International Journal of Fatigue xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

International Journal of Fatigue

journal homepage: www.elsevier.com/locate/ijfatigue

Participatory database of repair cases on fatigue damaged welded structures

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ARTICLE INFO

Article history:
Received 14 August 2016
Received in revised form 28 December 2016
Accepted 9 January 2017
Available online xxxx

Keywords:
Database
Steel bridge
Fatigue
Repair
Wiki

ABSTRACT

We report a Web database in which 204 fatigue-related steel bridge repair cases have been summarized. Since the database is based on the PukiWiki system, which is a Wiki-type content management arrangement, any user can participate in creating and modifying database files, much as is commonly done in Wikipedia. Furthermore, failures causes, repair methods, service years, crack occurrences, and welding defect types are analyzed using the cases included in this database. In this paper, we introduce the database and present the results of the analyses.

1. Introduction

Since information on past repair cases is very useful when considering fatigue damage repair methods, it is important to summarize causes and repairs for previously reported fatigue damage cases, and to provide this comprehensive information to anyone who wishes to access it. As a part of the International Institute of Welding's (IIW), Commission XIII (Fatigue of Welded Components and Structures), Working Group 5 (Life Extension of Welded Structures by Repair, Retrofitting and Structural Monitoring) (hereafter referred to as IIW-XIII-WG5) activities, the second author, who previously served as IIW-XIII-WG5 chairman, worked on the database compilation of repair cases involving welded structures that had been damaged by fatigue. This database has been opened on the Internet and was also presented as an IIW Document [1]. In addition, the database, which has been consulted by numerous researchers, has been widely utilized and mentioned in various publications, such as Ref. [2]. This report presents the results of the past activities as a research paper. The primary sources of the information contained in the first version of this database were literature and reports in Japan collected by the second author along with reports complied by IIW-XIII-WG5 members. In contrast, the new version of this database has been modified to include a function that permits any user to contribute case information. We have also increased the number of the recorded incidents by adding recent cases to the database. Furthermore, failure causes, repair methods, service years, crack occurrences, and types of welding defects have been analyzed using the case information included in this database. In this paper, we will begin by introducing the new database system, after which the results of various analyses will be presented.

2. New database version

2.1. Concept

The database was recently revamped and rereleased in order to facilitate the addition of new repair cases. The principal characteristic of the new version of the database is that, as with Wikipedia [3], users can participate in creating and modifying case files. More specifically, any user can contribute a repair case that was published in a newspaper, on a website, or in a company technical report. However, since the accuracy of the information might be compromised if any user can edit any part of the database website, there are distinctions between pages that any user can read and edit and those that can only be edited by expert database managers. The Contribution page, which will be described in detail later, is of the former type, and all other pages are of the latter type.

2.2. Basic system

The database was constructed using PukiWiki [4], which is a Wiki-type content management system. The primary characteristics of PukiWiki are as follows:

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http://dx.doi.org/10.1016/j.ijfatigue.2017.01.010
0142-1123/

(1) Updating the database can be performed using a Web browser, as is the case with Wikipedia.
(2) Since PukiWiki has a collision detection function, multiple members can edit the database at the same time.
(3) PukiWiki has a full text search function that is very useful for extracting information from the database.

2.3. Address

The database can be accessed at the following Web address: http://fatigue.civil.tcu.ac.jp/pukiwiki/

Because there are no restrictions on reading, any user can access and read all of the database pages. The front page of the database, shown in Fig. 1, is displayed when users access the database via a Web browser.

2.4. Constitution

The database is broken down into the following sections: Contribution, Repair cases, Members, and References. The names of members engaged in the construction and management of this database are listed on the Members page. Documents describing cases are listed on the Reference pages. Details about the Contribution and Repair Cases pages, which are the main component of this database, will be discussed in detail below.

2.4.1. Contribution

The Contribution page appears when users click Contribution (See Fig. 2). Here, users can contribute fatigue damage information by referring to the samples listed at the bottom of the page. After the entered information is examined and approved by our experts (based on IIW-XIII guidelines), the contributed case is adopted as a Repair case. Fig. 3 shows the process flow from contribution to case exhibition.

2.4.2. Repair cases

Authorized repair cases are recorded on the Repair pages, which contain cases that were included in the previous database, along with more recent ones. The 204 recorded cases are presented along with additional information in the form of photographs and figures. Newly published cases are regularly added to this database, and all repair cases are described using the same format (shown in Table 1). Fig. 4 shows a Repair case example.

2.5. Search function

The search function allows users to easily extract information about fatigue damage and repair methods based on actual repair cases. A search button is located at the top of all database pages. A keyword input screen as shown along with the search button (see Fig. 5a). When a user enters “box” and “peening” in the keyword input box and clicks the search button, the list of pages

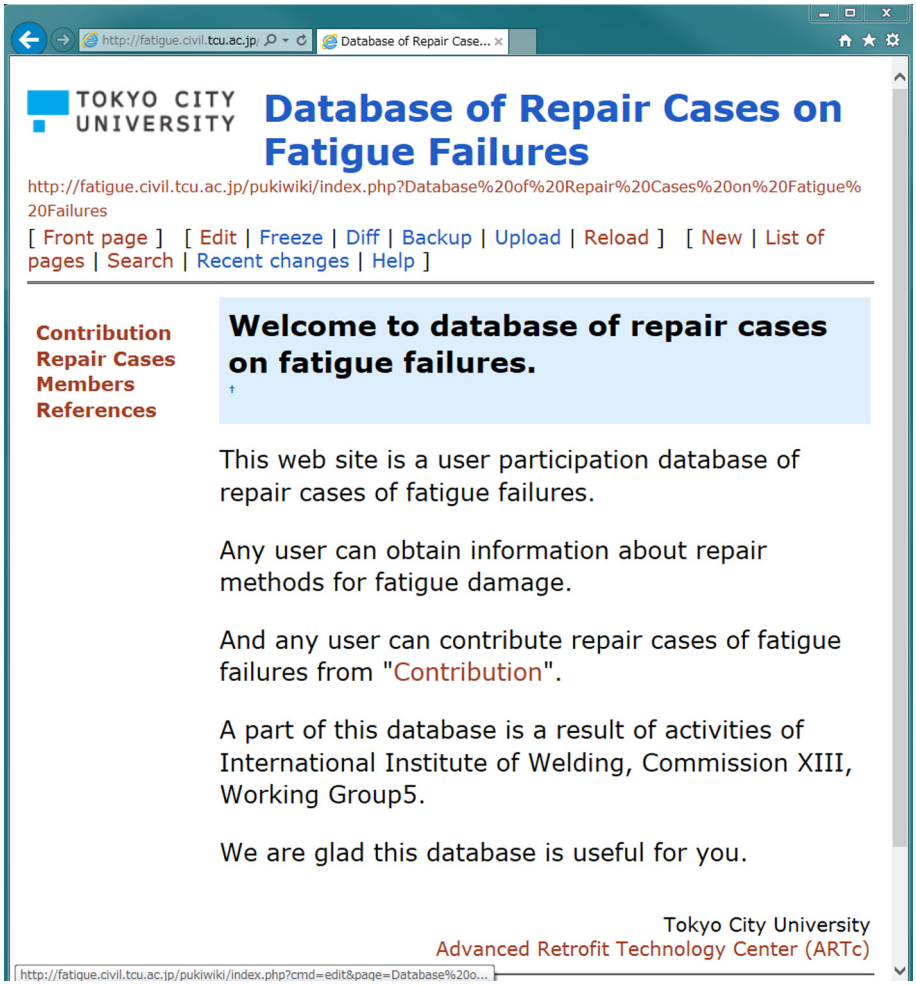

Fig. 1. New database front page.

Please cite this article in press as: Yokoyama K, Miki C. Participatory database of repair cases on fatigue damaged welded structures. Int J Fatigue (2017), http://dx.doi.org/10.1016/j.ijfatigue.2017.01.010