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Bevel Plug Method design guidelines

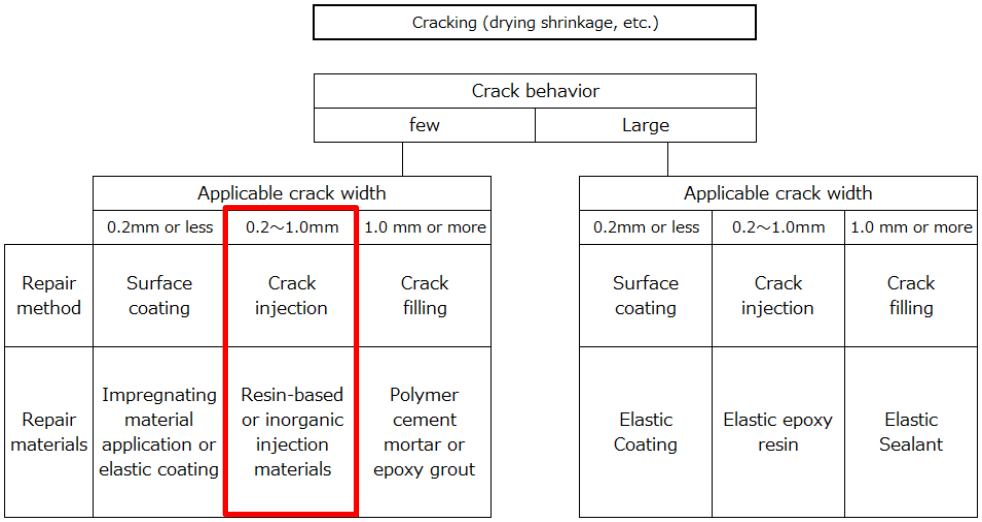
Crack injection method using inorganic materials（NETIS TH-160015-A）

Table of contents

Japan Mente Corporation

1. Bevel plug method application range

The bevel plug method is an injection (filling) method using inorganic materials that is used as a repair measure for cracks and other damage that has occurred in concrete structures.



Examples of crack repair methods　　Scope of application

Dealing with progressive cracks

Due to the characteristics of inorganic (mainly cement-based) injection materials, they can be applied to cracks up to about 5.0 mm in width. In addition, by compounding and combining injection materials, it is possible to use materials that are effective against deterioration factors, making it possible to apply them to progressive cracks.

Dealing with internal defects

The water flow drilling method produces clean drilled walls that are not clogged with cuttings, making it possible to inspect them with an endoscope and inject them into any internal defects (such as peanuts or cavities) that have been identified.

Bevel plug method repair scope

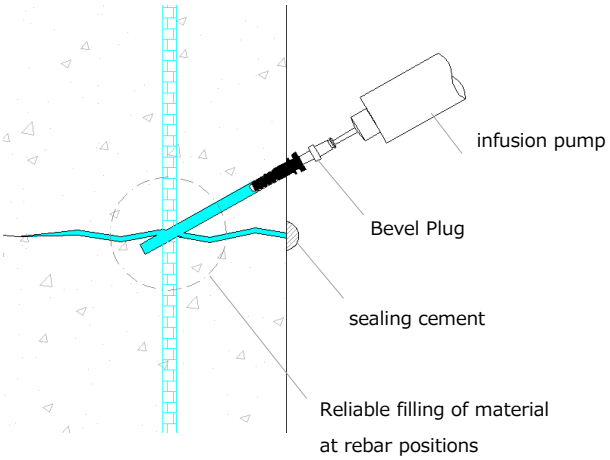
target	condition	Applicable crack width	Movement
Cracks caused by materials and construction	Cracks caused by initial defects such as drying shrinkage	0.2mm～5.0mm	few
Progressive cracking	Cracks caused by deterioration factors such as carbonation, salt damage, and ASR		
Honeycombing	Internal voids, cold joints, etc.	—	
Water leak crack	Water leakage from the rear of the structure	—	

References:Concrete crack inspection, repair and reinforcement guidelines2022(JCI)

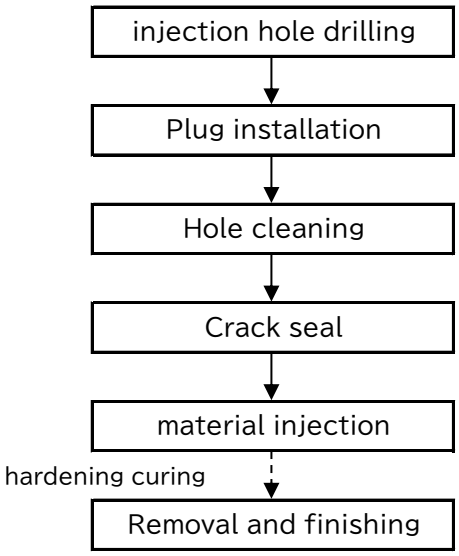
2. Construction method overview

2-1)Injection System

By using a drilled-hole insertion plug, the required amount of grout can be continuously injected into the rebar position without being affected by surface obstructions.



〔horizontal cross section〕

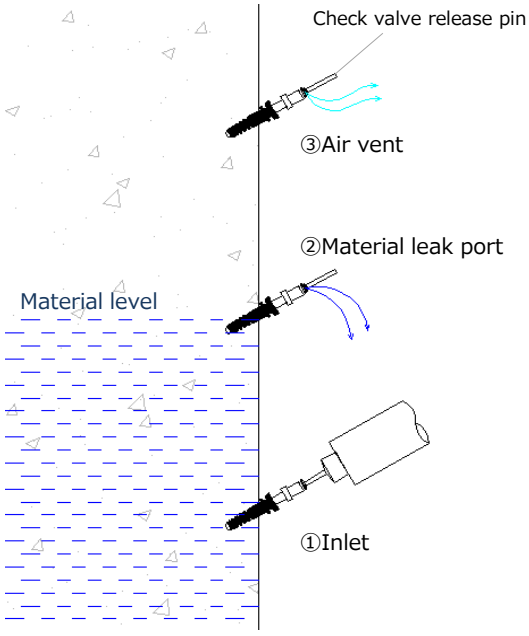


Low pressure injectable self-fixing plug

Bevel plug optimized for inorganic material injection

When injecting inorganic materials, the application of high pressure causes separation of the material. This can cause injection problems in grease nipple etc. type systems used for resin injection,

One bevel plug has three functions



〔Side cross-sectional view〕

The bevel plug has a built-in valve to prevent backflow, which is normally closed.By inserting the included valve release pin, the check valve will be opened.

①Inlet

Using a hand gun, inorganic grout is injected into the plug at the appropriate pressure.

②Material leak port

By inserting a check valve opening pin, it functions as a leak check port for the material filled inside the crack.

③Air vent

By inserting the check valve release pin, the air inside the crack is released and the internal pressure is relieved.

Check for material leaks from plugs close to the injection port (usually from bottom to top), and move sequentially from those plugs.

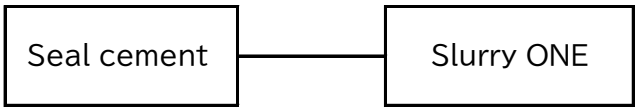
2-2)Inorganic injection material

Purpose	Product name	remarks
Crack sealing material	Seal cement (30 minutes hardening)	Cartridge Type 250g
Crack injection material	Restore AID Slurry ONE	polymer cement slurry
Crack injection material	Restore AID SF	Salt-adsorbing polymer cement slurry
Crack injection material	Restore AID WS	Geopolymer-based waterproofing

As of 2026.3

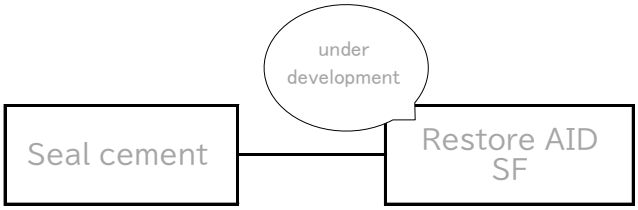
Three types of specifications are available depending on the condition and symptoms of the cracks.

ⅰ) Standard specifications (general cracks)



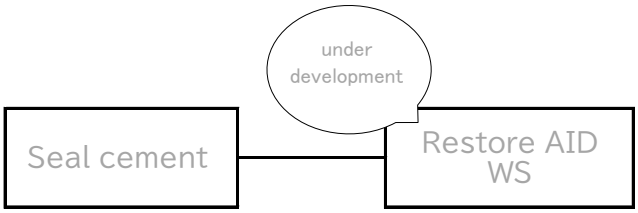
Range: 0.5 to 5.0㎜

ⅱ) Salt damage prevention specifications (Chloride ion adsorbent)



Concrete with an inherent salt content of 4% or more

ⅲ) Water-stop injection specifications



Cracks and joints with water leaks

・Materials can be designed to suit the repair purpose.
・It is also possible to use commercially available inorganic injection materials.

3. Quality control standards

Injection material (polymer cement /Slurry ONE)

Test items		results	remarks
Consistency	(seconds)	16.8	JSCE-K542 compliant
Water retention coefficient	(%)	48	
Expansion and contraction rate	(%)	1.06(expansion)	Material age: 1 days
Compression strength	(N/mm^2)	56.7	Material age: 28 days
Adhesive strength	(N/mm^2)	5.42	
Bending strength	(N/mm^2)	5.7	
Water absorption rate	(%)	13.1	

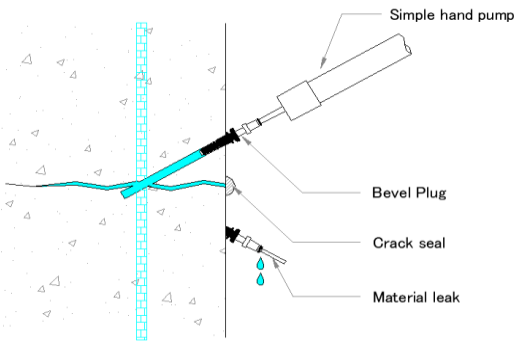
W/C:50%

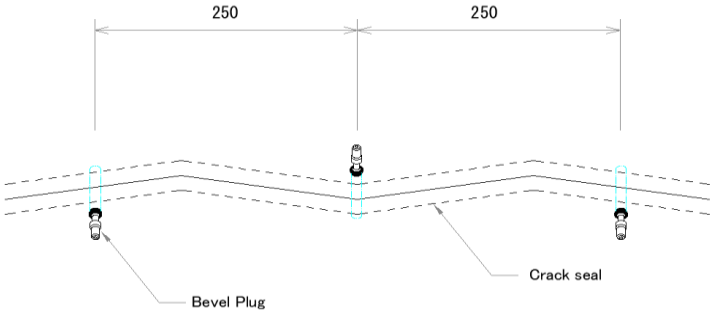
Sealing material (inorganic sealing cement)

Test items		unit	Standard value
Compression strength	σ 7	N/mm^2	30 or more
	σ 28		50 or more
curing time	20±2℃	min	15～45

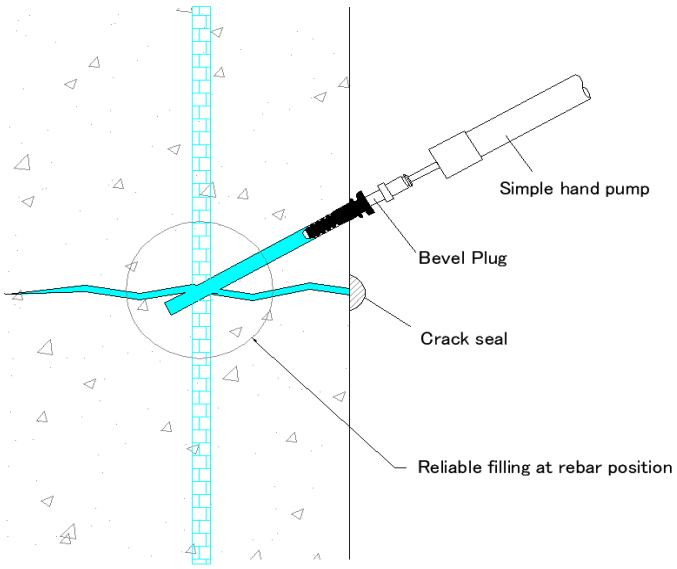
4. Standard construction drawings

General construction drawing

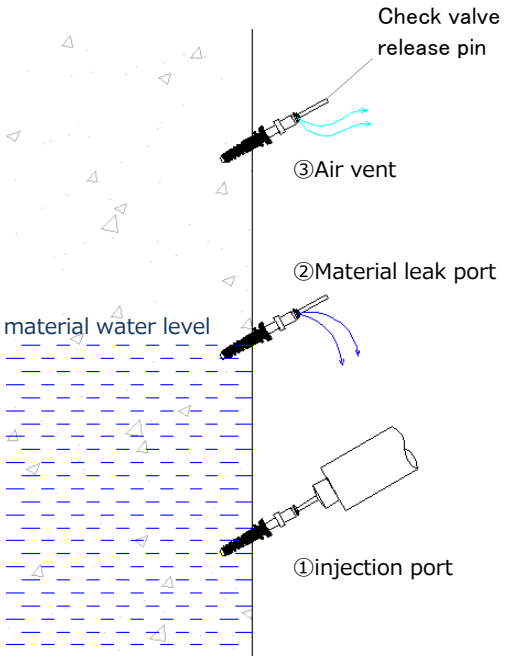




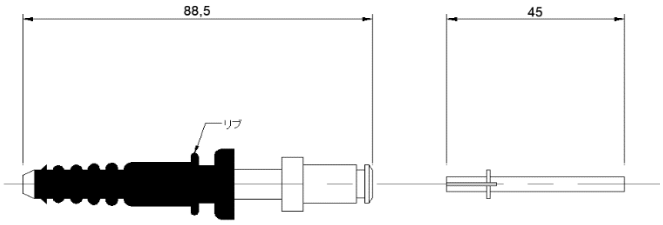
horizontal cross section



Side cross-sectional view



Plug details



5. Estimate criteria

Enter the yellow part.

Design price calculation sheet

input				
Repair specifications	Standard	Spec	Unit void volume	125.0 ml/m
Repair quantity	30.0	m	Per plug	31.3 ml
Crack width	0.5	mm	Inlet hole drilling	120 hole
Crack depth	250.0	mm	Plug installation	120 pieces
Plug Pitch	4.0	pc/m	Seal Extension	30.0 m
			Injection site	120 places

	Name/Item	quantity	unit	unit price	amount of money	remarks
Bevel plug method						
1	Labor costs	9.0	person day		0	person 0.30 day/m
2	Material cost					100%
	Bevel Plug	126.0	piece		0	5% loss 0 ¥/m
	Seal Cement	20.0	bottle		0	1.5m/bottle 0 ¥/m
	Slurry ONE	5.13	kg		0	18% loss 0 ¥/m
3	Miscellaneous expenses Includes machine usage fees	1.0	set		0	0 ¥/m
				total	0	
				per m	0	¥/m

Note 1) Separate quote for lengths of 30m or less

Note 2) Separate quote required for upward construction and mobile scaffolding construction

Note 3) Measures for heating in winter and cooling in summer are calculated separately

Note 4) Does not include costs for various surveys, tests, etc.

Note 5) Prices may change if there are significant fluctuations in labor and material costs.