Summary and Conclusions

Revisiting my first investigation, the least weight and most cost effective lateral system made use of HSS members in a chevron bracing configuration. Because, the system is located on the exterior of the structure, the beams in each frame must support the masonry façade at each floor level. The masonry deflection limits of L/600 or 0.3" controlled the design of each member. The chevron braces, connected at the center of each beam, decrease each span by half. This reduction in span greatly reduces the lateral frame beam sizes without compromising their load carrying capacity within the frame.

Looking back on each lateral system, choosing one over another is a matter of architectural needs, location of lateral frames, and total engineering time. Designing a concentric system with braces used for their tension capacity only, is an attractive option because it eliminates compression related design issues such as effective length and buckling. In this particular case, I would recommend the use of the alternate chevron bracing scheme.

Depending on building use and occupancy, the need to prescribe strict vibration criteria is a debatable issue. In the case of the Duquesne University Multipurpose Athletic Facility, the name says it all. The building is used to house athletic and office type facilities, and should be designed to comfortably accommodate both. With that in mind, each of four floors was redesigned to the standards laid out in AISC Design Guide 11. The redesign yielded a building that is both vibrationally sound and yet, cost feasible. This is made possible because of the economical capabilities of castellated beam members used in long span areas. Because the cost of the alternate design is within $20,000 of the existing structure, I would recommend that the alternative design be used (assuming the structure had yet to be built).

On the subject of personal comfort, acoustical properties of interior spaces were also taken into consideration. The construction of most all critical interior walls that separate active and inactive spaces is satisfactory. Only in a few instances did the assembly not meet sound transmission criteria. At these walls, adding an extra layer of gypsum board or a thicker sound attenuation blanket would be a quick, effective fix. The floor/ceiling assemblies throughout the building (6.5" concrete slab and composite steel framing) are satisfactory in regards to sound related issues.

Throughout the research and design process, I have tried to improve the overall performance of the structure while reducing, or maintaining existing cost values. I feel that each alternate system proposed, whether for lateral or gravity loads, is an effective solution both in terms of structure and cost.