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HAZARD-IDENTIFICATION MATRIX
FOR
10-MW_e SOLAR-THERMAL CENTRAL-RECEIVER PILOT PLANT
(PRELIMINARY HAZARD-ANALYSIS INPUT)

22 November 1978

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DOE/ET/21007--T9

10 MW

SOLAR COLLECTOR SUBSYSTEM

HAZARD IDENTIFICATION MATRIX

The attached hazard matrix is our gross identifier of potential solar collector subsystem hazards. The matrix will be used as a hazard reference in the accomplishment of the preliminary design hazard analysis, and to assist system design engineers in the evaluation of the specific subsystem design. This matrix is submitted in accordance with Martin Marietta correspondence to STMPO, 4 October 1978, Subject: Hazards Analysis Plan and Schedule.

SOLAR COLLECTOR SUBSYSTEM HAZARD IDENTIFICATION MATRIX

HAZARD/POTENTIAL ACCIDENT EFFECT	HAZARD APPLIES	HAZARD MAY APPLY	HAZARD DOES NOT APPLY	APPLICABLE SPECIFICATIONS & STANDARDS	REMARKS
1. <u>Acceleration/Shock</u>				The following specifications and standards will be appropriately cited as references on each hazard analysis sheet.	The completed hazard analysis, addressing both collector subsystem design and operational criteria, will be delivered to the STMPO 30 days prior to CDR.
(1) Structural Deformation	X				
(2) Breakage by Impact	X				
(3) Displacement of Parts or Piping		X			
(4) Seating/Unseating Valves or Electrical Contacts	X			1. Occupational Safety and Health Administration Standards, Title 29 Labor	
(5) Loss of Fluid Pressure Head (Cavitation)			X	(a) CFR Part 1910, Occupational Safety and Health Standards	
(6) Pressure Surges in Fluid Systems			X	(b) CFR Part 1926, Safety and Health Regulations for Construction	
(7) Failure/Malfunction of Control Equipment	X				
2. <u>Chemical Energy</u>					
(1) Fire	X			2. California Occupational Safety and Health Regulations California Administrative Code, Title 8	
(2) Explosion			X		
(3) Nonexplosive Exothermic Reaction			X		
(4) Material Degradation		X			
(5) Toxic Gas Production			X		
(6) Corrosion Fraction Production			X	3. American National Standards Institute (ANSI)	Other ANSI standards as applicable REF: System Safety Design Criteria for the Central Receiver Solar Thermal Power System Para. 9.2.
(7) Swelling of Organic Materials			X	(a) A12.1-1973 Safety Requirements for Floor and Wall Openings, Railings and Toeboards	
3. <u>Contamination</u>					
(1) Clogging or Blocking of Components			X		
(2) Friction between Moving Surfaces			X		

10 MW ELECTRIC POWER PLANT

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HAZARD/POTENTIAL ACCIDENT EFFECT	HAZARD APPLIES	HAZARD MAY APPLY	HAZARD DOES NOT APPLY	APPLICABLE SPECIFICATIONS & STANDARDS	REMARKS
3. <u>Contamination</u> (continued) (3) Deterioration of Fluids (4) Degradation of Performance of Sensors/Operating Components (5) Erosion of Lines or Components (6) Fracture of Lines or Components (Fas Moving Particles) (7) Electrical Insulation Breakdown		X X	X	(b) A14.1-1975 Safety Code for Portable Wood Ladders (c) A14.2-1972 Safety Code for Portable Metal Ladders (d) A14.3-1974 Safety Code for Fixed Ladders	Major hazard items 2 (1), 13 (2) (3), and 14 (1) represent personnel and material hazard potential associated exclusively with concentrated solar beams and beam reflections.
4. <u>Electrical Energy</u> (1) Electrocution (2) Involuntary Personnel Reaction (3) Personnel Burns (4) Ignition of Combustibles (5) Equipment Failure (6) Inadvertent Activation of Equipment (7) Loss of Control/Indication Functions	X X X X X X X		X	(e) A58.1-1972 Minimum Design Loads in Buildings and Other Structures (f) A92.2-1969 Vehicle Mounted Elevating and Rotating Work Platforms (g) C2-1973 National Electrical Safety Code	
5. <u>Human Capability</u> (1) Personnel Injury Due to: (a) Restricted egress/evacuation routes (b) Hazardous Location of equipment/controls		X	X	(h) Z53.1-1971 Safety Color Code for Marking Physical Hazards	

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5. <u>Human Capability</u> (continued)					
(1) (c) Inadequate visual/audible warnings		X		4. National Fire Protection Association (NFPA)	Other National Fire Codes - 1975 (VOL 1-15) as applicable. REF: System Safety Design Criteria for the Central Receiver Solar Thermal Power System, Para. 9.1.
(2) Equipment Damage by Improper Operation Due to:				(a) NFPA (70-1975)	
(a) Control Location		X		National Electrical Code (ANSI CI-1975)	
(b) Inadequate control/display identification		X		5. Standards of the National Electrical Manufacturers Association (NEMA)	
(c) Inadequate data for decision making		X		6. American Institute of Steel Construction	
6. <u>Human Hazards</u>				7. American Concrete Institute	
(1) Personnel Injury Due to:					
(a) Sharp edges/corners	X				
(b) Dangerous heights	X				
(c) Unguarded floor/wall openings	X				
(d) Limited work areas	X				
7. <u>Interface/Interaction</u>					
(1) Incompatible Materials Reaction			X		
(2) Interfacing Systems/Component Reactions		X			
8. <u>Kinetic Energy</u>					
(1) Linear Impact		X			
(2) Disintegration of Rotating Components			X		

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9. <u>Material Deterioration</u> (1) Change in Physical or Chemical Properties (2) Structural Failure (3) Electrical Component Failure	X X		X		
10. <u>Mechanical Energy</u> (1) Personnel Injury/Equipment Damage from Energy Release		X			
11. <u>Natural Environment</u> (1) Structural Damage (wind, hail, etc.) (2) Personnel Injury (3) Electrical Discharge (Lightning) (4) Dimension Changes for Solar Heating	X X X		X		
12. <u>Pressure</u> (1) Blast/Fragmentation from Overpressure Rupture (2) Line/Hose Whipping (3) Container Implosion (4) System Leaks (5) Heating/Cooling (Rapid Changes)			X X X X X		

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13. <u>Radiation</u> (1) Electronic Equipment Interference (2) Human Tissue/Eye Retinal Damage (3) Charring of Organic Materials (4) Decomposition of Chlorinated Hydrocarbons into Toxic Gases (5) Ozone or Nitrogen Oxide Generation	X X X		X X		Heliostat beam eye hazard evaluations will be accomplished and updated throughout the hazard analysis process for the collector field configuration. Calculations to define safe exposure distances are defined in the System Safety Design Criteria document. Eye hazard calculations include:
14. <u>Thermal</u> (1) Ignition of Combustibles (2) Initiation of Other Reactions (3) Distortion of Parts (4) Expansion/Contraction of Solids or Liquids (5) Liquid Compound Stratification (6) Personnel Injury	X X	X X X	X		1. Individual Heliostat Radiance Calculations.
15. <u>Toxicants</u> (1) Respiratory System Damage (2) Blood System Damage (3) Body Organ Damage (4) Skin Irritation or Damage (5) Nervous System Effects			X X X X X		2. Safe Retinal Exposure Values. 3. Coincident Multiple Beam Calculations. 4. Exclusion Zone Calculations.

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16. <u>Vibration/Sound</u> (1) Material Failure (2) Personnel Fatigue or Injury (3) Pressure/Shock Wave Effects (4) Loosening of Parts (5) Chattering of Valves or Contacts (6) Communication Interference (7) Impairment or Failure of Controls/Displays	X X X	 X	 X X X		