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RPP-WTP PDC



RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Field Applied Special Protective Coatings For Secondary Containment Areas

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Content applicable to ALARA? Yes No

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NOTE: Contents of this document are Dangerous Waste Permit affecting.

2	9-2-10	<i>Eric A. Hill</i>	<i>RL</i>	<i>LDK</i>	<i>Michael R. ...</i>	<i>JRB</i>
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SPECIFICATION No. 24590-WTP-3PS-AFPS-T0006						Rev 2

Revision History

Revision	Reason for Revision
0	Issued for Construction
1	<p>Incorporate 24590-WTP-3PN-AFPS-00016 with modifications to section 6.6.1 to read “All coating materials, thinners, solvents and cleaning materials used on SS shall be shown to have a low leachable halogens content that shall not exceed 200ppm, total sulfur content shall not exceed 400 ppm sulfur. The total amounts of low melting point metals such as lead, zinc copper, tin, antimony and mercury shall not exceed one (1) percent and mercury shall not exceed 50 ppm.”; 24590-WTP-3PN-AFPS-00017 with modifications to section 6.2.1.5.2 to remove “regulated tanks”, modify Appendix I note 2 to remove “or contain regulated tanks”; 24590-WTP-3PN-AFPS-00027; 24590-WTP-FC-C-05-0120; 24590-WTP-FC-C-06-0068; Add section 2.1.1.1 to incorporate job mock ups; Change section 4.2 to read “Only materials that are prequalified in accordance with Appendix B and the subcontractor has a current Appendix F shall be used.”; Add to section 7.3.3.2 “Concrete shall be suitably roughened and textured using one of the specified methods of surface preparation during the coating system mock-ups performed and accepted by the CONTRACTOR.”; Remove all section references on Appendix I Installation detail drawings; Add Appendix J to incorporate interface installation detail drawings; Delete Appendix D; Delete Appendix H</p>
2	<p>Incorporated 24590-WTP-FC-C-08-0535, 24590-WTP-FC-C-09-0102. Deleted all references to Appendix D throughout specification. Delete section 2.2.1. Added definitions for ALARA, ALARA Areas, and Non-ALARA Areas. Deleted term “Radiation Areas”; replaced with ALARA Areas throughout specification. In section 2.4.5, added phrase “in accordance with WTP E&NS Site requirements.” In section 3, updated codes and standards editions and added 24590-WTP-3PS-NW00-T0002. In section 3.1.4, deleted 24590-WTP-GPP-SRAD-007 because it is not IFC. Clarified section 4.2. In section 4.3, added requirement for Subcontractor to submit latest MSDS. Inserted or corrected G321-E & -V category numbers in section 4.5 and 4.9. Modified section 6.4 to align with abrasive requirements in other coating specifications. In section 6.6.1, add “adhesive-backed tape or labels” to list requiring testing for contact with stainless steel. In section 7.4.10, clarified acceptability requirement for drying time of coatings. In section 7.5.6, changed placeholder from “Later” to “Reserved for Future Use”. Added section 7.6. Reformatted section 8.1.9 to enhance readability. In section 8.3.1, added cross reference 8.1.6. In section 9.1.5, changed requirement for shelf life extension. Revised Appendix A. In Appendix C Table 1, added coating system SC-T5-P for outdoor secondary containment on concrete and steel. In Appendix C Table 2, added system code SW16-1, and changed SW16 to SW16-2. In Appendix C Table 2, added system code SW30 (SC-T5-P). Identified Appendix I Details as “No Scale”.</p>

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1 Scope

- 1.1 This specification defines the minimum requirements for the field application of Special Protective Coating's (SPC's) applied onto concrete and steel surfaces that have been identified as a Secondary Containment area. The coating systems for concrete and steel surfaces are identified in Appendix C Table 2 of this specification. The CONTRACTOR shall identify the areas requiring secondary containment coatings in the appropriate room finish schedule for each facility (i.e., LAW, HLW, PTF, LAB & BOF). Unless indicated elsewhere in the subcontract documents, the field coating Work shall include-
- Touch up of shop or field coated carbon steel embeds prior to application of identified secondary containment coating system.
 - Surface preparation and application of the applicable coating system for concrete and steel surfaces. Corner coving on floor/wall, wall/wall corners, around concrete, steel embed attachments, grouted anchor bolts and other items that create a corner or sharp transition in coating system direction.
 - Saw cutting and chipping concrete as required by applicable installation detail.
 - Surface preparation and application of a primer/sealer/barrier coat on shop coated steel embeds that have been determined unsuitable for the installation location exposure conditions in the secondary containment enclosure area or incompatible with the specified secondary containment coating system.
- 1.2 Finish color shall be as noted in Appendix E.
- 1.3 All SPC's are designated as Commercial Grade and non-safety. SPC quality program requirements must comply with DOE Order 414.1C as identified in Appendix A. The full order is not applicable (also refer to Section 5). **NOA-1 Quality Assurance requirements do not apply to the manufacture or application of SPC's.** However, SPC's used in high radiation areas (>2E8 rads over 40 years) shall be prequalified in accordance with Appendix B.
- 1.4 The Field application of all concrete and steel coatings will be performed at the WTP project located in the 200 East Area of the Hanford Site in Washington.

2 General

2.1 Responsibility

- 2.1.1 The SUBCONTRACTOR shall supply all personnel, coating materials and all necessary surface preparation, application, inspection and equipment including all Personal Protection Equipment (PPE), safety, rigging/access (as required), masking protection, containment, environmental control/dehumidification/ventilation equipment, area covering to protect from direct sunlight and inclement weather and all consumables. The SUBCONTRACTOR shall

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perform all pre-surface preparation, surface preparation, coating application, inspection and documentation for all SPC work.

- 2.1.1.1 The SUBCONTRACTOR shall perform a job mock up for each coating system identified for installation. Special concrete walls and floors or a sample area of the facility shall be provided by the CONTRACTOR for the mock ups. Each sample area shall be approximately 5'x5' in size. The mock up coating sample shall be applied in accordance with the specification and CONTRACTOR accepted procedures. Surface defects in the concrete shall be filled flush with the surface plane and shall result in a smooth, decontaminable finish when top-coated with the remainder of the coating system. The completed mock-up shall provide a surface finish acceptable to the CONTRACTOR. The accepted mock-up shall be used as a reference standard of quality for surface preparation and applied coating surface finish. At the CONTRACTOR's notification the SUBCONTRACTOR shall inspect all concrete surfaces scheduled for coatings to ensure they are suitable for performing the specified surface preparation and coating application. Within 72 hours of notification, the SUBCONTRACTOR shall notify the CONTRACTOR in writing, of items found to be damaged or otherwise unsuitable for surface preparation or coating application.
- 2.1.2 The SUBCONTRACTOR shall provide surface preparation of overlap or tie-in areas on stainless steel, concrete and carbon steel surfaces as required.
- 2.1.3 The SUBCONTRACTOR shall install flexible joint sealant, flexible epoxy filler material, foam backer rod, bond breaker tape and material where specifically identified for use by the CONTRACTOR.
- 2.1.4 The SUBCONTRACTOR shall store all coating materials in accordance with this Specification and CONTRACTOR accepted procedures. The coating system and associated coating materials shall be in accordance with Appendix C Table 1 Secondary Containment Coating Systems, and Table 2 Secondary Containment Coating Materials or as otherwise identified by the CONTRACTOR. All coating materials shall be used on a first in first out basis where the oldest batch of any given material or component is used before batches with a later expiration date.
- 2.1.5 The SUBCONTRACTOR shall perform all inspections and tests contained in this Specification prior to acceptance by the CONTRACTOR.
- 2.1.6 The SUBCONTRACTOR shall provide application and inspection documentation for all coating Work accepted by the CONTRACTOR.
- 2.1.7 The SUBCONTRACTOR shall provide marking materials that are fully compatible with the coating system(s) specified. Marking materials shall be suitable for use on stainless steel.
- 2.1.8 The SUBCONTRACTOR shall provide environmental control equipment as necessary for surface preparation, coating application and curing.
- 2.1.9 The SUBCONTRACTOR shall only use inspection equipment that is currently calibrated and controlled by a calibration program accepted by the CONTRACTOR.

- 2.1.10 The SUBCONTRACTOR shall give CONTRACTOR a minimum of ten (10) working days written notice prior to the start of coating Work and coordinate all field coating Work with the CONTRACTOR on a daily basis prior to the start of daily coating Work.
- 2.1.11 The SUBCONTRACTOR shall give the CONTRACTOR at least twenty four (24) hours written (e.g., letter, memo, e-mail) notice for all agreed upon inspection witness and hold points including mock-ups.

2.2 Surfaces Not To Be Coated

- 2.2.1 Deleted
- 2.2.2 Rubber or similar nonmetallic parts.
- 2.2.3 Non-Ferrous metals unless otherwise specified.
- 2.2.4 Stainless Steel surfaces unless specifically required by the CONTRACTOR (areas where stainless steel is welded to carbon steel the coating overlap onto the stainless steel shall be at least 1" or as otherwise specified).

2.3 Definitions

- 2.3.1 ALARA- "As Low As is Reasonably Achievable" is the approach to radiation protection to manage and control exposures (both individual and collective) to the work force and to the general public to as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. ALARA is not a dose limit but a process which has the objective of attaining doses as far below the applicable limits as is reasonably achievable.
- 2.3.2 ALARA Areas or ALARA Zones- The designation used to identify the "Work Area" where personnel exposure to radiation and radioactive materials is managed and controlled at levels As Low As is Reasonably Achievable (ALARA) by employing Special Protective Coatings (SPC's) to facilitate decontamination. Typically this includes C2 areas floors, C3 and occupied C5 areas (floors, walls, ceilings and various commodities) up to 7.5 feet above the floor finish or platform and reachable surfaces within 40 inches of the "Work Area".
- 2.3.3 Batch- A quantity of coating made in one production run. A unique batch number is assigned for each production run of the epoxy coating material, the curing agent, fillers and the thinner.
- 2.3.4 Bug Holes- Small regular or irregular cavities resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation.
- 2.3.5 Curing Membrane - Materials applied to prevent the moisture in uncured concrete from evaporating too rapidly. Where Special Protective Coatings are being applied, the curing membranes or compounds shall not contain paraffin, oil, silicone or other compounds in sufficient quantities to compromise proper coating adhesion.
- 2.3.6 CONTRACTOR- Means BECHTEL NATIONAL, INC. (BNI) and all of its authorized representatives acting in their professional capacities.

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- 2.3.7 Dry Film Thickness (DFT)- The thickness of an applied coating, once dry or cured. Usually expressed in mils (each mil is 1/1000 of an inch). Measured using a wet film thickness gage and calculating dry film thickness based on coating material volume solids. Alternatively measured using an ultra sonic dry film thickness device or using a destructive test that cuts the dry film and optically measures the dry film thickness.
- 2.3.8 Fish Eyes (cratering)- Formation of holes or visible depression in the coating film. Usually from a contaminated particle on the surface prior to applying the coating.
- 2.3.9 Efflorescence- A white crystalline or powdery deposit on the surface of concrete. Efflorescence results from leaching of lime or calcium hydroxide out of the permeable concrete mass over time by water, followed by reaction with carbon dioxide and acidic pollutants.
- 2.3.10 Form Release Agents- Compounds such as glossy paint or other film forming release material applied to forms to allow easy removal of forms. Where Special Protective Coatings are being applied the form release agent should not impart a residue of paraffin, oil, silicone or other contaminant onto the surface that could compromise proper coating adhesion.
- 2.3.11 Hydration- The reaction of water with the calcium silicate, aluminate or aluminoferrite components of fine cement grains, necessary for the setting and densifying of concrete. Hydration results in the formation of calcium hydroxide and colloidal gels which occupy a larger volume than the original cement.
- 2.3.12 Hydrostatic Pressure- The pressure exerted by water at rest.
- 2.3.13 Holiday- A Pinhole, skip, discontinuity, or void in the applied coating film.
- 2.3.14 Laitance- A thin, weak, brittle layer of cement and aggregate fines in a concrete surface. The amount of laitance is influenced by the degree of working or amount of water in the concrete. For the application of Special Protective Coatings all laitance must be removed to sound, dense concrete.
- 2.3.15 Item- An all inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, sub-assembly, sub-system, system, unit or support systems.
- 2.3.16 Mfg. Std. Coating- A manufacturer's standard coatings system applied to off the shelf items or standard line items of routine manufacture that are not specifically manufactured for the WTP project.
- 2.3.17 NIST- National Institute of Standards and Technology.
- 2.3.18 Non-ALARA Areas or Non-ALARA Zones- The designation for areas outside of the defined "Work Area" where the potential to become contaminated with radioactive material is low. This includes all C2 walls, all C1 areas and all other areas that do not have a contamination class designation.
- 2.3.19 Outgassing- The upward and outward emission of air or moisture vapor from concrete or coatings.

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- 2.3.20 Pinhole- Minute hole visible in the applied coating without magnification, that appear to penetrate one or more layers of the coating film.
- 2.3.21 Profile- The surface roughness resulting from surface preparation by abrasive blasting or other CONTRACTOR accepted methods (Refer to Section 7.3.4.3)
- 2.3.22 Deleted
- 2.3.23 Sag- The running of freshly applied coating on a vertical surface due to being applied too thick. (Same definition for runs and drips).
- 2.3.24 Supplier Deviation Disposition Report (SDDR)- A standard WTP project document that can be used by a vendor or SUBCONTRACTOR to identify an actual or potential deviation or discrepancy that requires engineering evaluation and disposition prior to acceptance.
- 2.3.25 Surface Hardeners- Compounds applied to a concrete surface to improve hardness, and to decrease permeability.
- 2.3.26 Surface Porosity- Permeability of the surface that allows absorption of vapors, moisture, chemicals, and coating liquids. Small interconnected voids that allow fluids to penetrate an otherwise impervious material.
- 2.3.27 SUBCONTRACTOR- Means the company, corporation, partnership, individual, or other entity to which this subcontract (purchase order/material requisition) is issued, its authorized representatives, successors, and permitted assigns.
- 2.3.28 Training and Certification- Training to include an understanding of the specification, CONTRACTOR accepted Work procedures and manufacturer's published instructions. Certification to include a documented performance test demonstrating quality Work acceptable to the CONTRACTOR. (Refer to Sections 4.6, 5.1.3.2, 5.1.7, 7.1.2, 8.1.1.1 and Appendix A)
- 2.3.29 RPP-WTP- River Protection Project-Waste Treatment Plant
- 2.3.30 Work Area- The physical area of the facility that operations personnel can come in contact with contaminated surfaces of the building structure or commodities therein.

2.4 Safety

- 2.4.1 All surface preparation and coatings Work shall comply with all applicable environmental and safety provisions, laws, regulations in local jurisdiction (e.g., County and State). Work being performed in the United States shall be in strict accordance with OSHA 29 CFR 1910, State and local safety and environmental requirements.
- 2.4.2 The SUBCONTRACTOR shall comply fully with OSHA Hazard Communication Standard 29CFR 1910. Material Safety Data Sheets (MSDS) for all materials, including thinners and cleaning solvents, shall be obtained from the materials manufacturer and made available at the place of application for review.
- 2.4.3 The Volatile Organic Compound (VOC) content of all materials shall comply with Federal, State and Local or other Regulatory requirements.

- 2.4.4 The SUBCONTRACTOR shall control safe working and environmental conditions employing items such as but not limited to barricades, masking/tarping, ventilation, dehumidification and safety watches to provide safe quality work from surface preparation through application, curing and inspection activities.
- 2.4.5 The SUBCONTRACTOR shall be responsible for proper disposal of liquid or solid waste generated during the work described herein (residual coating material, thinners, solvent, wipes, rags, etc.), in accordance to WTP E&NS Site requirements.

3 Applicable Documents

3.1 Codes and Standards

The latest applicable edition of the following codes, standards, specifications or WTP procedures form a part of this Specification.

3.1.1 American Society for Testing and Materials (ASTM)

- ASTM E337-02 (Reapproved 2007)
Test for Relative Humidity by Wet-and-Dry Bulb Psychrometer
- ASTM D412-98, 98 (Reapproved 2002), 06 (Editorial Revision 2008)
Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
- ASTM D1653-93 (Reapproved 1999), 03, 03 (Reapproved 2008)
Standard Test Methods for Water Vapor Transmission for Organic Coating Films
- ASTM D3912-95 (Reapproved 2001)
Standard Test Method for Chemical Resistance of Coatings Used in Light-Water Nuclear Power Plants
- ASTM D3276-00, 05, 07
Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)
- ASTM D4060-01, 10
Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser
- ASTM D4082-02
Standard Test Method for Effects of Gamma Radiation on Coatings for Use in Light-Water Nuclear Power Plants
- ASTM D4138-94 (Reapproved 2001), 07
Test Method for Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means
- ASTM D4227-99 (Reapproved 05), 05
Practice for Qualification of Journeyman Painters for Application of Coatings to Concrete Surfaces of Safety Related Areas in Nuclear Facilities
- ASTM D4228-99 (Reapproved 05), 05
Practice for Qualification of Journeyman Painters for Application of Coatings to Steel Surfaces of Safety Related Areas in Nuclear Facilities
- ASTM D4258-83 (Reapproved 2005), 05
Practice for Surface Cleaning of Concrete for Coating
- ASTM D4259-88 (Reapproved 2006)

- Standard Practice for Abrading Concrete
ASTM D4262-83 (Reapproved 2005), 05
- Standard Test Method for pH for Chemically Cleaned or Etched Concrete Surfaces
ASTM D4263-83 (Reapproved 2005)
- Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
ASTM D4285-83 (Reapproved 2006)
- Test Method for Indicating Oil or Water in Compressed Air
ASTM D4414-95 (Reapproved 2007)
- Practice for Measurement of Wet Film Thickness of Organic Coatings by Notch
Gages
ASTM D4417-93 (Reapproved 1999), 03
- Field Measurement of Surface Profile of Blast Cleaned Steel
ASTM D4537-91 (Reapproved 1996), 04
- Standard Guide for Establishing Procedures to Qualify and Certify Inspection
Personnel for Coating Work Inspectors in Nuclear Facilities.
ASTM D4541-02, -09
- Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion
Testers
ASTM D4940-98 (Reapproved 2003)
- Test for Conductimetric Analysis of Water Soluble Ionic Contaminants of Blasting
Abrasives
ASTM D5139-90 (Reapproved 2001)
- Standard Specification for Sample Preparation for Qualification Testing of Coatings
Used in Nuclear Power Plants
ASTM D5144-00, (Editorial Revision 2009)
- Standard Guide for Use of Protective Coating Standards in Nuclear Power Plants
ASTM D5498-01, 09
- Standard Guide for Developing a Training Program for Coating Work Inspectors in
Nuclear Facilities.
ASTM D6132-97, 04, 08
- Standard Test Method for Nondestructive Measurement of Dry Film Thickness of
Applied Organic Coatings Over Concrete Using an Ultrasonic Gage
ASTM D6237-98, 03, -09
- Standard Guide for Painting Inspectors (Concrete and Masonry Substrates)

3.1.2 The Society for Protective Coatings (SSPC)

- SSPC-AB1-91 (Editorial Revision 2004) -91 (Editorial Revision 2007)
Mineral and Slag Abrasive
- SSPC-PA2-96, 04
Measurement of Dry Paint Thickness with Magnetic Gages
- SSPC-SP1-82 (Editorial Revision 2004)
Solvent Cleaning
- SSPC-SP6-00, 07
Commercial Blast Cleaning
- SSPC-SP7-00, 07
Brush -Off Blast Cleaning
- SSPC-SP10-00, 07
Near-White Metal Blast Cleaning
- SSPC-SP11-87 (Editorial Revision 2004)

- Power Tool Cleaning to Bare Metal
SSPC-SP12-95, 02
Surface Preparation and Cleaning of Metals by Waterjetting Prior to Recoating
SSPC-SP13-97 (Reapproved 2003)
Surface Preparation of Concrete
SSPC-Vis 1-02 (Editorial Revision 2004)
Visual Standard for Abrasive Blast Clean Steel
SSPC-Vis 3-93, 04
Visual Standard for Power and Hand Tool Cleaning

- 3.1.3 Occupational Safety and Health Administration (OSHA)

OSHA 29 CFR 1910 Occupational Safety and Health Standards

- 3.1.4 WTP Project Documents

24590-WTP-3PS-AFPS-T0004 Field Applied Special Protective Coatings for Concrete Surfaces
24590-WTP-3PS-AFPS-T0003 Field Applied Special Protective Coating for Steel items and Equipment.
24590-WTP-3PS-AFPS-T0002 Special Protective Coating Limited-Combustible Testing Protocol
24590-WTP-3PS-AFPP-T0001 Painting (Professional Line Products) 09912
24590-WTP-3PS-NW00-T0002 Chemical Requirements for Materials Used in Contact with Austenitic Stainless Steel and Nickel Based Alloys

- 3.1.5 Department of Energy (DOE)

DOE Std. 1066-97 DOE STANDARD Fire Protection Design Criteria

DOE Order 414.1C
Change 1 Issued 6/17/07 Quality Assurance

- 3.1.6 National Fire Protection Association (NFPA)

NFPA 801 2003 Edition Standard For Fire Protection For Facilities Handling Radioactive Materials

4 Submittals

4.1 SUBCONTRACTOR shall submit detailed written procedures for the following-

- Material receiving, marking, storage, handling
- Surface preparation
- Environmental control
- Application
- Curing
- Inspection and testing

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- Touch-up/repair
- Application personnel qualification and Inspector qualification (G321-E, category 28.0)
- Proposed documentation forms. The final procedure and documentation forms shall be submitted for the CONTRACTOR's approval (G321-E category 15.0).

(The above items can be grouped into a common procedure where appropriate)

- 4.2 Materials shall only be used if they are prequalified in accordance with Appendix B and the subcontractor has a current Coating Manufacturer's Product Identity Certification Record, contained in Appendix F. **Coating material prequalification testing is only required of the coating manufacturer and not the Special Protective Coating Application SUBCONTRACTOR.**
- 4.3 The SUBCONTRACTOR shall identify the specific products by manufacturer and catalog number and shall submit the coating manufacturer's latest published product data sheet application instructions and Material Safety Data (MSDS). When coating/sealant material is purchased, it shall be accompanied by the latest MSDS revision for the material at the time of shipment. If the MSDS received with the material shipment is newer than the Project record on file for that material, the new revision of the MSDS shall be submitted by the SUBCONTRACTOR. Conflicts, if any, between the SUBCONTRACTOR's normal procedures, the coating manufacturer's recommendations, and this Specification shall be brought to the attention of the CONTRACTOR for resolution and written permission to proceed (G321-E category 11.0).
- 4.4 The SUBCONTRACTOR shall submit original Coating Manufacturer's Product Identity Certification Records for each and every batch of coating material purchased for use on the WTP project. (Refer to Appendix F) (Refer to G321 V category 13.0)
- 4.5 The SUBCONTRACTOR shall complete and submit a daily inspection record as a part of the Work procedures that includes all elements provided in Appendix G as a minimum. An entry for wet bulb is not required when the accepted device used to measure humidity and dew point does not require a wet bulb. (Refer to Section 8.1.9 and 10.2) (G321-V category 25.0)
- 4.6 The SUBCONTRACTOR shall submit with coating procedures a Supplier Quality Assurance Program Data Sheet (Appendix A) appropriate for the activity being performed (e.g. manufacture of SPC's or application of specified SPC's). The SUBCONTRACTOR shall identify their Quality Assurance Program (QA) Plan documents and paragraph references on the QA Program Data Sheet. All required QA Plan elements and corresponding SUBCONTRACTOR's identified documents are subject to CONTRACTOR's evaluation and verification.
- 4.7 The SUBCONTRACTOR shall provide a personnel training and certification plan for applicators and inspectors. (Refer to Sections, 5.1.3.2, 5.1.7, 7.1.2, 8.1.1.1 and Appendix A).
- 4.8 The SUBCONTRACTOR shall supply with their coating procedures a list of previous project case histories, where they applied coating materials similar to the materials specified herein. This list shall include the type of item coated, the project name, a project client contact name and phone number, if possible, for verification.

- 4.9 Color samples shall be submitted prior to the start of Work. Colors shall be as defined in Appendix E or as otherwise defined by the CONTRACTOR. Color samples shall be 1' x 1' in size. At least five sets of all colors shall be submitted. The type of panel used and the coating material used for the color samples shall be as agreed upon with the CONTRACTOR (G321-E category 10.0).

5 Quality Assurance

5.1 General

- 5.1.1 The SUBCONTRACTOR shall control the quality of items and services to meet the requirements of this Specification, applicable codes and standards referenced herein, and associated subcontract documents. The SUBCONTRACTOR shall prepare and maintain documentation to provide evidence of compliance with CONTRACTOR accepted procedures and this Specification. A copy of the coating inspection documentation shall be included in the shipping documentation.
- 5.1.2 The SUBCONTRACTOR, including any lower-tier organizations, shall be subject to surveillance inspection by the CONTRACTOR's representative until completion or termination of the subcontract. This surveillance inspection does not relieve the SUBCONTRACTOR from the responsibility for conformance to the requirements of procurement documents, this specification and CONTRACTOR accepted procedures.
- 5.1.3 The SUBCONTRACTOR shall maintain a quality assurance plan for items located in Non-ALARA and ALARA Areas, as defined in Section 2.3 that addresses as a minimum, the elements and implementing procedures called for in the Supplier Quality Assurance Program Data Sheet, Appendix A.
- 5.1.3.1 Quality Assurance Plan (QAP)**
- 5.1.3.1.1 A written QAP must be developed, implemented, and maintained.
- 5.1.3.1.2 The QAP must describe the organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the Work.
- 5.1.3.1.3 The QAP must describe management processes, including planning, scheduling, and resource considerations.
- 5.1.3.2 Personnel Training and Qualification.**
- 5.1.3.2.1 Personnel must be trained and qualified to ensure they are capable of performing their assigned Work.
- 5.1.3.2.2 Personnel must be provided continuing training to ensure that job proficiency is maintained.
- 5.1.3.3 Quality Improvement.**
- 5.1.3.3.1 Processes to detect and prevent quality problems must be established and implemented.

- 5.1.3.3.2 Items, services, and processes that do not meet established requirements must be identified, controlled, and corrected according to the importance of the problem and the Work affected.
- 5.1.3.3.3 Correction must include identifying the causes of problems and working to prevent recurrence.
- 5.1.3.3.4 Item characteristics, process implementation, and other quality-related information must be reviewed and the data analyzed to identify items, services, and processes needing improvement.
- 5.1.3.4 Documents and Records.**
 - 5.1.3.4.1 Documents must be prepared, reviewed, approved, issued, used, and revised to prescribe processes, specify requirements, or establish design.
 - 5.1.3.4.2 Records must be specified, prepared, reviewed, approved, and maintained.
- 5.1.3.5 Work Processes.**
 - 5.1.3.5.1 Work must be performed to established technical standards and administrative controls using approved instructions, procedures, or other appropriate means.
 - 5.1.3.5.2 Items must be identified and controlled to ensure their proper use.
 - 5.1.3.5.3 Items must be maintained to prevent their damage, loss, or deterioration.
 - 5.1.3.5.4 Equipment used for process monitoring or data collection must be calibrated and maintained.
- 5.1.3.6 Design.**
 - 5.1.3.6.1 NA
- 5.1.3.7 Procurement.**
 - 5.1.3.7.1 Procured items and services must meet established requirements and perform as specified.
 - 5.1.3.7.2 Prospective suppliers must be evaluated and selected on the basis of specified criteria.
 - 5.1.3.7.3 Processes to ensure that approved suppliers continue to provide acceptable items and services must be established and implemented.
- 5.1.3.8 Inspection and Acceptance Testing.**
 - 5.1.3.8.1 Inspection and testing of specified items, services, and processes must be conducted using established acceptance and performance criteria.
 - 5.1.3.8.2 Equipment used for inspections and tests must be calibrated and maintained.

5.1.3.9 Management Assessment.

5.1.3.9.1 NA

5.1.3.10 Independent Assessment.

5.1.3.10.1 NA

5.1.4 The SUBCONTRACTOR shall provide the CONTRACTOR's representative with a Work activity schedule and shall notify the CONTRACTOR of all required inspection points prior to the scheduled date for coating activities (Refer to Section 2.1.10 and 2.1.11 herein).

5.1.5 If the SUBCONTRACTOR's proposed Work plan or procedures differ from the requirements of this Specification, the SUBCONTRACTOR shall specifically identify and explain all differences in writing, using an SDDR or other appropriate WTP project document, and submitted to the CONTRACTOR for review and approval prior to proceeding with a known deviation after the fact.

5.1.6 All pre-established witness and hold points shall be witnessed by the CONTRACTOR unless a written waiver has been issued.

5.1.7 All personnel shall receive training in the specific project coating requirements and the associated CONTRACTOR accepted work procedures that are relevant to their individual work assignments.

5.1.7.1 Painter/coating application personnel used to prepare the surface and apply coatings shall be trained, qualified and certified in accordance with the SUBCONTRACTOR's procedures accepted by the CONTRACTOR.

5.1.7.2 The SUBCONTRACTOR's coating Work inspectors shall have previous experience in coating inspection and shall receive documented training in the specific project coating requirements, ASTM standards and other relevant standards including the CONTRACTOR accepted Work procedures. All coating inspectors shall be trained, qualified and certified Level I inspectors meeting the requirements of Section 8.1.1.1. Inspector training, qualification and certification shall also comply with the SUBCONTRACTOR's document(s) identified on the submitted Supplier QA Program Data Sheet (Appendix A).

6 Materials

6.1 Coating Materials

6.1.1 All Special Protective Coating (SPC) secondary containment materials applied to concrete or steel items located in ALARA Areas are prequalified in accordance with Appendix B. All SPC's applied to the building structure in ALARA Areas or in any of the process buildings shall employ Approved coating materials as defined in Appendix B.

6.1.2 The Volatile Organic Compound (VOC) content of all materials shall comply with Federal, State and Local or other Regulatory requirements that have jurisdiction. The maximum allowable VOC for this project is 3.8 lbs./gal (450 gms/liter)

- 6.1.3 Coating materials including the primer intermediate and finish coat on a given item, shall all be from the same manufacturer as identified in Appendix C.
- 6.1.4 Secondary Containment repair materials shall be the same as those originally used or shall be those recommended by the manufacturer or shown to be compatible with the original coating and acceptable to the CONTRACTOR. Repair materials shall be in pre-measured units, and only complete kits shall be mixed. Splitting or breaking down pre-measured units of multi-component coating materials may be considered if the SUBCONTRACTOR prepares a procedure that requires accurate measurement of all materials and the SUBCONTRACTOR's QC inspector monitors/verifies each and every mix. This procedure must be submitted to the CONTRACTOR for review and permission to proceed.
- 6.1.5 Appendix C Tables contain the specified Special Protective Coatings for the WTP project. Appendix C contains the generic coating systems and approved coating materials. The generic coating system (primarily Epoxy or Epoxy Novolac materials) used on concrete and steel in secondary containment areas shall be coordinated with the generic coating materials indicated in the Architectural Room Finish Schedules for LAW, HLW, PTF, LAB and selected areas of BOF and their physical location. The Architectural Room Finish Schedules will identify coating materials for Secondary containment based on evaluation of chemical exposure, temperature and mechanical abuse based on a case by case criteria and specifically tailored for the conditions / exposure that is to be expected.
- 6.1.6 Appendix F is the Coating Manufacturer's Product Identity Certification Record. This document is required from the coating manufacturer for each component of each batch of coating material (manufactured coating material not individual ingredients).
- 6.1.7 Appendix G is an example for a Surface Preparation and Coating Inspection Form. This form or a form that contains the same information is required for daily inspection documentation.

6.2 Patching/Filler Materials

- 6.2.1 Materials used to patch or fill holes, shrinkage cracks, and defects in the concrete shall meet the following requirements:
 - 6.2.1.1 For holes larger than 1/2" in its largest dimension, the filler may be a non-shrink structural concrete grout with a slump sufficient to fill holes on a vertical or overhead surface while staying flush with the surface plane. The concrete structural grout shall be compatible with the SPC system specified for use on the concrete surface. Compatibility shall be verified by applying the SPC over a cast sample of the structural concrete grout followed by a pull off adhesion of at least 200 psi per ASTM D4541 using test procedures applicable for type II and type IV instruments listed in Annex A.2 and A.4.
 - 6.2.1.2 For holes up to 2" in its largest dimension, the filler may be a 100% solids proprietary rigid polymeric filler material as recommended by the SPC manufacturer with a slump sufficient to fill holes on a vertical or overhead surface while staying flush with the surface plane. Rigid polymeric fillers using a curing compound, catalyst or accelerator that develop heat during the cure process shall not cause blowholes in the applied filler that requires subsequent repair. The polymeric filler may be applied in more than one application to fill large voids flush with the concrete surface plane of concrete to steel embed surface plane. The proprietary polymeric filler material shall be compatible with the SPC system specified

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for use on the concrete surface. Compatibility shall be verified by applying the SPC over a cast sample of the proprietary filler material followed by a pull off adhesion of at least 200 psi per ASTM D4541 using test procedures applicable for type II and type IV instruments listed in Annex A.2 and A.4.

- 6.2.1.2.1 Rigid polymeric filler materials used in R5 areas where the 40 year accumulated radiation level will be greater than 2E8 rads that are not made with the same generic resin type shall be radiation tolerance tested in combination with the SPC system specified for use in that particular area. The specimens shall be prepared for testing as follows:
- Using the standard concrete test blocks identified in Appendix B, drill a hole 1/2" x 1/2" in each face of each block. Fill the hole with the proposed filler material flush with the surface plane of the block. Apply the SPC systems identified for use in the R5 areas. Perform radiation tolerance testing per Appendix B.
- 6.2.1.3 For stable non moving cracks fill flush with the surface plane using a 100% solids proprietary polymeric filler material recommended by the SPC manufacturer as defined in section 6.2.1.2. Large cracks shall be routed out as shown on Appendix I installation detail 4.
- 6.2.1.4 Construction Joints
- 6.2.1.4.1 For construction joints (other than those at inside wall to wall or wall to floor corners) in walls or floors, within areas required for secondary containment "Dangerous Waste Permitting (DWP and/or Non-DWP), a formed or created (e.g., saw-cut) rectangular slot shall be provided by others, centered on the construction joint after the concrete is placed and cured, apply specified coating system primer in the joint, then install a bond breaking tape in the base of the joint. Install the flexible epoxy filler flush with the concrete surface and overcoat the joint with the specified coating system. Refer to Appendix I installation detail 3B.
- 6.2.1.5 For coving in corners (filler material with 2" radius) use a flexible epoxy filler material. Where coving materials will serve as a water stop, the prequalification requirements in Appendix B section 1.2.10 apply.
- 6.2.1.5.1 Secondary Containment (DWP and/or Non-DWP) areas that do not have free flowing drains must use the glass reinforced coving installation detail. Refer to Appendix I for installation details 2A and 2B.
- 6.2.1.5.2 Secondary containment areas that do not have regulated tanks and have free flowing open floor drains, do not require the glass reinforced coving detail (Refer to Appendix I for installation details 1A and 1B).
- 6.2.1.5.3 If the proximity of permanent plant equipment or material (e.g. drains, ladder, piping, electrical, etc.) prohibits the full 2" radius coving, the coving radius may be reduced to accommodate the coating installation.

6.3 Batch Information

6.3.1 Each container of coating material received and used by the SUBCONTRACTOR shall be marked with the following:

- The manufacturer's name
- The product designation
- Batch/lot number
- Location and date of manufacture
- The shelf life expiration date

6.4 Abrasives

6.4.1 Abrasives for blast cleaning shall be clean, free of oil or contaminants, and dry. The particle size shall be capable of producing the specified surface texture or surface profile. Mineral slag abrasives shall meet the requirements of SSPC AB-1. The first batch/lot of bulk, non packaged abrasives shall be tested for water soluble contaminants and the conductivity shall not exceed 500 microsiemens/cm when tested in accordance with ASTM D4940 Section 1.0-2.0. As an alternate, a chloride ion test kit such as the Chlor*Test "A" manufactured by Chlor Rid International, Inc. or CONTRACTOR accepted equal may be used. Abrasives used at the RPP-WTP project site shall be < 1% silica.

6.4.2 When using reclaimed steel grit/shot abrasive, the particle size shall be capable of producing the specified surface texture. All reclaimed abrasives shall be tested for water-soluble contaminants and conductivity. Conductivity shall not exceed 500 microsiemens when tested in accordance with ASTM D 4940 Section 1.0-2.0. Reclaimed abrasives already in use and the first batch/lot of bulk, non-packaged abrasives shall be tested for oil and grease contamination using the water floatation test at the beginning of each shift.

6.4.3 Reclaimed grit used for abrasive cleaning shall be tested for the presence of oil and grease by immersing a sample of spent abrasive in clean tap water and checking for oil flotation. Tests shall be made at the start of blasting and every four (4) hours thereafter. If oil is evident, the contaminated abrasive shall be cleaned or replaced. All surfaces blasted since the last successful test shall be completely cleaned of contamination then re-blasted using clean abrasive.

6.4.4 Expendable abrasive (Green Diamond / Black Beauty) shall be used on a once only basis and then discarded.

6.5 Water Quality

6.5.1 Water used for wet abrasive blasting or high pressure water jetting shall be clean tap or potable water and shall not exhibit any evidence of an oily sheen.

6.6 Coating Over Stainless Steel (SS)

6.6.1 All coating materials, adhesive-backed tape or labels, thinners, solvents and cleaning materials used on SS shall be shown to have a low leachable halogens content that shall not exceed 200 ppm, total sulfur content shall not exceed 400 ppm. The total amounts of low melting point

metals such as lead, zinc copper, tin, antimony and mercury shall not exceed one (1) percent and mercury shall not exceed 50 ppm.

7 Application

7.1 General

- 7.1.1 It shall be the SUBCONTRACTOR's responsibility to stop the surface preparation and coating at any time when conditions exist that might adversely affect the quality. The CONTRACTOR's representative may reject any prepared or coated surfaces not in compliance with this Specification.
- 7.1.2 All painters and other personnel used to apply coatings on to concrete and steel items shall be individually qualified and certified in accordance with the SUBCONTRACTOR's accepted written procedures that includes classroom training on the WTP Project Specification. Guidance for qualifying painters/application personnel are contained in ASTM D4228 and ASTM 4227 Section 1-10 and Figure #2 or other as accepted by the CONTRACTOR.
- 7.1.3 The secondary containment coating Mock ups shall have been satisfactorily completed and accepted by the CONTRACTOR prior to starting production work on a given area. That does not mean that all mock ups for all coating systems must be completed prior to the start of work, but at least the mock ups for the coating systems that are scheduled for facility production shall be completed prior to start of work with those coating systems.

7.2 Pre-Surface Preparation

- 7.2.1 Prior to mechanical cleaning, the surfaces to be coated shall be cleaned in accordance with SSPC SP1 to remove oil, grease, dirt, silicone, marks made with waxy or greasy makers, graffiti, curing compounds or form release residue or other foreign matter that could interfere with the proper bonding of the coating contamination of this type shall be removed by steam cleaning or solvent washing in accordance with ASTM D4258 Section 1.0 - 9.0. The SUBCONTRACTOR shall inspect floor for surface hardeners. Surface hardeners shall be removed prior to applying Special Protective Coatings.
- 7.2.2 Inspection of surfaces exhibiting fins, ridges, and sharp projections or surfaces that require repair of honeycomb areas, tie rod holes, and cavities that are greater than 1/2" in its largest dimension (i.e., length, width or depth) or cracks wider than 1/8" shall be performed by the SUBCONTRACTOR and includes a punch list to the CONTRACTOR. These defects must be removed or corrected prior to applying any coating.
- 7.2.3 All sharp corners that are scheduled to receive Special Protective Coatings shall be included in punch list and rounded to a radius of no less than 1/8" by others.
- 7.2.4 The SUBCONTRACTOR shall inspect all joint details and the configuration of the finished concrete sections in relation to the application of materials as shown in installation details shown in Appendix I Secondary Containment Installation Details and the requirements of this specification.

- 7.2.5 Any remaining sharp edges, weld spatter, or burrs, fins, ridges, tie rods, projections found after the start of coating Work shall be completely removed by grinding or other means. Pneumatic tools shall not be used unless they are fitted with effective oil and water traps on the exhaust air. If the steel embeds exhibits salt deposits or were shipped or stored so that the surface could have been contaminated with soluble salts (e.g., above deck ship transport, truck transport on dirt roads close to ocean, storage), the area shall be pressure water washed (e.g., 2,000-5,000 psi) with demineralized water to remove the soluble salt contamination as possible prior to abrasive blasting/water jetting.
- 7.2.6 Floor/Wall and Wall/Wall coving shall be installed using the same flexible epoxy filler material defined in section 6.2.1.5 or a filler material as recommended by the coating manufacturer and accepted by the CONTRACTOR. Coving shall be installed after concrete surface preparation and shall comply with the installation details in Appendix I.
- 7.2.7 To insure a seal and a smooth transition from concrete surfaces onto steel embed plates, the concrete shall be chipped away from the edge of the embed plate at least ½" and at least ¼" below the surface plane of the embed plate. The chipped away area shall be filled flush between the concrete and steel embed plate using the same rigid filler material defined in section 6.2.1.2 or a filler material as recommended by the coating manufacturer and accepted by the CONTRACTOR. (refer to Appendix I).
- 7.2.8 To provide a structurally sound termination of a floor coating, a perimeter key shall be placed in the floor (refer to Appendix I).

7.3 Surface Preparation

- 7.3.1 Prior to the start of Work, the SUBCONTRACTOR shall examine all surfaces to be coated to determine their acceptability for the specified coating application Work. If the surfaces are found to be unacceptable, the SUBCONTRACTOR shall either return the surface to an acceptable condition or immediately notify the CONTRACTOR in the punch list (section 7.2.2) if the repairs are outside the scope of work. Coating Work shall not commence until corrective action has been taken. Starting Work prior to completion of corrective action shall preclude any subsequent claim by the SUBCONTRACTOR. The CONTRACTOR may require corrective action at the SUBCONTRACTOR's expense.
- 7.3.2 The abrasive mixture and the compressed air shall be clean, dry and oil free. Moisture traps, in addition to oil and water separators mounted on the compressor, shall be used in compressed air lines to remove oil and moisture from air close to the point of use. (refer to Section 7.3.4.4 and 8.1.6)
- 7.3.3 Concrete Surfaces
- 7.3.3.1 Floors, walls shall be free of curing compounds, laitance, dirt or other residue that could interfere with proper adhesion of the coating system.
- 7.3.3.2 Concrete shall be suitably roughened and textured using one of the specified methods of surface preparation during the coating system mock-ups performed and accepted by the CONTRACTOR. To achieve a clean roughened surface suitable for the specified coating systems, surfaces may be dry abrasive blasted, wet abrasive blasted (Refer to ASTM D4259 Sections 1.0-10.0) or cleaned and roughened by high pressure (10,000 psi to 25,000 psi)

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water jetting using a rotating head hand lance or self propelled robot (Refer to SSPC SP12 Appendix C for a description and operation and SSPC SP13 Sections 3.0-6.0). Small areas may be prepared using grinders or sanders as accepted for use during mock-ups. Needle guns may only be used if followed by full abrasive blasting or water jetting to remove weakened/crushed concrete surface layer to sound dense concrete and only when the procedure has been shown to result in a coating adhesion of 200 psi minimum.

- 7.3.3.3 In addition, floors may be acid etched using 20 % citric acid solution when accepted by the CONTRACTOR. Acid etched surfaces shall be pH tested in accordance with ASTM D4262 Sections 1.0-8.0. The pH shall be no more than 1.0 pH lower or 2.0 pH higher than the pH of the potable rinse water. A suitable texture shall be achieved that will be agreed upon during the mock up coating application. A detailed procedure on the use, clean up and disposal of acid etching materials/rinse must be provided for review and acceptance by the CONTRACTOR.
- 7.3.4 Carbon Steel Surfaces
- 7.3.4.1 Prior to blast cleaning, items to be coated shall be visibly dry with the surface temperature of at least 5°F above the dew point. Concrete surfaces shall be determined suitably cured as defined by the CONTRACTOR.
- 7.3.4.2 Carbon steel surfaces to be coated shall be blast cleaned in accordance with the surface preparation requirements specified in Appendix D of 24590-WTP-3PS-AFPS-T0003. Where abrasive blasting will damage the items or is impractical, SSPC-SP11 Power Tool Cleaning to Bare Metal may be substituted only in limited areas and only with CONTRACTOR's written permission to proceed.
- 7.3.4.3 Abrasive blasting of carbon steel shall result in an angular surface profile 1.5 to 3.0 mils as measured using a Testex Press-O-Film replication tape in accordance with ASTM D4417 method C.
- 7.3.4.4 The recycled abrasive mix shall be maintained clean of contaminants by continuous effective operations of cleaning machine scalping and air wash separators. Reclaimed grit used for abrasive cleaning shall be tested for the presence of oil/grease by immersing a sample of spent abrasive in clean tap water and checking for oil flotation. Tests shall be made at the start of blasting, and every four (4) hours thereafter. If oil is evident, the contaminated abrasive shall be cleaned or replaced. All surfaces blasted since the last successful test shall be completely cleaned of contamination then re-blasted using clean abrasive. Blast cleaning shall not be performed in the immediate area where coating or curing of coated surfaces is in progress unless a vacuum system is employed that contains dust. All surfaces and equipment which are not to be coated shall be suitably protected from blast cleaning.
- 7.3.4.5 Burrs, slivers, scabs, lamination, and weld spatter fins, ridges, sharp protrusions which become visible after blasting shall be removed. The tools and manner employed to remove defects and sharp edges, shall not burnish or destroy the surface profile. If the profile or roughness is reduced, it shall be re-blasted to produce the profile and roughness as required. The exhaust of pneumatic grinders shall not impinge on the cleaned surface. If the surface becomes contaminated, it shall be cleaned of contamination then re-blasted as required. Carbon steel tools or implements shall not be used on stainless steel surfaces.

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- 7.3.4.6 If visible rust occurs or if the cleaned surface becomes wet or otherwise contaminated, these surfaces shall be re-cleaned to the specified standard. Cleaned surfaces remaining un-coated overnight shall be re-cleaned to the specified cleanliness prior to applying the coating. Where Concrete and Carbon Steel interface and are proposed to be coated in one operation every effort will be made to apply coating to the steel before surface deterioration.
- 7.3.4.7 After surface preparation is complete and before coating, pressurized air or a vacuum cleaning shall be used to remove all dust and abrasive residue. The air shall be clean and dry as verified in accordance with Section 8.1.6 so as not to contaminate the prepared surface. The operator shall ensure that all dust and abrasive residues are removed from the surface of blast profiles when vacuum cleaning is carried out.
- 7.3.4.8 Machined surfaces shall be protected from damage due to blasting and coating operations.
- 7.3.4.9 Equipment shall have all openings plugged, masked, and/or blinded sufficiently to protect internals before abrasive blasting. After the coating operation is complete all internals shall be blown clean and/or vacuumed to remove any dust or abrasive blast media that may have entered the coated equipment.
- 7.3.5 The abrasive mixture and the compressed air shall be clean, dry and oil free. Moisture Traps, in addition to oil and water extractor mounted on the compressor, shall be used in compressed air lines to remove oil and moisture from air close to the point of use. (refer to Section 7.3.4.4 and 8.1.6)
- 7.3.6 Where galvanized steel falls into secondary containment areas and requires a coating, the surface shall be cleaned per SSPC SP1 and allowed to dry. The galvanizing shall then be pretreated using a phosphoric acid solution (e.g., Amchem Galva-Prep) or brush blasted per SP7 as recommended by the manufacturer of the coating material intended for use. After flushing the acid off using potable water, the surface area contacted by the acid and the rinse water shall be tested for pH. The pH shall be as indicated in specification section 7.3.3.3.
- 7.3.7 Damaged galvanized steel shall be cleaned per SSPC SP11 using a 3M Clean-N-Strip disc and wheel, a flapper wheel with a 60-80 grit size or a slow variable speed sander using 60-80 grit sanding disc. All galvanizing to be coated shall be pretreated as indicated in specification section 7.3.6.

7.4 Coating Application

- 7.4.1 Prior to applying Special Protective Coatings (SPC's) the concrete surface shall be dry as determined by the plastic sheet method in accordance with ASTM D4263 sections 1.0-8.0.
- 7.4.2 Coatings shall be applied in accordance with CONTRACTOR accepted procedures (refer to Section 4.1). The coating manufacturer's recommendations for the application temperature and curing temperatures versus times (between coats and after last coat) of the specified material shall be considered when determining minimum and maximum cure to recoat time intervals. Application and curing temperatures above or below the limits allowed by this specification (Refer to Section 7.4.5) shall be submitted to the CONTRACTOR for review and permission to proceed.

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- 7.4.3 Coatings shall be applied using properly sized and type of equipment for the size and complexity of the item being coated. The equipment shall be clean with all components in good working order.
- 7.4.4 Bug holes, cracks and construction joints shall be filled flush with the concrete surface plane or as identified in Appendix I Secondary Containment Installation Details using a structural concrete grout, Five Star V/O or Five Star Vertical patch or CONTRACTOR accepted alternate structural concrete grout or polymeric filler. Structural Concrete grout shall be applied prior to applying the first coat or by applying the proprietary polymeric filler listed in Appendix C Table 2 for the selected coating system or CONTRACTOR accepted equal. Proprietary filler materials may be applied before or after the primer sealer coat where acceptable to the specific coating manufacturer. The filler technique shall be developed during the mock up to minimize the occurrence of pinholes in the finish coats.
- 7.4.5 Coatings shall be applied only when the surfaces to be coated are free of curing compound, free of concrete laitance, clean, properly textured and dry. The substrate temperature shall be a minimum of 5°F above the dew point during coating application and until the applied coating is no longer moisture sensitive per the coating manufacturer's published data or written recommendations. The substrate and air temperature during coating application and curing shall be a minimum of 50°F (Inorganic zinc primers 40°F) and a maximum of 110°F. The relative humidity during coating application shall not exceed 85 percent. Measure humidity in accordance with ASTM E 337 (Sections 1.0-19.0). Deviations from the above listed minimum and maximum substrate/air temperature and humidity limits may be allowed when in accordance with the coating manufacturer's published data or written recommendations and are accepted by the CONTRACTOR. The one firm limit is that the minimum substrate or air temperature shall not be less than 35°F regardless of the coating manufacturer's published or written recommendations.
- 7.4.6 The SUBCONTRACTOR shall record all batch numbers for each coating component used along with other information necessary for the CONTRACTOR to relate the batch to the area or item for which it was applied. (Refer to Appendix G)
- 7.4.7 All coatings shall be thoroughly mixed until they are smooth and free from lumps, then strained through a screen of at least 30 mesh. Heavy bodied materials that will not flow through a 30-mesh screen are exempt from straining. All coatings that could settle in the container during application must be kept under continuous mechanical agitation to ensure coatings expend their solid contents and do not settle during application.
- 7.4.8 Alternating coats shall have a visible color difference to insure full coverage over previous coats.
- 7.4.9 Dry film thickness of each coating shall be in accordance with Appendix C Table 2 Secondary Containment Prequalified Coating Materials or as specified in the subcontract document (Refer to Section 8.3.6). The film thickness of concrete primer sealer may be measured using a wet film thickness gage. The primer sealer must be tinted to a color that allows visual verification that it has been applied. At floors, walls and ceilings that only require a clear sealer, the sealer shall not require tinting.

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- 7.4.10 The minimum and maximum drying times between coats shall be in strict accordance with the coating manufacturer's latest published technical data sheets or written recommendations as accepted by CONTRACTOR.
- 7.4.11 Runs, sags, voids, drips, overspray, loss of adhesion, bubbling, peeling, pinholes or inadequate cure are not permitted and shall be corrected using CONTRACTOR accepted repair procedures.
- 7.4.12 Application equipment that will be reused such as spray equipment, brushes and rollers shall be cleaned using the coating manufacturer's recommended solvents/cleaners.

7.5 Remedial Work

- 7.5.1 The completed coating on each item shall have the correct dry film thickness and shall be free of damage and visible defects.
- 7.5.2 Repair of Dry Film Thickness (DFT) deficiencies
 - 7.5.2.1 Defects such as runs, sags, overspray and embedded particles shall be corrected by sanding to remove the defect. When the defects are in the finish coat, all areas sanded must be overcoated with the finish coat. If the DFT of primer or intermediate coat is reduced to less than the specified minimum, the area shall be abraded with 60-80 grit sand paper or flapper wheel and an additional layer of coating shall be applied until sufficient thickness is achieved. If noticed during application, the sags or runs may be brushed out.
- 7.5.3 Repair of Damage
 - 7.5.3.1 All damaged and loosely adhering coating shall be removed and the surface thoroughly cleaned using a vacu-blast or high pressure water jetting, 60-80 grit sanding disc, 60 - 80 grit sandpaper, 60-80 grit flapper wheel or 3M Clean-N-Strip. Edges of the breaks shall be feathered to insure a smooth transition and the designated number of prime and finish coats shall be applied. Care shall be taken to insure adjacent coatings are not heat damaged, polished or burnished.
- 7.5.4 Loss of adhesion, delamination, blisters, bubbling and fish eyes in the applied coating requires the affected area of coating to be removed and reapplied in accordance with this Specification.
- 7.5.5 Pinholes shall be filled or otherwise repaired prior to the application of the final coat. Pinhole repairs in the final coat shall blend in and not be visually obvious.
- 7.5.6 (Reserved for Future Use)
- 7.5.7 Touch-up Coating and Sealing of Steel Items Attached by Post-installed Concrete Anchors.
 - 7.5.7.1 Post-installed anchors that attach carbon steel items to concrete surfaces require the mechanical joint formed between the concrete and carbon steel attachment to be sealed. Carbon steel anchors and the anchored carbon steel item shall also receive coating touch-up.
 - 7.5.7.2 Stainless steel post-installed anchors that attach stainless steel items to concrete surfaces require the mechanical joint formed between the concrete and attachment to be sealed.

Stainless steel post-installed anchors and stainless steel attachments do not require touch-up coating.

7.6 Interferences

7.6.1 Refer to Appendix J

8 Inspection

8.1 General

8.1.1 The SUBCONTRACTOR shall have the full responsibility for the coating application quality in accordance with this Specification and shall be responsible for stopping Work activities when conditions develop that could adversely affect the quality. All Work is subject to the CONTRACTOR's inspection surveillance.

8.1.1.1 All coating Work inspection personnel shall be trained, qualified and certified in accordance with the SUBCONTRACTOR's accepted procedures. The inspectors shall meet or exceed the minimum requirements for a Level I coatings inspector as described in ASTM D4537 Section 1.0-8.0. At least one inspector shall meet the minimum requirements for a Level II inspector as described in ASTM D4537 Section 1.0-8.0. The SUBCONTRACTOR shall conduct an examination, a performance evaluation and issue a certification for each inspector in accordance with ASTM D4537 Section 9.0. The Level II inspector shall supervise the Work of all Level I Inspectors. The SUBCONTRACTOR's inspector must demonstrate his/her capability of using the inspection equipment and performing all the required inspections. The SUBCONTRACTOR's inspector training, qualification and certification plan and associated procedures shall satisfy the requirements of ASTM D4537, Sections 1.0-8.0 using the guidelines provided in ASTM D5498 including classroom training on the WTP specifications applicable to coating inspection. Additional coating work inspection guidance is found in ASTM D6237 and ASTM D3276 which shall be used in developing procedures for training and certifying coating work inspectors.

8.1.2 The CONTRACTOR's representative shall be the final authority on the specification compliance for surface preparation and material application. Any coating which, in the judgment of the CONTRACTOR's representative has not been applied in conformance with this Specification, shall be rejected.

8.1.3 The CONTRACTOR representative shall have access to each part of the process and shall have the right and opportunity to witness any of the Quality Control Tests.

8.1.4 The SUBCONTRACTOR shall furnish the necessary testing and inspection instruments, properly calibrated and certificates maintained. Calibration of testing and inspection instruments shall be traceable to NIST or CONTRACTOR authorized alternative standards. If equipment is suspected of being out of calibration, it shall be re-calibrated and certificates made available for verification by the CONTRACTOR. Such equipment shall be available for use by the CONTRACTOR in conducting surveillance of the Work.

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- 8.1.5 The SUBCONTRACTOR shall halt the coating Work and make corrections to the procedures, as necessary to correct repetitive faults found in the Work.
- 8.1.6 Prior to using compressed air, the quality of the air downstream of the separator shall be tested in accordance with the requirements of ASTM D4285 by blowing the air onto a clean white blotter or cloth for two (2) minutes at a distance of no more than twelve (12) inches to check for any contamination, oil, or moisture. This test shall be performed at the start of work and at not more than four (4) hour intervals. The test shall also be made after any interruption of the air compressor operation or as required by the CONTRACTOR. The air shall be used only if the test indicates no visible contamination, oil, or moisture. If contaminants are evident, the equipment deficiencies shall be corrected and the air stream shall be re-tested. Moisture separators shall be bled continuously. All lines shall be tested individually prior to use. Surfaces determined to have been blown down or blasted with contaminated air shall be cleaned of all contamination then re-blasted with clean air and abrasive. Coatings determined to have been applied using contaminated air shall be removed and reapplied using clean air.
- 8.1.7 Inspection points shall be established as follows:
- Prior to the start of Work
 - Immediately following the surface preparation
 - Immediately prior to the coating application
 - Following the application of each coat
 - Following the curing of the coating
 - Final inspection and sign-off, in accordance with the project requirements
- 8.1.8 Any defects disclosed by inspection shall be re-inspected after correction.
- 8.1.9 The SUBCONTRACTOR shall keep the records indicated below, and submit these records to the CONTRACTOR (refer to Section 4.5 and Appendix G). The following lists the frequencies:

Coating/Inspection Step		Required Frequency
1.	Pre-Surface Prep	100% visual on Pre-Surface
	Surface Preparation	100% on Surface Prep Cleanliness
	Profile / Texture	Steel profile first item of each type per shift and every 20 items thereafter / Concrete 100% visual for cleanliness and texture.
2.	Environmental/Air Quality	At the start of work and every 4 hours thereafter or more often during changing conditions.
3.	Recirculated Abrasive	At the start of work and as required with a minimum of every 4 hours thereafter
4.	Thickness per SSPC PA2	5 spot readings per 100 sq.ft. on large surfaces or steel items Surfaces or steel items < 100 sq.ft. 4 spot readings on each surface or steel item, 2 spot readings on steel items less than 4 inches. (e.g., valves, fittings, components, etc.)
5.	Visual on Applied Coating	100% of all items

8.2 Surface Preparation Inspection

- 8.2.1 Verify bug holes, voids, cracks and construction joints are properly filled. This is not necessary if filler is applied after surface preparation and sealer coat application.
- 8.2.2 Verify environmental conditions and compressed air quality (refer to Section 7.3.5, 7.3.4.1, 7.4.5)
- 8.2.3 Verify recycled abrasive is grease and oil free (refer to Section 7.3.5).
- 8.2.4 Verify surface cleanliness and texture.(refer to Sections 7.3.3.1, 7.3.3.2, 7.3.4.2 and 7.3.4.3).
- 8.2.5 Grease free chalk shall be used to mark local areas which do not meet the specified requirements (e.g., soapstone and crayons are not acceptable).

8.3 Coating Application

- 8.3.1 Environmental conditions and compressed air quality shall be verified per Sections 7.3.4.1, 7.3.5, 7.4.5, 8.1.6 and 8.1.9.
- 8.3.2 Dry coating thickness (DFT) on steel items shall be measured with a magnetic film thickness gage such as an Elektro-Physik "Mikrotest" or Positector 2000, 6000 or CONTRACTOR accepted equal in accordance with SSPC PA2. Steel items and individual items on equipment less than one hundred (100) sq.ft. in surface area shall have at least four (4) evenly spaced spot readings per item. Equipment or equipment components less than four (4) inches in its largest dimension only require two (2) evenly spaced spot reading per item.
- 8.3.3 Dry coating thickness (DFT) on concrete shall be measured using a Wet Film Thickness (WFT) gage (Refer to ASTM D4414 Sections 1.0-10.0 applicable to procedure A) and calculating thickness based on coating material volume solids (added thinners require recalculation of volume solids) or by using a nondestructive ultrasonic tester such as the Positector 100 or accepted equivalent (Refer to ASTM D6132 Sections 1.0-11.0). Each 100 sq.ft. shall receive 5 evenly spaced gage readings. Areas less than 100 sq.ft. in surface area shall have at least 2 evenly spaced spot readings per area.
- 8.3.4 Wet film thickness gages shall be of high quality steel or stainless steel, with a maximum blade width of 1.5", that can be purchased with calibration certifications. Wet film thickness gages shall be visually inspected for paint residue and physical damage at the start of work and every 4 hours thereafter during use.
- 8.3.5 The Dry Film Thickness gage shall have a minimum of a zero to 40 mil or zero to 60 mil working range and shall be checked for calibration accuracy in accordance with SSPC-PA2 at the start of each shift against certified coating thickness calibration standards for non-magnetic coating of steel traceable to NIST or CONTRACTOR's accepted alternative standards. The calibration standards shall be in the 1.5 mil to 40.0 mil range, unless otherwise specified. Any surface with a measured thickness outside of the limits described in section 7.4.9 shall be rejected. These areas shall be reworked or re-cleaned and re-coated at the SUBCONTRACTOR's expense prior to acceptance by the CONTRACTOR.

- 8.3.6 When dry film thickness becomes debatable or indeterminate, the CONTRACTOR reserves the right to require the use of destructive testing using a Tooke gage in accordance with ASTM D4138 Sections 1.0-9.0 or by nondestructive ultrasonic testing in accordance with ASTM D6132 Sections 1.0-11.0 to verify dry film thickness. All areas damaged by destructive testing shall be repaired by the SUBCONTRACTOR.
- 8.3.7 Runs, sags, voids, drips, overspray, loss of adhesion, bubbling, pinholes, peeling, or inadequate cure are not permitted and shall be repaired or reworked.

9 Storage, Handling and Shipping

9.1 Coating Materials

- 9.1.1 Coating materials shall not be stored in direct sunlight or exposed to inclement weather (e.g., rain, snow, sleet, freezing rain, dew point condensation, see also section 9.1.5). Materials shall remain under cover until ready to use.
- 9.1.2 Coatings, thinners, cleaning solvents and other flammable materials stored at any location, shall be kept away from combustion sources and shall be stored in metal flammable material storage cabinets meeting NFPA and OSHA standards. Thinners and solvents shall be transported to the point of use in approved safety containers meeting OSHA standards.
- 9.1.3 Coating material shall be delivered in manufacturer's original unopened containers. Each container shall be clearly identified with the manufacturer's name, product designation, batch number, date of manufacture and shelf life expiration date.
- 9.1.4 Coating materials shall have a minimum of 120 days of its shelf life remaining at the time the shipment arrives at the project site or the SUBCONTRACTOR's warehouse.
- 9.1.5 Coating materials that are older than twenty four (24) months from the date of manufacture or that exceed the manufacturer's shelf life, if less than twenty four (24) months, shall not be used and shall be placed on HOLD and segregated from other coating materials. Where the coating material has exceeded its shelf life and can be shown to have been stored as specified herein, an extension for no less than three (3) months and no more than six (6) months may be issued by the coating manufacturer. The shelf life extension shall be based on laboratory testing of retain samples taken at the time of manufacture or by testing a sample of the actual coating material in question. Where testing verified an outdated coating material still complies with its original design criteria, it is acceptable for shelf life extension. Expiration date stickers, provided by the coating manufacturer, shall be affixed to each container prior to release from HOLD. The stickers shall include the product number, batch/lot number, the new expiration date and suitably marked to indicate that they came from the coating manufacturer. A new Appendix F shall be provided by the coating manufacturer that includes the test results and specifically indicate that the new Appendix F was provided to document shelf life extension including new expiration date. Coating materials that have not been stored or handled in accordance with sections 9.1.1, 9.1.6, 9.1.7 and 9.1.8, may not have their shelf life extended.

- 9.1.6 Coating material shall be protected from moisture, direct sunlight and temperatures below 40°F or above 100°F unless otherwise allowed by the coating manufacturer's latest published instructions and accepted by the CONTRACTOR.
- 9.1.7 Coating material containers where the airtight seal has been broken or any of the contents are lost, shall not be used.
- 9.1.8 Coating material containers shall not be opened except for immediate use.
- 9.1.9 Unused material shall be returned to storage as soon as possible at the end of each Workday. Materials left out for more than ten (10) hours in an uncontrolled storage area (areas without environmental controls or environmental monitoring that are exposed to ambient weather) shall not be used and shall be placed in a segregated hold area until final disposition then removed from the job site if rejected. No water borne coatings shall be stored in areas where the temperatures are below 40°F.
- 9.1.10 All required coating material certifications for each batch of material delivered to the job site shall be available at the time of material receipt. Materials delivered to the shop or field without the required documentation shall not be used and the SUBCONTRACTOR shall tag and place discrepant materials into a hold area clearly separated from acceptable material. Once the required documentation is received or otherwise corrected and found to be acceptable, the discrepant material may then be taken off hold status and used.

10 Documentation

- 10.1 The SUBCONTRACTOR shall provide a record of all materials used (Regarding individual batch numbers, refer to Appendix F).
- 10.2 The SUBCONTRACTOR shall provide a record of all required daily inspections (Example- Appendix G) that includes pre-surface preparation, compressed air cleanliness, environmental conditions, surface preparation and roughness, location of field repairs coated, application, visual inspection, dry film thickness, and all touch up/repair. This record shall include the coating and thinner materials used and the ID of the items coated to provide traceability.
- 10.3 All quality documentation shall be available for review by the CONTRACTOR representative within twenty four (24) hours from the time it is generated.
- 10.4 SUBCONTRACTOR documentation forms or the way that the actual Work will be documented shall be provided by the SUBCONTRACTOR as part of the procedures submittal for review by the CONTRACTOR.

11 Design Changes Incorporated by Reference

- 11.1 The following is a listing of design changes that are identified by reference and do not require modification to the specification.

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Design Change Document
(none at this time)

* Denotes a new entry for this revision of the specification.

Appendix A Supplier Quality Assurance Program Requirements Data Sheet

SUBCONTRACTOR QUALITY ASSURANCE PROGRAM REQUIREMENTS DATA SHEET

DOE ORDER 414.1c REQUIREMENTS

The following marked QA Program Elements of DOE ORDER 414.1c apply and are subject to CONTRACTOR evaluation and verification.

SUBCONTRACTOR SHALL IDENTIFY QUALITY ASSURANCE DOCUMENTS AND ASSOCIATED PARAGRAPH REFERENCES FOR EACH REQUIRED ELEMENT

DOE O 414.1c

N/A

PROGRAM ELEMENTS

<input checked="" type="checkbox"/>	<input type="checkbox"/>	PROGRAM	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	PERSONNEL TRAINING & QUALIFICATION	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	QUALITY IMPROVEMENT	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	DOCUMENTS & RECORDS	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	WORK PROCESSES	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	DESIGN	NA
<input checked="" type="checkbox"/>	<input type="checkbox"/>	PROCUREMENT	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	INSPECTION & ACCEPTANCE TESTING	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	MANAGEMENT ASSESSMENT	NA
<input type="checkbox"/>	<input checked="" type="checkbox"/>	INDEPENDENT ASSESSMENT	NA

SIGNATURE OF SUBCONTRACTOR REPRESENTATIVE- _____ DATE- _____

TITLE _____

The SUBCONTRACTOR shall identify the Quality Assurance Documents and associated section(s) and procedures that address the elements listed above in compliance with DOE Order 414.1c.

Appendix B

WTP Project Special Protective Coating (SPC) Material Prequalification Requirements for Secondary Containment.

1.0 Prequalification Testing for ALARA Areas

- 1.1 All the coating material prequalification testing shall be performed by the coating manufacturers listed in Appendix C. Coating systems listed as "Prequalified" have been fully tested and all data has been reviewed and accepted. Only those systems listed as Prequalified may be used.
- 1.2 Coating systems that will be applied on items that will be located inside ALARA Areas shall satisfy the following test requirements:
 - 1.2.1 Radiation Tolerance Testing: Coating systems shall be tested for tolerance to radiation exposure as a complete system in accordance with the requirements of ASTM D4082 and as follows:
 - 1.2.1.1 For coating systems to be used in areas where the total anticipated accumulate dose will not exceed 2E8 rads, no radiation tolerance testing is required.
 - 1.2.1.2 For coating systems to be used in areas where the total anticipated accumulated dose is >2E8 rads up to 1E9 rads, test the coatings at 1E9 rads.
 - 1.2.1.3 For coating systems to be used in areas where the total anticipated accumulated dose is >1E9 rads, the test radiation level shall equal or exceed the highest anticipated accumulated dose.
 - 1.2.1.4 The acceptance criteria for the irradiation test shall be "no defects" as described in ASTM D4082. In addition to the defects stated in ASTM D4082, also check the coating on the test specimens for softening. The coating shall not soften because of the irradiation exposure.
 - 1.2.2 Decontamination Testing: Generic Special Protective Coating materials such as two component or three component Epoxy, and Epoxy Novolac's, type have historically shown very good decontamination and chemical resistance properties and are suitable for use on the WTP project. Other generic coating materials located in areas that will require operational decontamination must be able to withstand the decontamination chemicals and temperatures that will be used as part of the decontamination process.
 - 1.2.3 Abrasion Resistance Testing: In addition to radiation tolerance testing of coating systems that will be applied to surfaces inside ALARA Areas or on items that will be located inside ALARA Areas, those coating systems and

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selected Non-ALARA Area coating systems shall satisfy the following test requirements:

- 1.2.3.1 Coating systems for use -in secondary containment areas, where abrasion will be a factor in the in-service performance of the coating system, shall be tested in accordance with ASTM D4060. The weight loss shall not exceed 175 mg per 1000 cycles when a CS-17 wheel is used with a 1000-g load.
- 1.2.4 Adhesion Testing: Coating systems shall be tested for adhesion in accordance with the requirements of ASTM D4541 and ASTM D5144 Section 5.5.1. The minimum adhesion value shall be 200 psi for coatings applied to concrete or steel substrates.
- 1.2.5 Chemical Resistance Testing: Perform chemical resistance testing on coating systems in chemical exposure areas in accordance with the requirements of ASTM D3912 Section 6.3. The test reagents and test duration of the tests shall be governed by the anticipated service conditions. The test shall last for 5 days for secondary containment coating systems and for coating systems where cleanup of spills will not be immediate, for 24 hours.
- If the test duration exceeds 24 hours, examine the test specimens after each 24-hour period and report the condition of the specimens after each 24-hour interval. Examine and report the condition of the specimens in accordance with the requirements of ASTM D3912, Sections 7 and 8. The test reagents and concentrations shall be as follows:
- 1.2.5.1 Chemical Reagents and Concentrations that may require testing
- 2.0, 5.0 & 12.2 Molar HNO₃
 - 0.25, 2.0, 5 & 19 Molar NaOH
 - 3.27 Molar Sr(NO₃)₂
 - 7.4 Molar NaNO₂
 - 4.4 Molar NaMnO₄
- 1.2.6 Test Specimen Preparation: Test specimens shall be prepared in accordance with the requirements of ASTM D5139. The surface preparation methods utilized for radiation tolerance, adhesion and chemical resistance testing shall be representative of those proposed for use. If more than one surface preparation method is proposed for use, each proposed surface preparation method shall be tested independently. The size of the test specimens shall be appropriate for the test being carried out. The minimum size of test specimens shall be 2" X 4" X ¼" for steel substrates and 2" X 2" X 4" for concrete substrates.
- 1.2.7 Infra Red (IR) Scan: The coating manufacturer shall run an IR scan of the prequalification batch of the liquid component of each coating system to maintain as a record of that formulation. The IR scans shall be maintained indefinitely for all coating systems that are accepted for use by RPP/WTP and shall be identified and submitted with the test documentation for each coating

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system. Thereafter, the manufacturer shall certify that each subsequent batch of an accepted coating system was manufactured with the same formulation, raw materials, production methods, and quality control standards as the coating materials originally tested and accepted for use by the RPP/WTP (refer to the statement included on the Coating Manufacturer's Product Identity Certification Record in Appendix F).

- 1.2.8 Flame Spread and Smoke Developed: All Special Protective Coatings that will be applied on the building structure (e.g., concrete walls, floors, ceilings, structural steel) located in the LAW, HLW, PTF, LAB and areas of BOF that transport, process or store radioactive materials or items, shall comply with the requirements of NFPA 801, DOE Standard 1066, NFPA 255 and NFPA 253 as defined in specification 24590-WTP-3PS-AFPS-T0002 Special Protective Coatings Limited-Combustible Testing Protocol. Concrete floors are required to have a minimum Critical Radiant Flux rating of 0.45 watts/cm². The Maximum allowable flame spread for the building structure walls and ceiling is 25 and the maximum allowable smoke developed is 50. Concrete floors, equipment, piping, and steel items installed in the building do not require flame spread and smoke developed testing.
- 1.2.9 Volatile Organic Compounds (VOC): The VOC content of all Special Protective Coatings shall not exceed 3.8 lbs./gal (450 grams/liter). If the VOC requirement in the location where the coating is being applied is less than the 3.8 lbs./gal, the local (e.g., a facility offsite in Tri-Cities area) requirements take precedence and must be met.
- 1.2.10 Prequalification Testing for Flexible Epoxy Filler Material Acting as a Water Stop
- 1.2.10.1 Permeability testing of flexible epoxy filler material shall be preformed in accordance with ASTM D1653 method B. Permeability shall be similar to epoxy coating materials.
- 1.2.10.2 Radiation tolerance testing of flexible epoxy filler material shall be performed per ASTM D4082 when installed in areas where the 40 year integrated dose exposure is expected to be greater than 2E8 rads. The flexible epoxy filler shall exhibit residual flexibility and remain bonded to the substrate.
- 1.2.10.3 Elongation of the flexible epoxy filler material shall be at least 50% when tested in accordance with ASTM D412.
- 1.2.10.4 Abrasion resistance testing of flexible epoxy filler material per ASTM D4060 is not required.
- 1.2.10.5 Adhesion testing of the flexible epoxy filler material to concrete shall be performed in accordance with ASTM D4541 and ASTM D5144. The adhesion shall be 200psi minimum.

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- 1.2.10.6 Chemical resistance testing of the flexible epoxy filler material shall be performed per section 1.2.5 above. The testing results shall be reported.
- 1.2.10.7 Aging shall be demonstrated by at least 10 years of successful field service in secondary containment applications or other similar application. Accelerated aging testing may also be used such as radiation tolerance testing at 2E8 rads minimum (see Section 1.2.1 above).
- 1.2.10.8 Crack-filling- Due to the thick viscous nature of the flexible epoxy filler material, it is only required to be mechanically forced into the cracks, primarily bridging over the cracks creating a thick well bonded protective barrier.

2.0 Prequalification Testing for Non-ALARA Areas

Special Protective Coating materials or systems that will be applied on items that will be located in Non-ALARA areas have the same prequalification requirements as listed in Appendix "B" Section 1.0 except no radiation tolerance testing is required.

Appendix C

Table 1- Secondary Containment Coating Systems

Usage Type	Thickness Groups Concrete/ Steel	Resin Type/ Surface Type	Coating System Description	Prequalified Coating Systems						Remarks
				Ameron	Carboline	ICI-Devoe	Dudick	Inter-National	Sherwin Williams	
FLOOR COATING SYSTEMS										
SC	T4	ECF	Heavy Spray or Self Leveling Epoxy Floor Coatings (Epoxy primer and one coat of epoxy finish)	AM07	CA07	DE07	DD07	IN07	SW07	When the room finish schedule specifies system designation SC-E it includes this concrete floor coating system.
SC	T4	NCF	Heavy Spray or Self Leveling Epoxy Novolac Floor Coatings (Epoxy Novolac primer and one coat of epoxy Novolac finish)	AM08	CA08	DE08	DD08	(none)	SW08	When the room finish schedule specifies system designation SC-N it includes this concrete floor coating system.
WALL and SUMP COATING SYSTEMS										
SC	T2	ECW	Epoxy Wall & Sump Coatings (Fill bug holes flush, apply 1 coat of epoxy primer and two coats of epoxy finish)	AM15	CA15	(none)	(none)	IN15	SW15	When the room finish schedule specifies system designation SC-E it includes this concrete wall coating system.
SC	T2	NCW	Epoxy Novolac Wall & Sump Coatings (Fill bug holes flush, apply 1 coat of epoxy Novolac primer and two coats of epoxy Novolac finish)	AM16	CA16	(none)	(none)	IN16	SW16	When the room finish schedule specifies system designation SC-N it includes this concrete wall coating system.
STEEL EMBED COATING SYSTEMS										
SC	T4	ESE	Epoxy Coatings for Embed Plates and Support Steel, (Touch up existing shop coating or abrasive blast and apply two coats of Epoxy Finish)	AM19	CA19	(none)	(none)	IN19	SW19	When the room finish schedule specifies system designation SC-E it includes this steel coating system.
SC	T5	NSE	Epoxy Novolac Coatings for, Embed Plates and Support Steel (Touch up existing shop coating or abrasive blast and then apply two coats of Epoxy Novolac Finish)	AM20	CA20	(none)	(none)	IN20	SW20	When the room finish schedule specifies system designation SC-N it includes this steel coating system.
OUTDOOR SECONDARY CONTAINMENT COATING SYSTEMS										
SC	T5	P	Coating system for outdoor secondary containment areas; concrete and steel	(none)	(none)	(none)	(none)	(none)	SW30	100% solids Polyurea Coating

SC = Secondary Containment

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ECF = Epoxy Concrete Floors; NCF = Epoxy Novolac Concrete Floors; ECW = Epoxy Concrete Walls; NCW = Epoxy Novolac Concrete Walls

ESE = Epoxy Steel Embeds; NSE = Epoxy Novolac Steel Embeds

P = Polyurea

Appendix C

Table 2 Secondary Containment Prequalified Coating Materials

WTP Concrete System Code	Surface Type	Appendix C Table 1 Mfg. System Code	Coating Mfg.	Concrete Filler (flush)	Mfg. Products	Required Dry Film Thickness (Mils) **
SC-T4-ECF	Concrete Floors	AM07	Ameron	None	X00701 / Nu Klad 120A	1-2 / 40-60 = 41-62 mils
SC-T4-ECF	Concrete Floors	CA07	Carboline	None	Semstone 5401 / Semstone 140SL+SAND / 140SL	4-6 / 10-15 / 30-50 = 44-71 mils
SC-T4-ECF	Concrete Floors	DE07	Devoe	Futura- Bond 320 Gel	Pre Prime 167/ Devmat 111	1-2 / 40-60 = 41-62 mils
SC-T4-ECF	Concrete Floors	DU07	Dudick	None	Primer 67 / Polymer Alloy 2500 FR	4-6 / 40-60 = 44-66 mils
SC-T4-ECF	Concrete Floors	IN07	International	Intercryl 320	Interseal 670HS / Interzone 954	2-4 / 45-55 = 47-59 mils
SC-T4-ECF	Concrete Floors	SW07-2	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Cor-Cote HP SL Mortar	1.5-2 / 38.5-58 = 40-60 mils
SC-T4-NCF	Concrete Floors	AM08	Ameron	None	X00701 / Nu Klad 120A / Amercoat 91	1-2 / 34-50 / 6-10 = 41-62 mils
SC-T4-NCF	Concrete Floors	CA08	Carboline	None	Semstone 5401 / 145SL+SAND / 145SL.	4-6 / 40-60 = 44-66 mils
SC-T4-NCF	Concrete Floors	DE08	Devoe	Futura- Bond 320 Gel	Pre Prime 167/ Devmat 111	1-1.5 / 40-60 = 41-61.5 mils
SC-T4-NCF	Concrete Floors	DU08	Dudick	None	Primer 67 / Polymer Alloy 2100 FR	4-6 / 40-60 = 44-66 mils
SC-T4-NCF	Concrete Floors	SW08	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Cor Cote HCR / Cor Cote HCR SL Mortar.	4-6 / 36-54 = 40-60 mils
SC-T2-ECW	Concrete Walls	AM15	Ameron	Nuclad 114A	Amerlock 400 / Amerlock 400	4-8 / 4-8=8-16 mils
SC-T2-ECW	Concrete Walls	CA15	Carboline	Semstone 195	Carbogard 1340 / Carbog890C705 / C890S800	1-2 / 4-5 / 4-5=10-14 mils
SC-T2-ECW	Concrete Walls	IN15	International	Intercryl 320	Intergard 345 / 345 / 345	4-6 / 4-6 / 4-6=12-18 mils

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WTP Concrete System Code	Surface Type	Appendix C Table 1 Mfg. System Code	Coating Mfg.	Concrete Filler (flush)	Mfg. Products	Required Dry Film Thickness (Mils)**
SC-T2-ECW	Concrete Walls	SW15	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Macropoxy 646 / Macropoxy 646	1-2 / 3-7 / 4 -7=8-16 mils
SC-T2-NCW	Concrete Walls	AM16	Ameron	Nu Klad 114A	Amercoat 91 / Amercoat 91	4-8 / 4-8=8-16 mils
SC-T2-NCW	Concrete Walls	CA16	Carboline	Semstone 195	Carbogard 1340 / Phenoline1205FR0700 / 1205FRS800	1-2 / 5-6 / 5-6=12-16 mils
SC-T2-NCW	Concrete Walls	IN16	International	Intercyrl 320	Intertherm 228 / 228 / 228	2-4 / 4-6 / 4-6=10-16 mils
SC-T2-NCW	Concrete Walls	SW16-1	Sherwin Williams	Kem Cati-Cote HS or Steel Seam FT910	Cor-Cote HCR / Phenicon HS / Phenicon HS	1.5-2.0 / 3-6 / 3-6 = 7.5-14 mils
SC-T2-NCW	Concrete Walls	SW16-2	Sherwin Williams	Kem Cati-Cote HS or Steel-Seam FT910	Macropoxy 920 / Phenicon HS / Phenicon HS /	1.5-2.0 / 3-7 / 4-7=8.5-16 mils

WTP Steel System Code	Surface Type	Appendix C Mfg. System Code	Coating Mfg.	Steel Primer	Mfg. Products	Required Dry Film Thickness (Mils)**
SC-T4-ESE	Steel Embeds	CA19	Carboline	*Carbozinc 859	Carbogard 890 / 890	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE	Steel Embeds	IN19	International	*Interzinc 52	Intergard 475HS / 475HS	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE	Steel Embeds	SW19	Sherwin Williams	*Zinc Clad IV	Macropoxy 646 / 646	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T4-ESE*	Steel Embeds	AM19	Ameron	*Amercoat 68HS	Amerlock 385 / 385	3-5 / 4-6 / 4-6 = 11-17 mils
SC-T5-NSE	Steel Embeds	AM20	Ameron	* Amercoat 68 HS	Amercoat 91 / 91	3-5 / 6-12 / 6-12 = 15-29 mils
SC-T5-NSE	Steel Embeds	CA20	Carboline	*Carbozinc 859	Phenoline1205 / 1205	3-5 / 5-6 / 5-6 =13-17 mils
SC-T5-NSE	Steel Embeds	IN20	International	*Interzinc 52	Intertherm 228 / 228	3-5 / 4-6 / 4-6 = 13-17 mils
SC-T5-NSE	Steel Embeds	SW20	Sherwin Williams	*Zinc Clad IV	Phenicon HS / Phenicon HS	3-5 / 6-8 / 6-8 = 16-21 mils***

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FIELD APPLIED SPECIAL PROTECTIVE COATINGS FOR SECONDARY CONTAINMENT AREAS

WTP Concrete System Code	Surface Type	Appendix C Table 1 Mfg. System Code	Coating Mfg.	Concrete Filler (flush)	Mfg. Products	Required Dry Film Thickness (Mils) **
SC-T5-P	Concrete & Steel	SW30	Sherwin Williams	Steel-Seam FT910	Macropoxy 920 / Envirolastic AR425	1.5-2.0 / 40-60 = 41.5-62.0

NOTES TO APPENDIX C Table 2

* Note 1- This is a steel coating system shown on the room finish schedule for steel embedded in concrete and structural steel that requires the listed touch up primer and finish coating for chemical resistance. The steel coating system shall be from the same coating manufacturer as the concrete coating system.

** Note 2- The dry film thickness limitations listed in this column are based on testing to the NFPA 801-2003 and DOE STD 1066 flame spread and smoke developed requirements. The listed dry film thicknesses are the maximum allowed for wall coatings. The maximum total film thickness listed in this column includes the residual filler. Differences in dry film thickness from one coating manufacturer's system to another is due to NFPA 801 and DOE STD 1066 flame and smoke independent laboratory testing results.

*** Note 3- Using system SC-T5-NSE (SW20) from Sherwin Williams as an example, the required dry film thickness is determined by reading from left to right, the first coat is Zinc Clad IV applied at 3-5 mils, the slash separates the second coat which is Phenicon HS applied at 6-8 mils, the slash separates the third coat which Phenicon HS applied at 6-8 mils. An additional slash would define a fourth coat and so on. The total dry film thickness is listed after the equal sign.

Appendix D
Deleted

Appendix E

Color Scheme

- 1.0 The finish coat on all steel items and equipment other than electrical shall be ANSI* 70 Gray or approved substitute to ANSI color standard. (*American National Standards Institute)
- 2.0 The finish coat on standard electrical components and cabinets shall be ANSI 61 Gray or approved substitute to ANSI color standard.
- 3.0 Finish coat on floor coatings and sumps shall match Benjamin Moore color 2143-50 Old Prairie or approved substitute.
- 4.0 Finish coat on wall coatings shall match Benjamin Moore color 2143-60 Moonlight White or approved substitute.
- 5.0 Floor coatings color shall transition over the standard coving and up the wall 6"(-0" +1"). The thickness on the floor/wall coving and wall above the floor coating shall match the wall coating thickness. For gypsum board walls refer to drawing 24590-WTP-A3-A10T-04200002, WTP process Building Architectural Common Interior Wall Details, using detail #4, Detail for typical rated wall base at concrete floor.

Appendix F Coating Manufacturer's Product Identity Certification Record

Project Name: _____ Coating Manufacturer: _____
 Project Number: _____ Purchase Order Number: _____
 Project Location: _____ Contract Number: _____
 Coating Applicator: _____ Generic Coating Type: _____
 Product Name: _____ Product Number: _____

(For multi-component products, provide data for all components. Provide the standard range and actual batch values for each test)

TEST RESULTS		Component A Batch No.		Component B Batch No.	
Test	Test Method Used	Standard Range	Batch Actual	Standard Range	Batch Actual
Weight per Gallon					
Viscosity					
Flash Point (Typical)					
% Solids by Volume (Typical)					
Cure to recoat time @ 50F, 70F & 90F (Typical)					
Batch Size					
Date of Mfg.					
Shelf Life					
Expiration Date					

COMMENTS:

I hereby certify that the coating materials described above were manufactured with the same formulation, raw materials, production methods, and quality control standards as the coating materials originally tested and/or accepted for use at the River Protection-Waste Treatment Plant (WTP) Project site, located in the 200 East Area of the Hanford Site in Washington State in accordance with the requirements of Specifications 24590-WTP-3PS-AFPS-T0001, 24590-WTP-3PS-AFPS-T0003, 24590-WTP-3PS-AFPS-T0004 & 24590-WTP-3PS-AFPS-T0006.

Signed: _____ Date: _____
 Title: _____ Company: _____

Appendix G Surface Preparation and Coating Inspection Form

Page ___ of ___

REPORT NO: _____
 PROJECT: _____
 SUBCONTRACTOR: _____
 EQUIPMENT/AREA: _____
 SUBSTRATE: STEEL/CONCRETE/OTHER- _____
 ENVIRONMENTAL CONDITIONS: _____

DATE: _____
 DAY: M T W T F S S _____
 SHIFT: _____
 INSPECTOR: _____
 COATING SPEC NO/REV: _____

WORK ACTIVITY	TIME					
DRY BULB TEMP. °F						
WET BULB TEMP. °F						
RH %						
DEW POINT °F						
SURFACE TEMP. °F						
BLOTTER TEST						

PRE-SURFACE PREPARATION:

SP-1: _____ MASKING/PROTECTION: _____ SURFACE DEFECTS: _____

SURFACE PREPARATION:

METHOD: _____ ABRASIVE TYPE/SIZE/STORAGE: _____
 RECYCLED ABRASIVE OIL FLOATATION TEST: _____ ABRASIVE CONDUCTIVITY TEST: _____
 CLEANLINESS SPEC: _____ ACTUAL: _____ PROFILE SPEC: _____ ACTUAL: _____
 EQUIPMENT: _____

COATING MATERIALS & MIXING:

PRODUCT(S) _____
 BATCH NO(S)/QUANTITIES/EXPIRATION DATE: _____ / _____ / _____
 THINNERS/BATCH NO(S)/THINNING RATIO: _____ / _____ / _____
 STORAGE: _____ MIXING: _____ INDUCTION TIME: _____
 MATERIAL TEMPERATURE: _____ POT LIFE EXPIRATION TIME: _____
 COATING/LINING APPLICATION START TIME: _____ FINISH TIME: _____
 COAT: PRIMER/PRIMER T.U./SECOND/SECOND T.U./THIRD/THIRD T.U./OTHER _____
 METHOD: _____ WFT: _____ RECOAT TIME/TEMP: _____ CURE TIME/TEMP: _____
 EQUIPMENT: _____

APPLIED COATING:

VISUAL INSPECTION (FILM IMPERFECTIONS): _____
 DRY FILM THICKNESS: SPEC: _____ ACTUAL: _____ METHOD: _____
 HOLIDAY TEST: _____ METHOD: _____ OTHER TESTING: _____ METHOD: _____
 TOUCH-UP AND REPAIR: _____ FINAL CURE: _____

COMMENTS: (Use reverse side or attach extra pages)

 INSPECTOR'S SIGNATURE/DATE

Appendix H
Deleted

Appendix I

Secondary Containment Installation Typical Details (no scale)

- **Installation Detail 1A-Floor /Wall Junction**
- **Installation Detail 1B-Wall/Wall Junction**
- **Installation Detail 2A-Reinforced Floor/Wall Junction**
- **Installation Detail 2B-Reinforced Wall/Wall Junction**
- **Installation Detail 3A-Reserved**
- **Installation Detail 3B-Construction Joint**
- **Installation Detail 4-Crack Repair**
- **Installation Detail 5A-Embed Plates without Steel Attachment**
- **Installation Detail 5B-Embed Plates with Steel Attachment**
- **Installation Detail 6-Perimeter Key**
- **Installation Detail 7-Floor or Wall Steel Embed With Stainless Steel Plate Overlay**

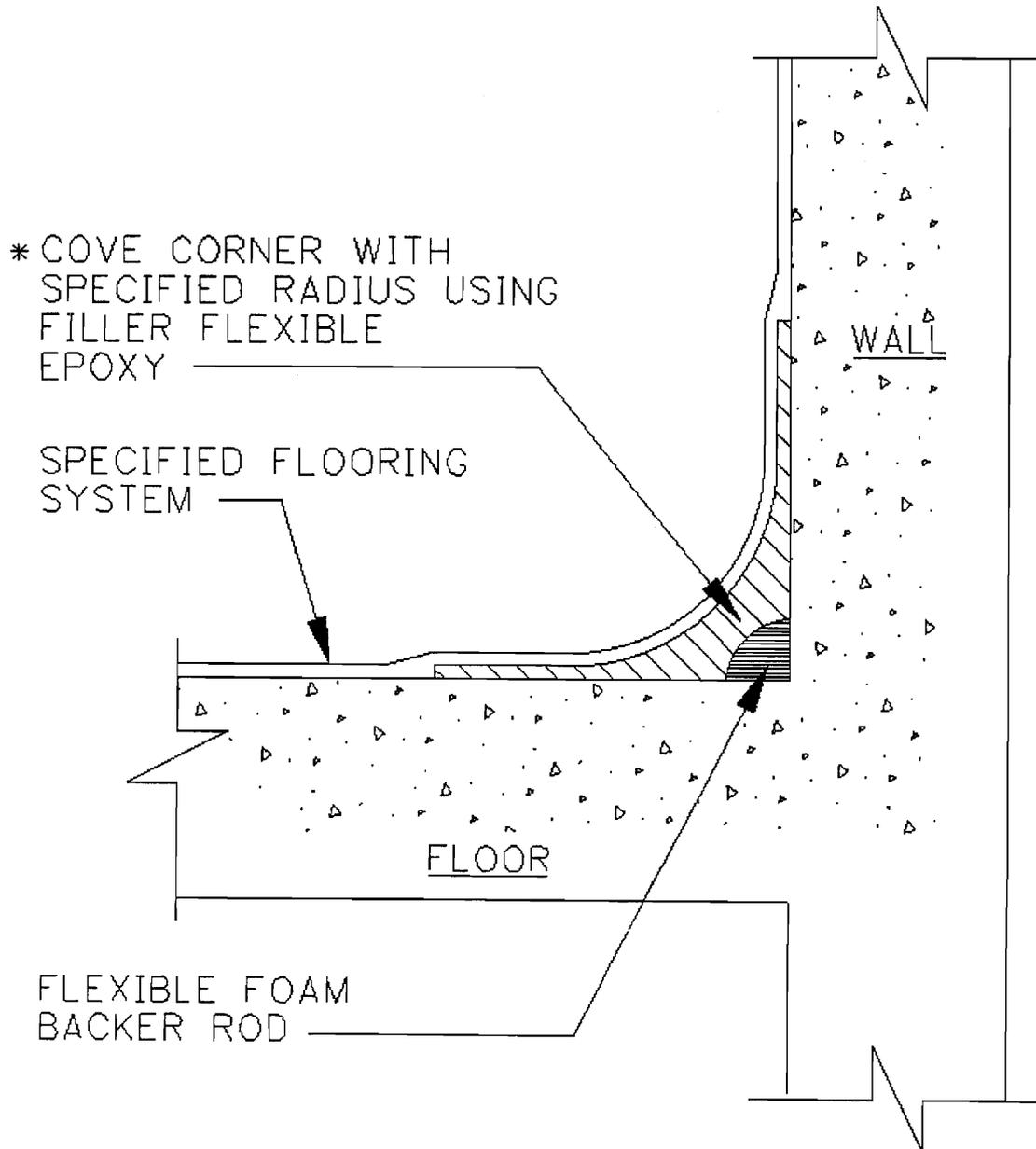
Notes-

1. Details 1A and 1B are used for areas containing ancillary equipment with normally open floor drains, which do not contain tanks. (DWP and/or Non-DWP affecting)
2. Details 2A and 2B are for areas that do not have normally open floor drains. (DWP and/or Non-DWP affecting)
3. RESERVED
4. Detail 3B is to be used for construction joints within the limits of the secondary containment lining. The 3B construction joint detail, formed or created (e.g., saw-cut) rectangular slot, shall be centered over the existing concrete construction joint (Refer to Section 6.2.1.4.1). (DWP and/or Non-DWP affecting)
5. Detail 4 is only to be used for large cracks other than minor shrinkage cracks. (DWP and/or Non-DWP affecting)
6. Detail 5A, 5B, 7 are to be used for embedded steel plates, angles, penetrations etc. The perimeter of all embeds shall be chipped back and filled as shown on detail 5A.

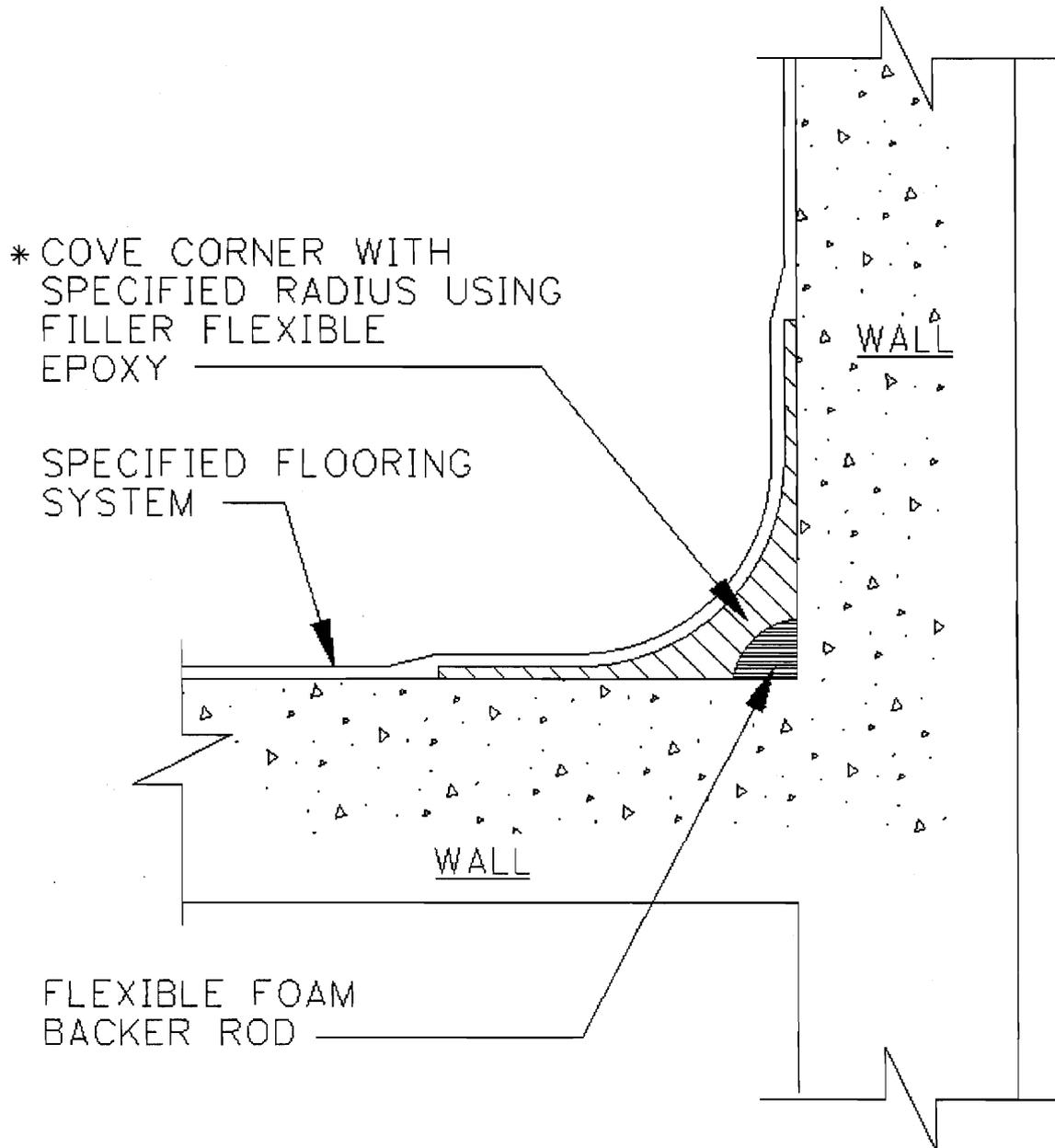
Areas containing free flowing floor drains shall use the rigid polymeric filler material. Areas that do not contain free flowing floor drains and within a flood zone shall use flexible polymeric epoxy filler material. (DWP and/or Non-DWP affecting)

- 7. Detail 6 is only used where the coating system terminates in the middle of a floor. (DWP and/or Non-DWP affecting)**

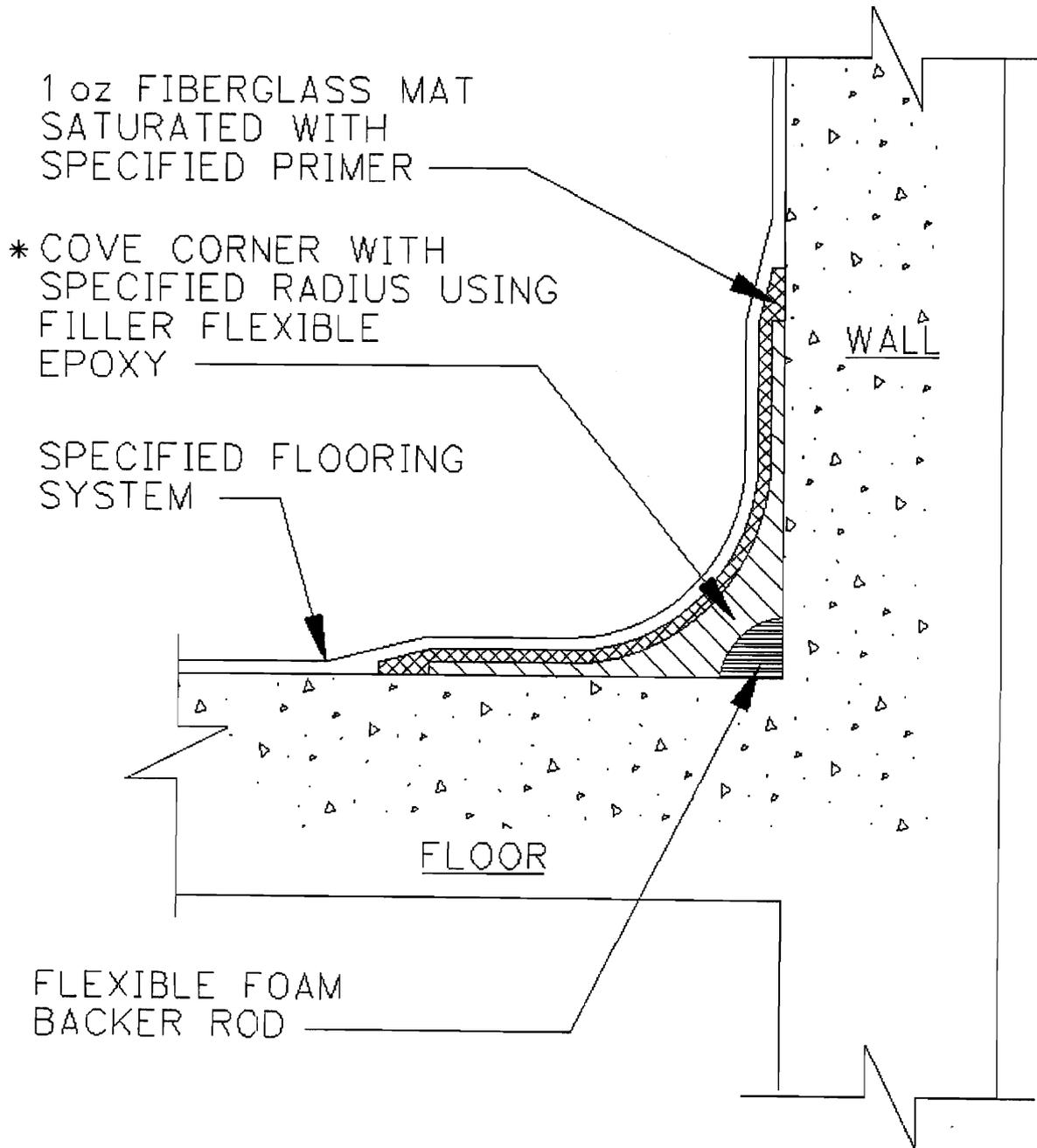
INSTALLATION DETAIL 1A - FLOOR/WALL JUNCTION



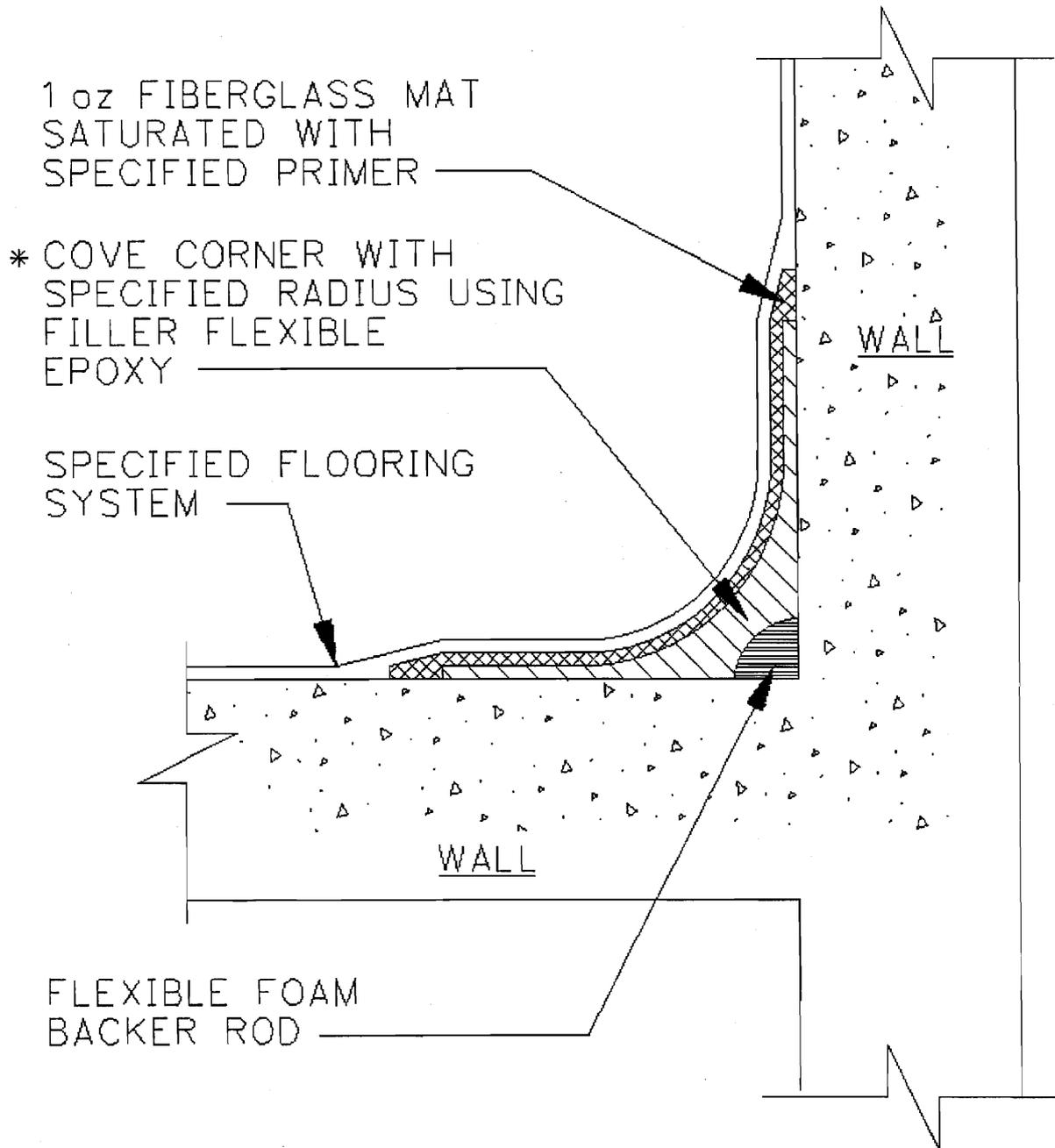
INSTALLATION DETAIL 1B - WALL/WALL JUNCTION



INSTALLATION DETAIL 2A
REINFORCED FLOOR/WALL JUNCTION

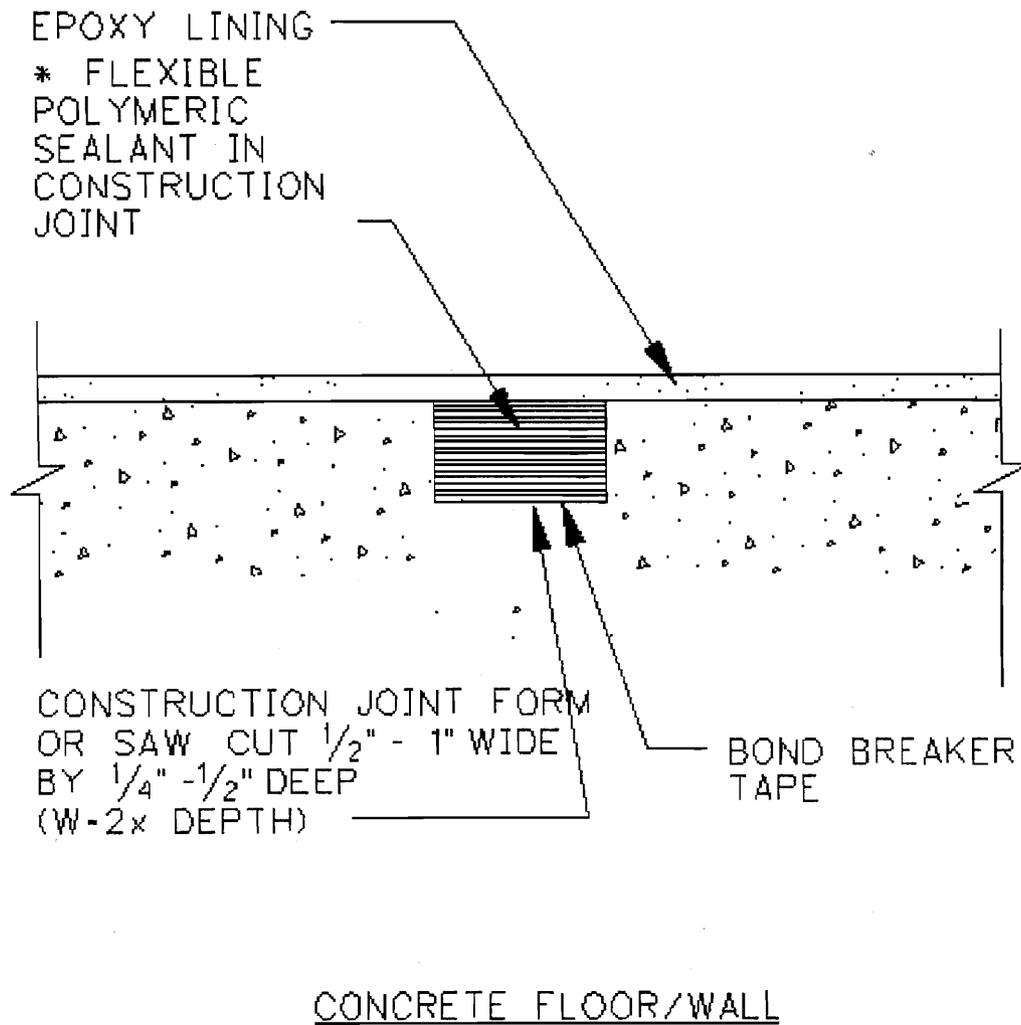


INSTALLATION DETAIL 2B
REINFORCED WALL/WALL JUNCTION

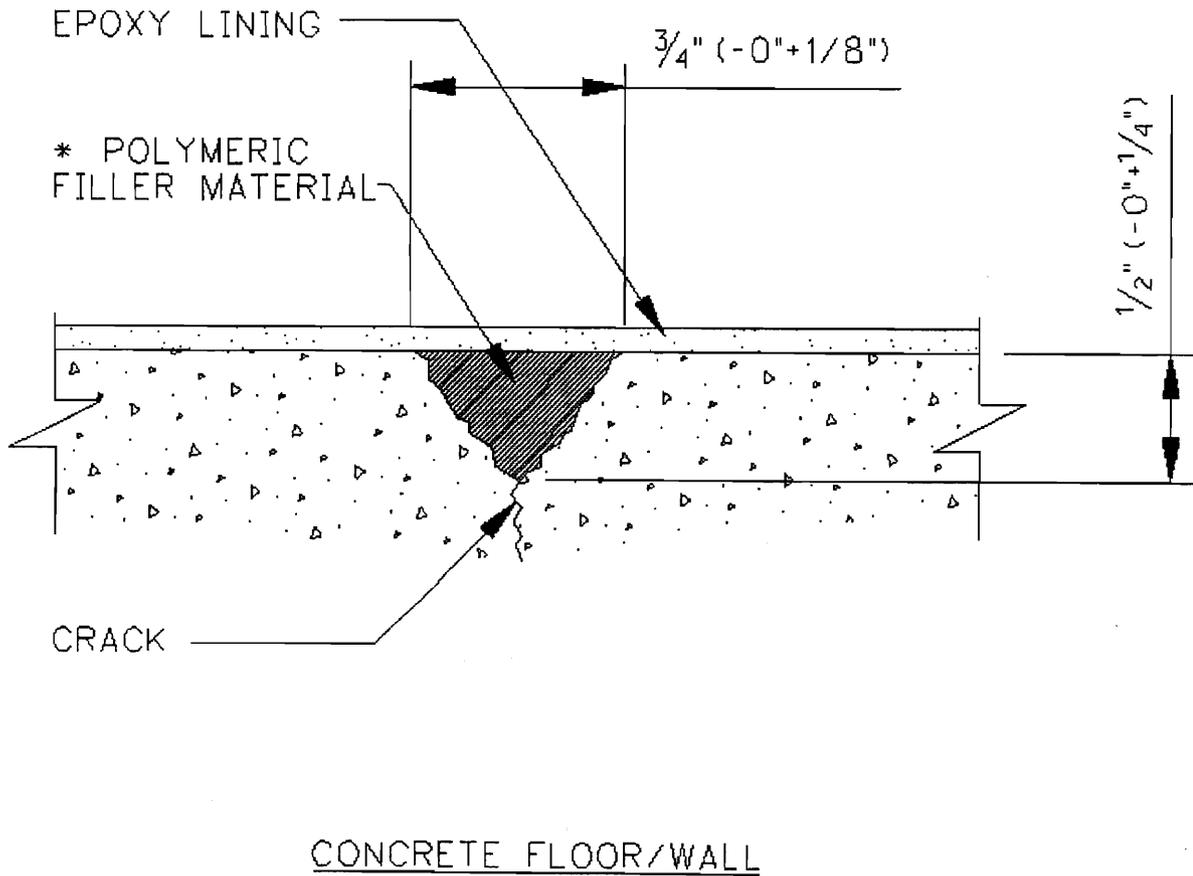


INSTALLATION DETAIL 3A - RESERVED

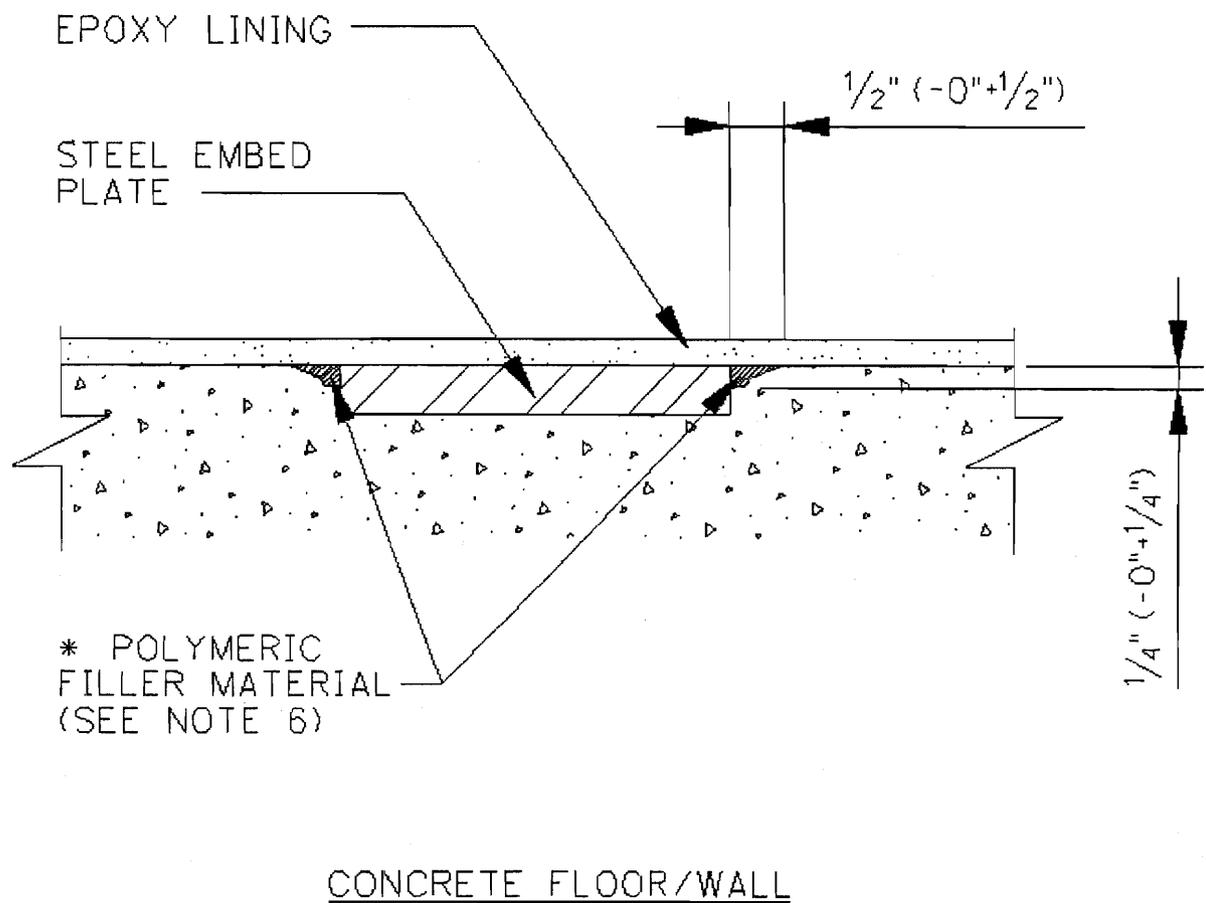
INSTALLATION DETAIL 3B - CONSTRUCTION JOINT



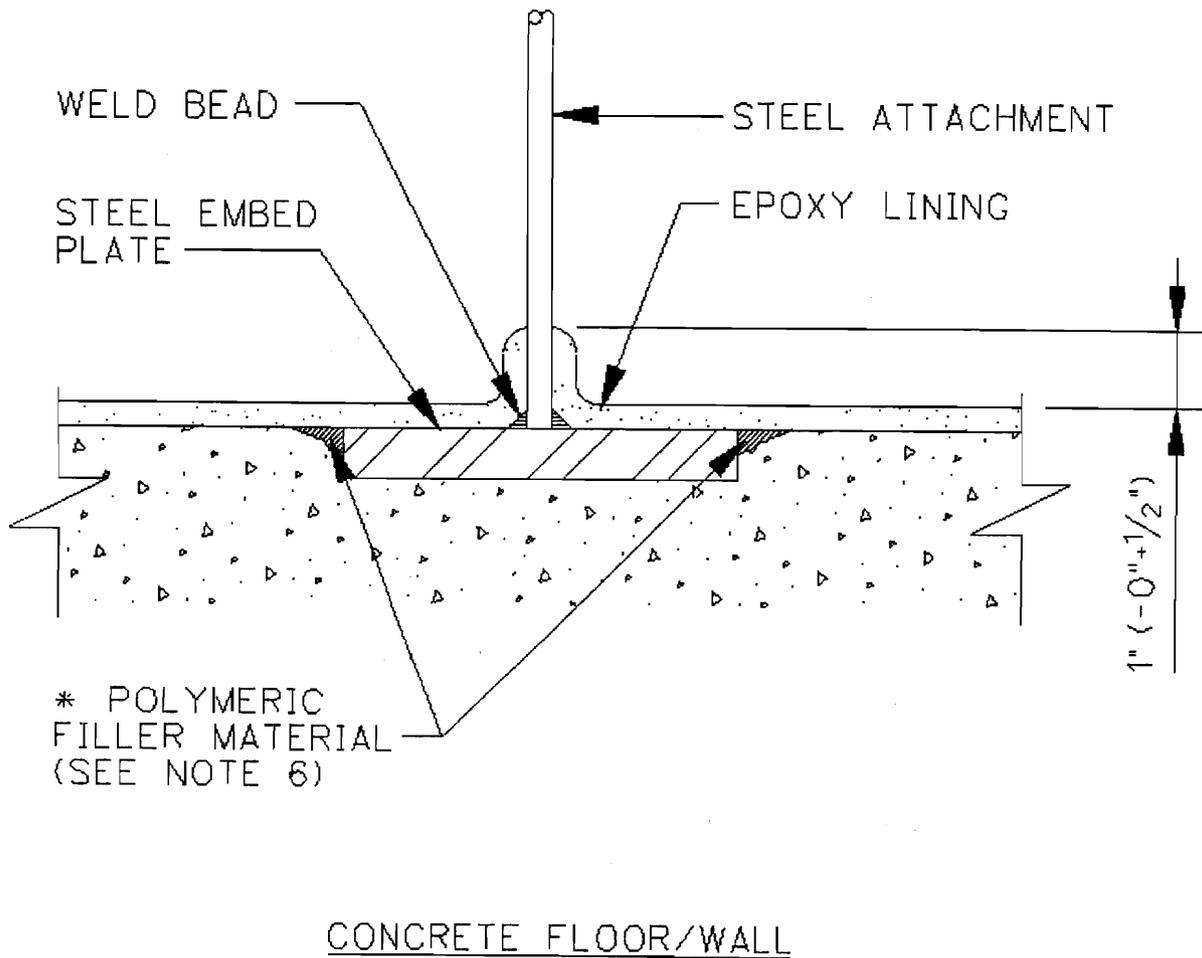
INSTALLATION DETAIL 4 - CRACK REPAIR



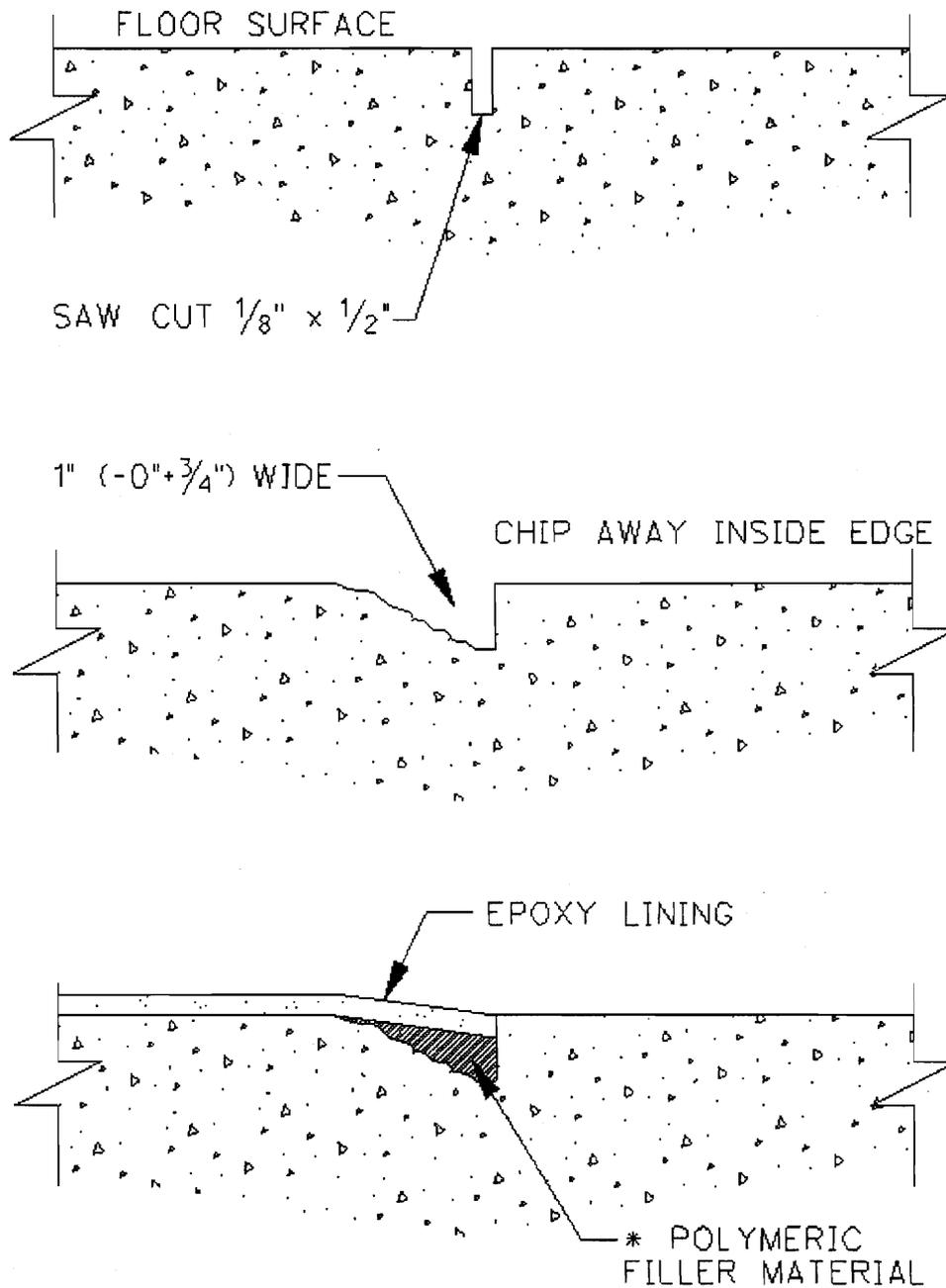
INSTALLATION DETAIL 5A - EMBED PLATES
WITHOUT STEEL ATTACHMENT



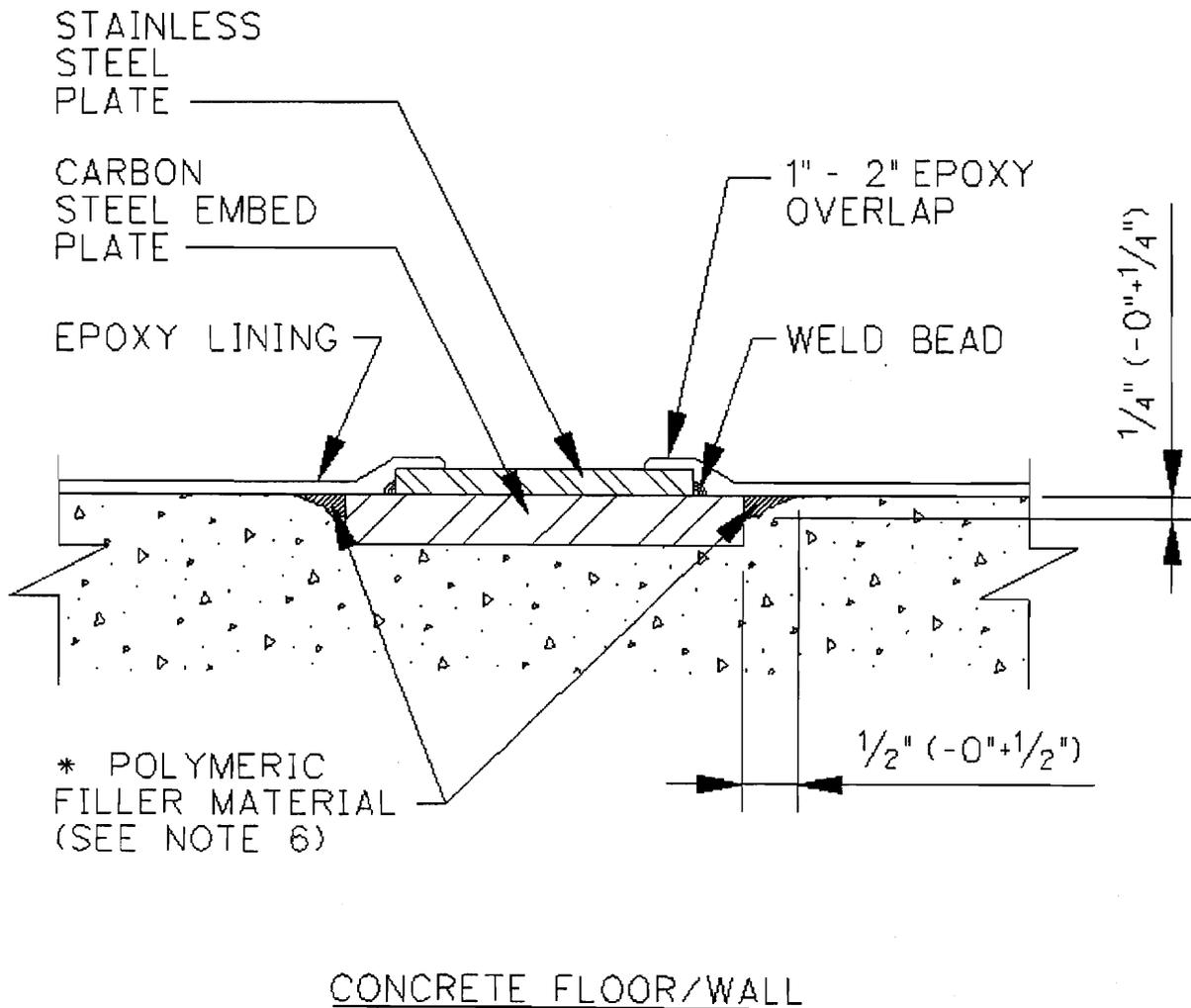
INSTALLATION DETAIL 5B - EMBED PLATES
WITH STEEL ATTACHMENT



INSTALLATION DETAIL 6 - PERIMETER KEY



INSTALLATION DETAIL 7 - FLOOR OR WALL STEEL
EMBED WITH STAINLESS STEEL PLATE OVERLAY



Appendix J

Interface Installation Detail Drawing References

The table below lists the drawing numbers for Secondary Containment Interface Installation Details. The latest issued revision of these drawings shall be used.

DRAWING NO.	DRAWING TITLE
24590-WTP-DD-S13T-00050	Civil/Structural Standard Secondary Containment Coating Details Electrical Interfaces
24590-WTP-DD-S13T-00051	Civil/Structural Standard Secondary Containment Coating Details Embedment Interfaces
24590-WTP-DD-S13T-00052	Civil/Structural Standard Secondary Containment Coating Details Steel Interfaces
24590-WTP-DD-S13T-00053	Civil/Structural Standard Secondary Containment Coating Details Concrete Interfaces
24590-WTP-DD-S13T-00054	Civil/Structural Standard Secondary Containment Coating Details Mechanical Interfaces
24590-WTP-DD-S13T-00056	Civil/Structural Standard Secondary Containment Coating Details Commodity Support Interfaces