FORM ERDA 535
(2/77)

U. S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

MILESTONE PLAN AND MANAGEMENT REPORT

1. Contract Identification: DEVELOPMENT OF AUTOMATED WELDING PROCESS FOR FIELD FABRICATION OF THICK WALLED PRESSURE VESSELS

2. Reporting Period: 03-29-79 through 06-29-79

3. Contract Number: EF-78-C-01-2771

4. Contractor (name, address): WESTINGHOUSE ELECTRIC CORPORATION
NUCLEAR EQUIPMENT DIVISIONS
P.O. BOX 19218
TAMPA, FLA. 33626

5. Contract Start Date: 09-29-78

6. Contract Completion Date: 09-28-81

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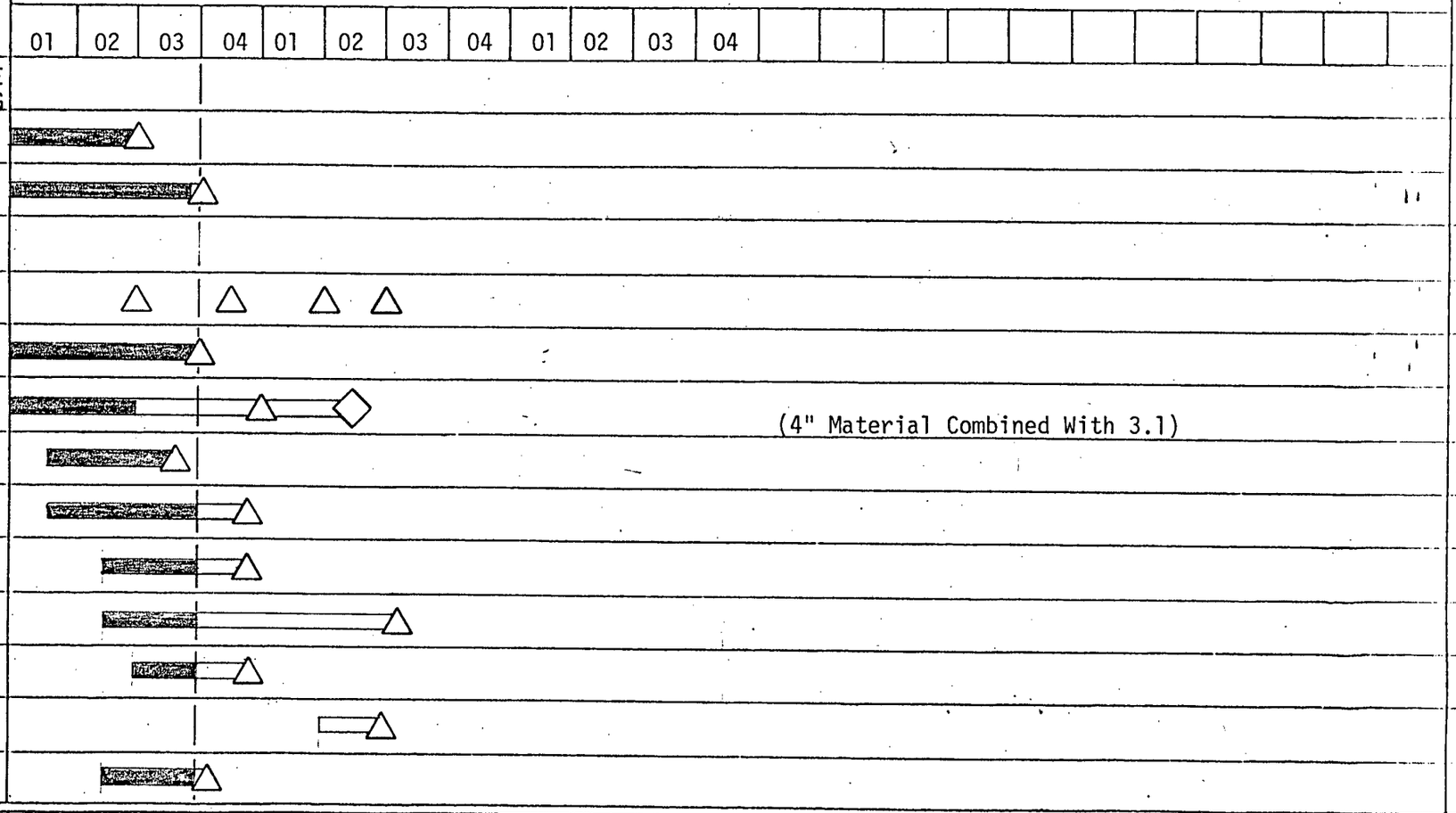
1.0	REVIEW OF CURRENTLY AVAILABLE WELD PROC. AND PROJ. PLANNING	
1.1	Project Planning	100
1.2	Welding Processes Review	95
2.0	DEVELOPMENT OF PROCESS AND LABORATORY DEMONSTRATION	
2.1	Consultation	
2.2	Facility Rearrangement	100%
2.3	Materials Procurement	50
2.4	Torch and Shield Adaptation	100
2.5	Process Mechanical Control	60
2.6	Joint Design Evaluation	25
2.7	Filler Wire Optimization	30
2.8	Non Destructive Evaluation	20
2.9	Repair Techniques	
2.10	Flat Position Parameters	70

9. Fiscal Years and Months



11. Remarks

12. Signature of Contractor's Project Manager and Date

13. Signature of Government Technical Representative and Date

DISCLAIMER

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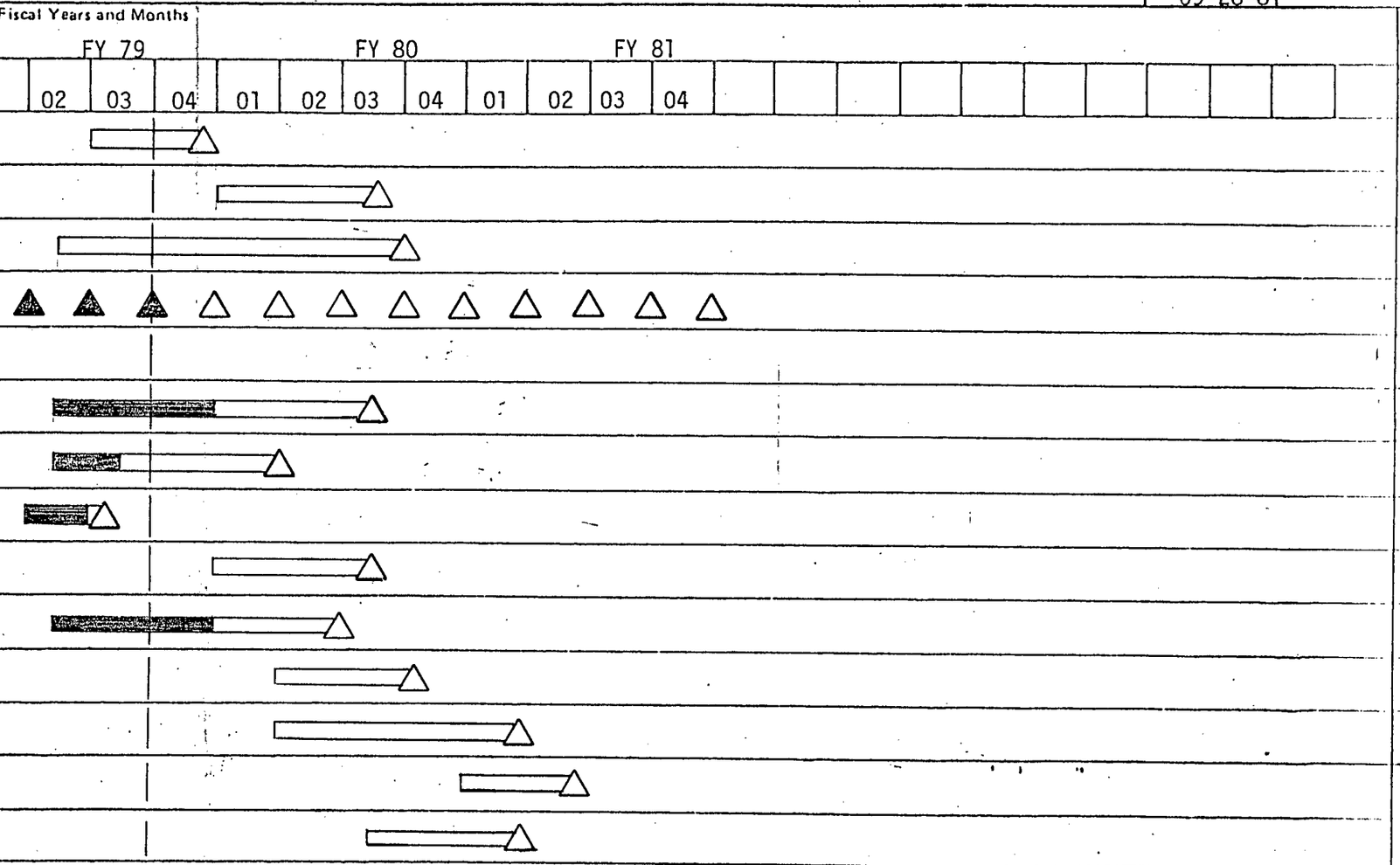
2.11	Horiz. Position Parameters	
2.12	Vert. Position Parameters	
2.13	Mechanical Testing & Qual.	
2.14	Quarterly Report & Final Task Report	
3.0	FIELD DEMONSTRATIONS	
3.1	Material Procurement	50
3.2	Demonstration Facility	15
3.3	Field Assembly Assessment	80
3.4	Post Weld Heat Treatment	
3.5	Procure Filler Wire	30
3.6	Equipment Qualification	
3.7	Full Section Process Refinements	
3.8	Finalize Demonstration Procedures	
3.9	Field Site Preparation	



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3.10	Horizontal Position Welding - PWHT	
3.11	Vertical Position Welding - PWHT	
3.12	Non Destructive Evaluation	
3.13	Mechanical Testing - Demonstration Welds	
3.14	Weld Demonstration Report	
3.15	Quarterly Reports	
4.0	WELDING PROCESS PROCEDURE HANDBOOK	
4.1	Process Specification	
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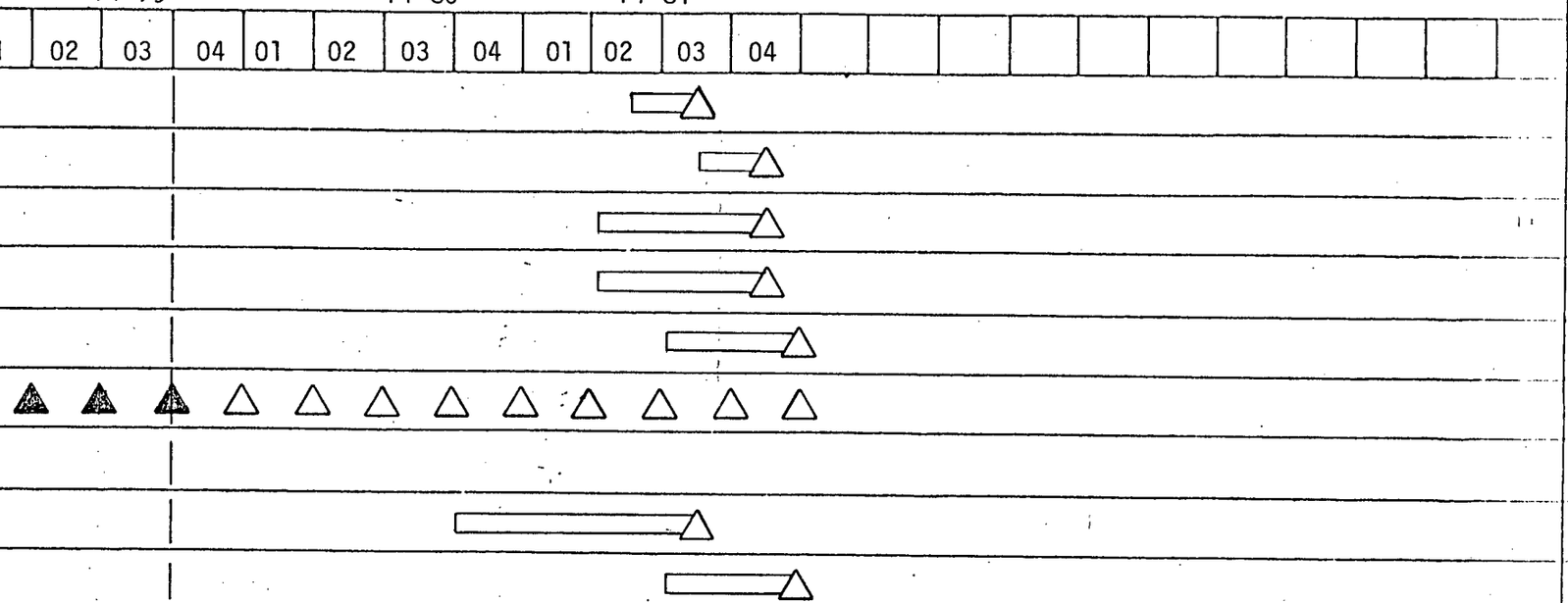

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MILESTONE LOG

TASK	DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	COMMENTS
1.0	REVIEW OF CURRENTLY AVAILABLE WELD PROC. AND PROJ. PLANNING			
1.1	Project Planning	4/1/79	3/20/79	
1.2	Welding Processes Review	8/1/79		
2.0	DEVELOPMENT OF PROC. AND LABORATORY DEMONSTRATION			
2.1	Consultation	4/1/80		
2.2	Facility Rearrangement	2/1/79	12/31/78	
2.3	Materials Procurement	10/1/79		Materials up to 4" thickness received & in use. 4" material combined with 3.1
2.4	Torch and Shield Adaptation	6/1/79	6/29/79	
2.5	Process Mechanical Control	11/1/79		
2.6.	Joint Design Evaluation	11/1/79		
2.7	Filler Wire Optimization	7/1/80		
2.8	Non Destructive Evaluation	11/1/79		
2.9	Repair Techniques	5/1/80		
2.10	Flat Position Parameters	8/1/79		
2.11	Horiz. Position Parameters	10/1/79		
2.12	Vert. Position Parameters	7/1/80		
2.13	Mechanical Testing & Qual.	8/1/80		
2.14	Quarterly Report & Final Task Report	As Req'd	As Req'd	Quarterly Reports: Jan., April, July, Oct. Final Report: 10/1/80

MILESTONE LOG

TASK	DESCRIPTION	PLANNED COMPLETION DATE	ACTUAL COMPLETION DATE	COMMENTS
3.0	FIELD DEMONSTRATION			
3.1	Material Procurement	6/1/80		
3.2	Demonstration Facility	1/1/80		
3.3	Field Assembly Assessment	4/1/79		
3.4	Post Weld Heat Treatment	5/1/80		
3.5	Procure Filler Wire	4/1/80		
3.6	Equipment Qualification	9/1/80		
3.7	Full Section Process Refinements	1/1/81		
3.8	Finalize Demonstration Procedures	4/1/81		
3.9	Field Site Preparation	1/1/81		
3.10	Horiz. Position Welding PWHT	6/1/81		
3.11	Vert. Position Welding PWHT	8/1/81		
3.12	Non Destructive Evaluation	9/1/81		
3.13	Mechanical Testing - Demonstration Welds	9/1/81		
3.14	Weld Demonstration Report	9/28/81		
3.15	Quarterly Reports	As Req'd		Quarterly Reports: Jan., April, July, Oct.
4.0	WELDING PROCESS PROCEDURE HANDBOOK			
4.1	Process Specification	6/1/81		
4.2	Operation Manual	9/28/81		

TECHNICAL PROGRESS REPORT

Contract No. EF-77-C-01-2771

For Period: FY-79, Third Quarter, Ending June 30, 1979

A. The following activity has been accomplished during the third quarter of this contract:

1.1 Project planning reported complete in second quarterly report.

1.2 The Welding Process Review is near completion. It examines five processes (GTAW, GMAW, SAW, ESW, EBW) in each of three categories: field fabrication; process; and metallurgy.

2.2 Facility rearrangement reported complete in first quarterly report. During the third quarter substantial effort was applied to refine the rearrangement for improved reliability and performance.

2.3 Two categories of the same plate chemistry are needed for this task. The first for rough trials or experimental runs, and the second - the full pedigree - for final test results.

Difficulties in obtaining a source have developed with the second category when a written materials specification is introduced that satisfies SA 387-22-2 and Section VIII-2 heat treatments. As a result, first category materials (satisfying SA 387-22-2) have been purchased on the open market for the initial work of 2.4 thru 2.10.

The 4" thick (second category - tasks 2.11 thru 2.13) material requirements have had to be combined with the 4" and 8" thick requirements of task 3.1 in order to not only meet the melter's minimum tonage requirements, but to buy time to find a plate supplier willing to deliver to the Code requirements.

2.4 Torch design * modifications complete - prototype built. Four variations of the torch ceramic tip have been built to evaluate different joint designs and joint depths.

2.6/ 3.7 Improved joint design (i.e. reduced root radius, included angle, and land thickness) have been machined, welded and x-rayed clear in the 2G position. Further tightening of the joint is proceeding.

2.7/ 3.5 Three separate heats of available commercial filler wire of the same classification but of predetermined chemical variations have been ordered in for evaluation for best deposit chemistry. These particular heats were chosen based on W experience with the welding process. Two are on hand - the other will be delivered during the fourth quarter.

* Independent W narrow groove torch design under separate W funding - same design will be built now from W design for DOE.

2.8 NTD evaluation has begun on initial plates.

2.10 Parameter review and modification (where required for this materials application) is continuing.

3.1 For reasons stated in task 2.3 (above), the placement of the P.O. for the 4" and 8" plate to be used in tasks 2.11 thru 2.13 and 3.7 thru 3.11 has been delayed approximately 6 months beyond the deadline for 3.7 - 3.11 and 12 months for 2.11 - 2.13.

The"open-market" purchase of the"SA 387-22-2 only" plate has reduced the 12 month impact (2.4 - 2.10 useage) to 3 months delay (2.11 - 2.13 useage).

The apparent 6 months impact for tasks 3.7 - 3.11 might be reduced to 3 months by the use of W SA 533A-2 plate in portions of tasks 3.6 - 3.8.

3.2 The subcontractor Merrick Corporation has been given a P.O. to develop outline drawings for the field demonstration welding equipment. This work is underway.

3.3 The field demonstration site has been selected and assessed as to services required. Assembly and inspection sequences are under study.

3.5 The purchase of the filler wire of tasks 2.7 & 3.5 have been combined. All wire for the project has been ordered - 65% has been delivered.

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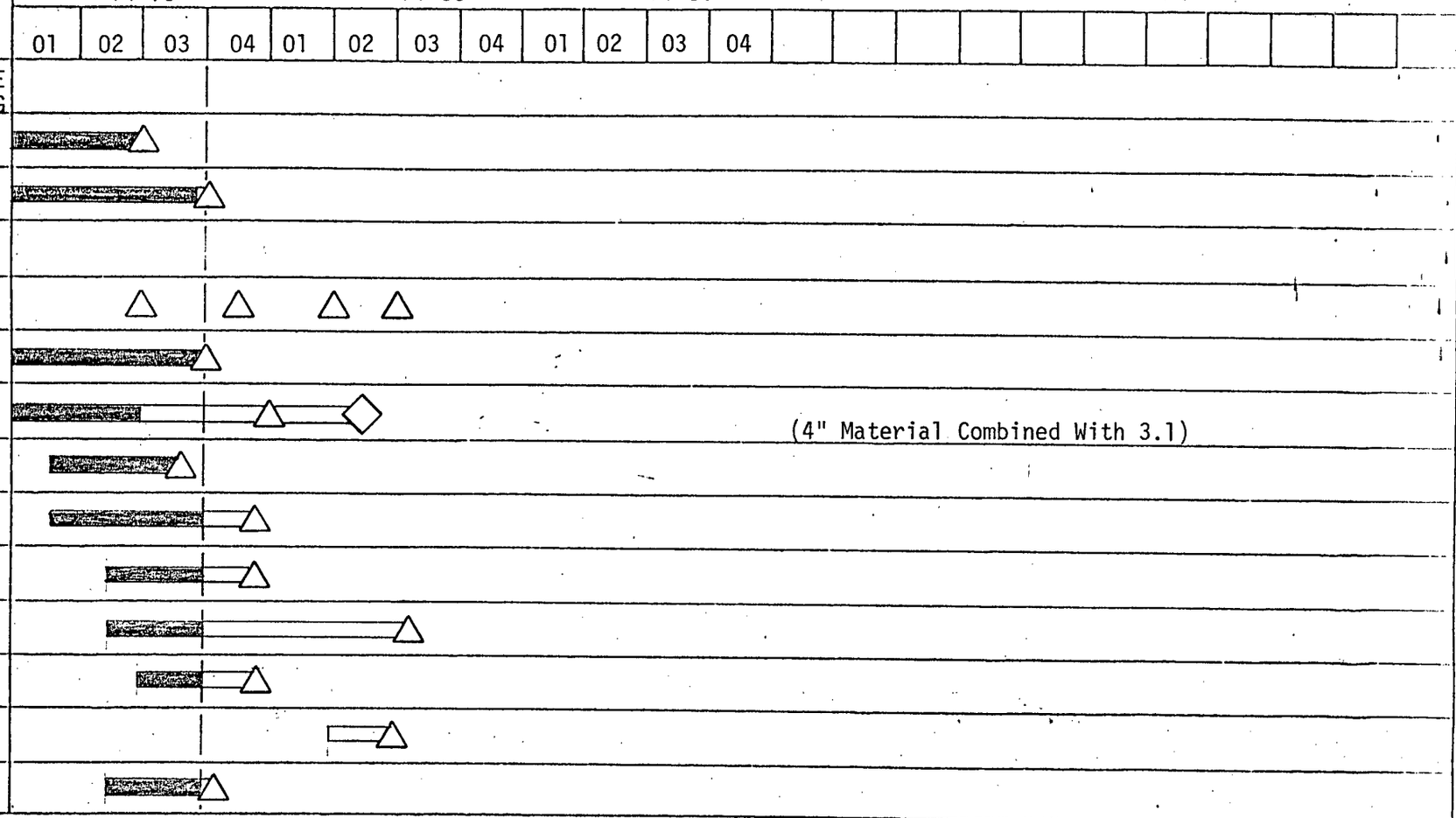

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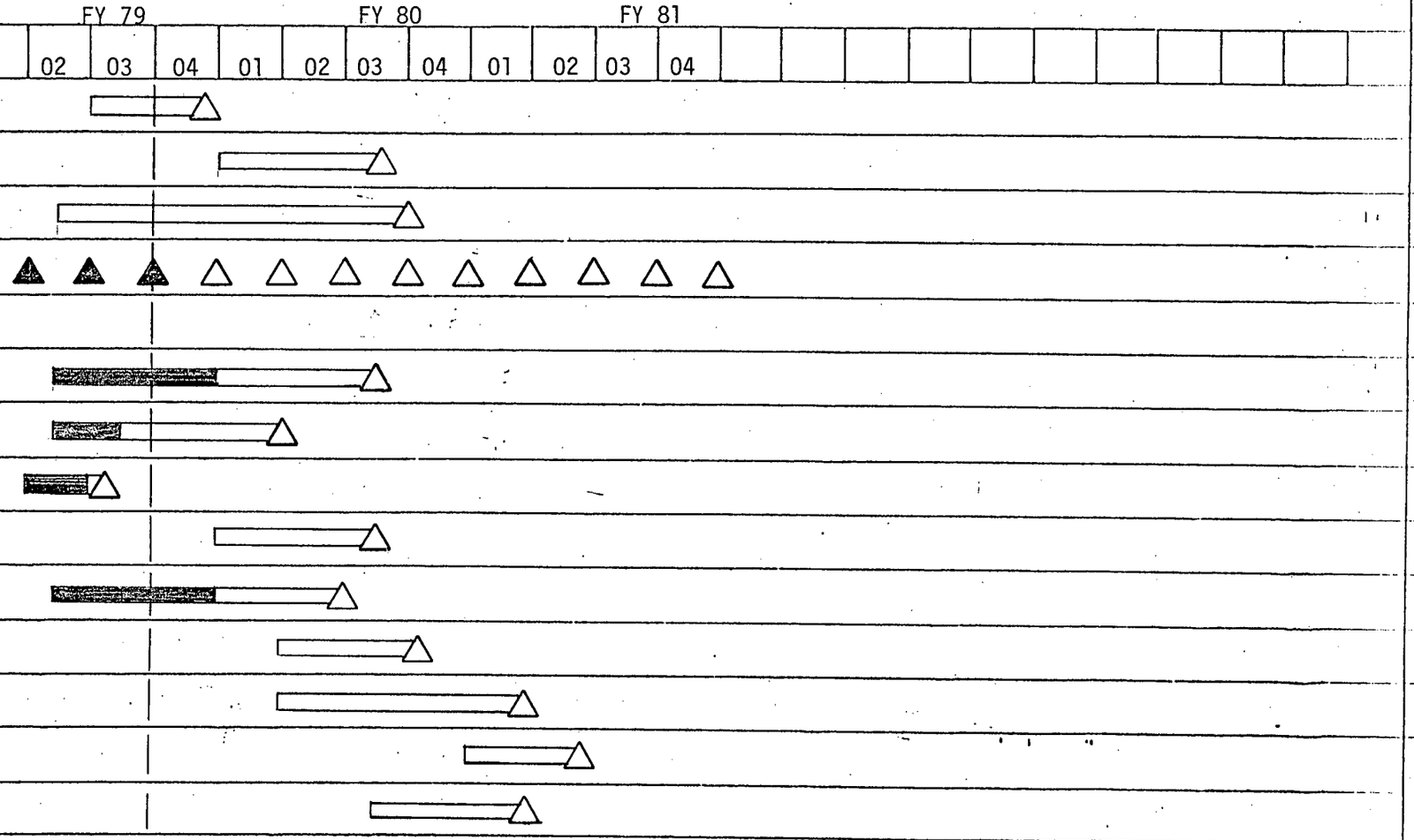

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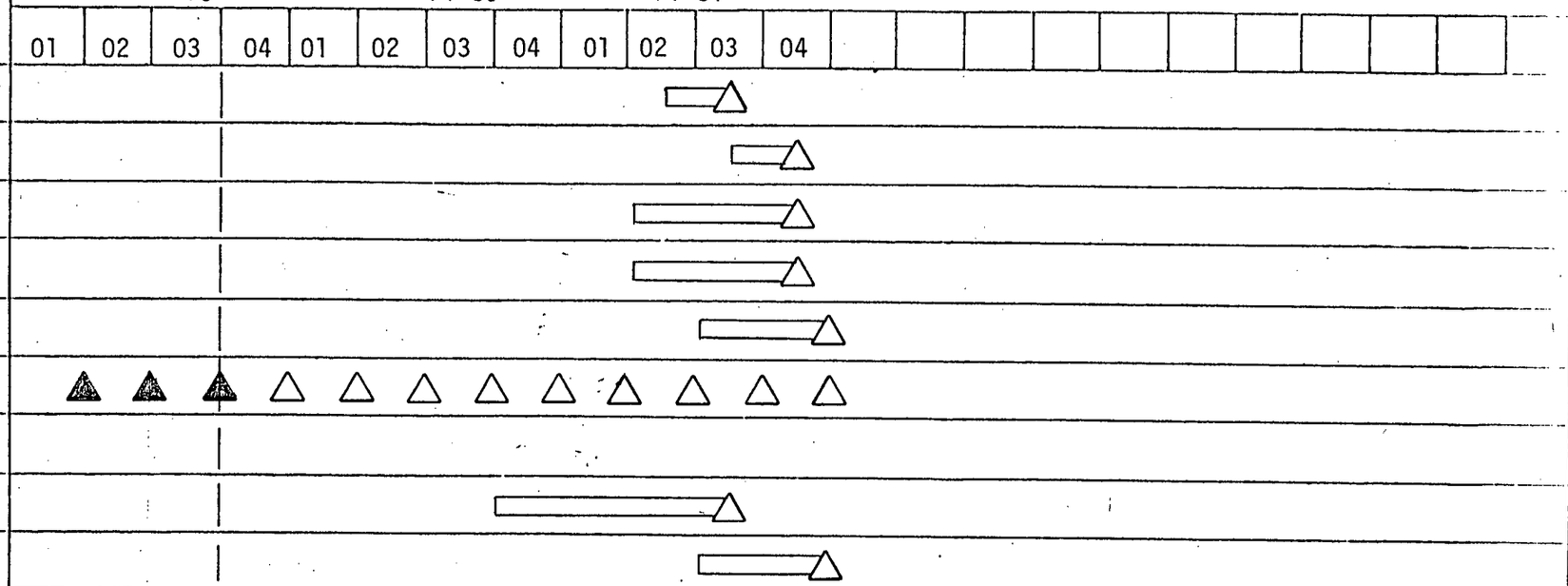

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