2016 HPVC India Design Scoring Criteria

	Design Report Evaluation	**100**	
	General	**5**	**Evaluated based on report**
1	**Form 6**	1	Form 6 completed and attached to front of report (V.F.1)
2	**Title Page**	1	Title page information correct and complete (V.F.2)
3	**3-View Drawing**	1.5	3-View drawing, in accordance with ASME Y14.5 and related standards such as ASME Y14.24 and ASME Y14.3
4	**Abstract**	1.5	Abstract included, correct length, clear, concise, and informative. This should be page 1
	Design	**15**	**Evaluated based on report and presentation**
1	**New Design**	2	2 - Teams must demonstrate that the entry is a new design (not just a new frame or fairing) completed during the current academic year, or not HPVC entry for last 2 years 1 -Some new elements (frame, fairing, etc.) or no HPVC entry for last year 0 - Similar to previous year's entry
2	**Design Methodology**		
	Design Objective	1	Provide clear design objectives and goals for project. (Hint: "To Win" or "To do better than last year" are not acceptable objectives)
	Background research	1	Include supporting research and review of prior art. Provide background information to justify your objectives, mission, design approaches, and design concepts. Background research should include specific information found/used to aid in design and development of the HPVC, but should not include your teams general competition history. Appropriate background research can include information found on HPV development, aerodynamics, HPV standards (such as ISO or Federal), competitive vehicles, etc. Cite references as appropriate.
	Prior Work	1	Clearly document any design, fabrication, or testing that was not completed in the current academic year. If teams reuse work from previous years and it is not listed here teams will be assessed a penalty for reusing content.
	Organizational Timeline	1	Include an organizational timeline or Gantt chart showing project scheduling and completion
	Design Criteria/PDS	1	Provide well established design criteria and product design specifications
	Alternatives and Evaluation	1	Present alternative designs that were considered using concept improvement and selection techniques
	Structured Design Methods	2	Document use of established design methodologies, including, but not limited to QFD, Decision Matrices, etc. How did you choose features of your design with respect to your specifications and requirements?
	Description	1	Describe the final vehicle design, making generous use of drawings and figures. Describe how the vehicle can be practically used, what environmental conditions were addressed and components and systems were selected or designed to meet the objectives.
3	**Discretionary Points**	4	Discretionary points based on overall thoroughness, quality, accuracy, and approach
	Analysis	**25**	**Evaluated based on report and presentation**
1	**Rollover/Side Protection System**		Per RPS requirements
	Top Load Modeling	1	Clearly and accurately describe constraints, idealizations, etc.
	Top Load Results	2	Clearly describe and interpret results, score depends on results and perceived validity of results. Target load is to be applied and deflection value is to be clearly documented as result. 0: Maximum total elastic deflection equal to or greater than 7.6 cm (3.0 in); 1: 6.4 cm (2.5 in); 2: 5.1 cm (2.0 in) or less
	Side Load Modeling	1	Clearly and accurately describe constraints, idealizations, etc.
	Side Load Results	2	Clearly describe and interpret results, score depends on results and perceived validity of results. Target load is to be applied and deflection value is to be clearly documented as result. 0: Maximum total elastic deflection equal to or greater than 6.4 cm (2.5 in); 1: 5.1 cm (2.0 in); 2: 3.8 cm (1.5 in) or less
2	**Structural Analytical Calculations**		Demonstrated appropriate and correct use of numerical computational tools such as FEA, CFD, etc.
	Objectives	1	Clear objective for the analysis
	Analysis Case Definitions	1	Clearly identify and describe analysis cases, include rationale for each
	Modeling	1	Clearly and accurately describe constraints, idealizations, use of symmetry, etc.
	Results	2	Clearly describe and interpret results
	Design Modifications	1	Demonstrate how results were used to modify and improve the design
3	**Aerodynamics**		
	Aero Device Incorporated	1	All entries are required to have an aerodynamic device incorporated into their design (make-shift items, false claims, and claims such as reclined rider position contributes to aero will not be granted credit)
	Alternatives Evaluated	1	Must evaluate several alternatives in a trade study
	Chosen Design Substantiated	1	Must substantiate chosen aero device through analysis
4	**Cost Analysis**		
		1	Tabulated cost summary of prototype included. Include all actual expenditures and income sources, but do not include student labor.
		2	Include production cost estimate, 0-None, 1 - Incomplete or not comprehensive, 2 - Complete & Comprehensive
5	**Other Analyses**		Vehicle handling, stability, steering, suspension kinematics & dynamics, optimizations, and other analyses
	Objectives	1	Clear objective for the analysis
	Analysis Case Definitions	1	Clearly identify and describe analysis cases, include rationale for each
	Results	1	Clearly describe and interpret results
	Design Modifications	1	Demonstrate how results were used to modify and improve the design
5	**Discretionary Points**	3	Discretionary points based on overall thoroughness, quality, accuracy, and approach
	Testing	**25**	**Evaluated based on report and presentation**
1	**Rollover/Side Protection System**		Per RPS requirements
	Top Load Testing Setup	1	Test method clearly described, appropriate, and scientific
	Top Load Testing Results	2	Clearly describe and interpret results, score depends on results and perceived validity of results. Increasing load is to be added to RPS until maximum defelction is reached and then load achieved is to be clearly stated as the result. 0: Less than 1780N (400 lbf); 1: 1780-2670N (400-599 lbf); 2: ≥2670N (600 lbf)
	Side Load Testing Setup	1	Test method clearly described, appropriate, and scientific
	Side Load Testing Results	2	Clearly describe and interpret results, score depends on results and perceived validity of results. Increasing load is to be added to RPS until maximum defelction is reached and then load achieved is to be clearly stated as the result. 0: Less than 890N (200 lbf); 1: 890-1330N (200-299 lbf); 2: >1330N (300 lbf)
2	**Developmental Testing**		Physical testing to develop or verify design, usually conducted prior to final vehicle construction
	Objective & Methodology	1	Clear objective for the experiment. Methodology clearly described, appropriate, and scientific
	Results and Discussion	1	Data is reported and presented clearly, with appropriate discussion (interpretation, error sources, uncertainty, etc.)
	Statistical Analysis	1	Data is analyzed and presented clearly, with appropriate statistical analyses (t-test, ANOVA, regression, etc.) and measures (mean and standard deviation, confidence intervals, p-value, etc.)
	Conclusions	1	Conclusions and recommendations stated clearly. Results should be quantitative where possible and include applicable statistical analyses (mean, standard deviation, student T test, etc.)
	Design Modifications	1	Demonstrate how testing results used to modify or improve the design
	Comparison with PDS and Analysis	1	Test results clearly compared with analysis results and product design specifications
	Comprehensiveness	1	Extent of developmental testing: 0: few experiments/little significance on design, 1: many experiments/significant effect on design
3	**Performance Testing**		Physical testing (often conducted on final vehicle) to evaluate and optimize performance
	Objective & Methodology	1	Clear objective for the experiment. Methodology clearly described, appropriate, and scientific.
	Results and Discussion	1	Data is reported and presented clearly, with appropriate discussion (interpretation, error sources, uncertainty, etc.)
	Statistical Analysis	1	Data is analyzed and presented clearly, with appropriate statistical analyses (t-test, ANOVA, regression, etc.) and measures (mean and standard deviation, confidence intervals, p-value, etc.)
	Conclusions	1	Conclusions and recommendations stated clearly. Results should be quantitative where possible and include applicable statistical analyses (mean, standard deviation, student T test, etc.)
	Design Modifications	1	Demonstrate how testing results used to modify or improve the design
	Comparison with PDS and Analysis	1	Test results clearly compared with analysis results and product design specifications
	Comprehensiveness	1	Extent of developmental testing: 0: few experiments/little significance on design, 1: many experiments/significant effect on design
4	**Discretionary Points**	5	Discretionary points based on overall thoroughness, quality, accuracy, and approach
	Safety	**20**	**Evaluated based on report and safety inspection**
1	**Rollover/Side Protection System**		
	Installation & Design	2	Rollover/Side protection system installed and functional
	Consistent with RPS rule	2	RPS design and fabrication appears consistent with rules
	Prevents bodily contatct with ground	2	RPS must prevent the riders appendages and head from contacting the ground in the event of a crash where the HPVC falls over or inverts
2	**Seat belt**	2	Seat belt installed correctly and appears to meet rules
3	**Steering system**	2	No excessive play or looseness, correct installation, apparent stability, etc.
4	**Sharp edges, protrusions, pinch points**	1	No sharp edges or protrusions on fairing, frame or components. No hazardous pinch points, especially near spoked wheels, chains, sprockets, etc. (Subtract points for serious hazards)
5	**Other hazards**	1	No other obvious hazards
6	**Rider's field of view**	1	Rider should have more than 180 degrees of visibility
7	**Safety Accessories**		
	Bell/Horn	1	Audible signal device installed and operational
	Headlight	1	White headlight installed and operational, visible 150 meters to the front, installed and operational
	Taillight	1	Red Taillight visible 150 meters to the rear, installed and operational
	Side reflectors	1	Amber reflectors on each side of vehicle properly installed
	Rear view mirrors	1	Mirror(s) installed providing the driver with views to the rear of the vehicle
8	**Materials of construction**	1	Materials of construction and production processes for frame and fairing chosen with safety in mind
9	**Manufacturing process**	1	Explain safety measures used during the construction of the vehicle
	Aesthetics	**10**	**Evaluated based on state of vehicle at safety inspection**
	Overall impression of vehicle	3	Overall impression
	Quality of craftsmanship	3	Craftsmanship (welds, joints, assembly, etc.) is professional and attractive
	Quality of custom parts	2	Team-fabricated and custom parts look professional and of high quality
	Quality of Frame/Fairing Finish	2	Exterior finish and decoration quality is neat, attractive, and professional (frame and/or fairing)