

HARRY H. HENNING

ATTACHMENT No. 3

UNITED ENGINEERS & CONSTRUCTORS INC.
GENERAL CONSTRUCTION AND
QUALITY CONTROL PROCEDURES
FOR
STRUCTURAL CONCRETE

QUALITY CONTROL PROCEDURE NO. 1

Construction Specification
Gilbert Associates, Inc.
SP 5406

Revision ² ~~X~~: NOVEMBER 7, 1968
~~AUGUST 30, 1968~~

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I. GENERAL

- A. Responsibility - The prime responsibility for the Quality Control Program and development and implementation of Quality Control Procedures for the Three Mile Island Nuclear Station - Unit No. 1 rests with the Construction Manager, United Engineers & Constructors Inc. (UE&C).
- B. Independent Testing Agency - United Engineers & Constructors will retain the services of an independent testing agency (T.L.) to perform the necessary inspections and tests required within the scope of these procedures. The activities of the T.L. will be under the direction of the UE&C Field Supervisor - Quality Control in matters relating to scope of duties and project policies. The T.L. shall act within themselves in matters relating to daily procedural activities.

The T.L. shall have sufficient personnel and equipment available at the project site in order to effectively, promptly, and accurately carry out the routine duties prescribed within these procedures. (NOTE: Any work performed by the T.L. off site will be only as authorized by the Field Supervisor - Quality Control.)

- C. Reports and Records - Reports generated by the T.L. will be as required within the following specific procedures. These reports will be submitted to the Field Supervisor - Quality Control and will become a part of the permanent Quality Control file. Copies of the reports will be distributed to the Engineer and the Owner as required.

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I. GENERAL (Continued)

- D. Scope - For purposes of licensability these procedures will apply to the concrete, concrete operations, reinforcing steel, and structural fill work within the Class I areas (those areas which have a first order effect on nuclear safety).

II. PROCEDURES

A. Preliminary Tests

1. Concrete Aggregates - The T.L. shall visit suggested sources for fine and coarse aggregates and obtain samples of each proposed aggregate size for preliminary testing and approval. Testing methods and acceptance standards shall be as follows:

<u>Test</u>	<u>Method</u>	<u>Acceptance Standard</u>
Sampling	ASTM D75-59	-
Gradation - Sand	ASTM C136-63	PDH, Form 408
Gradation - Stone	ASTM C136-63	PDH, Form 408
Mortar Strength - Sand	ASTM C87-63T	PDH, Form 408
Sodium Sulfate Soundness	ASTM C88-63	PDH, Form 408
Los Angeles Abrasion - Stone	ASTM C131-66	PDH, Form 408
Material Finer than No. 200 Sieve	ASTM C117-66	PDH, Form 408
Organic Impurities - Sand	ASTM C40-66	PDH, Form 408

In addition, the following tests may also be performed to give necessary information concerning the proposed aggregate, however, the basis for selecting aggregate shall not be limited to the results of these tests.

<u>Test</u>	<u>Method</u>
Petrographic Examination	ASTM C295-65
Fineness Modulus	ASTM C125-66
Unit Weight	ASTM C29-60
Specific Gravity and Absorption	ASTM C127-59 and C128-59

2. Cement - The T.L. shall obtain samples of the cement proposed for use in the project. Chemical and physical analyses of the samples shall be performed to determine compliance with the following test methods specified in ASTM C150-66 for Type II cements:

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II. PROCEDURES (Continued)

A. Preliminary Tests (Continued)

2. Cement (Continued)

<u>Test</u>	<u>ASTM Method</u>
Sampling	C183
Chemical Analysis	C114
Fineness by Air Permeability	C204
Autoclave Expansion	C151
Time of Setting	C266
Air Content of Mortar	C185
Compressive Strength	C109
Tensile Strength	C190

3. Mix Designs - All materials used shall be tested as specified above and shall meet the specification requirements and be approved in writing by the Engineer. Proportions for the concrete mixes shall be determined by Method 2 of Section 308 of ACI 301-66 to comply with the project design strengths specified in SP 5406.

- a. In addition to the above requirements, the maximum water-cement ratio and maximum total water content of any mix shall be as shown on the approved design mix.
- b. Slump for structural concrete shall not exceed four inches or be less than one inch. Structural concrete with slump not within these limits shall be rejected.
- c. Structural concrete shall be air-entrained with chemical admix conforming to ASTM C260-66T. Entrained air content shall be limited per aggregate sizes as follows:

<u>Nom. Max. Size</u> <u>Coarse Aggregate</u>	<u>Air Content</u> <u>% by Volume</u>
1/2"	5-9
3/4"	4-8
1-1/2"	3-6

- d. A retarding, water reducing densifier conforming to ASTM C494-65T, Type D and containing no calcium chloride shall be used with all 3000 psi and 5000 psi structural concrete.

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II. PROCEDURES (Continued)

A. Preliminary Tests (Continued)

3. Mix Designs (Continued)

- e. Results of the design mixes with recommended final mix proportions shall be presented to the Engineer for approval.

4. Reinforcing Steel - Mill test reports of chemical and physical analyses shall be furnished for all reinforcing steel received on the site.

- a. Mill test reports shall be reviewed for conformance to the following specification requirements:

Up to size #11 bars - ASTM A15
Size 14S and 18S bars - ASTM A408

- b. UE&C Quality Control personnel shall select from each heat and size of rebar received at the site, two specimens per sample lot for testing to determine the yield point, ultimate strength and percent elongation. These rebar tests will be termed "User Tests" and calculations shall employ the actual measured cross sectional area of the specimen and not the nominal area. A sample lot is defined as material of one heat weighing 25 tons or less. | 1.
- c. When a failure is noted in the User Tests, resampling will be conducted on twice the number of samples as originally selected and tested. When all of the resamples pass, the lot represented by the sample shall be considered acceptable. Only two resamplings of a lot will be permitted. Failure of the second resamples shall be cause for rejection of the represented lot.
- d. Reinforcing steel, when received, is bundled and metal-tagged by heat and size. Bars remain so bundled and tagged until User Tests are complete and results found acceptable. Then, and only then, are the tags and straps removed and the material released for construction. No tagged steel (indicative of "tests still unresolved") will be released for construction. Any steel which does not pass inspection or test requirements will be immediately removed from the site. A storage yard log is maintained showing material received, sampled, tested, and accepted for use. The log is kept up to date by information supplied by the Field Supervisor - Quality Control and is audited by the Quality Control group.

II. PROCEDURES (Continued)

A. Preliminary Tests (Continued)

5. Welded Wire Fabric

- a. Mill test reports will be required on welded wire fabric which shall conform to ASTM A185-64.
- b. Tensile and bending properties shall conform to ASTM A82.

6. Cadweld Splices

- a. Reinforcing steel bars larger than #11 shall be spliced with the "Cadweld" process.
- b. Mill test reports for splicing sleeves and powder will be required and reviewed for compliance with Specification requirements. Rejected material will be returned to the Vendor or otherwise removed from the site.
- c. Prior to production work, the operator designated to perform "Cadweld" splicing will be qualified by preparing a test joint for each bar size and position he will be required to splice. These test joints will be tested in tension after visual examination. If the test splice develops at least the minimum specified ultimate strength of the bar (A408 bars - 70 ksi) the operator shall be considered qualified to produce that size and position of splice.
- d. Using previously qualified operators, approximately fifty splices will be prepared under production conditions. From these splices, at least sixteen will be randomly selected and tested to destruction. Results of these tests will be turned over to the Engineer for evaluation and determination of the initial sampling rate for production splices.
- e. In qualification of both pre-production and production splices, each completed splice shall meet the following acceptance standards:
 - (1) Sound, non-porous filler metal shall be visible at both ends of the splice sleeve and at the top hole in the center of the sleeve. (A single shrinkage bubble present below the riser is not detrimental and should be distinguished from general porosity.)

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II. PROCEDURES (Continued)

A. Preliminary Tests (Continued)

6. Cadweld Splices (Continued)

e. (Continued)

- (2) There shall be evidence of filler metal between the sleeve and bar for the full 360°, however, splice sleeves which are not exactly concentric or axially aligned with the bars are acceptable.
 - (3) The bar ends shall be clean and free from rust, mill scale, slag, grease, paint, moisture, etc.
 - (4) Bars shall be longitudinally centered in the sleeves as shown by previously affixed center-punch marks or similar identifiable location marks on the bar.
 - (5) Bars shall not be scarfed and the portion of the bar in the sleeve shall have uniform deformations along its length consistent with the rolled mill pattern.
7. Structural Fill - Fill material from borrow areas previously selected by the Engineers shall be sampled by the T.L. for determination of moisture-density relationships.
- a. Selected non-plastic fill material shall conform to compaction standard ASTM D2049 and acceptance standard shall be 70% minimum relative density.
 - b. Selected plastic fill shall comply with compaction standard AASHTO modified method and acceptance standard shall be 95% of maximum density, minimum and \pm 2% of optimum moisture at time of compaction.
 - c. Prior to beginning placing fill on any day, the surface of the existing material will be scarified to a depth of at least 6 inches and moisture conditioned to within 2% of optimum moisture.
8. Concrete Batch Plant - The concrete batch plant, which includes the aggregate storage areas, weighing and measuring systems, and transit mixer trucks shall be inspected to conform with ASTM C94-65.
- a. The scales shall be calibrated prior to original use. Standard weights will be available for periodic checking of scale calibration (anticipated monthly).

II. PROCEDURES (Continued)

A. Preliminary Tests (Continued)

8. Concrete Batch Plant (Continued)

- b. Water measurement and admix dispensing will be checked by measuring the amount of liquid delivered from a dial setting. Water measurement will be checked weekly and admix dispensing will be checked continuously by the use of site gauges (or clear containers) through which the liquids flow.
- c. The automatic moisture compensating probe will be checked prior to daily operation of the plant against known sand moisture content.

B. Field Tests

- 1. Structural Fill - Prior to placing structural concrete on compacted fill, the fill will have been checked by the T.L. to determine that percentage compaction or relative density has been achieved. Field density may be determined by the sand cone or the balloon method. Subgrade will be free from debris and organic material and shall be thoroughly wetted.
- 2. Foundation - Vapor barriers shall be used under slabs poured on earth subgrade. No concrete may be placed on frozen subgrade material. Concrete seal mat (3" minimum) placed below bottom of structural concrete elevation shall be mapped and/or approved by Engineer and inspected by Quality Control. Rock subgrade shall be cleaned, washed, and air-blown prior to placing structural concrete. Old concrete surfaces shall be cleaned by water jet, brushing or air-blowing prior to placement of a new pour. It shall be the general foreman's responsibility to assure that these provisions are followed.

Horizontal joints in the Containment Building, shell wall and dome will be prepared by water jet or wire brushing. A carefully laid coat of cement and water grout will be placed on joint surface immediately prior to start of concrete placement.

- 3. Forms and Reinforcing Steel - Prior to a pour, the T.L. will check that forms are clean, oiled, tight and secure with embedments located per drawing. Size, placement, and splicing of reinforcing steel will be checked as required by the specifications and applicable drawings. It shall be the responsibility of the general foreman to assure that only approved reinforcing steel (subject to audit by the Quality Control group per paragraph II.A.4.d.) is used and that Cadweld splices comply with paragraph II.B.6.f. Cadweld splices are subject to inspection by the T.L. per paragraph II.B.6.

II. PROCEDURES (Continued)

B. Field Tests (Continued)

4. Batch Plant Inspection - The T.L. shall have an inspector at the batch plant whose duties in connection with each pour shall be:

- a. Check aggregate storage and cement to assure that sufficient materials are available to complete the scheduled pour.
- b. Prior to the first batch, sample and test the fine and coarse aggregate for gradation and surface moisture. Fine aggregate will be checked for moisture content at least every two hours during production. It is recommended that the batch plant inspector check each load of sand conveyed to a mixer truck for moisture using a hand probe, "Speedy Moisture Tester," or similar device. It is felt that more precise water and slump control can be gained in this manner. During periods of frequent concrete batching, this should be done as often as practical without sacrificing time from normal duties.

The coarse aggregate will be checked at least every two hours for moisture content and corresponding added water adjustments made manually.

- c. Adjust the automatic moisture compensating setting to account for surface moisture of fine aggregate to assure the correct addition of water as called for in the mix design. The "over-under" moisture gauge will be monitored and if the indications are that the fine aggregate is running wetter or drier than the determined setting, the surface moisture will be rechecked and the compensator adjusted accordingly.
- d. Enough water will be added at the project batch plant to produce an estimated 3" slump. In addition, each truck may carry an extra 2 gallons of water per cubic yard which may be added, if necessary, at the pour site under the direction of the T.L. inspector, and in accordance with the provisions of these procedures and those of SP 5406.

Prior to any addition of water at the pour site, the T.L. inspector shall check the batch ticket to determine how much water may be added without exceeding the total water requirement. (Batch plant inspector shall show on the batch ticket how much water can be added to the load without exceeding the allowable maximum water-cement ratio.) No more than this amount may be added at the pour site.

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II. PROCEDURES (Continued)

B. Field Tests (Continued)

4. Batch Plant Inspection (Continued)

d. (Continued)

No water shall be added at the pour site if the following mixing times have already been exceeded:

<u>Ambient Temperature</u>	<u>Max. Elapsed Time Prior to Addition of Water at Pour Site</u>
+90°F	30 Minutes
75 - 90°F	45 Minutes
-75°F	1 Hour

In no case shall more than 75% of the maximum revolutions or more than 60 revolutions at mixing speed have been exceeded prior to the addition of water at the pour site.

After any addition of water at the pour site the load will be mixed at least an additional 25 revolutions at mixing speed, but, in no case, shall the maximum of 100 revolutions at mixing speed or 300 revolutions total be exceeded.

Only 1 addition of water at the pour site shall be permitted.

Temperature of concrete will be checked after addition of water at the pour site.

Limits as shown in the approved design mix regarding maximum slump, water, and water-cement ratio shall not be exceeded. Mixing time, mixing revolutions or temperature shall not be violated due to pour site addition of water. Such violations remain cause for rejection.

1. 2.

- e. Check batch card to see that proper mix is being batched and that card is punched correctly.
- f. Prepare batch tickets that will show: date, time loaded, truck number, load number, initial number of revolutions on counter, concrete design strength, amount of concrete loaded, amount of each ingredient, including ice added, percent surface moisture of fine aggregate and coarse aggregate, total water content per yard (including surface moisture of aggregates), amount of water allowable to be added at the pour site, portion of the structure where used, and signature of the batch plant inspector. At the site of the pour, the field inspector will add to the batch ticket: ambient temperature, concrete temperature at time of placement, slump, amount of water added at pour site, total number of revolutions at mixing speed prior to addition of water at pour site, total number of revolutions at mixing speed, number of total revolutions, time of placement, and his signature.

1.

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I. PROCEDURES (Continued)

B. Field Tests (Continued)

4. Batch Plant Inspection (Continued)

- g. Check recording tapes for confirmation of actual batch weights and attach copy to the batch ticket.
- h. Make periodic checks of batch plant conveyors to assure that mix ingredients are introduced into the transit mixer simultaneously.
- i. Check that each transit mixer drum is free of excess water before mix ingredients are introduced into it. This shall be the responsibility of the batch plant supervisor and subject to audit by the batch plant inspector.

The T.L. batch plant inspector shall be solely responsible for adjustments in water content of the mix. Recommendations for adjustment of water content may be made by the T.L. field inspector(s), UE&C Quality Control personnel, or UE&C Construction Supervision. However, the T.L. batch plant inspector shall be the only one allowed to adjust water content. In no case shall this adjustment increase the water content to a point where the water-cement ratio, as shown on the approved design mix, is exceeded.

2.

A daily summary report of batch plant activities will be completed by the T.L. batch plant inspector. This report will include but not necessarily be limited to:

- a. Date
- b. Total yardage batched by class of concrete
- c. Location of each pour (specific portion of the structure)
- d. Brand of cement used
- e. Moisture content of sand at times checked
- f. List of water adjustments and reasons for them
- g. General remarks on plant operation.
- h. Signature of batch plant inspector

5. Field Inspection of Concrete

Structural fill, concrete forms and rebar shall be checked prior to each pour as noted above. No concrete pour will be made without release by the various craft supervisors' signatures on the Concrete Placement Checkout Sheet and final approval by the Job Engineer. The T.L. shall assign inspectors at the location of each pour who will assure that the free fall is a ~~maximum~~ ^{maximum} of three (3) feet, and the concrete is properly vibrated. The T.L. Field Inspector shall have the authority to reject truck loads of concrete. The basis for his rejection of concrete shall be its failure to comply with the procedure for Structural Concrete as defined in parts A through C of this section. The UE&C Concrete Superintendent, and the UE&C Quality Control personnel, shall also have the authority to reject truck loads of concrete. Reports of rejection shall be made directly to the UE&C Field Construction Supervisor.

1.

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II. PROCEDURES (Continued)

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B. Field Tests (Continued)

5. Field Inspection of Concrete (Continued)

No rejected concrete shall be returned to the batch plant for addition of water. The Concrete Superintendent shall direct rejected loads of concrete to predetermined locations that have been selected prior to daily concrete operations and shall record the concrete's disposition. The Concrete Superintendent shall also inform the Batch Plant Supervisor and Batch Plant Inspector of the slumps of rejected loads of concrete or other cause for rejection.

1.

The T.L. Field Inspector shall also make the following checks:

- a. The T.L. Field Inspector shall check each truck revolution counter and record the number of revolutions at mixing speed and the final revolution count prior to pour on the batch ticket. Loads that have had more than 100 revolutions at mixing speed, or that have had more than 300 total revolutions, or that have not been poured $1\frac{1}{2}$ hours after mixing shall be rejected.

If it is necessary to add water for workability to the concrete, the T.L. inspector shall check the batch ticket to see how much water may be added at the pour site. This water shall be added as outlined in II.B.4.d. above.

1.

- b. Check the concrete in each truck for slump following the procedure of ASTM C43-66 and record the results on the batch ticket. Loads with less than 1" slump or more than 4" slump shall be rejected.

The slump test will be taken from concrete sampled from the middle 80% of the load. If visual examination by the T.L. inspector of concrete being discharged from the truck indicates slump obviously below the 4" maximum, the truck shall be allowed to discharge completely while the test is being made for the record. Otherwise truck discharge shall be delayed until the slump test can be made.

If the slump is found to exceed 4", the truck may be allowed to move aside and turn at agitating speed for no more than 15 minutes providing time and total revolution limits are not exceeded. At the end of this time, the slump will be rechecked and if it is 4" or less the use of the concrete will be allowed.

1.

II. PROCEDURES (Continued)

B. Field Tests (Continued)

5. Field Inspection of Concrete (Continued)

- c. Determine the temperature of the concrete in each truck before it is poured and record the results on the batch ticket. Loads that are designated for mass concrete pours shall be rejected if their temperature exceeds 70°F, and loads designated for other pours shall be rejected if their temperature exceeds 90°F. Loads whose temperatures are lower than 50°F when the mean daily temperature falls below 40°F shall be rejected.
- d. Make and cure one set of concrete test cylinders (6" x 12") per ASTM C31-66 daily for each 50 cubic yards of concrete or portion thereof placed per class. A set of cylinders shall consist of 6 cylinders for 3000 psi concrete and 8 cylinders for 5000 psi concrete, taken from the middle 80% of one truck load of concrete. Concrete cylinders shall be cured initially in accordance with Section 9(a) of ASTM C31-66. Concrete cylinder molds shall conform to the requirements of ASTM C470-65T and certificates of compliance to this specification will be available and part of the permanent Quality Control file.
- e. From each load of concrete sampled for the make-up of concrete cylinders record results of a slump test, temperature check and an air content test per ASTM C231-62.
- f. Survey concrete placing operations for homogeneity of mass, proper vibration (consolidation) and for conformance to specification requirements unique to the pour; such as, preparation of subgrade, placement of vapor barrier, condition of adjacent concrete surfaces, finish as specified on drawings using appropriate equipment, etc.
- g. Return field-cured test cylinders from previous pour to field laboratory for standard laboratory cure. 11.
- h. Prepare a report of daily field concrete operations which shall contain the following information:
 - (1) Date
 - (2) Location of pour (portion of structure)
 - (3) Class and amount of concrete placed
 - (4) Number and identification of test cylinders made

II. PROCEDURES (Continued)

B. Field Tests (Continued)

5. Field Inspection of Concrete (Continued)

h. (Continued)

- (5) List of trucks with the time, water added at pour site, slump, concrete temperature, and total mixing data for all loads, accepted or rejected. | 1.
- (6) Results of air content checks and temperatures of concrete.
- (7) Weather conditions including ambient temperature extremes and recorded relative humidity.
- (8) Time of beginning and end of pour
- (9) Unusual conditions such as rejections or other remarks pertinent to the pour.

6. Cadweld Inspection - Cadwelding in the containment structure shall be inspected by a representative of the T.L. as follows:

- a. No Cadwelding will be permitted if the relative humidity is over 80%. | 1.
- b. Sleeves and crucibles shall be checked for cleanliness, rust, etc.
- c. Molds to be preheated when necessary (new mold or change of shift).
- d. Bar ends shall be free from loose mill scale, rust, and moisture.
- e. Bars shall not be scarfed.
- f. Bars shall be marked by center-punching or other suitable means, so that assurance of centering ends within the sleeve may be made.
- g. Completed splices shall be visually inspected in accordance with the following procedure. Any splice which, in the judgment of the inspector does not pass visual inspection, shall be cut out and replaced.
 - (1) Properly made splices will have filler metal visible at both ends of the sleeve and at the top hole in the center of the sleeve.

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II. PROCEDURES (Continued)

B. Field Tests (Continued)

6. Cadweld Inspection (Continued)

g. (Continued)

(2) Filler metal need not flow to the very edge of the sleeve due to the gasket action of the asbestos wicking used to seal in the molten filler metal.

(3) As a result of the Cadweld process, a shrinkage bubble may be visible at the top hole, where the molten metal is introduced and shrinkage fissures and pinholes may be visible at the top of a vertical splice. These casting flows do not adversely affect the physical performance of the splice and therefore do not constitute cause for rejection.

h. Random samples of visually acceptable splices at a rate to be specified by the Engineer shall be selected, cut from the structure and tested in tension to destruction.

i. For each Cadweld splice, data shall be recorded on rebar data sheets showing:

(1) Splice number (This number shall also be applied to the splicing sleeve using a heat and weather resistant marking pencil.)

(2) Location

(3) Size and orientation of the splice

(4) Operator number (crew number)

(5) Date, weather conditions, and time the splice was made.

(6) Inspectors initials

(7) Sample number and test result, if applicable.

j. Failure of a tension test of a splice selected from the structure as in "h" above (test result less than 70,000 psi) will be cause for additional sampling. The next previous or subsequent splice made by the source operator shall be cut from the structure and tested in tension to destruction. If this test result is over 70,000 psi the process will be considered in control. If this splice also fails, an engineering evaluation will be made, during which time the operator/crew responsible shall discontinue Cadwelding.

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II. PROCEDURES (Continued)

C. Periodic Sampling and Production Testing

1. Cement - The T.L. will sample cement from each manufacturer when a new silo is used. These samples will be tested for physical and chemical properties in accordance with ASTM C150-66. Tests conducted need not be limited to the field laboratory.
2. Concrete Aggregates - Aggregates delivered to the site will be sampled by the T.L. at least once for every 250 tons used and tested for gradation and determination of fineness modulus, specific gravity, and absorption. These tests shall be conducted in the field laboratory per test methods and acceptance standards as noted above in Preliminary Tests. Records will be maintained indicating date of receipt, amount received, gradation test results, and disposition of rejected loads.
3. Concrete Cylinders - After sufficient field-curing (usually 24 hours) the cylinders made by the T.L. field inspector will be transported to the field laboratory for stripping and curing and capping in accordance with ASTM C192-66. Two cylinders from each set will be tested at age 7 days, 2 at age 28 days, and 2 at age 90 days. Two additional cylinders will be tested at age 56 days for 5000 psi concrete. Compression tests of cylinders will be evaluated in accordance with Chapter 17 of ACI 301-66.
4. Cadweld Splices - Will be tested in tension in accordance with procedures outlined and referenced in ASTM A408 (minimum ultimate strength of specimen - 70,000 psi). These tests need not be performed in the field laboratory.
5. Other tests shall be performed as noted elsewhere in these procedures.

D. Other Items and Inspections

1. Concrete curing shall be as stipulated by the Engineer in the Specification SP 5406, Section 1:15. The reactor mat, floor bulkheads, walls and piers will be stripped in two days. Other forms will be stripped per SP 5406, Section 1:09.6.
2. The exterior forms required for the wall of the Reactor Building are designed so as not to impose undue forces on the steel liner and so that the deflection of the liner, if any, will not exceed permitted tolerance ($\frac{1}{8}$ " in any 10 feet of arc).

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POOR ORIGINAL

II. PROCEDURES (Continued)

D. Other Items and Inspections (Continued)

3. Visual inspection shall be made by the concrete supervisor and checked by the T.L. inspector or UE&C Quality Control group of the condition, placement and use of miscellaneous items; i.e., construction joint material, expansion joints, water stops, anchor bolts, pipe sleeves, floor hardener, wiring compounds, grout and grouting, vapor barrier, insulation, and waterproofing. Such inspection shall be documented by the Concrete Placement Checkout Sheet.
4. The mixing water (including ice) shall be checked weekly to assure that it does not contain more than 100 ppm each of chlorides, sulfides, and nitrates and that its turbidity does not exceed 2000 ppm. At the same time, its potability will be checked.
5. Cold Weather Protection - Provisions for cold weather protection shall be made by use of: insulated forms/covers, temporary enclosures, indirect heaters and/or combination of aforementioned techniques.
6. A commercial concrete supplier will be retained to act as a "back-up" supplier in the event of a breakdown of the on-site batch plant or if additional concrete deliveries are needed during large pours. Field construction and inspection procedures will be as noted in II.B.5. above. Batch plant inspection will be as noted in II.B.4. above, except that the prime responsibility for batch plant quality control will rest with the supplier with continuous surveillance maintained by a T.L. inspector. Back-up supplier may withhold any or all mixing water from the load which may be added at the pour site subject to all other provisions of II.B.5. and II.B.4. above. Necessary adjustments in inspection techniques will be made depending on the type of plant equipment in use (automatic with full recordation, automatic-interlocked, semi-automatic, or manual). When necessary, ice will be added by UE&C using the on-site facility.

2.

The supplier will submit a quality control procedure for review, comment, and approval by the UE&C Field Supervisor - Quality Control.

E. Reports and Records

Reports of all activities of the T.L. shall be presented to the UE&C Field Supervisor - Quality Control for inclusion in the Quality Control file and distribution to the Owner and Engineer, as required.

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II. PROCEDURES (Continued)

E. Reports and Records (Continued)

Completed records to be maintained shall include:

1. Batch tickets
2. Concrete Placement Checkout Sheets
3. Daily Summary Report of Batch Plant Activities
4. Daily Summary Report of Concrete Field Operations
5. Records of Disposition of Rejected Loads of Concrete
6. Rebar Data Sheets
7. Records of all test results
8. Results of Receipt Inspection of reinforcing steel, coarse aggregate, and fine aggregate.
9. Results of water analyses

Copies of the recorder tapes for each load shall be on file at the batch plant.

Longhand written copies of reports of activities and tests shall be presented to the Field Supervisor - Quality Control no later than the morning of the work day following execution of the work.

F. Deficiencies

Results of all tests or inspections that do not meet specification requirements shall be immediately reported to the Field Supervisor - Quality Control who shall inform the UE&C General Superintendent and appropriate corrective action taken. In the event of a disagreement between the Field Supervisor - Quality Control and the General Superintendent as to remedial actions or measures required to bring production within standard Quality Control and the limits of the engineering specifications, it is then the duty of the Field Supervisor - Quality Control to inform the Construction Manager and request compliance. Final recourse for action by the Field Supervisor - Quality Control shall be to inform the Manager of Reliability and Quality Assurance in the Home Office. A Home Office decision shall then be made for the disposition and corrective action to be taken.

G. Changes

Any changes to this procedure shall be approved in writing by the Engineer and UE&C Construction Superintendent and Field Supervisor - Quality Control prior to their implementation. UE&C shall be responsible for providing up-dated copies of the revised procedure to the parties concerned.

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UNITED ENGINEERS & CONSTRUCTORS INC.

METROPOLITAN EDISON COMPANY
THREE MILE ISLAND NUCLEAR STATION
UNIT NO. 1

CONCRETE PLACEMENT CHECKOUT SHEET

Area: _____

Date: _____

Concrete Type: _____

J.O. No. 9459.01

Cement Manufacturer: _____

Computed Quantity: _____

Specific Location: _____

<u>CHECK-OUT ITEM</u>	<u>CRAFT SUPERVISOR</u>		<u>REMARKS</u>	<u>DATE</u>
	<u>UE&C</u>	<u>Subcontractor</u>		
1. Surface Preparation				
2. Forms				
3. Reinforced Steel				
4. Sleeves & Blockouts				
5. Embedded Misc. Iron				
6. Anchor Bolts				
7. Piping				
8. Electrical				
9. Line and Grade				
10. Field Engineer or Area Superintendent				
11. Quality Control				

NOTE: All items must be initialed prior to pour.
General Foreman to check with Job Engineer.

Distribution: Supt. of Construction
Batch Plant
Quality Control
U. S. Testing
File

Pour Release Approved:

Job Engineer

Date

1588 078

POOR ORIGINAL

Procedure For Patching Voids In Structural Concrete

I. Purpose - This procedure is intended for use in patching of voids occurring in that portion of the Reactor Containment Building foundation mat which constitutes the ceiling of the Tendon Gallery. Voids occurred as a result of undiscovered patches of earth silt or miscellaneous debris remaining in the formed foundation mat area during concrete placement.

II. Classification of Voids -

- A. Voids adjacent to the flush embedded 3-3/4" thick bearing plates for 169 wire tendon system. Locations are:
 1. between plates V8-0 & V9-0 max. 12" deep
 2. between plates V146-0 & V147-0 max. 8" deep
 3. between plates V160-0 & V161-0 max. 12" deep
- B. Voids adjacent to flush embedded 3-3/4" thick bearing plates for 169 wire tendon system, which are a max. of 3-3/4" deep.
- C. Voids adjacent to bearing plates or in between areas which average approximately one inch deep.

III. Materials - "Colma Bonding Compound", manufactured by Sika Chemical Corporation shall be used as a bonding agent for plastic portland cement grout. Grout shall be proportioned 1 part cement to 3 parts sand. Copy of Sika Manual describing aforementioned product is attached.

Procedure to Patch Voids -

1. Surface Preparation - Chip or sandblast entire concrete surface to a clean, sound and dry condition. Wire brush or sandblast all exposed rebar or bearing plate steel as necessary to remove mill scale, rust or oil. Chip out void so as to produce a square or rectangle area, eliminating outward sloping sides.

By use of space heater or infra red bulbs raise the ambient and old concrete temperature to approximately 70°F plus or minus 10°. All material for patching shall be in this temperature range prior to mixing.

Prepare Sika's "Colma Bonding Compound", as per manufacturer's directions. Prime all surface of concrete, rebar, etc. within the void, with the Colma adhesive.

METROPOITAN EDISON CO. 11-17-68

APPROVED

CHECKED BY

DESIGNED BY

DRAWN BY

DATE

1588 099

POOR ORIGINAL

11-25-68 RM
1-7-69 RM - Rev. #1

Procedure For Patching Voids In Structural Concrete (Cont'd)

4. Fresh grout is to be applied while "Colma Bonding Compound" is fresh or still tacky.
5. With larger voids (See II a.) portland cement grout shall be a "dry" mix consistency, suitable for tamping into place. With shallow and surface voids (see II b. & II a.) portland cement grout consistency shall be varied to suit overhead placing conditions.
6. Extreme care shall be exercised to assure the larger voids are 100% filled and compact with no occurrence of sagging or separation of grout filler.

V. Miscellaneous -

Directly adjacent to one side of bearing plate for tendon #V147-0 a first layer bottom LBS radial rebar prevents 100% cleaning and exposure of the void at this area, (see II a-2). Concurrence and approval by the Engineer to remove a 20" length of this one bar was obtained in order to insure complete cleaning and filling of the void.

1588 100

Concrete Bending Agent for Placed Concrete

Used To bond fresh concrete or mortar to hardened concrete or other structural materials.

DESCRIPTION: Consists of an epoxy-polysulfide system with an organic amine as hardener. Yields a translucent liquid of light syrupy consistency when mixed.

	50 F	75 F	90 F
Minimum temperature (approx)	1 1/2 hr	40 min	30 min
Minimum ambient or surface temp			
Time to set	1 1/2 hr	3 hr	1 hr
Time to cure	10 days	7 days	3 days
Packaging: unit: 10 gal, 2 gal, 2 per case; 1 qt, 1/2 qt case. Shelf life: 6 months.			

Advantages: Low viscosity insures efficient, high coverage. Strength develops at a rate paralleling the strength gain of concrete and mortar. Tensile strength of 4,000 psi exceeds the best concrete or mortar. Compressive strength is 8,000-10,000 psi. Resistant to water, gasoline, oil, most solvents, alkalis and acids.

Coverage: 500 sq ft per 2-gal unit for brush application. Coverage will be greater on smooth surfaces, less on rough surfaces.

Application: Portion of component 'A' and component 'B' into clean container. Scrape 'A' and 'B' cans clean with rubber spatula. Mix well with Silka paddle on low-speed drill. When smaller quantity is needed, thoroughly stir each component separately with paddle on drill. Then simply proportion equal parts of 'A' and 'B' into clean container and mix well with paddle on drill. Mix 1-gal unit by hand with spatula.

Preparation: Surfaces must be clean and sound. Apply mixed material to existing surface with brush, brush or roller. Fresh concrete may be placed in contact immediately or at any time while Concrete Bending Compound is still tacky (see table above).

Limitations: Application below 50 F not recommended due to slow, erratic cure. Do not use on wet steel. Low adherence to zinc or galvanized surfaces. Exposure to temperatures above 225 F not recommended.

Caution: Contains organic amine and polysulfide. Avoid contact with skin or eyes.

POOR ORIGINAL