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**August 2, 2017**

**NOTICE OF ADDENDUM  
ADDENDUM NO. 3**

**CONTRACT NO. 7952  
JUDGE DOYLE GARAGE**

Revise and amend the contract document(s) for the above project as stated in this addendum, otherwise, the original document shall remain in effect.

Please acknowledge this addendum on page E1 of the contract documents and/or in Section E: Bidder's Acknowledgement on Bid Express.

Electronic version of these documents can be found on the Bid Express web site at:

<http://www.bidexpress.com>

If you are unable to download plan revisions associated with the addendum, please contact the Engineering office at 608-266-4751 receive the material by another route.

Sincerely,

Robert F. Phillips, P.E., City Engineer

Cc: Gregory T. Fries, P.E.

**ADDENDUM NO. 3**  
**City of Madison, Engineering Department**

**CONTRACT NO. 7952**  
**JUDGE DOYLE GARAGE**

This addendum is issued to modify, explain or correct the original Drawings, Specifications, or Contract Documents of the subject contract and is hereby made a part of the contract documents.

**CIVIL**

**SPECIFICATION ITEMS**

**None**

**DRAWING ITEMS**

**Drawing C-141.0:**

Revised Note 5 to state that contractor is responsible for coordinating all site utilities and that the city of Madison will pay for AT&T relocation charges. ATTACHED DRAWINGS (FULL SIZE):

**C-141.0**

**ATTACHED SPECIFICATIONS:**

**None.**

**LANDSCAPE**

**SPECIFICATION ITEMS**

**None.**

**DRAWING ITEMS**

**None.**

**ATTACHED DRAWINGS (FULL SIZE):**

**None.**

**ATTACHED SPECIFICATIONS:**

**None.**

**ARCHITECTURAL**

**SPECIFICATION ITEMS**

**Section 00 00 05 - Table of Contents:** Refer to attached section.

Deleted Section 07 18 16 - Vehicular Traffic Coatings.

Deleted Section 11 31 00 – Appliances.

**Section 01 23 00 – Alternates:**

Delete Alternate A-1. Refer to attached section.

**Section 07 13 26 - Blindsided Self-Adhering Sheet Waterproofing Option C – Horizontal and Vertical**

Section revised to add language to clarify materials required to meet the intent of the specification. The Vapor Retarder must be a waterproofing membrane must be continuous under all footings, sump pits, elevator pits, etc. and it must be fully integrated with the vertical blindsided waterproofing. Further, the section was revised to add language to include a hot-applied horizontal waterproofing membrane on top of structural slabs and/or over occupied space. Refer to attached section.

**Section 07 13 52 - Modified Bituminous Sheet Waterproofing (Blindsided Waterproofing) Option S – Horizontal and Vertical**

Section revised to add language to clarify materials required to meet the intent of the specification. The Vapor Retarder must be a waterproofing membrane must be continuous under all footings, sump pits, elevator pits, etc. and it must be fully integrated with the vertical blindsided waterproofing. Refer to attached section.

**Section 07 18 16 - Vehicular Traffic Coatings:**

Delete this section.

**Section 11 31 00 – Appliances:**

Delete this section.

**DRAWING ITEMS**

**Drawing A-100.1:**

Traffic coating note deleted.

**Drawing A-100.5:**

Low point of floor drain was changed to 887'-0". Elevation of vestibule slab was changed to 888'-6". Slab elevation and floor drain low point between Col. 5&6 and Col. C&D.5 were revised. New low point for drainage is at 891'-6". Slab elevations are 892'-0".

**Drawing A-101.0:**

Entry ramp slab elevations revised. Provide spray cellulose insulation at slab below Bicycle Center. Traffic coating note deleted.

**Drawing A-102.0:**

Provide spray cellulose insulation at slab below Bicycle Center.

**Drawing A-211.0:**

K3, H3, K6, and H6 – Stair sections revised per slab elevation changes on Sheet A-100.5.

**Drawing A-310.0:**

Ramp slope revised per elevation changes on Sheet A-100.5.

**Drawing A-311.0:**

Updated .

**Drawing A-312.0:**

Dimension updated.

**Drawing A-402.0:**

Elevation tag added and dimension updated

**Drawing A-411.0:**

Garage entry updated to show "Dynamic Message" signage indicated in Parking Signage Schedule.

**Drawing A-414.0:**

Garage entry updated to show "Dynamic Message" signage indicated in Parking Signage

Schedule.

ATTACHED DRAWINGS (FULL SIZE):

**A-100.1**  
**A-100.5**  
**A-101.0**  
**A-102.0**  
**A-211.0**  
**A-310.0**  
**A-311.0**  
**A-312.0**  
**A-402.0**  
**A-411.0**  
**A-412.0**

ATTACHED SPECIFICATIONS:

**Section 00 00 05**  
**Section 07 13 26:**  
**Section 07 13 52:**

**STRUCTURAL**

SPECIFICATION ITEMS

**None**

DRAWING ITEMS

**Drawings S-001.0:** Revision to concrete note for parking levels.

**Drawings S-100.1:** Extension of concrete wall along grid D.5 at grids 3 and 10

**Drawings S-100.3:** Extension of concrete wall along grid D.5 at grids 3 and 10.

**Drawings S-100.5:** Extension of concrete wall along grid D.5 at grids 3 and 10. Extension of foundation wall on grid 1 at grid E to accommodate slab stepping at Level 1.

**Drawings S-101.0:** Adjustment to slab sloping at ramp. Beam depths revised to accommodate slab sloping. Slab elevations revised at retail – corresponding beams were revised to accommodate these elevation changes. Existing MMB Annex foundation added to plan.

**Drawings S-103.0:** Removal of temporary slabs above elevator and stair openings.

**Drawings S-120.5:** Update to slab reinforcement.

**Drawings S-204.0:** Addition of slab elevations to sections 3 and 5.

**Drawings S-306.0:** Modification to beam schedule to accommodate slab sloping and elevation changes identified on plans..

ATTACHED DRAWINGS (FULL SIZE):

**S-001.0**  
**S-100.1**  
**S-100.3**  
**S-100.5**  
**S-101.0**  
**S-103.0**  
**S-120.5**  
**S-204.0**  
**S-306.0**

ATTACHED SPECIFICATIONS:

**None.**

**PARKING CONTROL**

SPECIFICATION ITEMS

**None**

DRAWING ITEMS

**Drawing PA-100.5:**

On Plan Level UO from grid points C-2.1 to E-2.1 added note to read "PAINT BOTTOM 18" OF OVERHEAD SLAB/WALL WITH ALTERNATING YELLOW/BLACK STRIPES 6" WIDE ON 45 DEGREE ANGLE. ADD NOTE ABOVE STRIPING (7'-0" HEADROOM) WITH 6" HIGH LETTERS AT 3 LOCATIONS".

**Drawing PA-601.0:**

On the Sign Schedule changed the Sign Type for the following signs:

1. S1 to I.
2. S3 to I.
3. S3A to I.
4. S12 to I.
5. S24 to DM. Drawing PA-601.0:

On the Sign Schedule deleted the remark "ILLUMINATED" for Sign S26. It is a dynamic messaging sign. On the Sign Types Legend changed Mark V to read type - "VEHICULAR (RETRO REFLECTIVE TEXT ONLY)."

ATTACHED DRAWINGS (FULL SIZE):

**PA – 100.5**

**PA – 601.0**

ATTACHED SPECIFICATIONS:

**None.**

**MECHANICAL**

SPECIFICATION ITEMS

**None.**

DRAWING ITEMS

**Drawing M-600:**

Unit number and tube lengths on the gas fired radiant heater schedule updated.

**PLUMBING**

**SPECIFICATION ITEMS**

**None.**

**DRAWING ITEMS**

**None:**

**ELECTRICAL**

**SPECIFICATION ITEMS**

**Section 26 3213 - Switchboards**

An enclosure is not required for the generator. References to an enclosure for the generator have been removed from the specifications. (Section 1.2.A. Removed reference to drop over sound attenuated enclosure. Section 1.4.A.2.l and m were removed. Removed enclosure reference from section 2.2.D.3.)

Removed section 2.3.G.6.b and c. Generator control panel shall be mounted on the engine generator per 2.3.G.6.a.

**Section 26 2413 – Engine Generators**

Removed requirement for switchboard feeder breakers to be insulated case type from section 2.7.B.1.

**DRAWING ITEMS**

**Drawing E-120.5:**

Updated combination horn/strobes to combination speaker / strobes in U001, U002, U006-1, U007, U008, U009, U010, U011 and one device in U000. Added combination speaker / strobes in U006, U012 and the corridor between U006 and U012 TECHNOLOGY

**SPECIFICATION ITEMS**

**None.**

**DRAWING ITEMS**

**None.**

**ATTACHED MEP/TECHNOLOGY DRAWINGS (FULL SIZE):**

**M-600:**

**E-120.5:**

**ATTACHED SPECIFICATIONS:**

**26 24 13**

**26 32 13**

**CLARIFICATIONS**

Q155: I was hoping to clarify the switchboard breakers on this project. Page 5 – section 2.7 lists Breaker types. 2.7.B for some reason notes “enclosed Insulated case breakers”, then, 2.7.B.1 notes that the Main is insulated case, and all feeders 600A and greater are insulated case. Is this the intent that all breakers 600A and above need to be insulated case? Typically we see the main breaker as insulated case and the branch breakers as standard molded case.

**A155: Switchboard feeder breakers are not required to be insulated case type. Specification section 262413 has been updated in addendum 3.**

Q156: Specification section 11 31 00 - Appliances is included in the specifications. Reviewing this specification there are no products specified to be provided and there is no reference to appliances on the plan sheets for what we are to provide. Please clarify if there is something that we are to provide per the appliance specification or strike it if it doesn't apply to the project.

**A156: Appliance specification deleted. Appliances provided by Owner**

Q157: In addendum #1 the answer to question #9 states that all type 1 and type 3 walls are to receive a concrete curb typical. In addendum #2 sheet A-500.0 note on detail 1 it states that curbs are to be provided at garage vestibules. Please confirm that all non garage vestibule masonry walls are to be placed directly on the concrete deck and no curb provided per addendum #2.

**A157: Confirmed**

Q158: In addendum #2 the architectural drawings remove temporary roofs and concrete slabs. The structural drawings added these temporary slabs in on sheet S-103.0. Please confirm that these temporary slabs are not to be included in the contract.

**A158: Confirmed**

Q159: Addendum #2 sheet A501.0 eliminates the traffic coatings from the project and adds in sealed concrete on all the slabs, sheet A100.1 calls out traffic coating, A101.0 calls out traffic coating thru out as an alternate 1 add. Addendum #2 completely strikes the traffic coating specification and the alternate specification 012300 calls to provide the traffic coating in the base bid and the alternate is to deduct the traffic coating from the project. Please clarify what is to be provided in the base bid, and alternate and re include the traffic coating specification as required for the base bid/alternate. Additionally please update bid express to reflect the added alternate for the elimination of the traffic coating if we are to provide it.

**A159: Traffic coatings have been removed from the project. Add alternate for traffic coatings has been removed from the bid.**

Q160: Neither addendum #1 or addendum #2 addressed turning in the SBE at a later time than the bid. This was mentioned that it might get changed at the pre-bid walk thru. Please clarify if contractors will be able to turn the SBE good faith documentation at a later time than the bid and if so will we be allowed to email it.

**A160: There has been no change to the time that the SBE package must be turned in. The SBE package is due at the same time as the lump sum bid.**

Q161: Contract drawings of the fuel system and any application schedule. This is needed to see how the system is setup and what items and accessories are needed for a complete operating system. The specification provided appears to be very generic and not specific to the project. Day Tank Capacity Pumps: How many, required flow rate and discharge pressure available voltage.

**A161: 1. The day tank is required to be sized at 133% of the generator full load consumption for 8 hours. (1.33 x full load consumption x 8) Generator full load consumption depends on the specific generator manufacturer and specific generator. The contractor should size the tank based on the generator they received a quote for.**

**a. An example is Cummins 650DQPAB which has a 49gal / hour full load consumption. (1.33x49x8 = 521.36 gallons)**

**2. The voltage for the day tank pump and controls should be 120V.**

**3. Refer to drawing 3/M-705 for day tank control instrumentation diagram.**

Q162: Most of the project is pretty clear as to where the spray cellulose insulation is required. However, detail F6 shows insulation on the underside of level 2 and level 3 decks in the area of the bike shop. The plan views do not show insulation in those areas so we can't determine the extent of that insulation. Can you please provide the areas on those floors to received spray insulation?

**A162: Spray cellulose insulation provided above and below Bicycle Center. Please see sheets A-101.0 and A-102.0 – Addendum #3.**

Q163: Generator Enclosure - Is there an enclosure? Section 26 32 13, 1.2 describes one, but there's no more mention of it in the Specification. Since the Generator is enclosed within the building I am assuming an enclosure for the generator is not required. Please confirm.

**A163: An enclosure is not required for the generator since it is located inside the building. Specification section 263213 has been updated in addendum 3 to remove references to a generator enclosure.**

Q164: GRH 2 – Co-Ray-Vac does not have a CTH2-250 MBH Unit. Can you please clarify this unit?

**A164: Unit number and tube lengths on the gas fired radiant heater schedule updated on drawing M-600.**

Q165: Regarding the City fiber optic, can you confirm that the city is paying any fees and the General Contractor is just to coordinate the work?

**A165: The contract needs to carry the conduit routing. The City will provide and pull the line.**

Please acknowledge this addendum on page E1 of the contract documents and/or in Section E: Bidder's Acknowledgement on Bid E

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<https://www.bidexpress.com/>

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**For questions regarding this bid, contact:**

David Schaller

City of Madison Engineering (Facilities)

Construction Manager

Phone: (608) 243-5891

Email: dschaller@cityofmadison.com



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**LOTHAN VAN HOOK DESTEFANO AND ARCHITECTS LLC  
2 AUGUST 2017**

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**LOTHAN VAN HOOK DESTEFANO AND ARCHITECTS LLC  
2 AUGUST 2017**

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**LOTHAN VAN HOOK DESTEFANO AND ARCHITECTS LLC  
2 AUGUST 2017**

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52		Not Used
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SECTION 01 23 00

ALTERNATES

PART 1 – GENERAL

1.1 [RELATED DOCUMENTS](#)

1.2 [SUMMARY](#)

1.3 [DEFINITIONS](#)

1.4 [PROCEDURES](#)

PART 2 – PRODUCTS

Not Used

PART 3 – EXECUTION

3.1 [SCHEDULE OF ALTERNATES](#)

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Section includes administrative and procedural requirements for alternates.

**1.3 DEFINITIONS**

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternates into the Work. No other adjustments are made to the Contract Sum.

**1.4 PROCEDURES**

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Execute accepted alternates under the same conditions as other work of the Contract.
- C. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 SCHEDULE OF ALTERNATES**

- A. Alternate No. S-1: CONCRETE ADMIXTURES.
1. Base Bid: Provide concrete mix designs and admixtures per drawing schedule.
  2. Alternate: Provide crystalline admixture in the scheduled concrete mix design for the structural decks.
- ~~B. Alternate No. A-1: VEHICULAR TRAFFIC COATINGS.~~
- ~~1. Base Bid: Provide vehicular traffic coatings as indicated on Drawings A-100.2, A-100.3, A-100.4, A-100.5, A-101.0, and A-203.0 and as specified in Section 07 18 16 "Vehicular Traffic Coatings".~~
  - ~~2. Alternate: Delete vehicle traffic coatings scope of Work as indicated on Drawings A-100.2, A-100.3, A-100.4, A-100.5, A-101.0, and A-203.0 and as specified in Section 07 18 16 "Vehicular Traffic Coatings".~~





SECTION 07 13 26

BLINDSIDE SELF-ADHERING SHEET WATERPROOFING OPTION C – HORIZONTAL AND VERTICAL

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 DESCRIPTION**

- A. Carlisle Coatings and Waterproofing Blindside Waterproofing System utilizes the MiraPLY-H Waterproofing System fully adhered to poured concrete. The dual membrane is comprised of TPO and Butyl Alloy adhesive with a total thickness of 70 mils.
- B. Carlisle Coatings and Waterproofing Blindside Waterproofing System utilizes the MiraPLY-V Waterproofing System fully adhered to poured concrete. The dual membrane is comprised of TPO and Butyl Alloy adhesive with a total thickness of 47 mils.

**1.3 REFERENCE STANDARDS**

- A. ASTM D 412 Standard Test Methods for Rubber Properties in Tension
- B. ASTM D 570 Standard Test Methods for Water Absorption of Plastics
- C. ASTM D 624 Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
- D. ASTM D 882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
- E. ASTM D 903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
- F. ASTM D 1876 Standard Test Method for Peel Release of Adhesives (T-Peel)
- G. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- H. ASTM D 3767 Standard Practice for Rubber - Measurements of Dimensions
- I. ASTM D 5385 Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes
- J. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials
- K. ASTM E 154 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

ISSUED FOR ADDENDUM #3

JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE

CONTRACT # 7952 MUNIS # 11471

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BLINDSIDE SELF-ADHERING SHEET  
WATERPROOFING

1 **1.4 QUALITY ASSURANCE**

- 2 A. MiraPLY-H Blindsided Waterproofing System and MiraPLY-V Blindsided Waterproofing System must  
3 be installed by a Carlisle Coatings & Waterproofing Inc Authorized Applicator in compliance with  
4 shop drawings approved by Carlisle Coatings & Waterproofing Inc. There must be no deviations  
5 made from Carlisle's specifications or details without the prior approval from Carlisle Coatings &  
6 Waterproofing Inc.  
7 B. The Contractor shall employ a third-party independent observer (TPIO) to confirm compliance with the  
8 manufacturer's requirements and the general intent of all blindsided waterproofing scope of work. The TPIO  
9 must be present at all blindsided waterproofing and affiliated work. The TPIO shall attend all construction  
10 meetings and shall provide daily reports on a bi-weekly basis.  
11 C. A pre-installation meeting shall be coordinated by the General Contractor and attended by the  
12 waterproofing applicator, the TPIO, and other trades working on the Blindsided System both before  
13 and after installation. The purpose of this meeting is to discuss the necessity of ensuring proper  
14 waterproofing membrane protection during all phases of installation and to review other applicable  
15 requirements or unusual field conditions.  
16 D. Provide primary materials which are the products of one manufacturer, for each type of material  
17 required for the work.  
18 E. Upon request by the authorized applicator and in coordination with the TPIO, an inspection will be conducted  
19 by a Carlisle Coatings & Waterproofing Inc representative to ensure that the waterproofing membrane has  
20 been installed according to Carlisle Coatings & Waterproofing Inc specifications and details. This inspection  
21 shall be coordinated prior to installing the Blindsided components so that access to the membrane is not  
22 impaired.  
23 F. An in-progress inspection shall be scheduled after the initial inspection (after the membrane installation is  
24 completed) to ensure proper protection procedures are being followed to prevent possible damage to the  
25 membrane during the installation of above membrane components.

26 **1.5 SUBMITTALS**

- 27  
28 A. General: Submit in accordance with Section 01 33 23.  
29 B. Product Data: Submit manufacturer's product literature and installation instructions.  
30 C. Subcontractor's approval by Manufacturer: Submit document stating manufacturer's acceptance of  
31 subcontractor as an Approved Applicator for the specified materials.  
32 D. Warranty Submit a sample warranty identifying the terms and conditions stated in Section 1.06.  
33

34 **1.6 WARRANTY**

- 35 A. Provide a written, single-source warranty for all system components agreeing to promptly make  
36 repairs or replace defective waterproofing system materials without additional cost to the owner  
37 during the warranty period.  
38 B. A 10-year System Warranty is available for a charge on commercial buildings and applies only to  
39 products manufactured or marketed by Carlisle Coatings & Waterproofing Inc. The membrane  
40 system is defined as membrane, flashings, adhesives, sealants and other Carlisle brand products  
41 utilized in this installation. For a complete description of these products, refer to the "Products  
42 Section" or the applicable "Attachment" in the Carlisle specifications.  
43 C. Access for warranty service - it shall be the owner's responsibility to expose the waterproofing  
44 membrane assembly in the event warranty service is required.  
45 D. For the MiraPLY-V Warranty: the formation or presence of mold or fungi in a building is dependent  
46 upon a broad range of factors including, but not limited to, the presence of spores and nutrient  
47 sources, moisture, temperatures, climatic conditions, relative humidity, and heating/ventilating  
48 systems and their maintenance and operating capabilities. These factors are beyond the control  
49 of Carlisle and Carlisle shall not be responsible for any claims, repairs, restoration or damages  
50 relating to the presence of any irritants, contaminants, vapors, fumes, molds, fungi, bacteria, spores,  
51 mycotoxins, or the like in any building or in the air, land, or water serving the building.  
52

53 **1.7 JOB CONDITIONS**

- 54 A. Coordination between various trades is essential to avoid unnecessary traffic to prevent damage to  
55 the membrane. Heavily traveled areas must be protected by placing temporary protection courses  
56 to prevent damage to the membrane.  
57 B. Coordinate waterproofing work with other trades. The applicator shall have sole right of access to  
58 the specified areas for the time needed to complete the application.  
59 C. Protect adjoining surfaces not to be waterproofed against damage or soiling. Protect plants,  
60 vegetation and animals which might be affected by waterproofing operations.  
61 D. Wear applicable protective clothing and respiratory protection gear.

**ISSUED FOR ADDENDUM #3**

**JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE**

**CONTRACT # 7952 MUNIS # 11471**

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**BLINDSIDE SELF-ADHERING SHEET  
WATERPROOFING**

- 1 E. Maintain work area in a neat and orderly condition, removing empty containers, rags, and rubbish  
2 daily from the site.  
3
- 4 **1.8 PRODUCT DELIVERY, STORAGE AND HANDLING**
- 5 A. Deliver materials to project site in original, factory-sealed, unopened containers bearing  
6 manufacturer's name and label intact and legible with the following information.  
7 1. Name of material  
8 2. Manufacturer's stock number and date of manufacture  
9 3. Material safety data sheet
- 10 B. Store membrane and accessory products in a protected area out of direct sunlight and between  
11 40°F and 100°F. Protect from rain, physical damage and construction traffic.

12 **PART 2 - PRODUCTS**

13 **2.1 GENERAL**

- 14 A. Provide products manufactured and supplied by Carlisle Coatings & Waterproofing Inc, 900 Hensley  
15 Lane, Wylie Texas 75098, phone (800) 527-7098, fax (972) 442-0076.  
16 B. The components of this Blindside System are to be products of Carlisle Coatings & Waterproofing Inc. The  
17 installation, performance or integrity of products by others is not the responsibility of Carlisle Coatings &  
18 Waterproofing Inc and is expressly disclaimed by the warranty.

19 **2.2 MEMBRANE**

- 20 A. MiraPLY-H Sheet Membrane: Shall be CCW-MiraPLY-H self-adhering adhesive coated membrane,  
21 and shall meet or exceed the requirements listed in charts found on Technical Data Sheet.  
22 B. MiraPLY-V Sheet Membrane: Shall be CCW-MiraPLY-V self-adhering adhesive coated membrane,  
23 and shall meet or exceed the requirements listed in charts found in section 2.

24 **2.3 VAPOR RETARDER**

- 25 **A. MiraPLY-H Sheet Membrane: Shall be CCW-MiraPLY-H self-adhering adhesive coated**  
26 **membrane, and shall meet or exceed the requirements listed in charts found on Technical**  
27 **Data Sheet.**

28 **2.4 HOT-APPLIED LIQUID MEMBRANE**

- 29 **A. Shall be CCW-500R, supplied by Carlisle Coatings & Waterproofing, Inc.**
- 30 1. **Hot-applied liquid membrane: Shall be CCW-500 Hot-Applied Membrane, rubberized asphalt**  
31 **compound, and shall meet or exceed the requirements of CGSB-37.50-M89.**
- 32 2. **Reinforcing fabric: Shall be CCW-500 Reinforcing Fabric which is a 1.18 oz/square yard**  
33 **spunbond polyester fabric.**
- 34 3. **Flashings: Shall be CCW-711-90 90-Mil Sheet Membrane and Flashing or CCW 60-mil uncured**  
35 **neoprene for non-exposed areas and Sure-Seal® EPDM, Sure Weld 120-mil AFX TPO or Sure**  
36 **Seal Fleeceback 115-mil EPDM for exposed areas.**
- 37 4. **Surface Primer: Shall be CCW-550 Primer.**
- 38 5. **Mastic: Shall be CCW-550, CCW-702, CCW-702LV or CCW-AWP.**
- 39 6. **Sealants: Shall be CCW-703 Vertical Grade LIQUISEAL™ Membrane or CCW-201 two-**  
40 **component Polyurethane Sealant.**
- 41 7. **Backer Rod: Shall be closed-cell polyethylene foam rod.**
- 42 8. **Expansion Joints: Shall be the EJ-500**
- 43 9. **Protection Course: Shall be CCW Protection Board-HS or H.**
- 44 10. **Root Barrier: Shall be the CCW Root Barrier**
- 45 11. **Drainage Composite: Shall be CCW MiraDRAIN as recommended by the manufacturer for**  
46 **each condition.**
- 47 12. **Insulation: Shall be extruded or expanded polystyrene insulation with a minimum 40 psi (or**  
48 **as specified by architect) compressive strength as manufactured by Insulfoam, Foamular or**  
49 **Dow.**
- 50 13. **CCW 200V, CCW 300 HV or H.P Protective Mat shall be applied over insulation prior to**  
51 **overburden placement.**

- 1 **2.5 MIRAPLY-H RELATED ACCESSORY PRODUCTS**  
2 A. Seam Tape: MiraPLY Seam Tape, MiraPLY Seam Tape LT or SecurTAPE – 6” wide  
3 B. Detailing Tapes: Shall be:  
4 1. MiraPLY Detail Tape – 6” wide  
5 2. P/S Elastoform Flashing  
6 C. Primers:  
7 1. Low VOC Primer  
8 2. HP-250 Primer  
9 3. CAV-GRIP  
10 D. Termination Sealant:  
11 1. Sure-Seal Lap Sealant  
12 2. Universal Single Ply Sealant  
13 E. Detail Sealants:  
14 1. Sure-Seal Lap Sealant  
15 2. Universal Single Ply Sealant  
16 3. DOW 758  
17 F. 2-Part Liquid Membrane: CCW-703V LiquiSeal  
18 G. Reinforcing Fabric:  
19 1. CCW-LiquiFiber-6”, 12” wide  
20 H. Termination Bar: Sure-Seal Termination Bar  
21 I. Water Stop: CCW MiraSTOP  
22 J. Backer Rod: Closed-cell polyethylene foam rod  
23 K. Expansion joints: EJ-500  
24 L. Drain Composite: CCW MiraDRAIN Drainage Composite as selected per project  
25 M. Perimeter Drainage System: Where required, shall be CCW MiraDRAIN HC  
26 N. Cleaner: Weathered Membrane Cleaner or approved equal

- 27 **2.6 MIRAPLY-V RELATED ACCESSORY PRODUCTS**  
28 A. Seam Tape: Shall be SecurTAPE – 6” wide  
29 B. Detailing Tapes: Shall be:  
30 1. CCW-Detail Tape – 2”, 6” wide  
31 2. P/S Elastoform Flashing  
32 C. Primers shall be:  
33 1. Low VOC Primer  
34 2. HP-250 Primer  
35 D. Termination Sealant:  
36 1. Sure-Seal Lap Sealant  
37 E. Detail Sealants:  
38 1. Sure-Seal Lap Sealant  
39 2. Universal Single Ply Sealant  
40 F. 2-Part Liquid Membrane: CCW-703V LiquiSeal  
41 G. Reinforcing Fabric:  
42 1. CCW-LiquiFiber – 6”, 12” wide  
43 H. Termination Bar: Shall be Sure-Seal Termination Bar  
44 I. Water Stop: CCW MiraSTOP  
45 J. Backer Rod: Closed-cell polyethylene foam rod  
46 K. Expansion joints: EJ-500  
47 L. Drain Composite: CCW MiraDRAIN Drainage Composite as selected per project  
48 M. Perimeter Drainage System: Where required, shall be CCW MiraDRAIN HC  
49 N. Cleaner: Weathered Membrane Cleaner or approved equal  
50 O. Reinforcing Membrane/Flashing: Sure-Seal P/S Elastoform Flashing

- 51 **2.7 CARLISLE BLINDSIDE PHYSICAL PROPERTIES MIRAPLY-H**  
52 A. Please refer to Technical Data Sheet.

- 53 **2.8 CARLISLE BLINDSIDE PHYSICAL PROPERTIES MIRAPLY-V**

Property	Method	Unit	Typical Value
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**LOTHAN VAN HOOK DESTEFANO AND ARCHITECTS LLC  
01 AUGUST 2017**

TPO	—	mils (mm)	22 (.56)
Butyl Alloy	—	mils (mm)	25 (.64)
Thickness per ASTM D 5147 across sheet	ASTM D1970	mils (mm)	47 (1.19)
Water Vapor Transmission	ASTM E96 (Water Method)	perms	0.100
Tensile Strength <sup>1</sup>	ASTM D882	psi	1,360
300% Modulus <sup>1</sup>	ASTM D412	psi	1,390
90° T-Peel	ASTM D1876	lb.	>5.0
Elongation @ Break @ 23°C (Die C) <sup>1</sup>	ASTM D412	%	335
Flexibility Temperature @ -29°C (-20°F) <sup>1</sup>	ASTM D1970	pass/fail	No Cracking @-29°C (-20°F)
Hydrostatic Pressure Resistance	ASTM D5385	ft.	>231 ft. (100 psi)
Peel Strength Over Poured Concrete (tested w/2" strips)	ASTM D903	lb.	5.6
Puncture Resistance Elongation	ASTM E154	in	4.9
Puncture Resistance Load at Puncture	ASTM E154	lb.	106.4
Tear Strength of Vulcanized Rubber and Thermoplastics Die C <sup>1</sup>	ASTM D624	psi	685
Soil Decay Testing- E 96 Permeance	ASTM E154		Pass
Soil Decay Testing- Weight Loss	ASTM E154		Pass
Lateral Water Migration Resistance <sup>2</sup>	ASTM D5385 modified		Pass at 100 psi (231 ft) of hydrostatic pressure

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<sup>1</sup>Data Listed according to Machine Direction criteria where applicable

<sup>2</sup>Lateral water migration resistance test is performed by casting concrete against butyl side of membrane with a hole and applying a hydrostatic head pressure with water. This test measures the resistance of lateral water migration between membrane and concrete.

1 **PART 3 - EXECUTION**

2 **3.1 GENERAL**

- 3 A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all  
4 lagging and support for any deficiencies. Should any deficiencies exist, the architect, owner, or  
5 general contractor shall be notified in writing and corrections made.

6 **3.2 SUBSTRATE REQUIREMENTS**

- 7 A. The substrate shall be even without noticeable high spots or depressions, smooth, free of protrusions,  
8 debris, sharp edges or foreign materials and must be free of accumulated water, ice and snow. For  
9 MiraPLY-H system, earth, crushed stone, or soil shall be compacted such that the soil is not  
10 displaced from traffic or concrete placement.  
11 B. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine  
12 all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general  
13 contractor shall be notified in writing and corrections made.  
14 C. All work shall be performed in accordance with Carlisle-CCW application instructions.

15 **3.3 INSTALLATION: HORIZONTAL**

- 16 A. Refer to the applicable Manufacturer's Technical Data Bulletins for cautions and warnings.  
17 B. All substrates shall be smooth and even. Concrete substrate should likewise be smooth and monolithic.  
18 Gaps or voids greater than 0.5in (12mm) shall be filled. Gravel sub-base must be 3/4" or smaller aggregate,  
19 level and compacted. Install MiraDRAIN over sub-base before installing MiraPLY-H, if substrate  
20 requirements cannot be met or required by project requirements. There is to be no standing water.  
21 C. CCW MiraDRAIN Composites by Carlisle Coatings and Waterproofing is an acceptable substrate. Install  
22 CCW MiraDRAIN with fabric side facing down.  
23 D. Always comply with the instructions found in manufacturer's literature, which includes:  
24 1. Apply the product with the TPO surface against the prepared surface and the butyl alloy adhesive  
25 side facing up.  
26 2. Carefully position successive sheets to overlap the previous sheet by 3 in. (75mm) minimum along  
27 the lap line. Be sure the product lays flat with no openings. End laps must be staggered.  
28 3. For side laps simultaneously remove the release liner on the FAT (factory applied tape) pre-  
29 primed strip then mate the two sheets together.  
30 4. For end laps, position the MiraPLY Seam Tape in the lap area. Remove release liner on the MiraPLY  
31 Seam Tape and mate the two sheets together. For SecurTAPE option, the TPO and Butyl surfaces  
32 of lap area shall be clean and primed with HP-250 Primer or Low VOC Primer and allow to flash off  
33 then position SecurTAPE 6" in the lap area. Remove release liner on the SecurTAPE and mate two  
34 sheets together. Lap area shall be rolled with firm hand pressure to ensure a continuous bond is  
35 achieved.

36 **3.4 INSTALLATION: VERTICAL**

- 37 A. Refer to the applicable Manufacturer's Technical Data Bulletins for cautions and warnings.  
38 B. All substrates shall be smooth and even. Concrete substrate should likewise be smooth and monolithic.  
39 Gaps or voids greater than 0.5in (12mm) shall be filled.  
40 C. Cover soil retention systems with CCW MiraDRAIN Composites by Carlisle Coatings and Waterproofing.  
41 Install CCW MiraDRAIN with fabric side facing toward grade/blind side.  
42 D. Always comply with the instructions found in manufacturer's literature, which includes:  
43 1. Start the installation at one corner of the building. Unroll the first sheet of MiraPLY-V and install it  
44 square/parallel to building wall centered in the corner with the TPO side facing the MiraDRAIN  
45 attached to the soil retention system (lagging, sheet pile, shotcrete, etc.) and the adhesive/release  
46 liner facing out. Mechanically fasten the membrane vertically, use fasteners with plastic washer  
47 heads that are compatible with the substrate. Ensure MiraPLY- V is not bridging or wrinkled and tight

ISSUED FOR ADDENDUM #3

JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE

CONTRACT # 7952 MUNIS # 11471

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BLINDSIDE SELF-ADHERING SHEET  
WATERPROOFING

- 1 to the corner with no seams in the corner. Install an adequate number of fasteners across the top of
- 2 the MiraPLY-V to support and keep the membrane tight against the substrate without wrinkles and
- 3 blousing until concrete is poured. Walls higher than 8'-0" require fasteners in the field of the MiraPLY-
- 4 V membrane with approximately 1 fastener per 2 ft<sup>2</sup> (not including fasteners at the perimeter). Fasten
- 5 perimeter edges of MiraPLY approximately 12" on center and a minimum of 6" from the edge.
- 6 Caution – over driven fasteners can cause stress in the membrane and seams.
- 7 2. Unroll the the next sheet of MiraPLY-V and align parallel to and overlap the preceding roll of
- 8 MiraPLY-V 3" and a minimum 3" end overlap. Stagger end laps. Ensure that the membrane
- 9 lays flat and no openings are visible. Make sure that the TPO side of the lap is clean, dry and
- 10 free of contaminants and prime TPO with HP-250 Primer or Low VOC Primer.
- 11 3. Remove the release liner on the lap (edge of the sheet) and mate the two sheets together. Lap area
- 12 shall be rolled with a hard rubber roller using firm hand pressure.
- 13 4. Leave the plastic liner on MiraPLY-V until ready for concrete pour or placement of rebar. Cover
- 14 fasteners with a 3" x 3" piece of SecurTAPE, P/S Elastoform Flashing or CCW Detail Tape.
- 15

### 3.5 INSTALLATION: HOT-APPLIED LIQUID MEMBRANE

#### A. Inspection

- 16 1. Before any waterproofing work is started the waterproofing applicator shall thoroughly
- 17 examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner,
- 18 or general contractor shall be notified in writing and corrections made.
- 19 2. Condition of Concrete Surfaces:
- 20 a. The concrete surfaces shall be of sound structural grade, 3500 psi minimum, and shall
- 21 have a wood float or fine broom finish, free of fins, ridges, voids or entrained air holes.
- 22 b. Concrete shall be cured by water curing method. Curing compounds must be of the
- 23 pure sodium silicate type and be approved by the Carlisle representative.
- 24 c. Concrete shall be cured at least 14 days and shall be sloped for proper drainage.
- 25 d. Voids, rock pockets and excessively rough surfaces shall be repaired with approved
- 26 non-shrink grout or ground to match the un-repaired areas.
- 27 e. Two-stage drains shall have a minimum three inch flange and be installed with the
- 28 flange flush and level with the concrete surface.
- 29 f. Surfaces at cold joints shall be on the same plane.

#### B. Surface Preparation

- 30 1. The concrete surface must be thoroughly clean, dry and free from any surface contaminates
- 31 or cleaning residue that may harmfully affect the adhesion of the membrane.
- 32 2. Detail expansion joints per manufacturer's recommendation using the EJ-500.
- 33 3. Apply a thin film of CCW-550, CCW-702, CCW-702LV or CCW-AWP primer 16" wide, centered
- 34 over sealed cracks and joints. Apply 60-90 mils of CCW-550, CCW-702, CCW-702LV or CCW-
- 35 AWP membrane to cover primed areas. Install a 12" wide strip of CCW-711-90 centered over
- 36 joints and cracks greater than 1/16" in width.
- 37 4. Preferred Flashing Method (500-4B): Apply CCW-550, CCW-702, CCW-702LV or CCW-AWP
- 38 Primer at the juncture of all horizontal surfaces and vertical surfaces to the height indicated
- 39 on the drawings (eight inches min. recommended), such as parapet walls, curbs, columns
- 40 and all penetrations through the deck at at the published sq. ft. per gallon rate recommended.
- 41 Avoid puddles. Allow primer to dry for 1 hour minimum, 8 hours maximum. Membrane will not
- 42 properly adhere to wet primer. Apply 60-90 mils of CCW-500 membrane to cover primed areas.
- 43 Install CCW-711-90 mil sheet membrane or uncured neoprene flashing into this first course
- 44 of CCW-500 to cover the vertical section and extend six inches onto deck surface. Flashing
- 45 installation may be done during crack and joint treatment or during installation of the first
- 46 layer of CCW-500 membrane. Completely cover all flashing material during installation of the
- 47 subsequent layers of CCW-500 membrane.
- 48 5. Install Sure-Seal EPDM, Sure Weld 120-mil AFX TPO or Sure Seal Fleeceback 115-mil EPDM
- 49 flashings in exposed areas per Carlisle recommendations (500-4A). Always clean and prime
- 50 per Carlisle splice procedure prior to application of CCW-500 membrane.
- 51 6. Apply a thin film of CCW-550, CCW-702, CCW-702LV or CCW-AWP Primer in a four foot square
- 52 area around drains. Allow primer to dry, one hour minimum, eight hours maximum. Apply 60-
- 53 90 mils of CCW-500 membrane to cover primed areas. Install a three foot square section of
- 54 CCW-711-90 or uncured neoprene flashing over the drain and onto the deck. No splices or
- 55 seams are allowed within three inches of the drain flange. Terminate the flashing under the
- 56 clamping ring of the drain and cut away the inner portion of the flashing. Use firm pressure
- 57
- 58
- 59

1 to press the flashing against the CCW 500 surface and ensure good adhesion. Do not interfere  
2 with weep holes. Completely cover all flashing material during installation of the subsequent  
3 layers of CCW-500 membrane.

4 **C. Application**

- 5 1. Apply CCW-550, CCW-702, CCW-702LV or CCW-AWP primer to all surfaces and at the juncture  
6 of all horizontal surfaces and vertical surfaces, to the height indicated on the drawings (eight  
7 inches min. recommended), such as parapet walls, curbs, columns and all penetrations  
8 through the deck, to receive CCW-500 Waterproofing Membrane, including over flashings at  
9 the published sq. ft. per gallon rate recommended. Avoid puddles. Allow primer to dry for one  
10 hour minimum, eight hours maximum. Membrane will not properly adhere to wet primer.  
11 2. Heat CCW-500 Membrane blocks in a twin wall kettle with continuous agitation and apply at  
12 350°F or between temperatures of 325°F to 375°F. (Caution: Do not exceed maximum safe  
13 operating temperature of 375°F.).  
14 3. Apply heated CCW-500 Hot Applied Membrane to primed area and any pre-installed flashings  
15 at a rate of 18 sq. ft. per gallon or as required to obtain an average thickness of 90 mils.  
16 4. Apply CCW-500 Reinforcing Fabric and any required flashings while membrane is still warm  
17 and tacky. Cut and trim off any wrinkles or overlap sections of the reinforcing fabric or hot  
18 the fabric splices together with CCW-500.  
19 5. Apply a second coat of CCW-500 Hot Applied Membrane at a rate of 13 sq. ft. per gallon or as  
20 required to obtain an average thickness of 125 mils. Total thickness of the CCW-500-R System  
21 shall be 215 mils.  
22 6. Apply CCW Protection Board H or HS into the last course of CCW-500 and splice the  
23 protection board seams together with CCW-500.

24 **D. Integrity Testing**

- 25 1. Test is required for all expanded warranties beyond the standard material warranty of  
26 horizontal applications.  
27 2. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires  
28 2" minimum head of water for a period of 24 hours.

29 **E. Protection Course**

- 30 1. Install CCW MiraDRAIN HC Perimeter Drainage System as the first course of drainage  
31 composite immediately after membrane has cured on vertical surfaces. Install CCW  
32 MiraDRAIN Drainage Composite to complete the drainage and protection System on Vertical  
33 installations.  
34 2. Install CCW MiraDRAIN 9000 or 9900 over CCW Protection Board immediately after flood  
35 testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to  
36 protect the CCW-500 membrane from damage by other trades. Apply CCW Root Barrier in  
37 planter areas and green roofs covered with soil and plants. Apply over Protection Board and  
38 beneath the MiraDRAIN. CCW Root Barrier splices are a minimum of four feet and taped with  
39 CCW MiraDRAIN Drainage Composite Board.  
40

41 **END OF SECTION**



SECTION 07 13 52

MODIFIED BITUMINOUS SHEET WATERPROOFING (BLINDSIDE WATERPROOFING) OPTION S –  
HORIZONTAL AND VERTICAL

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**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. Work shall include, but is not limited to, the following:
  - 1. Preparation of all field and flashing substrates.
  - 2. Drainage mat, mechanically fastened.
  - 3. Protection board, mechanically fastened.
  - 4. SBS-modified bitumen vertical field membrane.
  - 5. SBS-modified bitumen horizontal field membrane.
  - 6. Protection sheet, self-adhered.
  - 7. Liquid-applied, reinforced flashings.
  - 8. All related materials and labor required to complete specified waterproofing necessary to receive specified manufacturer's warranty.

**1.3 DEFINITIONS**

- A. ASTM D 1079 – Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

ISSUED FOR ADDENDUM #3

JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE

CONTRACT # 7952 MUNIS # 11471

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MODIFIED BITUMINOUS  
SHEET WATERPROOFING

1 **1.4 REFERENCES**

- 2 A. American Standard of Testing Methods (ASTM):  
3 1. ASTM C 836 - Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric  
4 Waterproofing Membrane for Use with Separate Wearing Course.  
5 2. ASTM D 903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.  
6 3. ASTM D 1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet  
7 Materials Used as Steep Roofing Underlayment for Ice Dam Protection.  
8 4. ASTM D 412 - Standard Test Method for Tensile Strength and Ultimate Elongation.  
9 5. ASTM D 5385 - Standard Test Method for Hydrostatic Pressure Resistance of Waterproofing  
10 Membranes.  
11 6. ASTM D 5385 (modified) – Standard Test Method for Lateral Water Migration.  
12 7. ASTM D 5601 - Standard Test Method for Tearing Resistance of Roofing and Waterproofing  
13 Materials and Membranes.  
14 8. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.  
15 9. ASTM E 154 - Standard Test Method for Water Vapor Retarders Used in Contact with Earth Under  
16 Concrete Slabs, on Walls, or as Ground Cover.  
17 10. ASTM D 1876 - Standard Test Method for Lap Peel Adhesion.  
18 11. ASTM D 570 - Standard Test Method for Water Absorption.  
19 12. ASTM D 1434 - Standard Test Method for Methane Gas Permeability.  
20 13. ASTM D 1894 - Standard Test Method for Coefficient of Friction.

21 **1.5 ACTION SUBMITTALS**

- 22 A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general  
23 requirements for each component.  
24 B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.  
25 C. Sample/Specimen Warranty from the manufacturer and contractor.  
26 D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

27 **1.6 INFORMATIONAL SUBMITTALS**

- 28 A. Contractor Certification: Submit written certification from waterproofing manufacturer certifying that the  
29 applicator is authorized by the manufacturer to install the specified materials and system.

30 **1.7 CLOSEOUT SUBMITTALS**

- 31 A. Warranty: Provide manufacturer's and contractor's warranties upon substantial completion of the  
32 waterproofing.

33 **1.8 QUALITY ASSURANCE**

- 34 A. Manufacturer Qualifications:  
35 1. Manufacturer shall have 20 years of experience manufacturing SBS-modified bitumen waterproofing  
36 materials.  
37 2. Provide specified warranty upon satisfactory project completion.  
38 B. Contractor Qualifications:  
39 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding  
40 period through satisfactory project completion.  
41 2. Contractor shall provide full time, non-working, on-site superintendent experienced with the specified  
42 waterproofing through satisfactory project completion.  
43 3. Applicators shall be skilled in the application methods for all materials.  
44 4. Contractor shall maintain a daily record, on-site, documenting material installation and related project  
45 conditions.  
46 5. Contractor shall maintain a copy of all submittal documents, on-site, available at all times, for  
47 reference.  
48 C. The Contractor shall employ a third-party independent observer (TPIO) to confirm compliance with the  
49 manufacturer's requirements and the general intent of all blindside waterproofing scope of work. The TPIO  
50 must be present at all blindside waterproofing and affiliated work. The TPIO shall attend all construction  
51 meetings and shall provide daily reports on a bi-weekly basis.

52 **1.9 DELIVERY, STORAGE AND HANDLING**

- 53 A. Refer to each product data sheet or other published literature for specific requirements.  
54 B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name,  
55 related standards, and any other specification or reference accepted as standard.

- 1 C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the  
2 same day shall be removed from this location. During cold weather, store materials in a heated location,  
3 removed only as needed for immediate use.
- 4 D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or  
5 dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to  
6 protect materials from precipitation and to prevent exposure to condensation.
- 7 E. Carefully store waterproofing membrane materials delivered in rolls on-end with selvage edges up. Store  
8 and protect roll storage to prevent damage.
- 9 F. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged  
10 materials shall be removed from job site and replaced with new, suitable materials.

11 **1.10 SITE CONDITIONS**

- 12 A. Safety:
- 13 1. The contractor shall be responsible for complying with all project-related safety and environmental  
14 requirements.
- 15 2. Heat-welding shall include heating the specified membrane ply using propane roof torches or electric  
16 hot-air welding equipment. The contractor shall determine when and where conditions are  
17 appropriate to utilize heat-welding equipment. When conditions are determined by the contractor to  
18 be unsafe to proceed, equivalent SBS-modified bitumen materials and methods shall be utilized to  
19 accommodate requirements and conditions.
- 20 3. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot  
21 work operations.
- 22 4. The contractor shall review project conditions and determine when and where conditions are  
23 appropriate to utilize the specified liquid-applied, or semi-solid waterproofing materials. When  
24 conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall  
25 be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent  
26 approved materials and methods shall be utilized to accommodate requirements and conditions.
- 27 5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment  
28 related hazards, and take all necessary measures and precautions to comply with exposure  
29 requirements.
- 30 B. Environmental Conditions:
- 31 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such  
32 as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions  
33 are satisfactory to begin work and ensure conditions remain satisfactory during the installation of  
34 specified materials. Materials and methods shall be adjusted as necessary to accommodate varying  
35 project conditions. Materials shall not be installed when conditions are unacceptable to achieve the  
36 specified results.
- 37 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and  
38 will remain dry, during the application of waterproofing materials. Ensure all waterproofing materials  
39 and substrates remain above the dew point temperature as required to prevent condensation and  
40 maintain dry conditions.
- 41 3. Self-adhered membrane application: During cold weather, store the specified self-adhered  
42 membrane and primer materials in heated storage areas to ensure materials remain no less than  
43 70°F (21°C) during application. Ensure conditions allow primer to remain tacky, but not wet so that  
44 primer will transfer to finger when touched. Self-adhered primer should not fully dry and lose tack  
45 before applying the self-adhered membrane. Ensure conditions remain satisfactory to achieve  
46 membrane adhesion as specified.
- 47 4. Heat-Welding Application: Take all necessary precautions and measures to monitor conditions to  
48 ensure all environmental conditions are safe to proceed with the use of torches and hot-air welding  
49 equipment. Combustibles, flammable liquids and solvent vapors that represent a hazard shall be  
50 eliminated and primers shall be fully dry before proceeding with heat-welding operations. Refer to  
51 NRCA CERTA recommendations.

52 **1.11 WARRANTY**

- 53 A. Manufacturer's Warranty: The manufacturer shall provide the owner with the manufacturer's warranty  
54 providing labor and materials for a period of 10 years from the date the warranty is issued.
- 55 B. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty  
56 covering workmanship for a period of 2 years from completion date.

1 **PART 2 - PRODUCTS**

2 **2.1 MANUFACTURER**

- 3 A. Single Source Manufacturer: All products shall be provided by a single supplier with 20 years or more  
4 waterproofing manufacturing history in the US.  
5 1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.  
6 B. Product Quality Assurance Program: Manufacturer shall be an ISO 9001 registered company.  
7 C. Acceptable Manufacturer:  
8 1. Soprema, located at: 310 Quadral Dr.; Wadsworth, OH 44281; Tel: 800-356-3521; Tel: 330-334-  
9 0066; Website: [www.soprema.us](http://www.soprema.us).  
10 2. Acceptable Alternate Manufacturers: Tremco and Carlisle.

11 **2.2 WATERPROOFING SYSTEM**

- 12 A. Waterproofing Basis of Design:  
13 1. Soprema

14 **2.3 BLINDSIDE WATERPROOFING**

- 15 A. Vertical Field Membrane:  
16 1. SBS-Modified Bitumen:  
17 a. Soprema Colphene BSW V: SBS-modified bitumen, self-adhesive membrane with release  
18 film on the bottom surface and a sanded top surface used for vertical blindside waterproofing  
19 applications. Composite reinforcement. DUO SELVEDGE side laps.  
20 1) Thickness: 120 mils (3.0 mm)  
21 2) Width: 39.4 in (1 m)  
22 3) Length: 32.8 ft (10 m)  
23 4) Adhesion of Poured Concrete (ASTM D 903 modified): 24.2 lbf/in (4235 N/m)  
24 5) Puncture Resistance (ASTM E154): 350 lb (1557 N)  
25 6) Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)  
26 7) Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)  
27 8) Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)  
28 9) Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %  
29 10) Low Temperature Flexibility (ASTM D 1970): Unaffected at -4°F (-20°C)  
30 11) Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)  
31 12) Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9°F (-23°C)  
32 13) Lap Peel Adhesion (ASTM D 1876): 7.7 lbf/in (1360 N/m)  
33 14) Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m<sup>2</sup>)  
34 15) Water Absorption (maximum) (ASTM D 570): 0.5 %  
35 16) Methane Gas Permeability (ASTM D 1434): 1.6\*10<sup>-6</sup>ft<sup>2</sup>/hr at 14.7 psia (4.12\*10<sup>-7</sup>  
36 cm<sup>2</sup>/sec at 1 atm)  
37 17) Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.03 static 0.76  
38 kinetic  
39 18) Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.84 static 0.67  
40 kinetic  
41 b. Soprema Colphene BSW H: SBS-modified bitumen membrane with plastic burn-off film on  
42 the bottom surface and a sanded top surface used for vertical blindside waterproofing  
43 applications. Polyester reinforcement.  
44 1) Thickness: 140 mils (3.5 mm)  
45 2) Width: 39.4 in (1 m)  
46 3) Length: 32.8 ft (10 m)  
47 4) Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)  
48 5) Puncture Resistance (ASTM E154): 311 lb (1383N)  
49 6) Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)  
50 7) Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)  
51 8) Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)  
52 9) Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %  
53 10) Low Temperature Flexibility (ASTM D 1970): Unaffected at -4°F (-20°C)  
54 11) Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)  
55 12) Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9°F (-23°C)  
56 13) Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)  
57 14) Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m<sup>2</sup>)  
58 15) Water Absorption (maximum) (ASTM D 570): 0.5 %

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JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE

CONTRACT # 7952 MUNIS # 11471

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MODIFIED BITUMINOUS  
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- 1 16) Methane Gas Permeability (ASTM D 1434):  $1.6 \times 10^{-6}$  ft<sup>2</sup>/hr at 14.7 psia ( $4.12 \times 10^{-7}$   
2 cm<sup>2</sup>/sec at 1 atm)
- 3 17) Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static 0.71  
4 kinetic
- 5 18) Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63  
6 kinetic
- 7 B. Horizontal Field Membrane:
- 8 1. SBS-Modified Bitumen:
- 9 a. Soprema Colphene BSW H: SBS-modified bitumen membrane with plastic burn-off film on  
10 the bottom surface and a sanded top surface used for horizontal blindside waterproofing  
11 applications. Polyester reinforcement.
- 12 1) Thickness: 140 mils (3.5 mm)
- 13 2) Width: 39.4 in (1 m)
- 14 3) Length: 32.8 ft (10 m)
- 15 4) Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)
- 16 5) Puncture Resistance (ASTM E154): 311 lb (1383N)
- 17 6) Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
- 18 7) Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)
- 19 8) Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
- 20 9) Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
- 21 10) Low Temperature Flexibility (ASTM D 1970): Unaffected at -4°F (-20°C)
- 22 11) Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
- 23 12) Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9°F (-23°C)
- 24 13) Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)
- 25 14) Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1 ng/Pa·s·m<sup>2</sup>)
- 26 15) Water Absorption (maximum) (ASTM D 570): 0.5 %
- 27 16) Methane Gas Permeability (ASTM D 1434):  $1.6 \times 10^{-6}$  ft<sup>2</sup>/hr at 14.7 psia ( $4.12 \times 10^{-7}$   
28 cm<sup>2</sup>/sec at 1 atm)
- 29 17) Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static 0.71  
30 kinetic
- 31 18) Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63  
32 kinetic
- 33 C. Vapor Retarder
- 34 1. SBS-Modified Bitumen:
- 35 a. Soprema Colphene Flam 180
- 36 1) Thickness: 140 mils (3.5 mm)
- 37 2) Width: 39.4 in (1 m)
- 38 3) Length: 32.8 ft (10 m)
- 39 4) Adhesion of Poured Concrete (ASTM D 903 modified): 19.6 lbf/in (3430 N/m)
- 40 5) Puncture Resistance (ASTM E154): 311 lb (1383N)
- 41 6) Resistance to Hydrostatic Head (ASTM D 5385 modified): >360 ft (110 m)
- 42 7) Resistance to Lateral Migration (ASTM D 5385 modified): >360 ft (110 m)
- 43 8) Tensile Strength, MD/XD (ASTM D 412): 3437/2638 psi (23.7/18.1 MPa)
- 44 9) Ultimate Elongation, MD/XD (ASTM D 412): 67/74 %
- 45 10) Low Temperature Flexibility (ASTM D 1970): Unaffected at -4°F (-20°C)
- 46 11) Tear Resistance (ASTM D 5601): 28.1 lbf (125 N)
- 47 12) Low Temperature Crack Bridging (ASTM C 836 (C1305)): Unaffected at -9°F (-  
48 23°C)
- 49 13) Lap Peel Adhesion (ASTM D 1786): 7.7 lbf/in (1360 N/m)
- 50 14) Water Vapor Transmission (ASTM E 96 Procedure B): <0.037 perms (2.1  
51 ng/Pa·s·m<sup>2</sup>)
- 52 15) Water Absorption (maximum) (ASTM D 570): 0.5 %
- 53 16) Methane Gas Permeability (ASTM D 1434):  $1.6 \times 10^{-6}$  ft<sup>2</sup>/hr at 14.7 psia ( $4.12 \times 10^{-7}$   
54 cm<sup>2</sup>/sec at 1 atm)
- 55 17) Coefficient of Friction (ASTM D 1894): sanded side on sanded side, 1.04 static  
56 0.71 kinetic
- 57 18) Coefficient of Friction (ASTM D 1894): sanded side on concrete, 0.75 static 0.63  
58 kinetic
- 59 D. Flashing Membrane
- 60 1. Polymethacrylate Liquid-applied Flashing (PMA):

- 1 a. Soprema Alsan RS 260 LO Flash System: Liquid-applied, catalyzed flashing membrane with  
2 an embedded polyester reinforcement fabric used for monolithic waterproofing flashing  
3 membranes.
  - 4 1) Soprema Alsan RS 260 LO Flash: Low odor, rapid curing, polymethacrylate (PMA)  
5 liquid resin.
    - 6 a) VOC Content: 0.5 g/L
    - 7 b) Color: White
  - 8 2) Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMA  
9 resin products.
  - 10 3) Soprema Alsan RS Fleece: Woven polyester reinforcement used in PMA liquid  
11 membrane applications.
    - 12 a) Thickness: 30-40 mils (0.8-1 mm)
    - 13 b) Weights: 110 g/m<sup>2</sup>
    - 14 c) Width: Size as required.
    - 15 d) Length: 164 ft (50 m)
- 16 2. Polymethyl Methacrylate Liquid-applied Flashing (PMMA):
  - 17 a. Soprema Alsan RS 230 Flash System: Liquid-applied, catalyzed flashing membrane with an  
18 embedded polyester reinforcement fabric used for monolithic waterproofing flashing  
19 membranes.
    - 20 1) Soprema Alsan RS 230 Flash: Rapid curing, polymethyl methacrylate (PMMA) liquid  
21 resin with an embedded polyester reinforcement fabric used for monolithic blindside  
22 waterproofing flashing applications.
      - 23 a) VOC Content: 4.2 g/L
      - 24 b) Color: White
    - 25 2) Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMMA  
26 resin products.
    - 27 3) Soprema Alsan RS Fleece: Woven polyester reinforcement used in PMMA liquid  
28 membrane applications.
      - 29 a) Thickness: 30-40 mils (0.8-1 mm)
      - 30 b) Weights: 110 g/m<sup>2</sup>
      - 31 c) Width: Size as required.
      - 32 d) Length: 164 ft (50 m)
  - 33 3. Elastomeric Liquid-applied Flashing:
    - 34 a. Soprema Colphene Liquid Membrane Flashing System: Two-component elastomeric, solvent  
35 free liquid membrane reinforced with self-adhesive modified bitumen membrane.
      - 36 1) Soprema Colphene Liquid Membrane: Two component, elastomeric, solvent free  
37 liquid used to flash blindside waterproofing penetrations.
      - 38 2) Soprema Colphene 3000: SBS-modified bitumen, self-adhesive membrane with  
39 release film on the bottom surface and a polyethylene woven composite facer used to  
40 reinforce Soprema Colphene Liquid Membrane.
        - 41 a) Thickness: 60 mils (1.5 mm)
        - 42 b) Width: 36 in (0.9 m)
        - 43 c) Length: 61 ft (18.6 m)
  - 44 4. Bitumen-Urethane Liquid-applied Flashing:
    - 45 a. Soprema Alsan Flashing System: Liquid-applied, single-component, reinforced flashing  
46 membrane.
      - 47 1) Soprema Alsan Flashing: Single-component, polyurethane-bitumen resin with  
48 polyester reinforcing fleece fabric fully embedded into the resin used to flash  
49 penetrations in blindside waterproofing applications.
        - 50 a) Solids Content: 80%
        - 51 b) Meets or exceeds ASTM C836.
      - 52 2) Alsan Polyfleece: Non-woven polyester reinforcement.
  - 53 5. Polymethyl Methacrylate (PMMA) Detailing Flashing:
    - 54 a. Soprema Alsan RS Detailer Flashing System: Rapid curing, catalyzed polymethyl  
55 methacrylate (PMMA) liquid resin with microfibers used as the waterproofing paste where it  
56 is difficult to install a conventional reinforced waterproofing membrane.
      - 57 1) Soprema Alsan RS Detailer: Polymethyl methacrylate (PMMA) liquid resin with  
58 microfibers used as the waterproofing paste where it is difficult to install a conventional  
59 reinforced waterproofing membrane.
      - 60 2) Soprema Alsan RS Catalyst Powder: Reactive agent used to induce curing of PMMA  
61 resin products.

62 E. Drainage Mat:

**ISSUED FOR ADDENDUM #3**

**JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE**

**CONTRACT # 7952 MUNIS # 11471**

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**MODIFIED BITUMINOUS  
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- 1 1. Soprema Sopradrain 10-G: High density drainage mat with a non-woven, factory laminated geotextile  
2 fabric on the top side used to drain vertical and horizontal blindside waterproofing applications.  
3 a. Width: 72 in (1.83 m)  
4 b. Length: 50 ft (15.25 m)  
5 c. Compressive Strength (kPa): 550 (11,000 psf)
- 6 2. Soprema Sopradrain ECO-2: Entangled polypropylene filament drainage mat with a geocomposite  
7 fabric on both sides used to drain vertical and horizontal blindside waterproofing applications.  
8 a. Width: 39 in (1 m)  
9 b. Length: 100 ft (30 m)  
10 c. Compressive Strength: 1436 kPa (>30,000 psf)
- 11 F. Pre-applied Protection Board  
12 1. Soprema Sopraboard: Mineral fortified, asphaltic roof substrate board with glass fiber facers. For  
13 use as a protection board on vertical and horizontal substrates in blindside waterproofing  
14 applications. Asphaltic Protection Board shall be manufactured by the membrane supplier.  
15 a. Thickness: 1/4 in  
16 b. Dimensions: 4 x 4 ft
- 17 G. Post Applied Protection Sheet  
18 1. Soprema Colphene BSW Protect'r: SBS-modified bitumen, self-adhesive membrane with release film  
19 on the bottom surface and a sanded top surface used as a secondary protection on horizontal  
20 blindside waterproofing applications. Composite reinforcement.  
21 a. Thickness: 80 mils (2.0 mm)  
22 b. Width: 39.4 in (1 m)  
23 c. Length: 49.2 ft (15 m)

## 24 2.4 ACCESSORIES

- 25 A. Primers:  
26 1. Soprema Sopraseal Stick: Self-Adhered membrane primer. SBS polymer, resin and, solvent-based  
27 primer for the preparation of membrane substrates for self-adhered SBS membrane and self-adhered  
28 SBS flashing applications.  
29 2. Soprema Elastocol Stick Zero: Zero VOC, self-adhesive membrane primer. Low VOC solvent-based  
30 primer for the preparation of membrane substrates for self-adhered SBS membrane and self-adhered  
31 SBS flashing applications.
- 32 B. Fasteners and Plates:  
33 1. Soprema #12 DP Fastener and 3 in stress plate: Fastener and plate used to secure drainage mat to  
34 wood lagging.  
35 2. Soprema #12 DP Fastener and 2 in stress plate: Fastener and plate used to secure vertical field  
36 membrane to wood lagging.
- 37 C. Waterstop: Bentonite/butyl-rubber waterstop, RX-101 rectangle, 1" x 3/4", such as by Volclay,  
38 [www.CETCO.com](http://www.CETCO.com).

## 39 PART 3 - EXECUTION

### 40 3.1 EXAMINATION

- 41 A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as  
42 necessary to ensure conditions remain satisfactory throughout the project.
- 43 B. The contractor shall examine all waterproofing substrates.
- 44 C. The applicator shall not begin installation until conditions have been properly examined and determined to  
45 be clean, dry and, otherwise satisfactory to receive specified waterproofing materials.
- 46 D. During the application of specified materials, the applicator shall continue to examine all project conditions  
47 to ensure conditions remain satisfactory to complete the specified waterproofing system.
- 48 E. No waterproofing membranes will be installed during rain or snowfall. Use of salt or calcium is prohibited to  
49 remove ice or snow.
- 50 F. Verify the compatibility of all membrane components with curing compounds, coatings or other materials  
51 which are already or will be installed on the surfaces to be treated.

### 52 3.2 PREPARATION

- 53 A. Before commencing work each day, the contractor shall prepare all waterproofing substrates to ensure  
54 conditions are satisfactory to proceed with the installation of specified waterproofing materials. Preparation  
55 of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all  
56 incompatible materials, and cleaning.

## ISSUED FOR ADDENDUM #3

JUDGE DOYLE SQUARE - BLOCK 88 PARKING GARAGE

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MODIFIED BITUMINOUS  
SHEET WATERPROOFING

- 1 B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory  
2 to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3 **3.3 DRAINAGE MAT APPLICATION**

- 4 A. Drainage board must be supported and follow the shapes of the substrate.  
5 B. Drainage board can bridge cracks and/or holes in the substrate from 1 to 2 in wide and deep. Cracks and/or  
6 holes in the substrate exceeding 2 in shall be prepared using mortar, shotcrete, plywood, Sopraboard  
7 (mechanically attached to substrate) or other approved method prior to the placement of the drainage board.  
8 C. Install drainage mat in accordance with membrane manufacturer's published instructions.  
9 D. Place and secure drainage mat with the filter fabric facing the positive side of the waterproofing. Overlap the  
10 edges of the geotextile fabric to maintain continuity.  
11 E. For vertical applications, fasten drainage mat to substrate using appropriate fasteners and plates.  
12 F. Ensure drainage panels are not damaged during subsequent construction.

13 **3.4 PRE-APPLIED PROTECTION BOARD APPLICATION**

- 14 A. Install protection board in accordance with manufacturer's published instructions.  
15 B. Place and secure all boards fitted against adjoining boards to form tight joints.  
16 C. For vertical applications, fasten and secure protection board to substrate using appropriate fasteners for the  
17 substrate.  
18 D. Ensure protection board is not damaged during subsequent construction.

19 **3.5 POST APPLIED PROTECTION SHEET APPLICATION**

- 20 A. Follow material product data sheets and published general requirements for installation instructions.  
21 B. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application of the  
22 self-adhesive membrane.  
23 C. Ensure horizontal field membrane is prepared and acceptable to receive the self-adhesive membrane.  
24 D. Unroll the protection sheet and loose lay in place.  
25 E. Ensure minimum 1 in side and end-laps.  
26 F. Adhere the protection sheet in a continuous longitudinal strip over the horizontal waterproofing membrane  
27 by removing the silicone release film.  
28 G. As the release film is peeled away, use a stiff push broom or roller to firmly set the sheet in place. Ensure  
29 full contact is made between the ply and the substrate for full adhesion.  
30 H. Each day, physically inspect all side and end-laps, and ensure the membrane is sealed watertight.  
31 I. Inspect the installation each day to ensure the plies are fully adhered. Repair all un-adhered voids, wrinkles,  
32 open laps and all other deficiencies.  
33 J. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs,  
34 prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged  
35 membrane.

36 **3.6 PRIMER APPLICATION**

- 37 A. Examine all substrates and conduct adhesion peel tests as necessary to ensure satisfactory adhesion is  
38 achieved.  
39 B. Apply the specified self-adhesive primer to dry, compatible substrates where determined primer is necessary  
40 to enhance adhesion.  
41 C. For the self-adhesive waterproofing applied during cold temperatures (below 50°F) the specified self-  
42 adhesive primer shall be applied.  
43 D. Apply primer using brush, roller, or sprayer at the rate published on the product data sheet.  
44 E. Ensure self-adhered membrane primer is tacky to-the-touch, but not wet. Primer should not transfer to the  
45 finger tips when touched.  
46 F. As project conditions vary throughout the day, applicator shall monitor changing conditions, monitor the  
47 drying time of primers, and monitor the adhesion of the membrane plies. Adjust primer and membrane  
48 application methods as necessary to achieve the desired results.

49 **3.7 VERTICAL FIELD MEMBRANE APPLICATION (COLPHENE BSW V)**

- 50 A. Follow material product data sheets and published general requirements for installation instructions.  
51 B. Temporarily fasten the top leading edge of the waterproofing ply in place using specified fasteners and  
52 plates. Upon completion, remove and seal fastener holes using specified heat welded waterproofing  
53 membrane or specified liquid-applied flashing.  
54 C. Vertical blind side waterproofing membrane shall be applied in lengths not exceeding 16 ft or as necessary  
55 to accommodate project conditions.  
56 D. Once in place, remove the release film on the underside of the sheet.

**ISSUED FOR ADDENDUM #3**

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- 1 E. As the release film is peeled away, use an approved membrane roller to roll-in vertical membrane to firmly
- 2 set the sheet in place. Ensure full contact is made between the ply and the substrate for full adhesion.
- 3 F. Ensure a minimum 4 in side-lap is achieved.
- 4 G. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat
- 5 welded membrane along the outside edge of the side-lap.
- 6 H. Using a roller, seal the self-adhesive portion of the side-lap, and use an approved roofing torch or hot-air
- 7 welder to seal the 2 in heat welded portion of the side lap.
- 8 I. All waterproofing end-laps shall be overlapped 6 in and fully adhered by heat welding.
- 9 J. All end lap joints shall be aligned and overlapped a minimum of 6 in beyond all fastener penetrations and
- 10 holes where fasteners were removed.
- 11 K. Ensure all membrane T-joints are heat welded and fully sealed.
- 12 L. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of
- 13 membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing
- 14 reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
- 15 M. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.
- 16 N. If a negative/back-water lap is created on the positive side of the waterproofing, heat weld or self-adhere a
- 17 reinforcing ply to strip-in the end-lap joint. The reinforcing ply shall extend a minimum of 4 in beyond the
- 18 joint in both directions.
- 19 O. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully
- 20 sealed watertight.
- 21 P. Inspect the installation each day to ensure the plies are secure and adhered.
- 22 Q. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs,
- 23 prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged
- 24 membrane.

25 **3.8 VERTICAL FIELD MEMBRANE APPLICATION (COLPHENE BSW H)**

- 26 A. Follow material product data sheets and published general requirements for installation instructions.
- 27 B. Temporarily fasten the top leading edge of the waterproofing ply in place using specified fasteners and
- 28 plates. Upon completion, remove seal and fastener holes using specified heat welded waterproofing
- 29 membrane or specified liquid-applied flashing.
- 30 C. Vertical blind side waterproofing membrane shall be applied in lengths not exceeding 16 ft or as necessary
- 31 to accommodate project conditions.
- 32 D. Ensure a minimum 4 in side-lap is achieved.
- 33 E. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat
- 34 welded membrane along the outside edge of the side-lap.
- 35 F. Remove the side-lap release film, and use a roller to seal the self-adhesive portion of the side-lap. Use an
- 36 approved roofing torch or hot-air welder to seal the 2 in heat welded portion of the side lap.
- 37 G. All end lap joints shall be aligned and overlapped a minimum of 6 in beyond all fastener penetrations and
- 38 holes where fasteners were removed.
- 39 H. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of
- 40 membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing
- 41 reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
- 42 I. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.
- 43 J. If a negative/back-water lap is created on the positive side of the waterproofing, heat weld or self-adhere a
- 44 reinforcing ply to strip-in the end-lap joint. The reinforcing ply shall extend a minimum of 4 in beyond the
- 45 joint in both directions.
- 46 K. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully
- 47 sealed watertight.
- 48 L. Inspect the installation each day to ensure the plies are secure and adhered.
- 49 M. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs,
- 50 prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged
- 51 membrane.

52 **3.9 HORIZONTAL FIELD MEMBRANE APPLICATION (COLPHENE BSW H)**

- 53 A. Follow material product data sheets and published general requirements for installation instructions.
- 54 B. Unroll horizontal blind side waterproofing membrane loose-laid onto the prepared substrate, or onto
- 55 specified drainage mat/protection board where applicable per design requirements.
- 56 C. The 4 in duo-selvage side-lap consists of 2 in of self-adhesive on the inside edge of the lap and 2 in of heat
- 57 welded membrane along the outside edge of the side-lap.
- 58 D. Remove the side-lap release film, and use a roller to seal the self-adhesive portion of the side-lap. Use an
- 59 approved roofing torch or hot-air welder to seal the 2 in heat welded portion of the side lap.

- 1 E. All end lap joints shall be overlapped a minimum of 6 in.
- 2 F. End-laps shall be staggered 12 in or more. Where T-joints are formed at the end-laps, cut away a 4 in corner
- 3 at a 45° angle from the overlying end-lap.
- 4 G. Waterproofing over concrete cold joints shall be reinforced by installing an additional 12 in reinforcing ply of
- 5 membrane over the cold joint, fully heat-welded or self-adhered over primed surface. The waterproofing
- 6 reinforcing ply shall be centered in the angle of the cold joint or over the cold joint.
- 7 H. All waterproofing membrane tie-ins shall be heat-welded to the adjacent ply.
- 8 I. Each day, the contractor shall physically inspect all side and end-laps, and ensure the membrane is fully
- 9 sealed watertight.
- 10 J. Inspect the installation each day to ensure the plies are secure and adhered.
- 11 K. Repair deficiencies using specified heat-welded or self-adhesive membrane. For self-adhesive repairs,
- 12 prime surfaces using specified self-adhesive primer. Repairs shall extend 6 in beyond the damaged
- 13 membrane.

14 **3.10 LIQUID-APPLIED FLASHING, (PMA MEMBRANE APPLICATION) (ALSAN RS 260 LO FLASH)**

- 15 A. Refer to manufacturer's details drawings, product data sheets and published general requirements for
- 16 application rates and specific installation instructions.
- 17 B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being
- 18 flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied
- 19 flashing membrane is fully reinforced.
- 20 C. Apply the base coat of catalyzed liquid resin onto the substrate using a brush or roller, working the material
- 21 into the surface for complete coverage and full adhesion.
- 22 D. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work the
- 23 reinforcing fabric into the wet resin while applying the second coat of catalyzed liquid resin to completely
- 24 encapsulate the fleece.
- 25 E. Refer to reinforced, polymethacrylate (PMA) specification section and application instructions, details
- 26 drawings, product data sheets and published general requirements for installation instructions.

27 **3.11 LIQUID-APPLIED FLASHING, (PMMA MEMBRANE APPLICATION) (ALSAN 230 FLASH)**

- 28 A. Refer to manufacturer's details drawings, product data sheets and published general requirements for
- 29 application rates and specific installation instructions.
- 30 B. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being
- 31 flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied
- 32 flashing membrane is fully reinforced.
- 33 C. Apply the base coat of catalyzed liquid resin onto the substrate using a brush or roller, working the material
- 34 into the surface for complete coverage and full adhesion.
- 35 D. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work the
- 36 reinforcing fabric into the wet resin while applying the second coat of catalyzed liquid resin to completely
- 37 encapsulate the fleece.
- 38 E. Refer to reinforced, polymethyl-methacrylate (PMMA) specification section and application instructions,
- 39 details drawings, product data sheets and published general requirements for installation instructions.

40 **3.12 LIQUID-APPLIED FLASHING, (ELASTOMERIC LIQUID MEMBRANE APPLICATION) (COLPHENE**  
41 **LIQUID MEMBRANE)**

- 42 A. Refer to manufacturer's detail drawings, product data sheets and published general requirements for
- 43 application rates and specific installation instructions.
- 44 B. Dispense the liquid-applied membrane from 2-component cartridge onto the substrate, then evenly apply
- 45 over the work area using a trowel.
- 46 C. Remove release film from Colphene 3000 and apply over the wet Colphene liquid Membrane immediately
- 47 before the liquid skins over.
- 48 D. For pipe penetrations and similar round details, secure a stainless steel pipe clamp around top leading edge
- 49 of the reinforced liquid flashing before Colphene Liquid Membrane has cured.

50 **3.13 LIQUID-APPLIED FLASHING, (BITUMEN-URETHANE MEMBRANE APPLICATION) (ALSAN**  
51 **FLASHING)**

- 52 A. Refer to manufacturer's details drawings, product data sheets and published general requirements for
- 53 application rates and specific installation instructions.
- 54 B. Pre-cut Colphene BSW H to conform to penetration.
- 55 C. Field-wrap and heat weld Colphene BSW H to completely flash and seal the penetration watertight.
- 56 D. Apply reinforced Alsan Flashing over Colphene BSW H to fully encapsulate and seal the penetration.

- 1 1. Pre-cut polyester reinforcing fleece to conform to roof terminations, transitions and penetrations  
2 being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed  
3 liquid-applied flashing membrane is fully reinforced.
- 4 2. Apply the base coat of liquid resin onto the substrate using a brush or roller, working the material into  
5 the surface for complete coverage and full adhesion at 2.0 gallons per square.
- 6 3. Immediately apply the reinforcing fleece into the wet base coat of resin. Using a brush or roller, work  
7 the fleece into the wet resin while applying the second coat of liquid resin to completely encapsulate  
8 the fleece at 2.0 gallons per square, and extend the liquid resin 1 inch beyond the fleece.
- 9 4. Allow the liquid membrane to sufficiently cure for 24 to 48 hours then apply the finish coat of liquid  
10 resin at 2.0 gallons per square.
- 11 E. Pre-cut Colphene BSW V and remove the self-adhesive release film.
- 12 F. Ensure Alsan flashing has cured then wrap the pipe with the Colphene BSW V.
- 13 G. Secure a stainless steel pipe clamp around the Colphene BSW V.

14 **3.14 CLEAN-UP**

- 15 A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to  
16 prevent damages and disruptions to operations.

17  
18

**END OF SECTION**

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31 **PART 1 - GENERAL**

32 **1.1 RELATED WORK**

- 33 A. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables
- 34 B. Section 26 0526 – Grounding and Bonding for Electrical Systems
- 35 C. Section 26 0529 – Hangers and Supports for Electrical Systems
- 36 D. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems
- 37 E. Section 26 0553 – Electrical Systems Identification
- 38 F. Section 26 0573 – Power System Studies
- 39 G. Section 26 0812 – Power Distribution Acceptance Tests
- 40 H. Section 26 0813 – Power Distribution Acceptance Test Tables
- 41 I. Section 26 0913 – Electrical Power Monitoring and Control
- 42 J. Section 26 2813 – Fuses
- 43 K. Section 26 4300 – Surge Protective Devices

44 **1.2 DESCRIPTION**

- 45 A. Section includes free-standing, dead-front type low-voltage distribution switchboards.

46 **1.3 REFERENCE STANDARDS**

- 47 A. ANSI/IEEE C37.13 – Low-Voltage AC Power Circuit Breakers Used in Enclosures
- 48 B. ANSI/NECA 400 – Recommended Practice for Installing and Maintaining Switchboards
- 49 C. IEEE C62.41.1 Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- 50 D. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits
- 51 E. NFPA 70 – National Electrical Code
- 52 F. NEMA AB 1 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit Breaker Enclosures
- 53 G. NEMA AB 3 – Molded-Case Circuit Breakers and Their Applications
- 54 H. NEMA FU 1 – Low-Voltage Cartridge Fuses
- 55

- 1 I. NEMA KS 1 – Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum)
- 2 J. NEMA PB 2 – Dead-Front Distribution Switchboards
- 3 K. NEMA PB 2.1 – General Instructions for Proper Handling, Installation and Maintenance of Dead-Front
- 4 Distribution Switchboards Rated 600 Volts or Less
- 5 L. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)
- 6 M. UL 98 – Enclosed and Dead-Front Switches
- 7 N. UL 486A-486B – Wire Connectors
- 8 O. UL 489 – Molded-Case Circuit Breakers, Molded-Case Switches, and Circuit-Breaker Enclosures
- 9 P. UL 869A – Reference Standard for Service Equipment
- 10 Q. UL 891 – Dead-Front Switchboards
- 11 R. UL 1053 – Ground-Fault Sensing and Relaying Equipment
- 12 S. UL 1066 – Low-Voltage AC and DC Power Circuit Breakers Used in Enclosures

13 **1.4 SUBMITTALS**

- 14 A. Product Data: For switchboard, components and accessories indicated:
  - 15 1. Include data on features and components and complete description; submit catalog cut sheets
  - 16 showing voltage, size, rating and size of surge protective devices, switching and overcurrent
  - 17 protective devices.
  - 18 2. Features, characteristics, factory settings and time-current curves of individual protective devices,
  - 19 auxiliary components and ground fault relaying.
- 20 B. Shop Drawings:
  - 21 1. For switchboard specified in this Section:
    - 22 a. General Arrangement:
      - 23 1) Indicate front, plan, and side views of switchboards; access requirements (front, side,
      - 24 rear); overall dimensions and components list; shipping splits and weights.
      - 25 2) Front elevation indicating location of devices and instruments.
      - 26 3) Sections through switchboard showing space available for conduits.
    - 27 b. Conduit entrance locations and requirements.
    - 28 c. Nameplate legends.
    - 29 d. Configuration, size and number of bus bars for each phase and current rating of buses.
    - 30 e. Ground bus.
    - 31 f. Neutral bus.
    - 32 g. Short circuit ratings of switchboards and overcurrent protective devices, and bus withstand
    - 33 rating.
    - 34 h. Instrument details; enclosure types and details.
    - 35 i. Wiring diagrams: power, signal and control wiring.
    - 36 j. Utility company's metering provisions with indication of approval by utility company.
    - 37 k. Descriptive documentation of optional barriers specified for electrical insulation and isolation.
    - 38 l. UL listing for series rating of installed devices.
  - 39 2. Contractor to submit 1/4" scale floor plans with switchboard locations and required clearances and
  - 40 service space around equipment.
- 41 C. Manufacturer's Installation Instructions:
  - 42 1. Indicate application conditions and limitations of use stipulated by product testing agency. Include
  - 43 instructions for storage, handling, protection, examination, preparation, installation, and starting of
  - 44 product.
- 45 D. Test Reports: Indicate field test and inspection procedures and interpret test results and corrective action
- 46 taken for compliance with specification requirements.
- 47 E. Complete review of this specification noting for each paragraph whether proposed equipment complies with
- 48 project specifications or deviates. Justification must be given for each deviation.
- 49 F. Closeout Submittals:
  - 50 1. Project Record Documents:
    - 51 a. Record actual locations, configurations, and ratings of switchboard and major components on
    - 52 single-line diagrams and plan layouts.
  - 53 2. Operation and Maintenance Data:
    - 54 a. Include manufacturer's recommended operating instructions, maintenance procedures and
    - 55 intervals, and preventive maintenance instructions.
    - 56 b. Include manufacturer's written instructions for testing and adjusting overcurrent protective
    - 57 devices.
    - 58 c. Include spare parts data listing, source, and current prices of replacement parts and supplies.
    - 59 d. Include Manufacturer Seismic Qualification Certification and Installation Seismic Qualification
    - 60 Certification.

- 1 e. Include time-current curves, including selectable ranges for each type of overcurrent  
2 protective device.
- 3 **1.5 QUALITY ASSURANCE**  
4 A. Obtain switchboards from one source and by single manufacturer.  
5 B. Regulatory Requirements:  
6 1. Comply with NFPA 70 for components and installation.  
7 2. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose  
8 specified and indicated.
- 9 **1.6 DELIVERY, STORAGE, AND HANDLING**  
10 A. Store in clean, dry space. Maintain factory wrapping or provide additional canvas or plastic cover to protect  
11 units from dirt, fumes, water, corrosive substances, construction debris, and traffic. Provide temporary  
12 heaters in switchboards as required to prevent condensation.  
13 B. Deliver switchboards individually wrapped for protection, and mounted on shipping skids. Mark crates,  
14 boxes, and cartons clearly to identify equipment. Show crate, box, or carton identification number on  
15 shipping invoices.  
16 C. Handle switchboards in accordance with NEMA PB 2.1 and ANSI/NECA 400. Use factory-installed lifting  
17 provisions. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.
- 18 **1.7 WARRANTY**  
19 A. Refer to Division 01 and Section 26 0000 – General Electrical Requirements for general warranty  
20 requirements.  
21 B. Manufacturer shall provide standard 1 yr warranty against defects in materials and workmanship for products  
22 specified in this Section. Warranty period shall begin on date of substantial completion.

23 **PART 2 - PRODUCTS**

24 **2.1 MANUFACTURERS**

- 25 A. Square D

26 **2.2 RATINGS**

- 27 A. Nominal system voltage: As indicated on the drawings or scheduled.  
28 B. Main bus continuous amp: As indicated on the drawings or scheduled.  
29 C. Short circuit current rating: as indicated on drawings.  
30 D. Brace switchboard components to withstand mechanical forces for symmetrical fault current shown.

31 **2.3 CONSTRUCTION**

- 32 A. NEMA PB 2, UL 891  
33 B. Free-standing, dead-front type; vertical sections bolted together; sides and rear covered with removable  
34 bolt-on covers; adequate ventilation within enclosure; supporting frame: steel rigidly fastened together, with  
35 same outside dimensions as the enclosure.  
36 C. Adequate strength and rigidity necessary to resist conditions of use to which it may be subjected and to  
37 support equipment, devices and appurtenances contained therein.  
38 D. Incoming lug locations: Top or bottom, as coordinated by electrical contractor.  
39 E. UL service entrance label.  
40 F. Environmental Limitations:  
41 1. Ambient temperatures: Not exceeding 40°C.  
42 2. Temperature rise: Not to exceed 65°C over a 40°C ambient environment, with no derating required.  
43 G. Device Mounting and Type:  
44 1. Front accessible switchboard: Rear aligned for placement against the wall:  
45 a. Main device: Panel mounted circuit breaker  
46 b. Feeder devices: Panel mounted circuit breakers  
47 c. Devices: Front removable; load connections: Front accessible.  
48 H. Bus:  
49 1. Material: Copper; copper: 98% conductivity. The bus bars shall have sufficient cross-sectional area  
50 to meet UL 891 temperature rise requirements through actual tests. The bus bars shall be standard  
51 density rated for 1000 amperes per square inch copper.

- 1           2.     Connections:
- 2           a.     Bolted:
- 3                 1)     Not fewer than 4 bolts for each 4" x 4" contact.
- 4                 2)     Not fewer than 2 bolts for each 2" x 2" contact.
- 5                 3)     Grade 5 bolts and conical spring-type washers.
- 6                 4)     Clamp joints are not allowed.
- 7           3.     Sizing: Standard size, based on 65°C over 40°C.
- 8           4.     Main Phase Buses: Three phase, 4 wire; fully rated; uniform capacity for entire length of switchboard; ampacity as indicated on drawings; rated for the main protective device frame size or main incoming conductors.
- 9
- 10
- 11           5.     All feeder device line and load connection straps: Rated to carry current rating of device frame (not trip rating).
- 12
- 13           6.     Support for Buses: Mounted on high-impact, non-tracking insulated supports; joints in the vertical bus are not permitted.
- 14
- 15           7.     Bus arrangement: A-B-C (left to right, top to bottom, front to rear).
- 16     I.     Ground Bus: Extend length of switchboard.
- 17           1.     1/4" x 2" minimum-size, hard-drawn copper of 98 percent conductivity, equipped with pressure connectors for feeder ground conductors. For busway feeders, extend insulated equipment grounding cable to busway ground connection.
- 18
- 19
- 20     J.     Neutral Bus: 100% of the ampacity of phase buses, equipped with pressure connectors for outgoing circuit neutral cables. Bus extensions for busway feeder neutral bus are braced.
- 21
- 22     K.     Main incoming compartment.
- 23     L.     Hinged Front Doors: Allow access to metering and accessory compartments; concealed hinges; fastened by head bolts.
- 24
- 25     M.     Cable Supports: For each vertical section.
- 26     N.     Dimensions: 90" maximum height, excluding floor sills, lifting members and pull boxes. Length and depth indicated scaled on the drawing are maximum allowed.
- 27
- 28     O.     Line and Load Terminations: Mechanical type accessible from front only of switchboard, suitable for conductor materials and sizes as indicated on drawings; suitable for number, size and trip ratings.
- 29
- 30     P.     Enclosure: Steel, NEMA 250, Type 1

31 **2.4     SERVICE ENTRANCE**

- 32     A.     UL 869A
- 33     B.     Switchboards labeled as suitable for use as service entrance equipment, where applicable, with incoming line isolation barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems.
- 34
- 35
- 36     C.     Surge arrestors on all phases: per requirements in Section 26 4300 – Surge Protective Devices.

37 **2.5     SHORT CIRCUIT CURRENT RATING**

- 38     A.     Switchboard with minimum short circuit current rating as indicated on drawings.
- 39     B.     Switchboards: Marked with their maximum short circuit current rating at supply voltage.
- 40     C.     Switchboards: Fully rated. Series rated switchboards are not acceptable.

41 **2.6     SURGE PROTECTIVE DEVICES (SPD)**

- 42     A.     Furnished under 26 4300 – Surge Protective Devices
- 43     B.     IEEE C62.41.1; integrally mounted, plug-in style, solid-state, parallel-connected, suppression and filtering modules
- 44
- 45     C.     Per requirements in Section 26 4300 – Surge Protective Devices

46 **2.7     OVERCURRENT PROTECTIVE DEVICES**

- 47     A.     Molded-Case Circuit Breaker: NEMA AB 1, NEMA AB 3, UL 489; lockable handle; interrupting capacity to meet available fault current.
- 48
- 49           1.     Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit breaker frame sizes 200 A and below.
- 50
- 51
- 52           2.     Electronic (solid-state microprocessor based) trip unit circuit breakers: digital true RMS sensing trip units; interchangeable in the field within the frame size (field-replaceable rating plug to determine the breaker trip rating), field-adjustable settings and the following trip functions for circuit breaker frame sizes 100 A - 1200 A:
- 53                 a.     Instantaneous trip
- 54                 b.     Long- and short-time pickup levels
- 55
- 56
- 57



- 1 c. Long- and short-time time delay adjustments with I2t response
- 2 d. Ground-fault pickup level, time delay, and I2t response
- 3 3. Current-Limiting Circuit Breakers: No fusible element, frame sizes 400 A and smaller; let-through
- 4 ratings less than NEMA FU 1, RK-5.
- 5 4. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with current-limiting fuses; trip
- 6 activation on fuse opening or on opening of fuse compartment door.
- 7 5. Breakers 800A and greater shall be listed for 100% of breaker's continuous ampere rating.
- 8 B. Enclosed, Insulated-Case Circuit Breaker and Accessories: NEMA AB 1, UL 489; fully rated circuit breaker
- 9 with interrupting capacity rating to meet available fault current.
- 10 1. Main breaker shall be insulated-case type circuit breakers. ~~Feeder circuit breakers 600A and above~~
- 11 ~~shall be insulated-case type circuit breakers.~~
- 12 2. Two-step, stored-energy closing; manually operated.
- 13 3. A charging handle, closed pushbutton, open pushbutton and Off/On/Charge indicator located on the
- 14 breaker escutcheon and visible with the breaker compartment closed.
- 15 4. Electronic (solid-state microprocessor-based) trip units with interchangeable rating plug, trip
- 16 indicators, field-adjustable settings and the following trip functions:
- 17 a. Instantaneous trip.
- 18 b. Long- and short-time pickup levels.
- 19 c. Long- and short-time time delay adjustments with I2t response.
- 20 d. Ground-fault pickup level, time delay, and I2t response.
- 21 5. Local and remote trip indication and control.
- 22 6. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 55% of rated voltage, where
- 23 indicated.
- 24 C. Circuit Breaker Electronic Trip Units general characteristics:
- 25 1. Circuit breakers, with solid-state microprocessor based trip units:
- 26 a. Unit shall consist of current sensors, solid-state trip device, and solid-state adjustable
- 27 time/current curve shaping elements.
- 28 b. Trip units shall be removable to allow for field upgrades.
- 29 c. Trip units shall incorporate "True RMS Sensing."
- 30 2. Solid-state elements shall provide functions as indicated above.
- 31 3. Adjustments shall be made using non-removable, discrete steps.
- 32 4. Sealable transparent cover shall be provided over adjustments.
- 33 5. Adjustable long-time pickup (I<sub>r</sub>) and delay shall be available in an adjustable rating plug that is UL
- 34 listed as field-replaceable. Adjustable rating plug shall allow for five minimum long-time pickup
- 35 settings from 0.4 to 1.0 times the sensor plug (I<sub>n</sub>). Other adjustable rating plugs shall be available
- 36 for more precise settings to match the application. Long-time delay settings shall be at least three
- 37 bands.
- 38 6. Short-time pickup shall allow for five minimum settings from 1.5 to 10 times I<sub>r</sub>. Short-time delay shall
- 39 be at least three bands with I2t ON and OFF.
- 40 7. Instantaneous settings on the trip units shall be available in five minimum bands from 2 to 15 times
- 41 I<sub>n</sub>. The instantaneous settings shall also have an OFF setting when short-time pickup is provided.
- 42 8. Trip units shall have the capability to electronically adjust the settings locally and remotely to fine
- 43 increments below the switch settings. Fine increments for pickup adjustments are to be one ampere.
- 44 Fine increments for delay adjustments are to be one second.
- 45 9. Trip unit shall indicate:
- 46 a. Long-time fault
- 47 b. Short-time fault
- 48 c. Instantaneous fault
- 49 d. Ground fault, where provided
- 50 10. Trip unit shall provide local trip indication and capability to indicate local and remote reason for trip,
- 51 i.e., overload, short circuit or ground fault.
- 52 11. Trip unit shall contain means to conduct circuit breaker test, or via separate test kit.
- 53 12. Breaker shall be equipped with externally accessible test points to be used for field testing.
- 54 13. Trip units shall be available to provide real time metering. Metering functions include current, voltage,
- 55 power and frequency.
- 56 14. Trip units shall be provided with the following standard features:
- 57 a. True RMS sensing
- 58 b. LSI
- 59 c. LSIG/Ground-fault trip, where indicated on drawings
- 60 d. Ground Fault Alarm (no trip), with external relay, where required
- 61 e. Adjustable rating plugs
- 62 f. LCD or LED – Long-time pickup

- 1 g. LCD or LED – Trip indication
- 2 h. Communications
- 3 i. LCD dot matrix display
- 4 j. Protective relay functions
- 5 k. Neutral protection
- 6 l. Incremental fine tuning of settings
- 7 m. Selectable long-time delay bands
- 8 D. Ground Fault protection equipment on breakers, where indicated: Integrally mounted relay and trip unit,  
9 push-to-test feature and ground fault indicator:
  - 10 1. Ground-fault protection with at least three adjustable short-time delay settings and three trip-time  
11 delay bands; adjustable current pickup with maximum setting of 1200 amps. Arrange to provide  
12 protection for the following:
    - 13 a. Three-wire circuit or system
    - 14 b. Four-wire circuit or system
    - 15 c. Four-wire, double-ended substation
  - 16 2. Neutral current transformers shall be provided for 4-wire system.
  - 17 3. Ground-fault settings for circuit breaker sensor sizes 1200 A or below shall be in nine bands from 0.2  
18 to 1.0 times In. The ground-fault settings for circuit breakers above 1200 A shall be in minimum three  
19 bands up to 1200 A.
  - 20 4. Ground-Fault Relay: UL 1053; self-powered type with mechanical ground-fault indicator, test  
21 function, tripping relay with internal memory, and 3-phase current transformer/sensor.

22 **2.8 CONTROL POWER, COMPONENTS IDENTIFICATION, AND CONTROL WIRING**

- 23 A. Control Circuits: 120 V, supplied through secondary disconnecting devices from control-power transformer.
- 24 B. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate  
25 compartments, with interlocking relays, connected to the primary side of each control-power transformer at  
26 the line side of the associated main circuit breaker. 120 V secondaries connected through automatic transfer  
27 relays to ensure a fail-safe automatic transfer scheme.
- 28 C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of  
29 transformer and fuses for protection of control circuits.
- 30 D. Control components mounted within assembly, such as relays, pushbuttons, switches, etc.: Suitably marked  
31 for identification, corresponding to appropriate designations on manufacturer's wiring diagrams.
- 32 E. Control Wiring: Factory installed, with bundling, lacing, and protection included; flexible conductors for #8  
33 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping  
34 units; insulated locking spade terminals for all control connections, except where saddle type terminals,  
35 integral to a device; current transformer secondary leads, connected to short circuit terminal blocks; terminal  
36 blocks with suitable numbering strips for group of control wires leaving switchboard, with wire markers at  
37 each end of control wiring.

38 **2.9 ACCESSORY COMPONENTS AND FEATURES**

- 39 A. Furnish portable test set to test functions of solid-state trip devices without removal from switchboard.  
40 Include relay and meter test plugs suitable for testing switchboard meters and switchboard class relays.
- 41 B. Furnish accessory set including tools and miscellaneous items required for overcurrent protective device  
42 test, inspection, maintenance, and operation.
- 43 C. Furnish one portable, floor-supported, roller-based, elevating carriage arranged for movement of circuit  
44 breakers in and out of compartments for present and future circuit breakers.
- 45 D. Furnish overhead circuit breaker lifting devices, mounted at top front of switchboard, with hoist and lifting  
46 yokes matching each drawout circuit breaker.
- 47 E. Furnish set of tools for manually charging circuit breaker stored energy device.
- 48 F. Lockout Devices: Circuit breakers with integral, lockout/tagout devices.

49 **PART 3 - EXECUTION**

50 **3.1 COORDINATION**

- 51 A. Instruct manufacturer about the location of incoming lugs, i.e., top or bottom feed based on incoming feeder  
52 entrance location.
- 53 B. Coordinate installation of housekeeping concrete pad based on actual equipment supplied:
  - 54 1. Concrete: Per requirements in Division 03 – Concrete.
  - 55 2. Dimensions: Per requirements in Section 26 0529 – Hangers and Supports for Electrical Systems.

- 1 C. Coordinate with miscellaneous trades for equipment foreign to the electrical installation to be outside of  
2 dedicated electrical space.
- 3 D. Coordinate utility company metering equipment requirements.
- 4 E. Verify with manufacturer that “touch-up” paint kit is available for repainting.
- 5 **3.2 EXAMINATION**
- 6 A. Examine areas and surface to receive switchboards for compliance with requirements, installation  
7 tolerances, and other conditions affecting performance. Proceed with installation only after unsatisfactory  
8 conditions have been corrected.
- 9 B. Verify that space indicated for switchboard mounting meets code-required working clearances.
- 10 C. Notify Architect/Engineer of any discrepancies prior to submittal of product data and shop drawings.
- 11 **3.3 INSTALLATION**
- 12 A. Install switchboard in accordance with NEMA PB 2.1 and ANSI/NECA 400.
- 13 B. Switchboard mounting and seismic restraints:
- 14 1. Bolt switchboards to concrete housekeeping pads, using anchor bolts in accordance with Section 26  
15 0529 – Hangers and Supports for Electrical Systems. Cast anchor bolt inserts into pads.
- 16 2. Install bushing assemblies for anchor bolts for seismic restraints per requirements in Section 26 0548  
17 – Vibration and Seismic Controls for Electrical Systems.
- 18 C. Install engraved plastic nameplates under provisions of Section 26 0553 – Electrical Systems Identification  
19 for switchboard, every instrument, overcurrent protective device and disconnect device. Attach nameplate  
20 to exterior of switchboard using small corrosion-resistant metal screws and rivets. Do not use contact  
21 adhesive. Indicate switchboard manufacturer’s name and drawing number, name, amperage, voltage,  
22 phase, number of wires, short circuit current rating (amp, RMS symmetrical and MVA 3-phase symmetrical)  
23 and momentary and fault-closing ratings (amp, RMS asymmetrical). For each overcurrent protective device  
24 and disconnect device, include circuit, load and area served, voltage/phase rating, and fuse size and type,  
25 when applicable.
- 26 D. Provide framed, printed operating instructions for switchboards, including control and key interlocking  
27 sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear  
28 acrylic plastic. Mount on front of switchboards.
- 29 E. Install switchboards in dedicated electrical space per NFPA 70, and as indicated on drawings.
- 30 F. Tighten electrical connectors and terminal according to equipment manufacturer’s published torque-  
31 tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A-  
32 486B.
- 33 G. Install fuses in fusible switch at job site per requirements in Section 26 2813 – Fuses.
- 34 H. Install surge arrestors in cable termination compartments and connect to each phase of circuit, per  
35 requirements in Section 26 4300 – Surge Protective Devices.
- 36 I. Connect surge protective devices to switchboard bus per requirements in Section 26 4300 – Surge  
37 Protective Devices.
- 38 J. Install utility company metering equipment, devices and wiring in conformance with serving utility  
39 requirements.
- 40 K. Tighten electrical connectors and terminals according to equipment manufacturer’s published torque-  
41 tightening values. Where manufacturer’s torque values are not indicated, use those specified in UL 486A-  
42 486B.
- 43 L. Apply temporary heat to maintain temperature according to manufacturer’s written instructions.
- 44 **3.4 CONNECTIONS**
- 45 A. Ground switchboards according to Section 26 0526 – Grounding and Bonding for Electrical Systems.
- 46 B. Connect power and control wiring according to Section 26 0519 – Low-Voltage Electrical Power Conductors  
47 and Cables.
- 48 **3.5 FIELD QUALITY CONTROL**
- 49 A. Inspect switchboards for physical damage, proper alignment, connections, anchorage, seismic restraints  
50 and grounding.
- 51 B. Test continuity of each circuit.
- 52 C. Test switchboards per requirements in Sections 26 0812 – Power Distribution Acceptance Tests and 26  
53 0813 – Power Distribution Acceptance Test Tables.
- 54 D. Interpret test results in writing and submit to Engineer.
- 55 E. Test switch operators after energizing.

- 1 **3.6 REPAINTING**  
2 A. Remove paint splatters and other marks from surface of equipment.  
3 B. Touch-up chips, scratches or marred finishes to match original finish, using manufacturer-supplied paint kit.  
4 Leave remaining paint with Owner.
- 5 **3.7 ADJUSTING**  
6 A. Set field-adjustable circuit breakers trip settings or change the trip settings to values indicated on drawings  
7 or recommended by the overcurrent protective device coordination study per Section 26 0573 – Power  
8 System Studies.  
9 B. Field adjustments or changing of trip setting and adjustment or replacement of equipment to comply with  
10 Section 26 0573 – Power System Studies; no additional cost to Owner.
- 11 **3.8 CLEANING**  
12 A. Vacuum dirt and construction debris from interior and exterior of equipment; do not use compressed air to  
13 assist in cleaning.
- 14 **3.9 DEMONSTRATION**  
15 A. Provide training session by manufacturer for one workday at a job location, to train the Owner's personnel  
16 in the operation and maintenance of switchboards.

17 **END OF SECTION**

18

SECTION 26 32 13  
ENGINE GENERATORS

- 1
- 2
- 3 PART 1 – GENERAL
- 4 1.1 RELATED WORK
- 5 1.2 DESCRIPTION OF SYSTEM
- 6 1.3 REFERENCE STANDARDS
- 7 1.4 SUBMITTALS
- 8 1.5 DELIVERY, STORAGE, AND HANDLING
- 9 1.6 OPERATION AND MAINTENANCE MANUALS
- 10 PART 2 – PRODUCTS
- 11 2.1 MATERIALS
- 12 2.2 RATINGS AND PERFORMANCE
- 13 2.3 FABRICATION AND MANUFACTURER
- 14 2.4 INTERFACE WITH BUILDING MANAGEMENT SYSTEM (BMS)
- 15 PART 3 – EXECUTION
- 16 3.1 INSTALLATION
- 17 3.2 ACCEPTANCE TESTS
- 18 3.3 LOAD TEST

19 **PART 1 - GENERAL**

20 **1.1 RELATED WORK**

- 21 A. Section 20 0700 – Mechanical Systems Insulation
- 22 B. Section 23 1214 – Liquid Fuel Systems
- 23 C. Section 23 2118 – Pipe and Pipe Fittings
- 24 D. Section 23 3114 – Ductwork
- 25 E. Section 23 3314 – Ductwork Specialties
- 26 F. Section 26 0000 – General Electrical Requirements
- 27 G. Section 26 0519 – Low-Voltage Electrical Power Conductors and Cables
- 28 H. Section 26 0526 – Grounding and Bonding for Electrical Systems
- 29 I. Section 26 0548 – Vibration and Seismic Controls for Electrical Systems
- 30 J. Section 26 0812 – Power Distribution Acceptance Tests
- 31 K. Section 26 0813 – Power Distribution Acceptance Test Tables
- 32 L. Section 26 2313 – Paralleling Low-Voltage Switchgear
- 33 M. Section 26 3623 – Automatic Transfer Switches

34 **1.2 DESCRIPTION OF SYSTEM**

- 35 A. Section describes complete package generator set, unit-mounted radiator cooling system, microprocessor
- 36 based control and monitoring panel, battery and charger, Building Management System (BMS)
- 37 communications module, remote annunciator, ~~drop over sound attenuated enclosure~~
- 38 B. Package generator set rated for emergency standby duty
- 39 C. Engine fuel system:
- 40 1. Day Tank provided under specification section 231214 Liquid Fuel Systems

41 **1.3 REFERENCE STANDARDS**

- 42 A. NEMA MG-1 – Motors and Generators
- 43 B. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and
- 44 Industrial Applications
- 45 C. NFPA 37 - Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines
- 46 D. NFPA 110 – Standard for Emergency and Standby Power Systems
- 47 E. UL 2200 – Stationary Engine Generator Assemblies
- 48 F. IEC8528 Part 4 – Control Systems for Generator Sets
- 49 G. UL 142 – Steel Aboveground Tanks for Flammable and Combustible Liquids
- 50 H. UL 2085 – Protected Aboveground Tanks for Flammable and Combustible Liquids

- 1 **1.4 SUBMITTALS**  
2 A. Shop Drawings  
3 1. Provide in writing at the beginning of the shop drawings any deviations or exceptions taken to any  
4 portion of this specification. If the shop drawings lack this information they will be rejected.  
5 a. For each deviation, provide a numbered footnote with reasons for the proposed deviation.  
6 b. For each exception, provide a numbered footnote with reasons why the equipment does not  
7 comply with the specification.  
8 2. Submit for engineering review and approval prior to production release. Include the following for  
9 engine-generator:  
10 a. Outline drawings of equipment showing weights  
11 b. Overall dimensions including bolting template and earthquake restraints  
12 c. Right hand, left hand, end, and top views of proposed assembly  
13 d. Battery, battery rack, battery charger, and wiring diagrams  
14 e. Vibration isolation bases, mounts, and hangers  
15 f. Exhaust silencer and flexible fittings  
16 g. Stub ups for fuel  
17 h. Power and control wiring entrance locations  
18 i. Main circuit breaker size, location, and required clearance  
19 j. Lug sizes and locations  
20 k. Engine-generator control panel drawings showing devices to be provided, with each device  
21 referenced to material list with complete description for device.  
22 l. ~~Weather protective enclosure installation drawings, structural calculations, lighting fixture~~  
23 ~~catalog cut, conduit, and wiring.~~  
24 l. ~~Enclosure sound performance data~~  
25 l. Muffler characteristics  
26 m. Calculations for starting based on step loads outlined in Paragraph 2.2, B.5.  
27 n. Factory certified prototype test report indicating fuel efficiency and emission levels  
28 3. Information on engine characteristics:  
29 a. Make, type, and number of cylinders  
30 b. Brake horsepower (bhp) available  
31 c. Jacket water heat rejection  
32 d. Cooling pump characteristics  
33 e. Exhaust flow rate and temperature at 25, 50, 75, and 100% rated load  
34 f. Ventilation requirements  
35 g. Combustion air requirements  
36 h. Fuel consumption rates at 25, 50, 75, and 100% rated load  
37 i. Liquid refill capacities  
38 j. Exhaust backpressure limitation  
39 k. Type and manufacturer of governor  
40 l. Alternator size to limit voltage dip to 10%  
41 4. Information on generator characteristics:  
42 a. Make and type  
43 b. Type of construction and overspeed capabilities  
44 c. Temperature rise  
45 d. Regulation characteristics  
46 e. Ventilation requirements  
47 f. Type of winding insulation  
48 g. KW power factor  
49 h. Type of exciter and voltage regulator  
50 B. Interconnection detail drawing showing control and power connections in complete standby system. Control  
51 connections between components are to be labeled with identical nomenclature. Coordinate with generator  
52 manufacturer.  
53 C. Accessories including fuel lines, flexible exhaust couplings, exhaust flange, and other exhaust system  
54 components.  
55 D. Complete review of this specification, noting for each paragraph whether proposed equipment complies with  
56 project specifications, or deviates in some fashion. Justification must be provided for each deviation.  
57 E. Complete test specification detailing testing procedure to be used to verify performance of equipment  
58 provided.  
59 F. Recommended spare parts lists.  
60 G. Test Reports:  
61 1. Submit certified factory tests report on engine-generator delivery. Alarms, sensors, and meters must  
62 be tested and certified.

- 1           2.       Submit, upon completion of installation and testing of engine-generator sets, certified test reports  
2           from load tests for each engine-generator.

3 **1.5       DELIVERY, STORAGE, AND HANDLING**

- 4       A.       Handle equipment in accordance with manufacturer's written instructions. One copy of instructions is to be  
5       included with equipment at time of shipment. Maintain factory bracing, packaging, and wrapping.

6 **1.6       OPERATION AND MAINTENANCE MANUALS**

- 7       A.       Refer to Section 01 7700 - Closeout Procedures and herein below.  
8       B.       Submit Operation and Maintenance (O&M) manuals to Engineer for review 60 days prior to acceptance of  
9       unit.  
10      C.       Installation, maintenance, and operating instruction manuals shall include, but not limited to, the following:  
11           1.       100% accurate system "as-installed" drawings, interconnect diagrams, schematic diagrams, wiring  
12           diagrams, individual sub-system component manuals, operation procedures, system description with  
13           theory of operation, maintenance schedules and procedures, original programmed settings and  
14           parameters, and other information necessary for the Owner to maintain, operate, test, and  
15           troubleshoot system.  
16           2.       The O&M manual shall contain step-by-step instructions for startup and shutdown. The first page  
17           shall contain name, address, and phone number of local representative to be called for service or  
18           parts. Follow with complete parts lists by actual ordering catalog numbers. O&M manual also shall  
19           contain four copies each of test record forms and service record forms for Owner use. Forms shall  
20           show proper interval for testing, servicing, and replacing of components, lubrication, filters,  
21           antifreeze, etc., including recommended specifications and fluid levels for lubricants.  
22           3.       Recommended spare parts list (with pricing) for 2 yrs of operation.  
23      D.       O&M manuals shall not solely rely on sub-component manuals. Thorough consolidation of operating and  
24           maintenance information shall be available in system overview guide. Include major components of system  
25           in overview.  
26      E.       Turn final reviewed manuals over to Owner prior to conducting training of Owner personnel.  
27      F.       Seal single copy of service record forms, recommended operation and service practices for unit in plastic  
28           and wall mount in weather-protective enclosure.

29 **PART 2 - PRODUCTS**

30 **2.1       MATERIALS**

- 31      A.       Acceptable Manufacturers:  
32           1.       Engine Generator Set - Caterpillar, Cummins, MTU Onsite Energy  
33           2.       Exhaust Silencer – Maxim, Nelson, or approved equal  
34           3.       Isolation equipment  
35           4.       Battery charger – Sens, La Marche, Charles Industries

36 **2.2       RATINGS AND PERFORMANCE**

- 37      A.       Engine Generator Set  
38           1.       Generator kW Output: As shown on drawings  
39           2.       Altitude 500 ft above sea level in ambient temperature of 90°F  
40           3.       Stable frequency regulation  
41      B.       Alternator  
42           1.       As shown on drawings, .8 Power Factor  
43           2.       480 V, 3 Ph, 60 Hz, 4 Wire Y  
44           3.       Stable voltage regulation 0-full load less than or equal to ± .5%.  
45      C.       Transient Performance  
46           1.       Engine  
47               a.       Start and load in 10 seconds per NFPA 110  
48               b.       Accept 100% block load per NFPA 110  
49           2.       Frequency regulation ± .25% no load to full load. ± .25% steady state.  
50           3.       Alternator  
51               a.       15% Voltage dip  
52               b.       AC waveform output contains <5% total harmonic distortion (THD) at full linear load when  
53               measured from line to neutral with <3% in any single harmonic, and no third-order harmonics  
54               or their multiples.  
55               c.       Telephone influence factor < 40

- 1 d. Telephone harmonic factor < 3
- 2 D. Factory Prototype Test Certified
- 3 1. Harmonic Distortion Levels
- 4 a. Demonstrate
- 5 2. Airflow Restriction tests
- 6 a. Demonstrate controlled shutdown after overheating
- 7 3. Unit tested ~~with enclosure~~
- 8 a. UL 2200 listed
- 9 4. 30 Degree Water Spray Unit Rain Test
- 10 a. Demonstrate no water leakage into electrical boxes
- 11 5. Overload Test
- 12 a. Demonstrate 10% overload with no damage to engine
- 13 6. Air Filter Test
- 14 a. Demonstrate engine contains engine backfire explosion
- 15 E. Factory Production Test Certified
- 16 1. Alternator Impedance to Ground
- 17 2. Dielectric Testing
- 18 a. At 1000 V and 2 times rated voltage
- 19 3. Maximum kW Rating
- 20 4. Engine Response Time
- 21 5. Alternator Construction Testing
- 22 a. Impedance Balance Tested
- 23 6. Alternator Insulation Testing
- 24 a. Surge Tested

25 **2.3 FABRICATION AND MANUFACTURER**

- 26 A. Engine:
- 27 1. Type: Inline or vee
- 28 2. Four-stroke cycle diesel compression ignition at 1800 RPM consistent with engine durability.
- 29 3. Aspiration: Turbo Charged
- 30 4. Horsepower
- 31 a. Brake Horsepower Rule of thumb = 1.6 x kW
- 32 5. air cooled
- 33 6. Fuel Type: No. 2 domestic diesel fuel oil.
- 34 7. Engine accessories:
- 35 a. Fuel filter
- 36 b. Lube oil filter
- 37 c. Intake air filter
- 38 d. Lube oil cooler
- 39 1) Suitable for operation of generator set at full rated load in ambient temperature
- 40 specified.
- 41 e. Fuel transfer pump
- 42 f. Fuel priming pump
- 43 1) Engine driven positive displacement, mechanical, full pressure
- 44 g. Gear driven water pump
- 45 h. Electronic direct fuel injection or have suitable emission control equipment
- 46 i. Electric speed sensing governor capable of isochronous regulation.
- 47 j. Safety-shut-offs for:
- 48 1) High water temperature
- 49 2) Low oil pressure
- 50 3) Overspeed
- 51 4) Overcranking
- 52 8. EPA Certified Tier 2
- 53 B. Cooling System:
- 54 1. Engine skid mounted, engine-driven radiator with blower type fan, sized to maintain safe operation
- 55 at 122°F ambient temperature.
- 56 2. Arrange liquid-cooled prime movers for NFPA level 1 applications for closed-loop cooling.
- 57 3. Provide radiator with:
- 58 a. Motor-driven fan with voltage same as generator
- 59 b. Motor Starter
- 60 c. Initiating contacts to actuate on generator startup



- 1 d. Connect to generator distribution system
- 2 e. Core guard
- 3 f. Fan guard
- 4 g. Mounting hardware
- 5 h. Direct adapter flange. Ductwork with flexible connection between radiator and exhaust
- 6 plenum to be provided by Division 23. Coordinate with Division 23.
- 7 i. Flexible pipe connections at engine and radiator.
- 8 j. Supply power for fans and pumps on remote radiators from a tap at generator output terminals
- 9 or ahead of first load circuit overcurrent protective device.
- 10 k. Heat exchangers
- 11 4. Block Heater
- 12 a. Water Jacket Heater: Circulating
- 13 b. Maintain engine jacket water to 110°F in ambient temperature of 30°F
- 14 c. Heater to be equipped with thermostatic switch.
- 15 d. Single phase 208V
- 16 e. Provide two heaters, 4500 W each minimum.
- 17 5. Fill engine cooling system with solution of 50/50 mix ethylene glycol at initial fill.
- 18 6. Ductwork with flexible connection between radiator and exhaust dampers to be provided by others.
- 19 Refer to Section 23 3113 – Facility Fuel Oil Piping.
- 20 C. Exhaust System:
- 21 1. Furnish critical type exhaust silencer:
- 22 a. Sized according to manufacturer's recommendations
- 23 b. Mount so weight is not supported by engine
- 24 c. Flexible exhaust fitting
- 25 d. Installation indoors by Mechanical Contractor
- 26 e. Refer to Section 23 2113 – Hydronic Piping
- 27 2. Condensate Traps
- 28 a. Drain plug at low point of muffler
- 29 3. Thermal Expansion
- 30 a. Stainless steel exhaust flex to accommodate thermal growth and vibration isolation
- 31 4. Acceptable Back Pressure
- 32 a. Coordinate silencer exhaust pipe size with mechanical contractor so exhaust back pressure
- 33 does not exceed maximum limitations specified by generator set manufacturer.
- 34 5. Exhaust clearing area
- 35 D. Starting System
- 36 1. Provide DC electric starting system with positive engagement drive. Provide DC voltage
- 37 recommended by manufacturer.
- 38 2. Provide fully automatic start-stop controls.
- 39 3. Provide cycle cranking to open and lock out start circuit after 3 attempts to start failed engine start.
- 40 4. Batteries
- 41 a. Provide sealed lead-acid storage battery set:
- 42 1) Heavy duty diesel starting type
- 43 2) Voltage compatible with starting system voltage
- 44 3) Capacity to provide for 1-1/2 minutes total cranking time at 0°F without recharging. In
- 45 accordance with NFPA Level 1.
- 46 b. Provide vinyl coated steel battery rack.
- 47 c. Provide starting battery heater:
- 48 1) Heater plate under battery
- 49 2) Heater type blanket around battery case
- 50 3) Thermal switch - heater control relay
- 51 4) 120 VAC input
- 52 d. Battery cables and clamps
- 53 5. Battery Charger
- 54 a. Four Rate Battery Charger
- 55 1) Constant current, constant voltage, high rate taper, and float equalized.
- 56 b. Dual Rate Battery Charger
- 57 1) Constant current, and float equalized
- 58 c. Charger Accessories:
- 59 1) Overload protection
- 60 2) ±0.5% line and load regulation
- 61 3) Electronic current limit output 105%
- 62 4) DC ammeter and voltmeter

- 1 5) UL 1236 listed and meets NFPA 110 requirements
- 2 6) Output protection
- 3 7) Temperature compensation
- 4 8) Enclosed in NEMA 1 aluminum or stainless steel enclosure
- 5 9) Form C contacts for the following alarms
- 6 a) AC fail
- 7 b) Low battery volts
- 8 c) High battery volts
- 9 d) Charger fail
- 10 e) Battery fault
- 11 6. AC input voltage: 208 V
- 12 7. When installed on the engine generator set, mount on vibration isolators.
- 13 E. Speed Control
- 14 1. Electronic: Isochronous
- 15 F. Alternator:
- 16 1. Maximum temperature rise 135°C at 40°C ambient
- 17 2. Synchronous type
- 18 3. Self ventilated
- 19 4. Drip-proof construction
- 20 5. Directly connected to engine flywheel housing with a flex coupling
- 21 6. Capable of sustaining 300% overcurrent for 10 seconds under a 3 Ph symmetrical short circuit
- 22 7. 120 V Anti-Condensation heater
- 23 8. Subtransient Reactance limited to 12%
- 24 9. Insulation
- 25 a. Complies with NEMA (MG1-33.4)
- 26 b. Class H Insulation Systems
- 27 1) UL 1449 recognized
- 28 2) Vacuum impregnated with epoxy varnish
- 29 3) Fungus resistant
- 30 10. Permanent magnet brushless excitation (PMG)
- 31 a. PMG shall derive excitation current from pilot exciter mounted on the rotor shaft. It is to be
- 32 able to sustain 300% of rated current for ten seconds during a fault condition.
- 33 b. Self-excited system to be brushless and consist of a 3 Ph armature and a 3 Ph full wave
- 34 bridge rectifier mounted on the rotor shaft. Include surge suppressors to protect the diodes
- 35 from voltage spikes.
- 36 11. Rotor
- 37 a. 4 pole
- 38 b. Winding
- 39 1) Wet layer wound
- 40 c. Varnish process
- 41 1) Epoxy based material applied to each layer of magnet wire
- 42 d. Coil supports
- 43 1) Driven through flexible coupling to ensure permanent alignment.
- 44 e. End winding spacing
- 45 f. Amortisseur windings
- 46 g. Bearings
- 47 1) Double
- 48 12. Stator
- 49 a. 3 Ph winding
- 50 b. Laminations
- 51 c. Cooling air passages and fan
- 52 1) Provide space heater to keep alternator free of moisture. Space heater to be 1500 W,
- 53 120 VAC, 1 Ph.
- 54 d. Welded laminations to prevent cutting of wires
- 55 e. Skewed stack to minimize slot ripple on output voltage and produce smooth voltage
- 56 waveform.
- 57 f. Pitch – Skewed design to optimize efficiency and minimize total harmonic distortion.
- 58 g. Varnish process
- 59 1) 2 dips and bakes using Class A impregnating varnish

- 1 13. Alternator Components  
2 a. Solid state design digital voltage regulator:  
3 1) Performance  
4 a) Microprocessor based.  
5 b) Programmable  
6 c) Regulation:  $\pm .25\%$  at any constant load for any load from 0% to 100% of pf  
7 rating.  
8 d) 3 Ph, true RMS sensing  
9 e) PMG input, engine unloading  
10 f) Design insensitive to severe, load induced wave shape distortion from SCR or  
11 thyrister circuits such as those used in battery charging, UPS, and motor speed  
12 control equipment loads.  
13 g) Controls to limit build-up of AC generator voltage to provide a linear rise and  
14 limit overshoot.  
15 h) Digital adjustments for out voltage adjustment gain, damping and frequency  
16 rate-off  
17 i) System setup controls and fault alarms.  
18 2) Protection  
19 a) Over-excitation protection  
20 b) Electronic voltage buildup protection  
21 c) Loss of sensing protection  
22 d) Temperature compensation  
23 e) Limitation of voltage overshoot on startup  
24 3) Features  
25 a) Parallel support  
26 b) VAR/PF control  
27 4) Environmentally sealed  
28 5) UL 508A listing  
29 b. Output Circuit Breaker(s)  
30 1) (3) 100% circuit breakers – LSI type, 1000A and greater to be LSIA  
31 a) Breakers shall be selected to selectively coordinate with downstream circuit  
32 breakers per specification section 26 0573 Power System Studies. Breakers  
33 which do not selectively coordinate shall be replaced with new at contractor's  
34 expense.  
35 2) Adjustable long time, long time delay, short time, and short time delay curve shaping  
36 elements  
37 3) Shunt Trip for integration with load bank controls (Load bank breaker shall be shunt  
38 trip type)  
39 4) Solid state trip fixed mounted insulated case generator mounted circuit breaker  
40 5) NEC required access in front of breaker  
41 6) Ground fault alarm only: Monitoring relay for breaker 1000A and above. Relay to be  
42 adjustable from 3.8 – 1200A and include an adjustable time delay of 0-10S.  
43 G. Controls:  
44 1. NFPA 110 listed  
45 2. Micro-processor based solid state controls to automatically start, protect and monitor engine-  
46 generator set with panel illuminating lighting and digital display.  
47 3. Control panel includes:  
48 a. Solid state trip main circuit breaker  
49 b. Motor starting switch  
50 c. Electrically operated fuel control  
51 d. Relay to disconnect battery charger during cranking  
52 e. Switching lamps and meters to be oil tight and dust tight. All active components to be installed  
53 within a NEMA 1 enclosure. There shall be no exposed components with door open operating  
54 750 V.  
55 f. Protective relays to open main circuit breaker and shut down and lockout engine on abnormal  
56 conditions including:  
57 1) Overspeed  
58 2) Operation of Remote Stop  
59 3) Overcrank (alarm only when fire pump is operating)  
60 4) Low lube oil pressure (alarm only when fire pump is operating)  
61 5) High Engine Temp (alarm only when fire pump is operating)  
62 6) Low coolant level (alarm only when fire pump is operating)

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- 7) Fail to crank (alarm only when fire pump is operating)
  - 8) Dead battery (alarm only when fire pump is operating)
  - g. Monitoring items shall include but is not limited to the following items and control:
    - 1) Coolant temperature
    - 2) Oil pressure
    - 3) Battery voltage
    - 4) RPM
    - 5) Voltmeter, 3-1/2" dual type, 0.5% accuracy with selector switch
    - 6) Ammeter, 3-1/2" dual type, .05% accuracy with selector switch
    - 7) Frequency meter, 55-65 Hz  $\pm$ 0.125 Hz.
    - 8) Running Time Meter (hours and 1/10 hours)
    - 9) AC power metering to be 0.5% accuracy and include frequency, phase, selector switch with real time power metering including, kW, kVA, kVAR, kWh, PF, % of rated load.
  - h. Control Items:
    - 1) Voltage level adjustment rheostat
    - 2) Overspeed level adjustment
    - 3) Overvoltage level adjustment
    - 4) Undervoltage level adjustment
    - 5) Overfrequency level adjustment
    - 6) Underfrequency level adjustment
    - 7) Position function switch(es) marked AUTO, MANUAL RUN, OFF/RESET and STOP
    - 8) 4 NO and 4 NC dry contacts for local and remote alarms, wired to terminal strips.
    - 9) Emergency off mushroom button
    - 10) Automatic remote start capability. Engine cranking system to permit minimum 4 cranking attempts of 10 seconds (adjustable) duration with rest of periods of 10 seconds (adjustable).
      - a) Overcrank lockout shall occur after 4 cranking attempts.
    - 11) 1 NO and 1 NC contact wired to BAS control panel in the generator room to signal control panel when generator is called to start.
  - i. In accordance with NFPA 110, Level 1, control panel shall furnish battery-powered individual visual alarm indicator functions at battery voltage and visual and audible pre-alarm:
    - 1) Overcrank
    - 2) Low water temperature
    - 3) High engine temperature pre-alarm
    - 4) High engine temperature
    - 5) Low lube oil pressure pre-alarm
    - 6) Low lube oil pressure
    - 7) Overspeed
    - 8) Low fuel main tank
    - 9) Low coolant level
    - 10) EPS supplying load
    - 11) Control switch not in automatic position
    - 12) High battery voltage
    - 13) Low cranking voltage
    - 14) Low voltage in battery
    - 15) Battery charger ac failure
    - 16) Lamp test
    - 17) Contacts for local and remote common alarm
    - 18) Low starting air pressure
    - 19) Low starting hydraulic pressure
  - j. Engine shut down, with audible alarm:
    - 1) Low oil pressure
    - 2) High engine temperature
    - 3) Overcrank
    - 4) Overspeed
    - 5) Overcurrent (circuit breaker trip and lockout)
    - 6) Low-coolant level
  - k. Status report:
    - 1) Engine running
    - 2) Circuit breaker open
    - 3) Circuit breaker closed
4. Visual alarm resettable only after fault condition has been corrected.

- 1 5. Audible alarm shall include silencing circuit, which, after activation, will permit annunciation of
- 2 subsequent failures.
- 3 6. Control Panel mounting:
- 4 a. Mounted on engine generator set in NEMA 1 enclosure on shock isolators
- 5 7. ~~Wall mounted in NEMA 1 enclosure~~
- 6 7. ~~Free standing in NEMA 1 enclosure~~
- 7 7. Provide remote annunciator panel
- 8 a. Compliant with NFPA Level 1 requirements.
- 9 H. Isolate engine generator set from building structure and from connecting services.
- 10 1. Separately derived grounding system. Connect generator ground as shown on drawings to
- 11 grounding electrode system.
- 12 I. Termination Bars and Connections:
- 13 1. Silver- or tin-plated copper bus bars for terminating cables.
- 14 2. Standard NEMA standard bolt hole spacing, for 3 Ph and neutral, within generator connection box
- 15 with gasketed bolt on cover.
- 16 3. Engine-generator set control interfaces to other system components to be made on a permanently
- 17 labeled terminal block assembly. Provide labels describing connection points.
- 18 4. Connections to engine-generator set: Flexible or isolation type connections. Include electrical, fuel,
- 19 exhaust, and ventilation connections.
- 20 J. Equipment Bases:
- 21 1. Mount complete unit on a structural steel sub-base, rectangular in shape, with sufficient rigidity to
- 22 maintain alignment of generator set. Provide perimeter beams with minimum depth equal to 1/10 of
- 23 longest dimension of base, except beam depth need not exceed 14" provided that deflection and
- 24 misalignment are kept within acceptable limits as determined by manufacturer. Engine-generator
- 25 set to be statically and dynamically balanced at factory. Peak-to-peak amplitude of vibration velocity
- 26 in horizontal, vertical, and axial direction shall not exceed 0.65" per second at main structural
- 27 components.
- 28 2. Engine-generator set weight distribution is to be considered to provide uniform deflections.
- 29 3. Bases shall provide equipment alignment and assure uniform weight distribution. Provide side
- 30 brackets on bases to contain isolating mounts and reduce total installed heights of equipment.
- 31 K. Vibration Isolators:
- 32 1. Required between the structural steel sub-base and concrete housekeeping pad.
- 33 2. Steel or cast iron top and bottom housings incorporating 1 or more steel springs with built-in leveling
- 34 bolts and built-in resilient chocks to control oscillation and withstand lateral forces in all directions.
- 35 L. Fuel System
- 36 1. Day Tank provided under specification section 231214 Liquid Fuel Systems
- 37 M. Load bank tap box:
- 38 1. Manufacturer: Powertron or engineer approved equal
- 39 2. UL listed
- 40 3. Wall mount, NEMA 3R
- 41 4. Front lockable access door
- 42 5. Mechanical set screw lugs
- 43 6. Integral GFCI receptacle
- 44 7. Remote start/stop terminals
- 45 8. Cam-Lock male receptacles
- 46 9. Power distribution block
- 47 10. 480V, 800A

**2.4 INTERFACE WITH BUILDING MANAGEMENT SYSTEM (BMS)**

- 48 A. Interface shall be as follows:
- 49 1. Control panel shall incorporate communication module with digital communication port connection to
- 50 building automation system (BAS) via BACnet Ethernet communication.
- 51 2. Communications shall be for the following:
- 52

TYPE	CONDITION/DESCRIPTION	RANGE/UNITS
LDI 1	Low lube oil pressure prealarm	
LDI 2	Low water temperature	
LDI 3	High engine temperature prealarm	
LDI 4	Battery charger AC failure	
LDI 6	Control switch not in automatic position	
LDI 7	High battery voltage	
LDI 8	Low coolant level	

TYPE	CONDITION/DESCRIPTION	RANGE/UNITS
LDI 9	Low cranking voltage	
LDI 10	Low voltage in battery	
LDI 11	EPS supplying loads	
LDI 12	Generator circuit breaker ground fault	
LDI 13	Low lube oil pressure	
LDI 14	High engine temperature	
LDI 15	Overcrank	
LDI 16	Overspeed	
LDI 17	Remote emergency manual stop switch	
LDI 18	Overcurrent (circuit breaker trip and lockout)	
LDI 19	Reverse power relay trip	
LDI 21	Engine running	
LDI 22	Generator running	
LDI 23	Generator circuit breaker open	
LDI 24	Generator circuit breaker closed	
LDI 25	Generator circuit breaker failed to close	
LDI 26	Spare	
LDI 27	Control voltage failure	
LDI 29	Battery charger failure	
LAI 1	Generator phase A-B voltage	Volts
LAI 2	Generator phase B-C voltage	Volts
LAI 3	Generator phase C-A voltage	Volts
LAI 4	Generator phase A current	Amperes
LAI 5	Generator phase B current	Amperes
LAI 6	Generator phase C current	Amperes
LAI 7	Total real power	KW
LAI 8	Total apparent power	KVA
LAI 9	Total reactive power	KVAR
LAI 10	Generator power factor	
LAI 11	Generator phase A frequency	Hertz
LAI 12	Generator phase B frequency	Hertz
LAI 13	Generator phase C frequency	Hertz
LAI 14	Battery voltage	Volts
LAI 15	Engine oil pressure	KPA
LAI 16	Engine speed	RPM
LAI 17	Engine water temperature	Degrees Centigrade
LAI 18	Engine running time	Hours

- 1 Notes:
- 2 LDI - LAN: Digital Input from control panel communication module to BMS via Ethernet
- 3 communication.
- 4 LAI - LAN: Analog Input from control panel communication module to BMS via Ethernet
- 5 communication.
- 6 LAN – Local Area Network
- 7 3. Provide all additional information as required for a complete and operable system.

8 **PART 3 - EXECUTION**

9 **3.1 INSTALLATION**

- 10 A. Install engine-generator set and associated equipment as indicated. Coordinate final location of equipment
- 11 with General Contractor. Final location of equipment to be reviewed with Engineer prior to installation.
- 12 B. Install equipment in accordance with manufacturer's recommendations. Provide equipment protection
- 13 during and subsequent to installation.

14 **3.2 ACCEPTANCE TESTS**

- 15 A. Testing by Electrical Contractor

- 1 B. Perform Acceptance Testing in accordance with Section 26 0812 - Power Distribution Acceptance Tests and  
2 Section 26 0813 – Power Distribution Acceptance Test Tables.

3 **3.3 LOAD TEST**

- 4 A. Conduct load testing of engine-generator set, under direct supervision of factory-authorized representatives  
5 of manufacturers of engine-generator set and auto-transfer switch.  
6 B. Tests to include minimum of 10 starts of engine-generator set, minimum of 10 operations of auto-transfer  
7 switch, 8 h maintained operation under conditions of randomly applied loads at 10 to 100% of rated capacity.  
8 1. Loading shall be by use of load banks.  
9 C. Provide certified results of testing, including frequency and voltage regulation at 25, 50, 75, and 100% of  
10 rated load, fuel consumption and exhaust emissions at the above load ratings, actual measured values for  
11 pickup and drop out relays for ATS, measured values for time delay relays.  
12 D. Engine-generator set test results are to be certified to comply with specification parameters or necessary  
13 corrective actions implemented and tests repeated until compliance is certified.  
14 E. At conclusion of testing, service engine-generator set including replacing air, oil and fuel filters, changing  
15 lubrication oil, checking and refilling batteries, adjusting fan belts for proper tightness, and refilling of cooling  
16 system as required.  
17 F. Provide fuel for load testing of engine-generator set.

18 **END OF SECTION**

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