



FIRE ASSESSMENT REPORT

FC18216-01-1

COATBACK REQUIRMENTS FOR SECONDAY AND TERTIARY STEEL MEMBERS CONNECTED TO PRIMARYY STEEL MEMBERS PROTECTED WITH NULLIFIRE SC902 INTUMESCENT COATING

CLIENT

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ASSESSMENT OBJECTIVE

To assess the effect of unprotected secondary and tertiary steel members on the fire resistance of primary steel members protected with Nullifire SC902 intumescent coating in accordance with AS 1530.4: 2014.

CONCLUSION

It is considered that a coatback length of 400 mm on an unprotected secondary member is suitable to limit the temperature on a Nullifire SC902 protected member for an FRL of at least 120/-/- provided the thickness of the Nullifire SC902 coating applied to the secondary member is equal to thickness applied to the primary member.

It is considered that unprotected tertiary steel members which cumulatively do not exceed 3,000 mm^2 of the cross-sectional area per metre length of the primary steel member or per metre of surface area do not require coatback.

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

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1. INTRODUCTION

This report gives BRANZ's assessment on the coatback requirements for primary steel members protected with Nullifire SC902 intumescent coating when connected to unprotected secondary and tertiary members.

The purpose of the coatback is to limit the temperature rise on the protected primary member such that its fire resistance is not reduced.

In this report consideration is given to the effects of 400 mm coatback for reactive fire protection systems.

The type of fire protection is limited to Nullifire SC902 intumescent coating.

2. DISCUSSION

Where unprotected steel members are connected to protected steel members there are concerns that a local hot spot may develop at the junction and cause premature failure of the protected member.

A University of Manchester paper "*Effects of partial fire protection on temperature developments in steel joints protected by intumescent coating",* published in Fire Safety Journal 44 (2009) examined the effects of coat back through a series of fourteen fire resistance tests where various intumescent fire protection schemes were tested.

It concluded that by:

- Protecting a segment of the connected beams by about 400 mm from the joint appeared to be sufficient to achieve full protection'.
- 400 mm steel protection has similar thermal resistance as the applied intumescent coating.

The testing which formed the basis of the University of Manchester paper evaluated the effects of coatback for a duration of 60 minutes. Nullifire SC902 is a coating which has been tested and certified for up to 120 minutes. Tremco CPB Australia have provided test data gathered from an internal fire resistance test (TRN 2329) where two short column sections were applied with a nominal 120 minute intumescent thickness of Nullifire SC902 (4.7 mm). Column A was a standard column deemed to be the 'control'. Column 2 was provided with two, 1,000 mm long, 100 mm x 5 mm thick steel flat bar sections which were screwed to the outer face of one of the column's flanges.

The flat bar sections were partially coated with the same thickness of SC902 as applied to the column, the SC902 coating was applied to give nominally 200 mm of coatback at each end of the flat bar sections, at each end of the flat bar sections, 175 mm was left uncoated.

The two columns were subjected to a 120 minute fire test using the heating conditions of BS 476: Part 20. The time to reach a mean temperature of 550^{o}C was recorded for each column. For Column A this was 118 minutes, for Column B it was 119 minutes. The test demonstrated that the attachment of partially protected secondary members to a primary member protected with Nullifire SC902 did not have a detrimental effect on the thermal performance of the primary member for 120 minutes.

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On the basis of the above research and referenced documents it is considered that a 400 mm coatback for secondary steel members would limit the temperature rise on the protected primary steel member so that it maintains its fire resistance level and loadbearing capacity for the fire resistance period it is intended to provide up to 120 minutes. The research work carried out also used the thickness of the fire coating appropriate to the protected member. In some cases this may mean that the unprotected member has a thinner coating than would be suitable for its protection. However the unprotected secondary member is not expected to maintain a fire resistance and the coating is applied to limit heat conduction into the protected primary member which was the purpose of the studies referenced in Section 4.

FABIG Technical Note 13 provides guidance for the coatback requirements for secondary and tertiary attachments for hydrocarbon applications. It categorises tertiary attachments as brackets for cable trays, instrument piping and handrails which would have small cross-sectional areas therefore the heat transfer would not be significant. It concludes that providing that the cumulative cross-sectional area of the tertiary attachment does not exceed 3,000 mm^2 per metre length of the primary steel member or per square metre of surface area, coatback is not required.

3. CONCLUSION

It is considered that a coatback length of 400 mm on an unprotected secondary member is suitable to limit the temperature on a Nullifire SC902 protected member for an FRL of at least 120/-/- provided the thickness of the Nullifire SC902 coating applied to the secondary member is equal to thickness applied to the primary member.

It is considered that unprotected tertiary steel members which cumulatively do not exceed 3,000 mm^2 of the cross-sectional area per metre length of the primary steel member or per metre of surface area do not require coatback.

4. REFERENCES

Fire Safety Journal 44 (2009). *Effects of partial fire protection on temperature developments in steel joints protected by intumescent coating*. University of Manchester.

TRN 2329. *SC 902 columns with 200 mm coatback.* Construction Products Group.

Fire and Blast Information group (FABIG), (2014). *Design Guidance for Hydrocarbon Fires,* Technical Note 13-September 2014. Page 39. Ascot UK.

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