2023 Idaho Pre-Engineering Criticality Survey (26)

CONTENT STANDARD 1.0: PROFESSIONAL ORGANIZATIONS AND LEADERSHIP	
Performance Standard 1.1: Effective Leadership and Participation in Career Technical Student Organizations (CTSO) and Professional Associations	
Q2. 1.1.1 Explore the role of professional organizations and/or associations in the engineering industry.	1.38
Q3. 1.1.2 Participate in content-aligned CTSO.	1.46
Q4. 1.1.3 Participate in a CTSO event at the local level or above.	1.50
Q5. 1.1.4 Engage in career exploration and development through CTSO participation.	1.62
CONTENT STANDARD 2.0: LAB/WORKPLACE SAFETY AND TOOL USE	
Performance Standard 2.1: Safety	
Q6. 2.1.1 Describe the role of the Occupational Safety and Health Administration (OSHA).	2.00
Q7. 2.1.2 Comply with requirements for personal protection equipment (PPE).	2.44
Q8. 2.1.3 Describe material handling, storage, use, and disposal requirements.	2.08
Q9. 2.1.4 Interpret safety data sheets (SDS) before using materials (i.e., handling, storage use, disposal requirements).	2.08
Q10. 2.1.5 Interpret safety signage for hazards, evacuation routes, and safety areas.	2.28
Q11. 2.1.6 Identify the location and the types of fire extinguishers and other fire equipment.	2.00
Q12. 2.1.7 Describe procedures for using fire extinguishers and other fire safety equipment.	1.88
Q13. 2.1.8 Describe the requirements for using eye-wash stations.	1.88
Q14. 2.1.9 Describe electrical hazards and the effects of electrical shock on the human body.	2.04
Performance Standard 2.2: Tool Identification and Safe Use	
Q15. 2.2.1 Identify hand tools and power tools, including precision measuring tools.	2.40
Q16. 2.2.2 Maintain tools.	2.04
Q17. 2.2.3 Match tools to their intended use and purpose.	2.32
Q18. 2.2.4 Perform a safety check before using tools.	2.16
CONTENT STANDARD 3.0: IMPACT OF ENGINEERING	
Performance Standard 3.1: Engineering Careers	
Q19. 3.1.1 Define engineering.	1.84
Q20. 3.1.2 Research career opportunities and the educational requirements for a given engineering field.	1.76
Q21. 3.1.3 Create an education and career plan for a career in engineering.	1.64
Q22. 3.1.4 Describe the importance of collaboration in the engineering industry.	2.00
Performance Standard 3.2: Ethics in Engineering	
Q23. 3.2.1 Identify current engineering codes of ethics and their purpose.	1.84
Q24. 3.2.2 Describe ethical engineering issues.	1.92
Q25. 3.2.3 Analyze the ethical issues involved in an engineering failure.	2.00
CONTENT STANDARD 4.0: ENGINEERING DESIGN PROCESS	
Performance Standard 4.1: Design Process Concepts	
Q26. 4.1.1 Apply the steps of the design process to solve a design problem (i.e., define the problem, generate concepts, develop a solution, develop a design proposal, construct and test a prototype, refine the design, evaluate a solution, and communicate the processes and results).	2.52
Q27. 4.1.2 Describe how social, environmental, regulatory, and financial constraints influence the design process.	1.72
Q28. 4.1.3 Describe the evolution and lifecycle of a product (i.e., introduction, growth, maturity, decline).	1.76
Performance Standard 4.2: Measuring and Scaling	
Q29. 4.2.1 Identify imperial/standard and metric/SI units of measure and level of accuracy requirements for an engineering problem/design.	2.56
Q30. 4.2.2 Convert between imperial/standard and metric/SI units of measure in an engineering problem/design.	2.44
Q31. 4.2.3 Determine scale on a blueprint.	2.36
Q32. 4.2.4 Apply algebraic and geometric calculations to determine size, mass, volume, and surface area in an engineering problem/design.	2.20
Q33. 4.2.5 Convert between fractions and decimals in an engineering problem/design.	2.60
Q34. 4.2.6 Report measurements by using and reading precision measuring tools.	2.56

Performance Standard 4.3: Technical Sketching and Drawing	
Q35. 4.3.1 Communicate ideas, using freehand sketching (e.g., pictorial, multi-view) and annotations.	2.28
Q36. 4.3.2 Produce drawings from sketches.	2.24
Q37. 4.3.3 Identify the six primary orthographic views.	2.04
Q38. 4.3.4 Identify the alphabet of lines (i.e., styles, weights) and line conventions.	2.04
Q39. 4.3.5 Apply basic elements (e.g., title block information, dimensions, and line types) in a technical drawing.	2.00
Q40. 4.3.6 Identify basic industry standard symbols on sketches, drawings, and blueprints.	2.20
Q41. 4.3.7 Produce various types of drawings (e.g., part, assembly, pictorial, orthographic, isometric, and schematic), given an engineering design.	2.20
Q42. 4.3.8 Arrange dimensions and annotations, using ANSI and ISO standards for an engineering problem/design.	1.84
Q43. 4.3.9 Create a bill of materials or schedule from blueprints and specifications.	2.04
Performance Standard 4.4: Engineering Documentation	
Q44. 4.4.1 Describe documentation and communication methods used in engineering.	2.00
Q45. 4.4.2 Maintain documentation during the engineering design process.	2.32
Q46. 4.4.3 Describe the importance of proprietary documentation (e.g., copyright, patent) in engineering.	1.96
Q47. 4.4.4 Create project-management timelines for an engineering design.	2.16
Q48. 4.4.5 Write a technical report for an engineering design.	2.16
Performance Standard 4.5: Modeling	
Q49. 4.5.1 Identify the areas of modeling (e.g., physical, conceptual, mathematical).	1.92
Q50. 4.5.2 Create a scale model or a working prototype.	2.08
Q51. 4.5.3 Evaluate the accuracy of a scale model or a working prototype.	1.84
CONTENT STANDARD 5.0: MATERIALS	
Performance Standards 5.1: Material Properties	
Q52. 5.1.1 Identify the major categories of materials (e.g., ceramics, composites, polymers, metals) and their applications.	2.00
Q53. 5.1.2 Describe characteristics of materials by their applications in engineering.	2.00
Q54. 5.1.3 Describe the cost and environmental factors that affect choosing specific materials for a design process.	1.84
Q55. 5.1.4 Differentiate among raw material, standard stock, and finished products.	2.04
Performance Standards 5.2: Materials Strength	
Q56. 5.2.1 Describe the various forms of stress (e.g., compression, tension, torque, and shear) and how it affects materials selection for an engineering design.	2.13
Q57. 5.2.2 Describe the fundamental principles of a stress-strain curve.	1.63
Q58. 5.2.3 Create free-body diagrams of objects, identifying all forces acting on the object.	1.54
Q59. 5.2.4 Differentiate between scalar and vector quantities.	1.67
Q60. 5.2.5 Define magnitude, direction, and sense of a vector.	1.71
Q61. 5.2.6 Measure magnitude, direction, and sense of a vector.	1.63
Q62. 5.2.7 Define moment and torque forces.	1.83
Q63. 5.2.8 Calculate moment and torque forces in an engineering design.	1.79
CONTENT STANDARD 6.0: FUNDAMENTAL POWER SYSTEMS AND ENERGY PRINCIPLES	
Performance Standard 6.1: Basic Mechanical Systems	
Q64. 6.1.1 Distinguish among the characteristics and components of the six simple machines.	1.88
Q65. 6.1.2 Measure forces and distances related to mechanisms in an engineering design.	1.79
Q66. 6.1.3 Determine efficiency in a mechanical system.	1.79
Q67. 6.1.4 Calculate mechanical advantage and drive ratios of mechanisms.	1.83
Q68. 6.1.5 Calculate work, power, and torque/moment.	1.83
Q69. 6.1.6 Design a basic mechanical system.	2.04
Q70. 6.1.7 Assemble a basic mechanical system.	2.04
Q71. 6.1.8 Test a basic mechanical system.	1.96
Performance Standard 6.2: Power Systems and Energy Forms	
Q72. 6.2.1 Identify the types of basic power systems, components, and related terminology (e.g., energy, potential energy, kinetic energy, power, work, horsepower, watts).	2.00

Q73. 6.2.2 Describe the factors that affect choice of power system in an engineering design.	1.91
Q74. 6.2.3 Calculate the efficiency of power systems and conversion devices.	1.65
Q75. 6.2.4 Categorize major forms of energy (e.g., thermal, radiant, nuclear, chemical, electrical, mechanical, fluid).	1.83
Q76. 6.2.5 Define units used to measure energy.	2.00
Q77. 6.2.6 Calculate conversions between common energy measurements in an engineering design.	2.00
Q78. 6.2.7 Describe the purpose and function of an energy conversion device (e.g., solar panel, windmill, battery, turbine).	1.96
Performance Standard 6.3: Energy Sources and Applications	
Q79. 6.3.1 Categorize various energy sources as nonrenewable, renewable, or inexhaustible.	1.74
Q80. 6.3.2 Measure circuit values, using a multimeter.	2.09
Q81. 6.3.3 Calculate power in a system that converts energy from electrical to mechanical.	1.74
Q82. 6.3.4 Determine efficiency of a system that converts an electrical input to a mechanical output.	1.74
Q83. 6.3.5 Describe the relationship of voltage, current, and resistance.	2.17
Q84. 6.3.6 Calculate values of current, resistance, and voltage in a circuit, using Ohm's law.	2.04
Q85. 6.3.7 Create series and parallel circuits, using basic laws of electricity and Kirchhoff's law.	1.91
Performance Standard 6.4: Automation Systems	
Q86. 6.4.1 Create detailed operational flowcharts and logic in a system-control program.	1.78
Q87. 6.4.2 Select appropriate input and output devices, based on system specifications and constraints.	1.91
Q88. 6.4.3 Differentiate between the attributes of digital and analog devices.	2.00
Q89. 6.4.4 Compare open and closed loop systems.	2.04
Performance Standard 6.5: Basic Fluid Systems	
Q90. 6.5.1 Define fluid systems (e.g., hydraulic, pneumatic, vacuum).	1.83
Q91. 6.5.2 Identify the components of fluid systems and their functions.	1.74
Q92. 6.5.3 Compare hydraulic and pneumatic systems.	1.70
Q93. 6.5.4 Identify the advantages and disadvantages of using fluid power systems.	1.74
Q94. 6.5.5 Describe the difference between gauge pressure and absolute pressure.	1.57
Q95. 6.5.6 Describe the safety concerns of working with liquids and gases under pressure.	1.96
Q96. 6.5.7 Calculate mechanical advantage, using Pascal's law.	1.48
Q97. 6.5.8 Calculate values in a pneumatic system, using the ideal gas law (i.e., general gas equation).	1.48
CONTENT STANDARD 7.0: ANALYSIS OF DESIGNS AND PROTOTYPES	
Performance Standard 7.1: Statistics	
Q98. 7.1.1 Define statistical terminology (e.g., mean, mode, median, range, standard deviation).	1.95
Q99. 7.1.2 Illustrate frequency distribution.	1.59
Q100. 7.1.3 Calculate the central tendency of a data array to include mean, median, and mode.	1.73
Q101. 7.1.4 Calculate data variation to include range, standard deviation, and variance.	1.68