6.1 ENGINEERED SAFETY FEATURE MATERIALS

6.1.1 METALLIC MATERIALS

6.1.1.1 Materials Selection and Fabrication

Materials for ESF systems' components are selected to withstand the environmental conditions listed in Section 3.11. All applicable materials are in accordance with ASME Code Section III, Articles NC-2160 and NC-3120, and ASME Section II Parts A and B. The pressure retaining materials of the ESF systems are specified in Table 6.1-1.

Materials located inside the containment, which are exposed to boric acid containment spray solution following a LOCA, are indicated on Table 6.1-2. These materials are compatible with this solution.

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All materials used on Class I and Class II Main Steam and Feedwater Systems on the Waterford 3 Project were impact tested except for those components exempted by paragraphs NB-2311 or NC-2311. The Containment Spray, Component Cooling Water, Safety Injection, and Emergency Feedwater Piping Systems utilize austenitic stainless steel, carbon steel with diameters of six (6) inches or less and carbon steel greater than six (6) inches in diameter having wall thickness of 5/8" or less. These systems are exempt from impact testing under ASME Section III rules.

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For the carbon steel components (safety injection tanks, and shutdown heat exchangers) constructed of ASME SA-516 Gr7O materials designed to ASME Section III, fracture toughness testing was not required on the basis that ASME VIII, Division 2, allows the exemption with less stringent design stress limits. The primary membrane stress limits of ASME Section III, NC, are lower than those of Section VIII, Division 2. The exemption from fracture toughness testing is provided in Figure 218.1 and Table ACS-1 of ASME Section VIII, Division 2.

The ESF systems meet the intent of Regulatory Guide 1.44, "Control of the use of Sensitized Stainless Steel" (May, 1973). The following requirements for preventing intergranular corrosion of stainless steel components are included in the materials specifications:

a) All seamless steel pipe and fittings, electric arc welded steel plate, pipe and fittings, forged materials and castings are in the solution annealed condition. Manufacturers are required to control the temperature, holding time and cooling rate so that the material can be accepted under Practice E of ASTM A-262-70, "Copper-Copper Sulfate-Sulfuric Acid Test" and to optionally screen the material by Practice A, the "Oxalic Acid Etch Test." The tests are performed on a production basis for pipe and fittings which are above two in. wall thickness or which are not quenched in water. One test per heat for each heat treatment lot is required to test materials in accordance with Practice E of ASTM A-262-70, "Copper-Copper Sulfate-Sulfuric Acid Test" optionally screened by Practice A, the "Oxalic Acid Etch Test." The test is performed on a minimum of one test per heat for each heat treatment lot of a given casting configuration.

b) All stainless steel components are cleaned, descaled, pickled and passivated to requirements which will protect against contaminants capable of causing stress corrosion cracking.

c) Castings contain a minimum of five percent ferrite as determined by test report chemical analysis applied to the Schaeffler Constitution Diagram or by metallographic means.

d) Base metal is cleaned prior to and after welding to remove contaminants capable of causing stress corrosion cracking. Grinding wheels and brushes used on this material are used only on stainless steels.

e) The interpass temperature for austenitic materials does not exceed 350°F.

6.1.1.1.1 Control of Delta Ferrite

The following recommendations of Regulatory Guide 1.31 "Control of Stainless Steel Welding" (August 11, 1972), are used as a means of controlling delta ferrite:

a) Austenitic stainless steel filler metals are purchased to the acceptance test requirements of Section III of the ASME Boiler and Pressure Vessel Code. Purchase orders specified an additional requirement, i.e., that austenitic stainless steel filler metals, other than SFA-5.4 Type 16-8-2, should have a chemical analysis which would cause five to 20 percent ferrite to be present in undiluted weld deposits.

b) Flux bearing filler metals are tested for ferrite yield by chemical analysis using material obtained from all weld metal test samples. Bare filler metals, to be deposited by inert gas shielded processes have ferrite yield predicted from wire analysis. The analyses results are applied to the Schaeffler Constitution Diagram for ferrite determination.

c) All weld metal test samples, required for flux bearing filler metals, are produced according to the method described in the ASME Specification SFA-5.4. The acceptable ferrite range for all filler metals are five to 20 percent. ASME SFA-5.4, Type 16-8-2, is excluded from this requirement.

d) The filler metal suppliers made chemical analysis tests, using material samples as required by the filler metal type. The analytical results are applied to the Schaeffler Constitution Diagram for ferrite determination.

e) The results of the analytical tests required by Paragraphs "b" and "c" above are included in a Certified Materials Test Report, per the requirement of the ASME code, Section III, NB-2130. The results of the ferrite determination are also included in the Certified Test Report. A copy of this Certified Material Test Report is provided as part of the documentation package.

→(EC-2800, R307)

(The replacement CEDMs adhere to the provisions of Reg. Guide 1.31 Rev. 3, which supersedes earlier revisions and BTP MTEB 5-1.)

←(EC-2800, R307)

f) Production welds, including repair welds, (with the exception of fillet welds having a throat dimension of 3/8 in. or less) in material greater than one inch nominal thickness are tested on a 100 percent basis for ferrite using magnetic permeability measuring equipment. The instruments are to be calibrated from, or traceable to, those of the National Bureau of Standards, to the procedures described by the American Welding Society (AWS) Welding Research Document, dated July 1, 1972, "Calibration Procedures for Instruments to Measure Ferrite Control of Austenitic Stainless Steel Weld Metal," as supplemented by AWS Specification A 4.2-74. Calibration of the instruments is performed on a weekly basis.

g) Magnetic testing for ferrite is performed about the circumference of pipe welds at 90 degree or 1/4 weld length intervals on the weld centerline. The minimum required ferrite level, averaged over four readings, must be three percent. The four ferrite determinations are not to include any ferrite values below one percent.

h) In the event the acceptable ferrite criteria is not met, a comparison of the welding service requirements is made relative to the ASME criteria for fatigue strength. Conservative fatigue data representing weld metal containing fissures is used, when available, to enhance the low ferrite bearing weld metal.

i) If fatigue data is not available, low ferrite welds are examined for fissures. The test sample is a highly restrained flat position welded butt joint four by four by one in. thick, produced with those filler metals and using the parameters employed in the production weldment. The finished weld is sectioned at mid-length and one cut surface examined at 10 times magnification. A single tear or fissure defect less than 1/16 in. or a maximum of three defects, 1/64 to 1/16 in. in length, within any 0.2 sq. in. area of weld metal is acceptable.

j) Those welds found unacceptable by the simulated weld tests of "i" are removed and rewelded.

k) Production welds (with the exception of fillet welds having a throat dimension of 3/8 in. or less) in the material nominal thickness range greater than 3/8 in., to and including one in., are tested on a sampling basis according to Table II of MTEB 5-1, "Interim Regulatory Position on Regulatory Guide 1.31," (November 24, 1975).

   Procedures and acceptance criteria for acceptable ferrite in the material thickness range greater than 3/8 in., to and including one in., are the same as for material greater than one in. thickness. Subsequent to July, 1978, the recommendations of Regulatory Guide 1.31, Revision 3, (April, 1978) were followed primarily on erection work.

6.1.1.1.2 Cold Worked Stainless Steel

Cold worked stainless steel is not used for ESF components.

6.1.1.1.3 Cleaning and Handling

For cleaning and handling of all ESF components, all recommendations of Regulatory Guide 1.37 "Quality Assurance Requirements for Cleaning of Fluid Systems and Associated Components of Water-Cooled Nuclear Power Plants" (March, 1973) and ANSI N45.2.1-73 "Cleaning of Fluid Systems and Associated Components for Nuclear Power Plants" are complied with.

There is no low alloy steel utilized for any ESF component. Therefore, Regulatory Guide 1.50, "Control of Preheat Temperature for Welding of Low Alloy Steel" is not applicable.

Compliance with Regulatory Guide 1.71, "Welder Qualification for Areas of Limited Accessibility" (December, 1973) was not specified in Waterford 3 equipment specifications for shop fabrication of any ESF component. Due to the availability of positioning equipment in the shop and the capability of manufacturing organizations to structure their operation to provide optimum welder accessibility, limited accessibility is considered to be minimal. However, the following were imposed for field welding:

a) Waterford 3 piping systems design takes cognizance of welder accessibility at piping joints. This control is augmented by a systematic plan for piping site erection sequence. The normal annular space requirement for welder accessibility is greater than 12 in. The standard ASME Section IX welder performance qualification test procedure is considered adequate for those production conditions which limit welder accessibility at the joint to 10 in.

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A limited access test requirement is imposed for any joint where accessibility is below 10 in. for more than 30 degrees about the circumference, simulating the conditions of the production joint. The material for this test is 0.5 in. thick with the test weldment to be evaluated radiographically to the criteria for the production joint. A welder, whose performance qualification test has been accepted and has incorporated the restriction requirements, is not required to requalify if there is a change in the restriction limitations imposed by the production weld joints.

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b) A limited access test is conducted simulating production conditions according to the above item "a".

c) Welder performance test requalification is required when the essential variables listed in ASME Section IX for the performance test are changed.

d) Adherence to production welding performance qualification test requirements is monitored by the maintenance of a welding procedure qualified welders list, to assure that welders are properly qualified to specific welding procedures. This program also assures that the qualification status is current, requiring requalification when the 6 month period, specified by ASME Section IX for qualification validity, has expired.

All components are required to be free of sand, hard scale, rust, organic matter, weld splatter, dirt or any other foreign material before being shipped to the site. The following cleaning procedure was required for austenitic stainless steel components.

Scale that results during piping system fabrication may be removed by blast cleaning, pickling, or power or hand brushing as described herein. Removal of surface scale of any foreign matter shall be in accordance with ASTM A-380, "Descaling and Cleaning Stainless Steel Surfaces," excluding Paragraphs 4 (b) (1), (2), (3) and (4). Pickling, in accordance with Paragraphs 4 (b) (5), shall be limited to a maximum of 10 minutes for each submersion at room temperature. For solution temperatures greater than 100°F, the submersion time is limited to a maximum of three minutes for each submersion. The total number of submersions at any temperature is limited to a maximum of six. Iron or steel grit (or shot) are not employed.

Hydrochloric Acid is not used in any cleaning solution. Cleaning materials should not contain chloride ions in excess of 20 ppm. Where trichlorethylene is used for cleaning or degreasing, the parts are thoroughly dried before they are dipped into water-rinsing solutions. As an alternate to blast cleaning, as covered in ASTM A-380, it is permissible to use clean austenitic stainless steel brushes, not previously used on other nonstainless material, to clean surfaces by hand or power driven techniques.

6.1.1.1.4 Non-Metallic Insulation

All non-metallic insulation materials installed on stainless steel piping and equipment of the ESF are made of calcium silicate, expanded pearlite, fiberglass fiber, or similar materials and are consistent with the recommendations of Regulatory Guide 1.36, "Nonmetallic Thermal Insulation for Austenitic Stainless Steel" (February 23, 1973).

6.1.1.1.5 Shipping and Corrosion Protection

All weld ends, flanges and other parts of piping are capped or sealed to protect against dirt or damage during transit or outdoor storage. All machined weld end preparations are protected by using a metal cap with 1/4 in. thick plywood liner disc held securely against the beveled ends. All other weld ends are protected by a metal cap without the liner disc. Austenitic stainless steel flanges are protected by plywood discs affixed and wrapped in kraft paper.

Internal and external surfaces of stainless steel piping are not coated. Hanger and restraint clamps on insulated as well as uninsulated piping are prime coated with 1-2 mil dry film thickness of Dimetcota E-Z. Top coat is given in the field.

All carbon steel surfaces of the containment fan coolers are sand blasted in accordance with steel structures Painting Council Specification SSPC-SP10, (1963 with changes made in 1967 and 1971) and painted with the following protective coatings:

Primer Coat	Amer Coat 71	2-4 mils DFT
Top Coat	Amer Coat 90	5-7 mils DFT

The protective coatings are applied in compliance with the recommendations of Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water Cooled Nuclear Power Plants" (June, 1973). The coatings will withstand a temperature up to 350°F and are compatible with the containment spray solution.

The galvanized steel duct work which is part of the Containment Cooling System has high corrosion resistance and is compatible with the containment spray solution.

All duct work welding was initially performed in accordance with the requirements of AWS D1.1-75 structural welding code. Prequalified welding procedures conforming to Paragraph 1.3 of AWS D1.1 were used for carbon steel and galvanized steel. As of June 1995, duct work sheet metal welding is performed in accordance with AWS D9.1

6.1.1.2 Composition, Compatibility, and Stability of Containment and Core Spray Coolants

Borated water spray is used to cool the containment environment in the unlikely event of an accident. Two chemicals are used in the cooling water for post accident iodine retention and pH adjustment. They are boric acid and trisodium phosphate dodecahydrate (TSP) respectively.

→(DRN 03-2060, R14)
A boric acid solution is maintained in the refueling water storage pool (RWSP) for the injection phase of Containment Spray and Safety Injection Systems. The concentration of boric acid in the RWSP is maintained operable between 2050 and 2900 ppm. The solution has a pH of approximately 5.0. The RWSP is lined with stainless steel and is not subject to significant corrosion from borated water. The dilute boric acid solution stored at atmospheric pressure in the RWSP is stable for extended periods under these conditions.
←(DRN 03-2060, R14)
Borated water is also stored in the stainless steel lined safety injection tanks. Operating experience and tests show that no significant corrosion of the tank lining will occur.

Long-term chemistry control of the recirculated solution is accomplished by the pH Control System discussed in Subsection 6.1.3. This system is provided to avoid the stress-corrosion cracking of austenitic stainless steel by maintaining SIS sump pH greater than 7.0 and to avoid excessive generation of hydrogen by corrosion of metals.

6.1.1.2.1 Compatibility of ESF Materials

All materials for ESF components which are in contact with the containment spray water are listed in Table 6.1-2. These materials of construction are considered compatible with the spray solutions as described below:

a) All austenitic stainless steel and galvanized steel are not subject to significant corrosion in borated water.

b) Carbon steel components, including weld metal and hangers, are coated with protective coating systems which meet the intent of the recommendations of Regulatory Guide 1.54.

6.1.2 ORGANIC MATERIALS

Many organic materials in common industrial use may deteriorate in the post accident environment and contribute substantial quantities of solids and residue to the containment sump. Some organic materials could possibly interact with engineered safety features materials. However, all organic materials used in significant quantities inside the containment can withstand the design basis accident conditions.

6.1.2.1 Protective Coatings

The protective coating materials used in significant surfaces of Service Level I Areas (inside the steel containment vessel) meet the requirements of the ANSI Standards N5.12, "Protective Coatings (Paints) for the Nuclear Industry," dated June 20, 1974, and N101.2, "Protective Coatings (Paints) for Light Water Nuclear Reactor Containment Facilities," dated May 30, 1972. Service Level I Areas are defined as those areas pertaining or related to systems and components which are essential to the prevention or mitigation of consequences of the postulated accident conditions for the station involving health and safety of the public. Significant areas include:

a) Steel containment vessel plate (inside),

b) Concrete surfaces inside primary containment vessel floors, walls, ceilings, columns, equipment pedestals, etc.,

c) Piping and equipment installed inside the containment,

d) Containment structural steel, and

e) Miscellaneous steels.

A list of surface coatings, areas, locations, and quantities are given in Table 6.1-3.

The coating systems meet the decontaminability requirements of the plant. Surface areas of concrete and all masonry, and significant areas of steel received protective coatings which have been successfully tested under design basis accident conditions at independent laboratories or at the coating manufacturer’s laboratories.

Stability, radiation, chemical and fire effects were evaluated in accordance with the requirements of the ANSI Standards N5.12 and N101.2. Flame spread rate, fuel contribution and smoke density are determined to assure that the combustible gas sources are at acceptable minimum level in accordance with ANSI Standards. Quality assurance during manufacturing, transportation and storage for field coating work are in compliance with ANSI Standard N101.4, "Quality Assurance for Protective Coating Applied to Nuclear Facilities," dated November 1972, in conjunction with general QA requirements of ANSI N45.2. Significant equipment and structures located inside the containment which were purchased subsequently to LP&L’s commitment (March 1975) to the NRC Green Book, WASH-1309, meet the intent of Regulatory Guide 1.54, Quality Assurance Requirements for Protective Coating Applied to Water Cooled Nuclear Power Plants, June 1973. In addition, where feasible, purchase orders placed prior to the March 1975 commitment date were revised in a way to insure partial or total compliance to an extent they were economically feasible. The only source of coatings subject to jet impingement on containment spray and purchased prior to the issuance of Regulatory Guide 1.54, June 1973, is provided in Table 6.1-5. Where changes were not feasible on purchase orders placed prior to the date above, review on an individual basis was made, all conditions evaluated and a judgment made of each intended function and physical location within the containment. Evaluation and subsequent judgment are applicable mainly to ferritic steels. Partial compliance was evaluated on basis of shop coating materials used, compliance with all manufacturer’s recommendation for application, suitability of the coating system for the functional purpose, retrievability of any materials and application records, surface area involved.

The review on an individual basis was judged suitable under the following categories (this applies only to ferritic steels).

a) Compliance with ANSI Standards N101.2 and N5.12 but not full compliance with ANSI N101.4. This means that all coating materials used had been DBA tested and qualified but the shop application had not been required to be subject to QA.

   Written statement of application in accordance with the manufacturer's recommendation could be obtained. Application procedure has been reviewed and approved.

b) Partial compliance with ANSI Standards N101.2, N5.12, and N101.4. In this category, materials used were DBA tested and qualified but did not have retrievable manufacturer records. Shop and field application had not been subject to QA, as per the Purchase Order. Verbal statement of compliance with the manufacturer's recommendation have been obtained. Shop and field application procedure had been reviewed and approved. Subsequent repair and touch-up work comply with ANSI Standards N101.2, N5.12, and N101.4.

c) Materials used for specific equipment were not DBA tested and did not require QA compliance. However, materials were adequate for the intended function as recommended by the manufacturer. Application in the shop was done in accordance with a written procedure as submitted for review and approval.

<u>Statements of Compliance</u>

Compliance in accordance with categories a and b above was judged satisfactory because materials, systems, and application was under reasonable assurance that basic requirements had been met.

Compliance in accordance with item c was judged satisfactory because only minor items fall into this category.

Any presently unaccounted significant area failing under category c undergoes an evaluation as soon as such equipment is delivered to the site. Such an evaluation could result in removing the existing unqualified coating and reapplying qualified coating systems in accordance with Reg. Guide 1.54. As a result of this continuous evaluation and recoating program, only miscellaneous insignificant surface areas scattered, within the Reactor Containment Vessel will represent this category. Because these areas are small and scattered, they do not represent any significant concentration in one area of eventual removed material by DBA, assuming these coatings could be removed under such conditions. In addition, there is no indication that any of these unqualified materials will have adverse interactions with engineering safety features as a result of materials released by radiation, decomposition on chemical reaction in the post accident environment.

The Table below relates equipment's and/or structures subject to their categories.

Equipment and/or Structure	Categories
Containment Vessel Steel Plate (Inside)	a
Containment Structural Steel	b
NSSS Equipment (not under thermal insulation)	b and c

While no chemical precipitation of appreciable sized particles is expected, any precipitation that might occur will settle at the bottom of the Safety Injection System sump or be trapped by grating or the sump screens. This is further discussed in Subsection 6.2.2.

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6.1.2.2 Insulation

Insulation used to cover the piping and mechanical equipment inside the containment is either reflective metallic type, glass wool fiber totally encapsulated in metal jacketing, or thermal wrap blanket. Thermal wrap blanket insulation qualified per Reference 1 may not be jacketed. For jacketed applications, jacketing covers the entire length of insulation including valves and fittings. Other than thermal wrap blanket insulation qualified per Reference 1, there is no exposed insulation to react with the borated water.

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A major portion of cabling insulation is contained inside the jacketing material. The jacketing material used is either hypalon-chlorosulphurated polyethylene or neoprene. All exposed insulation is comprised of EPR-ethylene propylene rubber or XLPE cross linked polyethylene. Both the jacketing and the exposed insulation are qualified to the post accident conditions given in Section 3.11.

6.1.2.3 Other Organic Materials

Plastic and wood are present in the containment in a very insignificant amount. The major lubricant present in significant amount is the lube oil associated with the reactor coolant pumps. Approximately 160 gallons of oil is present in each reactor coolant pump's lube oil system (total of 640 gallons). This oil is contained in a closed system and is not exposed to the containment spray. Asphalt is not used inside containment.

6.1.2.4 Effects of Debris on SIS Sump Performance

→(DRN 06-1026, R15; EC-999, R302)

See Section 6.2.2.2.2.1.

←(DRN 06-1026, R15; EC-999, R302)

SECTION 6.1.2: REFERENCES

1) Topical Report OCF-1, Nuclear Containment Insulation System, on file with U.S. Nuclear Regulatory Commission.

6.1.3 POST ACCIDENT CHEMISTRY

→(DRN 04-705, R14)

A post accident pH control system is provided in order to reduce the possibility of chloride stress corrosion and to prevent re-evolution of iodine in SIS sump water. Sufficient trisodium phosphate dodecahydrate (TSP) is stored in the containment to raise the SIS sump pH to a value greater than or equal to 7.0 following a design basis LOCA. The TSP is stored in 33 stainless steel baskets on the -11' MSL elevation. 15 of the baskets are the original baskets measuring 3'-0" long x 1' wide x 3'-0: high each. The remaining 18 baskets, installed during Refuel 8, measure 3'-0: long x 1'-6" wide x 4'-0" high each. A minimum total of $380ft^3$ of TSP is required to achieve a post-LOCA SIS sump pH of 7. The baskets are constructed of stainless steel angles, stainless steel plates at top and bottom, and stainless steel wire mesh on the four vertical sides. The construction is all welded with a hinged top plate to allow for TSP surveillance inspection.

←(DRN 04-705, R14)

Borated water from various sources, e.g., the ECCS and containment spray, will submerge the TSP baskets at elevation -11.00' and dissolve the TSP. With one ECCS train operating, the TSP will dissolve during the injection phase and mixing is achieved as the solution is continuously recirculated from the sump to the spray nozzles. All TSP will be dissolved within three hours following CSAS. There are no significant quantities of acids or bases inside the containment which could affect the SIS sump pH.

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TABLE 6.1-1 (Sheet 1 of 2)

PRINCIPAL ESF PRESSURE RETAINING MATERIALS

PRODUCT FORM	ASME SPECIFICATIONS
Plate	SA 285 GR C
	SA 515 GR 55
	SA 515 GR 70
	SA 516 GR 70
	SA 240 TP 304, TP 304L
	SA 240 TP 316, TP 316L
Forgings	SA 181 GR I, GR II
	SA 105 GR 2
	SA 182 F6
	SA 182 F304, F 304L
	SA 182 F316, F 316L
	SA 638 GR 660
Castings	SA 216 GR WCB
	SA 351 CA 15
	SA 487 GR CA6 NM
	SA 351 CF8 CF 8M
Pipe	SA 106 GRB
	SA 312 TP 304, TP 304L
	SA 312 TP 316, TP 316L
	SA 358 TP 304, Class 1
	SA 376 TP 304, TP 316
	SB 111
	SB 167
	SA 358 GR TP 316 Class 2
Tube	SA 249 TP 304
	SA 213 316SS, TP 304
	SB 167
Bar	SA 479 TP 304, TP 304L
	SB 166
	SA 479 TP 316, TP 316L
	SA 638 GR 660
Bolting	SA 193 GR B7, GR B8, GR B8M
	SA 453 GR 660
	SA 307 GR B,
	SA 325
	SA 449
	SA 564 Type 630 H100

TABLE 6.1-1 (Sheet 2 of 2)

PRINCIPAL ESF PRESSURE RETAINING MATERIALS

PRODUCT FORM	ASME SPECIFICATIONS
Nuts	SA 194 GR 2H, GR 8 SA 194, GR 8M, GR 6 SA 453 GR 660
Weld Filler Metals	SFA 5.1 Class E 7015 Class E 7016 Class E 7018 SFA 5.4 Class E 308-15 308-16 308L-15 308L-16 309-15 309-16 316-15 316-16
	SFA 5.9 Class ER 308 ER 308L ER 309 ER 316 SFA 5.11 Class E Ni-Cr-Fe-3 SFA 5.14 Class ER Ni-Cr-3 SFA 5.17 Class EH 14 SFA 5.18 Class ER 7OS-3 ER 70S-6 ER 70S-2

TABLE 6.1-2 (Sheet 1 of 2)

ENGINEERED SAFETY FEATURES STRUCTURAL MATERIALS
THAT COULD BE EXPOSED TO CORE COOLING WATERS
OR CONTAINMENT SPRAY

PRODUCT FORM	ASTM/ASME SPECIFICATIONS
Pipe	A/SA 376 GR TP 304, TP 316 A/SA 312 GR TP 304 A/SA 358 GR TP 304 Class 1 A/SA 358 GR TP 316 Class 2 A/SA 312 TP 316 A/SA 53 (painted)
Forgings	A/SA 181 GR I A/SA 181 GR II A/SA 182 GR F 304 A/SA 182 GR F 316, GR F 316L A/SA 105 G2 (painted)
Casting	A/SA 351 GR CF 8 A/SA 351 GR CF 8 M
Plate	A 570 GR D A/SA 283 GR C A/SA 283 GR D A 284 GR C A 284 GR D A 666 A/SA 516 GR 70 (painted) A/SA 36 (painted)
All Structural Shapes except Steel Plate	A/SA 36
Galvanized Steel Plate	A 526* A 527*
Bolts	A/SA 193 GR B7 A/SA 193 GR B8, GR B8M A/SA 307 GR B A/SA 325 A/SA 449 A/SA 453 GR 660 SA 564 Type 630 Type H100

* Galvanized steel sheet is coated with ASTM A-525 Coating G-90 (see Subsection 6.1.2)

TABLE 6.1-2 (Sheet 2 of 2)

ENGINEERED SAFETY FEATURES STRUCTURAL MATERIALS
THAT COULD BE EXPOSED TO CORE COOLING WATERS
OR CONTAINMENT SPRAY

PRODUCT FORM	ASTM/ASME SPECIFICATIONS
Nuts	A/SA 194 Grade 8, GR 8F A/SA 194 Grade 2H, GR 6
Bar	B/SB 166

TABLE 6.1-3 Revision 10 (10/99)

COATING MATERIALS IN THE CONTAINMENT

SURFACE TO BE COATED	COATING CODE (1)	SYSTEM(S) PRIMER AND TOPCOAT .	THICKNESS (MILS) (2)	APPROXIMATE AREA IN. SQUARE FT.	APPROXIMATE VOLUME IN U.S. GALLONS (3)	DRY DENSITY IN LB MASS PER U.S. GALLONS	APPROXIMATE WEIGHT IN POUNDS .
Concrete walls and equipment pedestals inside Primary Containment	D-3	Nu-Klad 114 and	31-94	58,300	405	10.9	4,415
		Amercoat 66	4-6	58,300	500	11.0	5.500
Concrete floors inside Primary Containment	D-4	Nu-Klad 11OAA and	31-94(sump) 94-156(floors)	24,524	311	16.2	5,050
		Amercoat 66	4-6	24,524	210	11.0	2,313
Carbon Steel exposed to Primary Containment Atmosphere - Uninsul-ated piping, structural main equipment	M-4 and M-5	Dimetcote F-Z	2-7	275,825	740	16.0	11,840
		Dimetcote 6	2-7				
		Amercoat 71 and	2-18		2,216	11.0	24,376
		Amercoat 90	5-11	275,825	2,500	11.0	27,500
Containment vessel plates	M-4 and	CarboZinc 11	2-5	91,900	500(4)	21.3	10,650
		Carboline 191 and	3.5-7				
	M-5	Phenoline 305	5-7	91,900	560(4)	11.0	6,160
Miscellaneous touch up on galvanized steel	M-4 and M-5	ZRC cold galvanizing compound	3-4	8,000	16	17.8	284

NOTES:

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1. COATING CODES
   D-3 - No foot or rubber wheel traffic. High chemical, radiation, impact and abrasion resistance and subject to Design Basis Accident Conditions.
   D-4 - Heavy foot and rubber wheel traffic in addition to conditions described in D-3 above.
   M-4 - Nonimmersion steel subject to continuous weathering, industrial exposure and abrasion, subject to & continuous temperatures up to 750°F. All subject to Design Basis Accident Conditions.
   &
   M-5 – Nonimmersion steel surfaces subject to continuous weathering, industrial exposure and abrasion. Will withstand radiation and design basis accident conditions and temperatures up to 350°.
2. One mil equals one thousandth of an inch.
3. Estimated to completion.
4. 100 percent completed

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TABLE 6.1-4

CONTAINMENT COATING MATERIAL ASSUMED TO FAIL

Coated Surface	Primer and Topcoat *	Thickness (mils)	Dry density (lbm/gal)	Approximate Area (sq ft)
Carbon steel exposed to primary containment atmosphere-uninsultated piping, structural main equipment	Dimetcote E-Z	2-7	16.0	275,825
	Dimetcote 6	2-7	16.0	
	Amercoat 71	2-18	11.0	
	Amercoat 90	5-11	11.0	
Containment vessel dome and liner plates	Carbozinc 11	2-5	21.3	91,900
	Phenoline 305	5-7	11.0	
	Carboline 191	3.5-7	11.0	
Miscellaneous touch up on galvanized steel	ZRC cold galvanizing compound	3-4	17.8	8,000

* Dimetcote E-Z, Dimetcote 6, Amercoat 71, Carboline 191, and Carbozinc 11 are Primers; Amercoat 90 and Phenoline 305 are Topcoats. Only one primer was used on any surface in preparing a surface for the application of a topcoat.

TABLE 6.1-5

WATERFORD SES UNIT NO. 3 - UNQUALIFIED COATINGS
SUBJECT TO JET IMPINGEMENT AND/OR CONTAINMENT SPRAY
AND PURCHASED PRIOR TO THE ISSUANCE OF REGULATORY GUIDE 1.54, JUNE 1973

ITEM*	SURFACE AREA (SQ. FEET)
1. CSRR Series Hangers	1.2
2. Supports	1.0
3. Whip Restraints	8.0
4. Polar Crane	15.0
5. Unistrut Stock Steel	33.2
6. Steam Generator Framing & Steam Generator Mountup Brackets	2.0
7. Elevator Screens	1.0
8. Valves (4)	15.3
9. RCP Motor (& Skirts)**	5872
10. ZRC Organic Zinc Primer for Touch Up of Galvanized Surfaces***	8000
TOTAL	13,948.7

* Dry film thickness values based on usual coating practices.

** Film thickness is 6 mils thick.

*** Film thickness is 3.5 mils thick.