Commonwealth Edison
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November 30, 1976

Director of Nuclear Reactor Regulation
Attn: Mr. Dennis L. Ziemann, Chief
Operating Reactors - Branch 2
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden Station Units 2 and 3
Quad-Cities Station Units 1 and 2
Proposed Amendments to Appendix A
Technical Specifications to Incorporate
Limiting Conditions for Operations and
Surveillance Requirements for Maintaining
Drywell-Torus Differential Pressure -
NRC Docket Nos. 50-237/249 and 50-254/265

Reference (a): D. L. Ziemann (NRC) Letter to R. L. Bolger (CECo) dated October 4, 1976 - NRC Docket Nos. 50-237/249 and 50-254/265.

Dear Mr. Ziemann:

In response to Reference (a), descriptions of the methods, equipment, and instrumentation for maintaining drywell to torus differential pressure (ΔP) are submitted. Also included are the proposed Technical Specifications for maintaining the ΔP. The Technical Specifications are submitted in the respective format of the Dresden and Quad-Cities specifications utilizing the model provided in Reference (a) as a guide. Also included in these Technical Specifications are the bases for the drywell-torus ΔP.

Although the proposed Technical Specifications utilized those in Reference (a) as a guide, there are some differences.

Establishment of ΔP will be keyed to placement of the reactor mode switch in the "Run" position. This corresponds to the attainment of normal operating temperature and pressure, but it is a more definite, recognizable, and accountable event. Establishment of ΔP and relaxation thereof is in the same time frame as the inerting requirements.

Twelve hours is proposed in order to reestablish the ΔP after testing and during maintenance. This period is suggested in

12338

order to assure an orderly approach to the differential pressure. At Quad-Cities Station, the drywell pressure is within a fraction of a pound of the ECCS initiation, and thus caution is warranted in the approach to that point.

The action in the event one is unable to maintain the ΔP is similar to the guide of Reference (a) in that a unit would have to be in cold shutdown 36 hours after the lapse of the ΔP. Commonwealth Edison Company proposes to allow 12 hours to correct a potential problem and a shutdown within 24 hours of the end of the 12 hour period. This would allow time to correct equipment problems or establish an alternate method of establishing the ΔP. This will also allow the load dispatcher adequate time to procure replacement capacity in the event ΔP could not be reestablished and a shutdown was necessary.

These proposed changes have received on-site and off-site review and approval.

Three (3) signed originals and 37 copies are provided for your use.

SUBSCRIBED and SWORN to before me this 30th day of November, 1976.

Nancy M. Hollingsworth
Notary Public

Very truly yours,

R. L. Bolger
Assistant Vice President

Enclosure (1): Forty (40) copies of amended pages 117b, 127, and 127a for the Dresden Units 2 and 3 Technical Specifications.

Enclosure (2): Forty (40) copies of amended pages 3.7/4.7-7, 3.7/4.7-7a, 3.7/4.7-13, 3.7/4.7-14, and 3.7/4.7-14a for the Quad-Cities Units 1 and 2 Technical Specifications.

Enclosure (3): Forty (40) copies of description of Dresden drywell-torus ΔP control system. B. Stephenson (CECO) letter to D. L. Ziemann dated October 29, 1976.

Enclosure (4): Forty (40) copies of description of Quad-Cities drywell-torus ΔP control system.

d. Whenever the reactor is in power operation, the primary containment oxygen sampling system shall be operable. If this specification cannot be met, the system must be restored to an operable condition within 7 days or the reactor must be taken out of power operation.

e. The maximum containment repressurization pressure using the containment makeup inerting system shall be 26 psig.

Drywell Suppression Chamber Differential Pressure

a. Differential pressure between the drywell and suppression chamber shall be maintained at equal to or greater than 1.00 psid except as specified in (1), (2), and (3) below:

(1) This differential shall be established within the 24 hour period subsequent to placing the reactor mode switch into the run mode during a startup and may be relaxed 24 hours prior to a reactor shutdown when the provisions of 3.7.A.5 (b) apply.

(2) This differential may be decreased to less than 1.00 psid for a maximum of 12 hours during required operability testing of the drywell pressure suppression chamber vacuum breakers, HPCI testing and reactor pressure relief valve testing.

(3) The differential pressure can be reduced below 1.00 psid for a maximum of 12 hours for related equipment maintenance. If the 1.00 psid cannot be restored within this time, the provisions of 3.7.A.8 apply.

If the specifications of 3.7.A cannot be met, an orderly shutdown shall be initiated and the reactor shall be in a Cold Shutdown condition within 24 hours.

d. The containment oxygen analyzing system shall be functionally tested once per week and shall be calibrated once per 6 months.

7. Drywell Suppression Chamber Differential Pressure

a. The pressure differential between the drywell and suppression chamber shall be recorded at least once each shift when the differential pressure is required.

A means to determine post LOCA containment oxygen concentration is necessary to readily enable the reactor operator to take appropriate action to control containment atmosphere. In the interim, prior to installation of the CAD and associated monitoring systems, the containment oxygen analyzing system will be available.

The maximum containment repressurization pressure of 26 psi provides adequate margin to containment design pressure and a delay time prior to purge which results in acceptable purge doses.

Following a LOCA, periodic operation of the drywell and torus sprays will be used to assist the natural convection and diffusion mixing of hydrogen and oxygen when other ECCS requirements are met and O_2 concentration exceeds 4%.

Bases:

The drywell pressure suppression chamber differential pressure is important to minimize the load applied to the torus following a loss of coolant accident. Tests conducted by General Electric revealed a phenomenon known as pool swell wherein large volumes of water in the pressure suppression chamber are violently lifted by the steam vented under the surface following a loss of coolant accident (LOCA). Although the phenomenon was discovered while testing a Mark III containment analysis and testing subsequently showed the phenomenon to be possible in the Mark I containments found at Quad-Cities Units 1 and 2 and Dresden Units 2 and 3.

The loads imposed by pool swell approach ultimate strenght values for some components and thus it was necessary to mitigate these loads until the changes developed for the Mark I containment long term and short term programs could be implemented.

Upon completion of the Mark I containment long term program, it is expected that maintenance of the drywell-torus ΔP will not be necessary.

Operation with minimum pressure suppression chamber water level also reduces the loads imposed by pool swell, but maintaining the normal pool level and a pressure differential of 1.00 psid between drywell and torus is adequate to assure loads are within the capability of the containment.

Drywell-suppression chamber differential pressure may be reduced for a period of 12 hours for testing or maintenance. This is acceptable because of the very narrow range of LOCA for which pool swell is possible and the very low probability of their occurrence during this time period.

The establishment of drywell-torus differential pressure at the plant startup is keyed to placing of the mode switch in run because it is a significant and well defined event of the startup. The period allowed to establish the differential during startup and to relax it during shutdown are based on the current drywell inerting requirements. Because of the low pressures existing in the drywell during periods of inerting and purging, establishment of a differential pressure is impractical. Thus requiring the drywell-torus differential to be established within the same time frame as inerting is a conservative requirement.

B. Standby Gas Treatment System and C Secondary Containment

The secondary containment is designed to minimize any ground level release of radioactive materials which might result from a serious accident. The reactor building provides secondary containment during reactor operation, when the drywell is sealed and in service; the reactor building provides primary containment when the reactor is shutdown and the drywell is open, as during refueling. Because the secondary containment is an integral part of the complete containment system, secondary containment is required at all times that primary containment is required as well as during refueling.

The standby gas treatment system is designed to filter and exhaust the reactor building atmosphere to the stack during secondary containment isolation conditions, with a minimum release of radioactive materials from the reactor building to the environs. One standby gas treatment fan is designed to automatically start upon containment isolation and to maintain the reactor building pressure to approximately a negative 1/4-inch water gauge pressure; all leakage should be in-leakage. Should the fan fail to start, the redundant alternate fan and filter system is designed to start automatically. Each of the two fans has 200% capacity. Ref. Section 5.3.2 SAR. If one standby gas treatment system circuit is inoperable, the other circuit will be tested daily. This substantiates the availability of the operable circuit and results in no added risk; thus, reactor operation or refueling operation can continue. If neither circuit is operable, the plant is brought to a condition where the system is not required.

While only a small amount of particulates are released from the pressure suppression chamber system as a result of the loss of coolant except as specified in Specification 3.7.A.5.b.

b. Within the 24-hour period subsequent to placing the reactor in the Run mode following a shutdown, the containment atmosphere oxygen concentration shall be reduced to less than 5% by weight, and maintained in this condition. Deinerting may commence 24 hours prior to a shutdown.

3.7.A.6 Containment Systems

Drywell-Suppression Chamber Differential Pressure

a. Differential pressure between the drywell and suppression chamber shall be maintained at equal to or greater than 1.30 psid except as specified in (1), (2), and (3) below:

(1) This differential shall be established within the 24 hour period subsequent to placing the reactor mode switch into the RUN mode during a startup and may be relaxed 24 hours prior to reactor shutdown when the provisions of 3.7.A.5(b) apply.

(2) This differential may be decreased to less than 1.30 psid for a maximum of 12 hours during required operability testing of the HPCI system pump, the RCIC system pump, the drywell-pressure suppression chamber vacuum breakers, and reactor pressure relief valves.

4.7 CONTAINMENT SYSTEMS

Drywell-Suppression Chamber Differential Pressure

a. The pressure differential between the drywell and suppression chamber shall be recorded at least once each shift.

(3) This differential may be decreased to less than 1.30 psid for a maximum of 12 hours for equipment maintenance. If the differential cannot be restored within this time, the provisions of 3.7.A.7 apply.

7. If Specification 3.7.A cannot be met, an orderly shutdown shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.

B. Standby Gas Treatment System

1. Both circuits of the standby gas treatment system and the diesel generators required for operation of such circuits shall be operable at all times when secondary containment integrity is required.

B. Standby Gas Treatment System

1. Standby gas treatment system surveillance shall be performed as indicated below:

   a. At least once per operating cycle it shall be demonstrated that:

      1) Pressure drop across the combined high-efficiency and charcoal filters is less than 5.7 inches of water at 4000 cfm, and

      2) Inlet heater ΔT shall be a minimum of 14° F at 4000 cfm.

   b. At least once during each scheduled secondary containment leak rate test, whenever a filter is changed, whenever work is performed that could affect the filter system efficiency, and at intervals not to exceed 6 months between refueling outages, it shall be demonstrated that:

      1) The removal efficiency of the particulate filters is not less than 99% for particulate matter larger than 0.7 micron.

      2) No bypassing of the filter occurs, based on a Freon-12 test. This test is considered satisfactory if 99% of the

hydrogen, if it is present in sufficient quantities to result in excessively rapid recombination, could result in a loss of containment integrity.

The 5% oxygen concentration minimizes the possibility of hydrogen combustion following a loss-of-coolant accident. Significant quantities of hydrogen could be generated if the core cooling systems did not sufficiently cool the core.

The occurrence of primary system leakage following a major refueling outage or other scheduled shutdown is much more probable than the occurrence of the loss-of-coolant accident upon which the specified oxygen concentration limit is based. Permitting access to the drywell for leak inspections during a startup is judged prudent in terms of the added plant safety offered without significantly reducing the margin of safety. Thus, to preclude the possibility of starting the reactor and operating for extended periods of time with significant leaks in the primary system, leak inspections are scheduled during startup periods, when the primary system is at or near rated operating temperature and pressure.

The 24-hour period to provide inerting is judged to be sufficient to perform the leak inspection and establish the required oxygen concentration. The primary containment is normally slightly pressurized during periods of reactor operation. Nitrogen used for inerting could leak out of the containment but air could not leak in to increase oxygen concentration. Once the containment is filled with nitrogen to the required concentration, no monitoring of oxygen concentration is necessary. However, at least once a week, the oxygen concentration will be determined as added assurance.

Bases:

The drywell pressure suppression chamber differential pressure is important to minimize the load applied to the torus following a loss of coolant accident. Tests conducted by General Electric revealed a phenomenon known as pool swell wherein large volumes of water in the pressure suppression chamber are violently lifted by the steam vented under the surface following a loss of coolant accident (LOCA). Although the phenomenon was discovered while testing a Mark III containment analysis and testing subsequently showed the phenomenon to be possible in the Mark I containments found at Quad-Cities Units 1 and 2 and Dresden Units 2 and 3.

The loads imposed by pool swell approach ultimate strength values for some components and thus it was necessary to mitigate these loads until the changes developed for the Mark I containment long term and short term programs could be implemented.

Upon completion of the Mark I containment long term program, it is expected that maintenance of the drywell-torus ΔP will not be necessary.

Operation with minimum pressure suppression chamber water level also reduces the loads imposed by pool swell, but maintaining the normal pool level and a pressure differential of 1.3 psid between drywell and torus is adequate to assure loads are within the capability of the containment.

Drywell-suppression chamber differential pressure may be reduced for a period of 12 hours for testing or maintenance. This is acceptable because of the very narrow range of LOCA for which pool swell is possible and the very low probability of their occurrence during this time period.

The establishment of drywell-torus differential pressure at the plant startup is keyed to placing of the mode switch in run because it is a significant and well defined event of the startup. The period allowed to establish the differential during startup and to relax it during shutdown are based on the current drywell inerting requirements. Because of the low pressures existing in the drywell during periods of inerting and purging, establishment of a differential pressure is impractical. Thus requiring the drywell-torus differential to be established within the same time frame as inerting is a conservative requirement.

B. Standby Gas Treatment System

The standby gas treatment system is designed to filter and exhaust the reactor building atmosphere to the stack during secondary containment isolation conditions, with a minimum release of radioactive materials from the reactor building to the environs. One standby gas treatment fan is designed to start automatically upon containment isolation and to maintain the reactor building pressure to approximately a negative 1/4-inch water gauge pressure; all leakage should be inleakage. Should the fan fail to start, the redundant alternate fan and filter system is designed to start automatically. Each of the two fans has 200% capacity (reference SAR Section 5.3.2). If one standby gas treatment system circuit is inoperable, the other circuit must be tested daily. This substantiates the availability of the operable circuit and results in no added risk; thus, reactor operation or refueling operation can continue. If neither circuit is operable, the plant is brought to a condition where the system is not required.

While only a small amount of particulates are released from the pressure suppression chamber system as a result of the loss-of-coolant accident, high-efficiency particulate filters before and after the charcoal filters are specified to minimize potential particulate release to the environment and to prevent clogging of iodine filters. The high-efficiency filters have an efficiency greater than 99% for particulate matter larger than 0.3 micron, which is demonstrated by the manufacturer prior to installation. The minimum iodine removal efficiency is 99%. Filter banks will be replaced whenever significant changes in filter efficiency occur. Testing (Reference 4) of impregnated charcoal indentical to that used in the filters indicated that shelf life up to 5 years leads to only minor decreases in methyliodine removal efficiency.

The efficiency of 99% of the charcoal and particulate filters is sufficient to prevent exceeding 10 CFR 100 guidelines for the accidents analyzed. The analysis of the loss-of-coolant accident assumed a charcoal filter efficiency of 90%, a particulate filter efficiency of 95%, and TID 14844 fission product source term. Hence, requiring 99% efficiency for both the charcoal and particulate filters provides adequate margin. A 10-kW heater maintains relative humidity below 70% in order to assure the efficient removal of organic iodine on the impregnated charcoal filters.

C. Secondary Containment

The secondary containment is designed to minimize any ground level release of radioactive materials which might result from a serious accident. The reactor building provides secondary containment during reactor operation, when the drywell is sealed and in service; the reactor building provides primary containment when the reactor is shut down and the drywell is open, as during refueling. Because the secondary containment is an integral part of the complete containment system, secondary containment is required at all times that primary containment is required as well as during refueling, except, however, for initial fuel loading of Unit 1 prior to initial power testing (reference SAR Section 1).

D. Primary Containment Isolation Valves

Double isolation valves are provided on lines penetrating the primary containment and open to the free space of the containment. Closure of one of the valves in each line would be sufficient to maintain the integrity of the pressure suppression system. Automatic initiation is required to minimize the potential leakage paths from the containment in the event of a loss-of-coolant accident.

References

1. 'Bodega Bay Preliminary Hazards Summary Report,' Appendix 1, Docket 50-205, December 28, 1962.
2. C. H. Robbins, 'Tests of a Full Scale 1/48 Segment of the Humboldt Bay Pressure Suppression Containment,' GEAP-3596, November 17, 1960.
3. Quad-Cities Special Report Number 4.
4. 'Nuclear Safety Program Annual Progress Report for Period Ending December 31, 1966, ORNL-4071.'

except as specified in Specification 3.7.A.5.b.

b. Within the 24-hour period subsequent to placing the reactor in the Run mode following a shutdown, the containment atmosphere oxygen concentration shall be reduced to less than 5% by weight, and maintained in this condition. Deinerting may commence 24 hours prior to a shutdown.

3.7.A.6 Containment Systems

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(2) This differential may be decreased to less than 1.30 psid for a maximum of 12 hours during required operability testing of the HPCI system pump, the RCIC system pump, the drywell-pressure suppression chamber vacuum breakers, and reactor pressure relief valves.

4.7 CONTAINMENT SYSTEMS

Drywell-Suppression Chamber Differential Pressure

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(3) This differential may be decreased to less than 1.30 psid for a maximum of 12 hours for equipment maintenance. If the differential cannot be restored within this time, the provisions of 3.7.A.7 apply.

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   b. At least once during each scheduled secondary containment leak rate test, whenever a filter is changed, whenever work is performed that could affect the filter system efficiency, and at intervals not to exceed 6 months between refueling outages, it shall be demonstrated that:

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The efficiency of 99% of the charcoal and particulate filters is sufficient to prevent exceeding 10 CFR 100 guidelines for the accidents analyzed. The analysis of the loss-of-coolant accident assumed a charcoal filter efficiency of 90%, a particulate filter efficiency of 95%, and TID 14844 fission product source term. Hence, requiring 99% efficiency for both the charcoal and particulate filters provides adequate margin. A 10-kW heater maintains relative humidity below 70% in order to assure the efficient removal of organic iodine on the impregnated charcoal filters.

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D. **Primary Containment Isolation Valves**

Double isolation valves are provided on lines penetrating the primary containment and open to the free space of the containment. Closure of one of the valves in each line would be sufficient to maintain the integrity of the pressure suppression system. Automatic initiation is required to minimize the potential leakage paths from the containment in the event of a loss-of-coolant accident.

References

1. 'Bodega Bay Preliminary Hazards Summary Report,' Appendix 1, Docket 50-205, December 28, 1962.
2. C. H. Robbins, 'Tests of a Full Scale 1/48 Segment of the Humboldt Bay Pressure Suppression Containment,' GEAP-3596, November 17, 1960.
3. Quad-Cities Special Report Number 4.
4. 'Nuclear Safety Program Annual Progress Report for Period Ending December 31, 1966, ORNL-4071.'

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NRC Dkts. 50-237/249

October 29, 1976

BBS Ltr. #760-76

Mr. Dennis L. Ziemann
Operating Reactors - Branch 2
Division of Operating Reactors
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

SUBJECT: Technical Specification Changes for Drywell-Torus Differential Pressure

REFERENCE: Your letter to Mr. R. L. Bolger, of Commonwealth Edison, dated October 4, 1976; concerning Dresden Units 2/3 Differential Control System

Dear Mr. Ziemann:

In the referenced letter you requested information in connection with our differential pressure control system. This letter is in response to your request.

In regards to the method used to maintain the Drywell-Torus differential two methods are employed at Dresden. Either the Nitrogen Inerting System or the Differential Pressure Control System will satisfactorily maintain a differential pressure of 1.0 PSID. Specific operating methods and changes in valve line up are covered in our Technical Specification change submittal of April 12, 1976.

Concerning the method used to monitor the drywell-torus differential pressure we have found that the computer system is the most accurate. This system will give a print out of drywell pressure, and torus pressure at a regular interval or upon demand. In addition to the computer system, drywell and torus pressure can be read on control room indicators. Containment pressure can be read from indicator 8540-1 on panel 902(3)-3. Instrument 8540-1 has a range of zero to five pounds; and is fed from pressure transmitter 1624. Torus pressure can be read from indicator 1602-1 which has a range of minus five inches Hg to a positive five pounds. This instrument is fed from pressure transmitter 1623. For both torus and drywell pressure indicators, only one instrument channel exists. Of the two pressure indicators only the -5 to +5 torus pressure indicator is mentioned in the Technical Specifications. The -5 to +5 torus pressure indicator is required by Table 4.2.1 to be calibrated once every three months.

Also, in regards to the effect of torus water level on the PUA, we have determined that water level in excess of the required minimum will not change the PUA. This subject is covered in greater detail in our letter from Mr. G. A. Abrell to you dated October 1, 1976.

Enclosed you will find our proposal for a change in the Technical Specifications dealing with the drywell pressure suppression chamber differential pressure. You will note in our proposal that a loss of cooling lake capacity was added to the exceptions for the requirement for a differential pressure. This addition is based on the number of deviations occurring from a loss of cooling lake capacity. Also, in our proposal a change was made to increase the allowable reduction period from 2 hours to 12 hours. The bases for this change is the normal eight hour period required to build up drywell suppression chamber pressure with the nitrogen make up system, and to allow an adequate time for the station to go to open cycle operation in the event of a loss of cooling lake capacity.

If you have any questions in regards to the information contained in this letter please contact Mr. T. Lang of this station.

Sincerely,

B. B. Stephenson
Station Superintendent

BBS:CES:gt

Enclosure

cc: File/NRC

QUAD-CITIES STATION DESCRIPTION OF DRYWELL-TORUS ΔP CONTROL SYSTEM

The following response is provided to the information requested in the letter of Mr. Dennis L. Ziemann of October 4, 1976:

a) There are currently two methods available for maintaining the required drywell to suppression chamber differential pressure of 1.3 psid.

The preferred method utilizes a nitrogen recirculation scheme from the suppression chamber to the drywell. This system is composed of two Screw-Type Rotary packaged air compressors manufactured by Ingersoll-Rand Company in parallel, a receiver tank and a recirculation flow control system. Suction is taken from the suppression chamber through nitrogen inerting system piping. The discharge of the recirculation system is through the nitrogen makeup system piping to the drywell. The suction and discharge points for this new system are outside primary containment isolation valves and piping and thus, this system does not constitute part of the containment boundary.

The alternate method uses the Nitrogen Makeup System and the Standby Gas Treatment System in a "feed-and-bleed" scheme to maintain the drywell to suppression chamber differential pressure.

b) The nitrogen recirculation system takes suction from the suppression chamber through valves AO-1601-56 and AO-1601-55 to the compressor inlet. From the compressor discharge, the nitrogen at approximately 115 psig enters a receiver tank. From the receiver tank the nitrogen flows to the drywell through valves FCV-8799-29, MO-1601-57 and AO-1601-59.

The feed-and-bleed system adds nitrogen to the drywell through the present nitrogen makeup to the drywell valve lineup. Leakage into the suppression chamber is drawn off by normal venting of the suppression chamber through the Standby Gas Treatment System.

c) No new instrumentation has been installed to monitor drywell to suppression chamber differential pressure. The pressure controller for the nitrogen recirculation system takes inputs from the drywell pressure local transmitter (PT-1625), and from the suppression chamber pressure local transmitter (PT-1623). The pressure controller is located on Control Room Panel 901-3 (902-3). An electrical current signal is sent from the controller to an I/P converter. This pneumatic signal controls the flow control valve FCV-8799-29.

Drywell pressure is recorded on a continual basis on recorder PR-8740-12 which has a narrow range of -5 in Hg to +5 psig, and a wide range of 0 to 75 psig. Suppression chamber pressure indication is also on the 901-3 (902-3) panel, and the indicator has a range of -5 in Hg to +5 psig.

No new pressure suppression chamber water level instrumentation has been added due to the differential pressure requirement. Level indication is presently on the 901-3 (902-3) panel. The range of the level indicator is from +25" to -25". A high/low level alarm, also on the 90X-3 panel, annunciates at +1" or -1". The level transmitter is mounted locally, and the high/low level switch is located on Control Room panel 901-19 (902-19).