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ACRS (16)
RO (3)
OGC
DLZiemann, L:ORB #2
CJDeBevec, L:ORB #2
JCSnell, L:ORB #2
RMDiggs, L:ORB #2
SVarga, L:RP

JUN 11 1974

Docket No. 50-220

Niagara Mohawk Power Corporation
ATTN: Mr. Philip D. Raymond
Vice President - Engineering
300 Erie Boulevard West
Syracuse, New York 13202

Gentlemen:

Your letter dated June 29, 1973, submitted a report on pipe failures outside of containment for Nine Mile Point Unit 1 (NMP-1) as required by our letter of December 18, 1972. Our letters of December 18, 1972, and January 16, 1973, contained criteria by which a postulated rupture in any high energy fluid piping outside the primary containment was to be evaluated to assure safe plant shutdown capability. On January 30, 1973, a meeting was held to discuss the criteria and the results of your preliminary study of NMP-1. Upon completion of our initial review of your report, further clarification of the analysis was requested in our letter of January 29, 1974. Your letter dated February 28, 1974, responded to this request.

Based upon our review of your report, as supplemented, we have concluded that Nine Mile Point Unit 1 would withstand the consequences of postulated ruptures in high energy fluid piping outside containment without loss of capability to initiate and maintain safe shutdown of the plant. A copy of our related Safety Evaluation is enclosed.

Sincerely,

Original signed by:
Karl R. Goller

Karl R. Goller
Assistant Director for
Operating Reactors
Directorate of Licensing

Enclosure:
Safety Evaluation

cc: See next page

APPL.

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SURNAME▷	JCSnell	CJDeBevec	DLZiemann	Gallo	KRGoller	
DATE▷	4/16/74	4/23/74	4/23/74	6/4/74	6/5/74	

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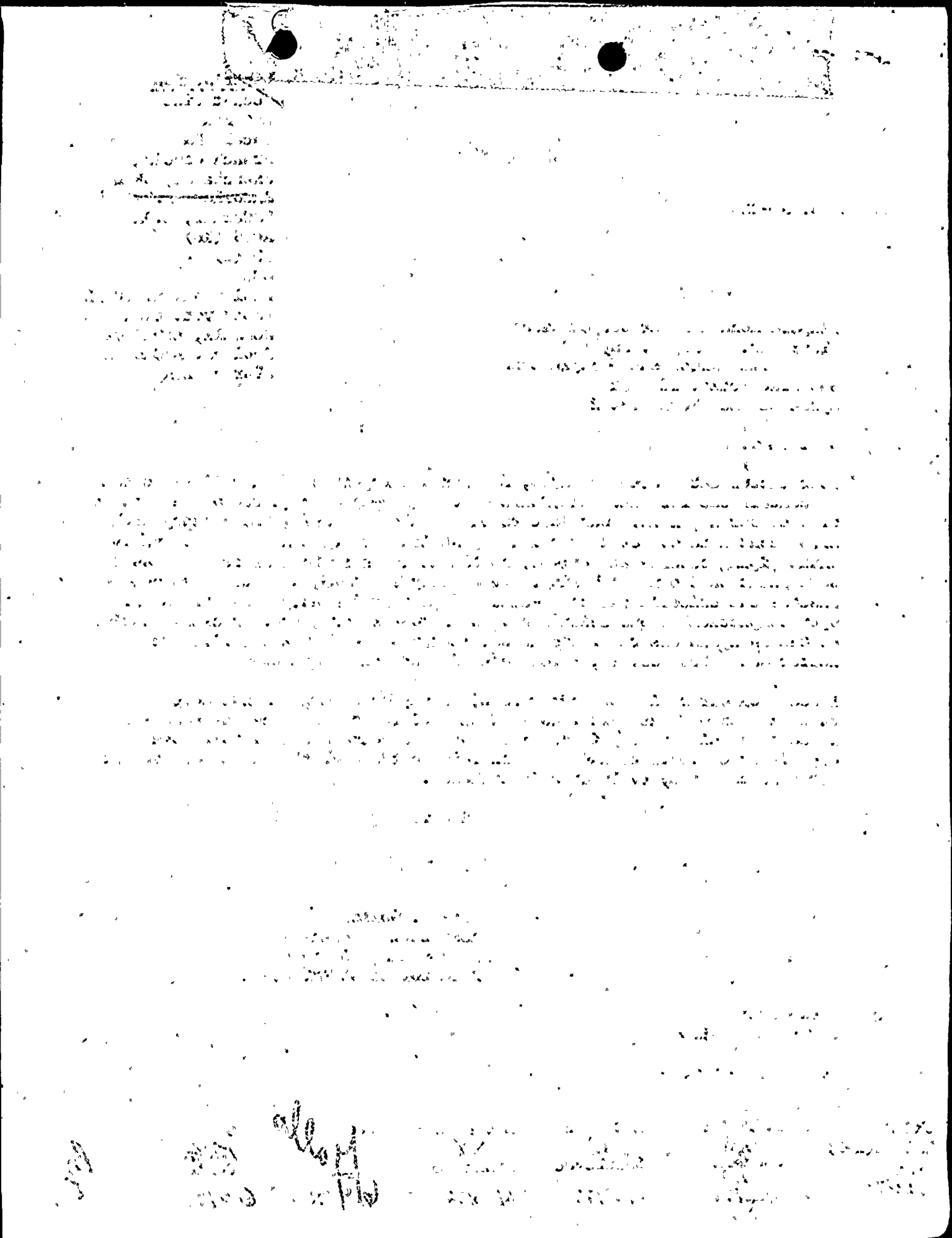

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UNITED STATES ATOMIC ENERGY COMMISSION
SAFETY EVALUATION BY THE DIRECTORATE OF LICENSING
DOCKET NO. 50-220
NINE MILE POINT UNIT 1

ANALYSIS OF THE CONSEQUENCES OF HIGH ENERGY PIPING FAILURES OUTSIDE CONTAINMENT

INTRODUCTION

On December 18, 1972, and January 16, 1973, the Atomic Energy Commission's Regulatory staff sent letters to Niagara Mohawk requesting a detailed analysis to substantiate that the design of the Nine Mile Point Unit 1 (NMP-1) is adequate to withstand the effects of a postulated rupture in any high energy fluid piping system outside the primary containment, including the postulated double-ended rupture of the largest line in the main steam and feedwater systems. It was further requested that if the results of the analysis indicated that changes in the design were necessary to assure safe plant shutdown, information on these design changes and plant modifications would be required. Criteria for conducting this evaluation were included in the letters. A meeting was held on January 30, 1973, to discuss the information already available on the NMP-1 design concerning postulated pipe ruptures, to clarify the applicable criteria, and to identify the areas where additional information was required. In response, a report describing postulated high energy pipe ruptures outside containment was filed by Niagara Mohawk on June 29, 1973. A subsequent letter from Niagara Mohawk dated February 28, 1974, provided additional information in response to our letter dated January 29, 1974.

EVALUATION

Criteria

A summary of the criteria and requirements that were used in our evaluation was included in our letter of December 18, 1972, and is set forth below:

a. Protection of equipment and structures necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming a concurrent and unrelated single active failure of protected equipment, should be provided from all effects resulting from ruptures in pipes carrying high energy fluid, where the temperature and pressure conditions of the fluid exceed 200°F and 275 psig, respectively, up to and

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including a double-ended rupture of such pipes. Breaks should be assumed to occur in locations specified in the "pipe whip criteria". The rupture effects to be considered include pipe whip, structural (including the effects of jet impingement), and environmental.

b. In addition, protection of equipment and structures necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming a concurrent and unrelated single active failure of protected equipment, should be provided from the environmental and structural effects (including the effects of jet impingement) resulting from a single open crack at the most adverse location in pipes carrying fluid routed in the vicinity of this equipment. The size of the cracks should be assumed to be 1/2 the pipe diameter in length and 1/2 the wall thickness in width.

High Energy Systems

Our evaluation included the following piping systems containing high energy fluids:

Main, Extraction, and Auxiliary Steam Systems
Feedwater System
Core Spray System
Condensate System
Containment Spray System
Emergency Condenser
Liquid Poison System
Reactor Head Spray System
Reactor Water Cleanup System (RWCU)
Reactor Shutdown Cooling System
Sample Lines (Environmental Effects Only)

Areas or Systems Affected by High Energy Pipe Breaks

An evaluation was made of the effects of high energy pipe breaks on the following systems, components, and structures which would be necessary (in various combinations, depending on the effects of the break) to safely shut down, cool down, and maintain cold shutdown conditions:

a. General

1. Control Room
2. Control and Instrument Cables and Tunnels
3. Electrical Distribution System
4. Emergency dc Power Supply (batteries)
5. Emergency ac Power Supply (diesels)
6. Heating and Ventilation Systems (needed for long-term occupancy to maintain the reactor in safe shutdown condition)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

b. Reactor Control Systems and associated instrumentation

c. Cooling and Service Water Systems

d. ECCS components

Specific Areas of Concern

The applicant has provided the results of his examination of all postulated safety-related high energy line break locations and evaluated the break consequences. We have reviewed all of this information, including the following specific areas of concern where the potential consequences might be severe or where specific corrective action would further assure safe cold shutdown of the plant.

a. Compartment Pressurization

Large pipe breaks, including the double-ended rupture of the largest pipes in a system, and small leakage cracks up to the design basis size have been considered for the main steam tunnel, the turbine building, the ECCS rooms, and the valve compartments.

In the main steam tunnel, the effects of a main steam line break were considered as the worst case. The resultant pressure was calculated to increase to a peak of 33.1 psia. The tunnel has a minimum design of 34.6 psia so that the calculated peak is below the design pressure, thus assuring a margin.

A postulated high energy line failure in the reactor water cleanup system results in a single-ended piping failure until isolation is achieved. Safety related equipment would not be affected; therefore, a safe shutdown of the plant could be accomplished.

b. Pipe Whip

The steam tunnel has been designed with thick reinforced concrete capable of withstanding static and dynamic loads. The reinforced concrete steam tunnel in which the main steam and feedwater lines are routed from the primary containment to the turbine room is subjected only to the loads of the piping and a live load from the floor on top of the tunnel roof.

Analyses of pipe whip effects on concrete barriers indicate that local cracking of the barriers can occur, however, the structural integrity of the walls is maintained. Cracks and access openings can allow steam to escape to other parts of the floor and building.

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Analyses have also shown that pipe whip can cause column failure in the area of the break. However, there is sufficient design margin in the other columns such that the structural integrity of the floors is maintained.

Other high energy systems, such as the emergency condenser, liquid poison, and the core spray, have been evaluated for whipping. While a whipping line in some of these systems may cause failure of additional systems or equipment, the incident would not prevent the safe shutdown of the unit.

Other high energy lines, such as the sample lines and reactor water cleanup lines, are located such that their rupture would not cause damage to the torus or prevent redundant safety related equipment from functioning to allow the plant to be safely shut down.

c. Control Room Habitability

The main control room is physically isolated from all high energy lines. Neither the control room equipment nor its ventilation system will be affected by environmental effects caused by a rupture of a high energy line.

d. Environmental Effects

Components and equipment were analyzed and checked for possible adverse environmental effects which could be caused by the rupture of a high energy line. Adverse temperature, pressure, and humidity were the parameters which were used in the evaluation of safety related equipment. We have reviewed the licensee assessment of the consequences of environmental effects on safety related equipment. We find that safety related equipment has been designed to limits in excess of postulated conditions which could arise from the rupture of a high energy line.

CONCLUSION

On the basis of this review of the information submitted to us and based on our discussions with Niagara Mohawk, we find that the consequences of high energy line failures outside containment are acceptable. We have

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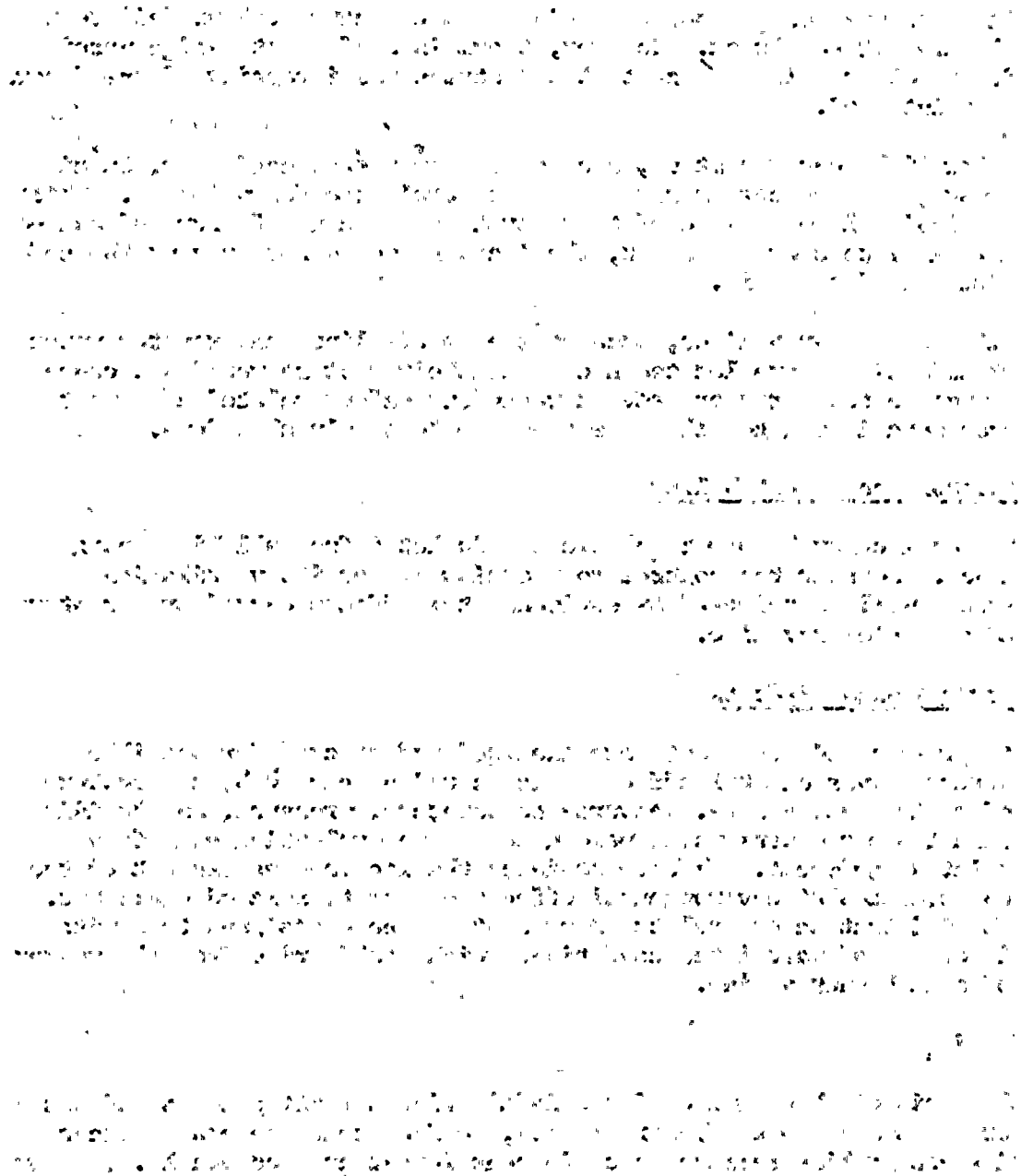

concluded that the potential consequences of these postulated high energy pipe failures could not prevent achieving safe cold shutdown conditions consistent with the single failure and redundancy requirements described in our letter of December 18, 1972, and thus there is reasonable assurance that the health and safety of the public will not be endangered by continued operation in the manner proposed.

for

James C. Snell
Operating Reactors Branch #2
Directorate of Licensing

Original signed by
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch
Directorate of Licensing

Date: JUN 11 1974

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JUN 5 1974

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Docket No. 50-220

Niagara Mohawk Power Corporation
ATTN: Mr. Philip D. Raymond
Vice President - Engineering
300 Erie Boulevard West
Syracuse, New York 13202

Gentlemen:

The Commission adopted amendments to its Regulations in 10 CFR Parts 50, 70, and 73 dated November 6, 1973, which required licensees to submit a physical security plan by January 7, 1974. Each licensee is required to provide physical protection against industrial sabotage and theft of special nuclear materials. Relative to these physical security plans, our position on guards is expressed in section C.1.a of Regulatory Guide 1.17, "Protection of Nuclear Power Plants Against Industrial Sabotage". We have determined that an acceptable physical security plan must provide for the use of armed guards. We further believe that this feature of the security plan should be implemented as soon as possible, ideally by July 1, 1974.

Please advise us immediately as to your plans to implement this feature of Regulatory Guide 1.17.

Sincerely,

Original Signed by
Karl Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Directorate of Licensing

cc: Arvin E. Upton, Esquire
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Appl.

OFFICE ➤	L:ORB #2	L:ORB #2	L:OR			
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DATE ➤	6/5/74	6/5/74	6/5/74			

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