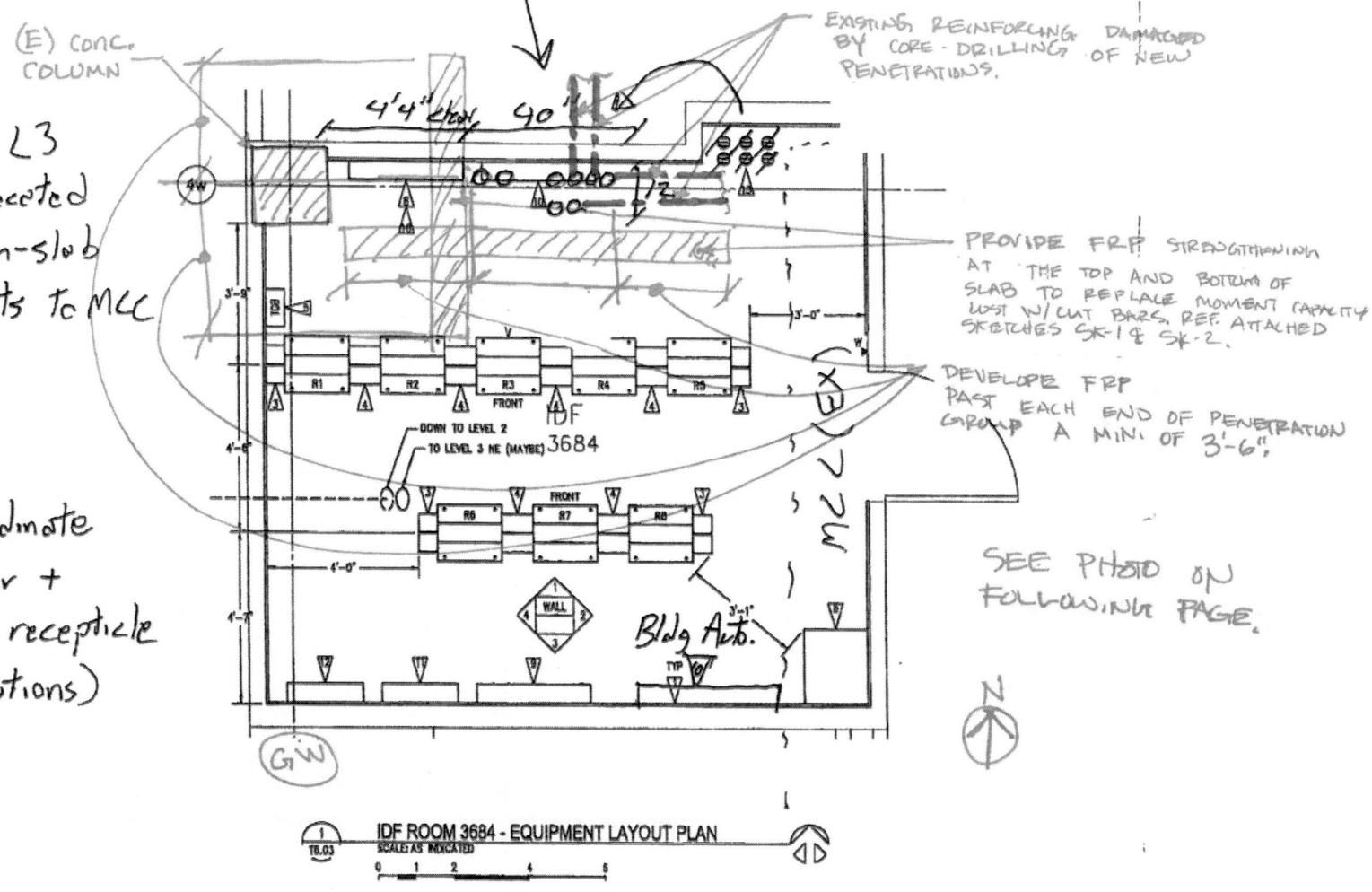
None

1.) THE PROPOSED PENETRATIONS DESCRIBED FOR ITEM 1 HAVE BEEN INSTALLED, AND (E) SLAB REINF. WAS DAMAGED AS A RESULT. THE SLAB WILL REQUIRE STRENGTHENING AS OUTLINED IN THE ATTACHED MARKUPS.

2&3) IT IS STRUCTURALLY ACCEPTABLE TO RELOCATE THE DESCRIBED PENETRATIONS PROVIDED THE REQUIREMENTS, AS SHOWN ON THE ATTACHED MARKUPS, ARE FOLLOWED.

John M. Holland / CATENA / 06/14/2012

Add offset pipes to get into 2003A



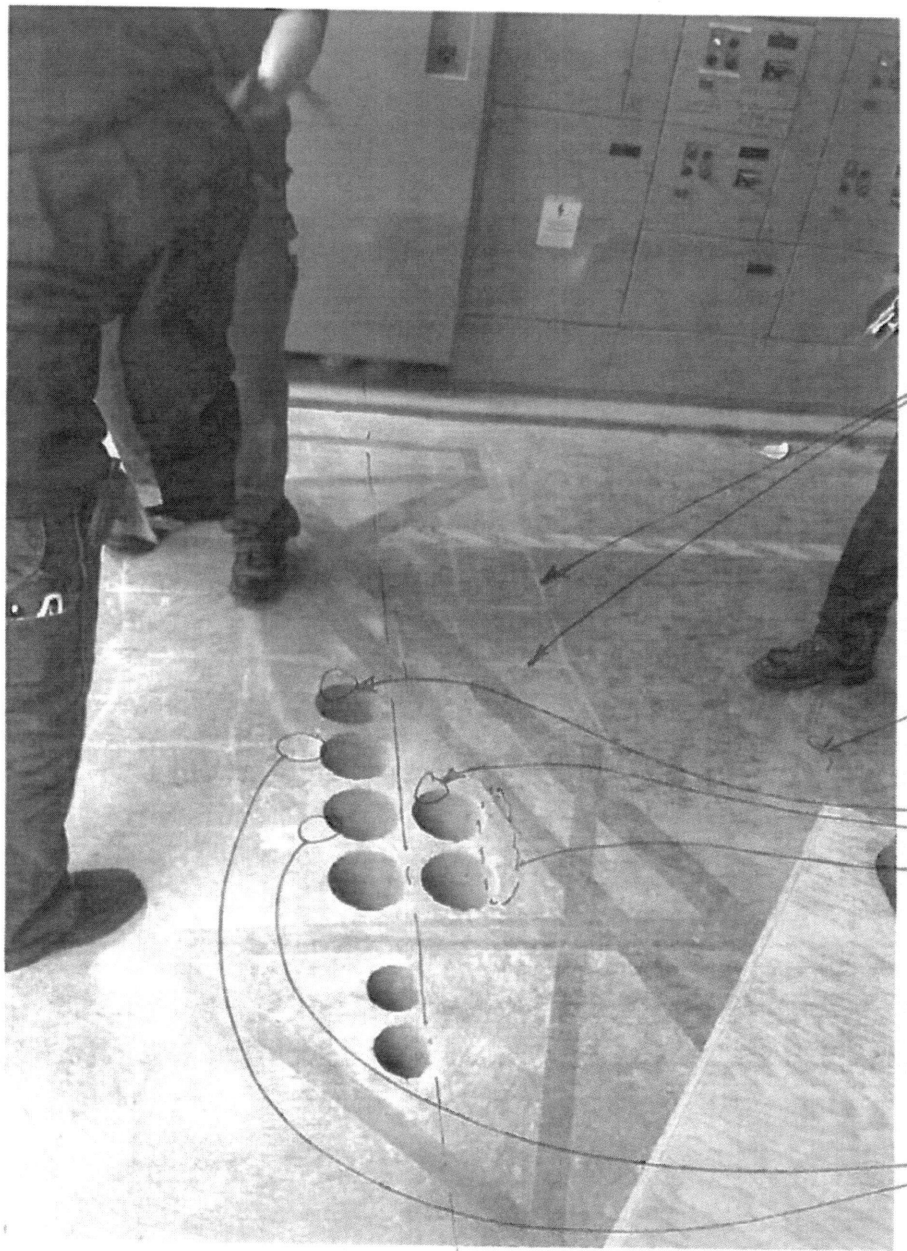
Pipes from L3 to L2 relocated to avoid in-slab live conduits to MCC

*OEG coordinate BAS power + ~~to~~ 120v receptacle (swap locations)

LEVEL 3

-BJJ, HCCO 6/8/12

LEAS R. RFI #124



SEE PREVIOUS PAGE FOR ADDITIONAL INFO.

CHALK LINES INDICATE WHERE (E) REINF. HAS BEEN LOCATED TO OCCUR WITHIN THE SLAB.

LEVEL 3 SLAB

NEW PENETRATIONS WERE CORE-DRILLED THROUGH EXISTING EAST-WEST SLAB REINFORCING

IT APPEARS THAT NEW PENETRATIONS MAY HAVE BEEN CORE-DRILLED THROUGH EXISTING EAST-WEST REINFORCING AT THIS LOCATION.

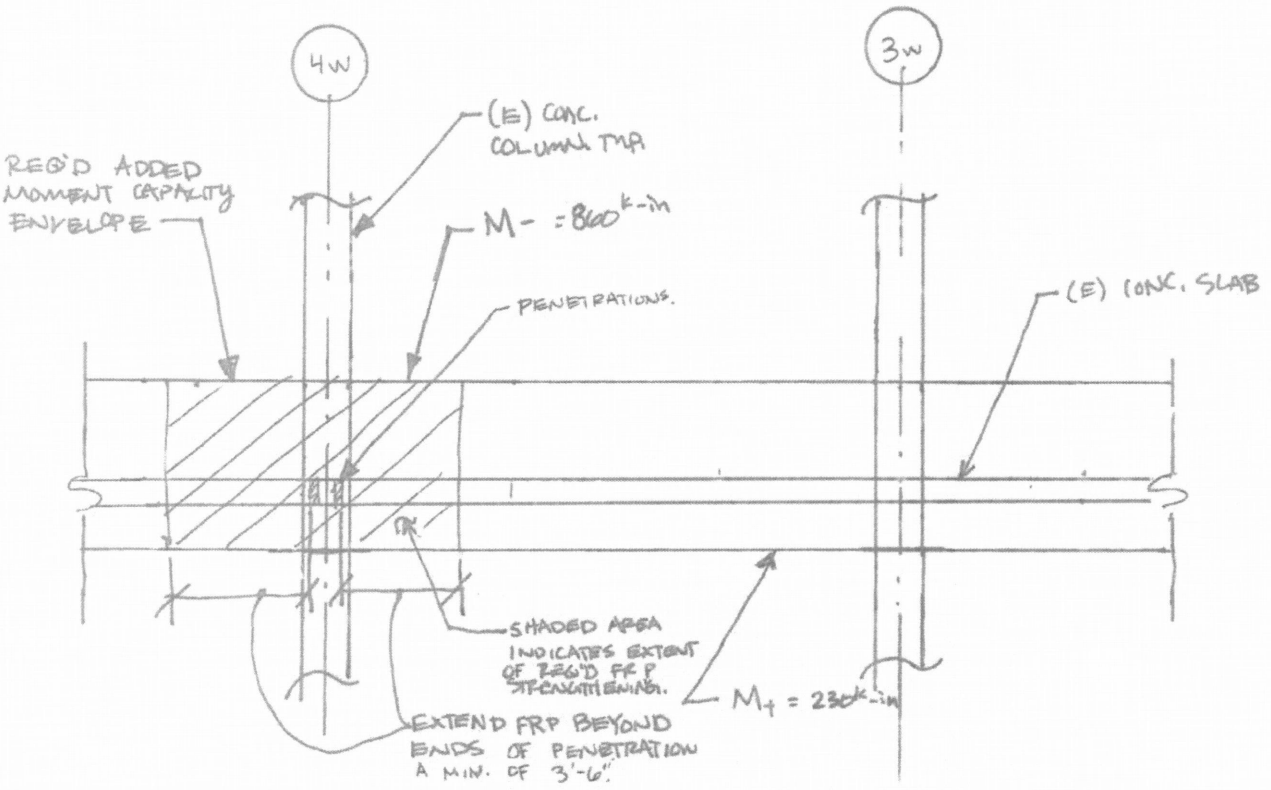
N

EXISTING NORTH-SOUTH REINFORCING WAS CORED THROUGH AT THESE LOCATIONS.

4W

LEAS R. RFI #124

catena consulting engineers	Project: LEAS R.	No: 20101206.00	Page:
	Subject: RFI #124	By: JMH	Date: 06/14/12



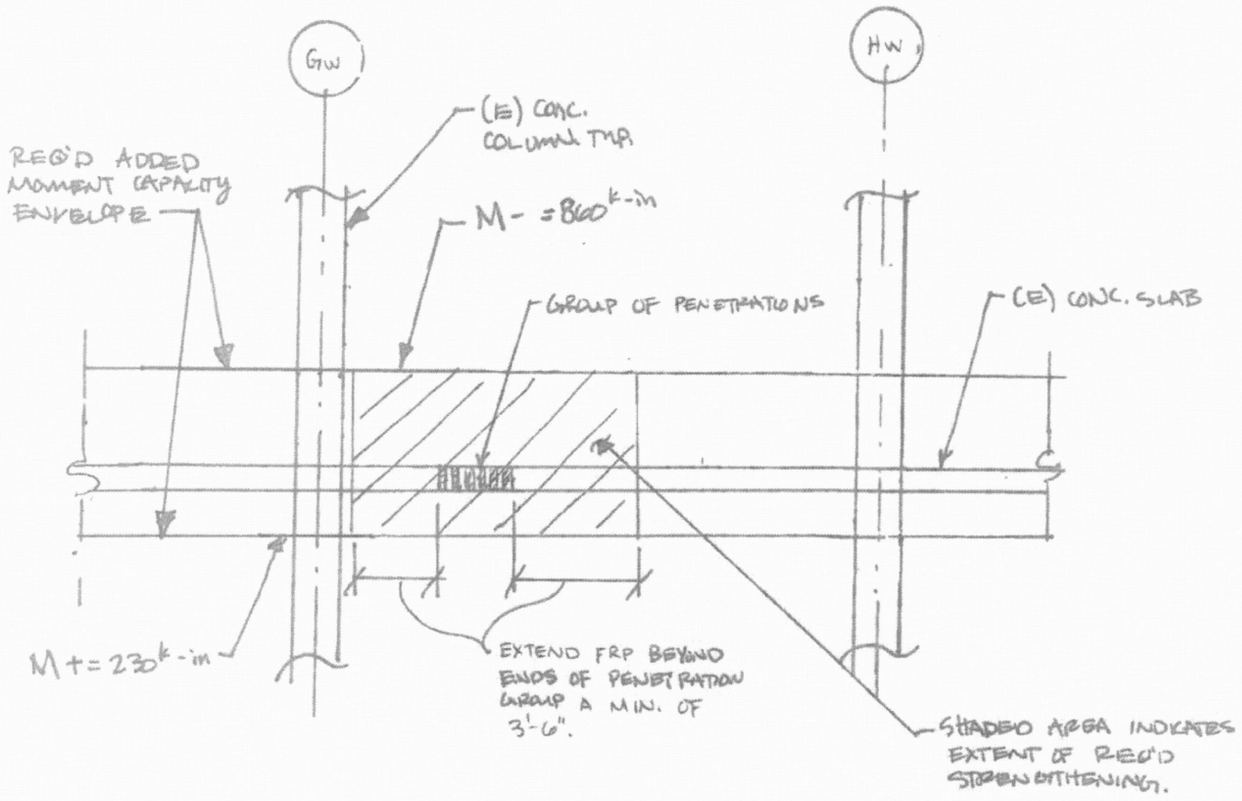
NOTES:
1. MOMENTS LISTED ARE ADDITIONAL CAPACITY REQUIRED AT AREAS OF FRP STRENGTHENING. REF. PLAN FOR EXTENT OF FRP STRENGTHENING. WHERE FRP IS NOT INDICATED, ADDITIONAL CAPACITY IS NOT REQ'D.
2. ASSUME f'c = 6 KSI, fy = 75 KSI, AND MAXIMUM CONCRETE STRAIN = 0.005.
3. REF. SPEC. SECTION 03 20 00 FOR ADDITIONAL INFORMATION.
4. REF. PLAN FOR (E) SLAB REINFORCEMENT.
5. LIMIT PENETRATIONS VIA FASTENERS TO NO MORE THAN 1% OF THE AREA OF THE APPLIED FRP AND LIMIT FASTENERS TO NO MORE THAN 0.145"Ø P.A.F. @ 12"o.c. OR ¼"Ø HOLES @ 24"o.c. MAX. PENETRATION SIZE IS ¼"Ø.

SK-1

N-S DIRECTION
FRP SLAB STRENGTHENING

LEAS R. RFI #124

catena consulting engineers	Project: LEAS R.	No: 20101206.00	Page:
	Subject: RFI #124	By: JMH	Date: 06/14/12



NOTES:
1. MOMENTS LISTED ARE ADDITIONAL CAPACITY REQUIRED AT AREAS OF FRP STRENGTHENING. REF. PLAN FOR EXTENT OF FRP STRENGTHENING. WHERE FRP IS NOT INDICATED, ADDITIONAL CAPACITY IS NOT REQ'D.
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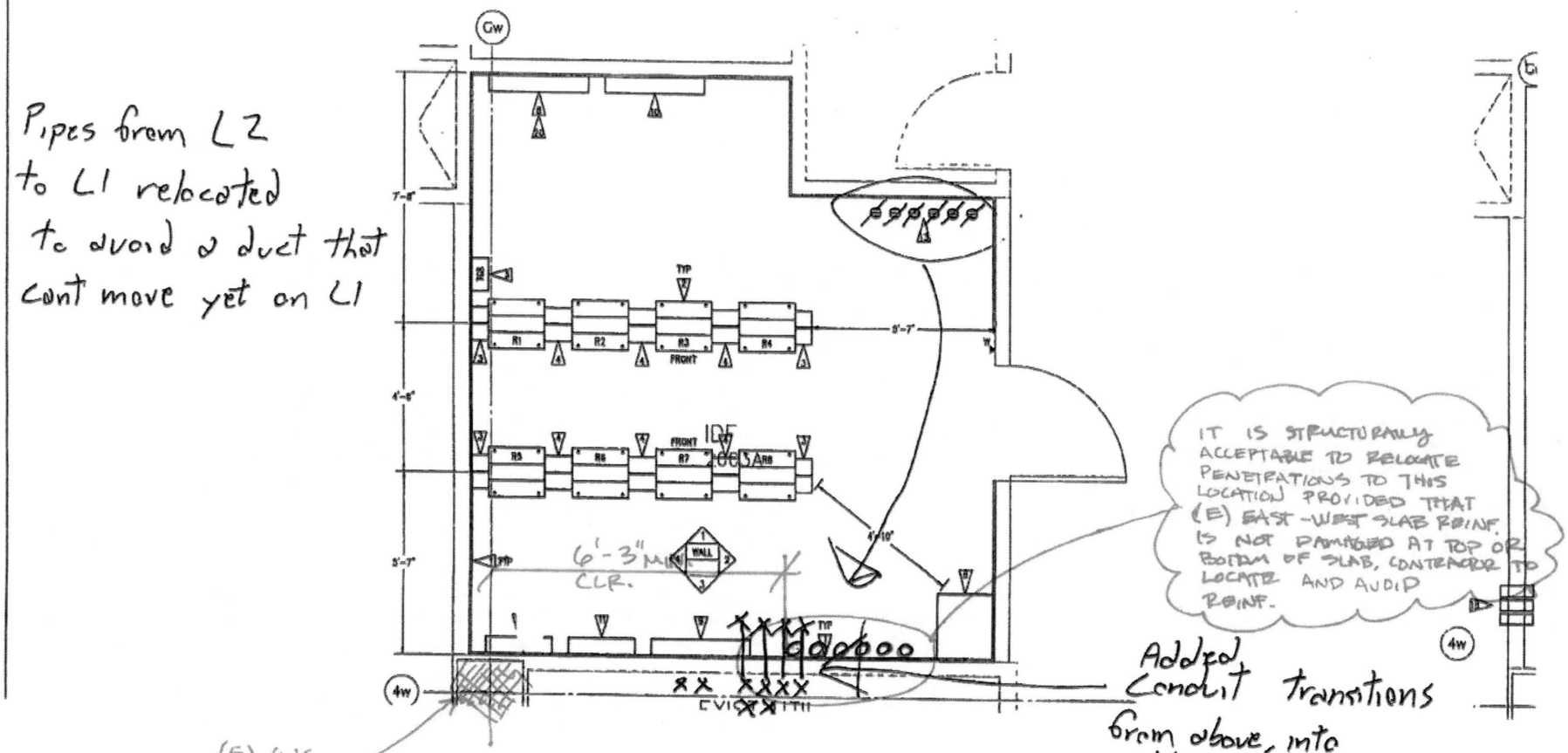
SK-2

E-W DIRECTION
FRP SLAB STRENGTHENING
LEAS R. RFI #124

- BJJ, MCCO 6/8/12

Pipes from L2 to L1 relocated to avoid a duct that cant move yet on L1

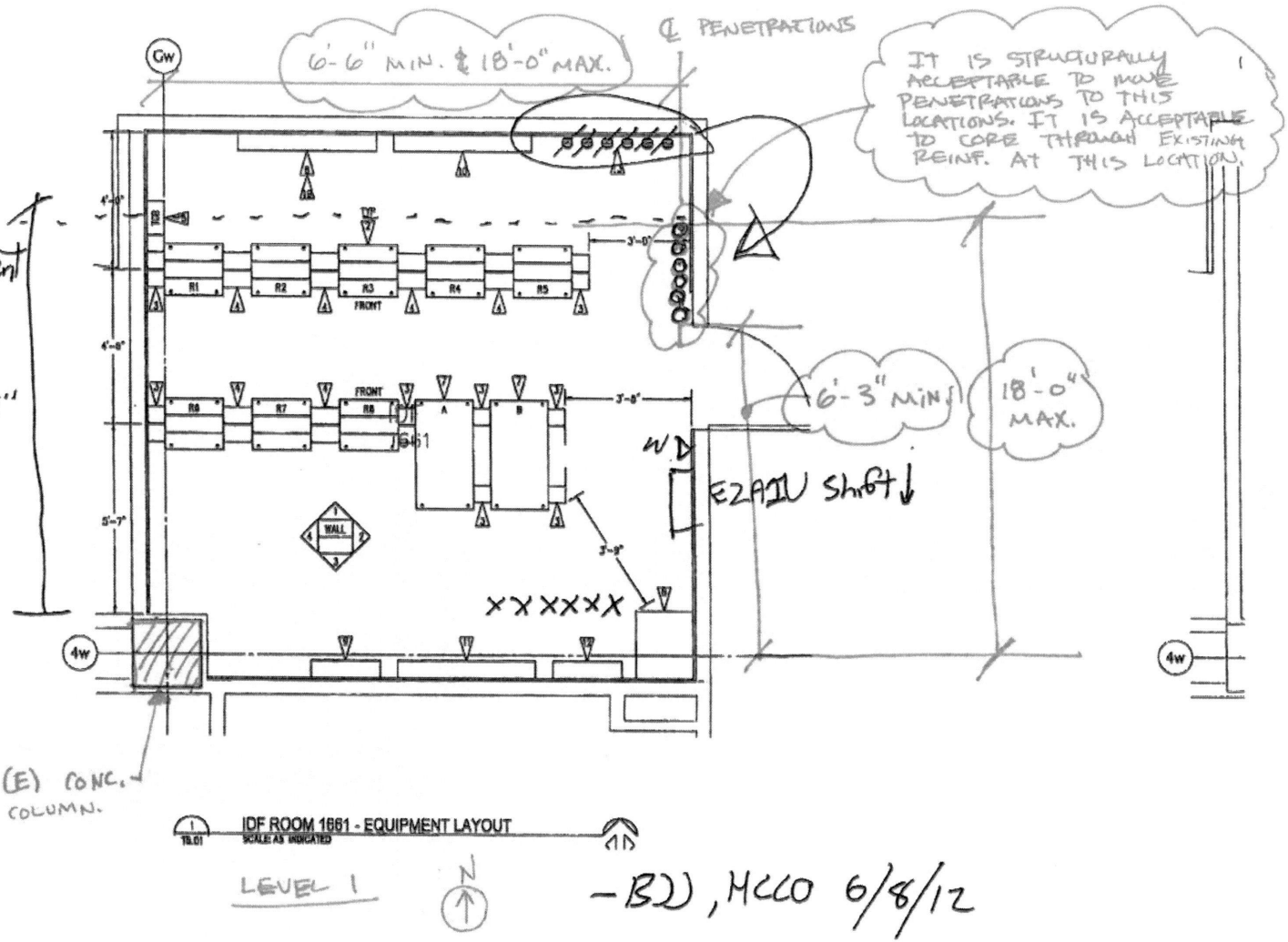


L2

LEVEL 2

LEAS. R. RFI #124

Pipes from L1 to Basement relocated to keep core-drills within allotted containment



*CEG coordinate starline bus length with risers

-BJ, MCCO 6/8/12

LEASE RFI #1124

ZGF

ZIMMER GUNSUL FRASCA ARCHITECTS LLP

ZGF | 1223 SW Washington Street, Suite 200 Portland, OR 97205 United States

Submittal Transmittal

Submittal ID: AS-0087-032500-0087
Transmittal ID: 00721
Date Sent: 6/25/2012

Project: Legacy Emanuel Infill Renovations
Number: P80920

To:
Mark Sawallich
Hoffman Construction Company
2801 N. Gantenbein Avenue
Portland, OR 97227
US
503-221-8811 (Phone)
503-221-8885 (Fax)

From:
Dave Guthrie
ZGF
1223 SW Washington Street, Suite 200
Portland, OR 97205
United States
503-863-2392 (Phone)
503-224-2482 (Fax)

Subject: FRP Shop Drawings
Area: Info Exchange
Spec Section: 032500
Purpose: Make Corrections Noted
Remarks:
CC: Ali Sadri(Legacy Health)
Greg Parks(Legacy Health)

Contents

Quantity: 1 Dated: 6/25/2012 Number:
Description:
0087-032500-0087 - FRP Shop Drawings.pdf
Action:
Remarks: