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Supervision and Inspection of the Structures of the German Federal Railway

Surveillance et contrôle des ouvrages d'art de la Deutsche Bundesbahn

Überwachung und Prüfung der Kunstbauten der Deutschen Bundesbahn

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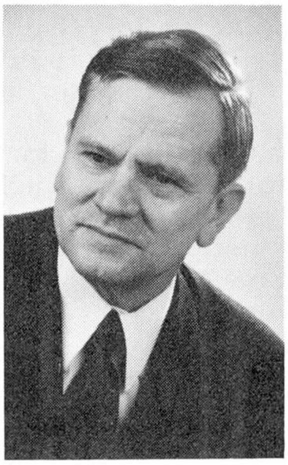

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SUMMARY
Regular inspections of structures contribute to the safety of the traffic using the structure and therefore to the safety of people and objects. Thus, the German Federal Railway fulfills its obligation to take responsibility for the safety and order of its fixed installations. Moreover, the quality of future structures can be improved by feedback of the damages found.

RESUME
Les contrôles réguliers des ouvrages d'art constituent une contribution à la sécurité du trafic franchissant les ouvrages et, partant, à la sécurité des personnes et des biens concernés. La Deutsche Bundesbahn satisfait ainsi l'obligation de répondre de la sécurité et du bon ordre de ses installations ferroviaires. Par ailleurs, l'analyse des défauts constatés peut contribuer à améliorer la sécurité des ouvrages futurs.

ZUSAMMENFASSUNG
Die Dauerhaftigkeit eines Bauwerkes hat neben den Ausgaben für die Erstellung entscheidenden Einfluss auf seine Kosten. Sie hängt wesentlich von der konstruktiven Ausbildung aller Bauwerksglieder ab. Die erforderlichen gestalterischen Regeln sind nicht mathematisierbar. Es wird beschrieben, wie die Deutsche Bundesbahn versucht, die Konstruktion dauerhafter Bauwerke zu erreichen.

1. 100 year history

Modern transport technology developed in parallel with bridge technology. The major indications on very old road maps are the fords and the very few bridges leading across the rivers whereas there is only vague information on the course of the actual roads. With the construction of the railways, bridge construction technology developed using in particular the new technical building material 'steel'. The advance of road construction after the invention of the automobile required highways with numerous bridges of dimensions unknown until then, leading to the development of the prestressed concrete construction method. A further phase of bridge construction was introduced for the new lines (NBS) of the German Federal Railway (DB) with numerous valley crossover spans for fast moving trains and trains with high loads.

The development of rail and road bridge construction becomes particularly clear by the length of lines which compared to the total distance involved lead via structures. Whereas this percentage is negligible in the older road network, it achieves approximately 1 % in a classical railway network. About 3 % of a modern highway and about 10 % of the new lines under construction lead via bridges.

A further distinguishing feature of modern transport systems is the very brief period in time during which they were mainly developed. Therefore, the distribution of the service life of the German Federal Railway's bridges shows a marked inconsistency. This same inconsistency can be observed in outlines in connection with the highway network which expanded considerably in the last decade and according to the existing planning for the new lines, in this area too, the construction of structures will concentrate to a few years.

The difficulties arising in connection with such concentrated construction work but also the manifold experience and the mutually stimulating technical developments fascinate all the experts, and keep the building and research industries in business. The rapid development is then followed by disillusionment, particularly with the "lucky" owners of these wonderworks of technology. One asks himself

- how long this splendour will last
- what is to be done when the wear and tear makes itself felt,
- what service life is to be expected,
- how much maintenance cost may be incurred,
- how the inspection is to be organized and
- how the safety of an existing structure is to be judged.

Dozens of questions, requiring an answer. Questions which were first asked 100 years ago and still have not been answered satisfactorily.

In 1873, the "presumable life of iron structures" was the subject of the delegates 'meeting of the union of German architects' and engineers' associations, as an old agenda shows (Fig. 1).

Schlußreferat

über muthmaßliche Dauer von Eisenconstructionen.

Vorgetragen

in der Ingenieur-Abtheilung der III. General-Versammlung des Verbandes deutscher Architekten- und Ingenieur-Vereine zu Dresden,

am 3. September 1878.

Von Dr. Hermann Fritzsche, k. k. Bezirksingenieur.

(Abdruck aus dem Organ für die Fortschritte des Eisenbahnwesens. Neue Folge. XVII. Bd. 1. Heft. 1880.)

Das Thema über muthmaßliche Dauer von Eisenconstructionen wurde, wie Ihnen bekannt, von der Abgeordneten-Versammlung des Verbandes im Jahre 1873 in Eisenach aufgestellt, zu weiterer Behandlung den Verbandsvereinen mitgetheilt und für die Tagesordnung der I. General-Versammlung des Verbandes, welche im September 1874 in Berlin stattfand, in Aussicht genommen.

Das Referat war dem sächs. Ingenieur- und Architekten-Verein, das Correferat dem Hannoverschen Architekten- und Ingenieur-Vereine über- worden und hatte letzterer den Herrn Launhardt, ersterer mi- Vertreter gewählt.

Um allzuweit führende Wiederholungen ... Inhalt meines Referats nicht näher ... ständigen Abdruck desselben im ... Jahrgang 1875, Heft ...

Der ...

Figure 1: Final report

The following apprehension was expressed: "After a period of 50 to 100 years, the old iron structures might start to show breaks more frequently than we anticipate at the moment". They were of the opinion that "the collapse of an iron structure would not necessarily be caused by molecular changes - metal fatigue as we call it today - but by rust and that this collapse would be preceded by easily visible deformations" and the following was decided: "We recommend that repeated checks of iron structures be undertaken using the same methods and that a standard form for the collation of this information be introduced".

In 1878, the time had come: They agreed on a standard form in accordance with which the results of deflection measurements and some other major data on iron bridge girders were to be recorded.

In 1895, the Prussian State Railway Administration introduced "Regulations for the supervision and inspection of bridges with iron superstructure". Instructions were given to carry out detailed inspections at regular intervals. One distinguishes between annual inspections and main inspections at 5 year intervals. All the findings obtained are to be entered in a bridge book, where all major technical data are recorded, too. Material samples are to be kept of important bridges. It is then indicated which parts of the bridge special attention is to be given to during the inspections. A major part of the main inspection is the load test which is to supply information on the safety of the bridge. Thus, one also reckons to be in a position to judge the carrying capacity, with respect to lateral oscillations and vibrations, which cannot be calculated.

2. A modern system

The checks serve as basis for repair and renewal, which is to be arranged by the railway district operating offices in simple cases, if the checks were more costly or timeconsuming, they would be arranged by the Regional Headquarters. Special emphasis is to be placed on paragraph 15 of those regulations which says: "The officer carrying out the inspection must inform the superior Regional Headquarters on the experience to be gained on the appropriateness of the inspection regulations as well as the more or less good results obtained in practice with the various types of construction and individual forms for the purpose of putting them to use in future draft plans".

Truly, a very modern regulation in terms of cybernetic administration. It is not the purpose of this lecture to investigate whether there are further or more interesting documents from the beginnings of the railways concerning the inspection and supervision of railway bridges, the examples selected at random, spotlight this in a remarkable way. They are followed by further data taking into account the changed forms of organization of the railways. In 1926, this was the "Regulation for the supervision and inspection of bridges, halls and roofs", in 1940 a new edition of this regulation was published and the 3rd edition followed in 1956. This development is continued with the introduction of the "Regulation for the supervision and inspection of structures" (VÜP) DS 803 of the German Federal Railway, effective as of January 1, 1981.

This means, approximately 100 years of supervision and inspection of structures: What has changed, what has remained, what was achieved? In the more recent history of technology, the railways are the first owners of such a large number of valuable structures spread over a wide area. They could perhaps be compared with the major cities with their ramified public utility and waste disposal structures the maintenance of which is of vital importance for the entire population and the inspection, supervision and repair of which raise problems of documentation, know-how, costs and feasibility without the efforts and the success being correctly recognized and appreciated by those concerned. Nevertheless, the problems of judgment and conservation of railway bridges are of a different nature. Similarities can, however, be expected with regard to modern road bridges; the problems for the road construction agency will only become more critical one generation later, as it is the case at the moment for the condition of railway bridges. Reason enough to enter into a close exchange of experience with railway administrations and road construction agencies worldwide on the subject of renewal and maintenance, supervision and inspection of bridges. The views and experience of the German Federal Railway (DB) may be a contribution to this.

One thing is sure, if one had carried out all the required checks in the required order over the past 100 years, today excellent figures would be available to the railway administrations. If one then evaluated these figures by means of modern statistical methods, numerous questions would be answered. One may regret it, presumably the regulations were not adhered to with the required conscientiousness or where they were adhered to and books were kept, they were lost in turbulent times, or the bridges were renewed and the old books were put aside, or it is too troublesome to search in the yellowed documents or the technical solutions are so outdated that no conclusions can be drawn today from these behaviour patterns; the fact of the matter is that the German Federal Railway (DB) does not have any figures from that period at its disposal, which would supply information on the condition, on the fact whether good results were obtained in practice, on the maintenance costs or estimated renewal.

The desire to have such figures at one's disposal still exists as it did 100 years ago, therefore the 1981 regulations largely concern the recording of these data. Today's records shall also serve as basis for renewal and repair of the loadbearing parts. Special attention is attached to the feedback regarding the observed success in practical operation of the structural design of details. As you see, major parts of the supervision instructions remained unchanged. There was a change as regards the number of the components to be inspected on structures: For bridges not only the superstructures, but also the bridge supports, abutments and foundations have to be supervised; to this one added the load-bearing parts of halls and roofings as well as high retaining walls, chimneys and masts. There was a change of attitude towards load tests as means of checking the safety of the loadbearing parts. The implementation of this load test is questionable, expensive and interferes with operation and therefore is only carried out upon special order, above all in case of complicated loadbearing parts in connection with strain measurements in order to answer questions of spatial carrying capacity. In conjunction with calculated assumptions, spare carrying capacity that might exist can be determined. One also considers obtaining, by low-cost "normal measurements" by means of load test waggons available to the German Federal Railway (DB), statistical data on the "normal behaviour" of loadbearing parts of the same kind in order to gain wellfounded data on the difference between "theoretical and actual behaviour. This can extend the findings concerning the design methodology and possibly simplify matters, and in the case of old loadbearing parts significant deviations might lead to judging changes, as was expressed in the first supervision instructions.

3. Present procedure

The question remains whether the most recent statement tries to translate the desires into reality; for this the organization of supervision and inspection is to be described. 30 000 rail and road bridges (Fig. 2) exist in the area of the 10 Regional Headquarters, for each of the Regional Headquarters 2 bridge inspectors are available. The main inspections are to be carried out every 6 years, i.e. one bridge inspector must inspect approximately 150 bridges over the period of one year (Fig. 3).

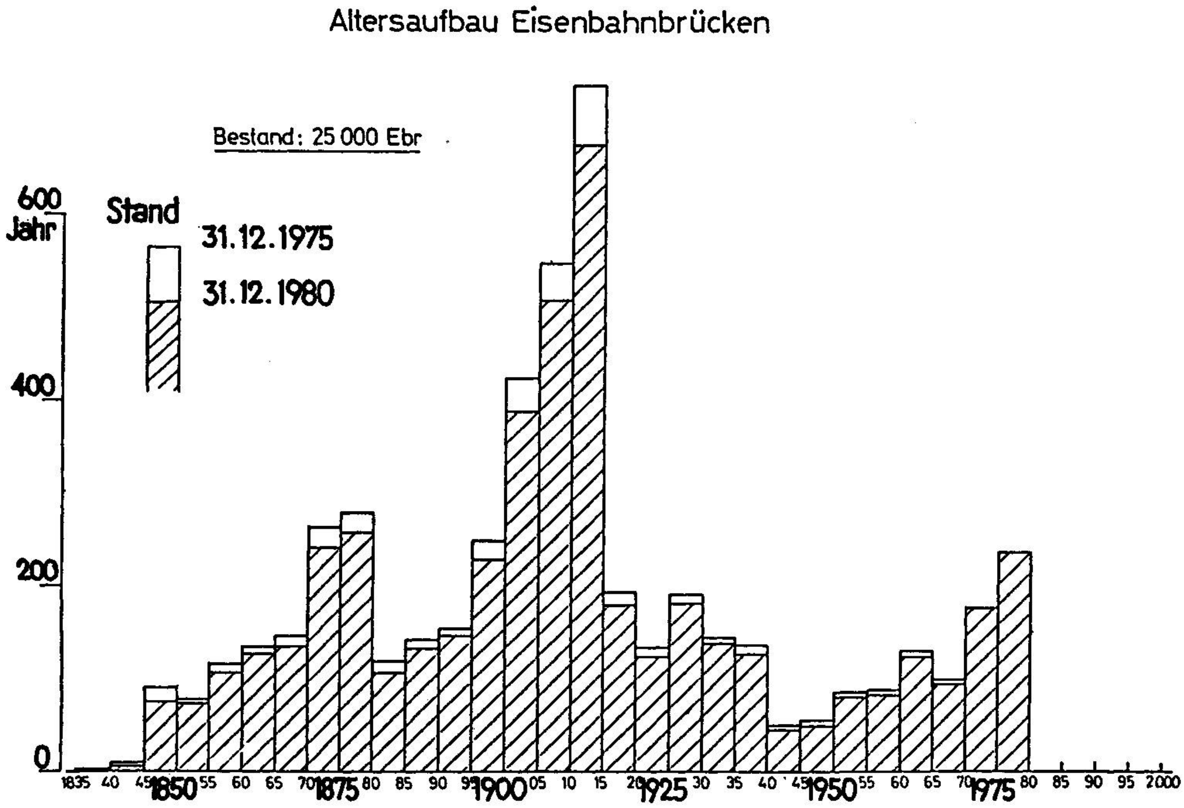


Figure 2: Age-structure of DB-bridges

DB/ZFB FRANKFURT (M) 13A.1352 -RUF 955/5064-
BD MUENCHEN BUREAU D -RUF 962/1449-

09.12.81

JAHRESPRUEFPLAN FUER BRUECKEN PRUEFJAHR 1982.

BD HANNOVER

STRECKEN-NR. 1424 STRECKENNAME: VON Abzw. Ulbremen.......... BIS Bremen Rbf. .. G.-Bahn LAGE: KM VON 0.103. BIS 4.326

ZU LFD.NR. 003 DES GESAMTJAHRESPRUEFPLANES GEMAESS DV 803 (VUEP) BA/BM. Bremen 1 .. Bremen..................

BA/BM..

SEITE 1

LFD. NR.	BRUECKEN-NUMMER	LAGE KM	BAUWERKSBEZEICHNUNG	BRUECKEN-LAENGE	BRUECKEN-BREITE	ANZAHL OEFFNG.	TRAGWERKE IN BAUWEISE: DER TRAGW.	STAHL	STAHL+MASSIV	MASSIV	KLEINSTER BETA-S-WERT	ERSTELL. JAHR FRUEH.	ERSTELL. JAHR SPAET.	BRUEKKEN FLAECHE	ANSTR. FLAECHE	ABD. FLAECHE	GEPRUEFT VON	GEPRUEFT BIS
1	1.21260	0.332	EBR UE SALZBURGERSTRASSE	13,6	6,30	1	1	0	1	0	100	1915	1915	86	0	75		
2	1.21270	0.478	EBR UE PASSAUERSTRASSE	13,7	5,10	1	1	0	1	0	100	1915	1915	70	0	58		
3	1.21280	8.525	EBR UE BAB ZUBRINGER FREIHAEFEN	30,6	4,80	2	2	0	0	2	100	1962	1962	147	0	66		
4	1.21290	0.735	EBR UE NEUEN KAMPE	13,7	5,10	1	1	0	1	0	100	1915	1915	70	0	72		
5	1.21300	0.965	EBR UE DEN HOHWEG	13,6	5,05	1	1	0	1	0	100	1915	1915	69	0	59		
6	1.21310	1.329	EBR UE FLEETSTRASSE	13,6	5,05	1	1	0	1	0	100	1915	1915	69	0	59		
7	1.21321	4.373	EBR UE HALMER WEG	11,6	33,50	1	1	0	1	0	100	1914	1914	389	0	384		

Figure 3: Auval inspection plan

To prepare the inspection, an inspection team under the direction of an experienced foreman, cleans the structure and records the damages discovered on a diagnosis sheet and/or damage sheet (Fig. 4). The bridge inspector himself will then continue the inspection and assesses the existing damages on a findings sheet using his judgment as an engineer. In order to achieve a homogeneous judgment of the condition of structures with the purpose of controlling the input of capital and engineer's capacity on a mediumterm basis, uniform checklists were introduced. The findings of an inspection are to be entered in those lists in a uniform manner. In order to relieve the inspector, the data of the structure from the fixed installations inventory file are printed on the findings sheet by means of central data processing systems (Fig. 5). For all bridges to be inspected in a certain inspection year, the inspector receives the findings sheets prepared in the manner described above at the beginning of the year. At the same time, the structures to be inspected are also compiled on lists (Fig. 3).

The inspection results are entered on the findings sheets at the respective site by checking off. The major decision is the appraisal of the findings. In this connection, it must be decided for each component printed on the sheet whether it can be considered

- okay = A
- whether it requires maintenance = B or
- whether it requires renewal = C.

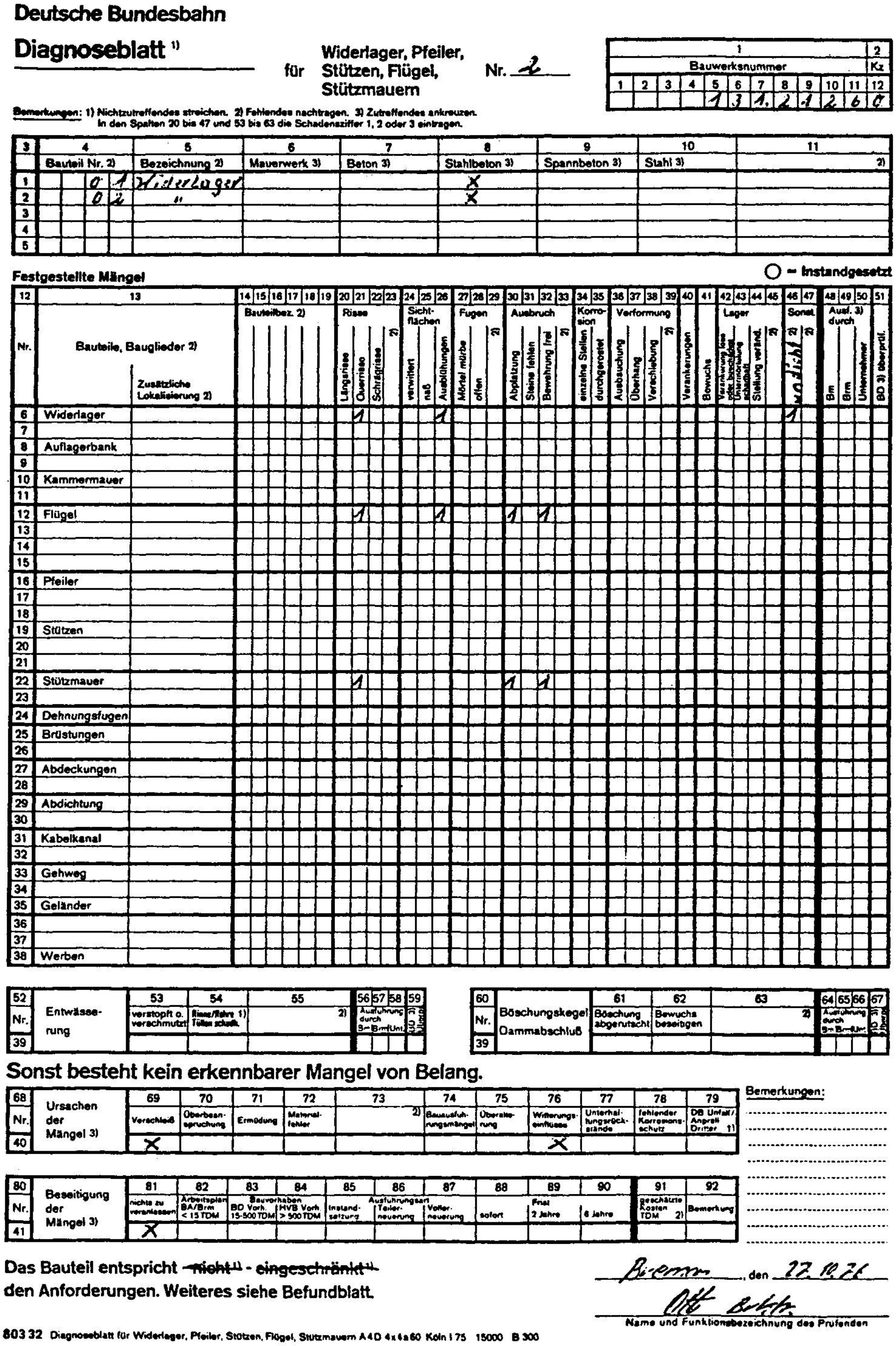
If renewal or maintenance work is necessary, an immediate attempt at roughly estimating the costs is to be made. Furthermore, ideas on the type and periods for this work will be given.

On this basis of the data entered for the various components of the bridge, the inspector then proposes a decision for the entire structure regarding

- the costs of the project and the agency responsible for the repair and

- the currently existing carrying capacity of the structure.

That means that he has to decide whether the structure meets the requirements for railway operation without any restricitions or whether the speed or load of the trains must be reduced pending the implementation of the required construction schemes. For this purpose, it ist necessary that the inspector submits statements relevant to safety and costs: Only very experienced engineers are suitable for such tasks.



Deutsche Bundesbahn

Diagnoseblatt 1) für Widerlager, Pfeiler, Stützen, Flügel, Stützmauern Nr. 2

1											2
Bauwerksnummer											Kz
1	2	3	4	5	6	7	8	9	10	11	12
				1	3	1,	2	1	2	6	0

Bemerkungen: 1) Nichtzutreffendes streichen. 2) Fehlendes nachtragen. 3) Zutreffendes ankreuzen.
In den Spalten 20 bis 47 und 53 bis 63 die Schadensziffer 1, 2 oder 3 eintragen.

3	4	5	6	7	8	9	10	11
	Bauteil Nr. 2)	Bezeichnung 2)	Mauerwerk 3)	Beton 3)	Stahlbeton 3)	Spannbeton 3)	Stahl 3)	2)
1	0 1	Widerlager			X			
2	0 2	"			X			
3								
4								
5								

Festgestellte Mängel ○ = Instandgesetzt

12	13		14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
			Bauteilbez. 2)						Risse				Sicht-flächen			Fugen			Ausbruch				Korro-sion		Verformung						Lager				Sonst.		Ausf. 3) durch			
Nr.	Bauteile, Bauglieder 2)	Zusätzliche Lokalisierung 2)							Längsrisse	Querrisse	Schrägrisse	2)	verwittert	naß	Ausblühungen	Mörtel mürbe	offen	2)	Abplatzung	Steine fehlen	Bewehrung frei	2)	einzelne Stellen	durchgerostet	Ausbauchung	Überhang	Verschiebung	2)	Verankerungen	Bewuchs	Verankerung lose oder beschädigt	Unterklotzung schadhaft	Stellung veränd.	2)	undicht 2)	2)	Bm	Brm	Unternehmer	BD 3) überprüf.
6	Widerlager									1					1																				1					
7																																								
8	Auflagerbank																																							
9																																								
10	Kammermauer																																							
11																																								
12	Flügel									1					1				1		1																			
13																																								
14																																								
15																																								
16	Pfeiler																																							
17																																								
18																																								
19	Stützen																																							
20																																								
21																																								
22	Stützmauer									1									1		1																			
23																																								
24	Dehnungsfugen																																							
25	Brüstungen																																							
26																																								
27	Abdeckungen																																							
28																																								
29	Abdichtung																																							
30																																								
31	Kabelkanal																																							
32																																								
33	Gehweg																																							
34																																								
35	Geländer																																							
36																																								
37																																								
38	Werben																																							

52		53	54	55	56	57	58	59
Nr.	Entwässerung	verstopft o. verschmutzt	Rinne/Rohre 1) Tüllen schadh.	2)	Ausführung durch S=Bm/Brm/Unt.			BD 3) überpr.
39								

60		61	62	63	64	65	66	67
Nr.	Böschungskegel Dammabschluß	Böschung abgerutscht	Bewuchs beseitigen	2)	Ausführung durch S=Bm/Brm/Unt.			BD 3) überpr.
39								

Sonst besteht kein erkennbarer Mangel von Belang.

68		69	70	71	72	73	74	75	76	77	78	79
Nr.	Ursachen der Mängel 3)	Verschleiß	Überbeanspruchung	Ermüdung	Materialfehler	2)	Bauausführungsmängel	Überalterung	Witterungseinflüsse	Unterhaltungsrückstände	fehlender Korrosionsschutz	DB Unfall/Anprall Dritter 1)
40		X							X			

Bemerkungen:

80		81	82	83	84	85	86	87	88	89	90	91	92
				Bauvorhaben		Ausführungsart				Frist			
Nr.	Beseitigung der Mängel 3)	nichts zu veranlassen	Arbeitsplan BA/Brm < 15 TDM	BD Vorh. 15-500 TDM	HVB Vorh. > 500 TDM	Instandsetzung	Teilerneuerung	Vollerneuerung	sofort	2 Jahre	6 Jahre	geschätzte Kosten TDM 2)	Bemerkung
41		X											

Das Bauteil entspricht ~~nicht 1)~~ - ~~eingeschränkt 1)~~ den Anforderungen. Weiteres siehe Befundblatt.

Bremen, den 27.10.76

[signature]

Name und Funktionsbezeichnung des Prüfenden

803 32 Diagnoseblatt für Widerlager, Pfeiler, Stützen, Flügel, Stützmauern A4D 4x4a60 Köln I 75 15000 B 300

Figure 4: Diagnoses sheet

Deutsche Bundesbahn **BEFUNDBLATT**

Zum Befund gehören: 1 Befundblätter, ____ Diagnoseblätter, ____ Schadensblätter, ____ sonstige Anlagen, ____ Fotos

1. Allgemeine Angaben (Anleitung vgl. DS 803, Anlage 10, Rückseite)

BD	HANNOVER
BA	BREMEN
Bm	BREMEN
Strecke	ABZW UTBREMEN BREMEN RBF
km	0,332
Bauwerk	EBR UE SALZBURGERSTRASSE

1	2
Bauwerks-Nr.	
13 1.21260	

Hauptprüfung am: 27.10.81

Sonderprüfung am: ____

2. Bauteile / **3. Entscheidung für die Bauteile** [3]

3 Teilblatt	4 Abschnitt Zeile	5 Öffnungs-Nr.	6 Bauteil-Nr.	7 Bauteilbez.	8 Baustoff	9 Bauweise	10 Baujahr	11 Wertung A	12 Wertung B	13 Wertung C	14 nichts zu veranlassen	15 Instand-setzung	16 Teiler-neuerung	17 Voller-neuerung	18 Verfüllen	19 Verrohren	20 Verschleißen	21	22 Frist zur Erfüllung d. Maßnahme: sofort	22 2) Jahre	22 6 5) Jahre	23 geschätzte Kosten TDM 2)
00	10	00	01	1	4	14	1915	X														
00	11	00	02	1	4	14	1915	X														
00	20	01	01	1	1	45	1915	X														
00	21	01	01	1	4	45	1915	X														

(Columns 14–20: Ausführungsart - Maßnahme 5))

4. Entscheidung für das Gesamtbauwerk [3]

4.1 ☐ HVB-Vorhaben ☐ BD-Vorhaben ☐ Arbeitsplan geschätzte Gesamtkosten TDM: ____

4.2 Das Bauwerk entspricht: ☒ den Anforderungen ☐ eingeschränkt den Anforderungen ☐ nicht den Anforderungen
Grund: ____

4.3 Betriebliche Maßnahmen: ☒ nicht erforderlich ☐ erforderlich ☐ LA-Stelle ☐ Lastbegrenzung

4.4 Sonstige Maßnahmen: ☒ nicht erforderlich ☐ erforderlich

Bemerkung zu 4.1 bis 4.4: ____

Datum: ____ Unterschrift: ____ Bktr./Br Prüfing. [1]

5. Nebenprüfung-Befund [3] Dazu gehören: 4 Diagnoseblätter, ____ sonstige Anlagen

	ja [4]	nein
Höhen-, Lastbegrenzungsschilder, Leitmale fehlen [1]		X
Anprallschäden von Straßenfahrzeugen sind vorhanden		X
Veränderungen gegenüber der Hauptprüfung wurden festgestellt		
Die Verkehrsbedeutung der Straße, des Wasserweges hat sich geändert		X
Planungsänderungen für das Bauwerk - Kreuzung - sind bekannt		X
Sonderprüfung durch BD ist durchzuführen		

Bemerkung: ____

Das Gesamtbauwerk entspricht: ☒ den Anforderungen ☐ eingeschränkt den Anforderungen ☐ nicht den Anforderungen

Datum: 27.10.81 Unterschrift und Funktionsbezeichnung: ____

803 10 Befundblatt A4 5c-70

Figure 5: Findings sheet

The inspector's decisions are compiled in an annual inspection results schedule which is the continuation of the annual inspection schedule printed out by Elektronic Data Processing (EDP). This schedule allows a quick survey of the construction work to be carried out in the coming years.

The final decision on the further procedure ist taken on this basis by the Head of the Bridge Construction Department of the Regional Headquarters in agreement with the bridgé inspector and the planning engineers responsible for the respective area and is laid down in the annual inspection decision schedule (Fig. 6).

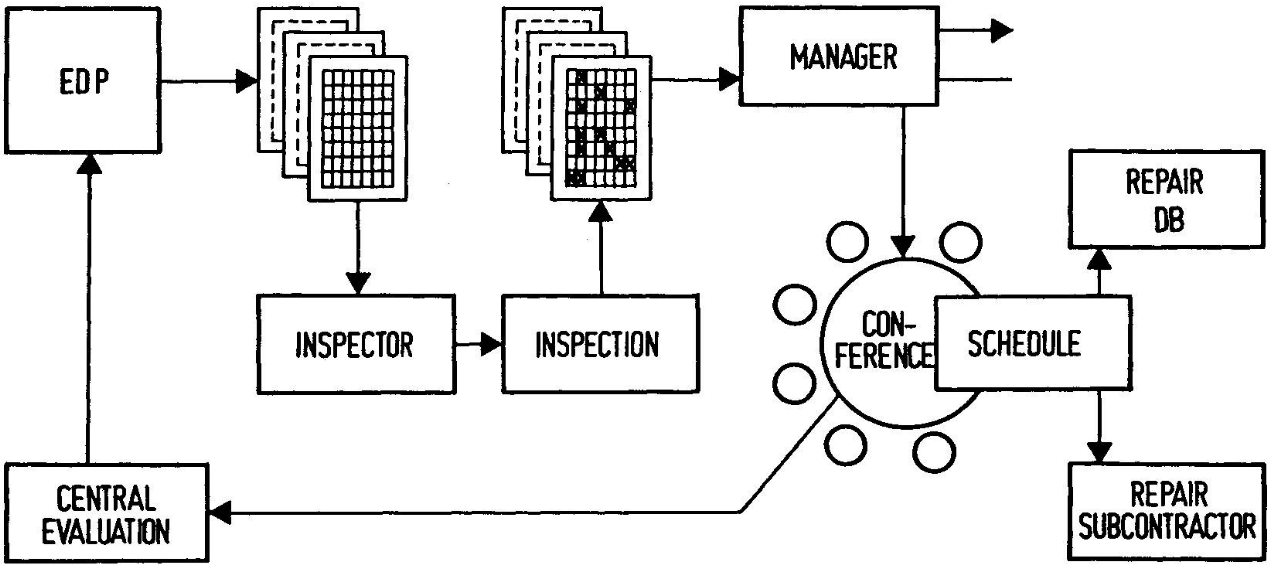


Figure 6: Procedure plan

These decisions together with those of the preceding years and the desires to change structures or build new bridges will then constitute the bridge construction programme of a certain year which is subject to further agreement processes for taking into account the financial situation and the company targets. This explains the long preparatory period required for planning necessary renewal in due order. At the moment the German Federal Railway spends approximately 250 million DM annually for the renewal and maintenance of the bridges in the existing network. The expenditure for a main inspection amounts to about 1 000 DM on the average.

For the main inspections, data are required on the type of construction and particularly sensitive or critical components. As such documents were lost in most cases during the last wars, special attention must be attached to this prerequisite when establishing new bridge books.

All findings of the main inspection are entered into the bridge book so that it will be possible to fill this past gap as time goes by. On the findings sheets themselves there will be enough space for entering the results of the intermediate inspections. Intermediate inspections of a bridge take place once between two main inspections.

They are carried out by the local engineer responsible for all constructional and operational matters, the Divisional Manager. No special preparations are made on the structure. In the intermediate inspections it is to be checked by means of visual inspection whether the condition - as laid down on the findings sheets - of the structure or the surroundings, for railway overbridges for instance also the overhead clearance for motor vehicles, have changed in a manner that might have an impact on the bridge. Special attention has to be attached to the fact whether, for instance, waterways were by-passed or road were "undedicated", no longer requiring a bridge or whether at least the dimensions could be reduced. In most cases, local agencies know of such dircumstances earlier and have more details than the large central offices.

4. Prospects

The existing organization with EDP support quite useful at the present stage ensures

- a complete inspection of all structures of the German Federal Railway (DB),
- an inspection carried out on schedule,
- avoiding staff-intensive manual recordings and their reproduction and thus a reduction of inspection expenditure by about 20 %,
- a uniform procedure for the entire German Federal Railway (DB),
- a high efficiency of inspection as numerous aids are provided by the obligation to make a statement,
- well-founded figures on the condition of an important part of infrastructure,
- foresighted planning for re-investment in the area of bridges,
- coordination of the planned re-investment with the functions and targets of the company as well as
- useful experience regarding the success in practice of the various construction methods and construction details.

The last of the above items requires that those first mentioned be fulfilled. Therefore, every effort ist made at the moment to ensure that the findings on diagnosis sheets have an interpretative quality of the same standard. All lists are set up in a manner allowing their data being easily recorded on data carriers, updated an statistically evaluated. First attempts have been made and new constructions were derived from the results. Trend-setting steering data from the evaluations are to be expected shortly. They will certainly not only please railwaymen and politicians, but also be useful for finding the narrow path leading the railway along the abyss and also leading the sensitive railway infrastructure into the future.

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