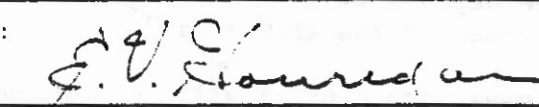


TO: MAIN OFFICE REGIONAL OFFICES SUPERSEDED BY EB 98-014 EFFECTIVE 4/24/1998	ENGINEERING INSTRUCTION NEW YORK STATE DEPARTMENT OF TRANSPORTATION
Distribution: <input checked="" type="checkbox"/> Main Office <input checked="" type="checkbox"/> Regions <input type="checkbox"/> Special	Code: <u> EI 78-60 </u>
APPROVED:  <hr/> Deputy Chief Engineer (Structures)	Date: <u> 12/12/78 </u> Supersedes:

A nonredundant superstructure is one supported by one or two primary members, the failure of one of which would be likely to result in collapse of the bridge. In a nonredundant superstructure, there is no viable alternate load path if a primary supporting member should fail for any reason. Nonredundant tension members and components of members are referred to as Fracture Critical Members (FCM's) in AASHTO Specifications. Special provisions for FCM's in AASHTO and NYS DOT Specifications reflect deep concern for the possibility of disastrous instantaneous collapse which may be brought about by brittle fracture of a nonredundant tension member. The failure of a nonredundant compression member can also result in collapse if the member is severely overloaded or damaged by corrosion, accidental impact or fire. Examples of nonredundant superstructures are those supported by one or two plate girders, box girders, trusses, arches or cables.

In contrast, a redundant superstructure is one consisting of several supporting members, which act together to carry loads. The loads are distributed among members through the deck slab and/or other connections. The failure of one main supporting member rarely can cause collapse without warning, since adjacent members take the load originally carried by the failed member. The remaining members may then be overstressed and the bridge may have to be partially or totally closed to traffic, but it will generally remain standing until repairs are made.

In view of the insurance provided by redundancy in a structure, nonredundant steel superstructure systems are to be avoided if there is a feasible alternate. In particular, superstructures supported by one or two box girders or deck girders are not to be used since a multistring system can be constructed in the same situation. It is recognized that there is usually no feasible alternate redundant design for very long span structures, in which case a nonredundant system is appropriate. It is also often not feasible to design a redundant superstructure in place of a through-girder railroad bridge where clearances are critical.

Subject: DESIGN CRITERIA FOR BRIDGES 78-1, NONREDUNDANT SUPERSTRUCTURES

FHWA Technical Advisory T 5140-4, dated September 28, 1978, on the subject, "Tied Arch Bridges," warns that that type of structure should be particularly avoided, stating:

"While the tied arch structure may be economically competitive with other alternate designs, it is one of the most nonredundant structures, relying entirely on the capability of two tie girders to accommodate the total thrust imposed by the arch ribs."

Specific approval of the Deputy Chief Engineer (Structures) will be required prior to progressing detail design of bridges composed of nonredundant steel superstructures.

Where nonredundant systems are approved for use, the designer must identify fracture critical members and design them as such.