Traumatism of Pathways and Structures in Yasouj, Akbarabad and Suburbs in Iran—Geotechnical Reasons

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ABSTRACT

The present research is studied about traumatism of path ways and structures in Yasouj, Akbarabad and suburbs. The methodology in this research is according to survey and gathering data has been done with using field study and library. Information about the generality of Yasouj concerning weather condition, area geotechnical situation, water tables states and their changes and also the condition of rainfall and its intensity, the number of freezing days in a year, temperature changes, present plans as well as the relating books and papers with the same source of research from the related offices have been provided. The plan of whole city and the plan of all paths connected to Yasouj have been obtained from the related offices. According to those plans, all streets which their characteristics were mentioned on the plan stand in three areas of city. It means areas number one, two and three. Akbarabad is mentioned as another area and suburb of Yasouj is also as another area that villages around the city as much as fifty kilometers are contained. Then, according to magazine number 296 with the title of improvement guidance, destruction of asphalt and gravel covering in nineteen parts have been classified. Then, with sectional surveys, the destruction of pathway have been studied and with three different labels were recorded: "H" destruction with high intensity. "M" destruction with average intensity and "L" low intensity of destruction. These destructions are related to fractions which are classified according to the creating sources and their appearances. Building destructions is also recorded in special tables separately with the title of fractions. Finally, when information about destructions of pathway are standing near the buildings, a general picture from the present destruction situation in the area and in some cases the reason of intensity creation, the reason of reduction as well as suitable solutions for prevention of these kinds of destructions are given to us. With studying about these reasons, the final conclusion in Yasouj. Akbarabad and suburb was that executive principal as well as week management and excessive digging by water and drainage sewage offices in streets were the most important reasons of destructions. At last, joint and graving as well as burnishing are the most amounts of destruction in building and fraction under the windows and all around vertical fraction in buildings.

KEYWORDS: destruction; fraction; pathways; buildings.

INTRODUCTION

Yasouj is one of the cities of Iran, that is situated in mountain and its development embraced a part of Sarrood field. Common slope of the city is from north to south and northeast to southwest. The average height of the city is about 1850 meters from the sea and the lowest height is 1755 meters from the sea. The area geology, are included Jurassic and Pliocene the presence of deposit layers in low depth concavities, is sometimes about thousands of meters. It shows that the related period in the area were in low depth sea covering. The main part of stones in the upper level are limestone, marl, shale and conglomerate. In the last of Pliocene, concurrent with the creation of Zagros range in southeast of the area, falling or descending was created. Elevated parts of the area have been created from syncline and anticline parallel to each other to ward southeast. And in the central parts, there are intense fault and folding.

The passing of a wheel load over a crack in the existing pavement causes three critical pulses, one maximum bending, and two maximum shear stresses [Lytton,1989]. As the movement of the crack increases, the propagation of the crack to the overlay occurs faster as shown in Figure 1 [Sheng et al,2010]. Thermal movements also contribute to reflection cracking. Contraction and curling of the old pavement caused by temperature variation may result in the opening of the cracks, which may induce horizontal stresses in the Hot-mix asphalt (HMA) overlay.

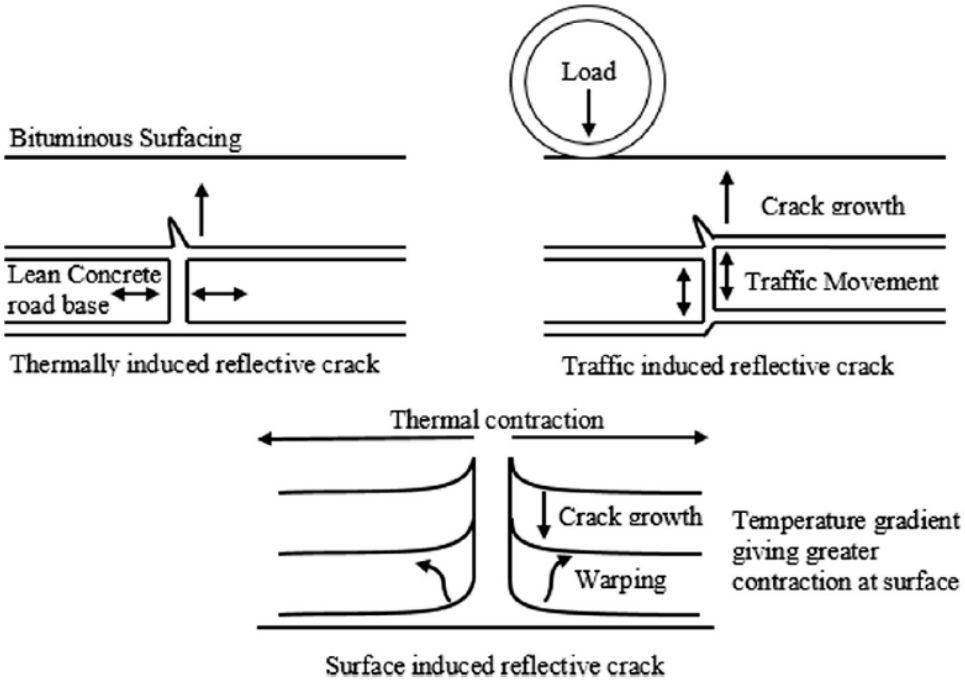

Figure 1: Mechanisms of reflection cracking. Adapted from Sheng et al. [Sheng et al,2010].

Hot-mix asphalt overlays are commonly applied on existing flexible and rigid pavements when pavement conditions (structural and functional) have reached an unacceptable level of service. Overlays are designed to resist fatigue and/or rutting failure mechanisms; however, overlays may still show cracking patterns similar to the ones, which existed in the old pavement after a short period of time [Pierce et al, 1993; Bayomy et al, 1996; Jacobs et al, 1992]. This distress is known as 'reflection cracking.' The discontinuities (cracks or joints) in underlying layers cause reflection cracking, which propagate through a HMA overlay due to continuous movement at the discontinuity prompted by

thermal expansion and traffic loading. If the new overlay is bonded to the distressed layer, cracks and joints in the existing pavement often propagate to the surface within one to five years; as early as few months have been reported [Chen and Frederick,1992]. Seasonal temperature variations may also accelerate the reflection cracking process, especially when dealing with rehabilitated rigid pavements. Reflection cracking is a serious challenge associated with pavement rehabilitation as it leads to premature failure of the overlay and allows water infiltration through the cracks, which causes stripping in HMA layers and weakening and deterioration in the base and/or subgrade [Elseifi and Bandaru, 2011].

Since the early 1930s, considerable resources and efforts have been spent on finding new and relatively inexpensive techniques to delay reflection cracking [Barksdale et al, 1989]. Different methods, including the use of interlayer systems, have been suggested for enhancing pavement resistance to reflection.

Praticò and Lédée in 2012 were investigated on Trends And Issues In Mitigating Traffic Noise Through Quiet Pavements. Their paper concentrates on the analysis of trends and issues in the mitigation of road traffic noise through the use of quiet pavements. Quiet pavements were listed and analysed. Results demonstrate that it still remains crucial that experiences are shared in order to permit that innovations and products developed for use within specific member states may be equally beneficial or valid for use in a wider area.

Also Hong-hai Liu et al in 2016 studied on research and verification of transfer model for roughness conditions of pavement construction and in order to study the transfer law of roughness during asphalt pavement construction, a mathematical model concerning the effect of sub layer, paving layer, random factors and paving materials compactness on final surface layer roughness was established through theoretical deduction and data statistical analysis. The critical conditions of sub layer roughness transfer to final surface layer were determined through the application of the Error Propagation Theory, allowing to further establish, the transfer model for roughness conditions in asphalt pavement construction, internal relationships among paving roughness, initial compactness and final surface layer roughness were also clarified.

AGROLOGY CHARACTERISTICS

Soil in intrusion area of Yasouj based on glancing study about soil in Kohkiloye by institution of agrology and soil productivity is known and classified as follows:

1. The kind of soil in Yasouj in the form of low depth soil with the color of brown oriented to dark yellow that is day and gravel with pebble.
2. The kind of soil in the west of Yasouj (Sharafabad) is like above with this difference that it has lime powder.
3. The kind of soil in Sarook area in the form of low depth soil with the color of brown oriented to red with clay and gravel with pebbles on the day and earth soil.
4. The kind of soil in the area of Tal-khosrow in the form of low depth soil with color of brown to dark brown with clay, and gravel to clay with amount of lime.
5. The kind of soil in Beshar stream in the form of low depth soil with the color of dark brown with clay and gravel with pebble that often have 30 percent pebbles that is shown in figure 2.
6. The kind of soil in Rom field in Hosseinabad in the form of deep soil with color of brown oriented to red with clay stone and low amount of lime powder (debris soil).

7. The kind of soil in Rom field in the form of deep soil with color of brown to dark brown with clay and gravel that has intense lime level in depth in which the level of water table is almost high.

Figure 2: The range deposits, and pebble, stream in the range of mountains as near as twenty one kilometers in axle of Yasouj – Shiraz.

METHODOLOGY

The methodology in this research is according to survey and gathering data by using objective observation and the method of gathering data by using field study and library.

Research works in this study was done in the year of 1388 in a way that it studied about the removal of destruction of path ways asphalt and also fractions in buildings view in Yasouj and suburb. These fractions in path ways asphalt that were identifiable have been classified. Fractions in buildings views in the form of horizontal, vertical or sideling, all around horizontal, all around vertical, fractions in separation place from wall and building, fraction under the window, wavy fraction and consular fraction are all classified and recorded in regional form.

At first, these destruction are studied completely, then removal phase started. For exact recording the destruction of: path ways, the plans from municipality, and house and town planning organization were used that had all boulevard, street, and valleys that all their characteristics are on the city plan.

These faults on the related plans were used based on the destruction intensity are shown in the form of "H": high destruction intensity, "M": average destruction intensity, "L" low destruction intensity in the form of three, two and are solid circle orderly. Then in the provided tables, destruction in the form of (H), (M), (L) destruction are marked under the destruction row in the se tables. In the provided tables, the related fractions from buildings and destructions in building views in pal way have been removed. The most amount of destruction in building views that were visible, were fractions in the different forms. Some of these fractions were related to structure and week building and some of them were related to the soil factors like subsidence, consolidate and other related effects on earth.

In the next please, all destructions that are in similar kind are shown with different intensity that were accumulated in different areas and by using excel software their bar charts were drawn.

According to them, destruction in street buildings are displayed from maximum to minimum.

By using them the most amount of destruction in each area can be simply identified. At last, standing the removal destruction from pathways near the destruction in buildings view illustrates a general situation of destruction presented in the city. From this removal, the reasons of creation of intensifier factors of the se faults can be identified as well. Some ways for avoidance from progression of the fault have been done and some ways for their reconstruction have been identified and those faults have been reconstructed as well. In this way, the loss of much amount of cost in construction will be avoided.

ANALYSIS OF THE PASSAGES

The number and percentage of the present destruction in the streets of Yasouj, Akbarabad and suburbs

In this phase, all removal destruction from streets have been classified separately. Based on them, some chutes according to the number and percentage of destructions for each street have been drawn.

Table 1 shows destruction in each street (each destruction separately) with any intensity. This table was drawn by using surveys and chart numbers based on the number and kind of destructions that will be shown in next parts.

Table 1: The total number of destruction in Yasouj, Akbarabad and suburbs

The weathering	Swelling	semilunar crack	shoving	rutting	Pit hole	Polished aggregate	Carving	Longitudinal and*	Drop the way	Reflection crack	edge cracking	Local settlement	Wash berding	Ups and downs	mosaic crack	asphalt bleeding	Alligator cracks	address
6	2	1	0	0	7	14	16	5	4	1	0	7	0	9	2	1	3	Shahedha & javanmardan
5	0	1	0	0	6	12	12	3	3	0	0	6	0	7	0	1	1	emamtha
0	0	1	0	0	0	1	3	0	1	0	0	3	0	3	0	1	1	Palestine, Karun, Persian Gulf
0	0	1	1	2	0	1	2	2	2	0	1	2	1	2	0	2	1	Boulevard justice
1	0	0	0	2	0	1	1	2	1	0	0	1	0	1	1	1	1	Shahid qarany Blvd.

1	0	0	0	0	0	1	2	0	1	0	0	1	0	1	0	1	0	Keshavarz Blvd.
0	0	0	0	2	0	2	2	2	2	0	0	2	0	2	0	2	1	The jahad to the Bensanjan and Isfahan
1	0	0	0	0	0	1	1	1	0	0	0	1	0	1	0	0	0	rahdaran
1	1	0	1	2	0	2	3	3	0	0	0	2	0	1	0	1	0	shahid Davarpanah Street, Shohadaye dolat abad Street, Takhti Street
1	1	0	1	1	0	1	2	2	1	0	0	2	1	2	0	1	1	Ma’ad Blvd.
0	1	0	1	1	0	2	3	0	2	0	0	1	0	0	0	4	0	Emam Khomeini (from Revolution Square to the streets Army)
1	0	0	1	1	1	0	2	2	1	0	0	2	0	2	0	2	0	Imamat Blvd.
1	1	0	0	1	0	1	1	1	1	0	0	1	0	1	0	1	0	shahid Montazeri Street
3	0	0	1	1	3	4	5	1	1	0	0	6	0	3	1	3	5	20 metriCui Imam Hussein, a subsidiary of the town of Imam Hussein, Cui educators
3	0	0	0	0	3	3	4	0	0	0	0	4	0	3	1	2	3	Sub-zireTal
0	0	0	0	0	0	1	1	1	1	0	0	1	0	1	0	0	1	Pasdaran

5	0	0	0	0	3	8	5	0	0	0	0	5	0	6	0	3	3	Eramha va 20 metri ta’avon
4	0	0	0	0	4	6	7	0	0	0	0	6	0	5	1	3	3	Abuzar
8	0	1	0	0	5	14	9	0	0	0	0	7	0	8	1	1	3	Kashani
3	1	0	0	0	1	3	4	2	0	0	0	2	2	4	0	3	1	Shohada and velayat faghih
1	0	0	3	3	0	2	3	2	3	0	1	0	3	0	0	1	1	teacher Street, army and pasdaran
2	1	0	2	2	0	3	3	2	2	0	0	0	2	0	0	1	1	North Sardar jangal and shahid Ghodousi street
0	1	0	2	2	1	0	2	2	2	0	1	0	2	0	0	2	0	Motahari Blvd.
0	0	0	2	2	1	1	2	2	1	0	1	0	2	0	0	1	1	Hafte-Tir Square to the Square of shohada
0	0	0	0	2	0	1	2	2	1	1	1	2	1	1	0	1	1	Eram Blvd
2	0	0	1	2	0	2	3	2	2	1	1	2	0	0	0	0	4	Abuzar Blvd
1	0	0	1	1	1	1	1	1	1	0	0	1	0	1	0	0	1	Holy Abdullah to the waterfall
0	1	1	0	0	0	0	0	0	0	1	1	1	1	0	0	1	0	Forest Park Iran
1	0	0	1	2	1	1	2	2	2	0	0	2	0	2	0	1	1	Ayatollah Kashani Blvd
3	1	0	0	2	0	2	3	3	1	1	1	3	1	2	0	2	2	Taleghani St., Chamran and

																	ferdosy
2	1	0	1	2	1	2	3	2	1	0	1	1	1	1	1	1	emam Khomeini Blvd from Army Street to Imam Hussein square
1	1	0	0	1	0	1	2	2	1	0	0	1	0	0	0	1	Islamic Republic Street
6	2	0	0	0	5	11	9	0	2	0	0	9	1	8	2	3	Golestanha
3	3	1	0	0	0	6	5	3	0	2	0	3	0	5	1	4	Ibn Sina
5	2	1	0	0	3	6	4	3	0	2	0	3	1	4	1	4	Saadi
4	1	1	2	3	1	5	6	3	3	0	0	3	1	2	0	1	Ghazi Tabatabaei, Saddughi, Ashrafi Esfahani, Dastgheyb, madani, Rajai
10	2	1	0	0	4	11	8	5	2	2	2	7	3	7	1	4	tohidha

* transverse cracks

Also, for showing the type of present destruction in path ways in Yasouj, Akbarabad and suburbs, five regions contained region one, two and three and Akbarabad and suburbs were shown. The number of present destructions in this region obtained by the whole present destructions in the streets of that area (every destruction gathered separately) that is illustrated in table 2 canal their charts. The number of present destruction in the area is obtained by the whole am ant of destructions in the region streets (each destruction is gathered separately) that is shown in table 2 and its charts are drawn as well.

Table 2: destruction in each region (each destruction separately)

The weathering	Swelling	semilunar crack	shoving	rutting	Pit hole	Polished aggregate	Carving	Longitudinal and transverse cracks	Drop the way	Reflection crack	edge cracking	Local settlement	Wash berding	Ups and downs	mosaic crack	asphalt bleeding	Alligator cracks	address
24	6	4	6	13	20	47	60	25	21	1	1	42	2	39	5	23	18	Region 1
39	9	2	13	21	23	58	60	24	19	4	8	42	16	38	5	25	27	Region 2
34	11	5	12	16	13	42	43	31	13	6	3	37	12	36	4	23	17	Region 3
10	1	1	1	3	9	16	16	12	6	1	1	15	0	16	1	8	7	Akbar-abad
9	3	3	2	5	5	13	3	10	10	6	9	15	9	12	4	16	9	suburbs

Study of four factors in creating destruction in streets and regions in Yasouj, Akbarabad and suburbs

In tables 3 creating factors in destructions for streets and regions in Yasouj, Akbarabad and suburbs were surveyed in the form of numbers and percentage.

Also, their charts a were drawn separately that will be shown next. From then, useful conclusions obtained that showed operative factors in regions 1,2 and 3 had the most amount of destruction. Structural factors had the least amount of destruction in these areas. In Akbarabad and suburbs other factors had the most amount of destructions anal structural and loading factors had orderly the least amount of destruction in regions. Totally, it can be said that extensive amount of digging by governmental offices specially water and sewage organization with week executive management are all the most important creating factors in destruction in pathways in Yasouj and suburbs. This part need, paying more exact attentions.

Table 3: The number of the factors responsible for failure in the area of Yasouj, Akbar Abadi and suburbs

Total	Other	loading	operational	Structure	address
1208	358	262	378	210	Region 1
1196	366	243	357	230	Region 2
476	151	90	150	85	Region 3
252	91	40	76	45	Akbarabad
0	0	0	0	0	suburbs

study about eight creating factors in destruction of streets and regions of Yasouj, Akbarabad and suburbs.

Table 4 shows eight creating factors in destruction of pathways of Yasouj, Akbarabad and suburbs. Based on them the type of destruction in effect of each one of those eight factors can be identified. In this table, each destructive factor is mentioned with two English letters in which C is abbreviation of construction means do or manipulate, S is abbreviation of soil, A is abbreviation of Asphalt, E is abbreviation of weather condition, L is abbreviation of Loading, D is abbreviation of designing and P is abbreviation of preparation.

Table 4a: Eight creating factors in destruction of pathways of Yasouj, Akbarabad and suburbs

The weathering	Swelling	semilunar crack	shoving	rutting	Pit hole	Polished aggregate	Carving	Longitudinal and transverse cracks	Drop the way	Reflection crack	edge cracking	Local settlement	Wash berding	Ups and downs	mosaic crack	asphalt bleeding	Alligator cracks	failure factors
		*	*	*	*		*		*		*	*	*				*	Poor Construction of soil layers (CS)
*					*		*	*		*			*	*	*	*		Poor Construction of asphalt layers (CA)
	*		*		*		*		*		*						*	Inappropriate materials soil layers (MS)
*						*	*	*							*	*		Inappropriate materials asphalt layers (MA)

	*							*		*				*	*			Climatic effects (EC)
		*	*	*	*	*	*				*						*	loading (L)
		*				*		*		*	*			*		*	*	Inappropriate design of asphalt layer (DA)
*		*				*										*		Inappropriate preparation of asphalt (PA)

Also in Table 5, eight destruction factors in region of Yasouj, Akbarabad and suburbs have been surveyed from the point of view of numbers.

Table 4b: the number of each of the eight factors causing failures in the area of Yasouj, Akbarabad and suburbs

total	PA	DA	L	EC	MA	MS	CA	CS	Failure factors / regions
1203	98	158	169	76	184	132	199	187	Region 1
1445	128	186	212	80	211	159	234	235	Region 2
1170	105	163	151	88	177	112	202	172	Region 3
420	36	62	54	31	63	41	73	60	Akbarabad
451	45	78	49	35	55	41	74	74	suburbs

These charts showed that the most important factors in creating destructions in region one & two are weak soil layers and asphalt layers. In region three the most important factor in destructions are weak asphalt layers and un appropriate material of asphalt layer. In Akbarabad weak asphalt layers and un appropriate asphalt layer are important destructive factor. In suburb, un appropriate asphalt layer designing and weak operation of asphalt layer are important destructive factor. Managers as well as engineers who observe the operations should pay more exact attention until the rate and intensity of destructions in buildings decrease.

OBTAINING SEVERAL PCI SAMPLES WITH USING THE PRESENT INFORMATION IN PREVIOUS PARTS

1-when PCI is between the ranges of 45-95, facing situation is very good and small faults should be corrected. Facing situation by doing secondary operations with law intensity and fraction coating should be improved.

2-when PCI is between the ranges of 60-75, facing situation for life growth will be done. Some beliefs are in this way that coating the fractions in a suitable form can be one of these preventive keeping ways.

3-when PCI is between 50-60, facing situation is average. Facings with this situation have often coatings with noticeable destruction and also the destruction is lower layers have been started. As a whole, these kinds of coatings cannot be classified in preventive keeping method of reconstruction. But they can be kept in a useful situation until the necessary as set are provided. Often keeping contains joint in ditch. Areas with fractions like crocodilian skin or areas with reflective, mosaic, length or width fractions with high intensity can be coated. By coating, the facing life in this phase can be increased until the time of basic reconstruction.

4-when PCI is between 25-50, facing situation is weak. Facing related to this group needs a coating layer often. Fraction coating can be done before coating operation that cracks in the sealing pavement when reflective fractions in facing create, water will not penetrate in lower layers (base and sub base).

5-when PCI is between 0-25, facing situation is very weak, and facing should be reconstructed. Here, the purpose is new facing operation like cover layer removal.

1. PCI related to shahid hormoz Pur Boulevard.

PCI = 31.63 (RCI) ½[(205-DMI)/205] ×K+M

$$DMI = \sum_{i=1}^{n} W_i (S_i + D_i)$$

Di=1, Si=2, RCI=4, K=0.924, M=8.856, Wi=3

DMI=3(1+2) =9

PCI = 31.63 (4) ½[(205-9)/205]×0.924+8.856

PCI=64.74

2. PCI related to Yasouj, semiron road for tar.

Di=2, Si=2, RCI=7, K=0.924, M=8.856, Wi=0.5

DMI=0.5(2+2) =2

PCI = 31.63 (7) ½[(205-4)/205]×0.924+8.856

PCI=84.67

3. PCI related to pasdaran street for crocodilian skin fraction.

Di=1, Si=2, RCI=5, K=0.924, M=8.856, Wi=3

DMI=3(2+1) =9

PCI = 31.63 (5) ½[(205-9)/205] ×0.924+8.856

PCI=71.33

4. PCI related to Eram Street for track.

Di=1, Si=1, RCI=4, K=0.924, M=8.856, Wi=3

DMI=3(1+0.5) =6

PCI = 31.63 (4) ½[(205-6)/205] ×0.924+8.856

PCI=65.59

5. PCI related to Jucgle park for edge fraction.

Di=1, Si=2, RCI=4, K=0.924, M=8.856, Wi=0.5

DMI=0.5(2+1) =1.5

PCI = 31.63 (4) ½[(205-1.5)/205] ×0.924+8.856

PCI=66.88

CONCLUSIONS

In destructions related to buildings of Yasouj, Akbarabad and suburbs five regions were classified and all related information about building fractions gathered by reference and local scanning and photography and they surveyed. The concessions of the survey are shown as follows:

1.In region one, fractions under the window, are all around vertical and all around horizontal, and in region two, tractions are all around vertical and under the windows, in region three, fractions are under the window, vertical, all around vertical and horizontal.

In Akbarabad, fraction are sideling, all around horizontal and under window, and in suburbs fraction are all around vertical, under window. They are the most important numbers in order.

2.It can be said that in region two, because of antiquity of most of the building and in region five (suburbs) because the area is rural and buildings are very old with weak material, all around vertical fractions can be found abundantly, perhaps the creation of some of these fractions is because of the weakens of building and subsidence.

3.in region five (suburbs) we can see the most fractions, but in regions one, three and four, fractions under the window are almost seen in building and even in short buildings that can be mentioned uprising the water table levels in some parts of the region and subsidence of building as creating factor of fraction.

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